HOBART AIRPORT – AVIATION RESCUE FIRE FIGHTING SERVICES
PRELIMINARY SITE INVESTIGATION

REPORT FOR AIRSERVICES AUSTRALIA

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1. ABBREVIATIONS

Acronym	Definition
ACM	Asbestos Containing Material
AFFF	Aqueous Film Forming Foam
AHD	Australian Height Datum
Airservices	Airservices Australia
ARFFS	Aviation Rescue and Fire Fighting Services
AST	Above-ground Storage Tank
Bgl	Below Ground Level
BTEXN	Volatile Monocyclic Aromatic Hydrocarbons [benzene (B), toluene (T), ethyl-benzene (E), o,m&p xylenes (X) and naphthalene (N); commonly referred to as BTEXN]
CAA	Civil Aviation Authority
CFTG	Current Fire Training Ground
CoPC	Contaminant(s) of Potential Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
EC	Electrical Conductivity
ESA	Environmentally Significant Areas
FAC	Federal Airports Corporation
FFTG	Former Fire Training Ground
FTG	Fire Training Ground
FtS	Fluorotelomer Sulphonate
GME	Groundwater Monitoring Event
HIAPL	Hobart International Airport Pty Ltd
MBAS	Methylene Blue Active Substances
mbgs	Metres Below Ground Surface
MFS	Main Fire Station
Nav Aid	Navigational Aid
OR	Operational Response
PAH	Polycyclic Aromatic Hydrocarbons
PFAS	Per- and Poly- fluorinated Alkyl Substances
PFHxS	Perfluorohexane Sulphonate
PFOA	Perfluorooctanoic Acid

Acronym	Definition
PFOS	Perfluorooctane Sulphonate
PSH	Phase Separated Hydrocarbons
PSI	Preliminary Site Investigation
SAQP	Sampling Analysis and Quality Plan
SEMF	SEMF Pty Ltd
TDS	Total Dissolved Solids
TFS	Tasmanian Fire Service
The LIST	The Land Information System of Tasmania – web based interactive search tool for numerous Tasmanian databases
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
TSS	Total Suspended Solids
UST	Underground Storage Tank
UTas	University of Tasmania

2. EXECUTIVE SUMMARY

The Preliminary Site Investigation (PSI) for Hobart Airport (refer to Figure 1) confirmed or identified 23 locations where aqueous film forming foams (AFFF) (and other contaminants of potential concern (CoPC)) have or may have been used (Table 2).

- 13 sites within the Airport (Sites A to M);
- 6 sites off-Airport (Sites N to S); and
- 4 general Airport areas.

It should be noted that exact locations for some on-Airport sites are uncertain, locations for off-Airport sites have not been confirmed, and general Airport areas are generalised only. Locations are shown in Figure 2.

A synopsis of AFFF usage information for each Site A to S has been compiled based on interview information and is summarised in Appendix G. The summary suggests that the sites with a high likelihood of contamination from AFFF are Sites:

- A – Main Fire Station (MFS),
- B – Current Fire Training Ground (FTG),
- E – Old Pond,
- F – University of Tasmania (UTas) building,
- H – Landfill A,
- I – Navigational Aid (NavAid) building, and
- L – Control Tower.

Site G is also likely to have AFFF contamination but its location is not confirmed.

Based on their usage period and anecdotal evidence, the following sites are considered unlikely to have any AFFF impact, or only very low impact from AFFF:

- C – Former Firefighting Training Ground (FFTG),
- D – Landfill B,
- J – Sand Pit, and
- K – Igloo.

Only water was used at OR sites N and R, hence AFFF impact would be minimal.

OR sites where AFFF was used included Sites O, P, Q and S. Their locations are not confirmed. Impact from AFFF is likely, but has not been assessed in this PSI.

Site M has not been assessed beyond the initial site inspection, as the Soil Stockpiles area is under Hobart International Airport Pty Ltd (HIAPL) control and management.

Based on the above, and information available from previous investigations, a Sampling Analysis and Quality Plan (SAQP) was developed for limited sampling to be undertaken at 6 sites, A, B, F, H, I and L. These were locations with the highest likelihood of AFFF contamination. Site E was not

directly included though surface water sampling locations up-gradient and downgradient of the former pond were aimed at gaining an understanding of possible leaching of AFFF from Site E to surface water.

Soil samples were collected from Sites A, B, F, H, I and L by sampling near surface soils (0.1m and 0.5m) via hand auger drilling. Only limited targeted locations were sampled. Soils were also sampled from 2 new wells DG7 and DG8, drilled northeast of the CFTG (Site B).

Groundwater sampling was undertaken at 1 open well, Site F, and from the 2 new wells, DG7 and DG8.

Surface water was sampled along Sinclair Creek and at several other locations north of the Airport, where water was present. Sediment samples were taken in lieu of surface water where none could be sampled at nominated sampling locations.

All samples were tested for Per- and Poly- fluorinated Alkyl Substances (PFAS) and total petroleum hydrocarbons / total recoverable hydrocarbons (TPH / TRH). If TPH / TRH were above the laboratory limits of reporting (LORs), benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN) and polycyclic aromatic hydrocarbons (PAH) were also tested.

Analytical results have been compared to applicable interim criteria, as outlined in Table 9 and Table 10. Previous surface water and some previous soil and groundwater data have been added to the summary tables of results (Appendix K) to allow for a contextual assessment of the data, where possible.

Soils Results Summary

Sediment results are included in the soil results summary. Hydrocarbon impact in near surface soils tested is negligible or nil.

PFAS impact appears to be as follows:

- Only 1 location investigated reported an exceedance of the adopted criteria: BH028-02 (0.5m), in the southwest corner of the CFTG (Site B), reported a PFOS concentration of 4.93 mg/kg, in excess of the Commercial / Industrial 60% species Ecological protection criterion;
- Low level perfluorooctane sulphonate (PFOS) and perfluorohexane sulphonate (PFHxS) impact is pervasive throughout near-surface soils;
- At many locations PFOS concentrations were found to be more elevated at 0.5m than at 0.1m;
- Low level Perfluorooctanoic Acid (PFOA) impact appears to be restricted to the MFS (Site A), CFTG (Site B) (including in the southeast corner of the potential new Fire Training Ground (FTG)), Landfill A (Site H) and most sediment samples;
- Low level 6:2 fluorotelomer sulphonate (FtS) detections only occurred in samples situated on the eastern side of the CFTG: BH023, BH029 and DG-8; and
- Low level 8:2 FtS detections only occurred in samples from the MFS and CFTG.

Surface Water Results Summary

Hydrocarbon impact in surface water appears to be negligible or nil.

PFAS impact appears to be as follows:

- PFOS, PFHxS and PFHxS+PFOS Ecological criteria are exceeded at all sampling locations downstream of the "MFS" stormwater discharge point to Sinclair Creek (except HIA07 due likely due to dilution from the TasWater WWTP discharge) and HIA09 (Sinclair Creek / 5-Mile Beach confluence);
- PFOS concentrations reported at HIA09 (Sinclair Creek / 5-Mile Beach) exceed Human Health Fish Consumption criterion, but are within the Human Health Recreational and the Ecological criteria.
- Low level PFOS and PFHxS impact is pervasive throughout surface water sampling locations including at the most upstream samples in Sinclair Creek where PFOS was detected but no PFHxS;
- Low level PFOA impact appears to be pervasive in most surface water sampling locations with the exception of the three most up-gradient locations in Sinclair Creek and the two northernmost locations in the swale drains northwest of the runway;
- 6:2 FtS was below LOR in all samples; and
- 8:2 FtS was only detected in stormwater samples at the MFS (Site A).

Groundwater Results Summary

Hydrocarbon and PFAS impacts are known to be present in groundwater beneath the MFS (Site A). Results have not been added to the PSI summary tables as the Site is the subject of separate groundwater investigations and monitoring.

Hydrocarbon results for most wells discussed in the PSI show no hydrocarbon impact with the exception of 3 wells at the CFTG, DG-5, DG-8 and DG-3 which has the higher concentrations and detectable BTEXN. John Sloane also reported having possibly intersected a thin layer of phase separate hydrocarbon (PSH) when dipping wells DG-2 and DG-5 (January 2017).

PFAS impact appears to be as follows:

- PFOS and PFHxS impact is pervasive in groundwater throughout all wells tested;
- PFOA is only detected above the LOR in CFTG wells;
- 6:2 FtS is only detected above the LOR in CFTG wells DG-3 and DG-5, situated south of the detention ponds and mock-up respectively;
- 8:2 FtS is only detected above the LOR in CFTG wells DG-3 south of the detention ponds;
- Exceedances of Ecological criteria for PFOS, PFHxS and PFHxS+PFOS occur in CFTG wells (DG-2, DG-3 and DG-5) and the 2 wells northeast of the CFTG, DG-8 and MW1;
- HA20, near Surf Road, southwest of the runway, has the highest PFOS concentration of the perimeter wells that have been tested for PFAS; and
- DG-7, situated close to Pittwater Road, reported detectable though low concentrations of PFOS and PFHxS.

Groundwater Gradients at CFTG

Survey (Sloane, 2017) of 9 wells and water level at the CFTG, and to the northeast and southeast of the CFTG has shown that groundwater is mounded at the CFTG and has a low gradient to the northeast and to the southeast (refer to Figure 10 in Appendix A). The mounding and the gradient(s) and direction(s) could be influenced, or compounded by:

- regular aviation rescue and fire-fighting services (ARFFS) fire-fighting training at the CFTG;
- possible leakage from one or both wastewater ponds;
- lack of vegetation within the CFTG footprint resulting in less water uptake and evapotranspiration; and
- sealed areas may act as a boundary to evaporation within their footprints.

The water table was at around 2m depth in January 2017. Groundwater movement direction(s) and gradient from the CFTG without these anthropogenic changes could differ from those shown in Figure 10 (Appendix A).

Conclusions

Soils

There appear to be low PFAS (in particular PFOS) concentrations across surface soils at all the sites investigated. Soil PFAS and hydrocarbon concentrations across the Sites and depths investigated within this PSI do not appear to present a human health or ecological risk if left *in situ*.

As might be expected, PFAS concentrations in soils were generally at higher concentrations at the MFS (Site A) and the CFTG (Site B) than at the other Sites (F, H, I and L). Average PFOS concentrations in near surface soils (using comparable samples from this PSI only) are listed below in order of highest to lowest. The concentrations appear to correlate closely with expected and reported frequency and quantity of AFFF use at each Site.

- Site A - MFS: 10 samples, 1.39mg/kg;
- Site B - CFTG: 7 samples (in fenced area), 0.82mg/kg;
  13 samples (outside fenced area), 0.05mg/kg;
- Site H - Landfill A: 7 samples, 0.011mg/kg;
- Site F - UTas Building: 6 samples, 0.007mg/kg;
- Site L - Control Tower: 13 samples, 0.0038mg/kg; and
- Site I – Nav Aid Building: 4 samples, 0.002mg/kg.

Rabbit burrows were encountered at several locations on the eastern side of Tower Hill (Site L). It is understood that landscaping contractors have backfilled a number of holes with soil. This may have resulted in slightly lower average PFAS concentrations at this Site.

Given the leachability of PFAS compounds and low water PFAS detection LORs, it is possible that soils which do not exceed Human Health and Ecological criteria, could be leaching PFAS to surface water and groundwater. Given the sandy permeable profile throughout the Airport land and the

relatively shallow water table across most of the land (1.5 – 2.5m), leaching to groundwater is highly likely.

Several sediment samples were taken in lieu of surface water. They are also potentially representative of transported PFAS via leaching in stormwater, or via sediment transport. All sediment samples reported detectable PFAS concentrations. The lowest concentration were in the 2 samples (HIA20-SED and HIA21-SED) east of the runway and situated between Site I (Nav Aid Building) and Sinclair Creek. Both samples were taken from low lying drainage areas which carry water eastwards from Site I and east of the eastern gravel road. The Nav Aid building had the lowest PFAS in soils concentrations (of the Sites tested) and this correlates well with the lower sediment concentrations.

Sediment sample HIA15-SED was taken from a stormwater drain feeding from the carpark west of the Terminal and past the hospital kitchen building. It is likely that stormwater from Tower Hill might report to that drain, and the low level impact in the sediments of HIA15-SED (0.0056mg/kg) is of a similar order to the soil at Site L (0.0038mg/kg).

The 2 sediment samples taken from the northernmost samples, HIA11-SED and HIA14-SED have the higher PFAS concentrations of the sediment samples, with PFHxS+PFOS concentrations of 0.012 and 0.014mg/kg respectively. HIA11-SED was taken from the northernmost point along the northeastern swale drain. HIA14-SED was taken in the southernmost point along what appears to be a linear depression north of the Terminal, which runs parallel to and west of the runway.

The sediment samples results appear to show that transport of PFAS has or is occurring via stormwater, even from areas with very low PFAS impact.

Groundwater results at wells HA19 and the open well near the UTas Building (Site F) suggest that PFAS impacts to groundwater have occurred via percolation to the water table. Groundwater results at well HA21, next to Landfill A (Site H) also suggests impacts to groundwater from PFAS percolating through the profile.

Surface Water - Hydrocarbons

Hydrocarbon impact in surface water samples is insignificant or not detected in the samples taken (December 2016, during this PSI) and past samples reviewed. Hence hydrocarbon management measures on Airport appear to be effective in minimising impact to surface waters.

Surface Water – PFAS – General Airport

Surface water PFAS concentrations in the 2 northernmost samples HIA04-W (NW of runway) and HIA10-W (northern end of runway) are of a similar order, with PFHxS+PFOS being 0.045ug/L and 0.078ug/L. This is likely to represent the low level diffuse PFAS concentrations expected in surface waters draining from low PFAS soil impact areas.

PFAS concentrations in water sample at HIA16-W, immediately north of the apron, are an order of magnitude higher than HIA04-W and HIA10-W, suggesting that there is PFAS impacted soil or infrastructure draining to that area. Apron, taxiways and grassed areas drain to this sampling point, however actual source(s) have not been confirmed.

Sinclair Creek

PFOS concentrations reported at HIA09 (Sinclair Creek / 5-Mile Beach) exceed Human Health Fish Consumption criterion, but are within the Human Health Recreational and the Ecological criteria. The risk to human health, associated with potential recreational fishing at 5-Mile Beach has not been assessed. The samples were taken within the Sinclair Creek channel, and it is expected that dilution along 5-Mile Beach would be rapid, but has not been confirmed. Accumulation of PFAS in sediments/sands and biota along Sinclair Creek channel east of the Airport land, and at 5-Mile Beach may have occurred but has not been tested.

The stormwater pipe coming from the MFS (Site A) and discharging near sampling point SW5 (Figure 2) appears to be the most significant source of PFAS to Sinclair Creek, though other lower PFAS concentration sources appear to be contributing to the creek. Input sources to Sinclair Creek have not been tested. The relatively high concentrations at HIA05-W and HIA03-W, east of the runway are of interest. Strong dilution is shown to occur at HIA07, up-gradient of these 2 locations, near the TasWater wastewater treatment plant (WWTP) discharge point to Sinclair Creek. The increase in concentrations downgradient of the WWTP discharge point, across the runway is not readily explained. It could be:

- that the sample at HIA07-W was taken from highly mixed water consisting mostly of WWTP effluent;
- that the WWTP effluent water does not mix readily with Sinclair Creek water due to differences in salinity and other physicochemical characteristics, which would mean that samples taken downstream at HIA05-W and HIA03-W, if taken within unmixed creek water, are showing natural downgradient dilution from the major source at SW5 (MFS stormwater discharge point); or
- that there could be other source(s) of PFAS contaminated surface water draining into Sinclair Creek east of the runway which are increasing the PFAS concentrations.

The hydrology of Sinclair Creek, including its input sources and potential PFAS inputs are not well understood, although it has been confirmed via this round of sampling, that the stormwater channel draining from the MFS (Site A) is the major contributor of PFAS. The contribution of PFAS from the former pond (Site E) appears to be suggested by the surface water sampling (i.e. there was an increase from the up-gradient sample HIA17-W (HIA06) to the downgradient sample HIA13-W). Further testing is required to confirm if Site E is a source, and to confirm Sinclair Creek water movements near the MFS (Site A) stormwater discharge point. It is also noted that the salinity of Sinclair Creek increases east of the runway, and organic matter in soils also increases within the salt marsh. Both of these factors may influence movement of PFAS in the creek water or adsorption along the creek bed.

Groundwater

Hydrocarbon and PFAS impacts in groundwater are known at the MFS (Site A) and have been confirmed at the CFTG (Site B). Both sites have an array of groundwater monitoring wells and are monitored annually.

Hydrocarbon and PFAS plume extent and movement at the MFS has not been completely modelled due to the complex interbedding of sand and clay horizons. Discharge of groundwater from the

MFS to surface water has not been tested. This is considered to represent the higher risk path to sensitive receptors.

Movement of groundwater-borne contamination from the CFTG could be in several directions, spanning an arc from the northeast to southeast, though southwest cannot be excluded, based on past monitoring results (Sloane Geoscience – several groundwater monitoring events). Sensitive receptors are present offsite and downgradient of the CFTG, including abstraction bores (northeast of the CFTG) and Seven Mile Beach, recreational users. Very low level PFAS contamination was detected in surface soils and in groundwater at well DG7, situated northeast of the CFTG near Pittwater Road. It is assumed that the impact at surface could be from spray drift of historical bush training operations or sprinkling of CFTG wastewater in the forest east of the CFTG, and impact to groundwater could be either from percolation of leached PFAS from surface, or from migration of groundwater from the CFTG. Potential impact from forestry or other operations within the area has not been assessed. DG7 is situated within forested land, close to pine plantations, located east of Pittwater Road. PFAS concentrations in DG7 are currently well below Human Health Drinking Water criteria and are therefore expected to be well below stock watering criteria. The current risk to the water quality of users to the northeast of the CFTG is considered to be low. Long term risks have not been assessed as hydrogeological modelling or fate and transport modelling have not been undertaken.

Well HA20, located at the southwest corner of the Airport, near Surf Road, reports the highest PFAS concentrations of all perimeter wells. The source of PFAS detected at this location is not confirmed. It may be from the CFTG, located 650m northeast, or from some other source south of the runway. There have been significant excavations in the last months at the southern end of the runway to accommodate the runway extension. The depth of excavations may affect groundwater flows locally, and between the CFTG and HA-20. The next round(s) of monitoring may provide an indication as to the possible connectivity between the two locations. If the concentrations at HA-20 decrease noticeably, it may be that:

- the nearby source of PFAS was removed during runway extension excavations; or
- the runway extension excavations have created a groundwater movement barrier between the CFTG and HA-20;

either way, that would mean that less PFAS is likely to report to Seven Mile beach at this end of the Airport.

If the concentrations at HA-20 remain similar, then it may be assumed that:

- the source area is near HA-20; or
- the connectivity between the CFTG and HA-20 has been maintained.

Confirmation of one or the other (or both) may need to be obtained via further investigation. ARFFS staff reported ‘numerous’ ORs south of the runway. None of the locations were known, however it is likely that AFFF impact occurred. PFOS concentration at HA-20 exceeds the Human Health Recreational level of 0.7ug/L (FSANZ, 2017).

DG-6, approximately 450m southeast of the CFTG, near Surf Road, reports low PFAS impact, lower than HA20, even though it is situated closer to and downgradient of the CFTG. The concentrations are currently within both Human Health Recreational and Ecological PFAS criteria, hence the

current risk of groundwater from this area discharging into Seven Mile Beach is considered to be low.

Drinking water and recreational values are not directly applicable to any of the groundwater wells at the Airport. Groundwater concentrations have therefore been assessed against Ecological criteria only. The CFTG and the MFS (GES, 2015) both have PFAS concentrations in groundwater which exceed Ecological criteria. Ecological receptors at and downgradient of these sites include:

- Sinclair Creek and its saltmarsh and 5-Mile Beach potentially downgradient of the MFS – discharge of groundwater from the MFS to Sinclair Creek (or to the backfilled pond, Site E and then to Sinclair Creek) has not been tested; and
- Seven Mile Beach southeast of the CFTG, and 5-Mile Beach to the northeast.

Stock watering, plant watering and recreational values are relevant beyond the boundary of the Airport. Groundwater criteria for these uses are more stringent than Ecological and are expected to be exceeded by the CFTG PFAS groundwater concentrations. Current risks to all of these sensitive offsite users are currently considered to be low, based on the groundwater results at bores closest to these locations, however longer term modelling and risks should be considered in order to inform possible management measures.

Conceptual Site Models

Based on a review of the information and data collected during the PSI, preliminary CSMs for each ARFFS site where AFFF has historically been used are summarised in Table 1. The table shows that, based on the PSI results and review of past investigations, the following Sites and media have concentrations of PFAS or TRH in excess of adopted interim criteria:

- Site A (MFS): PFAS in surface water and TRH in groundwater;
- Site B (CFTG): PFAS in soils, and PFAS and TRH in groundwater;
- PFAS in Sinclair Creek; and
- PFAS in groundwater at one perimeter well HA20.

Schematic representations of PFAS inputs and migration pathways have also been compiled for Site A (MFS) and Site B (CFTG), in Figures 14 and 15 (Appendix A). Sensitive receptors for which a potential complete pathway exists from a known and confirmed contamination source include:

- Aquatic and terrestrial biota using Sinclair Creek, downgradient of SW5;
- Workers who may come in contact with water from Sinclair Creek downgradient of SW5;
- Recreational users and fishers on 5-Mile Beach;
- Site workers who may come into contact with surface water or groundwater from the MFS and CFTG;
- Offsite groundwater users downgradient of the Site B (CFTG); and
- Beach users and biota down-groundwater gradient of Site B (CFTG), such as 5-Mile Beach, 7-Mile Beach.

Table 1: Preliminary Conceptual Site Models – PFAS & Hydrocarbons

Sites	Soils criteria				Surface Water criteria					Groundwater criteria				Receptors	Pathways to Receptors		
	PFAS - Commercial / Industrial	TRH - HSL A	PFAS - Open Space	PFAS & TRH Ecological	PFAS Recreational / Workers	PFAS Human Health-Fish Consumption	TRH - drinking water	PFAS - Ecological	TRH - Ecological	PFAS Recreational / Workers	TRH - drinking water	PFAS - Ecological	TRH Ecological		Soil	Surface Water	Groundwater
A - MFS	**Shallow soils** **Soils at depth**	√	O	**Shallow soils** **Xylenes & PAH > AER Ecological**	X	O	X	X	√	X (2014 data)	X (2014 data)	X (2014 data)	X (2014 data)	Workers A	no	no	no
														Workers B	yes	yes	yes
														Biota	underground organisms	discharge to Sinclair Creek	underground organisms
														Sinclair Creek	sediments	yes - not all sources of PFAS contamination to SW are known	connectivity is unknown
B - CFTG	√	√	O	X	O	O	O	O	O	X	X	X	√	Workers A	no	no	no
														Workers B	yes	yes (wastewater ponds)	yes
														Biota	underground organisms	yes (wastewater ponds)	underground organisms
														Groundwater extraction	via groundwater if soils leach PFAS	unlikely unless wastewater retention ponds leak and recharge groundwater	current low risk; long term risk to be determined
F - Utas Building	√	√	√	O	O	O	O	O	O	√	Δ	√	√	Workers A	no	no surface water	no
														Workers B	yes, but low risk based on PSI results	no surface water	low risk based on data and depth to groundwater @2m
														Biota	yes, but low risk based on PSI results	no surface water	risk is low based on data
H - Old Landfill A	√	√	√	O	O	O	O	O	O	√	Δ	√	√	Workers A	no	no surface water	no
														Workers B	yes, but low risk based on PSI results	no surface water	low risk based on data and depth to groundwater @2m
														Biota	yes, but low risk based on PSI results	no surface water	risk is low based on data
I - NavAid Building	√	√	√	√	O	O	O	O	O	Δ	Δ	Δ	Δ	Workers A	no	no surface water	no
														Workers B	yes, but low risk based on PSI results	no surface water	no data, but risk is low based on soil concentrations and depth to groundwater @2m
														Biota	yes, but low risk based on PSI results	no surface water	no data, but risk is low based on soil concentrations
L - Control Tower	√	√	√	O	O	O	O	O	O	Δ	Δ	Δ	Δ	Workers A	no	no surface water	no
														Workers B	yes, but low risk based on PSI results	no surface water	no data, but risk is low based on soil concentrations and depth to groundwater @2m
														Biota	yes, but low risk based on PSI results	no surface water	no data, but risk is low based on soil concentrations
Sinclair Creek	**No PFAS testing has been done in creek sediments**				X	X	X	X	√	O	O	O	O	Workers A		no	
														Workers B		yes	
														Recreational fishers (5-Mile Beach)		yes, and potential risk as exceeds HH criterion for fish consumption at HIA09	
														Recreational users (5-Mile Beach)		yes, but low risk based on concentrations at HIA09	
														Biota		yes	
General	Δ	Δ	Δ	Δ	O	O	O	O	O	O	O	O	O	Workers A	no		

Sites	Soils criteria				Surface Water criteria					Groundwater criteria				Receptors	Pathways to Receptors		
	PFAS - Commercial / Industrial	TRH - HSL A	PFAS - Open Space	PFAS & TRH Ecological	PFAS Recreational/ Workers	PFAS Human Health-Fish Consumption	TRH - drinking water	PFAS - Ecological	TRH - Ecological	PFAS Recreational/ Workers	TRH - drinking water	PFAS - Ecological	TRH Ecological		Soil	Surface Water	Groundwater
Airport Soils														Workers B	low risk based on PSI results in other airport areas		
														Biota	low risk based on PSI results in other airport areas		
General Airport Surface Water (excluding Sinclair Creek)	O	O	O	O	√	O	O	√	√	O	O	O	O	Workers A		no	
														Workers B		low risk based on PSI results in other airport areas	
														Biota		low risk based on PSI results in other airport areas	
General Airport Groundwater	O	O	O	O	O	O	O	O	O	**X (Well HA20)**	**Issue with Lab LOR for TRH**	**No PFAS data in ground-water north of Sinclair Ck and MFS**	√	Sinclair Creek			connectivity from major PFAS source areas (e.g. CFTG) is unknown
														Workers A			no
														Workers B			yes
														Offsite abstraction bores			GW use to be confirmed & connectivity tested if required
														Barilla Bay, Pittwater, 7-Mile Beach: users			actual discharge area(s) of GW from major PFAS sources are unknown
														Barilla Bay, Pittwater, 7-Mile Beach: biota			actual discharge area(s) of GW from major PFAS sources are unknown

Criteria Legend

√	Concentrations detected were below the criteria
X	Concentrations detected exceeded the criteria
O	Not applicable
Δ	Not investigated / not currently a priority
□	Data / knowledge gap

Pathways Legend

Workers A:	Everyday Airport Workers & Staff doing day-to-day tasks
Workers B:	Workers undertaking earthworks or environmental sampling (i.e. high likelihood of contact with soils, surface water or groundwater)
	No Pathway, or risk is very low
	Likely Pathway, or risk is high
	Pathway is not applicable
	Data / knowledge gap

3. INTRODUCTION

3.1 BACKGROUND

As a result of a number of investigations at a range of Australian airports, Airservices Australia Pty Ltd (Airservices) is aware that there is likely to be potential per- and poly- fluorinated alkyl substances (PFAS) impacts at all Aviation Rescue and Fire Fighting Services (ARFFS) locations where Aqueous Film Forming Foam (AFFF) had been present (including the fire stations, workshops and fire training grounds (FTGs)) and that ARFFS infrastructure, such as concrete training pads and wastewater treatment systems, which have been exposed to AFFF will likely be contaminated to some degree, and as a consequence must be considered to be potential secondary sources.

Airservices continues to take a scientific, risk-based approach in managing potential PFAS contamination at the airports where AFFF have historically been used by ARFFS. As part of Airservices' national program to manage potential PFAS residues at the airports and to improve data on potential risks to beneficial users, Airservices has commissioned SEMF Pty Ltd (SEMF) to carry out a Preliminary Site Investigation (PSI) at Hobart Airport. The PSI was to include limited intrusive sampling.

Some areas of Hobart Airport (the 'Airport') land are known to have been impacted by AFFF as a result of past fire-fighting activities. Furthermore, due to the ongoing requirements of fire-fighting training and operational responses at Hobart Airport, equipment and infrastructure are a potential source of environmental contamination if not appropriately managed.

3.2 OBJECTIVE

The project objective is to develop a comprehensive PSI for Hobart Airport, to refine Airservices' risk ranking of the Airport and potential AFFF-impacted locations within the Airport, which will assist Airservices with future management of AFFF-impacted areas, if required.

3.3 LIMITATIONS AND EXCLUSIONS

The PSI has been limited to a desktop review of available information, interviews with key Airport personnel, a site visit and a limited environmental sampling program[1]. SEMF has endeavoured to assess the accuracy of third party information received during the PSI, but cannot guarantee accuracy of any part, without further investigation.

The following limitations should be noted:

- The main focus of the PSI is potential PFAS contamination from the historical use of AFFF by the ARFFS; associated hydrocarbon use has also been considered.

[1] Hobart Airport – Aviation Rescue Fire Fighting Services, Preliminary Site Investigation, Sampling Report, for Airservices Australia, 13 April 2017 – Final – SEMF Pty Ltd, Project No: 2105.022

- No investigation into the contamination status of potentially PFAS-contaminated infrastructure such as concrete pads at the ARFFS washdown bay and at the current fire training ground (CFTG), wastewater oil-water separators and other wastewater treatment systems, stormwater pits and pipes.
- No investigations have been undertaken in ARFFS-used areas which pre-date AFFF use (e.g. Site C, Former Fire Training Ground (FFTG)) or areas where ARFFS trucks only used water (i.e. no foam), e.g. Site K, the Igloo).
- No investigations have been undertaken, on- or off-Airport, in locations identified as Operational Response (OR) locations.
- No investigations have been undertaken in areas) not managed or used by Airservices (e.g. Site M).
- No investigation into other contaminants of potential concern (CoPCs), potential for building contaminants such as asbestos, or lead-based paints has been undertaken.
- No interviews were held with long-standing Hobart International Airport Pty Ltd (HIAPL) personnel.
- A full audit of non-ARFFS sites at the Airport has not been undertaken to obtain a comprehensive inventory of current and/or historic AFFF storage areas or potential use.
- The potential for contamination from off Airport, impacting on the Airport and AFFF sites, has not been directly investigated.
- The potential for use of pesticides (and potential residual PFAS compounds) at the University of Tasmania (UTas) usage area (Site F) has not been considered.
- A complete review of demolished and existing buildings, roadway slabs/hardstand, etc. (e.g. age, construction materials and services) has not been undertaken.
- A Tier 1 risk assessment has been undertaken by comparing analytical results to interim assessment criteria. Contextual information has also been used to update the Conceptual Site Models (CSMs) and determine relative risks at the Airport.

4. SCOPE OF WORK

In order to satisfy the project objectives, the PSI was undertaken in several stages through implementation of the following:

- Stage 1 – development of a Stakeholder Communication Brief.
- Stage 2 – draft PSI investigation, including:
    - Requesting and reviewing relevant historical and current Airport information;
    - Reviewing and obtaining copies of historical aerial photographs at decade intervals;
    - Conducting Airport visits and interviews with ARFFS and Airport personnel;
    - Inspecting previously identified sites within the Airport, where AFFF had been used and collecting photographs;
    - Developing a preliminary CSM for selected sites where AFFF had been used;
    - Providing recommendations for limited intrusive investigations based on previous investigations, recent data, and an evaluation of the likelihood of the potential risks identified being realised;
    - Identifying neighbouring Airport landholders that may be affected by identified CoPC[2]; and
    - Compiling the findings into a draft PSI report[3].
- Stage 3 – development of a costed SAQP, including:
    - Determining the requirements (or not) for limited intrusive sampling at each identified site where ARFFS has been used, based on the preliminary CSMs; and
    - Compiling the SAQP[4].
- Stage 4 – implementation of the SAQP and reporting on the results in a Factual Report (SEMF, 2017(a))[5].
- Stage 5 – finalise the PSI investigation by compiling the findings from Stage 4 into the PSI report and integrating with previous data where appropriate and available (this report).

[2] Provided as a separate spreadsheet as required in PRN11384

[3] Hobart Airport – Aviation Rescue Fire Fighting Services, Preliminary Site Investigation, report for Airservices Australia, 30 August 2016 - Draft 2 - Project No: 2105.022, SEMF Pty Ltd

[4] Hobart Airport – Aviation Rescue Fire Fighting Services, Preliminary Site Investigation, Sampling and Analysis Quality Plan, for Airservices Australia, 31 October 2016 - Final V2 - Project No: 2105.022, SEMF Pty Ltd

[5] Hobart Airport – Aviation Rescue Fire Fighting Services Preliminary Site Investigation, Sampling Report for Airservices Australia, 13 April 2017 – Final - Project No: 2105.022, SEMF Pty Ltd

5. AIRPORT INFORMATION

5.1 AIRPORT IDENTIFICATION

The Airport location and details are summarised in Table 2 and illustrated in Figures 1 and 2 (Appendix AA). Infrastructure details at Site A, Main Fire Station (MFS) and Site B, CFTG, are provided in Figures 3 and 4 respectively (Appendix A).

Table 2: Location and Site Details

AIRPORT LOCATION:
Hobart Airport comprises Commonwealth-owned leasehold land and two freehold properties:
▪ Leased land: 1309 Tasman Highway, Cambridge, Tasmania, 7170
▪ Freehold land:
  ○ 158 Surf Road, Cambridge, Tasmania, 7170
  ○ 525 Pittwater Road, Cambridge, Tasmania, 7170

AIRPORT AREA: ▪ Hobart Airport occupies an area of approximately 565 hectares (comprising both Commonwealth and freehold land) ▪ Leasehold land is 498.5 hectares
IDENTIFIED SITES WHERE AFFF HAD-, OR MAY HAVE BEEN USED (Refer to Figure 2): ▪ Site A –MFS ▪ Site B –CFTG ▪ Site C – Former Fire Training Ground (FFTG) (also on Figure 6) ▪ Site D – Remote Training – Old Landfill B (also on Figure 6) ▪ Site E – Large Backfilled Pond (Sinclair Creek) (also on Figure 6) ▪ Site F – Remote Training – University of Tasmania Building (also on Figure 6) ▪ Site G – Remote Training – bush area ▪ Site H – Remote Training – Landfill A (also on Figure 7) ▪ Site I – Remote Training – Old Navigational (Nav) Aid Building (also on Figure 8) ▪ Site J – Remote Training – Sand Mine ▪ Site K – Remote Training – Igloo ▪ Site L – Remote Training – Control Tower (also on Figure 9) ▪ Site M – Soil Stockpiles ▪ Site N – Operational Response (OR) – Southern End of Runway ▪ Site O – OR – Tasman Highway Car Crash ▪ Site P – OR – Tasman Highway Plane Crash (not shown on Fig 2 as off-map) ▪ Site Q – OR – Tasman Highway BP truck overturned (not shown on Fig 2 as off-map) ▪ Site R – OR – Golf Course ▪ Site S – OR – Cambridge Airport (not shown on Fig 2 as off-map) ▪ General Airport – drainage network, grassed areas, hardstand and buildings near ORs, training and AFFS operations
CERTIFICATES OF TITLE: ▪ Leasehold land: 152454/1 ▪ Freehold land: SP148359 and SP148358

CURRENT LAND USE: ▪ Airport, supporting services, related operations and several other commercial tenancies ▪ Freehold land areas are used as pine plantations
HISTORICAL LAND USES: ▪ Agriculture – sheep grazing (prior to Airport operations) ▪ Some tree plantations
PROPOSED LAND USE: ▪ Generally, the land use will remain focussed on Airport operations and other associated and non-associated businesses

5.2 ZONING

Airport Land Zoning is as follows (refer to The LIST Clarence Interim Planning Scheme zoning map provided in Appendix B; *Clarence Planning Scheme* 2007 zoning maps are no longer available):

- Current zoning of Leasehold land under the *Clarence Planning Scheme* 2007 is 'Special Area Miscellaneous, Noise Exposure Forecast';
- The Leasehold land is unzoned under the *Clarence Interim Planning Scheme* 2015, as it is under Commonwealth ownership; and
- Both Freehold land areas are subject to statutory planning controls under the *Clarence Planning Scheme* 2007 and are zoned 'Recreation'. In the *Clarence City Council Interim Planning Scheme* 2015 these two titles have been rezoned 'Light Industrial', with particular note to aviation related uses.

The Airport area and surrounds are covered by the 'Airport Buffer Overlay' nominated under the *Clarence Planning Scheme* 2007, which remains the same in the *Clarence City Council Interim Planning scheme*, 2015.

Surrounding Land Zoning:

Based on the *Clarence Interim Planning Scheme*, 2015, land zoning surrounding the Airport comprises:

- To the south, adjacent to the southern Airport boundary along Seven Mile Beach, zoning is 'Environmental Management';
- To the east, adjacent to the eastern Airport land boundary, zoning is 'Rural Resource and Open Space';
- To the north, the Airport land is bounded by a thin strip of land zoned 'Utilities', and north of that by strips of land zoned 'Rural Resource', 'Open Space', 'Recreation', 'Light Industrial' and 'Commercial';
- To the west, the Airport land is bounded by land zoned 'Light Industrial', 'Recreation and Open Space';
- Further southwest by Seven Mile Beach locality, zoned 'Village'; and
- Further west by a large area zoned 'Rural Living'.

5.3 AIRPORT OWNER & OWNERSHIP HISTORY

The Airport has been Commonwealth-owned since 1988[6], when Federal Airports Corporation (FAC) assumed ownership and control of the Airport. Operation of the Airport was privatised under a land lease agreement and the lessee has undergone the following changes:

- In 1998 the Airport was privatised with HIAPL entering into a 99-year land lease with the Commonwealth Government (50 years (to 2048) plus a 49 year option for extension);
- From 1998 – 2004 the Airport was operated by HIAPL with a mix of international and local owners;
- From 2004 – 2007 the Airport was operated as a component part of Tasmanian Ports Corporation Pty Ltd (TasPorts); and
- In 2008, HIAPL was sold to its current owners the Tasmanian Gateway Consortium - this consortium comprises Macquarie Global Infrastructure Fund III, a Macquarie-managed unlisted infrastructure fund with a 50.1 percent interest in Tasmanian Gateway Consortium, and Retirement Benefits Fund Board, a Tasmanian superannuation fund with a 49.9 percent interest in Tasmanian Gateway Consortium.

Under the terms of the land lease, HIAPL is mandated to operate the Airport, to effect capital improvements in accordance with the Hobart Airport Master Plan 2015 (Master Plan), protect the environment and maintain the Airport in good repair.

5.4 AIRPORT DEVELOPMENT DATES

Airport development dates are summarised as follows:

- 1956 - Airport (including Terminal building and runway) at Llanherne was commissioned (Cambridge Aerodrome previously served the Hobart region);
- 1976 - Both the Terminal building and runway were re-developed;
- 1983 - An international Terminal was commissioned;
- 1985 - Further Airport upgrades occurred with Terminal building extension, additional apron and carpark facilities and the runway was extended to its current length; and
- 2009 – present – a range of developments as listed in Table 1b of the Master Plan.

5.5 HIAPL OPERATIONS AND OTHER AIRPORT USES

HIAPL operations include the provision of aeronautical services and facilities, including the following core Airport infrastructure:

[6] *Hobart Airport 2015 Master Plan*

- A single runway system, two taxiways and taxiways linking the runway to aprons to the east and south of the Terminal;
- Ground handling facilities including fuel storage;
- An integrated domestic and international Terminal facility,
- The Qantas Freight and TOLL Air freight facilities;
- General Aviation facilities primarily to service rotary wing (helicopter), Royal Flying Doctor Service and private jet aircraft;
- The Air Cargo freight facility leased by HIAPL to SkyTrek Pty Ltd;
- Airservices Australia facilities and infrastructure including navigation aids, aviation rescue and firefighting services, air traffic control tower; and
- Road, parking, sewerage, drainage, electrical and telecommunications reticulation.

Other facilities and services provided by HIAPL and its tenants include car rental, freight forwarding and logistics, emergency, meteorological, customs, immigration, retail, helicopter operations and training, ground transport services and quarantine services.

According to the Master Plan, in addition to its core aviation business and development, non-aviation uses have been supported within the Airport. Non-aviation development at the Airport has occurred successfully since privatisation in 1998 and the Airport currently has approximately 36 tenants that directly support aviation business and approximately 27 tenants that are not directly related to aviation[6].

Both parcels of Freehold land are currently used as pine plantations and have a history of pine plantation. They are managed under Forest Practices Plans.

Future Plans

The Master Plan (refer to Appendix C) outlines a range of expansions to the runway, Terminal, taxiways, aprons, internal and external roads, and changes to landside transport facilities over 0 to 5 years and 5 to 20 years, all of which will affect the Airport development footprints.

The Master Plan notes that the ARFFS area will remain unchanged during the redevelopments.

The Master Plan details a range of land use precincts, within the leasehold land (refer to Figure 12, Appendix A). These include:

- Runway Precinct;
- 2 Local Business Precincts;
- 2 Aviation Precincts;
- Terminal Precinct;
- Tourism / Mixed Use Precinct;
- 5 Environment Precincts; and
- 2 Light Industry Precincts, corresponding to the 2 Freehold land titles and consistent with their interim zoning.

5.6 REGIONAL SETTING

5.6.1 Airport Locality and Surrounding Land Use

The Airport is located approximately 15 kilometres east of Hobart, off the Tasman Highway. It is situated at the western end of the Seven Mile Beach Spit, and east of the Meehan Range hills. Being on a spit it is surrounded nearby and on three sides by tidal waterways, including Pitt Water to the north and east, and Frederick Henry Bay to the south.

Surrounding land uses and potential off-Airport receptors include:

- Users adjacent the Airport to the southwest, which includes golfers;
- Seven-Mile Beach (beach/spit and residential locality) and Frederick Henry Bay to the south, which includes residents and recreational beach and water users;
- Plantation pine forests, pasture and saltmarsh to the east, and 5-Mile Beach and Seven Mile Beach spit further east, which include forest workers, farmers and recreational beach and water users;
- Barilla Bay and Pitt Water to the north, which include golfers, aquaculture (oysters) farm, and recreational water users;
- Cambridge Airport and Cambridge Park commercial / industrial area to the northwest, which include Airport workers, users, commercial business employees and customers; and
- Pastureland and residential locality (Acton) to the west, which includes numerous horse paddocks and low density residential development.

5.6.2 AFFF Sites Locality and Surrounding Land Use

The locations of each of the identified sites where AFFF has been used are listed in Table 3. The site locations are shown on Figure 2 (Appendix A) with the exception of:

- Site M (not controlled by Airservices);
- Off Airport areas and areas with unconfirmed locations (e.g. Sites P, Q and S).

Table 3: AFFF-use Site Locations and Surrounding Land Use

Site ID	Site Name	Site Location	Surrounding Land Use
Known and Likely AFFF-use Locations			
Site A	MFS	Airport, airside, ARFFS buildings and immediate surrounds, includes vehicle wash-down and fuel storage	Airport use, hardstand, grassed areas, surface and underground water drainage
Site B	CFTG	Airport, airside, southeast of the leasehold land	Pine plantation to the north and east, plantation corridor and contractor bitumen batch plant to south, and Seven Mile Beach further south, plantation and runway to the west
Site E	Large backfilled pond on Sinclair Creek	Situated airside, along the course of Sinclair Creek, immediately south of the large tarmac area south of the ARFFS buildings (Site A)	Surrounded to the north by grassed areas and a tarmac area and the MFS (Site A), to the east by grassed area and Sinclair Creek downstream reaches, to the south by grassed area and Air BP and other operations, to the west by grassed area and Sinclair Creek upstream reaches
Site F	Remote Training (UTas building)	Situated centrally within a large cleared area located southeast of the Airport Terminal Precinct	Surrounded on all sides by a large cleared area of land, and to the north by Sinclair Creek, to the east by the runway, to the south by freehold pine plantation land, to the west by TasWater Wastewater Treatment Plant (WWTP), Air BP and other operators, as well as a golf course off-Airport
Site H	Remote Training (Landfill A)	Situated east of the runway (airside) and west of an internal roadway (which runs parallel to the runway and between the runway and Pittwater Road), approximately 650m north of the CFTG (Site B)	Surrounded to the north, east and south by remnant vegetation, and to the west by the runway and runway cleared precinct, a roadway runs to the east.
Site I	Remote Training (Old Navigational Aid Building)	Situated east of the runway, airside, within an area of cleared land.	Surrounded on all sides by cleared land, and intersected by three roadways, small stands / strips of remnant vegetation occur between 50 - 100m from Site I.

Site ID	Site Name	Site Location	Surrounding Land Use
Site L	Remote Training Control Tower	Situated to the north of the Control Tower, on the eastern slope of Tower Hill.	Surrounded to the north and east by cleared land, and in proximity to the Air Traffic Control Tower and other buildings and infrastructure on the hill; close to Llanherne House (heritage building).
Site O	Tasman Highway (car crash)	Described as near the Back Road and Tasman Highway intersection	Surrounded to the north and west by remnant vegetation and coastal heath bounding Barilla Bay, to the east by Airport land, including remnant vegetation and Site K, to the south by Hotel / Motel facilities.
Site P	Tasman Highway (plane crash)	Described as at the northern end of the runway, towards the west along Tasman Highway	Surrounded to the north and west by remnant vegetation and coastal heath bounding Barilla Bay, to the east by Airport land, including remnant vegetation and Site K, to the south by Hotel / Motel facilities.
Site Q	Tasman Highway (BP fuel truck roll-over)	Described as 10km west of the Airport on Tasman Highway (possibly in Mornington or Warrane)	Unknown
Site S	Cambridge Airport	Unconfirmed locations within the Cambridge Airport land area	Cambridge Airport land
General Airport	Drainage network - underground	Any existing and past underground stormwater infrastructure situated downgradient of AFFF usage areas	Airport land
General Airport	Drainage network - above ground	Any existing and past surface stormwater drainage network and infrastructure situated downgradient of AFFF usage areas	Airport land
General Airport	Slabs/paving/ hard-stand and any nearby buildings / infrastructure	Any past and current Slabs/paving/hard-stand and any nearby buildings / infrastructure, situated beneath, downstream, downwind of AFFF usage areas	Airport land

Site ID	Site Name	Site Location	Surrounding Land Use
General Airport	Grassed / vegetated areas	Any past and current grassed / vegetated areas, situated beneath, downgradient or downwind of AFFF usage areas	Airport land
Unconfirmed or Unlikely AFFF-use Locations			
Site C	FFTG	Situated south of Sinclair Creek, near the southwestern property / leasehold boundary	Surrounded by regrowth shrubs, bounded to north by shrubs, airside operations (Air BP), to the east by the TasWater WWTP and a cleared area, to the south by regrowth shrubs and a golf course, to the west by regrowth shrubs and a soil stockpile area (Site M)
Site D	Remote Training (Old Landfill B)	Situated airside, south of, or around the TasWater WWTP	Surrounded to the north by the WWTP, to the east and south by cleared land and the west by regrowth shrubs
Site G	Remote Training (Bush Area)	Anecdotal location (exact siting is unknown), situated east of the runway (airside) and east of an internal roadway (which runs parallel to the runway and between the runway and Pittwater Road), midway between the CFTG (Site B) and Old Landfill A (Site H); approximately 350m north of the CFTG	Surrounded on all sides by plantation pines, an internal roadway to the west, and a cleared area off-Airport to the east (which could correspond to Site G)
Site J	Remote Training (Sand Mine)	Situated northeast of the runway, airside, within an old disused sand pit	Surrounded on all sides by remnant vegetation and to the north by Tasman Highway and a restaurant on Barilla Bay, to the east by Pittwater Road and to the west by the runway precinct.
Site K	Remote Training (Igloo)	Situated to the west of the northern end of the runway, in and around a pre-existing building / hangar	Surrounded on all sides by hardstand and outside the hardstand by remnant vegetation to the north, east and west and cleared land to the south

Site ID	Site Name	Site Location	Surrounding Land Use
Site M	Soil stockpiles	Situated to the south of the new HIAPL administration building, landside; one area in particular is understood to contain unknown sources of soils and materials which may have been sourced from AFFF-impacted areas	HIAPL building to the north, long term car parking to the north, remnant bush / vegetation to the east, and the FFTG (Site C) further east, a golf course to the south, remnant scrub to the west and Sinclair Creek to the south and west; old club house (disused) to the west and paddocks further west.
Site N	Southern end of runway	Described as one or several scrub fires situated south of the southern end of the runway	Surrounded to the north by the runway precinct, to the east, south and west by coastal Seven Mile Beach vegetation and land, and further south by Frederick Henry Bay
Site R	Golf Course	Described as north eastern corner of the golf course	Surrounded to the west and south by golf course land, to the east by a stand of trees, then further north and east by Airport land.

5.6.3 Airport Topography

The Airport topography is relatively flat and stands at around 3 to 5m Australian Height Datum (AHD). There is a notable landmark topographical feature in the northwest of the land, Tower Hill, which has an elevation of around 22m AHD. Llanherne House and the Airport Control Tower are located on Tower Hill. Sinclair Creek, which runs west to east, bisecting the land, marks the lowest point along the centre of the Airport. Areas that have not undergone surface modifications for Airport use display gentle undulations reminiscent of aeolian dune sands.

5.7 ENVIRONMENTAL SETTING

5.7.1 Airport Environmental Setting

The environmental setting for the Airport is discussed in Section 5.6.1, with areas of ecological significance discussed in Section 5.7.2.

5.7.2 Airport Areas of Ecological Significance

As detailed in the Master Plan, the Airport includes areas that are environmentally significant at both Commonwealth and State levels.

The Airport's environmentally significant areas (ESAs), which have been identified by HIAPL in consultation with relevant Tasmanian and Federal conservation bodies, have remained largely unchanged since the development of the previous environment strategy, with the exception of the

Environment Protection and Biodiversity Conservation Act 1999 -listed critically endangered Tasmanian Lowland Native Grasslands; HIAPL increased the areas of environmental significance in 2009 to cover areas that may have contained these native grasslands.

Flora - Threatened plant species that have been noted within the Airport include:

- *Cynoglossum austral* – Australian Hounds;
- *Calocephalus citreus* – Lemon Beauty Heads;
- *Senecio Squarrosus* – Leafy Groundsel; and
- *Vittadinia gracilis* – Wooly New-Holland Daisy[7].

The general ESAs are shown on Figure 11 and Figure 3 (Appendix A). The boundaries of vegetation areas of conservation significance are also shown as supplied in the Master Plan; SEMF has not had access to the original mapping report(s) and has not verified the accuracy of the boundaries.

The saltmarsh community along Sinclair Creek (between the Airport land and 5-Mile Beach) is understood to be Commonwealth-listed though it is understood to be degraded and may become delisted as it does not meet the requirements for listing ([redacted]).

Fauna - A targeted fauna assessment was undertaken in March 2014[8], which identified potential habitat on Airport land for threatened fauna species. A field survey indicated that the only threatened fauna species to occur on site is the Commonwealth-listed Eastern-barred bandicoot (*Perameles gunni*), which is a common Tasmanian resident and not listed at the State level. In May 2014, an eagle nest site was located in the crown of a blue gum tree adjacent to the Tasman Highway and overlooking Barilla Bay. The nest site has the potential to be that of a White-bellied sea eagle (*Haliaeetus leucogaster*) due to its size and proximity to the coast. The nest site was monitored after its discovery and it did not appear to be active. In October 2014 it was noted that the nest site had been partially destroyed by recent strong winds and storm events. The Tussock skink (*Pseudemoia pagenstecheri*) is another listed species that has the potential to occur on Airport land due to the presence of grasslands.

The Pitt Water Orielton lagoon area, from Barilla Bay westwards is a Ramsar-listed wetland (refer to Figure 1).

5.7.3 ARFFS Sites Environmental Setting

The general environmental setting of each of the identified on-Airport sites where AFFF had or may have been used (Sites A to M) is discussed in Section 5.6.2. The environmental setting of AFFF-use sites (on Airport) relative to identified areas of environmental and heritage significance (refer to Section 5.9) is summarised in Table 4 and on Figure 11 (Appendix A).

[7] HIAPL Website Induction

[8] HIAPL, Annual Environmental Review, 2013 & 2014, October 2014

Table 4: Environmental and Heritage Setting of on-Airport Known and Possible AFFF-use Sites

Site ID	Site Description	Environmental and Heritage Setting / Feature
Site A	MFS	▪ None nearby, except for drainage to Sinclair Creek
Site B	CFTG	▪ Seven Mile Beach spit feature of geoheritage importance underlies the site
Site C	FFTG	▪ Situated east of an area of vegetation of Statewide significance ▪ Seven Mile Beach spit feature of geoheritage importance
Site D	Remote Training (Old Landfill B)	▪ Seven Mile Beach spit feature of geoheritage importance
Site E	Large backfilled pond on Sinclair Creek	▪ None nearby, except for drainage to Sinclair Creek
Site F	Remote Training (UTas building)	▪ Seven Mile Beach spit feature of geoheritage importance
Site G	Remote Training (Bush Area)	▪ Seven Mile Beach spit feature of geoheritage importance
Site H	Remote Training (Landfill A)	▪ Situated immediately south of an area of vegetation of Statewide significance ▪ Seven Mile Beach spit feature of geoheritage importance
Site I	Remote Training (Old Navigational Aid Building)	▪ Situated between and near several patches of vegetation of bioregional significance
Site J	Remote Training (Sand Mine)	▪ Surrounded by a large area of vegetation of Statewide significance. ▪ Llanherne Pleistocene Aeolian Deposit – feature of geoheritage importance. ▪ The Pitt Water Orielton Lagoon Ramsar site includes Barilla Bay situated immediately north.
Site K	Remote Training (Igloo)	▪ Surrounded on all sides by hardstand and outside the hardstand by remnant vegetation to the north, east and west and cleared land to the south ▪ Vegetated surrounding the hardstand on three sides is an area of vegetation of State-wide significance
Site L	Remote Training (Control Tower)	▪ Vegetation to the west, on Tower Hill is an ESA, and ▪ Vegetation west of that is recorded as having bioregional significance; ▪ Close to Llanherne House (heritage building).
Site M	Soil stockpiles	▪ Surrounded to the west and south by an ESA / vegetation stand, ▪ Vegetation of Statewide significance further east ▪ Vegetation of bioregional significance further north

5.8 GEOLOGY, HYDROGEOLOGY AND HYDROLOGY

5.8.1 Geology

In the northwest of the Airport, the visible hill underlying Llanherne House and the Airport Control Tower, consists of a quartzitic sandstone unit of the Triassic Upper Parmeener Supergroup, which is expected to extend at depth. The remainder of the Airport is underlain by Quaternary sediments, with the northern half consisting of undifferentiated sedimentary sequences, and the southern half consisting of sand, gravel and mud of alluvial, lacustrine and littoral origin (Refer to the LIST Geology in Appendix B). The mudflats of Sinclair Creek east of the runway are expected to be highly salty and muddy sediments.

GHD (2006) reports that the coastal sands underlying the **Airport land** comprise: undifferentiated calcareous sands that are up to 1.5m deep; uniform loamy sand overlying variously coloured sand with shell fragments to around 4m depth, and localised drainage areas with mottled uniform heavy clay.

SEMF hand auger investigations only extended to 0.5m depth. Soils encountered within those intervals included:

- Around Site A – MFS: fine sand, loamy sand and shelly sand;
- Around Site B – CFTG: fine sand and loamy sand;
- Around Site F – UTas building: fine sand and some loamy sand;
- Around Site H – Old Landfill: sand and gravel (some may be bill material);
- Around Site I – Nav Aid building: gravelly sandy silt (mostly fill and reworked natural soils); and
- Around Site L – Control Tower: loamy sand, with some sandstone gravel in eastern boreholes.

At the **CFTG** (GHD, 2009), the profile consists of a veneer of fill material 0.3m deep consisting of road base sandy gravel with minor silt, which is underlain by dune sands to a depth of at least 4m (Sloane, 2017)[9]. Sands colours range from orange brown at the surface, grading to orange / yellow and pale yellow / white with depth. Uniformly grey coloured marine sands including shell fragments (water or wind deposited) are also noted at depth.

The generalised profile at the **MFS** based on GHD (2006) and Sloane Geoscience (2009) is:

- 0 – 0.1m hardstand or grass;
- 0.1 - 0.5m fill consisting of grey, brown sandy clay with gravel, friable, dry to moist;
- 0.5 - 1.0m light coloured sand, some organic matter, coarse grains and moist;

[9] ARFF Fire Training Ground Groundwater Monitoring Bore Installation & Sampling, January 2017, Hobart International Airport, Cambridge, SGEO PN 118347.

- 1.0 - 2.0m moist, dark brown to black mottled grey and orange sand and sandy clay;
- 2.0 - 4.1m moist, brown to grey variably coarse sand; and
- > 4.1m high plasticity olive or greenish grey sandy clay.

GES (2015) investigations suggest that the MFS area is underlain by complex interbedded sedimentary horizons and lenses, comprising alternating sand, clay and organic matter.

5.8.2 Acid Sulphate Soils

The LIST notes that there is a low probability of acid sulphate soils being present at the site (6-70% chance of occurrence) for the majority of the Airport (refer to Appendix B). There is a high likelihood (>70%) of acid sulphate soils being present within the saltmarsh area of Sinclair Creek, on the eastern side of the runway (refer to Appendix B).

5.8.3 Airport Hydrology and Surface Water

Hydrology / Drainage

The natural hydrology of the Airport consists essentially of Sinclair Creek, which runs across the Airport from west to east and discharges to 5-Mile Beach east of the Airport land. 5-Mile Beach is connected to Frederick Henry Bay.

The course of Sinclair Creek across most of the Airport, has been modified into a straightened open channel, piped beneath the runway, then directed eastwards through the salt mash before discharging at 5-Mile Beach.

The Airport has an extensive internal network of reticulated systems and open and swale drains, which provide for the majority of the Airport stormwater drainage. Sinclair Creek receives a substantial amount of this drainage.

Due to the low lying nature and flat gradient of the Airport, drainage is often problematic particularly during periods of high rainfall. HIAPL has been undertaking drainage improvement works across the site to address these issues[10]. Airport areas either drain to Sinclair Creek, or to open swale drains which encourage pooling and infiltration (refer to Figure 3B). Water ponding reportedly occurs immediately north of the Terminal at the area sampled by HIA14-SED. Water ponding also occurs east of the runway, either side of Sinclair Creek, within the saltmarsh area. The TasWater WWTP, located on Airport land, discharges treated water to Sinclair Creek.

Airport Surface Water Monitoring

Lower Sinclair Creek receives runoff from a range of sources across the Airport including aprons, taxiways, airside wash down areas, surface drainage, grated drain inlets in car parking areas and open drains adjacent to the taxi holding park. Runoff from these areas has the potential to contain

[10] HIAPL, Annual Environmental Review, 2013 & 2014, October 2014

a range of contaminants including hydrocarbons, bacteria, general litter and sediment. Surface water quality monitoring is undertaken monthly by HIAPL at one location (HIA03A) and quarterly at HIA01, HIA04, HIA05, HIA06 (also labelled HIA17-W in SEMF's December 2016 sampling) and HIA08 (Clark's maintenance shed) (Figure 3, Appendix A) which HIAPL considers to be strategic locations around the Airport to detect levels of contaminants (if any) and to effectively manage the Airport so that impacts to surface water quality are minimised[11]. Surface water monitoring locations are shown in Figure 3 (Appendix A).

Water samples are tested for: conductivity, pH, dissolved oxygen (DO), total suspended solids (TSS), thermotolerant coliforms, hydrocarbons, nutrients ammonia, nitrogen, phosphorus, and metals. PFAS compounds are not tested routinely by HIAPL in its surface water monitoring program.

Surface water monitoring results for **Sinclair Creek** in the AER (2013-2014) and in the June 2016 monitoring round (which included an additional site to the north)[12] report the following quality:

- Conductivity at all sampling locations, with the exception of HIA03A, is defined as 'fresh' water at less than 1,600 µS/cm.
- Higher conductivity at HIA03A (east of the runway) is governed by tidal movement of estuarine waters, with higher water levels during King Tides when the surrounding salt marsh vegetation communities become flooded.
- The pH range of 6.45 to 8.44 pH units for all samples, sits within the specified fresh water range, and was generally in the lower pH range during June 2016 after a spell of rain.
- All DO results were above the threshold of 6 mg/L for fresh water systems.
- TSS fluctuated throughout the year with higher than normal levels attributed to rainfall events that entrain sediment. The Sinclair Creek system is subject to intermittent flows which are of short duration and explain the sediment loading.

During 2013 and 2014, at sample location HIA03A (most downstream sample within Airport land), the main exceedances of *Australian and New Zealand Environment Conservation Council Guidelines for Fresh and Marine Water Quality*, 2000 (ANZECC) or *Airport Environment Protection Regulations* 1997 (AEP) were for concentrations of the following nutrients and coliforms[13]:

- Ammonia;
- Total nitrogen;
- Phosphorus; and
- Thermotolerant coliforms

[11] HIAPL, Annual Environmental Review, 2013 & 2014, October 2014
[12] HIAPL, Water Quality Report, Quarterly, June 2016
[13] HIAPL, Annual Environmental Review, 2013 & 2014, October 2014

During June 2016, nutrients and thermotolerant coliforms were identified at varying concentrations at all locations. Levels of Total Recoverable Hydrocarbons (TRH) were within the AEP recommended limits across all locations. Zinc concentrations were slightly above the AEP recommended limits and the ANZECC Guidelines for the protection of aquatic ecosystems at several locations.

These may be related to TasWater WWTP discharge to Sinclair Creek and also to inflows from offsite from disturbed catchment areas. This is supported by samples taken from the location upstream of the WWTP discharge point.

Detailed surface water sampling has been undertaken along Sinclair Creek, and other Airport locations, as summarised in Section 8.4.

ARFFS Surface Water Monitoring

Surface water monitoring in June 2016 sampling, for the 4 locations around the MFS (labelled SW1 to SW4) and the 1 location southeast, in Sinclair Creek (labelled SW5) reported the following results (refer to Figures 3 and 4 for sampling locations):

- Medium concentrations of nutrients at all locations;
- TSS at low concentrations, and highest at the Sinclair Creek location (SW5);
- Methylene blue active substances (MBAS), polycyclic aromatic hydrocarbons (PAH) and oil below limit of reporting (LOR) at all locations;
- Low TRH C_{16}-C_{34} and ethylbenzene concentrations only at SW3, taken from the truck wash-down location; all other locations were below LOR for TRH and benzene, toluene, ethyl benzene, xylenes and naphthalene (BTEXN);
- Perfluorooctane Sulphonate (PFOS) concentrations ranged from 1.06 to 4.4 μg/L at the 4 locations around the MFS (SW1 to SW4) and was 46.2 μg/L at the Sinclair Creek location (SW5);
- Perfluorooctanoic Acid (PFOA) concentrations ranges from 0.031 to 0.421 μg/L around the 4 MFS locations and was 0.638 μg/L at the Sinclair Creek location; and
- 6:2 Fluorotelomer Sulphonate (FtS) was below LOR at all locations, 8:2 FtS ranged from 0.02 to 0.1 μg/L around the 4 MFS locations (SW1 to SW4) and was below LOR at the Sinclair Creek location (SW5).

The significantly higher PFOS and higher PFOA concentrations detected at the Sinclair Creek location is a key reason for the detailed surface water sampling undertaken along Sinclair Creek as part of this PSI. Surface water sampling results are discussed in Section 8.4.

5.8.4 Airport Hydrogeology & Groundwater Quality

At the **MFS**, groundwater has been intercepted at around 1.5 to 2m bgl. The groundwater gradient (Sloane Geoscience, 2009) is very low, about 1 degree to the southwest, or west-southwest. On the basis of the salinity (electrical conductivity and total dissolved solids (EC and TDS)) test results alone (Sloane Geoscience, 2009), the groundwater in monitoring bores AR1 to AR3 can be classified as potentially suitable for drinking water. The *State Policy on Water Quality Management*

1997 also assigns drinking water as a Protected Environmental Value (PEV) where the groundwater salinity is less than 1,000 m/L TDS.

GES (2015) investigations at the MFS found two discrete aquifers beneath the MFS:

- A shallow sandy and silty sand unconfined aquifer (at around 1.5m bgl); and
- A deeper sandy aquifer confined beneath a clay lense. The deeper aquifer was encountered at between 4 and 4.5m bgl and has a potentiometric level around 1.6 to 2m bgl. The deeper aquifer appears to have limited lateral continuity (pinches out).

Groundwater beneath the MFS has been shown to be impacted by hydrocarbons (from a historical leak); phase separated hydrocarbons have been pumped out, and a plume of hydrocarbon-contaminated water exists, though its extent and movement have not been successfully defined (refer to Section 6.4). Testing of groundwater at the MFS has also reported impact from PFAS compounds.

At the Air BP site, groundwater is interpreted to flow eastwards. 2014 water quality monitoring results at Air BP and at the BP retail service station (northwest of the Airport) suggest that there is no groundwater contamination beneath either of these sites from storage of hydrocarbon fuels at those locations.

At the **CFTG**, groundwater has been intercepted at around 2m bgl in the most recent round of monitoring (Sloane, 2017), though the water table in previous years has been reported to be around 1 – 1.5m lower between 3.0 and 3.5mbgl. The aquifer consists of an unconsolidated sedimentary aquifer (sand, gravel, shell grit) and is unconfined. GHD (2014) reported the groundwater gradient in the CFTG area as being towards the north to north-easterly direction. GHD noted that this was likely due to groundwater extraction having previously occurred via an array of wells northeast of the CFTG. Extraction is now occurring further northeast, approximately 600m from the CFTG. Extraction may create a cone of depression and gradient towards the extraction area, which is opposite to what would be expected. In February 2012, Sloane Geosciences reported a groundwater gradient at the CFTG towards the southwest (i.e. opposite to GHD's 2014 direction) and more in keeping with what would be expected. The most recent round of groundwater monitoring included a formal survey of 9 wells at and around the CFTG and measurement of water levels. The contoured water table surface in January 2017 (Sloane, 2017) suggests that groundwater at that time was moving both northeasterly and southeasterly at the same gradient (refer to Figure 10, Appendix A). The water table shows an apparent mounding at the CFTG which suggests that groundwater recharge occurs at Site B. Site B is not a topographical high, or a 'soak' area, and does not appear to be a particularly more suitable recharge area than the surrounding land. It is therefore likely that groundwater at the CFTG is being artificially recharged. Water sources for groundwater recharge could include fire training water overspray, and potentially leaking wastewater containment pond(s).

The pH of the groundwater has typically been neutral to slightly alkaline and TDS has ranged from around 400 to 1,800 ppm (i.e. slightly brackish). The sand aquifer throughout most of this area of the Airport means that groundwater flow rates are expected to be fairly rapid. Groundwater sampled has typically been in aerobic, i.e. unconfined conditions, which are in an oxidising regime.

GHD (2014) notes that the geological profile immediately north of the CFTG consists of high permeability sands with low organic content and no significant clay layers; which suggest that there is a high likelihood of vertical percolation (of rainfall and other water inputs) through the vadose

zone down to the water table. The water table is also shallow, around 1.9 to 2.3mbgl (just north of the CFTG), and the salinity is relatively low, which makes the shallow coastal aquifer highly vulnerable to contamination.

According to Sloane Geosciences (2014) the ARFFS Drill Ground (CFTG) and the southern part of the Airport are underlain by an unconfined coastal sand aquifer with a low groundwater gradient to the southwest and a water table depth of about 2.5 m. Low salinity, 'drinking water quality' groundwater is present in all CFTG bores apart from DG6, about 400m to the southeast of the CFTG. The salinity of the groundwater in this latter bore is unsuitable for drinking water but potentially suitable for irrigation of salinity tolerant vegetation and for stock water.

Monitoring at the CFTG has reported impacts from both PFAS and hydrocarbons in the groundwater.

Perimeter Bores

Groundwater is monitored annually across the Airport, around the perimeter, via 5 bores (HA19, HA20, HA21, HA22, HA23) (refer to Figure 3 and Appendix I) and at specific locations where activities with potential environmental risk occur, such as the fire training ground (CFTG) and fire station (MFS), at AirBP, which is the main Airport fuel storage area and at the BP retail fuel service station at the northwestern end of the Airport.

Estimated aquifer levels around the Airport's perimeter range in depth from 0.5 – 4.44m. Due to the nature of the sandy soils, there is the potential for mobile contaminants to migrate through soils and into the underlying groundwater. Groundwater Monitoring Events (GMEs) are undertaken by HIAPL and ARFFS[14].

March 2014 and August 2015 results for the perimeter bores reported[15] [16]:

- Low salinity water at all perimeter bores except HA22, situated in the saltmarsh in the east-central area of the land, along the course of Sinclair Creek;
- Relatively low nutrient concentrations in all bores except HA22 with a total nitrogen concentration of 3.6 mg/L, which is thought to be due to the organic matter in the salt marsh area;
- HA22 also had the highest sulphate (5,290 mg/L), dissolved iron (9,630 ug/L) and highest concentrations of most other dissolved metals tested; these are believed to be due to the salt marsh location; and

[14] HIAPL, Annual Environmental Review, 2013 & 2014, October 2014
[15] HIAPL, Annual Environmental Review, 2013 & 2014, October 2014
[16] Hobart International Airport Groundwater Monitoring, Beca Consultants Pty Ltd, 18 September 2015

- PFOS analysis results for HA19 to HA21 (*HA22 and HA23 samples were not tested for PFAS compounds*), reported detectable concentrations in March 2014 and August 2015, with the higher concentrations being in HA20. PFOA concentrations were below detection in most samples in March 2014 and August 2015, with the exception of HA20. 6:2 and 8:2 FtS concentrations, where tested, were below LOR. The specific reason for the apparently higher fluoro-surfactant results from HA20 is unknown. HA20 is situated west of the southern end of the runway. It is possible that ORs could have impacted soils up-gradient of HA20. Site N represents a number of ORs which occurred in the area south-west of the runway, but exact locations were not documented.

Although there are a number of gaps in the groundwater data and hydrogeological understanding at the Airport, the higher risk gap was identified to be related to PFAS and hydrocarbon contamination at the CFTG, and the potential for this contamination to move off-Airport and impact on sensitive users, and in particular groundwater users. Discussion of groundwater monitoring results from this PSI and past results is provided in Section 8.5.

5.9 HERITAGE

Historic Heritage

A key site of historic heritage significance identified on the Airport is **Llanherne House** (its location is shown in Figure 11 of Appendix A). Llanherne House is permanently listed on the Tasmanian Heritage Register. The site is used for office based tenant activities.

The **Hobart Airport Air Traffic Control Tower** is included in the Commonwealth Heritage Places list. The Control Tower is of historical significance in a national context as a rare and representative surviving example of a post-World War II era control tower equipped to an international standard The Hobart tower was built between 1956 and 1958, and commissioned in 1958. It is one of the oldest operational towers in Australia, together with Essendon and Launceston airports.

Aboriginal Heritage

The Master Plan reports that there are 13 recognised Aboriginal heritage sites located at the Airport which are largely comprised of isolated stone artefacts and artefact scatters, with one having an association of midden shell. Their locations remain confidential.

Geoheritage

The Airport land includes two sites of geoconservation significance:

- Seven Mile Beach Spit is listed on the Tasmanian Natural Values Atlas as a feature of geoheritage importance due to it being a 'notable example of type' – this overlaps Sites B, C, D, F, G, H, N and R; and
- The Sand Mine area (Site J) is listed as the Llanherne Pleistocene Aeolian Deposit in the Tasmanian Natural Values Atlas. The outcrop is significant due to the preserved suite of well-developed sedimentary structures; trace fossil burrows and a palaeosol which give important scientific insight into the palaeo-environment of the Coal River Basin.

5.10 SERVICES INFRASTRUCTURE

As detailed in the Master Plan, Airport services infrastructure are provided by:

- **Water:** A bulk water main connects into reticulated water supply within the Tasman Highway and runs along Holyman Avenue. Secondary connection on Back Road to the bulk water supply within the Tasman Highway however this is currently turned off. Water for fire suppression currently comes from the same mains as the domestic supply. Storage tanks for firefighting are located on Tower Hill. TasWater has adopted a policy that water supply for domestic and firefighting purposes are to be separate rather than combined.
- **Sewerage:** The Airport is currently serviced with a rising main that runs from the Tasman Highway, along Holyman Avenue and connects to an existing TasWater WWTP on Airport land.

  The freehold titles are not serviced at present.
- **Stormwater:** (refer to Section 5.8.3)
- **Electricity:** The Airport is supplied by TasNetworks infrastructure as dual 11 kV. 11 kV ring main feeds via a mix of overhead line and underground cable via Holyman Avenue, to the Terminal Precinct and around the Loop Road. The primary substation for the Terminal Precinct is located adjacent the administration building. This substation comprises a single 2MVA transformer, and as such provides no redundancy. It is less than 50 percent loaded, and so there is spare capacity for significant expansion of the Terminal facility.
- **Telecommunications:** Optical fibre services installed by Telstra run through the Airport, north to south, and connect to the main distribution frame room at the administration block. More recently, TasNetworks has installed optical fibre into the site, via Holyman Avenue, which currently services only the Royal Hobart Hospital kitchen.

Furthermore:

- **Fuel underground pipeline:** former and current underground fuel pipelines are known to be present at the Airport; their locations have not been confirmed.

No site plans showing the location, elevation and size of sewers, stormwater drains and underground utilities (such as power or communications infrastructure) were provided. Such plans may assist in identification of preferential contamination migration pathways, in the event that potentially mobile contamination is identified.

6. HISTORY OF AFFF USAGE

6.1 INFORMATION SOURCES

Based on the scope and objective of the project, Section 6 focusses on historical AFFF usage, however where other CoPC were identified during the review, these have also been noted.

A number of information sources pertaining to the past uses of AFFF at the Airport have been investigated:

- Land Titles (Section 6.2);
- Airport ARFFS Management Authorities (Section 6.3);
- Interviews (Section 6.4);
- Aerial Photography (Section 6.5);
- Provided Documentation (Section 6.6); and
- Anecdotal Evidence (Section 6.7).

6.2 LAND TITLE INFORMATION

Land title information for each of the identified sites where AFFF has or may have been used is provided in Table 5, based on The Land Information System of Tasmania (The LIST) information.

Table 5: AFFF-use Sites Land Title Information

Site ID	Site Description	Property Identification	Title Reference
Site A	MFS	7593048	152454/1
Site B	CFTG	7593048	152454/1
Site C	FFTG	7593048	152454/1
Site D	Remote Training (Old Landfill B)	7593048	152454/1
Site E	Large backfilled pond on Sinclair Creek	7593048	152454/1
Site F	Remote Training (UTas building)	7593048	152454/1
Site G	Remote Training (bush area (uncertain) location)	*7593048?*	*152454/1?*
Site H	Remote Training (Landfill A)	7593048	152454/1
Site I	Remote Training (Old Navigational Aid Building)	7593048	152454/1
Site J	Remote Training (Sand Mine)	7593048	152454/1
Site K	Remote Training (Igloo)	7593048	152454/1
Site L	Remote Training (Control Tower)	7593048	152454/1

Site ID	Site Description	Property Identification	Title Reference
Site M	Soil stockpiles	7593048	152454/1
Site N	Southern end of runway	7593048	152454/1
Site O	Tasman Highway (car crash)	Exact location unknown	Exact location unknown
Site P	Tasman Highway (plane crash)	Exact location unknown	Exact location unknown
Site Q	Tasman Highway (BP fuel truck roll-over)	Exact location unknown	Exact location unknown
Site R	Golf Course	Exact location unknown	Exact location unknown
Site S	Cambridge Airport	7382929	48205/1
General Airport	Drainage network – underground	7593048	152454/1
General Airport	Drainage network - above ground	7593048	152454/1
General Airport	Slabs/paving/hard-stand and any nearby buildings / infrastructure	7593048	152454/1
General Airport	Grassed / vegetated areas	7593048	152454/1

6.3 AIRPORT ARFFS MANAGEMENT AUTHORITIES

The following chronology of ARFFS management authorities was provided by Airservices (Table 6).

Table 6: Chronology of ARFFS Management Authorities

Date	Legislation	Comments
Pre 1986		Federal airports were owned and operated by the Commonwealth and the **Department of Aviation** provided ARFFS at Federal airports.
16 June 1986 – 14 June 1988	*Federal Airports Corporation Act 1986*	The Federal Airports Corporation (**FAC**) was established and certain airports were vested in the FAC. However, the ARFFS function did not vest in the FAC and was undertaken by the **Department of Transport and Communications** (the successor to the Department of Aviation).
15 June 1988 – 5 July 1995	*Civil Aviation Act 1988*	**The Civil Aviation Authority** (**CAA**) was established and had the function of providing ARFFS.
6 July 1995 - present	*Airservices Act 1995*	**Airservices** was established, acquiring the function of providing ARFFS.

6.4 ARFFS OPERATIONS

The Airport ARFFS MFS (Site A) was opened in 1956, concurrently with the Airport. The ARFFS is operated by Airservices and has the primary responsibility of firefighting and rescue operations associated with the airside runway and aircraft movement areas. Where relevant, the ARFFS would be assisted by the Tasmanian Fire Service (TFS) in firefighting operations that involve Airport emergencies. The TFS is the responsible authority for landside, non-aircraft related firefighting services, and is assisted by ARFFS as relevant to respond to calls for assistance. The ARFFS station is also well positioned to respond to fires and rescue on the landside areas of the Airport[17].

Due to the nature of its rapid response operations, the ARFFS needs to store fuel at the premises. Historically, some of these storages were underground, including a 1.5kL kerosene tank and a 2kL diesel tank, each with underground fuel lines. The 1.5kL kerosene underground storage tank (UST) was removed from the site in 2000 (SEMF, 2013). At the same time a diesel above-ground storage tank (AST) was also removed. The bowser was originally remote from the existing AST and consequently the supply pipework extended underground. Stock reconciliation of the product throughput indicated that approximately 1K L of diesel was lost in early 2006 via failure of the underground section of pipework.

[17] *Hobart Airport Master Plan 2015*

ARFFS operated the FFTG (Site C) prior to it being decommissioned in the 1970s, and has operated the CFTG (Site B) since the 1970s. Due to historical AFFF use at the CFTG and known soil and groundwater contamination issues, Airservices is considering decommissioning the CFTG and establishing a new FTG [18].

Detailed information related to the use of the CFTG (Site B) is provided in GHD (2009): *Hobart ARFFS undertakes live fire training at the site. This includes lighting kerosene fires on the mock-up plane approximately every second day. About 95% of the time, AFFF is applied during training exercises through the water cannons mounted on ARFFS fire trucks* [this was correct until 2010, after which AFFF has no longer been used at the Airport. Training practices at the CFTG only use water, from new trucks and hoses which have never used AFFF]. *Otherwise, AFFF is applied through hand held fire hoses on the ground. AFFF, which is used to extinguish the fires, combined with runoff consisting of water and kerosene is collected within the existing bunded concrete pad* [observations made by SEMF in 2016-2017 note that the concrete pad is only 'bunded' on 1 side, the other 3 edges end flush with the surrounding ground surface] *and runs to a drain in the pad, which is then filtered through an interceptor system. Kerosene collected from the interceptor system is stored in a waste oil AST (adjacent to the separator), and the wastewater is discharged to the on-site catchment pond. The waste oil AST is emptied periodically, with the kerosene used again during training exercises. Periodically the interceptors are cleaned and the wastes disposed of by Veolia. Water in the catchment pond is left to evaporate. The liner of the pond is inspected annually and replaced approximately every eight years. The site also includes a bunded AST containing kerosene. Pipes from this AST run underground to a fuel manifold and from there to the plane mock-up for release out of the mock engines. This AST is pressure tested annually. It is also noted that not all AFFF is captured inside the bund area during training exercises. Overspray (about 4% of total volume used) usually occurs due to the small size of training pad. The site has a licence for a 2,200L kerosene AST. Previous reports have indicated that prior to installation of the concrete training pad, kerosene and unleaded petrol was dispersed directly onto the ground for training exercises. There is anecdotal evidence that the site was remediated prior to upgrading of the site.*

A summary of the approximate quantities of material used between June 2006 and June 2007, logged within the ARFFS Drill Ground Log, is provided below. It provides an indication of the amount of foam and accelerants used per years when Ansulite foam was supplied:

- *Water – 120,000L*
- *Foam (AFFF - Ansulite) – 2,911L*
- *Kerosene – 3,100L*
- *Petrol – 800L*

[18] HIAPL, Annual Environmental Review, 2013 & 2014, October 2014

The site was used from around 1980 to around 1997 without any impervious surface. GHD (2009) notes that the site may have been remediated in 1997 prior to the existing concrete training pad being constructed.

ARFFS operations have also included remote training tasks, such as truck driver training (e.g. Site J) in different terrains; use of hoses in different situations, e.g. running up hills (e.g. Site L), targeting high buildings (e.g. Site K); use of roof monitor in different situations; training in bush areas; training in buildings to simulate indoor smoky environments (e.g. Sites B, F and I).

ARFFS are also called upon by the TFS to assist in emergencies within a short distance from the Airport.

An incident reporting and operational response system (ORS) was established with the start of Airservices in 1995. Recording of incidents and AFFF use prior to the ORS is not known.

6.5 AERIAL PHOTOGRAPHY

A search of historical aerial photography held by the Information & Land Services (I&LS) Division of the Tasmanian Department of Primary Industries & Water was conducted. Historical photography from 1946 was sourced generally from each decade. Mosaics of part coverage photographs have been composed to cover the Airport area where coverage was available. A suite of figures showing the historical aerial photography and locations of each identified potential AFFF site is provided in Appendix D. A review of each of the sites from these aerial photographs has been carried out and the summary of observations is tabulated and provided in Appendix D.

6.6 PROVIDED DOCUMENTATION

A number of investigations have previously been undertaken at the Airport and some documentation has been provided. A summary of the investigations, objectives, findings and recommendations, is provided in Appendix E. Salient points from this information are as follows:

- Investigations have focussed on two main areas the MFS and the CFTG; these investigations have been commissioned by Airservices;
- Investigations have included borehole soil sampling and installation and monitoring or groundwater monitoring wells within the immediate footprint of each of the main areas at the MFS and CFTG;
- The focus of investigations at the MFS have been hydrocarbon leaks and phase separated hydrocarbon (PSH) plumes, PFAS testing has been undertaken only during some of the more recent investigations (since 2009);
- Stormwater sampling is undertaken quarterly at the MFS at 4 locations around the station and 1 location downstream, in Sinclair Creek;
- The focus of investigations at the CFTG have been impacts from firefighting training activities, namely AFFF and hydrocarbons; and
- Both the MFS and CFTG have had regular groundwater monitoring events, though not all event included testing groundwater for PFAS.

- Investigations in other areas of the Airport are limited to:
    - An investigation (soil and groundwater) immediately north of the CFTG while planning for the relocation to a new fire-training ground; testing included PFAS compounds (commissioned by Airservices);
    - Investigations and remediation of a jet fuel line leak on the apron side of the Terminal (commissioned by HIAPL);
    - One round of surface water sampling at 5 locations along Sinclair Creek in December 2015 and testing for PFAS compounds (commissioned by HIAPL);
    - Annual groundwater monitoring of perimeter bores, of which only the southern ones are tested for PFAS compounds (commissioned by HIAPL);
    - Quarterly surface water monitoring of Sinclair Creek and an extra location north of the Airport which does not include PFAS compounds testing (commissioned by HIAPL); and
    - Several desktop PSI's (Airport runway extension, Landfill (Site H)) which consider the likelihood and magnitude of AFFF having impacted those areas (commissioned by HIAPL).

6.7 ANECDOTAL EVIDENCE

SEMF held interviews with key Airport-related personnel to obtain information pertaining to the historic use of AFFF at the Airport. These included:

- HIAPL Environmental Manager, employed since 2013;
- Two Leading Fire Fighters employed at the Airport ARFFS since 1988; and
- The ARFFS Fire Station Manager in the position for 3 months, but with prior experience at Hobart ARFFS.

Both Airport ARFFS and Airport personnel were interviewed and summaries of questions and responses from the two separate interviews are provided in Appendix F. An additional interview was held in August 2016 with ARFFS personal to clarify AFFF usage at particular sites. The summary is also provided in Appendix F.

A synopsis of the information relating to AFFF use at the Airport is listed below; a summary of the information for each of the identified individual sites where AFFF had historically been used, and where AFFF may have been discharged, is provided below and in Table 7. A synopsis of AFFF-usage dates for each site and estimated quantities of AFFF usage has been compiled and is provided in Appendix G.

- Types of AFFF used include: Protein foam (prior to around 1980); 3M Light Water (from around 1981-1982 (pers. comm. Craig Barnes)); Ansulite (from around 2002) and Solberg RF6 (from around 2010).
- No foam training at the Airport since around 2010. In 2010, when Solberg RF6 replaced AFFF, ARFFS trucks and fire hoses previously used with AFFF were removed from the Airport and replaced with new trucks and new fire hoses which have not been used with AFFF.

- ARFFS foam fire extinguishers contained AFFF until 2010. It is not known if other on-Airport fire extinguishers may still contain AFFF products.
- Quantities of 3M Light Water concentrate use was in the order of 20-50L/day; around 200L/week; quantities of Ansulite concentrate used were less due to costs. Concentrate AFFF to water proportion for operational responses was 6% for both 3M and Ansulite, though for training purposes, it was often only 3%.
- Non-ARFFS sources of AFFF are considered to be minor and to include: fire extinguishers, Rotorlift – some storage in the past but not currently, used off-Airport for firebombing, AirBP (3x20L Ansulite concentrate).
- Potentially impacted infrastructure includes: any above- and below-ground infrastructure such as underground service trenches, surface water/stormwater drainage networks, concrete pads and wastewater treatment equipment situated at, near and down-gradient from any firefighting training and operational response locations, which were at any ARFFS locations between around 1980 and 2010.
- Potentially impacted environmental areas may include any grassed / bare soil areas beneath or near any water and hot fire-fighting practices areas, surface water channels and groundwater which were exposed between around 1980 or 1982 to 2010.
- AFFF use included the practice of blanketing everything, it was widely sprayed and could have been windborne, as training and operational responses occurred in any weather conditions (except total fire ban).
- Due to a fault in the design of the trucks, if the foam switch was left on, foam could enter the water tank and cause a foam mixture to be produced; the foam mix would then overflow from the truck water tank and covered the truck and ground around it; this occurred on numerous occasions at many of the training sites.
- Historical discharges of AFFF to soil are known to have occurred in the vicinity of: MFS (Site A); CFTG (Site B); Remote training areas (Site F, Site H, Site I, Site L; all operational response sites during AFFF usage (nominally between approximately 1980 or 1982 to around 2010).
- Surface water run-off from AFFF-impacted areas (in particular from Sites A, H and I) may have historically discharged to Sinclair Creek or seeped through the soil; the well near Site F may have received AFFF-impacted spray water.
- Operational responses near the Airport have been described by ARFFS staff as only of minor in nature (since 1988); e.g. a small plane took off and turned over and crashed on Tasman Highway (exact location is unknown) – others detailed in Sites N to R in Table 7.
- HIAPL carries out quarterly surface water monitoring, but does not routinely include PFAS; Groundwater investigations and annual monitoring is undertaken within bores installed around the perimeter of the Airport; these include PFAS testing for the bores in the southern half of the Airport; monitoring is done concurrently with wells around the CFTG. Monitoring of wells around the MFS is done regularly; AirBP carries out annual monitoring of wells within its airline refuellers facility.

- Sensitive Receptors included:
    - Human: On Airport – operational and maintenance staff, travellers; Off-Airport – neighbouring farmland/residences and 7-Mile Beach locality;
    - Ecological: 5-Mile Beach, 7-Mile Beach, Ramsar wetland (Pitt Water Orielton Lagoon), Aquaculture farms (refer to Figure 1).

Table 7: Summary of Anecdotal Evidence in Relation to Individual Sites of AFFF Use

ID	Site Name	Anecdotal Evidence
Site A	MFS	▪ Opened in 1956 and modified since. ▪ Filling of trucks with foam occurred each day, as drills occurred every morning. ▪ Filling trucks with foam occurred at the MFS; filling often occurred at the wash-down bay; filling stopped once the concentrate tank overflowed; overflow on trucks and ground was washed down the wash-down bay drain. This practice stopped around 15 years ago. ▪ Roof monitor and hoses were used daily; all grassed areas around the MFS were used to practice use of hoses and monitor. ▪ The foam was and is stored as a concentrate prior to use. ▪ The trucks carried concentrate. ▪ Multiple accidental releases of foam (due to valve being left on) at the MFS. ▪ Annual discharge of foam fire extinguishers at the MFS on grassed area, and refilling. ▪ Truck wash-down interceptor pit only removes oils, it is not designed to remove foam, and wastewater from the pit discharges to Sinclair Creek. ▪ All AFFF tanks, trucks and fire hoses that used AFFF have been removed from the MFS; the new trucks and hoses have only ever been used with water or Solberg. ▪ An above-ground self-bunded diesel tank (5.7kL) is now used to store fuel at the MFS. ▪ Historically had around 2kL kerosene and 2kL diesel tanks and fuel lines – now removed; known to have leaked and remedial works including soil and groundwater extraction pumping have occurred; apparently leaded petrol was also previously stored underground at the MFS. ▪ 2 x 5kL above ground and bunded tanks of Solberg RF6 6% are stored undercover at the MFS. ▪ Historically only around 2kL of foam was stored at the MFS. ▪ Around 30 x 20L buckets of Ansul Purple-K Dry chemical powder are stored undercover in the MFS chemical store. ▪ 6 x bottles of compressed nitrogen are stored undercover in the MFS chemical store. ▪ Around 6 x jerry cans of unleaded petrol, small cans of paint and other products are stored in purpose built metal bunded cabinet in the MFS chemical store. ▪ Waste oil is collected in a 1000L tank stored in a bunded and covered outside area next to the workshop. ▪ Several fire extinguishers are stored at the MFS (dry chemical and foam)

ID	Site Name	Anecdotal Evidence
Site B	CFTG	▪ Set up prior to 1988. ▪ Drainage from the main pad is directed through the triple interceptor to a settling pond. A second pond is present but infeed is unconfirmed. Excess water from the ponds was previously disposed by irrigating to the forest around the outside of the fence. It is now pumped to tankered truck, and around 30kL a month is pumped out by Veolia and taken to Selfs Point to be disposed at the back end of the TasWater WWTP. ▪ 44 gallon drums were used for drills, with kerosene or waste oils. ▪ Due to a fault in the design of the trucks, if the foam switch was left on, foam could enter the water tank and create a foam mix in the water tank; this occurred regularly. ▪ After training, if the water tank had been mixed with foam, the foam mix was emptied 'over the fence' into the pine forest. ▪ The CFTG has a mock-up aircraft; a smoke hut and external ladders; old car bodies; old fuel storage tanks, all of which were used as fire-fighting practice structures. ▪ Areas around the CFTG (outside the fence) were also used as a remote attack practice locations. ▪ Fire trucks were used to extinguish either via the hose or the roof monitor. ▪ PFAS-impacted soils have been stockpiled by HIAPL and have been wrapped in plastic next to the CFTG.
Site C	FFTG	▪ Not discussed – located by SEMF on historical aerial photographs and predates interviewed staff; anecdotal information suggests AFFF was not used on this site.
Site D	Remote Training (Old Landfill B)	▪ Backfilled due to pond being a bird attractant and posing an aviation hazard; was used as a landfill. ▪ Used for remote training exercises and to extinguish landfill materials burn-off which occurred several times a week. ▪ Predates interviewed staff; anecdotal information suggests AFFF was not used on this site.
Site E	Large backfilled pond on Sinclair Creek	▪ Not discussed – located by SEMF on historical aerial photographs and predates interviewed staff.

ID	Site Name	Anecdotal Evidence
Site F	Remote Training - UTas building	▪ Was used as a remote attack practice location. ▪ A drum of kerosene was lit. ▪ Trucks and hoses were used to extinguish within the building. ▪ There is an open 'well' southeast of the buildings, and firefighters were told to stay away from the open well during training exercises. ▪ Building(s) had asbestos containing materials (ACM).
Site G	Remote Training (bush area (uncertain) location)	▪ Possibly used as a remote attack practice location. ▪ Fires would have been lit in drums, filled from jerry cans of 20-40L of kerosene, or waste oils. ▪ Fire trucks would have been used to extinguish either via the hose or the roof monitor. ▪ Predates interviewed staff; AFFF usage and site location could not be confirmed.
Site H	Remote Training (Landfill A)	▪ The tip was lit 2 – 3 times a week. ▪ Trucks dumped waste foam mix / AFFF waste drums, etc. at the landfill. ▪ Tyres were burned. ▪ 44 gallon drums with fuel or waste oil were burned. ▪ Tip was used as a fire-fighting drill ground, as part of extinguishing the landfill burn-off. ▪ Packaging and drums (including AFFF) – were either reused or dumped to site landfill.
Site I	Remote Training (Old Navigational Aid Building)	▪ Was an old navigational aid building; had ACM. ▪ Was used for training. ▪ A drum with kerosene was used as a fire fuel. ▪ Foam was used to extinguish, via a hose from the truck. ▪ The foam often overflowed from the truck over the ground around the building.
Site J	Remote Training (Sand Mine)	▪ Was used for fire training up to some time prior to 1988. ▪ From at least 1988, and possibly prior to 1988, the sand pit was used for driver training, for fire trucks in sand terrain. ▪ AFFF use at this site could not be confirmed and was considered unlikely.
Site K	Remote Training (Igloo)	▪ Historically, the igloo (northwest of the Airport) was used for firefighting practice. ▪ The building was used for hose practice with water only.

ID	Site Name	Anecdotal Evidence
Site L	Remote Training (Control Tower)	▪ Historically, the area was occasionally used for firefighting practice. ▪ Trucks were parked to the east of the hill and firefighters practiced running water filled hoses up the hill. ▪ Trucks were parked at the top of the hill, north of the Control Tower, and firefighters practiced with AFFF-filled hoses, blanketing the eastern side of the hill to simulating an emergency response on a plane crash into the hillside.
Site M	Soil stockpiles	▪ Unknown origin of stockpiles; they have been broadly segregated into clean, inert and reusable, or reusable like-for-like, or reusable under Airport roadways; however there is a large area containing stockpiles of soil and other materials which may be contaminated, some possibly with PFAS. NOTE this area is under HIAPL management and the stockpiles are HIAPL responsibility, not Airservices'.
Site N	Southern end of runway	▪ Operational response (OR): The ARFFS responded to a scrub fire at the southern end of the runway – the roof monitor was used to dispense water.
Site O	Tasman Highway (car crash)	▪ OR: There was a collision between two cars (taxi and police) on roadway north of Airport; ARFFS responded to emergency. AFFF would have been used to avert fire from fuels.
Site P	Tasman Highway (plane crash)	▪ OR: a small plane overturned on take-off and landed near the Tasman Highway; ARFFS responded to emergency. AFFF would have been used to avert fire from fuels.
Site Q	Tasman Highway (BP fuel truck roll-over)	▪ OR: There was a BP fuel truck that crashed and leaked fuel. ARFFS responded as stated in ORS report 209 29.12.2003. 413 L of AFFF was used.
Site R	Golf Course	▪ OR: scrub fire occurred; ARFFS responded; location approximate. The roof monitor was used to dispense water. The response lasted most of the day, with the trucks running back and forward to fill up and hose down the fire which was threatening a building in the northeast of the Golf Course
Site S	Cambridge Airport	▪ ORs: ARFFS has historically been called out and is still called out to Cambridge Airport for operational responses (as it is within the 1km response radius and is also controlled by the HIAPL Control Tower). AFFF would have been used between around 1980/1982 and 2010.

ID	Site Name	Anecdotal Evidence
General Airport	Drainage network – under-ground	▪ Monitor and hose use / practice occurred almost anywhere at the Airport; however foam was not always used; even with water, traces of foam are likely to have been present in the equipment. ▪ Training occurred in any weather conditions (except total fire ban). ▪ Firefighting trucks were used to rinse down the glycol de-icing for planes; although only water was used, traces of foam are likely to have been present in the equipment. ▪ Firefighting trucks were used to help clean up any fuel / oil spills; degreasers were used, then truck hoses were used to wash off the wastes; again, traces of foam are likely to have mixed with the water pumped out.
	Drainage network - above ground	
	Slabs/ paving/hard-stand and any nearby buildings / infra-structure	
	Grassed / vegetated areas	

6.8 AFFF USAGE SITE INSPECTIONS

A brief visual inspection of Sites A, B, F, H, I, J and M, where AFFF is known to have been previously been used, or to have possibly been used, was undertaken by SEMF on 22nd July 2016. A summary of the key observations is provided in Appendix G.

6.9 AFFF ESTIMATED RISK

A synopsis of AFFF usage information for each Site A to S has been compiled based on interview information and is summarised in Appendix G. The summary suggests that the sites with a high likelihood of contamination from AFFF are Sites A - MFS, B - CFTG, E – Old Pond, F – UTas Building, H – Landfill A, I – Nav Aid Building, and L – Control Tower; Site G is also likely to have AFFF contamination but its location is not confirmed.

Sites C - FFTG, D – Landfill B, J – Sand Pit and K – Igloo are considered, based on their usage period and anecdotal evidence, to be unlikely to have any impact, or only very low impact from AFFF.

Sites N, O, P, Q, R and S are OR sites, where only water was used (Sites N and R), or where AFFF was only used once as part of the emergency response (Sites O, P, Q and S).

Site M has not been assessed beyond the initial site inspection, as the Soil Stockpiles area is under HIAPL control and management.

A national review undertaken in 2010[19] ranked the Airport, and in particular the MFS (Site A) as having a “high risk”, CFTG (Site B) and remote training areas used between 1988 and 2002, as having a “medium risk” of contamination from AFFF.

6.10 INTEGRITY ASSESSMENT

The information provided in the PSI is considered as accurate as it can be, based on cross checking a number of sources, including publicly available information on The LIST, past reports, past documentation, several staff interviews, historical aerial photography and limited Airport inspection.

[19] SKM, AFFF Conceptual Site Model: Risk Assessment and Works Program, December 2010

7. IDENTIFIED POTENTIAL CONTAMINATION

7.1 NON-AFFF POTENTIAL CONTAMINATION

In addition to AFFF-related potential contamination areas, this PSI has opportunistically recorded other potential contaminating activities or incidents. This section is not comprehensive and only provides an indication of other potential contamination at the Airport and near potential AFFF-impacted areas.

Hazardous Materials

Hazardous materials that are currently produced, collected, stored or used at the Airport (and which are expected to continue to be produced, collected, stored or used at the Airport following the implementation of the Master Plan[20]) include:

- Pesticides and herbicides;
- Cleaning agents;
- Aviation and automotive fuel;
- Sludge from sumps, triple interceptors and wastewater treatment (biosolids);
- Removed asbestos / asbestos containing building materials;
- Paints and solvents;
- Batteries;
- Fire extinguishing and de-icing chemicals; and
- Quarantine waste.

An indicative list has been made of dangerous goods stored at Category 1 tenants' premises on the Airport land, as provided in the 2015 HIAPL Tenant Environmental Audit forms for each tenant. The list is provided in Appendix H. The list is indicative and does not include chemicals stored in small quantities (nominally less than 50L). Historical uses, storages or incidents may have occurred which are not recorded here, as the PSI scope does not include an audit of these facilities. It is noted that a number of tenants hold significant fuel and oil storages, some in underground tanks, and some in above-ground bunded tanks, which may have underground fuel / oil lines.

In particular, these include significant fuel storages at:

- ARFFS MFS (Site A) and CFTG (Site B);
- Air BP aviation refuellers;
- BP retail service station;

[20] HIAPL, Annual Environmental Review, 2013 & 2014, October 2014

- Hire car companies; and
- Helicopter Rotorlift Engineering.

TasWater WWTP also stores large quantities of sodium hypochlorite, aluminium sulphate, magnesium hydroxide, lime and dewatering polymer.

Fuel Leaks

- ***Terminal Apron*** - In January 1999 it was identified that an underground fuel pipeline carrying jet fuel had an integrity issue and had leaked fuel into the surrounding soils. Investigations showed that the leaked fuel had spread around 200m from the point of release. The leak was located on the eastern side of the Terminal beneath the Airport parking apron.

  Multiple investigations, extraction events, etc. have occurred and are documented separately; it is possible that groundwater in this area could still be impacted by jet fuel compounds.

  Anecdotally, it has been suggested that due to the period over which this fuel line was in use (thought to be up to 2005) soil and groundwater contamination from fuel could have occurred in other areas and could have impacted a wide area.
- ***ARFFS MFS*** *(Site A)* - Fuel leaks are known to have occurred at the MFS from former underground fuel storage tanks on the western side of the buildings; investigation, remediation and monitoring works have been ongoing since around 2006.

7.2 CONTAMINANTS OF POTENTIAL CONCERN

Sites used by ARFFS at and near the Airport, either for training or for emergency ORs, are likely to be impacted by some historically-used AFFF contaminants as a result of past firefighting activities and/or contaminants from workshop activities and fuel storage.

Expected CoPC related to ARFFS AFFF use include:

- Total petroleum hydrocarbons (TPH) / total recoverable hydrocarbons (TRH);
- Volatile monocyclic aromatic hydrocarbons [benzene (B), toluene (T), ethyl-benzene (E), o, m and p xylenes (X) and naphthalene (N); commonly referred to as BTEXN];
- Semi-volatile polycyclic aromatic hydrocarbons (PAHs);
- Full suite of PFAS, and in particular those with interim assessment criteria:
  - Perfluorooctane Sulfonate (PFOS);
  - Perfluorooctanoic acid (PFOA);
  - Perfluorohexane sulfonate (PFHxS) and
  - Fluorotelomer sulfonates (6:2 FtS and 8:2 FtS).

Based on a review of the information collected during the PSI, CoPC for each ARFFS site where AFFF has historically been used, are summarised in Table 8. Sites which were selected for limited intrusive investigation as a component of this PSI are shaded yellow.

Table 8: Summary of Identified Contaminants of Potential Concern (for this targeted PSI)

Site ID	Site Name	Potentially AFFF-related Contaminating Activities	CoPC (targeted)
Site A^*	MFS	▪ Storage / use of kerosene, diesel and AFFF (ASTs and UST). ▪ Vehicle refuelling and wash-down activities (vehicles and hoses). ▪ Monitor testing with AFFF in grassed areas to north and south of the MFS. ▪ Fire extinguisher discharge and refill with AFFF. ▪ Old training drill areas (water hoses, monitor). ▪ Historical storage of chemicals. ▪ Workshop activities. ▪ Wastewater run-off / discharge. ▪ Accidental AFFF release.	BTEXN, TPH/TRH, PAH, PFAS
Site B^*	CFTG	▪ Storage and use of kerosene (ASTs), use of AFFF and waste hydrocarbons, and storage of AFFF-impacted waste water in ponds / tanks. ▪ Hot fire training and use of AFFF. ▪ Discharge of residual AFFF from hoses and monitor, beyond the fence line which delineates the southern side of the CFTG. ▪ AFFF-impacted wastewater run-off. ▪ Years of hot fire training on bare ground prior to installation of slab and drainage infrastructure. ▪ Underground lines connecting ASTs to CFTG operational areas. ▪ Accidental AFFF release.	BTEXN, TPH/TRH, PAH, PFAS
Site C^	FFTG	▪ Storage / use of kerosene, use of waste hydrocarbons. ▪ Hot fire training, use of protein foam; unlikely to have used AFFF. ▪ Hot fire training on bare ground. ▪ Absence of drainage infrastructure.	BTEXN, TPH/TRH, PAH
Site D	Remote Training (Old Landfill B)	▪ Extinguishing of landfill burn-off fires with protein foam. ▪ Backfilling of old pond. ▪ Unknown use of old pond – stormwater containment; possible sewage treatment (backfilled around late 1970s, thermotolerant coliforms would expect to have bio-remediated if present). ▪ Absence of drainage infrastructure.	Unknown backfill materials

Site ID	Site Name	Potentially AFFF-related Contaminating Activities	CoPC (targeted)
Site E	Large backfilled pond on Sinclair Creek	▪ Downgradient of ARFFS. ▪ Collection of surface water runoff from sealed areas around ARFFS. ▪ Collection of surface water runoff from unsealed areas to north and south, and from Site C, Site D, Site A and surrounding grassed areas which were used for fire hose and monitor training (with water). ▪ Unknown use of old pond – stormwater containment; possible sewage treatment (backfilled around mid-1980s, thermotolerant coliforms would expect to have bio-remediated if present).	BTEXN, TPH/TRH, PAH, PFAS
Site F*	Remote Training (UTas building)	▪ Use of kerosene, use of AFFF. ▪ Hot fire training and use of AFFF. ▪ Possible discharge of residual AFFF from hoses. ▪ Possible AFFF-impacted wastewater run-off. ▪ Hot fire training on bare ground and in building. ▪ Possible accidental AFFF release. ▪ Absence of drainage infrastructure.	BTEXN, TPH/TRH, PAH, PFAS
Site G	Remote Training (bush area)	▪ Use of kerosene, diesel and waste fuels or oils. ▪ Hot fire training and use of AFFF. ▪ Possible discharge of residual AFFF from hoses. ▪ Possible AFFF-impacted wastewater run-off. ▪ Hot fire training on bare ground. ▪ Possible accidental AFFF release. ▪ Absence of drainage infrastructure.	BTEXN, TPH/TRH, PAH, PFAS
Site H*~	Remote Training (Landfill A)	▪ Possible use of kerosene and AFFF. ▪ Hot fire training and use of AFFF. ▪ Possible discharge of residual AFFF from hoses. ▪ Possible AFFF-impacted wastewater run-off. ▪ Hot fire training on bare ground. ▪ Possible accidental AFFF release. ▪ Absence of drainage infrastructure. ▪ Landfilling with materials and soils of unknown (Airport) origin.	BTEXN, TPH/TRH, PAH, PFAS
Site I*	Remote Training (Old Navigational Aid Building)	▪ Used as a Smoke Hut, prior to demolition ▪ Use of kerosene, and possibly AFFF. ▪ Hot fire training and use of AFFF. ▪ Possible discharge of residual AFFF from hoses. ▪ Possible AFFF-impacted wastewater run-off. ▪ Hot fire training on bare ground and in building. ▪ Possible accidental AFFF release. ▪ Absence of drainage infrastructure.	BTEXN, TPH/TRH, PAH, PFAS

Site ID	Site Name	Potentially AFFF-related Contaminating Activities	CoPC (targeted)
Site J*	Remote Training (Sand Mine)	▪ No known AFFF use. ▪ Truck driver training activities. ▪ Possible impact from truck fuel, oil, coolant, etc. or AFFF leaks	BTEXN, TPH/TRH, PAH, PFAS
Site K*	Remote Training (Igloo)	▪ Possible discharge of trace amounts of AFFF from water use in hoses. ▪ Possible AFFF-impacted wastewater run-off. ▪ Unconfirmed drainage infrastructure.	PFAS
Site L*	Remote Training (Control Tower)	▪ Discharge of AFFF from hoses used at the top of the hill ▪ Discharge of trace amounts of AFFF from hoses used to run up the hill filled with water. ▪ Possible AFFF-impacted wastewater run-off. ▪ Possible accidental AFFF release from parked truck at the top of the hill. ▪ Unconfirmed drainage infrastructure.	PFAS
Site M	Soil stockpiles	▪ Unknown sources of materials, including possibly AFFF-potentially-impacted building and service materials (e.g. piping) rubble and possibly AFFF-potentially-impacted soils and sediments (e.g. from desludging ponds and interceptors) ▪ NOTE: land and stockpiles are managed by HIAPL	BTEXN, TPH/TRH, PAH, PFAS
Site N~	Operational Responses - Southern End of Runway – several scrub fires	▪ Release of trace amounts of AFFF from use of hoses for water only	PFAS

Site ID	Site Name	Potentially AFFF-related Contaminating Activities	CoPC (targeted)
Site O~	Operational Response - Tasman Highway Car Crash (Taxi / Police Car)	▪ The operational response is expected to have occurred between late 1980s and mid 1990s[21]; this is within the period when AFFF would have been used due to presence of hydrocarbon fuel and risk of igniting. ▪ AFFF impact to burning equipment/materials (now removed and disposed), to surrounding hardstand, and to any exposed surrounding soils. ▪ Wastewater runoff to surrounding soils and possible nearby drainage lines or into shallow groundwater. ▪ Possible accidental AFFF release (truck design fault). ▪ Release of fuels and oils from burning vehicles.	PFAS
Site P~	Operational Response - Tasman Highway Plane Crash	▪ The operational response is expected to have occurred between late 1980s and mid 1990s[2]; this is within the period when AFFF would have been used due to presence of hydrocarbon fuel and risk of igniting. ▪ AFFF impact to burning equipment/materials (now removed and disposed), to surrounding hardstand, and to any exposed surrounding soils. ▪ Wastewater runoff to surrounding soils and possible nearby drainage lines or into shallow groundwater. ▪ Possible accidental AFFF release (truck design fault). ▪ Release of fuels and oils from burning vehicles.	PFAS
Site Q~	Operational Response - Tasman Highway BP truck overturned – Incident #209	▪ AFFF foam used – 413 L and 6,500 L of water. ▪ AFFF impact to all AFFF-coated equipment/materials (now removed), to surrounding hardstand, and to any exposed surrounding soils. ▪ Wastewater runoff to surrounding soils and possible nearby drainage lines or into shallow groundwater. ▪ Possible accidental AFFF release (truck design fault). ▪ Release of fuels and oils from overturned fuel truck.	PFAS

[21] ARFFS interviewees started employment in 1988 and recalled incident, but the incident is not reported in the Airservices incident reports which began in 1995

Site ID	Site Name	Potentially AFFF-related Contaminating Activities	CoPC (targeted)
Site R~	Operational Response - Golf Course – scrub fire near building	▪ Release of trace amounts of AFFF from use of hoses for water only.	PFAS
Site S~	Operational Responses - Cambridge Airport	▪ Any operational response between early 1980s and 2010 would have involved the use of AFFF if the incident involved the presence of hydrocarbon fuel and risk of igniting. ▪ AFFF impact to burning equipment/materials (now removed and disposed), to surrounding hardstand, and to any exposed surrounding soils. ▪ Wastewater runoff to surrounding soils and possible nearby drainage lines or into shallow groundwater. ▪ Discharge of residual AFFF from hoses / truck. ▪ Possible accidental AFFF release (truck design fault). ▪ Release of fuels and oils from burning vehicles.	PFAS
General Airport	Open Drainage Lines	▪ Impact to surface water drainage lines, erosion and accumulation of AFFF-impacted soils into sediment accumulation areas; ongoing leaching and release of AFFF from open swale and piped infrastructure, soils and sediments to surface water and groundwater.	BTEXN, TPH/TRH, PAH, PFAS

* Indicates sites that were used by Airservices from 1995 onwards.

^ Indicates sites that were used by an aviation fire-fighting rescue service prior to Airservices' creation in 1995.

~ Indicates sites where ARFFS carried out an operational response or assisted Airport operators.

NOTE: Where no notes are provided the dates and types of usages for those sites are unconfirmed or uncertain.

8. LIMITED SITE ASSESSMENT

8.1 CONTEXT

Details of the limited site assessment works undertaken as part of this PSI are provided in a separate report (SEMF, 2017)[22]. That report presents the analytical results and compares all data to all interim criteria outlined in Appendix J, regardless of setting and applicability. The following sections discuss the results of the limited site assessment against applicable criteria. To allow a more complete understanding of the available PFAS data on the Airport, previous PFAS results have also been included in the assessment. It should be noted that such data should be considered indicative due to differences in timeframe, season, sampling and decontamination methods between sampling events. The data nonetheless provide an indication of the order of magnitude of PFAS detected at particular locations and in the particular sampling media at the time of sampling.

8.2 APPLICABLE CRITERIA

Interim **PFAS** criteria nominated for this investigation (Appendix J) apply to the assessment of contamination for a range of settings or uses including:

⇨ **for water**:

- Human Health criteria for:
    - Consumption of Fish;
    - Drinking Water; and
    - Recreational.
- Ecological.

⇨ **for soil**:

- Human Health criteria for:
    - Residential;
    - Recreational Public Open Space; and
    - Commercial / Industrial.
- Ecological.

Interim criteria for **hydrocarbons** include:

⇨ **for water**:

- Human Health, Drinking Water.

[22] Hobart Airport – Aviation Rescue Fire Fighting Services, Preliminary Site Investigation, Sampling Report, for Airservices Australia, 13 April 2017 – Final – SEMF Pty Ltd, Project No: 2105.022

- Ecological:
    - Freshwater, and
    - Marine water.

⇨ **for soil:**

- Residential Health Screening Levels (HSLs) for TRH,
- Commonwealth AER Ecological criteria for TPH,
- Commonwealth AER Ecological and Human Health criteria for BTEX and PAH.

Soil criteria applicable for each Site have been determined based on their Land Use / Airport Precinct (refer to Figure 12 in Appendix A) and environmental values (refer to Figure 11, Appendix A), and are summarised in Table 9. Water criteria applicable for surface water and groundwater samples have been determined based on Airport precinct, environmental values, and potential nearest sensitive users and are summarised in Table 10.

TDS concentrations also govern whether water is drinkable or not. The AER considers concentrations under 1000 mg/L TDS to be 'drinkable', though the National Health and Medical Research Council (NHMRC, 2011)[23] notes that 'good' (human) drinking water should have less than 600mg/L TDS. Between 600 and 900mg/L TDS water palatability is 'fair', between 900 and 1,200mg/L TDS palatability is 'poor', and over 1,200mg/L water palatability is 'unacceptable'. TDS concentrations for stock watering are higher and TDS below 4,000mg/L are reported to have no adverse effects (ANZECC (2000), volume 3, Table 9.3.3)[24].

[23] NHMRC Australian Drinking Water Guidelines 6, 2011

[24] National Water Quality Management Strategy, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3, Primary Industries – Rationale and Background Information.

Table 9: Interim Criteria Applicable to Soil Samples in this PSI

Site	Land Use Precinct*	Environmental Values#	Applicable Criteria
Site A – MFS	Aviation	No significant values	Commercial / Industrial, but CRC CARE HSL A used and potential for Direct Contact by intrusive / maintenance worker
Site B – CFTG		7 Mile Beach Spit Geoconservation Area	
Site F – UTas Building		7 Mile Beach Spit Geoconservation Area	
Site H – Landfill A		7 Mile Beach Spit Geoconservation Area; near a stand of Vegetation of Statewide significance, and, further north Sinclair Creek and its 'Environmentally Significant Area'.	
Site L – Control Tower (including HIA11-SED, HIA14-SED and HIA15-SED)		Situated on the eastern part of the hill, which does not affect the western part of the hill which has a stand of vegetation included in an 'Environmentally Significant Area', which is bordered further west by Vegetation of Bioregional Significance	
Site I – Nav Aid building (including HIA20-SED and HIA21-SED)	Environment	Within an Environmentally Significant Area, and between stands of 'Vegetation of Bioregional Significance'.	Open space / Recreational & Areas of Environmental Significance

* refer to Figure 12, Appendix A

refer to Figure 11, Appendix A

Table 10: Interim Criteria Applicable to Water Samples in this PSI

Site / Locations	Land Use Precinct*	Environmental Values#	Applicable Criteria
Surface water			
All on-Airport surface water sample locations	Various	Only ecological values	Ecological For Intrusive Workers: Human Health Drinking Water for TRH and Human Health Recreational for PFAS (drinking water is considered too high and unlikely exposure)
Off-Airport surface water sample – HIA09-W	5-Mile Beach	Recreational use, fishing, swimming and ecological values	Human Health (Consumption of Fish & Recreational) Ecological
Groundwater			
Open well – groundwater (HIA-WELL01-W) and perimeter well HA19	Aviation	7 Mile Beach Spit Geoconservation Area	Ecological, (though groundwater is at around 2m depth) For Intrusive Workers: Human Health Drinking Water for TRH and Human Health Recreational for PFAS (drinking water is considered too high and unlikely exposure)
Site B – CFTG (and potential new FTG) – groundwater wells Perimeter wells HA20, HA21 and HA23	Aviation / Runway	7 Mile Beach Spit Geoconservation Area Stock drinking water	Ecological, (though groundwater is at around 2m depth) For Intrusive Workers: Human Health Drinking Water for TRH and Human Health Recreational for PFAS (drinking water is considered too high and unlikely exposure) Stock watering (not included) – could be derived from Human Health Drinking Water by multiplying by a suitable factor.

Site / Locations	Land Use Precinct*	Environmental Values#	Applicable Criteria
HA22	Environment	Environmentally significant area (Sinclair Creek salt marsh)	Ecological For Intrusive Workers: Human Health Drinking Water for TRH and Human Health Recreational for PFAS (drinking water is considered too high and unlikely exposure)

*refer to Figure 12, Appendix A

#refer to Figure 11, Appendix A

8.3 SOIL RESULTS

Soil results presented in the summary table in Appendix K include results from:

- Hand augered soils from this PSI (BH001 – BH030);
- Soil samples from the 2 new groundwater wells installed at the CFTG during this PSI (DG-7 and DG-8);
- Sediment samples (taken in lieu of surface water samples) during this PSI; and
- Soil samples from the investigation done into a new FTG, north of the CFTG (GHD, 2014)[25] (SB01 – SB018, and MW1 – MW3).

The data is believed to represent the extent of soil sampling testing for PFAS at the Airport.

8.3.1 Hydrocarbon Results

In accordance with the SAQP (SEMF, 2016b) for this PSI, only samples with TPH/TRH concentrations greater than the LORs were tested for BTEXN and PAH.

- None of the soil samples exceeded any of the applicable Human Health or Ecological TPH, TRH, PAH or BTEXN criteria.
- TRH detections were typically in the C_{16}-C_{34} fractions (F3) with the highest detection being 1,500mg/kg in a near-surface sample at SB12 (taken in 2014 at the potential new FTG).
- BTEXN were all reported below LOR.

[25] Airservices Australia PRN8979 – Replacement HB FTG Environmental Site Investigation, July 2014, GHD

- The highest PAH concentration was in sediment sample HIA15-SED with a concentration of 3.8mg/kg.
- All benzo(a)pyrene concentrations were below LOR.

Soils results table in Appendix K includes results for several newer wells (MW1 (MFS), MW2 (MFS), and MW3 (MFS)) installed at the MFS (Site A) in 2014 (SEMF, 2015). 4 soil samples were tested for hydrocarbons. Total PAH concentrations exceeded the AER Ecological criterion and one of these exceeded the total xylenes AER Ecological criterion.

8.3.2 PFAS Results

PFOS concentrations were reported above LORs from the majority of soil and sediment samples from most locations. All near-surface (0.1m) samples reported PFOS above LORs. All but one sediment sample (HIA20-SED) reported PFOS above LORs.

Except for 1 sample, **PFOS** concentrations were below the applicable Ecological Commercial / Industrial 60% protection criterion or 95% species protection-Ecological criterion. The more sensitive criterion was applied only to Site I samples and sediment samples from HIA20-SED and HIA21-SED (refer to Table 9). Sample BH028-02 (0.5m) taken from the southwest corner of the CFTG reported a concentration of 4.93 mg/kg which exceeds the Ecological Commercial / Industrial 60% protection criterion of 4.71 mg/kg.

PFHxS+PFOS concentrations are as per PFOS comments above. None of the concentrations exceeded the lowest Human Health criterion nominated (Appendix K, which is for low-density residential).

PFOA was detected above the LOR in samples from the MFS (Site A), CFTG (Site B), Landfill A (Site H) and most sediment samples. All PFOA concentrations were below the applicable Ecological criteria, which is the lowest PFOA criteria; hence all PFOA concentrations were below any of the nominated Human Health PFOA criteria (refer to Appendix K).

6:2 FtS and 8:2 FtS were detected in samples at the CFTG; all other soil samples had concentrations below LORs. All 6:2 FtS and 8:2 FtS concentrations were below the applicable ecological criteria, and below Residential Human Health criteria; there are no less-sensitive Human Health criteria nominated for 6:2 FtS and 8:2 FtS (refer to Appendix K).

8.3.3 Comments

It should be noted that most of the soil samples were taken from near-surface 0.1m and 0.5m depths. Only samples taken from new groundwater wells (DG-7, DG-8 and MW-1, MW-2 and MW3 (GHD, 2014)) drilled at/near the CFTG are at greater depths of between 1 and 4m. The water table was encountered at around 2m; samples in DG-7 and DG-8 taken at 3m and 4m were impacted by groundwater and poor drilling recoveries in a sandy profile.

Sediment samples tested during this PSI were subjected to silica-gel clean-up to remove naturally occurring hydrocarbons. None of the other surface samples were subjected to silica-gel clean-up though loamy sands are prevalent in the surface soils at the Airport.

95% species protection Ecological PFOS criterion (0.373 mg/kg) has only been considered applicable to a few sampling locations, namely those at and near Site I, which is located within an

Environmentally Significant Area (refer to Table 9). If it were applied to all samples, 7 samples from the MFS (Site A) and 2 samples from the CFTG (Site B) (within the CFTG fenced area) would exceed the 95% species protection Ecological criterion for PFOS. Neither the MFS nor the fenced area of the CFTG are considered ecologically sensitive areas warranting application of the 95% species protection; both locations are active ARFFS operational areas. The samples from all other Sites investigated (F, H, I and L) also met the 95% species protection Ecological criterion for PFOS. Locations of soil bores and wells are shown in separate figures for each site (Figures 3 to 9 in Appendix A).

8.3.4 Soils Results Summary

Hydrocarbon impact in near surface soils tested is negligible or nil.

PFAS impact appears to be as follows:

- Only 1 location investigated reported an exceedance of the adopted criteria: BH028-02 (0.5m), in the southwest corner of the CFTG (Site B), reported a PFOS concentration of 4.93 mg/kg, in excess of the Commercial / Industrial 60% species Ecological protection criterion;
- Low level PFOS and PFHxS impact is pervasive throughout near-surface soils;
- At many locations PFOS concentrations were found to be more elevated at 0.5m than at 0.1m;
- Low level PFOA impact appears to be restricted to the MFS (Site A), CFTG (Site B) (including in the southeast corner of the potential new FTG), Landfill A (Site H) and most sediment samples;
- Low level 6:2 FtS detections only occurred in samples situated on the eastern side of the CFTG: BH023, BH029 and DG-8; and
- Low level 8:2 FtS detections only occurred in samples from the MFS and CFTG.

8.4 SURFACE WATER RESULTS

Surface water results presented in the surface water summary tables (one for PFAS and one for hydrocarbons) in Appendix K include results from:

- Surface water samples taken as part of this PSI (December 2016);
- Stormwater samples taken in June 2016 as part of the quarterly MFS (Site A) water quality sampling event;
- Surface water samples taken by HIAPL in December 2015 as part of a one-off event which tested samples for PFAS; and
- Surface water samples taken by HIAPL in March and June 2016 as part of the quarterly Airport monitoring, which includes testing for hydrocarbons (but not PFAS).

Additional MFS stormwater PFAS data exist. Not all events and data have been collated, as only a representative set has been used to provide an overview of detected PFAS impact.

8.4.1 Hydrocarbon Results

The majority of TPH and TRH results were below LORs with the exception of 2 samples taken by HIAPL in March 2016 at HIA03A (east of runway, on Sinclair Creek, midway to 5-Mile Beach) and HIA07 (west of runway, and next to the TasWater WWTP discharge point) which reported 60 and 80 mg/kg TPH C_6-C_9 fractions respectively. Neither of the concentrations exceeded Ecological criteria. The TRH LORs are too high to be able to compare to the drinking water criterion of 0.09 µg/L TRH C_{10}-C_{40}.

8.4.2 PFAS Results

PFOS concentrations at HIA09 (confluence of Sinclair Creek and 5-Mile Beach) in this PSI (December 2016) and in the HIAPL sample (December 2015) exceed the PFOS criterion for Human Health – Fish Consumption, but are within the PFOS Recreational criterion. This is the only location assessed against the Human Health criteria for fish consumption.

PFOS, PFHxS and PFHxS+PFOS concentrations exceed Human Health Recreational values at all Sinclair Creek sampling locations immediately up-gradient of (HIA13-W), and downgradient of, the MFS stormwater discharge pipe. The only exception was the sample at HIA07-W taken next to the WWTP effluent discharge point. Human Health Recreational criteria are taken to approximate worst possible exposure to potential earthworks contractors.

PFOS was detected above LORs in all surface water samples. **PFHxS** was detected in all surface water samples except for HIA01, the most up-gradient sample in Sinclair Creek.

There are several locations which report PFOS, PFHxS or PFHxS+PFOS exceedances of Ecological criteria (refer to Appendix K). These include SW2 and SW4, 2 stormwater sampling locations on the north side of the MFS (Site A) and 4 locations in Sinclair Creek, at and downstream of the "MFS" stormwater discharge pipe to Sinclair Creek (Locations SW5, HIA12-W, HIA05-W and HIA03A-W) (refer to Figure 3 in Appendix A). A notable absentee is location HIA07-W, which is immediately next to the TasWater WWTP discharge pipe to Sinclair Creek, between samples HIA12-W and HIA05-W. The treated effluent flow is likely to be significant enough to create noticeable localised dilution at this location (refer to Figure 13). Figure 13 (Appendix A) is a schematic representation of PFOS concentrations at Sinclair Creek sampling locations, from the most upstream location (HIA01) to the most downgradient location (HIA09) at 5-Mile Beach.

The highest PFOS concentrations are at SW5 (next to the "MFS" stormwater discharge pipe to Sinclair Creek). At SW5, PFOS concentrations are at least 7 times the PFOS Ecological criterion. The concentrations appear to decrease downstream to HIA03A (where they are just under double the PFOS Ecological criterion). At HIA09 (Sinclair Creek / 5-Mile Beach confluence) the PFOS concentration is 1/10th the PFOS Ecological criterion.

Although the TasWater WWTP discharge (near HIA07-W) appears to provide localised dilution, PFOS concentrations downstream appear relatively elevated. The causes and dynamics in and near Sinclair Creek are not understood sufficiently to understand why this is occurring.

Another area of interest is up-gradient from SW5, Site E (backfilled pond). Sampling locations HIA17-W and HIA13-W are located respectively up-gradient and downgradient of Site E. There is an increase in PFAS concentrations in the downgradient sample relative to the up-gradient sample. Although the increase could be due to potential leaching of PFAS from the backfilled pond, it is

also possible that water at this location could be locally, moving upstream or mixing with upstream water. The gradient of Sinclair Creek is very low, and it is possible that during discharge inputs near SW5 (e.g. during truck washdown in dry periods) that water could disperse upstream a short distance, potentially impacting on the water quality at location HIA13-W. The hydrology of Sinclair Creek and its tributary channels is not fully understood. The effect of tidal ingress at 5-Mile Beach on the flow in Sinclair Creek is not known. The effect could impact on flows up-gradient of the saltmarsh, particularly during high tides. Presence of PFAS contamination in materials within the backfilled pond at Site E has not been tested and could also be impacted by PFAS which could be leaching into Sinclair Creek.

PFOA was detected above the LOR at most locations with a few notable exceptions: HIA01-W, HIA19-W and HIA18-W, the 3 most up-gradient samples in Sinclair Creek, as well as in HIA04-W and HIA10-W taken from the northern end of the stormwater drain northwest of the runway. All PFOA concentrations above the LOR are within Ecological criterion (Appendix K).

6:2 FtS concentrations were below the LOR for all surface water samples. 6:2 FtS concentrations were below the Ecological criterion (Appendix K).

8:2 FtS concentrations were below the LOR for most surface water samples except for stormwater samples (SW1, SW2, SW3 and SW4 (refer to Figure 4 in Appendix A)) taken around the MFS. 8:2 FtS concentrations were below the Ecological criterion (Appendix K).

8.4.3 Comments

TDS concentrations in water samples are typically higher than 900mg/L, i.e. the water quality is poor to unpalatable from a human drinking water perspective. The two locations with 'fair' to 'good' drinking water quality (from a TDS perspective) are HIA07 at the WWTP inlet (treated water), and at HIA16 (pooled rainwater). Neither of these locations are expected to be used for drinking water, and are not situated within a drinking water catchment. This confirms that assessment of surface water samples does not need to be made against drinking water criteria.

The TRH LORs are too high to be able to compare to the drinking water criterion of 0.09 µg/L TRH C_{10}-C_{40}.[26]

The catchment for the stormwater drain which feeds to Sinclair Creek next to sampling location SW5 has not been confirmed for this PSI. It is assumed to be from the MFS, however other areas may drain to this stormwater pipe. Sampling location SW5 is understood to be within Sinclair Creek rather than being an end-of-pipe sample.

8.4.4 Surface Water Results Summary

Hydrocarbon impact in surface water appears to be negligible or nil.

[26] SEMF enquired with ALS laboratories who noted that they are not typically requested to drop the LOR and would check whether this was feasible.

PFAS impact appears to be as follows:

- PFOS, PFHxS and PFHxS+PFOS Ecological criteria are exceeded at 3 out of 5 sampling locations downstream of the "MFS" stormwater discharge to Sinclair Creek; the 2 exceptions are HIA07, due to dilution from the TasWater WWTP discharge, and HIA09, due to dilution from 5-Mile Beach;
- PFOS concentrations reported at HIA09 (Sinclair Creek / 5-Mile Beach) exceed Human Health Fish Consumption criterion, but are within the Human Health Recreational and the Ecological criteria;
- Low level PFOS and PFHxS impact is pervasive throughout surface water sampling locations including at the most upstream samples in Sinclair Creek where PFOS was detected but no PFHxS;
- Low level PFOA impact appears to be pervasive in most surface water sampling locations with the exception of the 3 most up-gradient locations in Sinclair Creek and the 2 northernmost locations in the swale drains northwest of the runway;
- 6:2 FtS was below the LOR in all samples; and
- 8:2 FtS was only detected in stormwater samples at the MFS (Site A).

8.5 GROUNDWATER RESULTS

Groundwater results presented in the groundwater summary tables (one for PFAS and one for hydrocarbons) in Appendix K include results from:

- groundwater (and one open well) samples taken as part of this PSI (January 2017);
- groundwater samples taken at the CFTG as part of the annual monitoring event in September 2016;
- groundwater samples taken in the perimeter wells around the Airport as part of the annual monitoring event in August 2015; and
- groundwater samples taken in the wells established to the north of the CFTG, as part of an investigation in a potential new FTG (GHD, 2014).

8.5.1 Hydrocarbon Results

The majority of TPH and TRH results, and PAH and BTEXN (where tested), were below LORs with the exception of:

- DG-5 and DG-8 both reported low concentrations of TRH >C_{16}-C_{34} (F3) fractions of 230 and 170 mg/kg respectively;
- DG-3 reported detectable concentrations of all TRH fractions except >C_{34}-C_{40} (F4), 3 mg/kg benzene, 14 mg/kg toluene, 4 mg/kg ethylbenzene and 28 mg/kg total xylenes, PAHs below LORs; and
- There were no exceedances of ecological criteria in any of the groundwater samples.

The groundwater results table in Appendix K includes results for several newer wells (MW1 (MFS), MW2 (MFS), and MW3 (MFS)) installed at the MFS (Site A) in 2014 (SEMF, 2015). Total TPH C_{10}-C_{36} concentrations in all 3 wells exceeded the AER Ecological criterion.

8.5.2 PFAS Results

PFOS concentrations were above the LOR in all wells except for MW1 (CFTG), MW2 (CFTG) and MW3 (CFTG) drilled north of the CFTG in 2014 (GHD) (the LOR was 0.02 µg/L which is relatively high).

PFOS concentrations in the 3 newer wells (MW1 (MFS), MW2 (MFS) and MW3 (MFS)) drilled at the CFTG in late 2014 (SEMF, 2015) exceeded the Ecological criterion, and the Human Health Recreational criterion (used as a worst case exposure for Intrusive Workers).

PFOS concentration in HA20 (August 2015), located at the south-western perimeter of the Airport land, exceeded the Human Health Recreational criterion.

PFHxS concentrations were above the LOR in all samples tested (not all groundwater samples have been tested for an extended or full PFAS suite).

PFOS, PFHxS and PFHxS+PFOS concentrations in CFTG wells (DG-2, DG-3 and DG-5) and the 2 wells northeast of the CFTG, DG-8 and MW1, all exceeded the Ecological criteria and the Human Health Recreational criterion.

PFOA was detected above the LOR in the 3 wells within the CFTG (DG-2, DG-3 and DG-5) and the 2 wells northeast of the CFTG, DG-8 and MW1. All other wells has PFOA concentrations below the LOR and all PFOA concentrations are below the PFOA Ecological criterion (Appendix K).

6:2 FtS concentrations were below the LOR for most groundwater samples except for DG-3 and DG-5 in the CFTG. 6:2 FtS concentrations were below the Ecological criterion (Appendix K).

8:2 FtS concentrations were below the LOR for most groundwater samples except for DG-3. 8:2 FtS concentrations were below the Ecological criterion (Appendix K).

8.5.3 Comments

From a TDS perspective, most groundwater samples had TDS concentrations within human drinking water palatable concentrations with the exception of water from DG-6, near Surf Road, southeast of the runway, and from HA-22, east of the runway, close to Sinclair Creek within the 'saltmarsh' area. However, none of the wells are being used or likely to be used for drinking water supply so the results have not been compared to drinking water criteria. TRH LORs are higher than drinking water criteria.

HA22 and HA23 perimeter wells have not been tested for PFAS.

8.5.4 Groundwater Results Summary

Hydrocarbon and PFAS impacts are known to be present in groundwater beneath the MFS (Site A). Results have not been added to the PSI summary tables as the Site is the subject of separate groundwater investigations and monitoring.

Hydrocarbon results for most wells discussed in the PSI show no hydrocarbon impact with the exception of 3 wells at the CFTG, DG-5, DG-8 and DG-3 which has the higher concentrations and

detectable BTEXN. John Sloane also reported having possibly intersected a thin layer of phase separated hydrocarbons when dipping wells DG-2 and DG-5 (January 2017).

PFAS impact appears to be as follows:

- PFOS and PFHxS impact is pervasive in groundwater throughout all wells tested;
- PFOA is only detected above the LOR in CFTG wells;
- 6:2 FtS is only detected above the LOR in CFTG wells DG-3 and DG-5, situated south of the detention ponds and mock-up respectively;
- 8:2 FtS is only detected above the LOR in CFTG well DG-3 south of the detention ponds;
- Significant exceedances of Ecological criteria for PFOS, PFHxS and PFHxS+PFOS occur in CFTG wells (DG-2, DG-3 and DG-5) and the 2 wells northeast of the CFTG, DG-8 and MW1;
- HA20, near Surf Road, southwest of the runway, has the highest PFOS concentration of the perimeter wells that have been tested for PFAS; and
- DG-7, situated close to Pittwater Road, reported detectable though low concentrations of PFOS and PFHxS.

Survey (Sloane, 2017) of 9 wells and water level at the CFTG, and to the northeast and southeast of the CFTG has shown that groundwater is mounded at the CFTG and has a low gradient to the northeast and to the southeast (refer to Figure 10 in Appendix A). The mounding and the gradient(s) and direction(s) could be influenced, or compounded by:

- regular ARFFS fire-fighting training at the CFTG;
- possible leakage from one or both wastewater ponds;
- lack of vegetation within the CFTG footprint resulting in less water uptake and evapotranspiration; and
- sealed areas may act as a boundary to evaporation within their footprints.

The water table was at around 2m depth in January 2017. Groundwater movement direction(s) and gradient from the CFTG without these anthropogenic changes could differ from those shown in Figure 10 (Appendix A).

9. PRELIMINARY CONCEPTUAL SITE MODELS

9.1 OVERVIEW

The information captured in this PSI has been used to develop preliminary Conceptual Site Models (CSMs) for each ARFFS site where AFFF has historically been used. A CSM is a representation of an environmental system defining the possible contaminants, their source(s) and the possible pathways of exposure to human and environmental receptors. A CSM is typically revised as additional information and data are obtained to fill information gaps.

9.2 CONCEPTUAL SITE MODELS

The input elements of a preliminary CSM include consideration of the following:

- Sources of potential contamination and CoPC;
- Sensitive human and ecological receptors;
- Subsurface characteristics (geology, hydrogeology, soil);
- Underground services, buildings;
- Migration pathways – for a source of contamination to be of concern, there must be a mechanism for release into environmental media; and
- Exposure routes – for a risk to human health and / or the environment to exist, there must be a source of contamination, a release mechanism, a receptor and a complete migration pathway, which allow the contaminant to move from the source to the point of contact with a sensitive receptor (exposure route).

Based on a review of the information and data collected during the PSI, preliminary CSMs for each ARFFS site where AFFF has historically been used are summarised in Table 11. The table shows that, based on the PSI results and review of past investigations, the following Sites and media have concentrations of PFAS or TRH in excess of adopted interim criteria:

- Site A (MFS): PFAS in surface water and TRH in groundwater;
- Site B (CFTG): PFAS in soils, and PFAS and TRH in groundwater;
- PFAS in Sinclair Creek; and
- PFAS in groundwater at one perimeter well HA20.

Schematic representations of PFAS inputs and migration pathways have also been compiled for Site A (MFS) and Site B (CFTG), in Figures 14 and 15 (Appendix A).

Sensitive receptors for which a potential complete pathway exists from a known and confirmed contamination source include:

- Aquatic and terrestrial biota using Sinclair Creek, downgradient of SW5;
- Workers who may come in contact with water from Sinclair Creek downgradient of SW5;
- Recreational users and fishers on 5-Mile Beach;

- Site workers who may come into contact with surface water or groundwater from the MFS and CFTG;
- Offsite groundwater users downgradient of the Site B (CFTG); and
- Beach users and biota down-groundwater gradient of Site B (CFTG), such as 5-Mile Beach, 7-Mile Beach.

The potential for contamination from off-Airport, impacting on the Airport and AFFF-identified sites, has not been investigated as a component of the PSI. Current surrounding Airport uses include a mix of residential and agricultural premises. Agricultural practices and forestry plantation practices can use a range of products (e.g. pesticides and fertilisers) which can be spread broadly. Associated contamination is possible but has not been accounted for in this PSI.

9.3 DATA GAPS

In creating the preliminary CSMs the following data gaps were identified:

- Site A (MFS):
  - current soil PFAS concentrations at depth are not known;
  - current groundwater PFAS and TRH concentrations are not known;
  - potential connectivity between groundwater at Site A and Sinclair Creek.
- Site B (CFTG): the migration distance(s) of the PFAS and TRH contamination plume(s) and the potential for these to reach sensitive receptors are not known.
- General Airport: soil PFAS concentrations across the remainder of the airport are not known, but are likely to be low level.
- General Airport: groundwater PFAS concentrations north of Sinclair Creek, and beyond the MFS are not known.
- Apart from the 5 locations (SW1 to SW5) tested regularly around and downstream of the MFS, no other surface water investigations on Airport are known to regularly include PFAS compounds in their analytical suites.
- Groundwater monitoring bore locations and coverage outside of the MFS (Site A) and CFTG (Site B and immediately north in the proposed new FTG area) are very limited and are not necessarily downgradient of AFFF usage sites.
- Only 3 out of 5 perimeter wells are tested routinely for PFAS. The 2 northernmost wells have not been tested for PFAS.
- PFAS suites and LORs vary between investigations, with older investigations typically having higher LORs which often prevent comparison with recent data.
- PFAS have been detected in groundwater of perimeter well HA20, located at the southwest corner of the Airport land. The source(s) of this contamination has not been confirmed (e.g. CFTG or operational response Site N, or both).

- Groundwater monitoring appears to be undertaken in discrete and isolated programs, e.g. Site A (MFS), or Site B (CFTG); groundwater monitoring, testing and assessment does not appear to be assessed in a whole-of-Airport context.
- No groundwater modelling or assessment of the hydrogeological regime, water levels and movement direction(s) and water quality across the whole Airport has been undertaken.
- Off-Airport groundwater extraction influence (if any) on groundwater movement to / from the Airport land are not well understood.
- Little to no testing for soil vapour / volatile emissions has been undertaken except for a one-off survey within the ARFFS building (Site A).
- No interviews were held with long-standing Airport (HIAPL) personnel.
- No interviews were held with ARFFS personnel with experience of operations between 1980/1982 and 1988, which are the first 6 – 8 years of AFFF use by the ARFFS.
- Soils and materials removed from the Airport to off-Airport or to stockpile areas (e.g. Site M) by the Airport operator are of unknown Airport origin and have not been tested for PFAS compounds. Site M is under HIAPL management.
- Surface water catchments and channels inputs to Sinclair Creek have not been fully mapped / reviewed for this PSI. Sinclair Creek provides a direct pathway for PFAS and other contaminants to sensitive users and surface sampling results suggest that the MFS channel is not the only source of PFAS to the creek.
- No investigations were undertaken at Sites E, or at OR sites or sites where locations are uncertain (e.g. Site G) or AFFF impact risk is currently considered to be very low.

Table 11: Preliminary Conceptual Site Models – PFAS & Hydrocarbons

Sites	Soils criteria				Surface Water criteria					Groundwater criteria				Receptors	Pathways to Receptors		
	PFAS - Commercial / Industrial	TRH - HSL A	PFAS - Open Space	PFAS & TRH Ecological	PFAS Recreational/ Workers	PFAS Human Health-Fish Consumption	TRH - drinking water	PFAS - Ecological	TRH - Ecological	PFAS Recreational/ Workers	TRH - drinking water	PFAS - Ecological	TRH Ecological		Soil	Surface Water	Groundwater
A - MFS	Shallow soils Soils at depth	√	O	Shallow soils Xylenes & PAH > AER Ecological	X	O	X	X	√	X (2014 data)	X (2014 data)	X (2014 data)	X (2014 data)	Workers A	no	no	no
														Workers B	yes	yes	yes
														Biota	underground organisms	discharge to Sinclair Creek	underground organisms
														Sinclair Creek	sediments	yes - not all sources of PFAS contamination to SW are known	connectivity is unknown
B - CFTG	√	√	O	X	O	O	O	O	O	X	X	X	√	Workers A	no	no	no
														Workers B	yes	yes (wastewater ponds)	yes
														Biota	underground organisms	yes (wastewater ponds)	underground organisms
														Groundwater extraction	via groundwater if soils leach PFAS	unlikely unless wastewater retention ponds leak and recharge groundwater	current low risk; long term risk to be determined
F - Utas Building	√	√	√	O	O	O	O	O	O	√	Δ	√	√	Workers A	no	no surface water	no
														Workers B	yes, but low risk based on PSI results	no surface water	low risk based on data and depth to groundwater @2m
														Biota	yes, but low risk based on PSI results	no surface water	risk is low based on data
H - Old Landfill A	√	√	√	O	O	O	O	O	O	√	Δ	√	√	Workers A	no	no surface water	no
														Workers B	yes, but low risk based on PSI results	no surface water	low risk based on data and depth to groundwater @2m
														Biota	yes, but low risk based on PSI results	no surface water	risk is low based on data
I - NavAid Building	√	√	√	√	O	O	O	O	O	Δ	Δ	Δ	Δ	Workers A	no	no surface water	no
														Workers B	yes, but low risk based on PSI results	no surface water	no data, but risk is low based on soil concentrations and depth to groundwater @2m
														Biota	yes, but low risk based on PSI results	no surface water	no data, but risk is low based on soil concentrations
L - Control Tower	√	√	√	O	O	O	O	O	O	Δ	Δ	Δ	Δ	Workers A	no	no surface water	no
														Workers B	yes, but low risk based on PSI results	no surface water	no data, but risk is low based on soil concentrations and depth to groundwater @2m
														Biota	yes, but low risk based on PSI results	no surface water	no data, but risk is low based on soil concentrations
Sinclair Creek	No PFAS testing has been done in creek sediments				X	X	X	X	√	O	O	O	O	Workers A		no	
														Workers B		yes	
														Recreational fishers (5-Mile Beach)		yes, and potential risk as exceedes HH criterion for fish consumption at HIA09	
														Recreational users (5-Mile Beach)		yes, but low risk based on concentrations at HIA09	
														Biota		yes	
General	Δ	Δ	Δ	Δ	O	O	O	O	O	O	O	O	O	Workers A	no		

Sites	Soils criteria				Surface Water criteria					Groundwater criteria				Receptors	Pathways to Receptors		
	PFAS - Commercial / Industrial	TRH - HSL A	PFAS - Open Space	PFAS & TRH Ecological	PFAS Recreational/ Workers	PFAS Human Health-Fish Consumption	TRH - drinking water	PFAS - Ecological	TRH - Ecological	PFAS Recreational/ Workers	TRH - drinking water	PFAS - Ecological	TRH Ecological		Soil	Surface Water	Groundwater
Airport Soils														Workers B	low risk based on PSI results in other airport areas		
														Biota	low risk based on PSI results in other airport areas		
General Airport Surface Water (excluding Sinclair Creek)	O	O	O	O	√	O	O	√	√	O	O	O	O	Workers A		no	
														Workers B		low risk based on PSI results in other airport areas	
														Biota		low risk based on PSI results in other airport areas	
General Airport Groundwater	O	O	O	O	O	O	O	O	O	**X (Well HA20)**	**Issue with Lab LOR for TRH**	**No PFAS data in ground-water north of Sinclair Ck and MFS**	√	Sinclair Creek			connectivity from major PFAS source areas (e.g. CFTG) is unknown
														Workers A			no
														Workers B			yes
														Offsite abstraction bores			GW use to be confirmed & connectivity tested if required
														Barilla Bay, Pittwater, 7-Mile Beach: users			actual discharge area(s) of GW from major PFAS sources are unknown
														Barilla Bay, Pittwater, 7-Mile Beach: biota			actual discharge area(s) of GW from major PFAS sources are unknown

Criteria Legend

√	Concentrations detected were below the criteria
X	Concentrations detected exceeded the criteria
O	Not applicable
Δ	Not investigated / not currently a priority
□	Data / knowledge gap

Pathways Legend □

Workers A:	Everyday Airport Workers & Staff doing day-to-day tasks
Workers B:	Workers undertaking earthworks or environmental sampling (i.e. high likelihood of contact with soils, surface water or groundwater)
	No Pathway, or risk is very low
	Likely Pathway, or risk is high
	Pathway is not applicable
	Data / knowledge gap

10. CONCLUSIONS

10.1 SOILS

There appear to be low PFAS (in particular PFOS) concentrations across surface soils at all the sites investigated. Soil PFAS and hydrocarbon concentrations across the Sites and depths investigated within this PSI do not appear to present a human health or ecological risk if left *in situ*. Elevated PAH and total xylenes concentrations reported at depth (at 1.4+m) within the newer wells installed in 2014 at the MFS, exceed AER Ecological criteria. TRH concentrations are within HSL A.

As might be expected, PFAS concentrations in soils were generally at higher concentrations at the MFS (Site A) and the CFTG (Site B) than at the other Sites (F, H, I and L). Average PFOS concentrations in near surface soils (using comparable samples from this PSI only) are listed below in order of highest to lowest. The concentrations appear to correlate closely with expected and reported frequency and quantity of AFFF use at each Site.

- Site A - MFS: 10 samples, 1.39mg/kg;
- Site B - CFTG: 7 samples (in fenced area), 0.82mg/kg;
  13 samples (outside fenced area), 0.05mg/kg;
- Site H - Landfill A: 7 samples, 0.011mg/kg;
- Site F - UTas Building: 6 samples, 0.007mg/kg;
- Site L - Control Tower: 13 samples, 0.0038mg/kg; and
- Site I – Nav Aid Building: 4 samples, 0.002mg/kg.

It is noted that rabbit burrows were encountered at several locations on the eastern side of Tower Hill (Site L). It is understood that landscaping contractors have backfilled a number of holes with soil. This may have resulted in slightly lower average-PFAS concentrations at this Site.

Given the leachability of PFAS compounds and low water PFAS detection LORs, it is possible that soils which do not exceed Human Health and Ecological criteria, could be leaching PFAS to surface water and groundwater. Given the sandy permeable profile throughout the Airport land and the relatively shallow water table across most of the land (1.5 – 2.5m), leaching to groundwater is highly likely.

Several sediment samples were taken in lieu of surface water. They are also potentially representative of transported PFAS via leaching in stormwater (dissolved PFAS), or via sediment transport (physical / mechanical transport). All sediment samples reported detectable PFAS concentrations. The lowest concentration were in the 2 samples (HIA20-SED and HIA21-SED) east of the runway and situated between Site I (Nav Aid Building) and Sinclair Creek. Both samples were taken from low lying drainage areas which carry water eastwards from Site I and east of the eastern gravel road. The Nav Aid building had the lowest PFAS in soils concentrations (of the Sites tested) and this correlates well with the lower sediment concentrations.

Sediment sample HIA15-SED was taken from a stormwater drain feeding from the carpark west of the Terminal and past the hospital kitchen building. It is likely that stormwater from Tower Hill might report to that drain, and the low level impact in the sediments of HIA15-SED (0.0056mg/kg) is of a similar order to the soil at Site L (0.0038mg/kg).

The 2 sediment samples taken from the northernmost samples, HIA11-SED and HIA14-SED have the higher PFAS concentrations of the sediment samples, with PFHxS+PFOS concentrations of 0.012 and 0.014mg/kg respectively. HIA11-SED was taken from the northernmost point along the northeastern swale drain. HIA14-SED was taken in the southernmost point along what appears to be a linear depression north of the Terminal, which runs parallel to and west of the runway.

The sediment samples results appear to show that transport of PFAS has or is occurring via stormwater, even from areas with very low PFAS impact.

Groundwater results at wells HA19 and the open well near the UTas Building (Site F) suggest that PFAS impacts to groundwater have occurred via percolation to the water table. Groundwater results at well HA21, next to Landfill A (Site H) also suggests impacts to groundwater from PFAS percolating through the profile.

10.2 SURFACE WATER

10.2.1 Surface Water - Hydrocarbons

Hydrocarbon impact in surface water samples is insignificant or not detected in the samples taken (December 2016, during this PSI) and past samples reviewed. Hence hydrocarbon management measures on Airport appear to be effective in minimising impact to surface waters.

10.2.2 Surface Water – PFAS – General Airport

Surface water PFAS concentrations in the 2 northernmost samples HIA04-W (NW of runway) and HIA10-W (northern end of runway) are of a similar order, with PFHxS+PFOS being 0.045ug/L and 0.078ug/L. This is likely to represent the low level diffuse PFAS concentrations expected in surface waters draining from low PFAS soil impact areas.

PFAS concentrations in water sample at HIA16-W, immediately north of the apron, are an order of magnitude higher than HIA04-W and HIA10-W, suggesting that there is PFAS impacted soil or infrastructure draining to that area. Apron, taxiways and grassed areas drain to this sampling point, however actual source(s) have not been confirmed. None of the concentrations exceed Ecological or Human Health Recreational criteria.

10.2.3 Sinclair Creek

PFOS concentrations reported at HIA09 (Sinclair Creek / 5-Mile Beach) exceed Human Health Fish Consumption criterion, but are within the Human Health Recreational and the Ecological criteria. The risk to human health, associated with potential recreational fishing at 5-Mile Beach has not been assessed. The samples were taken within the Sinclair Creek channel, and it is expected that dilution along 5-Mile Beach would be rapid, but has not been confirmed. Accumulation of PFAS in sediments/sands and biota along Sinclair Creek channel east of the Airport land, and at 5-Mile Beach may have occurred but has not been tested.

PFAS concentrations at all 4 Sinclair Creek sampling locations (HIA01, HIA19, HIA18, HIA17/HIA06) situated up-gradient of site HIA13-W and of the MFS (Site A) stormwater discharge pipe were within the Ecological and Human Health Recreational criteria (used for Intrusive Workers potential exposure).

PFOS, PFHxS and PFHxS+PFOS concentrations at Sinclair Creek sampling locations (HIA13, SW5, HIA12, HIA07, HIA05 and HIA03A), situated near and downgradient of the MFS (Site A) stormwater discharge pipe, exceeded Human Health Recreational values. Human Health Recreational criteria are taken to approximate worst possible exposure to potential earthworks contractors. These same locations also exceeded Ecological criteria, with the exception of HIA07-W, taken next to the WWTP effluent discharge point.

The stormwater pipe coming from the MFS (Site A) which discharges near sampling point SW5 (Figure 2) appears to be the most significant source of PFAS to Sinclair Creek, though other lower PFAS concentration sources appear to be contributing to the creek. Input sources to Sinclair Creek have not been tested. Beca (2016b, 2017) trade waste sampling results from the triple interceptor downstream from the washdown bay at the MFS (Site A) reported 10.1 µg/L PFOS in December 2016, and 2.48 µg/L in August 2016. These are in the same order of magnitude as concentrations at SW5 (Sinclair Creek next to MFS stormwater pipe) of 4.4 µg/L PFOS in June 2016 and 46.2 µg/L PFOS in November 2015, however they appear to be lower than would be expected if the MFS discharge water is the most significant source of PFAS to Sinclair Creek.

The relatively high concentrations at HIA05-W and HIA03-W, east of the runway are of interest. Strong dilution is shown to occur at HIA07, up-gradient of these 2 locations, near the TasWater WWTP discharge point to Sinclair Creek. The increase in concentrations downgradient of the WWTP discharge point, across the runway is not readily explained. It could be:

- that the sample at HIA07-W was taken from highly mixed water consisting mostly of WWTP effluent;
- that the WWTP effluent water does not mix readily with Sinclair Creek water due to differences in salinity and other physicochemical characteristics, which would mean that samples taken downstream at HIA05-W and HIA03-W, if taken within unmixed creek water, are showing natural downgradient dilution from the major source at SW5 (MFS stormwater discharge point); or
- that there could be other source(s) of PFAS contaminated surface water draining into Sinclair Creek east of the runway which are increasing the PFAS concentrations.

The hydrology of Sinclair Creek, including its input sources and potential PFAS inputs are not well understood, although it has been confirmed via this round of sampling, that the stormwater channel draining from the MFS (Site A) is the major contributor of PFAS. The contribution of PFAS from the former pond (Site E) appears to be suggested by the surface water sampling (i.e. there was an increase from the up-gradient sample HIA17-W (HIA06) to the downgradient sample HIA13-W). Further testing is required to confirm if Site E is a source, and to confirm Sinclair Creek water movements near the MFS (Site A) stormwater discharge point. It is also noted that the salinity of Sinclair Creek increases east of the runway, and organic matter in soils also increases within the salt marsh. Both of these factors may influence movement of PFAS in the creek water and creek bed.

10.3 GROUNDWATER

Hydrocarbon and PFAS impacts in groundwater are known at the MFS (Site A) and have been confirmed at the CFTG (Site B). Both sites have an array of groundwater monitoring wells and are typically monitored annually.

Hydrocarbon and PFAS plume extent and movement at the MFS has not been completely modelled due to the complex interbedding of sand and clay horizons. Discharge of groundwater from the MFS to surface water has not been tested. This is considered to represent a high risk path to sensitive receptors.

Movement of groundwater-borne contamination from the CFTG could be in several directions, spanning an arc from the northeast to southeast, though southwest cannot be excluded, based on past monitoring results (Sloane Geoscience – several groundwater monitoring events). Sensitive receptors are present offsite and downgradient of the CFTG, including abstraction bores (northeast of the CFTG) and Seven Mile Beach, recreational users. Very low level PFAS contamination was detected in surface soils and in groundwater at well DG7, situated northeast of the CFTG near Pittwater Road. It is assumed that the impact at surface could be from spray drift of historical bush training operations or sprinkling of CFTG wastewater in the forest east of the CFTG, and impact to groundwater could be either from percolation of leached PFAS from surface, or from migration of groundwater from the CFTG. Potential impact from forestry or other operations within the area has not been assessed. DG7 is situated within forested land, close to pine plantations, located east of Pittwater Road. PFAS concentrations in DG7 are currently well below Human Health Drinking Water criteria and are therefore expected to be well below stock watering criteria. The current risk to the water quality of users to the northeast of the CFTG is considered to be low. Long term risks have not been assessed as hydrogeological modelling or fate and transport modelling have not been undertaken.

Well HA20, located at the southwest corner of the Airport, near Surf Road, reports the highest PFAS concentrations of all perimeter wells. The source of PFAS detected at this location is not confirmed. It may be from the CFTG, located 650m northeast, or from some other source south or west of the runway. ARFFS staff reported ‘numerous’ ORs south of the runway. None of the locations were known, however it is likely that AFFF impact occurred.

PFOS concentration at HA-20 exceeds the Human Health Recreational level of 0.7ug/L (FSANZ, 2017).There have been significant excavations in the last months at the southern end of the runway to accommodate the runway extension. The depth of excavations may affect groundwater flows locally, and between the CFTG and HA-20. The next round(s) of monitoring may provide an indication as to the possible connectivity between the two locations. If the concentrations at HA-20 decrease noticeably, it may be that:

- the nearby source of PFAS was removed during runway extension excavations; or
- the runway extension excavations have created a groundwater movement barrier between the CFTG and HA-20;

either way, that would mean that less PFAS is likely to report to Seven Mile beach at this end of the Airport.

If the concentrations at HA-20 remain similar, then it may be assumed that:

- the source area is near HA-20; or
- the connectivity between the CFTG and HA-20 has been maintained.

Confirmation of one or the other (or both) may need to be obtained via further investigation.

DG-6, approximately 450m southeast of the CFTG, near Surf Road, reports low PFAS impact, lower than HA20, even though it is situated closer to and downgradient of the CFTG. The concentrations are currently within both Human Health Recreational and Ecological PFAS criteria, hence the current risk of groundwater from this area discharging into Seven Mile Beach is considered to be low.

Drinking water and recreational values are not directly applicable to any of the groundwater wells at the Airport. Groundwater concentrations have therefore been assessed against Ecological criteria only. The CFTG and the MFS (GES, 2015) both have PFAS concentrations in groundwater which exceed Ecological criteria. Ecological receptors at and downgradient of these sites include:

- Sinclair Creek and its saltmarsh and 5-Mile Beach potentially downgradient of the MFS – discharge of groundwater from the MFS to Sinclair Creek (or to the backfilled pond, Site E and then to Sinclair Creek) has not been tested; and
- Seven Mile Beach southeast of the CFTG, and 5-Mile Beach to the northeast.

Stock watering, plant watering, recreational and potentially drinking water values are relevant beyond the boundary of the Airport. Groundwater criteria for these uses are more stringent than Ecological and are expected to be exceeded by the CFTG PFAS groundwater concentrations. Current risks to all of these sensitive offsite users are currently considered to be low, based on the groundwater results at bores closest to these locations, however longer term modelling and risks should be considered in order to inform possible management measures.

11. REFERENCES

AECOM, 2010: *Screening Human Health Risk Assessment – Refurbishment of ARFF Building, Hobart International Airport, November 2010.*

Airservices, 2003a*: ARFF Incident Detail Report #190: Extinguished smouldering fire next to the exhaust of Qantas tug, 23 July 2003.*

Airservices, 2003b*: ARFF Incident Detail Report #209: Mutual Aid Call: BP Fuel: overturned fuel tanker, 29 December 2003.*

Airservices, 2005*: ARFF Incident Detail Report #328: Aircraft - crash: TasAir aircraft, Fuel leaking from wing; no actual crash, 30 September 2005.*

Airservices, 2006*: ARFF Incident Detail Report #421: Aircraft - crash: Light aircraft crash on Runway 09, Cambridge Aerodrome, 30 September 2006.*

Australia and New Zealand Environmental Conservation Council, *National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000).

Beca Consultants Pty Ltd, 2015*: Hobart International Airport Groundwater Monitoring, 18 September 2015.*

Beca Consultants Pty Ltd, 2016a*: Hobart Hot Fire Training Ground Groundwater Monitoring, 29 September 2016.*

Beca Consultants Pty Ltd, 2016b: *Hobart ARFF Site Sampling Report 2016*, 5 September 2016.

Beca Consultants Pty Ltd, 2017: Site: Hobart, Job No. 3514722, visit of 8 December 2017, reported 22 May 2017. Ref. AU1-2275192-7 0.7

Department of Environmental Regulation, Government of Western Australia: *Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) – Contaminated Sites Guidelines*, (DER, January 2017).

Department of the Environment, 2016*: Environment Protection and Biodiversity Conservation Act Protected Matters Report PMST_34KZCD for Hobart Airport land, Sourced 23 August 2016*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: frame number 1946_hobart_9872 and 1946_hobart_9873, run 4, date flown 4 Mar 1946, scale 1:17,450; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 0332, frame number 004, run 5, project P1333, date flown 6 Mar 1958, scale 1:31,680; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 0382, frame number 078, run 2, project P1368, date flown 24 Jan 1963, scale 1:14,000; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 0433, frame number 160, run 11, project P1519, date flown 2 Feb 1965, scale 1:31,680; sourced August 2016.*

Department of Primary Industries & Water, 2016a: *Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 0534, frame number 133,135,140,142, run 1&2, project F142, date flown 4 Nov 1969, scale 1:13,464; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 0775, frame number 170, run 8, project F600, date flown 15 Jan 1979, scale 1:40,000; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 0817, frame number 028, run 69E, project M50, date flown 10 Feb 1981, scale 1:15,000; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 0875, frame number 059, run 1, project M148, date flown 28 Feb 1981, scale 1:16,000; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 0827, frame number 191, run 13, project A083, date flown 15 Feb 1981, scale 1:15,000; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 0986, frame number 051, run 6, project M379, date flown 11 Feb 1984, scale 1:20,000; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 1053, frame number 257, run PP, project M148, date flown 20 Jan 1986, scale 1:18,000; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 1105, frame number 167 and 165, run 14, project M628, date flown 4 Feb 1988, scale 1:12,500; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 1125, frame number 085, run 12, project M802, date flown 22 Dec 1988, scale 1:12,500; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 1152, frame number 152, run PP, project M148, date flown 30 May 1990, scale 1:16,000; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 1271 & 1272, frame number 226 & 136,135, run 13 & 12, project A083, date flown 15 Feb 1997, scale 1:12,500; sourced August 2016.*

Department of Primary Industries & Water, 2016a*: Geodata Services Branch, Tasmanian State Historical Aerial Photograph: film number 1451, frame number 017, 018 & 010, run 2 & 3, project A140HA, date flown 22 Nov 2010, scale 1:10,000; sourced August 2016.*

Department of Primary Industries, Parks, Water and Environment, 2016: *The List map interactive search tool: www.thelist.tas.gov.au, August 2016.*

Food Standards Australia New Zealand for Department of Health, *Health Based Guidance Values for PFAS for Use in Site Investigations in Australia*, (FSANZ, April 2017).

Geo-Environmental Solutions, 2015*: Hydrocarbon Delineation Assessment MW4-MW6 Installation, ARFFS, Hobart International Airport, August 2015.*

GHD, 2006*: Report for Hobart International Airport – Fire Services Building – Site Contamination Assessment, August 2006.*

GHD, 2009*: Report for ARFF National Testing Program Preliminary Site Contamination Assessment, Hobart ARFF Drill Ground, Hobart Airport, September 2009.*

GHD, 2014*: Replacement HB FTG Environmental Site Investigation, July 2014.*

GHD, Department of Infrastructure and Regional Development (DoIRD)-endorsed *Managing PFC Contamination at Airports Interim Contamination Management Strategy and Decision Framework*, June 2015 (GHD, June 2015).

Hobart International Airport Pty Ltd, 2014: *Annual Environmental Review, 2013 & 2014, October 2014.*

Hobart International Airport Pty Ltd, 2015a: *Hobart Airport 2015 Master Plan, 2015.*

Hobart International Airport Pty Ltd, 2015b: *Water Quality Sampling Sinclair Creek PFOS/PFOA, December 2015.*

Hobart International Airport Pty Ltd, 2015c: *Category 1 Tenants Audit Reports, October, November, December 2015.*

Hobart International Airport Pty Ltd, 2016a*: www.hiapl.com.au/induction*

Hobart International Airport Pty Ltd, 2016b*: Water Quality Report, Quarterly, June 2016.*

Hobart International Airport Pty Ltd, 2016c: *Category 1 Tenants Audit Reports, June 2016.*

National Environment Protection Council, *National Environment Protection (Assessment of Site Contamination) Measure*, 1999 made under the National Environment Protection Act 1994 (Commonwealth), amended in May 2013 (ASC NEPM).

National Health and Medical Research Council, *Australian Drinking Water Guidelines* 6, 2011.

Office of Legislative Drafting and Publishing Attorney-General's Department, *Airport (Environment Protection) Regulation 1997* (AEPR, 1997).

SEMF Pty Ltd, 2008: *Air Rescue & Fire Fighting Services, Hobart International Airport Pty Ltd – July 2008 Progress Report, July 2008.*

SEMF Pty Ltd, 2009*: Aviation Rescue & Fire Fighting Services, ARFF Fire Station, Hobart Airport – July 2009 Progress Report, September 2009.*

SEMF Pty Ltd, 2013*: Aviation Rescue & Fire Fighting Services- Hobart International Airport Groundwater Monitoring Event, January 2013.*

SEMF Pty Ltd, 2014a*: Aviation Rescue & Fire Fighting Services – Groundwater Extraction Event and Groundwater Monitoring Events, July 2014.*

SEMF Pty Ltd, 2014b*: Aviation Rescue & Fire Fighting Services Stormwater Management Plan, October 2014.*

SEMF Pty Ltd, 2015*: Hobart ARFFS – Groundwater Investigations – SEMF Recommendations, September 2015.*

SEMF Pty Ltd, *Hobart Airport Aviation Rescue Fire Fighting Services – Preliminary Site Investigation*, Draft 2, August 2016, Project 2105.022, issued to Airservices Australia.

SEMF Pty Ltd, *Hobart Airport – Aviation Rescue Fire Fighting Services Preliminary Site Investigation Sampling and Analysis Quality Plan*, for Airservices Australia, 31 October 2016 - FINAL V2 - Project No: 2105.022.

SEMF Pty Ltd, *Hobart Airport – Aviation Rescue Fire Fighting Services Preliminary Site Investigation, Sampling Report* for Airservices Australia, 13 April 2017 – Final - Project No: 2105.022.

SKM, 2010*: AFFF Conceptual Site Model: Risk Assessment and Works Program, Risk Assessment Report for Airservices Australia, Final, December 2010.*

Sloane Geoscience, 2008*: Groundwater Extraction Bore Installation: Air Rescue & Fire Fighting Services Station, Hobart International Airport, Cambridge, July 2008.*

Sloane Geoscience, 2009*: Groundwater Monitoring Bore Installation: Air Rescue & Fire Fighting Services Station, Hobart International Airport, Cambridge, August 2009.*

Sloane Geoscience, 2011*: Hobart ARFFS Drill Ground LMU Swab Sampling, Hobart International Airport, Cambridge Operations, February 2011.*

Sloane Geoscience, 2014*: Hobart ARFF Drill Ground Groundwater Monitoring – March 2014, Hobart International Airport Cambridge, March 2014.*

Sloane Geoscience, *ARFF Fire Training Ground Groundwater Monitoring Bore Installation & Sampling, January 2017*, Hobart International Airport, Cambridge, SGEO PN 118347, issued to SEMF, 24 February 2017.

UniQuest Pty Limited, 2012*: Disposal Options for PFC-contaminated bulk water from the Airservices Australia Fire Training Ground at Hobart Airport, July 2012.*

Appendix A – Figures

LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY

HOBART AIRPORT PSI

FIGURE 01
AIRPORT AND SITE LOCATIONS

SEMF Pty Ltd
ACN 117 492 814
W: www.semf.com.au
T: 1300 35 SEMF

Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

NOT TO SCALE

N

LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY

HOBART AIRPORT PSI

FIGURE 01
AIRPORT AND SITE LOCATIONS

SEMF Pty Ltd
ACN 117 492 814
W: www.semf.com.au
T: 1300 35 SEMF

Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

NOT TO SCALE

N

SITE ID LEGEND

A	MAIN FIRE STATION (MFS)
B	CURRENT FIRE TRAINING GROUND (CFTG)
C	FORMER FIRE TRAINING GROUND (FFTG)
D	REMOTE TRAINING - OLD LANDFILL B
E	LARGE BACKFILL POND
F	REMOTE TRAINING - UTAS BUILDING
G	REMOTE TRAINING - BUSH AREA
H	REMOTE TRAINING - LANDFILL A
I	REMOTE TRAINING - OLD NAV AID BUILDING
J	REMOTE TRAINING - SAND MINE
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
M	SOIL STOCKPILES
N	SOUTHERN END OF RUNWAY
O	TASMAN HIGHWAY CAR CRASH SITE
R	GOLF COURSE FIRE SITE

AFFF USAGE SUMMARY

CONFIRMED AFFF USE:

SITES A, B, F, G, H, I, L

LIKELY AFFF IMPACT:

SITE E

ARFFS USE BUT NO AFFF:

SITES C, D, J, K

OPERATIONAL RESPONSE - WATER ONLY:

SITES N, R

OPERATIONAL RESPONSE - AFFF USED:

SITE O & P, Q, S (OFF MAP OR UNCERTAIN)

UNDER HIAPL CONTROL:

SITE M

ABBREVIATIONS

ARFFS	AVIATION RESCUE & FIRE FIGHTING SERVICE
AFFF	AQUEOUS FILM FORMING FOAM

LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY
- (E) SITE LOCATION ID

HOBART AIRPORT PSI

FIGURE 02

AFFF SITES - AERIAL IMAGE 2016

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Prepared by: SEMF Pty Ltd

Project Number: 2105.022

NOT TO SCALE

N

SITE ID LEGEND

A	MAIN FIRE STATION (MFS)
B	CURRENT FIRE TRAINING GROUND (CFTG)
C	FORMER FIRE TRAINING GROUND (FFTG)
D	REMOTE TRAINING - OLD LANDFILL B
E	LARGE BACKFILL POND
F	REMOTE TRAINING - UTAS BUILDING
G	REMOTE TRAINING - BUSH AREA
H	REMOTE TRAINING - LANDFILL A
I	REMOTE TRAINING - OLD NAV AID BUILDING
J	REMOTE TRAINING - SAND MINE
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
M	SOIL STOCKPILES
N	SOUTHERN END OF RUNWAY
O	TASMAN HIGHWAY CAR CRASH SITE
R	GOLF COURSE FIRE SITE

SAMPLING LOCATION LEGEND

- SURFACE WATER SAMPLING LOCATION
- GROUNDWATER SAMPLING LOCATION (OPEN WELL)
- NEW GROUNDWATER WELL LOCATION
- SEDIMENT SAMPLING LOCATION
- PART OF ARFFS STORMWATER MONITORING PROGRAM
- EXISTING PERIMETER & CFTG MONITORING WELLS (SPECIFIC MFS & CFTG WELLS NOT SHOWN)
- XXX PFOS CONCENTRATION EXCEEDS HUMAN HEALTH FISH CONSUMPTION CRITERION
- XXX PFOS OR PFHxS OR PFHxS + PFOS CONCENTRATIONS EXCEED ECOLOGICAL CRITERIA

LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY
- E SITE LOCATION ID

HOBART AIRPORT PSI

FIGURE 03A

SURFACE WATER, GROUNDWATER & SEDIMENT SAMPLING LOCATIONS

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Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

NOT TO SCALE

N

SITE ID LEGEND

A	MAIN FIRE STATION (MFS)
B	CURRENT FIRE TRAINING GROUND (CFTG)
C	FORMER FIRE TRAINING GROUND (FFTG)
D	REMOTE TRAINING - OLD LANDFILL B
E	LARGE BACKFILL POND
F	REMOTE TRAINING - UTAS BUILDING
G	REMOTE TRAINING - BUSH AREA
H	REMOTE TRAINING - LANDFILL A
I	REMOTE TRAINING - OLD NAV AID BUILDING
J	REMOTE TRAINING - SAND MINE
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
M	SOIL STOCKPILES
N	SOUTHERN END OF RUNWAY
O	TASMAN HIGHWAY CAR CRASH SITE
R	GOLF COURSE FIRE SITE

SAMPLING LOCATION LEGEND

- SURFACE WATER SAMPLING LOCATION
- GROUNDWATER SAMPLING LOCATION (OPEN WELL)
- NEW GROUNDWATER WELL LOCATION
- SEDIMENT SAMPLING LOCATION
- PART OF ARFFS STORMWATER MONITORING PROGRAM
- EXISTING PERIMETER & CFTG MONITORING WELLS (SPECIFIC MFS & CFTG WELLS NOT SHOWN)
- xxx — PFOS CONCENTRATION EXCEEDS HUMAN HEALTH FISH CONSUMPTION CRITERION
- xxx — PFOS OR PFHxS OR PFHxS + PFOS CONCENTRATIONS EXCEED ECOLOGICAL CRITERIA

LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY
- E — SITE LOCATION ID

HOBART AIRPORT PSI

FIGURE 03B

SURFACE WATER, GROUNDWATER & SEDIMENT SAMPLING LOCATIONS

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T: 1300 35 SEMF

Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

NOT TO SCALE

N

SITE ID LEGEND

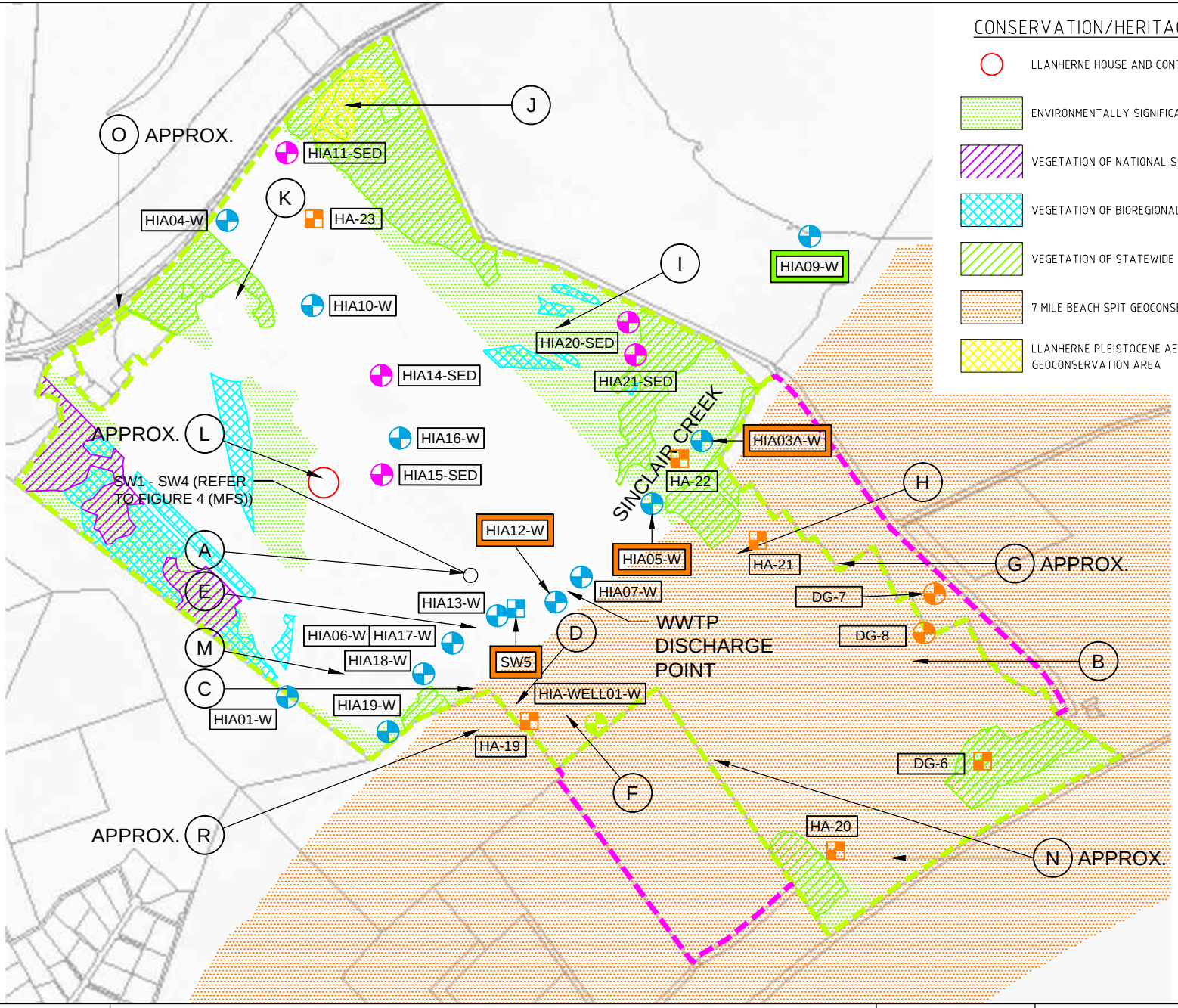
A	MAIN FIRE STATION (MFS)
B	CURRENT FIRE TRAINING GROUND (CFTG)
C	FORMER FIRE TRAINING GROUND (FFTG)
D	REMOTE TRAINING - OLD LANDFILL B
E	LARGE BACKFILL POND
F	REMOTE TRAINING - UTAS BUILDING
G	REMOTE TRAINING - BUSH AREA
H	REMOTE TRAINING - LANDFILL A
I	REMOTE TRAINING - OLD NAV AID BUILDING
J	REMOTE TRAINING - SAND MINE
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
M	SOIL STOCKPILES
N	SOUTHERN END OF RUNWAY
O	TASMAN HIGHWAY CAR CRASH SITE
R	GOLF COURSE FIRE SITE

SAMPLING LOCATION LEGEND

- SURFACE WATER SAMPLING LOCATION
- GROUNDWATER SAMPLING LOCATION (OPEN WELL)
- NEW GROUNDWATER WELL LOCATION
- SEDIMENT SAMPLING LOCATION
- PART OF ARFFS STORMWATER MONITORING PROGRAM
- EXISTING PERIMETER & CFTG MONITORING WELLS (SPECIFIC MFS & CFTG WELLS NOT SHOWN)
- xxx PFOS CONCENTRATION EXCEEDS HUMAN HEALTH FISH CONSUMPTION CRITERION
- xxx PFOS OR PFHxS OR PFHxS + PFOS CONCENTRATIONS EXCEED ECOLOGICAL CRITERIA

CONSERVATION/HERITAGE AREAS

- LLANHERNE HOUSE AND CONTROL TOWER
- ENVIRONMENTALLY SIGNIFICANT AREAS
- VEGETATION OF NATIONAL SIGNIFICANCE
- VEGETATION OF BIOREGIONAL SIGNIFICANCE
- VEGETATION OF STATEWIDE SIGNIFICANCE
- 7 MILE BEACH SPIT GEOCONSERVATION AREA
- LLANHERNE PLEISTOCENE AEOLIAN DEPOSIT GEOCONSERVATION AREA



LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY
- E SITE LOCATION ID

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FIGURE 03C

SURFACE WATER, GROUNDWATER & SEDIMENT SAMPLING LOCATIONS

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Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

NOT TO SCALE

N

SAMPLING LOCATION LEGEND

- SOIL SAMPLING LOCATION (2017 PSI)
- PART OF ARFFS STORMWATER MONITORING PROGRAM
- EXISTING GROUNDWATER WELL
- SWx — PFHxS + PFOS CONCENTRATION EXCEEDS ECOLOGICAL CRITERION

NOTE: PFAS IMPACT HAS BEEN PREVIOUSLY REPORTED AT THE MFS.

LEGEND

U/G	UNDER GROUND
A/G	ABOVE GROUND

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FIGURE 04

SITE A - MAIN FIRE STATION (MFS) - SOIL SAMPLING

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Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

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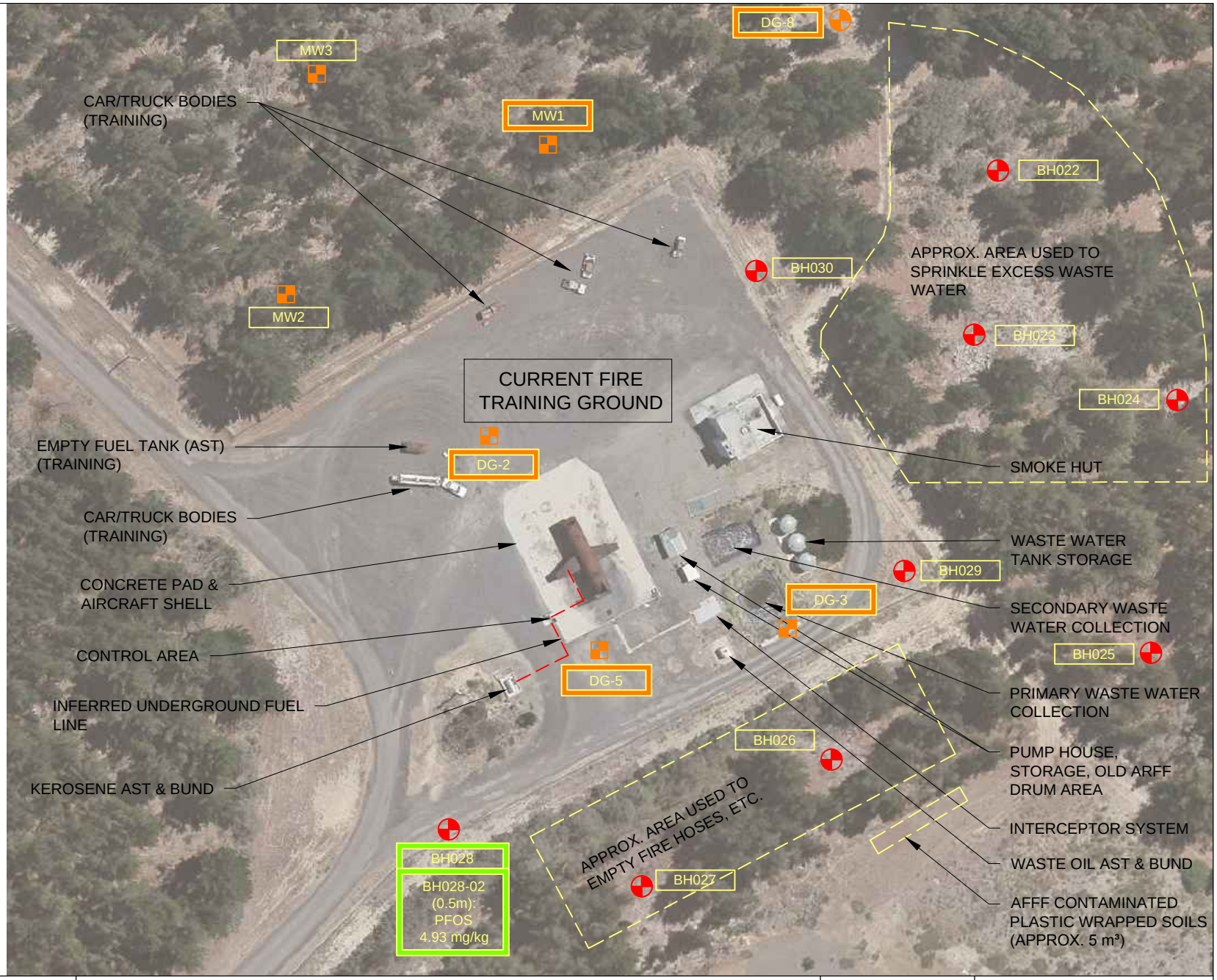
SAMPLING LOCATION LEGEND

- SOIL SAMPLING LOCATION (2017 PSI)
- NEW GROUNDWATER WELL LOCATION (INCLUDES SOIL SAMPLING) (2017 PSI)
- EXISTING GROUNDWATER WELL (CFTG)
- xxx — SOIL CONCENTRATION EXCEEDS ECOLOGICAL COMMERCIAL / INDUSTRIAL 60% PROTECTION
- xxx — PFOS OR PFHxS OR PFHxS + PFOS GROUNDWATER CONCENTRATIONS EXCEED ECOLOGICAL CRITERIA



LEGEND

ARFFS	AVIATION RESCUE & FIRE FIGHTING SERVICE
AFFF	AQUEOUS FILM FORMING FOAM
AST	ABOVE GROUND STORAGE TANK

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FIGURE 05

SITE B – CURRENT FIRE TRAINING GROUND (CFTG) – SOIL & GROUNDWATER SAMPLING

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Prepared by: SEMF Pty Ltd

Project Number: 2105.022

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SAMPLING LOCATION LEGEND

- SOIL SAMPLING LOCATION
- GROUNDWATER SAMPLING LOCATION (OPEN WELL)
- PERIMETER GROUNDWATER WELL

LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY

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FIGURE 06

SITES C,D,E & F - SOIL & GROUNDWATER SAMPLING

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Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

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SAMPLING LOCATION LEGEND

SOIL SAMPLING LOCATION

PERIMETER GROUNDWATER WELL

LEGEND

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FIGURE 07

SITE H (FORMER LANDFILL A) - SOIL SAMPLING

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Project Number: 2105.022

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SAMPLING LOCATION LEGEND

SOIL SAMPLING LOCATION

LEGEND

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FIGURE 08

SITE I (FORMER NAVIGATIONAL AID BUILDING) – SOIL SAMPLING

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T: 1300 35 SEMF

Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

NOT TO SCALE

N

SAMPLING LOCATION LEGEND

SOIL SAMPLING LOCATION

LEGEND

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FIGURE 09

SITE L (FLIGHT CONTROL TOWER) - SOIL SAMPLING

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Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

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N

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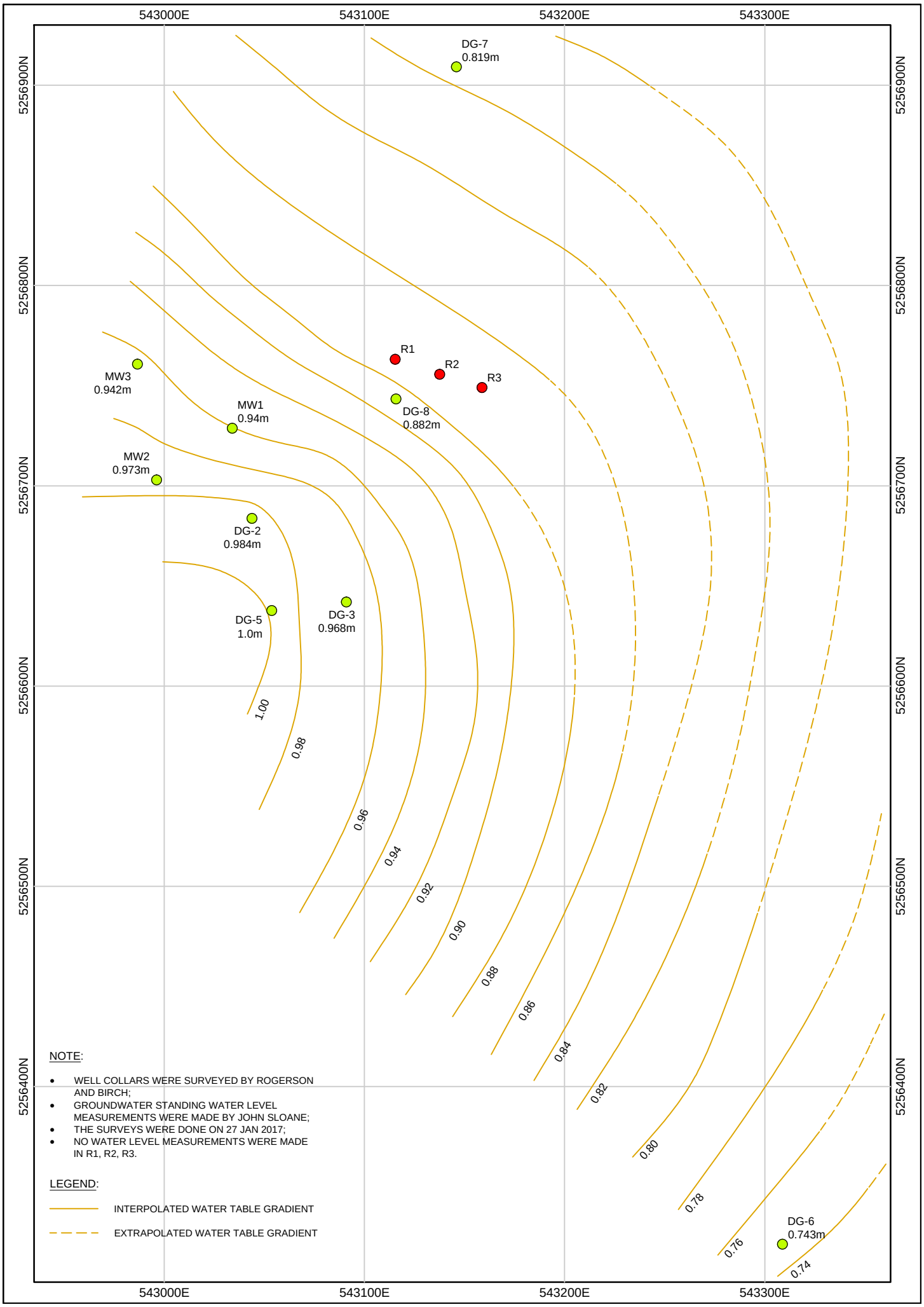
FIG 10 - CFTG (SITE B) LOCAL WATER TABLE GRADIENTS



SITE ID LEGEND

A	MAIN FIRE STATION (MFS)
B	CURRENT FIRE TRAINING GROUND (CFTG)
C	FORMER FIRE TRAINING GROUND (FFTG)
D	REMOTE TRAINING - OLD LANDFILL B
E	LARGE BACKFILL POND
F	REMOTE TRAINING - UTAS BUILDING
G	REMOTE TRAINING - BUSH AREA
H	REMOTE TRAINING - LANDFILL A
I	REMOTE TRAINING - OLD NAV AID BUILDING
J	REMOTE TRAINING - SAND MINE
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
M	SOIL STOCKPILES
N	SOUTHERN END OF RUNWAY
O	TASMAN HIGHWAY CAR CRASH SITE
R	LLANHERNE GOLF COURSE FIRE SITE

CONSERVATION/HERITAGE AREAS

- LLANHERNE HOUSE AND CONTROL TOWER
- ENVIRONMENTALLY SIGNIFICANT AREAS
- VEGETATION OF NATIONAL SIGNIFICANCE
- VEGETATION OF BIOREGIONAL SIGNIFICANCE
- VEGETATION OF STATEWIDE SIGNIFICANCE
- 7 MILE BEACH SPIT GEOCONSERVATION AREA
- LLANHERNE PLEISTOCENE AEOLIAN DEPOSIT GEOCONSERVATION AREA

LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY
- E — SITE LOCATION ID

HOBART AIRPORT PSI

FIGURE 11

AFFF SITES & CONSERVATION AND HERITAGE AREAS

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T: 1300 35 SEMF

Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

NOT TO SCALE

N

SITE ID LEGEND

A	MAIN FIRE STATION (MFS)
B	CURRENT FIRE TRAINING GROUND (CFTG)
C	FORMER FIRE TRAINING GROUND (FFTG)
D	REMOTE TRAINING - OLD LANDFILL B
E	LARGE BACKFILL POND
F	REMOTE TRAINING - UTAS BUILDING
G	REMOTE TRAINING - BUSH AREA
H	REMOTE TRAINING - LANDFILL A
I	REMOTE TRAINING - OLD NAV AID BUILDING
J	REMOTE TRAINING - SAND MINE
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
M	SOIL STOCKPILES
N	SOUTHERN END OF RUNWAY
O	TASMAN HIGHWAY CAR CRASH SITE
R	GOLF COURSE FIRE SITE

CONSERVATION/HERITAGE AREAS

- LLANHERNE HOUSE AND CONTROL TOWER
- ENVIRONMENTALLY SIGNIFICANT AREAS
- VEGETATION OF NATIONAL SIGNIFICANCE
- VEGETATION OF BIOREGIONAL SIGNIFICANCE
- VEGETATION OF STATEWIDE SIGNIFICANCE
- 7 MILE BEACH SPIT GEOCONSERVATION AREA
- LLANHERNE PLEISTOCENE AEOLIAN DEPOSIT GEOCONSERVATION AREA

LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY
- E — SITE LOCATION ID

HOBART AIRPORT PSI

FIGURE 11

AFFF SITES & CONSERVATION AND HERITAGE AREAS

SEMF Pty Ltd
ACN 117 492 814
W: www.semf.com.au
T: 1300 35 SEMF

Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

NOT TO SCALE

N

SITE ID LEGEND

A	MAIN FIRE STATION (MFS)
B	CURRENT FIRE TRAINING GROUND (CFTG)
C	FORMER FIRE TRAINING GROUND (FFTG)
D	REMOTE TRAINING - OLD LANDFILL B
E	LARGE BACKFILL POND
F	REMOTE TRAINING - UTAS BUILDING
G	REMOTE TRAINING - BUSH AREA
H	REMOTE TRAINING - LANDFILL A
I	REMOTE TRAINING - OLD NAV AID BUILDING
J	REMOTE TRAINING - SAND MINE
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
M	SOIL STOCKPILES
N	SOUTHERN END OF RUNWAY
O	TASMAN HIGHWAY CAR CRASH SITE
R	GOLF COURSE FIRE SITE

LAND USE PRECINCTS

- LOCAL BUSINESS
- AVIATION
- TERMINAL
- TOURISM/MIXED USE
- RUNWAY
- ENVIRONMENT
- LIGHT INDUSTRY

LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY
- E — SITE LOCATION ID

HOBART AIRPORT PSI

FIGURE 12

AFFF SITES & AIRPORT PRECINCTS

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Prepared by: SEMF Pty Ltd

Project Number: 2105.022

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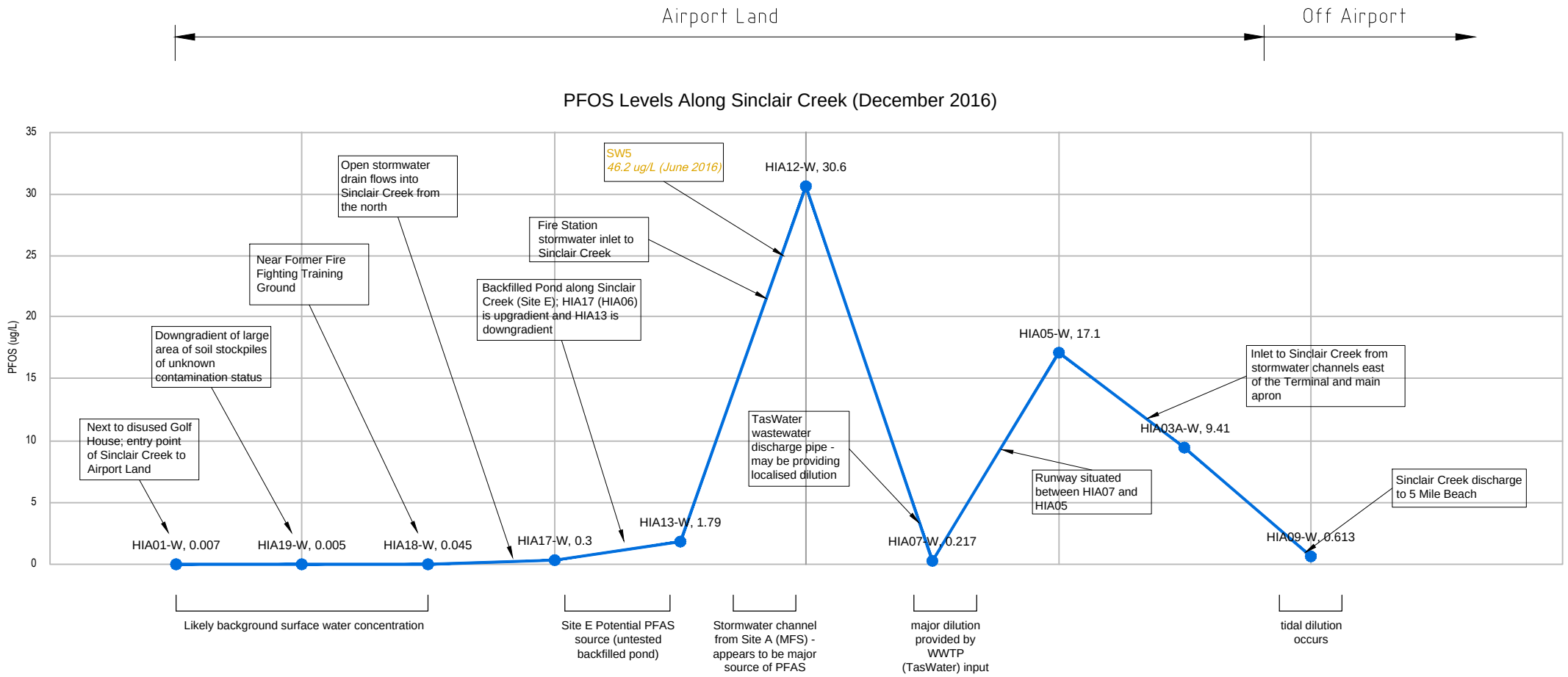
LEGEND

DECEMBER 2016 DATA



HOBART AIRPORT PSI

FIGURE 13

SINCLAIR CREEK – SCHEMATIC OF PFOS INPUTS & IMPACTS

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Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

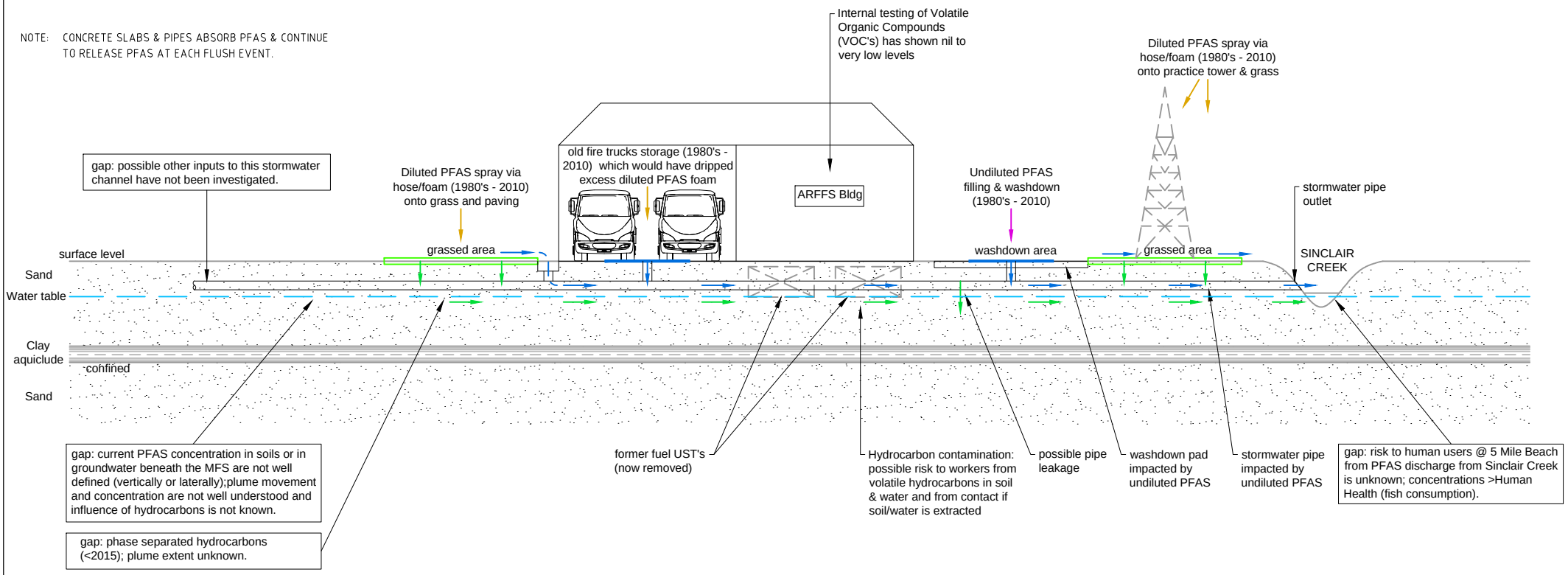
NOT TO SCALE

N

LEGEND

- UNDILUTED PFAS (FOAM) INPUT
- DILUTED PFAS (FOAM) INPUT
- MOVEMENT OF PFAS FROM SURFACE TO SOIL & POSSIBLY GROUNDWATER
- MOVEMENT OF PFAS FROM SURFACE TO STORMWATER

NOTE: CONCRETE SLABS & PIPES ABSORB PFAS & CONTINUE TO RELEASE PFAS AT EACH FLUSH EVENT.



NOTE: Groundwater wells have not been shown.

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FIGURE 14

SITE A (MFS)- SCHEMATIC PFAS CONTAMINATION MODEL

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Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

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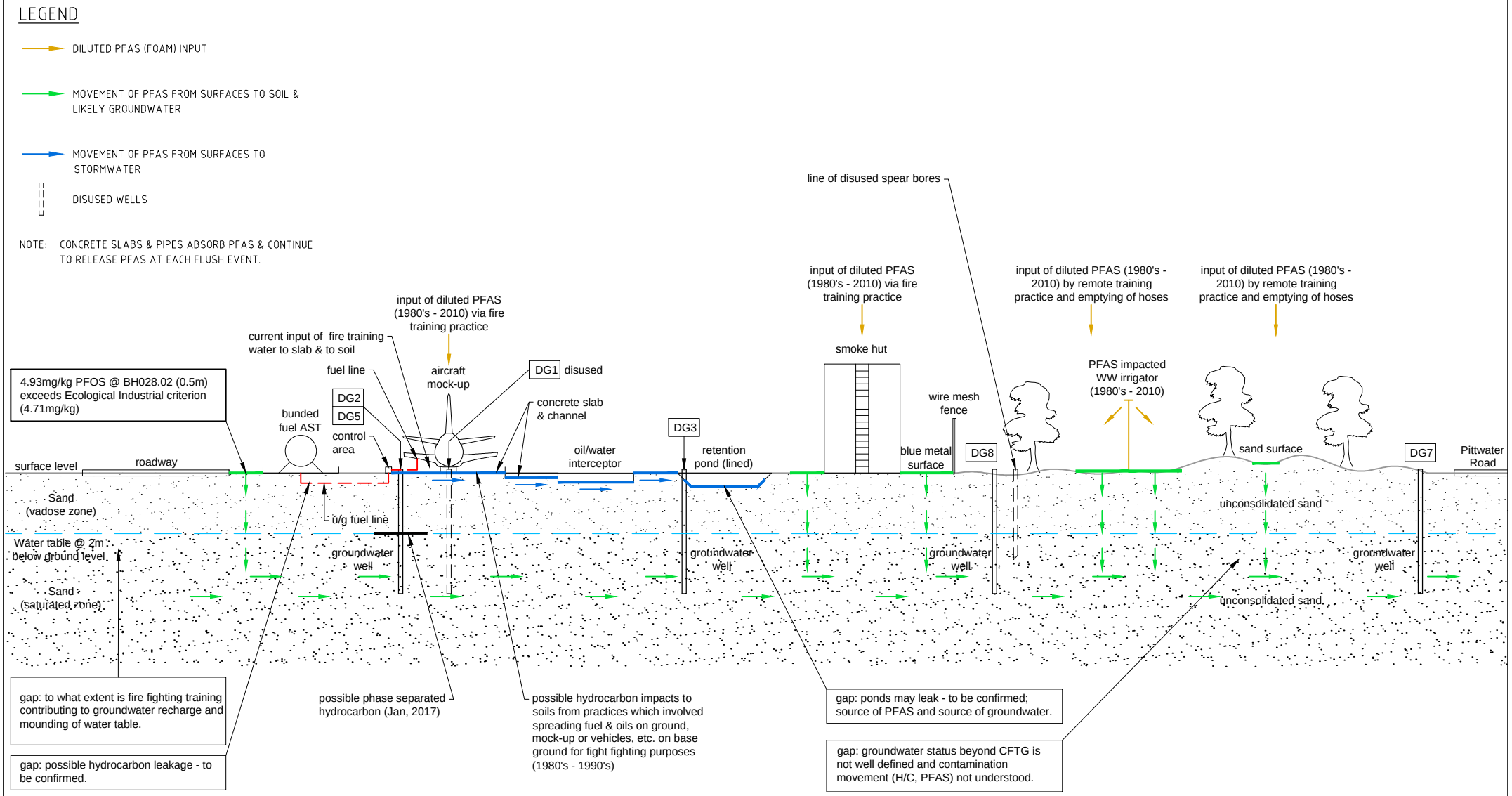

HOBART AIRPORT PSI

FIGURE 15

SITE B (CFTG)- SCHEMATIC PFAS CONTAMINATION MODEL

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T: 1300 35 SEMF

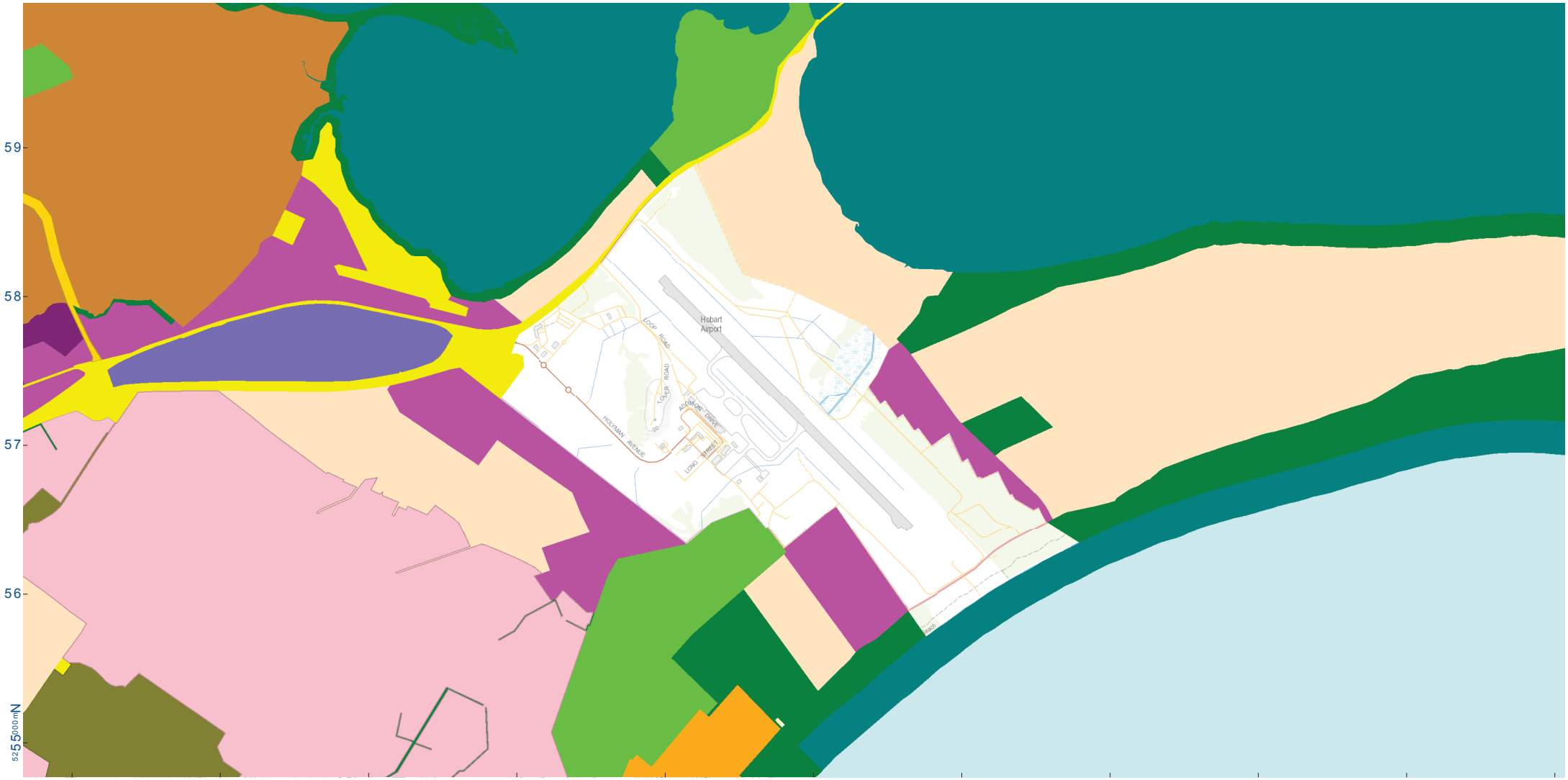
Date: 11th MAY 2017
Prepared by: SEMF Pty Ltd

Project Number: 2105.022

NOT TO SCALE

N

Appendix B – The LIST Figures



Grid Interval 1km (GDA94 MGA55)

www.thelist.tas.gov.au

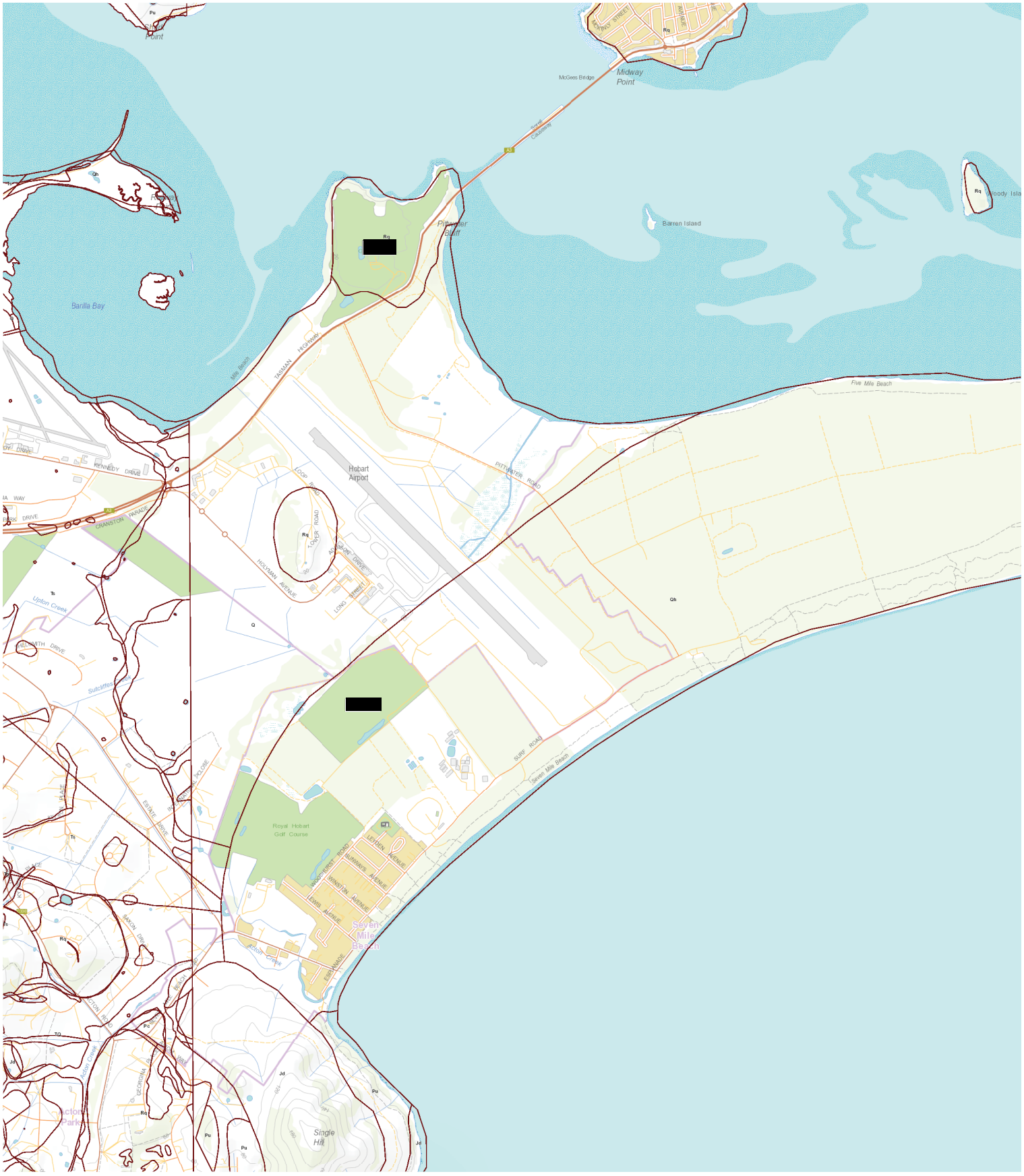
Legend

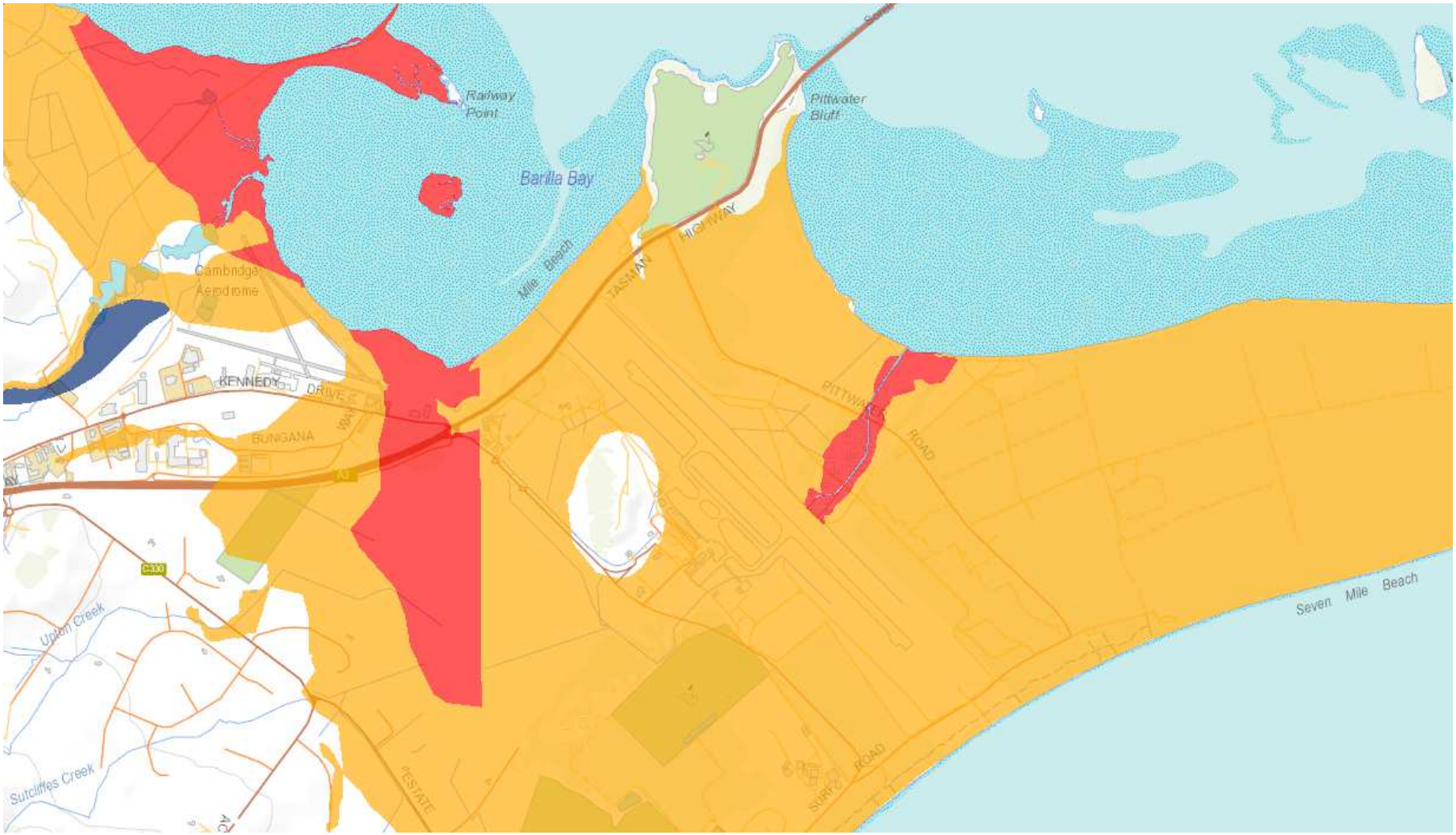
Tasmanian Interim Planning Scheme Zoning

- 10.0 General Residential
- 11.0 Inner Residential
- 12.0 Low Density Residential
- 13.0 Rural Living
- 14.0 Environmental Living
- 15.0 Urban Mixed Use
- 16.0 Village
- 17.0 Community Purpose
- 18.0 Recreation
- 19.0 Open Space
- 20.0 Local Business
- 21.0 General Business
- 22.0 Central Business
- 23.0 Commercial
- 24.0 Light Industrial
- 25.0 General Industrial
- 26.0 Rural Resource
- 27.0 Significant Agricultural
- 28.0 Utilities
- 29.0 Environmental Mangement
- 30.0 Major Tourism
- 31.0 Port and Marine
- 32.0 - 39.0 Particular Purpose

Topographic

Tasmanian Government





COASTAL ACID SULPHATE SOILS (0-20m AHD)

Source: The LIST, May 2017

High likelihood Low likelihood Extremely low likelihood

Legend

Geoconservation Sites

Listed

Geoconservation Sites (Outlines)

State Aerial Photo

Appendix C – HIAPL Master Plan Figures

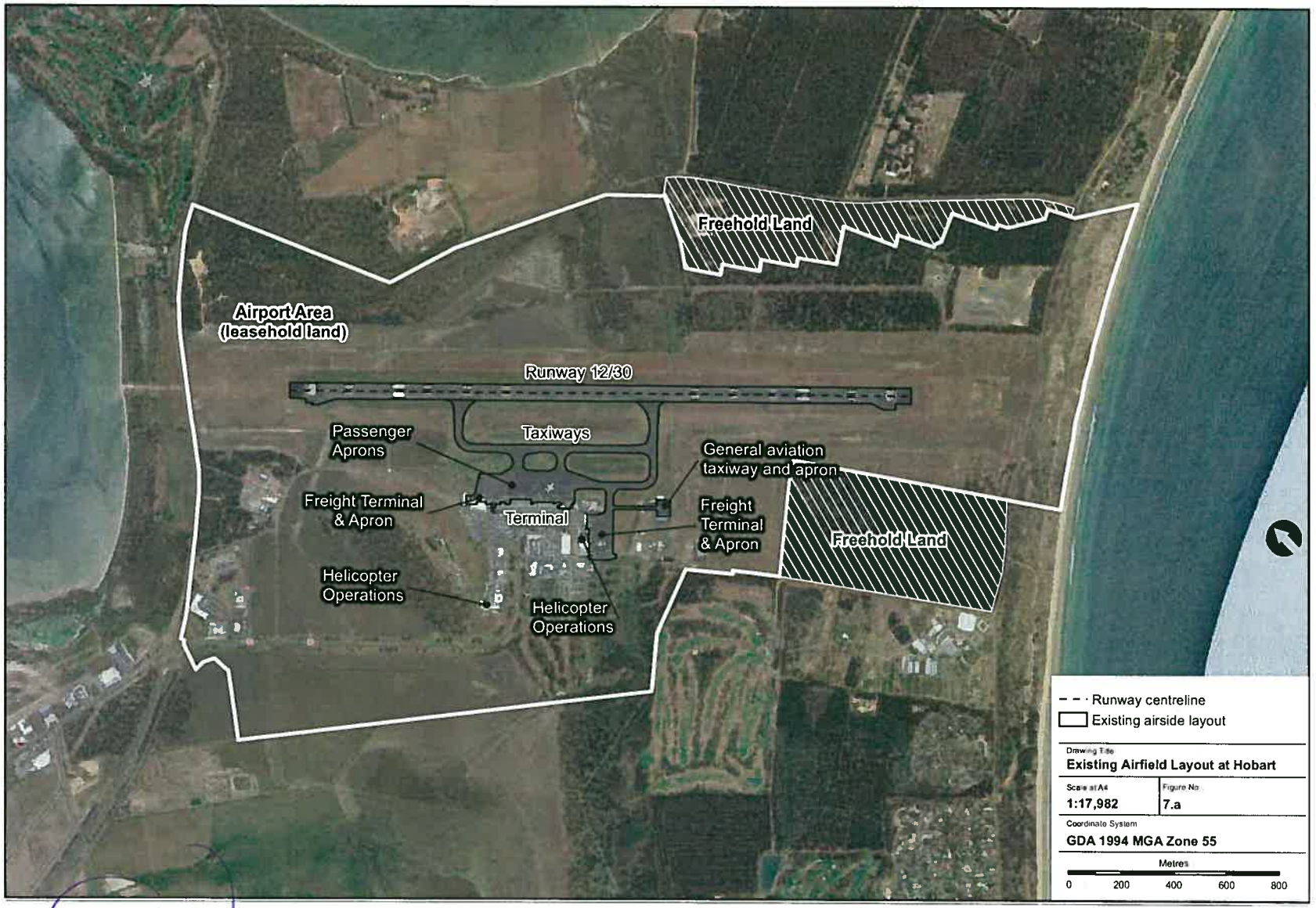


Figure 7.a Existing Airfield Layout at Hobart Airport

Figure 7.d Future Airfield Developments

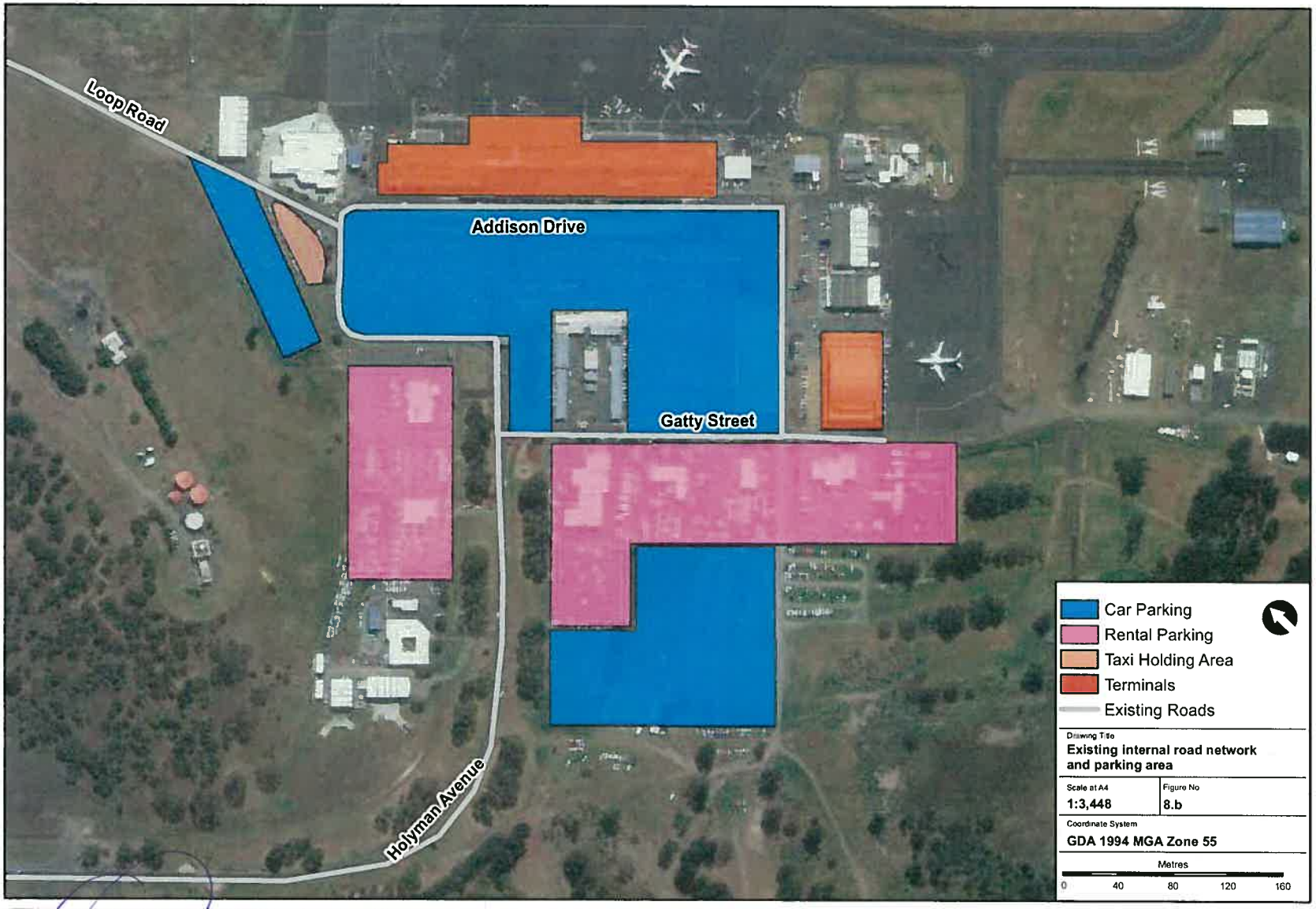


Figure 8.b Existing internal road network and parking areas

Figure 8.c Existing external road network

8.5.1 External Roads

The external road network includes a number of key upgrades to cater for the anticipated growth in traffic demand to Hobart Airport. These upgrades are generally concerned with providing additional capacity for airport related access.

- Upgrade the Tasman Hwy and Holyman Avenue intersection:

  The Tasman Highway, running along the northern edge of the airport, provides the only link into the airport from Hobart and is one of the primary routes out of Hobart to the north east coast of the State.

  The intersection of Holyman Avenue and Tasman Highway will need to be upgraded to provide road network capacity from the forecast airport related traffic demand and through traffic.
- Tasman / East Derwent Highway upgrade:
  DSG is currently undertaking a major upgrade to the intersection of the Tasman Highway and East Derwent Highway which will ensure that traffic coming from the East Derwent Highway will be able to access the Tasman highway through a dedicated lane, improving access to Hobart Airport.

Capacity improvements on the Tasman Highway could include, but are not limited to the following measures:

- Duplicate the Tasman Highway adjacent to Hobart Airport;
- Signalisation of the Tasman Highway and Holyman Avenue intersection; and
- Intersection upgrades at Tasman Highway.

HIAPL will engage with DSG as the responsible authority for these roads.

8.5.2 Internal Roads

Connections to the terminal precinct will be strengthened with additional capacity provided as well as new connections to the planned commercial precincts. Upgrades to the terminal precinct will include a revised forecourt to match the terminal development and new the commercial areas listed below.

- Service access road(s) to the Local Business 2 and Industrial Enterprise 1 precincts off Pittwater Road;
- Service access road(s) to the General Aviation 1 and Industrial Enterprise 2 precincts off Pittwater Road;
- Service access road(s) to the General Aviation 1 precinct off Greuber Avenue; and
- Service access road(s) to the Local Business 1 and Tourism Mixed Use precincts from Holyman Avenue.

Figure 8.g Future Transport Network (0-5 years)

Major internal road upgrades are discussed below:

Closure of Surf Road

Surf Road is an easement on Airport land at the southern end of the runway. The extension of the runway will bring aircraft closer to Surf Road as they land and take off. A vehicle travelling on Surf Road would breach the required regulated separation distance between an aircraft and an obstacle; as such the section of Surf Road along the southern end of the runway will need to close.

The southern end of Surf Road adjacent to the runway will be permanently closed to vehicles. This section of roadway – which currently lies between two gates – is part of Hobart Airport.

No other part of Surf Road will be affected. Pittwater Road will also be unaffected. Pedestrian, cyclist and non-vehicle access will be maintained through the construction of a new sealed path along the airport's southern boundary.

Existing traffic from Seven Mile Beach using Surf Road to access Pittwater Road and the Tasman Highway will be able to use Grueber Avenue to gain access via the Tasman Highway round-about. This is not a significant traffic movement and the additional traffic at the Tasman Highway round-about intersection will be accommodated in identified future upgrades.

There will also be additional aviation related development on the new section of Grueber Avenue. It is anticipated that traffic volumes associated with the aviation development will predominantly access the site from the Tasman Highway and should have negligible impact on Surf Road.

Grueber Avenue

Grueber Avenue is a new road that will be constructed to run from Surf Road through to the Tasman Highway along the western side of the Airport. Grueber Avenue will provide Seven Mile Beach with continued access to the Tasman Highway. Its exact alignment will be established in consultation with Clarence City Council. It will also provide access to the proposed Clarence City recreational grounds when developed, reducing additional traffic going through the Seven Mile Beach community.

Figure 8.h Future Transport Network (5-20 years)

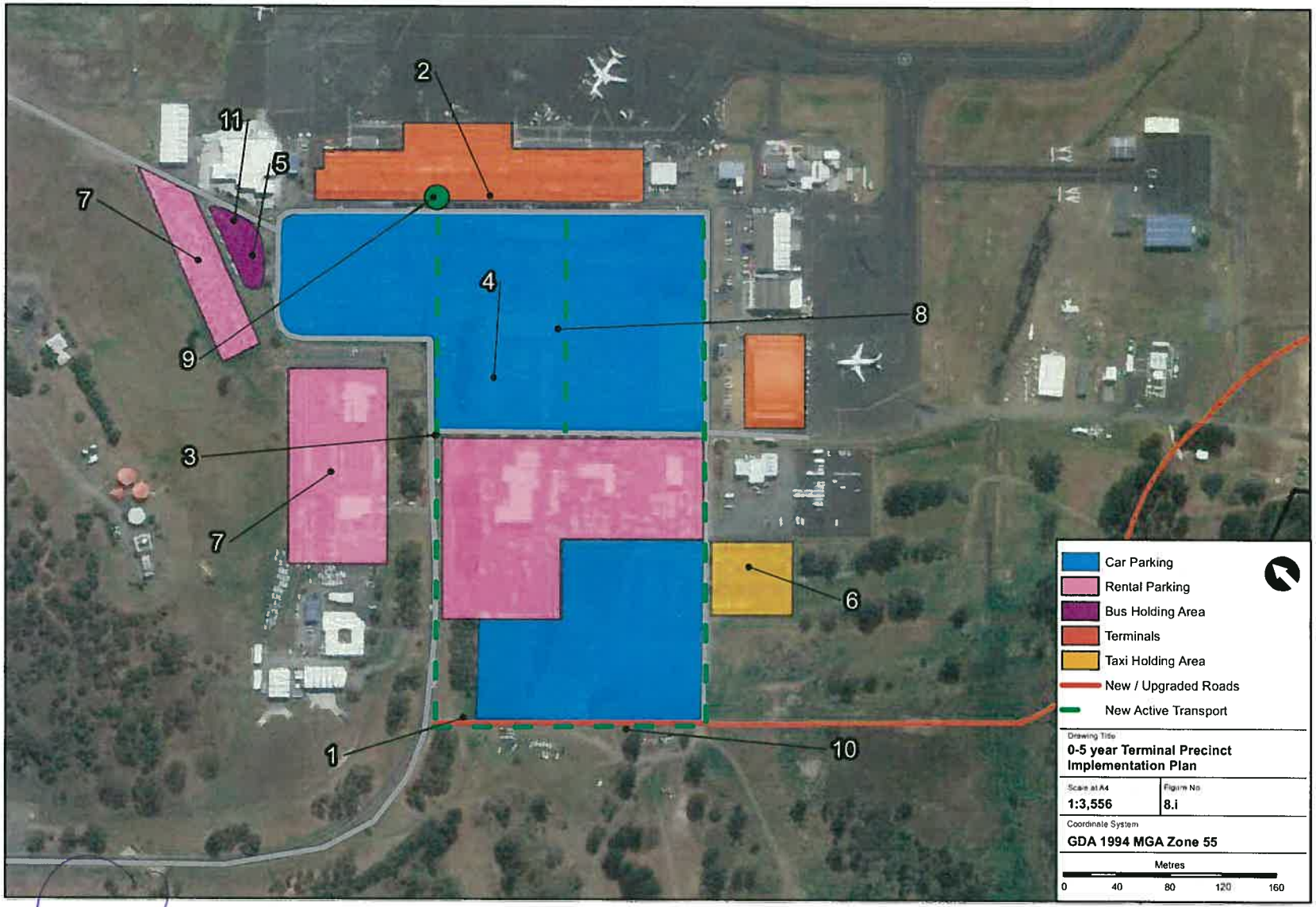


Figure 8.i 0-5 year terminal precinct implementation plan

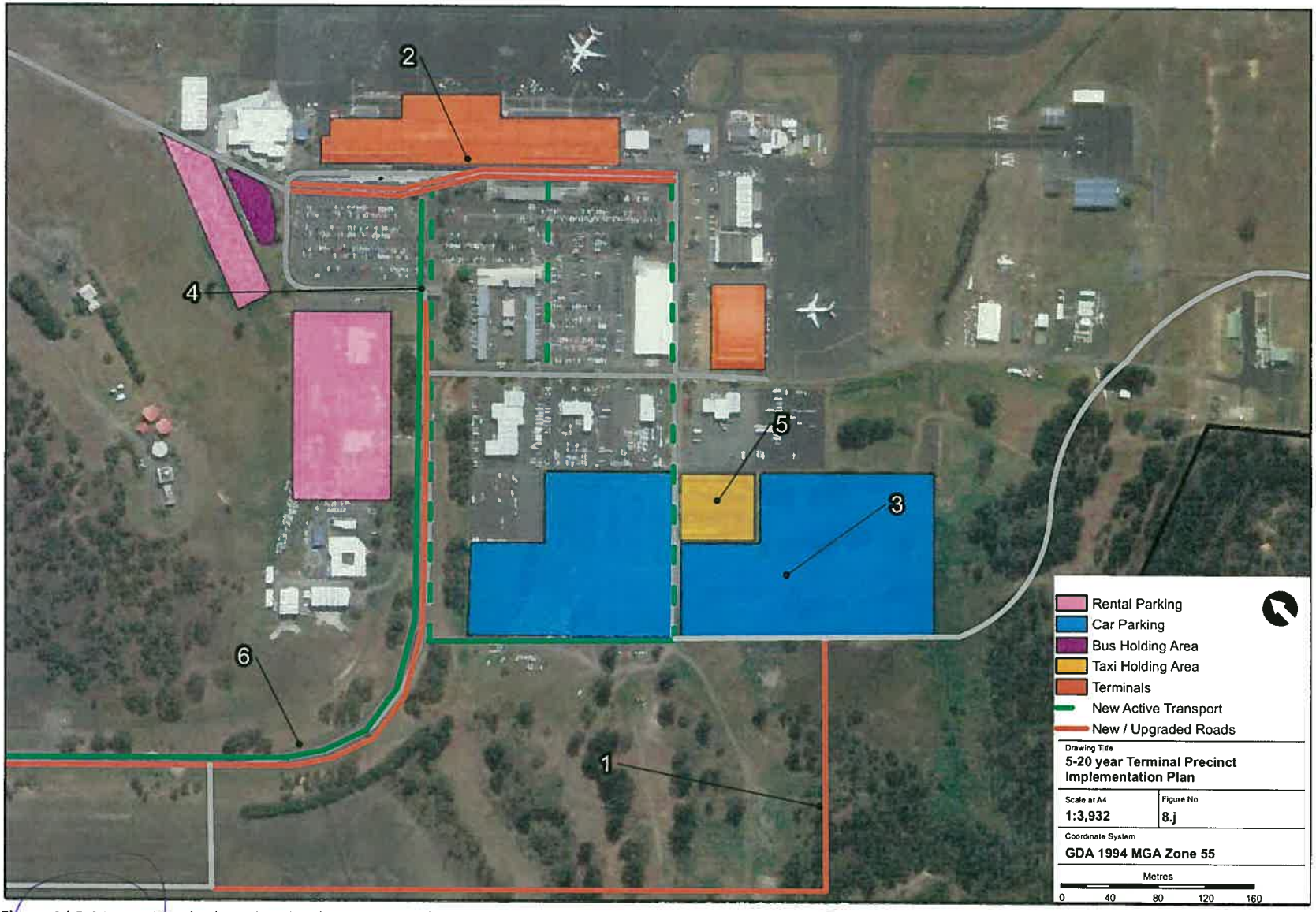


Figure 8.j 5-20 year terminal precinct implementation plan

Appendix D – Historical Aerial Photography Figures & Summary

Table D1: Observations from Review of Aerial Photographs

Date	Observation
Site A – Main Fire Station (MFS)	
1946	▪ Agricultural land, riparian area, north of the bed of Sinclair Creek; patchy vegetation and trees.
1958	▪ The MFS building is visible at the site together with other airport buildings. ▪ Development at the Airport is visible. ▪ Surrounding land consists predominantly of tree plantations and rural land, some stands of remnant vegetation to the north and southwest. ▪ A large pond is present along Sinclair Creek to the south of the MFS
1963	▪ The MFS building has been extended to the north, ▪ The building is surrounded to the north, east and south by grassed areas, ▪ An open surface water channel is situated to the east (20m approx..) of the building and parallel to the runway alignment ▪ A new building has been constructed to the west of the MFS. ▪ There is a 'black' / dark looking area, possibly wet, situated south of the MFS within a grassed area
1965	▪ No notable changes at the MFS or around the MFS compared to 1963
1969	▪ Concrete hardstand / paving has been added to the fire-truck parking area to the northeast of the MFS, and paving / concrete along the western side of the MFS
1981	▪ No notable changes to the MFS ▪ Surface water channel to the east is no longer visible; underground pipes may have been installed
1990	▪ Buildings have been added to the MFS to the south side, as well as a vehicle washdown
1997	▪ Substantially similar to 1990
2010	▪ Substantially similar to 1997, with a few more awnings, and a chemical store built on the southern side of the wash-down pad
2016	▪ Substantially similar to 2010 ▪ The grassed area immediately north along the tarmac has been paved

Date	Observation
Site B – Current Fire Training Ground	
1946	▪ Not visible, but likely to have been within an area of plantation forest similar to immediate surrounding area
1958	▪ Land cleared and plantations removed as part of the airport development (1956) ▪ Site area vacant ▪ Surrounded by vacant land of similar use and forest plantation to the east
1963	▪ Not visible
1965	▪ Same as 1958 except for a track leading to the site ▪ No evidence of any use except for the track
1969	▪ Same as 1965 ▪ Some tree growth in the area
1979	▪ Site has been cleared within a tree regrowth area ▪ Evidence of fire-fighting training being undertaken on the site ▪ No hardstand visible ▪ No drainage visible
1981	▪ As per 1979
1986	▪ The site is being actively used for fire-fighting training; there is a large black stain extending southwards from the mock-up aircraft; ▪ Drums and containers are present around the mock-up; ▪ Orange / brown vegetation colour beyond the southern boundary of the CFTG may be naturally occurring or could be due to operations at the CFTG
1990	▪ As above, ongoing use of the site for fire-fighting training ▪ Dark staining on the ground is visible ▪ Site appears more formalised with a clear angular boundary (fence)
1997	▪ Slab installed beneath the aircraft mock-up ▪ Drainage to a pond has been installed ▪ Above ground tanks are located on a slab/bund ▪ Drums, car wrecks, old tanks, etc for fire training practice are on bare ground
2010	▪ As above, gravel appears to have been spread on much of the training ground ▪ Two ponds are present and numerous water tanks ▪ A smoke hut has been constructed
2016	▪ The ponds appear dry or minimally full ▪ Only 3 water tanks remain ▪ A large cleared area is visible to the south, which has been used as a bitumen batch plant and contractor laydown area for airport construction works

Date	Observation
Site C – Former Fire Training Ground (FFTG)	
1946	▪ A plantation forest covers the area ▪ Situated south of the Sinclair Creek riparian area
1958	▪ Site has been cleared of forest as part of the land redevelopment to the airport use ▪ Bare soil is visible in patches and appears to be trafficked ▪ A track leads along the property boundary immediately south of the site
1963	▪ Site C is not visible on this photograph
1965	▪ A formal track / roadway and roundabout has been set up on Site C ▪ A shed or containers appear to be stored at the location ▪ The ground is worn and vegetation cleared
1969	▪ The former fire training ground is visible with an aircraft mock up in one area and possible oil staining noticeable around the mock up; ▪ A tall structure appears to be erected in the centre of a roundabout with possible oil staining noticeable around the structure; ▪ There is evidence of drums or small containers stored on bare ground ▪ There appear to be two buildings / stores or similar rectangular structures on site ▪ The area is marked by more tracks and heavy usage
1979	▪ The former fire-fighting training ground has been completely decommissioned ▪ There is no evidence of any structures or drums, etc. remaining on site ▪ The ground is still worn and bare of vegetation in most of the site area
1981	▪ As per 1979
1984	▪ Ground appears to be rehabilitating ▪ There is evidence of vehicular traffic through the site and along the southern track parallel to the boundary fence
1986	▪ The site is located west of a fence line (site is now situated landside); ▪ Soil stockpiles appear to have been placed over a large portion of the site; ▪ Vegetation has grown back with some remnant bare ground
1990	▪ As per 1986
1997	▪ Vegetation has grown back with only a small amount of remaining bare ground ▪ A WWTP has been built to the east
2010	▪ Some tracks and bare patches remain, but much of the site has revegetated
2016	▪ As above

Date	Observation
Site D – Remote Training – Old Landfill B	
1946	▪ Site located within a plantation forest area ▪ Situated south of the Sinclair Creek riparian area
1958	▪ Site has been cleared of forest as part of the land redevelopment to the airport use ▪ A diagonal trench / pond is visible at the site, with a pipe outlet/inlet and a small building; possibly a pump house ▪ The site is bounded by several tracks, one southwest, along the property boundary, one to the north
1963	▪ Not visible on this photograph
1965	▪ The site appears substantially similar to 1958, with a new track to the east leading to a small building ▪ Plantations west and south have been harvested
1969	▪ A large slab or hardstand has been constructed to the northwest of the 'pump house' ▪ The pond has been substantially backfilled with only around one fifth remaining at the northern end ▪ There is evidence of abundant soil stockpiles around the pond area and other waste being deposited nearby and likely within the pond backfill
1979	▪ Landfilling of the pond is complete ▪ The 'pumphouse' and separate slab remain. Several rectangular shapes visible which could include boxes or vehicles, including a large shape which could be a shipping container or similar.
1981	▪ As per 1979, with only the small building and slab visible as well as the 'shipping' container or similar, situated to the northwest of the slab. ▪ The land is fully cleared and the ground is bare
1984	▪ As per 1981
1986	▪ The old landfilled pond area is noticeable by the green grass over the area – not much rehabilitation / regrowth has occurred. ▪ A fenced compound has been built northwest of the former pond within holds above ground tanks (2), a rectangular tank or structure, and another open tanks? All structures are on concrete slabs; former wastewater treatment plant (WWTP)?
1990	▪ As per 1986 ▪ A white stockpile or similar has been added south of the small building
1997	▪ No change from 1990 ▪ The inferred WWTP has been enlarged with more tanks

Date	Observation
2010	▪ The inferred old WWTP has been mostly decommissioned and the new WWTP has been substantially constructed / completed; ▪ It has been fully fenced ▪ A bitumen seal covers much of the site ▪ The footprint covers around 2/3 of the northern part of the former pond ▪ Multiple spoil / soil stockpiles are piled on the southern 1/3 of the former pond footprint
2016	▪ The WWTP has been completed and the small building and slab are no longer present
Site E – Large Backfilled Pond	
1946	▪ Situated within the bed of Sinclair Creek ▪ Land is bare and grassed possibly due to creek flood processes and / or some grazing
1958	▪ The pond has been developed along the course of the creek ▪ Straight channels have been formed along the creek alignment as part of formalising drainage works during the airport development ▪ The pond consists of two ponds, a larger western pond that collects the water from up gradient Sinclair Creek, and a smaller eastern pond separated by a small bridge of soil; ▪ The eastern pond collects water from the channel which drains from the Terminal to the east of the MFS (Site A); the eastern pond then overflows to the Sinclair Creek channel that has been formed along its former bed and is piped under the airport runway
1963	▪ Not visible on this photograph
1965	▪ The two ponds appear to have been joined into one, with the soil bridge either removed or flooded
1969	▪ The eastern portion of the pond, corresponding to the former smaller eastern half of the pond, has been backfilled; ▪ A new discharge channel has been installed to feed from the remaining pond to the Sinclair Creek channel ▪ There appears to be a discharge pipe now feeding underground across the grassed area from the drainage channel which feeds water from the MFS and Terminal to the north
1981	▪ The pond is still present as per 1969 ▪ It appears clogged with algae or soil
1984	▪ The northwestern third of the pond has been backfilled

Date	Observation
1986	▪ The pond has recently been backfilled, a channel remains through the centre to allow drainage for Sinclair Creek;
1990	▪ The pond has been completely backfilled with only a wide drainage channel remaining to provide continuity to Sinclair Creek drainage ▪ A new subsidiary taxiway and parking apron has been built directly south of the ARFFS and across 'Sinclair Creek'
1997	▪ As above, some containers stored to the south on hardstand
2010	▪ As above, with extra buildings having been built around the subsidiary taxi way and apron, and to the south of the channel; ▪ The drainage line is clogged up with red growth – algae?
2016	▪ Small building constructed to the north of the drain ▪ The drain appears brown and clogged with algae
Site F – Remote Training – U.Tas Building	
1946	▪ Site located within a plantation forest area ▪ Situated south of the Sinclair Creek
1958	▪ Situated within a patch of cleared and grassed land, deforested as part of the airport development
1963	▪ Not visible in this photograph
1965	▪ A small track has been cut to access the site from another airport track ▪ A small building or structure has been constructed on the site
1969	▪ The building is visible with a number of vehicles along a well formed access track ▪ The area to the east has partly revegetated and a large rectangular area appears to have been set up in linear rows ▪ Soil stockpiles are scattered across a large portion of the area ▪ A circular structure appears to have been constructed to the south-southwest of the building at the end of a small track
1981	▪ The small building and another shed are visible as well as an additional building on the northern side of the rows ▪ The rows are very visible and the cleared patch stands out from the revegetated areas around it
1990	▪ The rectangular cleared area appears to be revegetating and may no longer be in use ▪ The same 3 buildings present in 1981 are still present ▪ The circular structure noted in 1969 is not visible, a small building is situated near its location

Date	Observation
1997	▪ The buildings remain as per 1990, but the vegetation has regrown and there is no evidence of the land being used for trials, etc. as in 1969 and 1981; the neat rows are no longer visible
2010	▪ The two larger buildings remain, the smaller building is no longer visible ▪ There is waste on the ground between the buildings ▪ The ground around the entire site and area has been cleared of high vegetation growth, only low ground cover remains, patchy, amongst parched ground
2016	▪ The buildings have been removed, footings and slabs remain
Site G – Remote Training – Bush Area	
1946	▪ Site located within a plantation forest area ▪ An east-west road cuts through / near the site
1958	▪ All plantations have been cleared over the site as part of the airport construction and development; A track is still visible through / near the site
1963	▪ Site is not visible on this photograph
1965	▪ No change from 1958; the land is still completely cleared
1969	▪ As per 1965 with some evident vegetation regrowth ▪ A north-south track is visible to the west of the site, parallel to the runway
1981	▪ As per 1969 with more vegetation growth
1990	▪ As per 1981 with further vegetation growth
1997	▪ As per 1990, some vegetation / tree clearing has occurred to the south of the track
2010	▪ No change from 1997
2016	▪ No noticeable change from 2010
Site H – Remote Training Landfill A	
1946	▪ Site located within a plantation forest area ▪ An east-west track cuts through / near the site
1958	▪ All plantations have been cleared over the site as part of the airport construction and development
1963	▪ Site is not visible on this photograph
1965	▪ No change from 1958
1969	▪ An elongated oval shaped ‘excavation’ oriented east-west is visible at the site ▪ It has dark staining in several patches

Date	Observation
1981	▪ The oval shape is still visible with other areas of disturbance and bare ground to the north and south of the original 'excavation'
1990	▪ Landfilling activities are visible on the northern side of the site, with several tracks formed on the northern and southern side and vegetation regrowth apparent in all unused areas
1997	▪ Landfilling appears to have ceased and the area does not appear to be actively used
2010	▪ Landfilling appears to have occurred again with white materials, possibly building demolition rubble
2016	▪ Landfilling materials are still visible as per 2010 but there is no clear evidence of additional dumping
Site I – Remote Training Old Nav Aid Building	
1946	▪ Site is within an active cropping field
1958	▪ Site has been developed as part of the airport construction and the navigational aid building is visible; building(s) and a radar ▪ A track has been constructed to it ▪ A drain has been cut from the site south-southeastwards towards the bed of Sinclair Creek
1963	▪ Additional tracks have been constructed to the building linking it the internal road network
1965	▪ No change to 1963
1969	▪ No change to 1965
1981	▪ No change to 1969
1990	▪ The radar dish is no longer visible and one structure has been removed leaving two larger buildings and a smaller one ▪ A fence has been constructed to the east and the site is now situated airside
1997	▪ The eastern most of the 3 buildings has been removed ▪ A small tank or box is placed to the west of the buildings
2010	▪ As per 1997
2016	▪ Most of the buildings have been removed; the smaller shed / building remains, and the small box also
Site J – Remote Training – Sand Mine	
1946	▪ Land is cleared of shrubs, appears to only have grass cover ▪ Vacant land, likely to be used for grazing or similar

Date	Observation
1958	▪ Sand mining is evident, with a roadway leading across the northern part of the runway to what appears to be a construction laydown area located to the west of the northern end of the runway ▪ Drainage from the mine appears to be directed north across Tasman Highway to a pond which drains to Barilla Bay ▪ All shrubs / trees to the south and east have been cut down
1963	▪ The sand mine is still active and has extended north-eastwards ▪ Drainage is still to the same pond to the north
1965	▪ The sand mine is still very visible though it has not expanded much laterally compared to 1963
1969	▪ The sand mine has been expanded by almost another 50% to the east
1981	▪ The eastern part of the mine has been planted and rehabilitated, and many of the peripheral areas of the mine are growing shrubs and revegetating ▪ The pond to the north appears disused
1990	▪ Peripheral areas of the mine are rehabilitating well, while other areas area still completely bare ▪ There is evidence of stockpiling of some materials on the north side of the mine area
1997	▪ No change from 1990, except for lack of stockpiling visible
2010	▪ No change from 1997, with some increase in revegetation
2016	▪ The site has undergone significant revegetation ▪ There is still evidence of traffic use of some tracks
Site K – Remote Training Igloo	
1946	▪ Possible sheep grazing paddock, sparse vegetation
1958	▪ The 'igloo' building has been built and is situated within a compound with other buildings and possibly building materials; it may have been the airport construction contractors area ▪ The site area has excellent roadways constructed from Holyman Avenue, to Tower Hill, the Terminal area and the runway
1963	▪ Area to west of igloo is clearly used for materials stockpiles, likely construction materials
1965	▪ As above, and the igloo and areas around it appears to be used to store materials
1969	▪ The building is surrounded by drums, other stockpiles of hard materials, and the area to the east is covered by numerous soil stockpiles; the western half of the compound is still used to stockpile materials

Date	Observation
1981	▪ Area around the igloo appears mostly free of materials; the western part of the compound is still active
1990	▪ A formalised roadway has been constructed to the igloo; ▪ A large awning has been constructed on its eastern side; ▪ A fenced compound has been set up next to the awning ▪ The building appears actively used and storing materials
1997	▪ As per 1990 with additional materials stored to the south and east of the building
2010	▪ Two small buildings / houses are present to the north of the igloo, it is not clear if they are permanent structures
2016	▪ A large free standing awning has been installed to the west of the building ▪ The building does not appear to be actively used ▪ The western area of the compound is still being used by several operations
Site L – Remote Training - Control Tower	
1946	▪ Llanherne House is present on the hill ▪ Vegetation is mostly cleared except for hedges
1958	▪ The Control tower, an access road and a large water tank have been built on the hill next to Llanherne House as part of the airport development
1963	▪ No change from 1958
1965	▪ No change from 1963
1969	▪ No change from 1965
1981	▪ No change from 1969
1990	▪ Extra navigational equipment has been constructed either side of the water tank
1997	▪ No change from 1990
2010	▪ 2 additional water tanks have been added and all have been covered; a pump house or similar has been installed next to the tanks
2016	▪ No change from 2010

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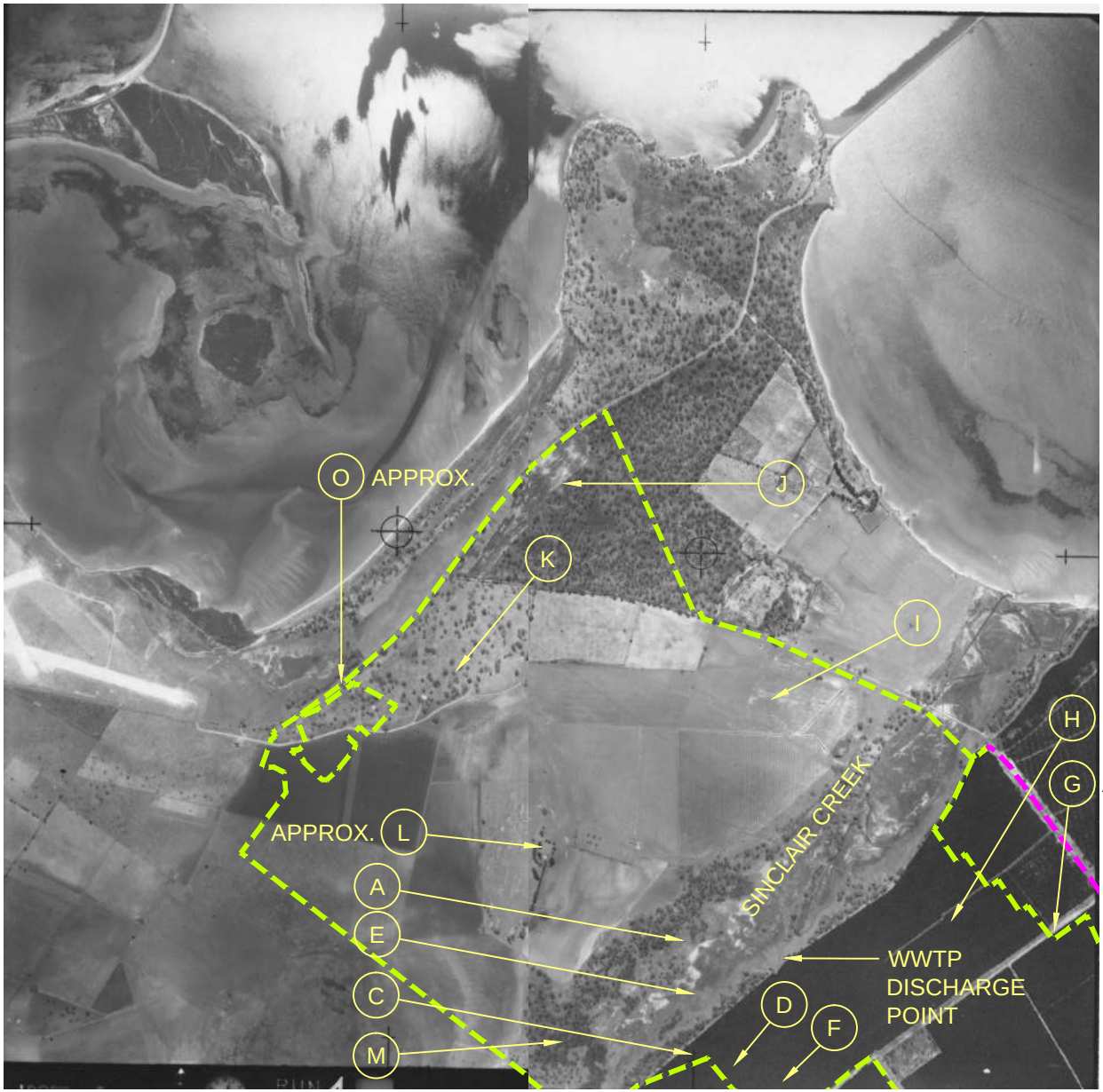
F	REMOTE TRAINING - UTAS BUILDING
G	REMOTE TRAINING - BUSH AREA
H	REMOTE TRAINING - LANDFILL A
I	REMOTE TRAINING - OLD NAV AID BUILDING
J	REMOTE TRAINING - SAND MINE
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
M	SITE STOCKPILES
O	TASMAN HIGHWAY CAR CRASH SITE



LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY
- E — SITE LOCATION ID

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HISTORICAL AERIAL IMAGE 1946

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J	REMOTE TRAINING - SAND MINE
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
M	SOIL STOCKPILES
N	SOUTHERN END OF RUNWAY
O	TASMAN HIGHWAY CAR CRASH SITE
R	GOLF COURSE FIRE SITE

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L	REMOTE TRAINING - CONTROL TOWER
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N	SOUTHERN END OF RUNWAY
O	TASMAN HIGHWAY CAR CRASH SITE
R	LLANHERNE GOLF COURSE FIRE SITE

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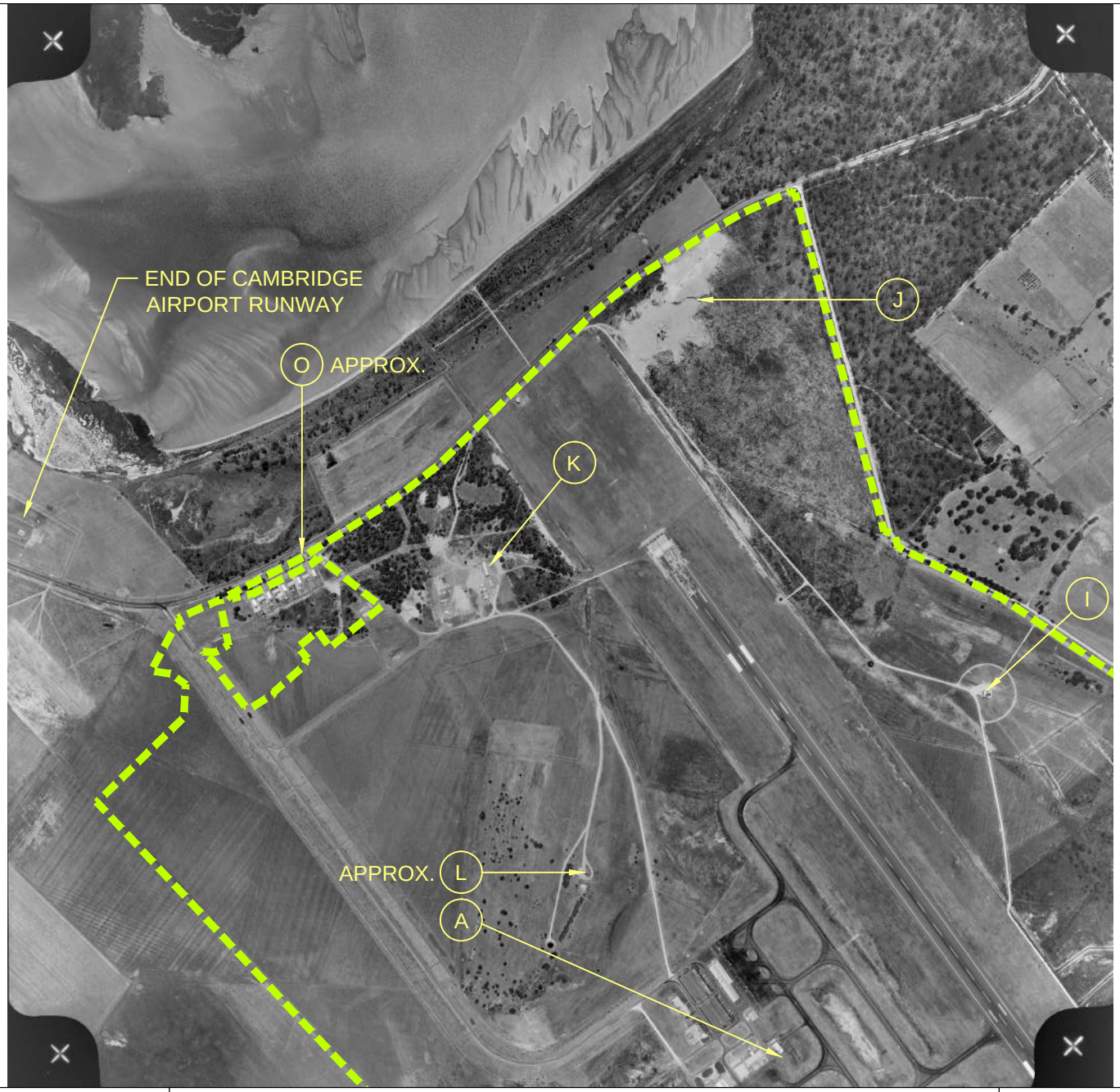
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
O	TASMAN HIGHWAY CAR CRASH SITE



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O	TASMAN HIGHWAY CAR CRASH SITE
R	GOLF COURSE FIRE SITE
S	CAMBRIDGE AIRPORT

LEGEND

LEASEHOLD BOUNDARY

FREEHOLD BOUNDARY

E SITE LOCATION ID

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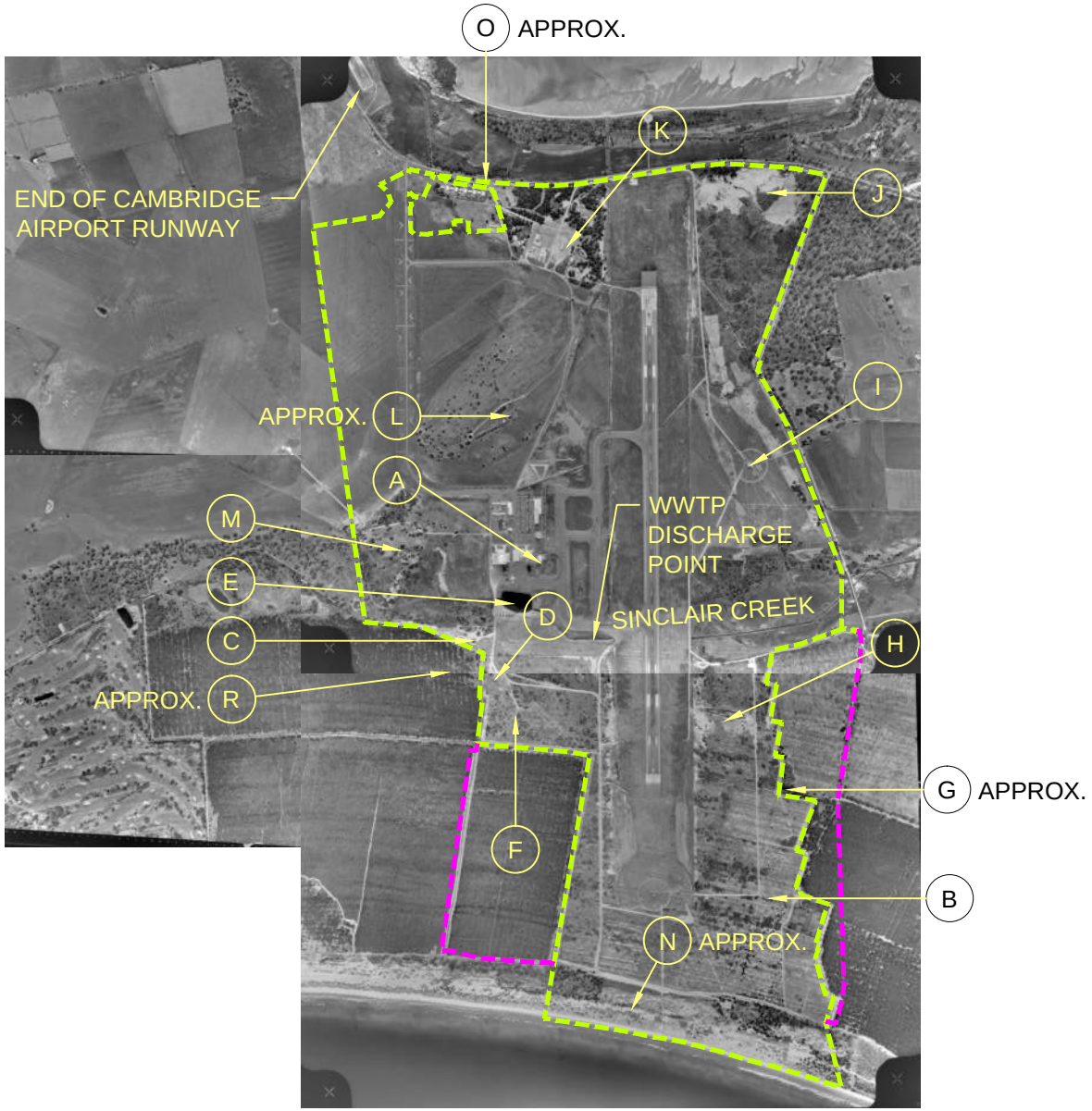

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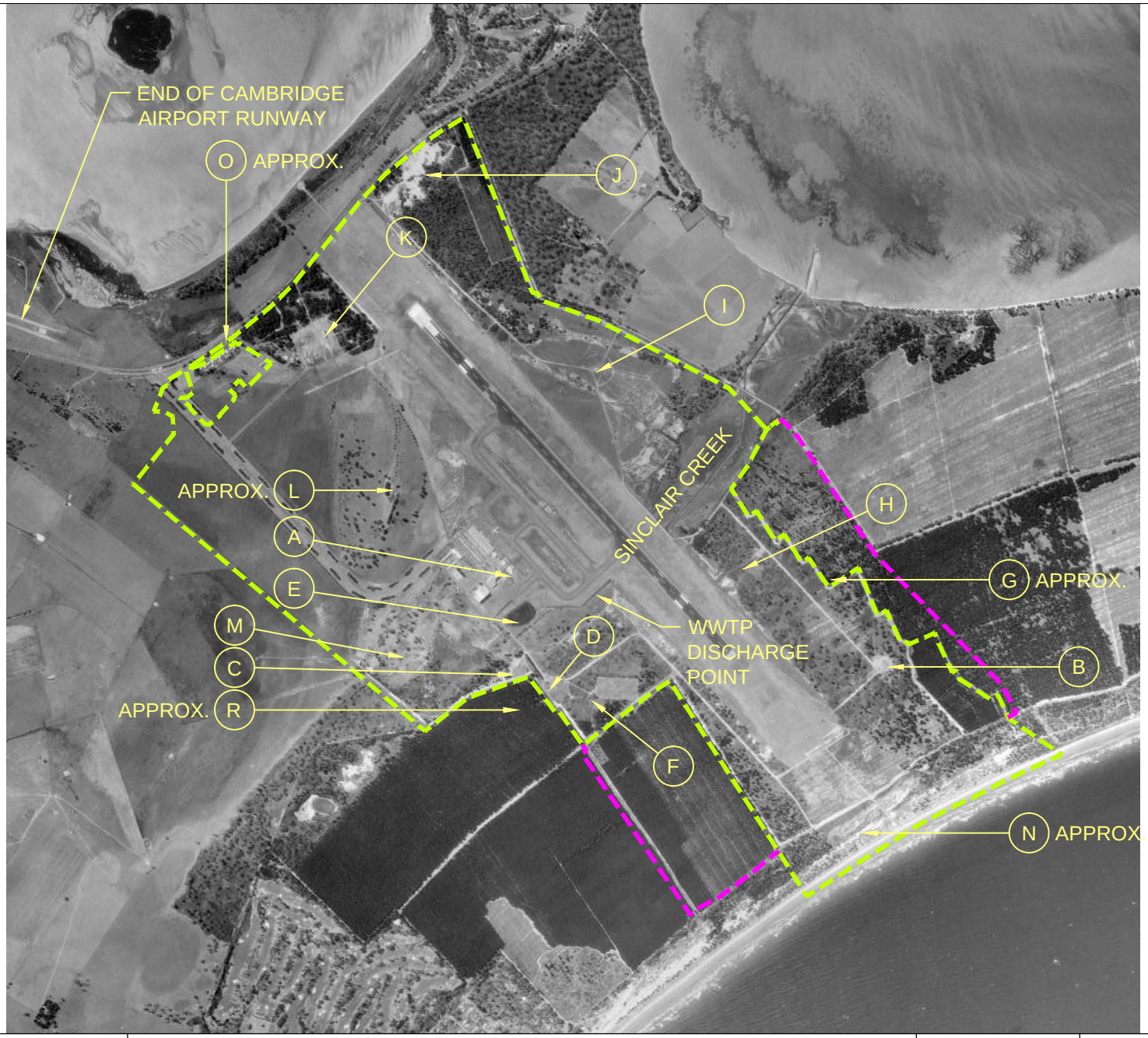

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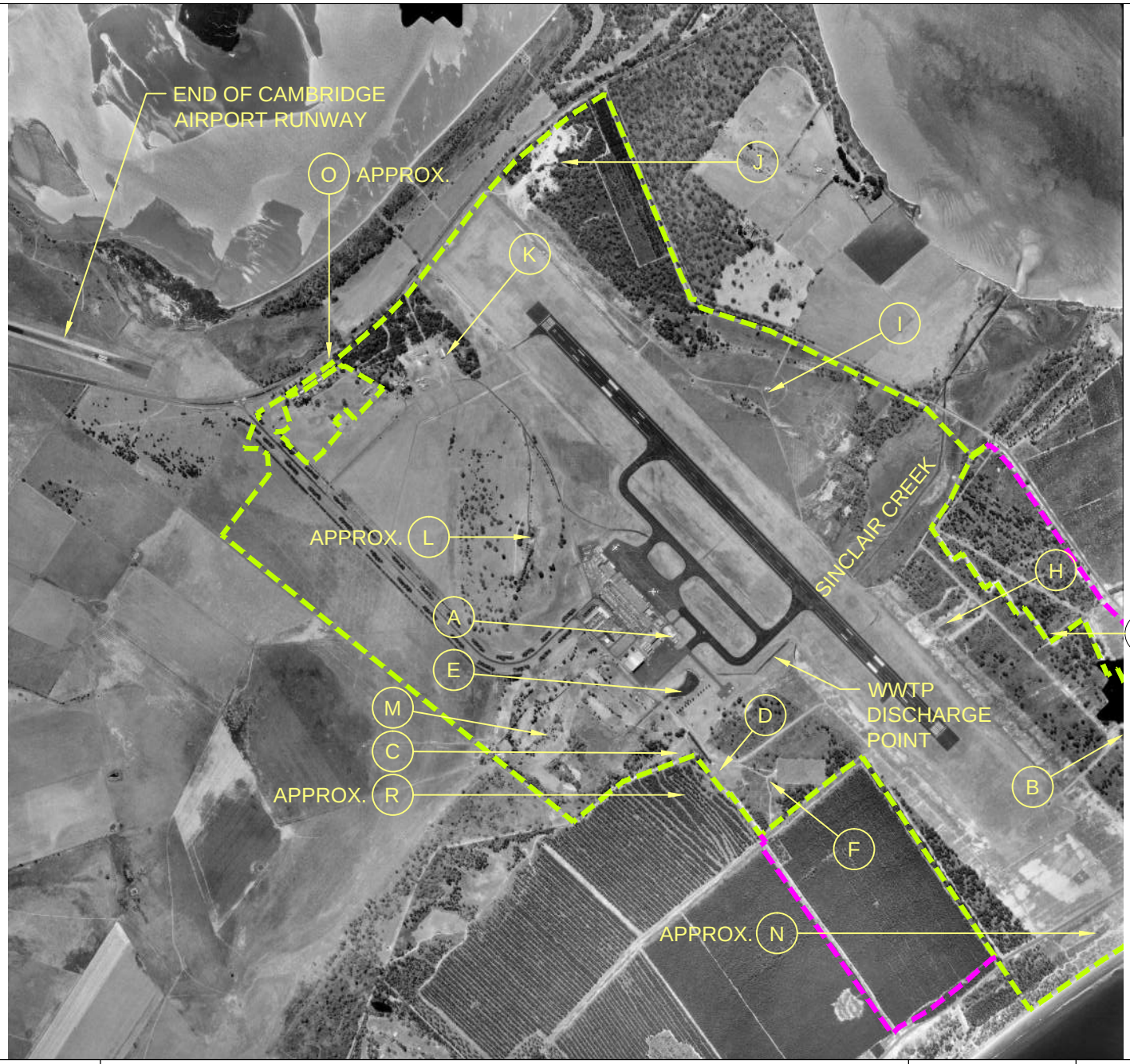

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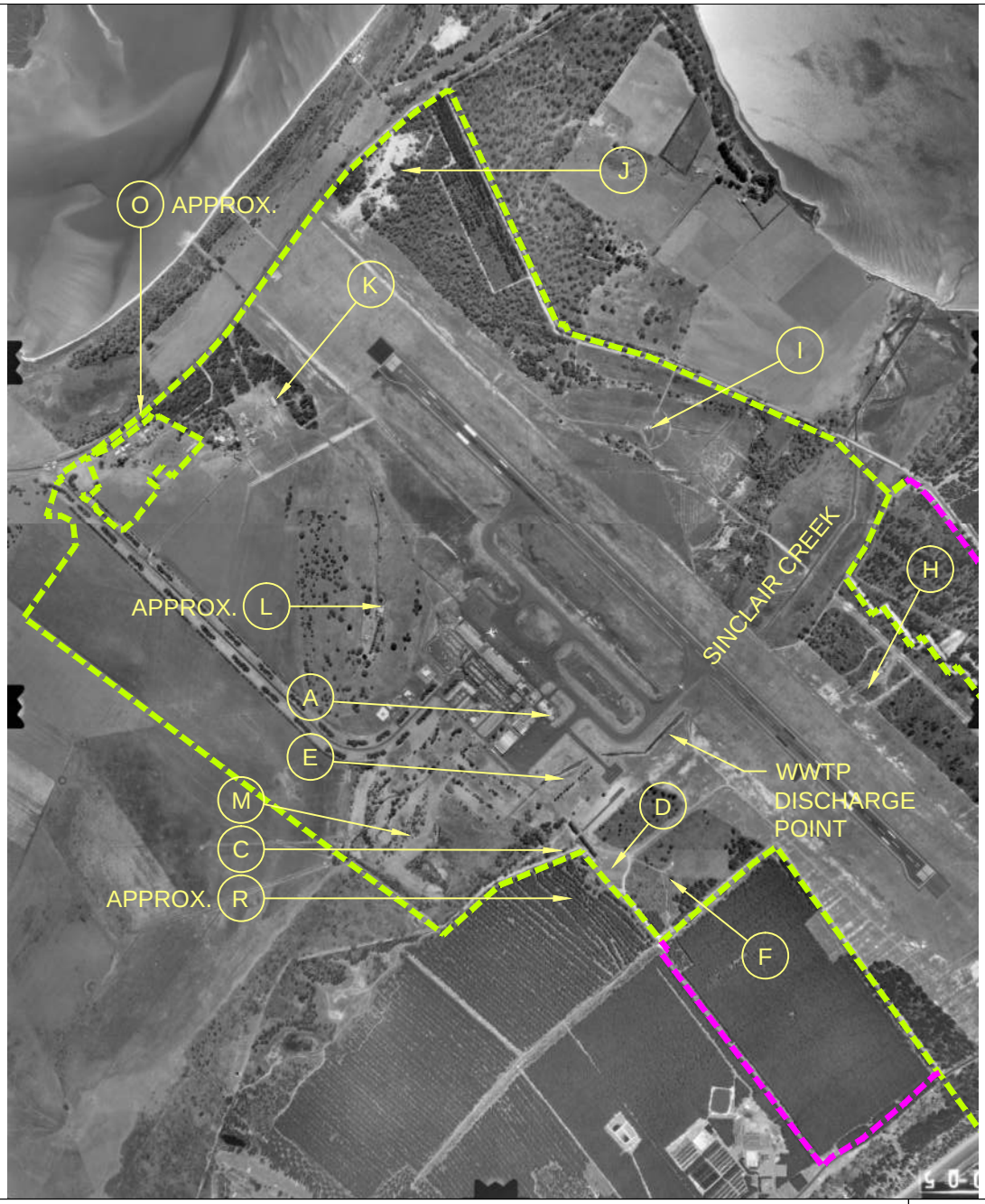

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E	LARGE BACKFILL POND
F	REMOTE TRAINING - UTAS BUILDING
G	REMOTE TRAINING - BUSH AREA
H	REMOTE TRAINING - LANDFILL A
I	REMOTE TRAINING - OLD NAV AID BUILDING
J	REMOTE TRAINING - SAND MINE
K	REMOTE TRAINING - IGLOO
L	REMOTE TRAINING - CONTROL TOWER
M	SOIL STOCKPILES
N	SOUTHERN END OF RUNWAY
O	TASMAN HIGHWAY CAR CRASH SITE
R	GOLF COURSE FIRE SITE

LEGEND

- LEASEHOLD BOUNDARY
- FREEHOLD BOUNDARY
- (E) SITE LOCATION ID

HOBART AIRPORT PSI

HISTORICAL AERIAL IMAGE 2010

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Appendix E – Summary of Provided Documentation

Table E1: Findings from Documentation Provided

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
Provided Documentation			
23/07/2003	*ARFF Incident Detail Report – (#190)*	Incident Report	▪ Qantas Passenger Apron: o Foam used – 6 L o Water used – 100 L Extinguished smouldering fire next to the exhaust of Qantas tug
29/12/2003	*ARFF Incident Detail Report – Mutual Aid Call (#209)*	Incident Report	▪ Tasman Highway 10km west of Airport [Site O of this PSI] o Foam used – 413 L o Water used – 6,500 L o Vehicles involved – ULFV6, MFB, police, ambulance, other BP Fuel – overturned fuel tanker – TFS called ARFF; the immediate area around the tanker was covered with foam using the vehicle monitor
30/09/2005	*ARFF Incident Detail Report – Aircraft - crash (#328)*	Incident Report	▪ Runway 30 / taxiway 'C' junction - Tasair: o Foam used – 20 L o Water used – 250 L o Vehicles involved – ULFV6, ULFV5, RIV and Airport safety Fuel leaking from wing; no actual crash; AFFF applied through hose to cover fuel area
30/09/2006	*ARFF Incident Detail Report – Aircraft - crash (#421)*	Incident Report	▪ Cambridge Aerodrome [Site S of this PSI]: o Foam used – 30 L o Water used – 500 L o Vehicles involved – ULFV5, MFB, Police, Ambulance Light aircraft crash on Runway 09; AFFF applied through hose to cover fuel area

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
Previous Investigations - MFS			
August 2006	*Report for Hobart International Airport – Fire Services Building – Site Contamination Assessment (GHD)*	**Objective**: limited Phase 2 Contamination Assessment adjacent to the Fire Services Building [**MFS**] to: ▪ Provide an initial assessment of the soil condition at the site with respect to potential land contamination from leakage of diesel fuel from an underground distribution pipework; ▪ Identify regional groundwater characteristics and quality with respect to potential groundwater contamination from leakage of diesel fuel from the underground distribution pipework. **Scope:** ▪ 9 soil sample bores in vicinity of diesel release; ▪ Soil sample the bores; ▪ Convert 4 bores to groundwater monitoring wells (50mm uPVC pipe); ▪ Sample groundwater; ▪ Report findings and recommendations.	**MFS – Diesel pipework leak:** ▪ CoPCs tested: TPH, BTEX, PAH, TOC ▪ Only selected soil samples were tested, based on odour, visual impact or at the water table ▪ Soil contamination detected: SB01 (1.3m) Total TPH 7,810mg/kg (mostly in C_{15}-C_{28} fractions); PAH 4.6 mg/kg anthracene; and SB01 (4m) total TPH 2,180mg/kg (mostly in C_{15}-C_{28} fractions); SB02 at 2m and SB03 at 2m has little to no TPH, BTEX or PAH contamination. ▪ Groundwater contamination detected: very high TPH, BTEX and PAH concentrations in SB01 well; apart from high benzene concentration, low to no detection of TPH and PAHs in SB02 well, and no detections in SB03 and SB07 wells. ▪ The presence of benzene, naphthalene and some TPH fractions suggest that the contamination could also be from a petroleum source not just a diesel source.

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
July 2008	*Air Rescue & Fire Fighting Services, Hobart International Airport Pty Ltd – July 2008 Progress Report* (SEMF)	**Objective:** To carry out and report on a series of groundwater extraction events to manage identified groundwater contamination at the ARFFS [**MFS**]. **Scope:** ▪ Two extraction wells were installed (100mm diameter) (EW1 and EW2); ▪ A series of groundwater extraction events was conducted from January 2008 to July 2008; ▪ Report on the results and findings	**Findings:** ▪ The analytical results of the LNAPL detected in EW3 (pre-existing bore) revealed that the product was a kerosene/diesel mix and hence indicated the potential presence of another source of contamination at the site (in addition to the known diesel leak and former diesel UST). ▪ Based on the outcomes of the Groundwater Extraction Events (GEE's) and other investigations conducted at the site to date (by GHD) it is considered that on-going groundwater extraction and monitoring will be required in order to manage the identified hydrocarbon contamination.
July 2008	*Groundwater Extraction Bore Installation: Air Rescue & Fire Fighting Services Station, Hobart International Airport, Cambridge* (Sloane Geoscience)	**Objective:** Install two groundwater extraction bores in the vicinity of a former diesel fuel leak on the western side of the ARFFS [MFS]. **Scope:** ▪ Drill, install and develop wells (EW1 and EW2); ▪ Survey wells to allow groundwater gradient determination; ▪ Carry out groundwater extraction events.	**Findings:** **Soil** – soil from EW1 was classified as clean fill; soil from EW2 was classified as Level 3 Contaminated soil and was disposed appropriately with EPA approval. **Groundwater** – gradient appeared to be very slight and to the southwest. **LNAPL** – present in SB01 (pre-existing well), EW2, EW3 (pre-existing well); Several extraction events were run by Sloane Geoscience with a total estimated 100L of product extracted. **LNAPL** test showed the product was around 5% kerosene and 95% diesel [poss heating oil mix].

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
Aug 2009	*Groundwater Monitoring Bore Installation: Air Rescue & Fire Fighting Services Station, Hobart International Airport, Cambridge* (Sloane Geoscience)	**Objective:** Install four groundwater monitoring bores around the ARFFS [MFS] to help inform an Environmental Site Assessment relating to groundwater remediation at the site [MFS]. **Scope:** ▪ Locate wells around the perimeter of the ARFFS building and between the building and potential off-site sources of hydrocarbon contamination; one well to be installed in the southeast to test for offsite migration of site groundwater contamination; ▪ Drill, install and develop wells (AR1 to AR4); ▪ Sample boreholes (2 soil samples per bore), tested for TPH and BTEX; ▪ Survey wells to allow groundwater gradient determination.	**Findings:** **Soil** – PID results were all zero or very low <0.5ppm; samples from 2.0m depth and 3.5 or 4.0m depth were submitted for testing; all samples had TPH and BTEX below LOR except for AR1 at 2.0m with a low TPH of 90mg/kg in diesel-typical fractions. **Groundwater** – gradient appeared to be very slight and to the southwest. Groundwater analysis is discussed in the SEMF report (Sept 2009). Note that groundwater contamination appears to still be localised near the ARFFS building, near the former UST and diesel fuel leak.

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
Sept 2009	*Aviation Rescue & Fire Fighting Services, ARFF Fire Station, Hobart Airport – July 2009 Progress Report* (SEMF)	**Objective:** Determine the source of identified kerosene contamination and further delineate the know diesel contamination with the groundwater at the ARFFS site [**MFS**]. **Scope:** Four investigation holes were drilled and converted to groundwater monitoring wells. A groundwater monitoring event was carried out to determine the hydrocarbon concentrations across the site.	**Findings:** ▪ Continued hydrocarbon contamination in the groundwater of four of the eleven bores sampled; including free product in SB01, EW1 and EW3; ▪ Elevated MBAS, PFOS, PFOA were detected in new well AR4, which may be affected by the water draining from the washdown pad; ▪ The hydrocarbon plume appears to be confined to the west of the ARFFS building and does not appear to have migrated; ▪ Hydrocarbon contamination on the ARFFS site appears to be the results of onsite activities; ▪ It is considered likely that the kerosene contamination within the groundwater is the result of the former 1.5kL kerosene UST removed from site in 2000; there does not seem to be a link with the known kerosene spill on the passenger apron in 1999 [unless underground services allowed for a preferential pathway from the passenger apron spill area back to the ARFFS site]
November 2010	*Screening Human Health Risk Assessment – Refurbishment of ARFF Building, Hobart International Airport (AECOM)*	**Objective:** Human Health Risk Assessment (desktop) (HHRA) for soil and groundwater impacted by PFOS and PFOA identified near the ARFF building [**MFS**]. The HHRA was to: ▪ Assess whether identified contamination present in local groundwater and soil may pose an unacceptable risk to the health of	**Findings:** With respect to potential human receptors: ▪ The estimated screening hazard index for Hobart construction/demolition activities (including drillers and geotechnical surveyors) under the Reasonable Maximum Exposure scenario did not exceed the relevant adopted acceptable risk criterion (1.0). ▪ Interpretation of the risk estimates for that scenario therefore suggested that the risk to workers and to Airservices personnel would be considered acceptable.

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
		current or future workers during proposed excavation and construction activities at the ARFF building. This assessment will include a screening human health risk assessment based on direct contact with soil and groundwater; and ▪ Provide preliminary advice with respect to an appropriate approach to the storage and management of excavated materials potentially impacted by PFOS and PFOA. **Scope:** HHRA to address only PFOS, PFOA, MBAS and 6:2 FtS as CoPCs.	Overall, the above risk estimates indicated that no unacceptable risk is posed to Hobart Site workers from the proposed construction/demolition activities through contact with soil at depths up to 1 mBGL. **Exclusions:** ▪ No assessment of contact with groundwater due to disturbance depth of less than 1m and groundwater being at over 1.5m depth; ▪ No assessment for MBAS and 6:2 FtS, due to a gap in toxicity data.
Jan 2013	*Aviation Rescue & Fire Fighting Services- Hobart International Airport Groundwater Monitoring Event* (SEMF)	**Objective:** Undertake a Groundwater Monitoring Event (GME) to determine current groundwater conditions surrounding the ARFF Building. **Scope:** ▪ One GME involving sampling of eleven operational groundwater/extraction bores;	**Findings:** Results show that a diesel/kerosene plume remains in the vicinity of bores EW1, EW3 and SB01 with free product otherwise known as Light Non-Aqueous Phase Liquid (LNAPL) present in those three bores. The plume extends out to bore EW2 which exceeded Airports (Environmental Protection) Regulations (AEPR) 1997 values for TPH and PAH. Levels of the fire-fighting foam constituent PFOS exceeded the Minnesota Administrative Rules (MAR, 2009) Health Risk Assessment guidelines in all bores (excluding SB01, EW1, EW3 since they contained free product and were unable to be sampled). This indicates that the presence of PFOS is widespread across the site and at very high levels (particularly in bore SB07).

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
		▪ Collection of relevant water chemistry field data whilst purging and sampling; and ▪ Preparation of this report detailing the sampling findings and recommendations for management options and for future work and/or monitoring.	Concentrations of perfluorooctane sulphonate (PFOA) in AR1, AR3, AR4, SB03, SB07 & EW2 exceeded the Minnesota Administrative Rules (MAR, 2009) health risk limit. Methylene Blue Absorbing Substances (MBAS) concentrations across the site exceeded AEPR guidelines in bores AR4 and SB07, however the laboratory was unable to detect to concentrations <300mg/L, and therefore it is likely that more bores may have exceeded guideline limits (of <0.05mg/L). The analytical results indicate that there are two specific areas that require remediation and management: 1. The diesel/kerosene plume; and 2. The presence of PFOS/PFOA site wide.
Jul 2014	*Aviation Rescue & Fire Fighting Services – Groundwater Extraction Event And Groundwater Monitoring Events* (SEMF)	**Objective:** Implement the Groundwater Remediation Plan to reduce the hydrocarbon plume to statutory levels to meet Airservices' obligations under the *Airports Act* 1996 (AA, 1996) and the *Airports (Environment Protection) Regulations* 1997 (AEPR, 1997). **Scope:** ▪ Groundwater extraction event (GEE) program – to extract phase separated hydrocarbons (PSH) and dissolved phase hydrocarbons in groundwater.	**Findings:** ▪ Based on the volumes of PSH removed from site to date (during the 2008 pumping event and recent GEE), it is estimated that 20-25 % of the original product spill has been recovered from the aquifer. ▪ An estimated PSH volume of 93 L was removed during the GEE. ▪ The GEE appears to have been effective in drawing groundwater from all over the site. ▪ Contaminant concentrations in a number of wells have decreased to their lowest levels since monitoring commenced. ▪ PSH continues to be present in wells EW1 and EW3.

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
		▪ Analysis of extracted groundwater – for disposal purposes. ▪ Storage and disposal of extracted groundwater – pre and post analytical results. ▪ Groundwater monitoring event (GME) program – to monitor the effectiveness of the GEE in reducing contamination to within acceptable limits. ▪ Progress reporting.	
Oct 2014	*Aviation Rescue & Fire Fighting Services Stormwater Management Plan* (SEMF)	**Objective:** The document provides a Stormwater Monitoring Plan (SMP) to monitor the quality of stormwater entering and exiting the (ARFFS MFS) site. The SMP will help determine if the receiving environment beyond the ARFFS site boundary may be affected by the MFS stormwater discharges. **Scope:** The SMP provides: ▪ recommended stormwater monitoring points, ▪ a sampling methodology, and ▪ a list of analytes to test for.	**Findings:** ▪ 4 strategically chosen locations are to be monitored; ▪ Testing of water samples should be for hydrocarbons, oil and grease, suspended solids, nutrients, MBAS, and a suite of PFAS; ▪ The samples are recommended to be taken quarterly; ▪ The SMP should be revised after 12 months of sampling based on results and findings.

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
Aug 2015	*Hydrocarbon Delineation Assessment MW4-MW6 Installation, ARFFS, Hobart International Airport, (Geo-Environmental Solutions)*	**Objective:** Undertake a Hydrocarbon Delineation Assessment at the Hobart International Airport ARFFS. **Scope:** ▪ Installation of additional groundwater wells in the deeper confined aquifer ▪ Gain a better understanding of the profile and the groundwater movement in the deeper aquifer ▪ Determine the extent of the phase separated hydrocarbon plume (PSH plume). ▪ Help inform groundwater hydrocarbon / PSH plume remediation options.	**Findings:** ▪ The shallower aquifer is unconfined and has a faster rate of groundwater movement than the deeper confined aquifer; both aquifers are sand dominated and separated by a clay horizon; ▪ Flow in the shallow aquifer is predominantly northeast, but can change seasonally to eastward; low permeability zones in the aquifers are forcing local changes of direction to the groundwater and the PSH plume migration; the low permeability zones are also slowing groundwater movement and PSH migration rates; ▪ The hydraulic gradient is also very low, which is slowing the movement of the plume and groundwater in the highly permeable sand aquifers, and also contributing to the plume's broad radial migration area; ▪ PFOS was detected at over 10 times (146 ug/kg) the MDH residential guideline concentration of 13 ug/kg, and PFOA was detected at 3 ug/kg in sample 1.9-2m in MW1 in January 2015; ▪ PFOS was detected at between 2.46 ug/L and 33.5 ug/L and PFOA at 0.58 ug/L to 2.46 ug/L in wells MW4, MW5 and MW6 in June and July 2015; all concentrations are above the MAR (2009) Drinking Water guideline of 0.3 ug/L applicable to both compounds. ▪ Overall, groundwater flow rates at the site appear to be slow, so risks to receptors downgradient are low. ▪ There is strong evidence to suggest that the plume is migrating to the northeast beneath the ARFFS building(s).

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
Sep 2015	*Hobart ARFFS – Groundwater Investigations – SEMF Recommendations* (SEMF)	**Objective:** Provide recommendations based on Groundwater investigations carried out at the MFS by Geo-Environmental Solutions (Report dated August 2015).	**Findings:** ▪ The investigations have provided an increased network of groundwater wells some of which are screened in the shallow aquifer, and some in the deeper aquifer. ▪ None of the recent works have located phase separated hydrocarbons (PSH). As none has been found, pumping of groundwater is not currently recommended. ▪ If the hydrocarbon plume is beneath the ARFFS buildings, there may be hydrocarbon (or hydrocarbon decomposition bi-products) vapour intrusion risk within the ARFFS buildings. ▪ As the flow rates modelled for the shallow aquifer are rapid SEMF recommended carrying out an ongoing 6-monthly groundwater monitoring program instead of only annual.
Dec 2015	*Water Quality Sampling Sinclair Creek PFOS/PFOA* (HIAPL)	**Objective**: To gain some baseline information on whether PFOS/PFOA is present or absent within Sinclair Creek. **Scope**: ▪ Select locations; ▪ Sample locations; ▪ Test for PFOS, PFOA, 6:2 FTS and 8:2 FTS.	**Findings:** All surface water sampling sites indicated levels of PFOS, PFOA, 8:2 FTS and 6:2 FTS below the ISLs with the exception of site 2 (Sinclair 2) [now labelled SW5] which is located directly downgradient from the Airservices fire station building. This site recorded a level of 0.33 mg/L PFOS compared against the ISL of 0.006 mg/L for toxicity effects on aquatic organisms. The confluence sampling (Sinclair site 5) (i.e. the Sinclair Creek discharge location) results indicate levels of PFOS, PFOA, 8:2 FTS and 6:2 FTS below the adopted Interim Screening Levels (ISLs). Airservices have been made aware of the PFOS levels in Sinclair Creek directly downgradient from the fire station and is positively linked to stormwater runoff coming from the site [**MFS**].

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
Previous Investigations - CFTG			
Sept 2009	*Report for ARFF National Testing Program Preliminary Site Contamination Assessment, Hobart ARFF Drill Ground, Hobart Airport* (GHD)	**Scope / Objective**: Preliminary Site Contamination Assessment at the 'drill ground' [**CFTG**] to provide preliminary information regarding potential contamination at the site, and to ascertain whether soil (and sediment) and / or groundwater contamination exists at the site as a result of former and current land uses as a fire fighting training ground; CoPCs included: TPH, PAH, AFFF. **Limitations / boundaries**: ▪ Investigation was limited in scope and included targeted sampling of known areas used for fire-fighting training (was not in accordance with all the stages of investigation as defined in the National Environment Protection Measure (Assessment of Site Contamination) (NEPM 1999). ▪ Investigations were not proposed to define the full vertical or horizontal extent of contamination, but provide an indication of potential contamination based on a presence / absence basis of AFFF-related contamination.	**CFTG (drill ground)**: ▪ Three soil bores (B1 to B3) were drilled to a maximum of 2mbgl and samples collected; one sediment sample was collected from the wastewater evaporation pond; drilling of B4 to 5mbgl and conversion to groundwater monitoring well DG5; GWM wells DG2 and DG3 (existing) and new DG5. ▪ GW standing water depth was between 3 and 3.5mbgl ▪ No odours, sheen or PSH were noted in the monitoring wells, except for DG3, which had a slight kerosene odour ▪ Soil contamination was noted in the following borehole samples: ○ The pond sediment sample had detectable PFOS concentration 190mg/kg, exceeding the MDH industrial and residential soil screen criteria; PFOA concentration was well below the guideline. ○ B4_0.1: PAHs fluoranthene and pyrene of 0.6 mg/kg and 0.7 mg/kg respectively ○ B4_0.1 reporting a TPH C_{10}-C_{36} concentration of 3,838 mg/kg ○ Three borehole soil samples from the site were analysed for PFOS and PFOA: two recorded detectable but low PFOS and low PFOA concentrations; PFOS concentrations were however above the Minnesota Department of Health (2007) (MDH) residential and industrial soil screen criteria ▪ Groundwater contamination was noted in the following: ○ DG2 and DG3 reported concentrations of TPH C_{10}-C_{36} and TPH C_{15}-C_{28} of 1,700 µg/L and 870 µg/L respectively, in excess of the Airport Regulations (1997) Marine Water investigation threshold of 600 µg/L for total TPH C_{10}-C_{36}

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
		For intrusive investigations, only the area surrounding the concrete bunded training pad area (where AFFF overspray had occurred) was targeted.	○ DG3 with a total PAH concentration of 3.2 µg/L (naphthalene), which exceeded the total PAH investigation threshold of 3 µg/L ○ All 3 groundwater samples had detectable PFOS and PFOA concentrations: PFOS concentrations were above the MDH (2007) 0.3 µg/L criteria, ranging between 52 µg/L and 250 µg/L; PFOA concentrations were above the MDH (2007) 0.5 µg/L criteria, ranging 18 µg/L and 50 µg/L ▪ Findings: ○ TPH soil contamination appears to be limited to the top 0.5mbgl; sampling was insufficient to gauge trends of PFOS/PFOA soil contamination with depth or laterally ○ TPH impact is noted in groundwater wells adjacent to the concrete drill pad (DG2), and adjacent to the interceptor system (DG3) and wastewater evaporation pond; the latter also had PAH impact The presence of PFOS and PFOA in groundwater at the drill ground site indicates that AFFF from site activities has migrated through soil and impacted groundwater at the site. In addition, PFOS and PFOA in groundwater indicates these compounds are present in the environment, and have potential to cause harm to aquatic ecosystems for surrounding sensitive receptors, including the Ramsar listed area (Pittwater-Orielton Lagoon).

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
February 2011	*Hobart ARFFS Drill Ground LMU Swab Sampling, Hobart International Airport, Cambridge Operations (Sloane Geoscience)*	**Objective:** Determine the presence and extent of any surface residue of perfluoroctane sulphonate (PFOS), perflurooctanic acid (PFOA) or 6:2 fluorotelomer sulfonate (6:2 FtS) associated with fire-fighting foams that had been previously been used at the site **[CFTG]**. **Scope:** Conduct surface swab sampling of the large mock up (LMU) training fuselage at the ARFFS training ground [**CFTG**]. Swab samples were taken at eight sites / locations on the LMU.	**Findings:** ▪ PFOS residues were identified; only minor amounts of PFOA residues were noted. 6:2 FtS concentrations were below LOR. The results appear to suggest that the dominant [foam] contaminant present in the oxidised LMU coating appears to be PFOS at apparently low levels. Rough calculation, based on average PFOS results from three samples from the surface of the fuselage of the LMU and an estimate of the outer surface area from drawings, suggests that a total of about 50 µg of PFOS may be present on the exterior surface of the LMU fuselage.
July 2012	*Disposal Options for PFC-contaminated bulk water from the Airservices Australia Fire Training Ground at Hobart Airport* (UniQuest Pty Limited)	**Objective:** Assess the quantity of PFCs in the stored water at the FTG [**CFTG**] and the potential impact on existing PFC loadings in the effluent and biosolids generated by the Prince of Wales Waste Water Treatment Plant (WWTP). PoW, and any associated risks in the receiving environment.	**Findings:** ▪ Receiving environments for both effluent and biosolids are already contaminated with PFCs; ▪ Due to the relativity of PFC concentrations and volumes of FTG wastewater to daily WWTP discharges, it is believed that the FTG wastewater will not have a material impact on those receiving environments above what is currently occurring; ▪ PFC-impacted wastewater could be disposed in small batches (e.g. 10m3), to one or several WWTP, ideally in the lower estuary to enhance mixing opportunities; ▪ To avoid impact to biosolids, consider discharging the PFC-impacted wastewater to WWTP without biosolids, or to those where biosolids are landfilled, or discharge to the WWTP discharge stream ('back end');

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
			▪ Develop trigger values for intervention if monitoring for PFCs is to extend beyond the discharge mixing zones areas required to be sampled by EPA.
Mar 2014 (*preceded by annual GMEs from 2008 which have not been reviewed in detail*)	*Hobart ARFF Drill Ground Groundwater Monitoring – March 2014, Hobart International Airport Cambridge* (Sloane Geosciences)(SGEO)	**Objective:** Conduct a groundwater monitoring event (GME) at the Air Rescue & Fire Fighting (ARFFS) Drill Ground at the Hobart International Airport. The GME is part of an ongoing program of monitoring and assessment of groundwater quality in the vicinity of the ARFFS Drill Ground [**CFTG**], with particular focus on determining the presence of any fluorosurfactants from fire-fighting foams that had been formerly used at the site. **Scope:** ▪ Groundwater samples were to be obtained from monitoring bores DG2, DG3 and DG5 and from DG6, about 400 m to the SE and down gradient from the Drill Ground and adjacent to Surf Road. In addition, samples were to be taken from HIA perimeter monitoring bores HA19, HA20 and HA21; ▪ Test Groundwater samples for: TPH, BTEX, PAH and PFOS, PFOA and 6:2 FtS; and	**Findings:** ▪ CFTG and southern part of the airport are underlain by a coastal sand aquifer with environmental value near 'drinking water' from a salinity perspective; ▪ TPH, TRH, BTEXN and PAH results were less than LORs for the three HIA perimeter bores and the three Drill Ground bores, apart from some TPH/TRH results above LORs for Drill Ground bores. These included C10-C14 in DG3, C15-C28 in all three Drill Ground bores and C29-C36 in DG5 and DG2. These results were higher than those for the February 2013 GME and were the highest since April 2009 when SGEO took over the monitoring program. However, TPH and TRH results for the March 2014 GME were below any relevant guideline values. The results suggest low-level contamination possibly from diesel and/or kerosene. ▪ PFOS, PFOA and 6:2 FtS results were above LORs for all Drill Ground bores but only PFOS exceeded the LOR for DG6. PFOS results were also above the LOR for perimeter bores HA19-21, with PFOA only exceeding the LOR for HA20. Results in excess of LORs exceeded AEPR and/or MAR guideline values. ▪ The highest surfactant results were returned for DG2, although results for this bore and DG5 were lower than February 2013 results. Higher results from DG2 may have been influenced to some extent by inadequate bore capping which was rectified during the March 2014 GME. Results may also have been influenced by the location of the bore in relation to dominant fire-fighting vehicle approach directions. ▪ For HIA perimeter bores HA19-21, the reason for higher fluoro-surfactant results from HA20 is unknown due to the limited number of monitoring bores, but any source is likely to be up gradient, to the north. ▪ Potential downstream receptors could include: golf club spear bore array; south-southeast of well HA19; low risk to coastal aquatic ecosystem.

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
		▪ Assess analysis results and provide relevant comments relating to groundwater quality.	
July 2014	*Replacement HB FTG Environmental Site Investigation (GHD)*	**Objective:** Undertake a Site Contamination Investigation of an **area located adjacent to the CFTG** (site). It is intended that the site be redeveloped as the new location for the fire training ground (new FTG). The objective is to assess the suitability of the site for its intended use (new fire-fighting training ground) and to establish a baseline with respect to the site's contamination status. **Scope included:** ▪ Desktop information and CSM; ▪ Drilling 21 soil bores in a grid pattern; logging bores, collecting soil samples at multiple depths; ▪ Installation, development and sampling of 3 groundwater monitoring wells (50mm uPVC); ▪ Testing of soil and groundwater samples for CoPCs	**Findings:** **Soil:** ▪ The soil analytical results of all samples were below the adopted ecological and human health investigation levels for the parameters tested, however no established *ecological* investigation levels were available for PFCs. ▪ Slightly elevated PFOS **soil** concentrations and significantly lesser concentrations of PFOA (except for MW1 (2.0m)) were reported; the highest concentrations were on the southern portion of the site closest to the fire training ground. PFCs in this area were also detected at a depth of 0.5m, at similar concentration to the surface samples indicating that contamination in this area is likely to be pervasive through the unsaturated zone. ▪ Presence of low concentrations of hydrocarbons is attributed to organic matter rather than anthropogenic impacts (GHD, 2014) **Groundwater** ▪ PFOA was detected at 7.51 ug/L in well MW1 (x25 the MDH 2009 criterion for drinking water, of 0.3 ug/L); PFOA was not detected in the other two wells (MW2 and MW3); PFOS and 6:2 FTS were not detected in any of the 3 well samples; ▪ Other PFCs were detected in MW1, some at high concentrations (PFBS 42.8ug/L, PFHxA 39.2 ug/L and PFHxS 104 ug/L); lower concentrations of PFCs were detected in MW2 and MW3.

Date	Document / Report	Objective	Key AFFF- (and other CoPC-) Related Findings
		▪ Soils sampled: 21 from surface; 13 samples from 0.5mbgl; and 3 at water table depth; ▪ Update CSM, assess data, report on suitability of site for its intended use, and baseline contamination status. CoPCs nominated were: TPH, PAHs, BTEXN, OCPs, OPPs, PFCs	▪ Groundwater analytical results of all other organic contaminants and inorganic contaminants were below the LOR and adopted investigation levels, respectively. **Impacts likely:** ▪ GHD consider that the PFC impact in soils near the southern part of the site is considered a secondary source of contamination which is likely due to overspray, possibly stormwater runoff, and to a much lesser extent, dust transport (aeolian) from the CFTG (primary source of contamination); ▪ GHD consider that the PFC impact in groundwater is sourced from the CFTG, either from groundwater migration, contamination diffusion, or percolation of contamination from stormwater runoff from the CFTG (primary source of contamination) then penetration through the profile; ▪ The shallow water table, permeable profile and low salinity make the coastal sand aquifer very vulnerable; ▪ Contaminated soils handling should be managed to avoid direct contact, and to ensure appropriated disposal; ▪ The new FTG site is considered suitable for the proposed use as a fire training ground providing appropriate soil and groundwater contamination management measures are put in place, as recommended in the report.

Other locations			
Dec 2015	*Water Quality Sampling Sinclair Creek PFOS/PFOA* (HIAPL)	**Objective**: To gain some baseline information on whether PFOS/PFOA is present or absent within Sinclair Creek. **Scope**: ▪ Select locations; ▪ Sample locations ▪ Test for PFOS, PFOA, 6:2 FTS and 8:2 FTS	**Findings:** All sites indicate levels of PFOS, PFOA, 8:2 FTS and 6:2 FTS below the ISLs with the exception of site 2 (Sinclair 2) which is located directly downgradient from the Airservices fire station building. This site recorded a level of 0.33 mg/L for PFOS compared against the ISL of 0.006 mg/L for toxicity effects on aquatic organisms. The confluence sampling (Sinclair site 5) (i.e. the Sinclair Creek discharge location) results indicate levels of PFOS, PFOA, 8:2 FTS and 6:2 FTS below the adopted Interim Screening Levels (ISLs). Airservices have been made aware of the PFOS levels in Sinclair Creek directly downgradient from the fire station and is positively linked to stormwater runoff coming from the site [**MFS**].

Appendix F – Interview Responses

Table F1: Interview Responses – ARFFS Personnel

No.	Question	Response
ARFF Services Contact: HOBART AIRPORT **Interviewee (name, position & period of time working at the airport):** [redacted] – Fire Station Manager (3 months) 13 years at the station; [redacted] – Leading Fire Fighter (28 years at this station, since 1988); [redacted] – Leading Fire Fighter (28 years, since Jan 1988). **Interview Date & Time:** 22/07/16, 13:00 – 15:15 (office) & 15:15-16:00 (drive & walk around).		
1	Where has AFFF been used at the airport?	Main Fire Station (MFS) [Site A]: ▪ Filling of foam in trucks occurred each day, as drills occurred every morning; ▪ Filling with foam occurred at the MFS; filling often occurred on the washdown bay; filling stopped once the concentrate tank overflowed; overflow on trucks and ground was washed down the washdown bay drain; ▪ This practice stopped around 15 years ago; ▪ Roof monitor and hoses were used daily; ▪ All grassed areas around the MFS were used to practice use of hoses and monitor; ▪ The foam was and is stored as a concentrate prior to use; ▪ The trucks carried concentrate; ▪ Multiple accidental releases of foam (due to valve being left on) at MFS ▪ Annual discharge of foam fire extinguishers at the MFS on grassed area, and refilling. Current Fire Training Ground (CFTG) [Site B]: ▪ Stormwater from the CFTG was collected and used to irrigate the pine forest around the CFTG; ▪ 44 gal drums were used for drills, with kerosene or waste oils; ▪ Due to a fault in the design of the trucks, if the foam switch was left on, foam could enter the water tank and create a foam mix in the water tank; this occurred regularly ▪ After training, if the water tank had been mixed with foam, the foam mix was emptied 'over the fence' into the pine forest ▪ The CFTG has a dummy aircraft; a smoke hut and external ladders; old car bodies; old fuel storage tanks, all of which were used as fire-fighting practice structures; Smoke Hut [Site I]: ▪ Was an old navigational aid building; had ACM (asbestos containing materials); ▪ Was used for training; ▪ A drum with kerosene was used as a fire fuel; ▪ Foam was used to extinguish, via a hose from the truck;

No.	Question	Response
		▪ The foam often overflowed from the truck over the ground around the hut; Sand Pit [Site J]: ▪ Was used for fire training up to some time prior to 1988; ▪ From at least 1988, and possibly prior to 1988, the sand pit was used for driver training, for fire trucks in sand terrain; The landfill (old tip) also called the Drill Ground [Site H]: ▪ The tip was lit 2 – 3 times a week; ▪ Trucks dumped waste foam mix / drums, etc. at the landfill; ▪ Tyres were burned ▪ 44 gal drums were burned ▪ Tip was used as a fire-fighting drill ground, as part of extinguishing the landfill burn-off Remote attack – to simulate aircraft crash locations [Site B, in forest around the CFTG and Site G]: ▪ Fires were lit in drums, filled from jerry cans of 20-40L of kerosene, or waste oils; ▪ Fire trucks were used to extinguish either via the hose or the roof monitor; Other remote attack – old university buildings (south of the MFS), [Site F]: ▪ A drum of kerosene was lit; ▪ Truck and hose were used to extinguish within the building; ▪ There is a 'well' in the centre of the area, and firefighters were told to stay away from the well during their exercises Other on-airport foam uses by fire trucks: ▪ Monitor and hose use occurred almost anywhere at the airport; however foam was not always used; ▪ Historically, the igloo (northwest of airport) [Site K] was used for fire-fighting practice; Operational Respons es near the airport: ▪ The FS responded to a scrub fire at the southern end of the runway [Site N] – the roof monitor was used to spread foam; ▪ There was collision between two cars (taxi and police) on roadway north of airport [Site O]; FS responded to emergency;

No.	Question	Response
		▪ ARFFS is called out (even currently) to Cambridge airport [Site S] for operational responses (as it is within the 1km response radius and that airport is also controlled by the HIAPL control tower); ▪ Operational responses at Hobart airport have been only of a minor nature; e.g. a small plane took off and turned over and crashed on Tasman Highway (unknown location); ▪ There was a BP fuel truck that crashed and leaked fuel. ARFFS responded as stated in ORS report 209 29.12.2003. This has been provided to SEMF.
2	Who has used AFFF at the airport (Airservices & others)?	▪ ARFFS ▪ Unknown whether others have used foam
3	What types of AFFF have been used at the airport? Quantities?	▪ Usage of 3M Light Water was of the order of 20-50L / day; around 200L/week ▪ Quantities of Ansulite were less due to costs ▪ Protein foam was used occasionally prior to 1988; ▪ 3M Light Water was in use in 1988 (and prior), until around 2000-2002 ▪ Ansulite use started around 2000-2002; ▪ Concentrate to water proportion was 6% for both 3M and Ansulite though for training purposes was often only 3%
4	What infrastructure may be potentially impacted by AFFF use?	▪ Stormwater drain, north and south of fire station; surface water drains both ways from FS ▪ Washdown bay within the fire station; water goes to stormwater, Sinclair creek; foam tanks on trucks always leaked; ▪ Sediment in the settlement pit beneath the washdown bay is collected by Collex, now Veolia; ▪ Trucks, MFS buildings; ▪ All pads and infrastructure at the FTG; ▪ Washdown bay pad and all drainage infrastructure; ▪ Most hardstands dating prior to 2010 could have some impact; ▪ Any wastes from building demolition / slabs, etc. of smoke hut and university buildings if disposed within the site landfill
5	When was AFFF used at the airport?	Different foam uses are likely to have been similar at Hobart as at other airports, namely: ▪ Protein foam initially (from 1970's to late 1980s – concurrently with 3M) ▪ 3M Light Water (from ~1978/1980 to around 2000-2002) ▪ Ansulite (from around 2000-2002 to around 2010) ▪ Solberg RF6 (from around 2010) ▪ Training with foam at Hobart airport ceased around 2010 ▪ Trained in any weather conditions, but not in total fire ban conditions ▪ Fire fighting trucks were used to rinse down the glycol de-icing for planes; although only water was used, traces of foam are likely to have been present in the equipment ▪ Fire fighting trucks were used to help clean up any fuel / oil spills; degreasers were used, then truck hoses were used to wash off the wastes; again, trace of foam are likely to have mixed with the water pumped out

No.	Question	Response
6	Is there any AFFF still stored at the airport?	▪ No PFOA containing bulk storage belonging to Airservices or at the fire station remains. ▪ Only Solberg RF6 is now stored (2x 5kL tanks) ▪ 3 x 20L containers at AirBP ▪ Don't know about any others
7	How was AFFF delivered / used / stored / disposed of at the airport?	▪ 3M lightwater was delivered in thin steel 200L drums, lined with a plastic 200L drum ▪ Ansulite was delivered in 200L blue plastic containers initially, then in 1000L totes / IBCs ▪ Volume stored was up to 2kL ▪ *Up to 2 x 2kL ASTs were stored at any time from around 1999 or 2002 (Previous AFFF questionnaire)* ▪ Plastic inserts from 3M Light Water and Ansulite 200 L drums were reused on site and by a range of people off-site for all sorts of purposes; ▪ 3M metal drums were re-used onsite or dumped to tip; ▪ Waste foam either went to the washdown bay, the tip (drums) and residual foam could have gone anywhere on site;
8	Why was AFFF used at the airport? What is now used instead?	▪ Fire suppression (trucks and fire extinguishers). ▪ Solberg RF6 is now used.
9	When using AFFF, was a Standard Procedure followed?	▪ No written procedure was followed for either 3M or Ansulite; ▪ There was no requirement around the amount of foam dispensed (operationally if there was a fire, as much foam as necessary was used to extinguish it). ▪ Less Ansulite was used than 3M due to cost of product;
10	Have any environmental assessments been conducted at the airport?	▪ Yes, sampling of surface water; ▪ Not sure of any others
11	Are you aware of any PFAS investigations and testing that have been undertaken (within and outside of the ARFFS site/s)?	▪ As above

No.	Question	Response
12	Site plans showing building locations, services (including underground), stormwater drains and pits, dangerous goods storage etc?	▪ 1 x 44 gal drum of oil stored at the MFS workshop ▪ Historically had around 2,000L kerosene and 2,000 diesel tanks and fuel lines – now removed; known to have leaked and remedial works including soil and groundwater extraction pumping have occurred ▪ Current storage includes 5,000L diesel bunded AST and 2 x 100L of ULP in Gerry cans at MFS and CFTG ▪ Check reports provided by ASA ▪ Check Hobart Airport Masterplan ▪ Old fuel lines (leaked) to be located via old Coffey report to be provided by HIAPL
13	How old are the buildings and structures?	▪ Main Fire Station (MFS) – built around 1956 and added to since. ▪ Fire Training Ground (FTG) – was set up around same time as MFS ▪ Several disused buildings were used as remote training areas (marked as B, north of the runway, and B south of the runway on the foam usage areas map); the buildings have since been demolished (in the last 5-10 years)– the materials contained asbestos
14	Location/s & details of groundwater monitoring wells?	▪ MFS – refer to SEMF GW reports; ▪ FTG – refer to GW monitoring reports for wells around the FTG
15	Are there any known ecologically sensitive areas (threatened flora, communities and threatened fauna) within the airport?	▪ Refer to Hobart Airport Master Plan (Ch 13).
16	Uses, types, storage locations and quantities of chemicals at the Airport?	▪ An above ground self-bunded diesel tank (5.7kL) is now used to store fuel at the MFS ▪ Leaded petrol and diesel were previously stored underground at the MFS – leaks are known to have occurred ▪ 2 x 5kL above ground and bunded tanks of Solberg RF6 6% are stored undercover at the MFS ▪ Historically only around 2kL of foam was stored at the MFS ▪ Around 30 x 20L buckets of Ansul Purple-K Dry chemical powder are stored undercover in the MFS chem store ▪ 6 x bottles of compressed nitrogen are stored undercover in the MFS chem store ▪ Around 6 x jerry cans of ULP, small cans of paint and other products are stored in purpose built metal bunded cabinet in the MFS chem store ▪ Waste oil is collected in a 1000L tank stored in a bunded and covered outside area next to the workshop ▪ Several fire extinguisher bottles are stored on site (dry chem and foam) ▪ These used to be filled on site, but it is understood contractors now take these offsite for filling

No.	Question	Response
17	Details of any environmental incidents (i.e. fires, chemical spills etc.)? Incident log?	▪ Foam concentrate typically overflowed from the tank when filling up the truck; usually occurred within the washdown pad; ▪ Foam mix was applied very broadly over a much wider area than the fire; ▪ As noted in section 1, due to a fault in the design of the trucks, if the foam switch was left on, foam could enter the water tank and cause a foam mixture to be produced; the foam mix would then overflow from the truck water tank and covered the truck and ground around it; this occurred on numerous occasions at many of the training sites; ▪ An incident logging database is kept called ORS – ASA has provided 4 incident reports for Hobart ARFFS
18	Are there any discharges to land and/or water?	▪ Any product, and washdown wastes within the washdown pad goes directly to stormwater, and Sinclair creek; ▪ Use of foam for firefighting and other exercises impacted those soils; all grassed areas around the MFS, treed areas around the FTG, all ground areas around any of the remote training areas as noted in 1. above, and exercises could have occurred anywhere around the airport, though the ones listed in 1. are the main / more frequently used ones. ▪ Collected (and foam impacted) stormwater from the FTG was irrigated in the forest around the FTG; ▪ Since around 2010, foam exercises are no longer done in Hobart
19	Wastewater collection and treatment details?	▪ MFS – current truck wash bay behind the MFS, where all trucks are washed and filled with foam. The area reports to a triple interceptor pit (Oil-water separator) which doesn't remove foam and discharges to stormwater / Sinclair Creek. ▪ MFS Sewage and grey water report the nearby TasWater WWTP. ▪ FTG – drainage from the main pad is directed through the triple interceptor to a settling pond. Does not flow into second pond. Excess water from the ponds used to be irrigated to the forest. It is now pumped to overflow tanks, and around 30kL a month is pumped by Veolia and taken to Selfs Point to be disposed out the back end of the TasWater WWTP.
20	What wastes are produced and where/how are they disposed of?	▪ Packaging and drums – were either reused or dumped to site landfill. ▪ IBCs were returned to the supplier. ▪ Most wastes were taken to the site landfill. ▪ Current wastes include: workshop wastes – they are all collected and disposed via Veolia; general and recyleables via bins and skips; fire extinguishers refilled by TasFire offsite; there has not been any use of foam since training has been undertaken offsite; no operational responses and therefore no waste foam containers produced.
21	Has PFAS impacted soil been taken away from the airport or moved around within the airport?	▪ Unknown, except for the stockpile wrapped in plastic next to the FTG which was sourced from stockpiles situated near the old landfill area, near the current WWTP.

No.	Question	Response
22	Locations of any stockpiled material / containment areas / drains / waste disposal areas / pits / ponds / lagoons?	▪ As noted above, and refer to Hobart Airport Master Plan
23	Do you have any details of local geology and hydrogeology? Aerial photographs?	▪ refer to Hobart Airport Master Plan and other soil and gw reports
24	What are the adjacent property uses (in all directions), now and historically?	▪ The airport has an Emergency Action Plan which includes all neighbours contact details ▪ Refer to Hobart Airport Master Plan
25	Has fire training been undertaken in areas outside of the current fire station and/or firefighting training ground (recently or historically)?	Since around 2010: ▪ All foam fire-fighting training occurs interstate; ▪ Any training in Hobart occurs with water only; ▪ Training occurs around the fire station, on the grassed area and at FTG only; ▪ Since change over to Solberg foam, old vehicles and hoses were removed from the fire station; ▪ The Fire station now operates only with new vehicles and new hoses which have never been used with non-Solberg foams. Historically: ▪ Refer to section 1
26	When AFFF was used in training, what volumes were used and what was the methodology for wash down of waste and equipment?	Washdown of trucks and hoses was typically undertaken at the MFS washdown bay. Around 20-50L/day was used; around 200L / week. Training occurred daily, mostly at FTG, but could rotate to any of the other remote locations and smoke hut.

No.	Question	Response
27	How widely was the AFFF dispersed aerially?	▪ Training was undertaken in any weather conditions so foam could be blown far and wide; 50+ metres ▪ Foam was used to completely blanket the fire area, so it covered a large footprint ▪ Stormwater impacted by foam from the FTG was collected in ponds and excess water irrigated via sprinklers within the pine forest north of the FTG
28	What are the nearest sensitive receptors (human and environmental)? Downstream receptors for surface water?	Human: ▪ On airport – operational and maintenance staff, travellers. ▪ Off-airport – neighbouring farmland/residences. 7-mile beach locality Ecological: ▪ 5-mile beach ▪ 7-mile beach ▪ Ramsar wetland ▪ Aquaculture farms
29	How long have the ARFFS locations been used by Airservices (and predecessor/s)?	▪ Since around 1956
30	Who / which operation previously occupied the ARFFS locations (going as far back as possible)?	▪ Airservices and its predecessors; ▪ Prior to that the area would have been used for sheep grazing.

Table F2: Additional Questions to ARFFS Staff – August 2016

Questions and Answers – 22/8/2016 **Provided by [redacted] (Airservices, ARFFS Hobart Airport)** **Compiled by SEMF – Fiona Keserue-Ponte**				
Site ID	**Site Name**	**Site Location**	**AFFF usage**	**Amounts of AFFF used / frequency / period of use**
Known locations –				
Site D	Remote Training (Old Landfill B)	Situated airside, south of / or around the TasWater WWTP	Predates AFFF (i.e. AFFF is not known to have been used at the site)	How often was the area used for remote training?.. Likely only used when extinguishing landfill burn-offs during its lifespan (pre-1979) hence only protein foam is likely to have been used.....
Site F	Remote Training (UTas building)	Situated centrally within a large cleared area located southeast of the Airport Terminal precinct	Remote training / smoke hut:	How often was the area used for remote training:. between 2 to 4 times a year..... Over what period: around 10 years, until mid/late 1990s How much AFFF (concentrate) was used at each training exercise: 20 – 50 L of concentrate, diluted to 2 or 3%

Questions and Answers – 22/8/2016 Provided by [redacted] (Airservices, ARFFS Hobart Airport) Compiled by SEMF – Fiona Keserue-Ponte				
Site ID	**Site Name**	**Site Location**	**AFFF usage**	**Amounts of AFFF used / frequency / period of use**
Site G	Remote Training (Bush Area)	Anecdotal location (exact siting is unknown), situated east of the runway (airside) and east of an internal roadway (which runs parallel to the runway and between the runway and Pittwater Road), midway between the CFTG (Site B) and Old Landfill A (Site H); approximately 350m north of the CFTG	Remote training location: unknown. Its use predates current staff knowledge Was AFFF used: unknown	Specifics on how the area was used for training are not known to current (even long standing) staff.
Site H	Remote Training (Landfill A)	Situated east of the runway (airside) and west of an internal roadway (which runs parallel to the runway and between the runway and Pittwater Road), approximately 650m north of the CFTG (Site B)	Remote training / Extinguishing landfill burn-off AFFF was used.	How often was the area used for remote training: ARFFS mostly extinguished landfill burn offs, around 3 times a week and typically used water. ARFFS could have also used the area for remote practice possibly once per month using AFFF. Over what period:until late 1990s, i.e. around 15 years. How much AFFF (concentrate) was used at each AFFF-training exercise: 20 – 50 L of concentrate, diluted to 2 or 3%
Site I	Remote Training (Old	Situated east of the runway, airside, within an area of cleared land.	Remote training / smoke hut:	How often was the area used for remote training:. 2 – 4 times per year ..... Over what period: .until late 1990s, so around 15 years

Questions and Answers – 22/8/2016
Provided by [redacted] (Airservices, ARFFS Hobart Airport)
Compiled by SEMF – Fiona Keserue-Ponte

Site ID	Site Name	Site Location	AFFF usage	Amounts of AFFF used / frequency / period of use
	Navigational Aid Building)			How much AFFF (concentrate) was used at each AFFF-training exercise: 20 – 50 L of concentrate, diluted to 2 or 3%
Site J	Remote Training (Sand Mine)	Situated northeast of the runway, airside, within an old disused sand pit	Remote training: Hot Training: unknown Was AFFF used: unknown	How often was the area used for remote training: it is not known if any foam / AFFF was ever used here
Site K	Remote Training (Igloo)	Situated to the west of the northern end of the runway, in and around a pre-existing building / hangar	Remote training: Hot Training: No Was AFFF used: No	How often was the area used for remote training: Possibly 1 to 3 times / year for hose / water training Over what period:.. assume.approx. 15 years . No AFFF was used, but residues may have been present in the hoses, etc.

Site ID	Site Name	Site Location	AFFF usage description	Amounts of AFFF used / frequency / period of use
Unconfirmed Locations				
Site L	Remote Training (north of Terminal) and/or Control Tower	Situated to the north of the Terminal parking area – exact location is unconfirmed, but is on the eastern slope of Tower Hill	Remote training: Hot Training: No, just foam exercise Was AFFF used: Yes	How often was the area used for remote training:. 2 times / year – used for hose / water exercise running up the hill and 2 times / year used with foam from Tower Hill road, facing down the hill downgradient from the control tower ..... Over what period:..assume 15 years.... ..... How much AFFF (concentrate) was used at each AFFF-training exercise: 20 – 50 L of concentrate, diluted to 2 or 3%
Site N	Southern end of runway	Described as a scrub fire situated to the south of the southern end of the runway	Operational Response – incident predates staff knowledge of the site; but they definitely often responded to small scrub fires south of the runway along the northern side of Seven Mile Beach.	Was AFFF used for this scrub fire? No, typically only water, but leaching from hoses etc. would have occurred at very low concentrations
Site Q	Golf Course	Described as eastern corner of the golf course	Operational Response – what sort of fire was it? Scrub; ARFFS operational response was to protect property; they used the roof monitor and blanketed the whole bush area around the building situated to the northeast of the golf course.	Was AFFF used for this fire? No, typically only water, but leaching from hoses etc. would have occurred a very low concentrations

Table F3: Interview Responses – Airport Personnel

No.	Question	Response
Airport Contact: HOBART AIRPORT **Interviewee (name, position & period of time working at the airport):** [redacted] – Hobart Airport Environment Manager (3 years, since Jul 2013) **Date & Time:** 18/07/16, 8:30-12:30 (HIAPL office & site visit)		
1	Where has AFFF been used at the airport?	▪ Fire Training Ground and any training grounds (ARFFS source of PFAS) – training activities. ▪ Landfill, to extinguish regular rubbish burning. ▪ Incidents.
2	Who has used AFFF at the airport?	▪ Airservices only on a large scale. ▪ Rotorlift – some storage in the past but not currently, used offsite for firebombing. ▪ Minor storages in small fire extinguishers and at AirBP (3x20L Ansulite) – but little or no use
3	What types of AFFF have been used at the airport? Quantities?	▪ 3M Light Water – quantities unknown. ▪ Ansulite – quantities unknown. ▪ Solberg – quantities unknown
4	What infrastructure may be potentially impacted by AFFF use?	▪ Under aprons ▪ Drainage networks. ▪ Stormwater network (inclu. triple interceptors / sediment traps) ▪ Freight area; ▪ Groundwater; ▪ Soil; ▪ Widely sprayed – could have been windborne
5	When was AFFF used at the airport?	▪ Not completely known, likely to be per other sites: 1980-2002 3M (high PFAS content), 2002-2010 Ansulite (min PFAS content); 2010 Solberg (fluorine free); however there has not been any foam fire-fighting training in Hobart since around 2010 – it is undertaken in VIC. ▪ It is not known how small fire extinguishers (some with PFAS) were tested / are tested
6	Is there any AFFF still stored at the airport?	▪ Only small quantities, e.g. AirBP Ansulite
7	How was AFFF delivered / used / stored / disposed of at the airport?	▪ Unknown.

No.	Question	Response
8	Why was AFFF used at the airport? What is now used instead?	▪ Training. ▪ Fire suppression. ▪ Solberg RF6 is now used.
9	Have any environmental assessments been conducted at the airport?	▪ A once-off targeted surface water quality for PFOS/PFOA has been undertaken in Sinclair Creek (airport drain) in November 2015; the PFOS/PFOA suite was added as a once off to the normal Surface Water monitoring – PFAS concentrations were below the interim guideline levels except for the location immediately downgradient of the MFS – there also appeared to be PFAS impact in stormwater north of the fire station (upgradient?) report provided to SEMF; very low PFAS concentrations at Sinclair Ck discharge point to 5-Mile Beach. ▪ HIAPL undertakes quarterly surface water monitoring, but do not routinely include PFAS (due to costs). ▪ Surface water migration direction is understood to be east/north-eastwards; ▪ Groundwater investigations and annual monitoring is undertaken within bores installed around the perimeter of the airport – representative reports provided to SEMF; PFAS analyses included since 2012-13; GW at southern boundary well has PFOS concentrations slightly above interim ecological limits (GHD) ▪ GW migration direction is understood to be southwards; ▪ Soil testing was undertaken as part of runway extension project; soil concentration of PFAS < guidelines; report provided to SEMF; ▪ Several small / targeted Phase 1 Preliminary Site Investigations (PSIs) (desktop only) have been undertaken in different areas of the airport; reports have been provided to SEMF; ▪ One PSI was done on the landfill site (east of runway); has asbestos, no hydrocarbons known to have been dumped; groundwater is reportedly ok; materials there used to be regularly burnt to reduce load and vermin; PFOS contamination likely in the landfill, but reportedly contained; apparently only water was used at the landfill to put out the fires; ▪ One PSI was done on Airservices relocation of Navigation beacon/aid; ▪ One PSI was done on Gruber Rd extension; ▪ Testing of several stockpiles of soil situated near the TasWater WWTP areas; soils were from airside; Contaminated piles (Level 2, low level contaminated soil) were taken to Copping; other piles uses like for like under roads on site; one stockpile (around 5cbm) with concentrations of PFOS>interim guidelines was transferred next to the fire training ground, wrapped and sign-posted; ▪ HIAPL uses a risk ranking (or trigger assessment as required by the Commonwealth) for testing of soils, due to expense of testing all samples; if ranking suggests low risk, then soils are not tested; if medium/high, then soils are tested (e.g. in gw flow downgradient direction from known sources; in vicinity of main training area) ▪ One PSI was done at the old landfill site (location B, south of fire station, on PFAS impact areas map), next to the current WWTP; the site was initially a man-made lake which was drained (attracted birds/hazards); was they infilled with rubbish; was burnt 3x/week; foams may have been used to extinguish fire ▪ An investigation was done on the old hangar to NW of airport, testing done for hydrocarbons & other COPCs. No PFAS were historically stored at this site.

No.	Question	Response
10	Location/s & details of groundwater monitoring wells?	▪ Located around the perimeter of the airport only (those monitored by HIAPL); ▪ AirServices has wells around the fire station and fire training ground; ▪ Locations shown in the GW reports examples ▪ Refer to the Hobart Airport Master Plan.
11	Are there any known ecologically sensitive areas (threatened flora, communities and threatened fauna) within the airport?	▪ Refer to the Hobart Airport Master Plan. ▪ Tasmanian Devils, bandicoots, wedge-tailed eagles; birds / migratory at nearby Ramsar wetland; HIAPL does regular monitoring, including at reference sites; ▪ 13 State listed flora on site which are monitored annually ▪ EPBC-listed vegetation communities are present ▪ TASVeg listed communities are present
12	Uses, types, storage locations and quantities of chemicals at the airport?	▪ All fuel (fuel farm) is now stored at Air BP, it has an OEMP; all fuel is trucked to aircraft; ▪ Air BP has an emergency cabinet with 2 x 20L containers of Ansulite and an extra 20L in storage; has been there since 2004 and has never been used (per Air BP staff); they have groundwater wells that are monitored; most recent report can is available. ▪ Small storages also exist: Hydro's cloud seeding supply in small self-bunded container; other small amounts in various workshops; ▪ There historically was a mobile fuel farm on site, near the old HIAPL building; it has been decommissioned; Coffey issued a report; ▪ There is a PSH plume under the apron, attributable in great part to an underground fuel line leak; Coffey issued a report; ▪ There were a number of UPSS on site, removal and validation reports were issued for all ▪ Other fuel storages include nearby service station (UPSS); Rotorlift (helicopter / water-bombing) (UPSS) they may also have / have had foam for aerial fire-fighting – would be in trailer-loads quantities but not on site; ▪ Jetstar/Virgin/Tiger do not use any hangars at Hobart airport; ▪ Other airside hangars might have some 44gal (200L) drums of fuel/oils; ▪ Rental car agencies have above ground storages; Hertz has an old UPSS, and ASTs; audit info for lessees with Chemicals and dangerous goods storages (Category 1 tenants) may have more information; ▪ Minor chemical quantities (<5L containers) are stored at the old army hut; ▪ A bitumen batch plant was established for contractors for previous airport works; situated south of the main fire training ground; ▪ Refer to the Hobart Airport Master Plan ch13.
13	Details of any environmental incidents (i.e. fires, chemical spills etc.)? Incident log?	▪ There have been no major environmental incidents in the recent past, since Jul 2013 (KL start); suggest we ask those with longer experience on site. ▪ Minor spills have occurred; ▪ QantasLink has a fuel spill, was diluted with water and swept up and sucker trucked and treated with 'orange' biodegradable remediation product; ▪ Historically aircraft de-icing used glycol, which was rinsed off with water. This is no longer an acceptable method and is now cleaned up with the sucker truck. Waste is disposed of as hazardous waste by Veolia.

No.	Question	Response
14	Are there any discharges to land and/or water?	▪ Known impacts from water coming on to site include: nutrients, *e.coli*, metals, no hydrocarbons; from TasWater, livestock and possibly other offsite uses; ▪ The airport drains surface water to Sinclair Creek which drains to 5-Mile Creek; several cut-off valves have recently been installed to stop movement of surface water from the airport in the event of a spill / incident; procedure for use / maintenance procedure is to be developed; ▪ Clarence City Council has a number of groundwater monitoring wells at Seven-Mile Beach; all properties are on septic; GW is saline; ▪ PFAS contaminated stormwater from the (historically impacted) fire training ground is captured in tanks/ponds and is disposed in truck loads to Selfs Point (at back end) ▪ Stormwater from AirBP fuel bund is processed via an oil/water separator then stored in a 10KL underground tank; overflow from the u/g tank is discharged to Sinclair creek;
15	Wastewater collection and treatment details?	▪ Airport wastewater goes to the TasWater WWTP ▪ Stormwater goes to Sinclair creek; ▪ FTG wastewater/stormwater runoff is collected and taken offsite
16	Has PFAS impacted soil been taken away from the airport or moved around within the airport?	▪ Refer to Section 9 above; 5cbm of PFAS impacted soil is stored in plastic north of the fire training ground; it came from the old landfill site, near the WWTP ▪ Others possible but not known ▪ There is a large area south of the new HIAPL building which stores a very large number of stockpiles of building demolition rubble, soil, tyres, etc.; although there may have been some segregation, it is possible that some of the soils could have been sourced from PFAS impacted areas
17	Locations of any stockpiled material / containment areas / drains / waste disposal areas / pits / ponds / lagoons?	▪ Landfill to northeast of runway; ▪ Old landfill footprint, near WWTP; ▪ 5cbm of PFAS impacted soil plastic wrapped, north of fire training ground; ▪ Large amount of soil and solid waste stockpiles south of the new HIAPL office, some of which will be removed or reused as part of the Grueber Road development; ▪ Sinclair creek is the main drainage line from the airport to off-site; ▪ Stormwater ponds and water tanks at the fire training ground to store PFAS impacted runoff;
18	Details of local geology and hydrogeology? Aerial photographs?	▪ Small dunal system is still visible in many parts of site; captures stormwater in constructed swales and may increase stormwater infiltration; ▪ refer to the Hobart Airport Master Plan – ch. 13 ▪ refer to ASA gw reports
19	What are the adjacent property uses (in all directions), now and historically?	▪ Refer to the Hobart Airport Master Plan.

No.	Question	Response
20	What are the nearest sensitive receptors (human and environmental)?	▪ Human health – Airport workers, lessees, Airservices staff and maintenance personnel. ▪ Ecological – refer to Hobart Airport Master Plan; Ramsar Wetland.
21	How long has the ARFFS location been used by Airservices (and predecessor/s)?	▪ Around 1956 / same time as airport establishment.
22	Who / which operation previously occupied the ARFFS Location (going as far back as possible)?	▪ Always a fire station since around 1956; paddock prior; historically the site was used for sheep grazing.
	Other information provided	▪ Airport established around 1956; ▪ Landfill, east of runway, was established around the same time ▪ WWTP is run by TasWater; it treats airport and other local sewage waste; it is a tertiary membrane treatment plant; has an EPN; it discharges to Sinclair Ck, it is monitored daily; has high salinity; too high for offsite irrigation ▪ Three senior operations officers with 20-30 yrs' experience are available for questions; two still work at HIAPL, the other as a contractor; their contact details have been provided to SEMF for further queries; their information has been included in PSIs provided ([redacted]
NOTE	Underlined text: reports / information which has been or will be provided by HIAPL	

Appendix G – AFFF Usage Site Inspection Findings and Estimated Quantities Used

Table G1: AFFF Usage Site Inspection Findings

Inspected Feature	Site A	Site B	Site C	Site D	Site E	Site F	Site G	Site H	Site I	Site J	Site K	Site L	Site M	Sites N to S	General Airport
	MFS	CFTG	FFTG	Remote Training – Old Landfill B	Backfilled Large Pond	Remote Training – UTas Building	Remote Training – Bush Area	Remote Training – Landfill A	Remote Training – Old Nav Aid Building	Remote Training – Sand Mine	Remote Training – Igloo	Remote Training – Control Tower	Soil Stockpiles	Operational Response areas	General drainage and surfaces
Disturbed, coloured or stained soil	None observed	Yes	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	None observed	Not inspected, unconfirmed location	In places	In places	None observed	Not inspected	Not inspected	In places	Not inspected	Not inspected
Bare soil patches	None observed	Yes	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	In places	Not inspected, unconfirmed location	In places	In places	In places	Not inspected	Not inspected	In places	Not inspected	Not inspected
Disturbed or distressed vegetation	None observed	Yes – beyond fence near sprinklers	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	None observed	Not inspected, unconfirmed location	None observed	None observed	None observed	Not inspected	Not inspected	In places	Not inspected	Not inspected
Unusual odour	None observed	None observed	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	None observed	Not inspected, unconfirmed location	None observed	None observed	None observed	Not inspected	Not inspected	None observed	Not inspected	Not inspected
Quality of surface water, sheens	None present	Sheen and sludgy water in ponds	Not inspected, rehabilitated; *HIA01 and HIA06 surface water sampling locations are nearby*	Not inspected, rehabilitated	Not inspected, rehabilitated; *HIA028 and SW5 surface water sampling locations are nearby*	None observed	Not inspected, unconfirmed location	None observed	None observed	None observed	Not inspected	Not inspected	None observed	Not inspected	Not inspected
Topography and surface water drainage	Flat, stormwater drainage and wash-down, after interceptor, drain to Sinclair Creek	Flat, drainage to lined containment ponds; disposal trucked to back end of offsite Sewage Treatment Plant	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	Relatively flat, drainage was and is uncontained	Not inspected, unconfirmed location	Relatively flat, drainage appeared uncontained	Relatively flat, drainage appeared uncontained	Sandy soil, no formal drainage, depression in old mine area; water would infiltrate and/or drain to depression	Not inspected – *HIA04 surface water monitoring could be situated downgradient*	Not inspected	Relatively flat, drainage appeared uncontained	Not inspected	Not inspected

Inspected Feature	Site A	Site B	Site C	Site D	Site E	Site F	Site G	Site H	Site I	Site J	Site K	Site L	Site M	Sites N to S	General Airport
	MFS	CFTG	FFTG	Remote Training – Old Landfill B	Backfilled Large Pond	Remote Training – UTas Building	Remote Training – Bush Area	Remote Training – Landfill A	Remote Training – Old Nav Aid Building	Remote Training – Sand Mine	Remote Training – Igloo	Remote Training – Control Tower	Soil Stockpiles	Operational Response areas	General drainage and surfaces
Groundwater bores	Present & documented	Present & documented	Not inspected, rehabilitated	Present & documented *(HA19 to south; but may not capture downgradient water)*	Not inspected, rehabilitated	Large well stand up pipe present	Not inspected, unconfirmed location	Present & documented *(HA21 to east)*	None observed	Present & documented *(HA23 to west; may not be downgradient of mine)*	Not inspected	Not inspected	None observed	Not inspected	Not inspected
Buildings and roads	Building condition in line with age, roads in good condition	Building condition in line with age, roads in good condition	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	Buildings demolished, roads are unsealed gravel	Not inspected, unconfirmed location	No buildings, roads are bitumen	Buildings demolished, roads are unsealed gravel	No buildings, sandy tracks	Not inspected	Not inspected	No buildings, gravel tracks	Not inspected	Not inspected
Presence of stockpiles, fill, containment areas, sumps, drains and waste disposal areas	No fill, chemical store in good order; workshop in good order; waste oil to bunded tank	AFFF-contaminated soil stockpiles, plastic wrapped; waste oil and fuel collected via separator and reused; car bodies, etc. used for FF practice	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	Remnant footings and slabs	Not inspected, unconfirmed location	Adjacent soil stockpiles (origin unknown), drainage uncontained	Remnant footings and slabs	Sand piles from mining activities	Not inspected	Not inspected	Hundreds of stockpiles of soils and 'inert' waste, building demolition rubble etc. of unknown (airport) origin, age or contamination status – Broad segregation only.	Not inspected	Not inspected
Evidence of cut and fill activities	None observed	None observed	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	None observed	Not inspected, unconfirmed location	None observed	None observed	Yes, from past mining activities	Not inspected	Not inspected	Possibly as located in old airport golf club grounds	Not inspected	Not inspected

Inspected Feature	Site A	Site B	Site C	Site D	Site E	Site F	Site G	Site H	Site I	Site J	Site K	Site L	Site M	Sites N to S	General Airport
	MFS	CFTG	FFTG	Remote Training – Old Landfill B	Backfilled Large Pond	Remote Training – UTas Building	Remote Training – Bush Area	Remote Training – Landfill A	Remote Training – Old Nav Aid Building	Remote Training – Sand Mine	Remote Training – Igloo	Remote Training – Control Tower	Soil Stockpiles	Operational Response areas	General drainage and surfaces
Presence of pits, ponds and lagoons	Small pond in BBQ outdoor area; pit and triple interceptor beneath truck wash-down	Oil-water separator & two wastewater containment ponds & 3 large containment tanks	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	None observed	Not inspected, unconfirmed location	No ponds / lagoons / pits	None observed	Depression in areas of the mine where sand has been extracted	Not inspected	Not inspected	None observed but could be buried, see above	Not inspected	Not inspected
Chemical storage tanks and infrastructure	10kL Solberg foam; 5kL diesel AST (bunded), packaged oils / degreasers / coolants at the workshop (bunded)	Kerosene AST, waste oil / kerosene recycling tank	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	None observed	Not inspected, unconfirmed location	None observed	None observed	None observed	Not inspected	Not inspected	None observed	Not inspected	Not inspected
Underground infrastructure	Electrical, communica-tions, stormwater, sewerage	Surface drainage to separator and ponds; underground fuel lines	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	Could still exist from former building(s)	Not inspected, unconfirmed location	Drainage uncontained	Could still exist from former building(s)	None observed	Not inspected	Not inspected	None observed, could be present towards old club house to west – unknown routes underground	Not inspected	Not inspected
Condition of chemical storage facilities	Good	Moderate	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	None present now	Not inspected, unconfirmed location	None observed	None observed	None observed	Not inspected	Not inspected	None observed	Not inspected	Not inspected
Evidence of chemical spillage	None observed	Staining in places	Not inspected, rehabilitated	Not inspected, rehabilitated	Not inspected, rehabilitated	None observed	Not inspected, unconfirmed location	None observed	None observed	None observed	Not inspected	Not inspected	None observed	Not inspected	Not inspected

Table G2: AFFF Estimated Usage Dates and Quantities - 1982 to 2010 (AFFF usage period at Hobart Airport)

Site ID / Description	AFFF used	Water only used ~	From * (year)	To (year)	Period (years)	Amount (concentrate) (L)	Concentration	Frequency (number of days per year)	Comment
A - MFS	yes		1982	2000	18	20 to 50	often undiluted	365	Filling of foam tanks at washdown - often spilled over
	yes		1982	2000	18	6	6%	1	Emptying fire extinguishers (assuming 20 extinguishers per year at 5L capacity each)
		yes	1982	2010	28	residue	very low	365	Hose and monitor training on grassed areas (assuming daily)
B - CFTG	yes	possibly	1982	2010	28	20 to 50	3 - 6%	50 - 150	Assuming 1-3 times per week
C - FFTG	not likely	not likely							
D - Landfill B	not likely	not likely							
E - Old Pond	no	no	1982	1985?	3	n/a	any	n/a	Pond was downgradient of usage areas
F - RT - UTAS Building	yes	yes	late 1980s	mid/late 1990s	10 to 15	20 to 50	3 - 6%	2 to 4	
G - RT - Bush Area	yes	unknown	unknown	pre-1988	unknown	unknown	unknown	unknown	
H - Landfill A	yes	yes	late 1980s?	2010	20+	20 to 50	3 - 6%	12	Usage was mostly governed by controlling landfill burn-offs
I - RT - Navigational Aid Building	yes	possibly	late 1980s/early 1990s	until late 1990s	10	20 to 50	3 - 6%	2 to 4	
J - Sand Pit	not likely	not likely							
K - Igloo	no	yes	mid 1980s	end 1990s	10 to 15	residue	very low	1 to 3	Used for hose training with water only - leaching of AFFF residue possible
L - Control Tower	yes	yes	mid to late 1980s	end 1990s	10 to 15	20 to 50	3 - 6%	2 to 4	Both foam and water use were undertaken on eastern side of Tower Hill, north of the Control Tower
M - Soil Stockpiles	no	no							Area may contain AFFF impacted soils/stockpiles and/or building materials; the area is under HIAPL control and management
N - Scrub fires-south of runway	no	yes	after 1988	before 1995	n/a	residue	very low	n/a	Several operational responses
O - Tasman Hwy car crash	yes	no	after 1988	before 1995	n/a	20+	6%	n/a	Operational response
P - Tasman Hwy plane crash	yes	no	after 1988	before 1995	n/a	20+	6%	n/a	Operational response

Site ID / Description	AFFF used	Water only used ~	From * (year)	To (year)	Period (years)	Amount (concentrate) (L)	Concentration	Frequency (number of days per year)	Comment
Q - Tasman Hwy - BP truck rollover (incident 209)	yes	no	2003	2003	n/a	413	6%	n/a	Single operational response
R - Golf course	no	yes	after 1988	before 1995	n/a	residue	very low	n/a	A large number of water truck loads were broadcast over the bush over a whole day to control the scrub fire and protect the building

yes = confirmed AFFF usage at this site
*if 1982 is stated it means from start of AFFF usage at Hobart airport
~ water used through fire trucks between 1982-2010
included residues of AFFF from the hoses
RT = remote training
MFS = main fire station
CFTG = current fire training ground
FFTG = former fire training ground
UTAS = University of Tasmania

Appendix H – Category 1 Tenants Dangerous Goods Storages >50L

Table - Indicative List of Dangerous Goods Stored at Category 1 Tenants (nominally >50L)

Tenant	Product	Maximum Volume (L)	Storage
ARFFS MFS & CFTG	Diesel	5000	AST
	ULP	100 + 100	Gerry cans
	Transmission oil	200	Drums
	Solberg foam	10,000	2 x 5000L tanks in bunded and covered area
	Engine oil	200	Drums
	Kerosene or Jet A1	2,200	AST at CFTG
AirBP – Aviation refuellers	Jet A1	3 x 110,000	AST, bunded
	Diesel	100 + 1,500	Generator and AST
	Ansulite	3 x 20L	Fire cabinet & shed
	Foam dispersal agent	80L	shed
BP retail fuel service station	ULP	41,000	UST
	BP Ultimate	24,000	UST
	Premium unleaded	14,500	UST
	Diesel	31,000	UST
Avis hire car	ULP	10,000	AST
	Diesel	10,000	AST
	New Oil GTX Proof	1,200	AST
	Waste oil	2,200	UST
Budget hire car	ULP	5,000	AST
	Diesel	3,000	AST
	Oil	410	AST
Clark Airport Services	Diesel	400	Trailer in shed
	Waste oil	205	Shed
Europcar	ULP	4,500	AST
	Diesel	2,200	AST
	Waste oil	2 x 205L	Drums
	Truckwash	205	Wash bay
	Degreaser	200	Washbay

Tenant	Product	Maximum Volume (L)	Storage
Hertz Autorent	ULP	15,000	UST
	Diesel	5,000	UST
Rotorlift (helicopter engineering)	ULP	5,000	UST
	Diesel	5,000	UST
TasWater - WWTP	Sodium hypochlorite	5,000	AST
	Aluminium sulphate	5,000	AST
	Magnesium Hydroxide	5,000	AST
	Lime	1,000kg	Hopper
	Dewatering polymer	36 x 25kg	Bags in shed
Thrifty hire car	ULP	4,500	AST
	New oil	400	AST
	Heavy duty vehicle wash	400	In bund
Hydro	Fuel	Unknown	Self-bunded containerised storage AST

Appendix I – Existing Monitoring Locations

Figure 3: Hobart ARFFS Building and Location of Stormwater Sampling Locations

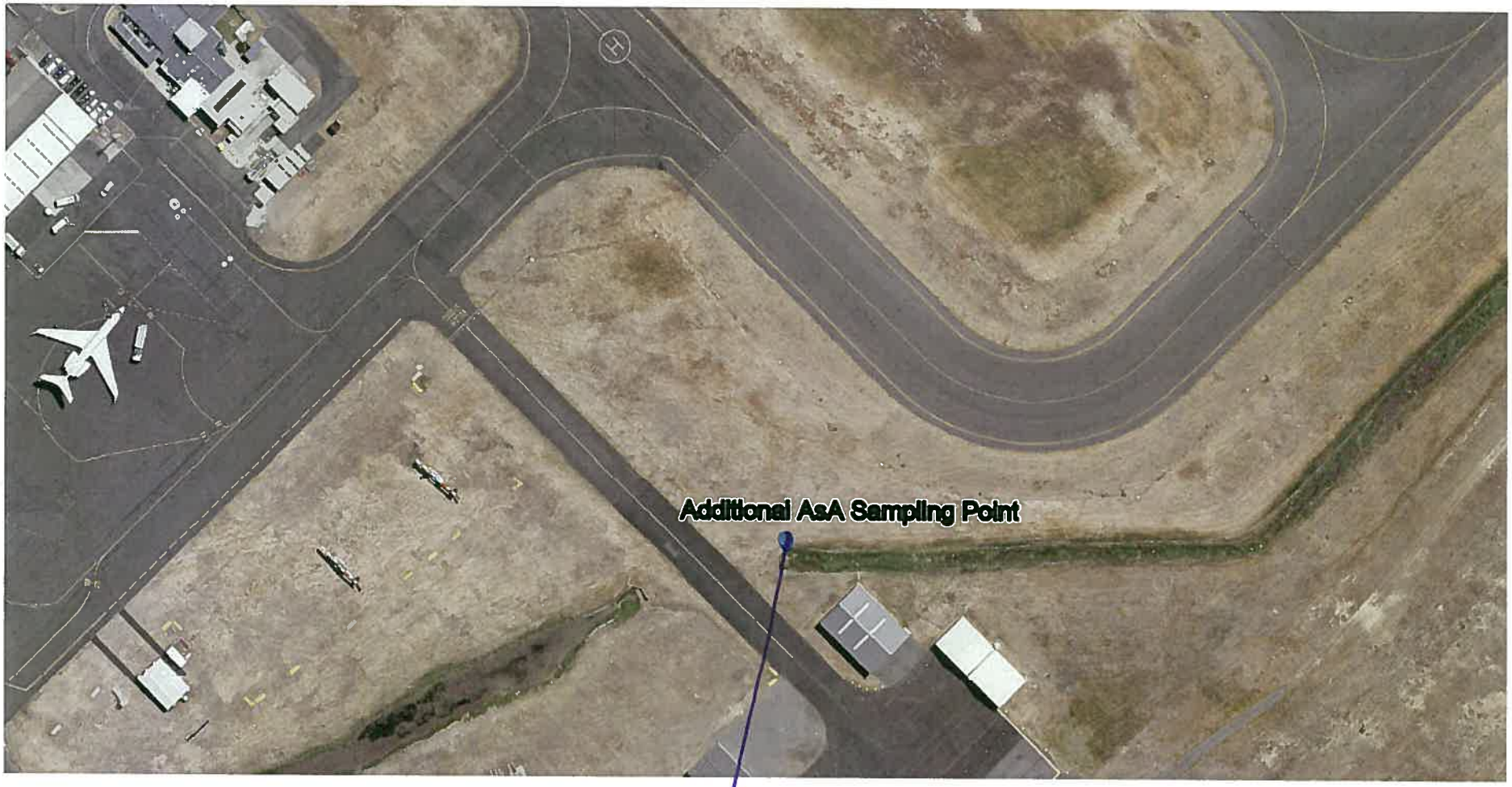
1 = SW 1
2 = SW 2
3 = SW 3
4 = SW 4

4.4 SAMPLING METHODOLOGY

4.4.1 Materials

Required materials for sampling include:

- Sample schedule;
- Latex (or equivalent material) gloves;
- Phosphate free detergent (Laboratory grade, i.e. Decon 90);
- Distilled or deionised water;
- Esky and ice supply;
- Laboratory supplied sample bottles;
- Sampling rod;



GPS Coordinates: GDA94 MGA55

541648 E

5256836 N

Figure 1 Surface Water Sampling Site Locations

Source: www.thelist.tas.gov.au

PFOS Sampling Sites

Generated at: 8:38 on 18-December-2015 | User: Public |

www.thelist.tas.gov.au

Tasmanian Government

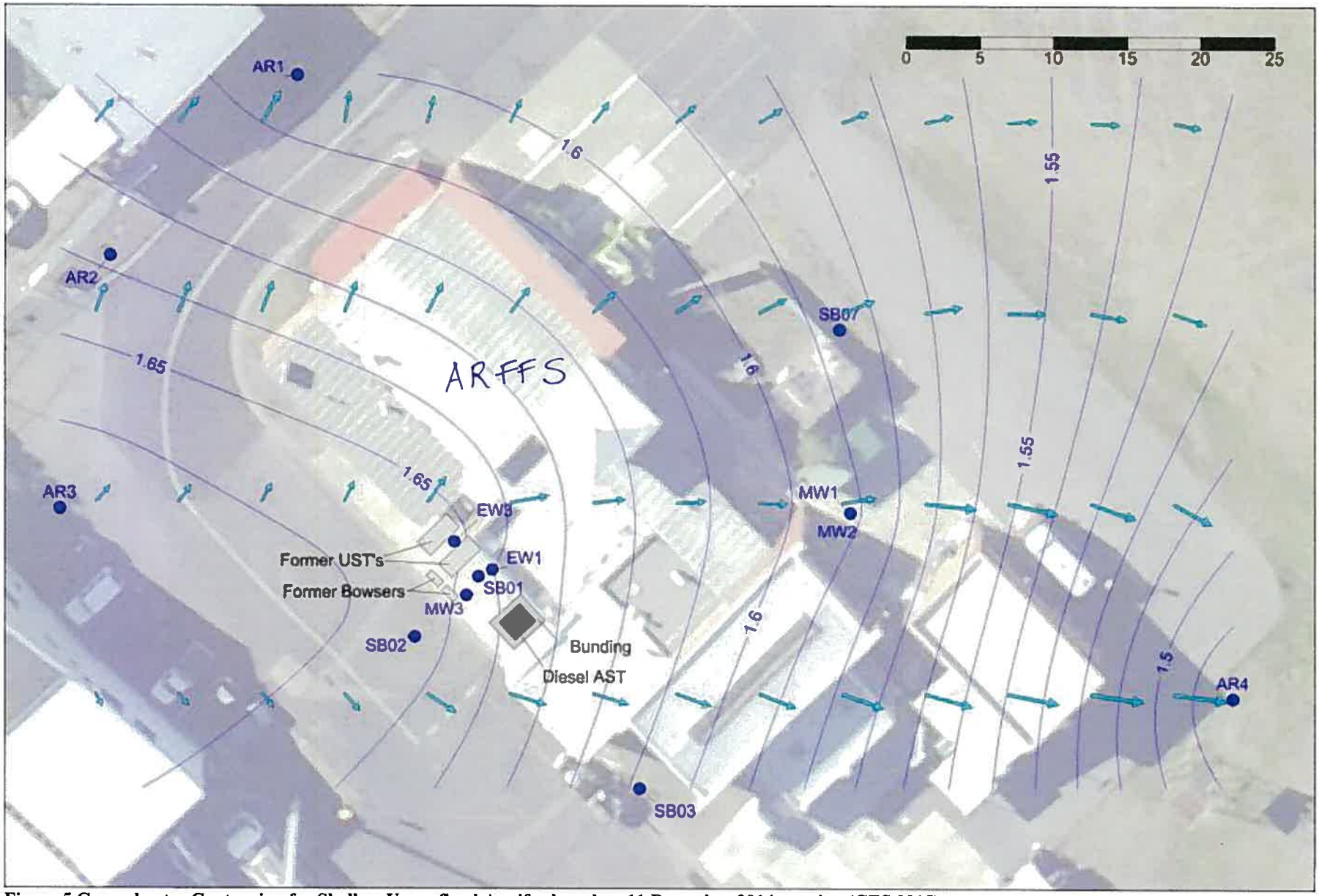


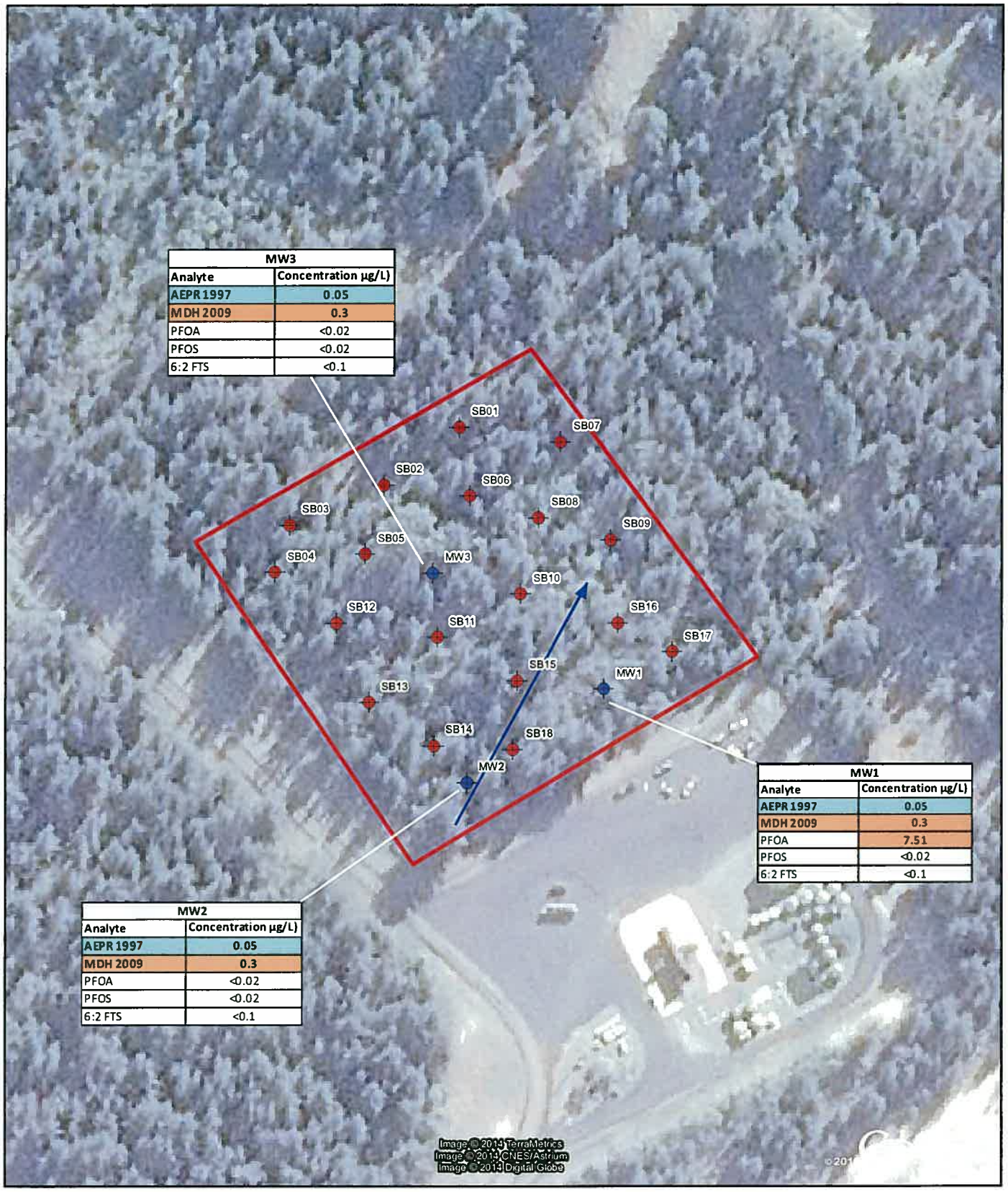
Figure 5 Groundwater Contouring for Shallow Unconfined Aquifer based on 11 December 2014 gauging (GES 2015)

MFS - SITE A

Figure 1: Groundwater Monitoring Bore Locations

SOUTH OF AIRPORT

Figure 1: ARFF Drill Ground existing and proposed monitoring bore locations.



LEGEND

- Site Boundary
- Inferred Groundwater Flow Direction
- Groundwater Monitoring Wells
- Soil Bores

Paper Size A4

0 10 20 30 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Airservices Australia
PRN8979 Replacement HB FTG

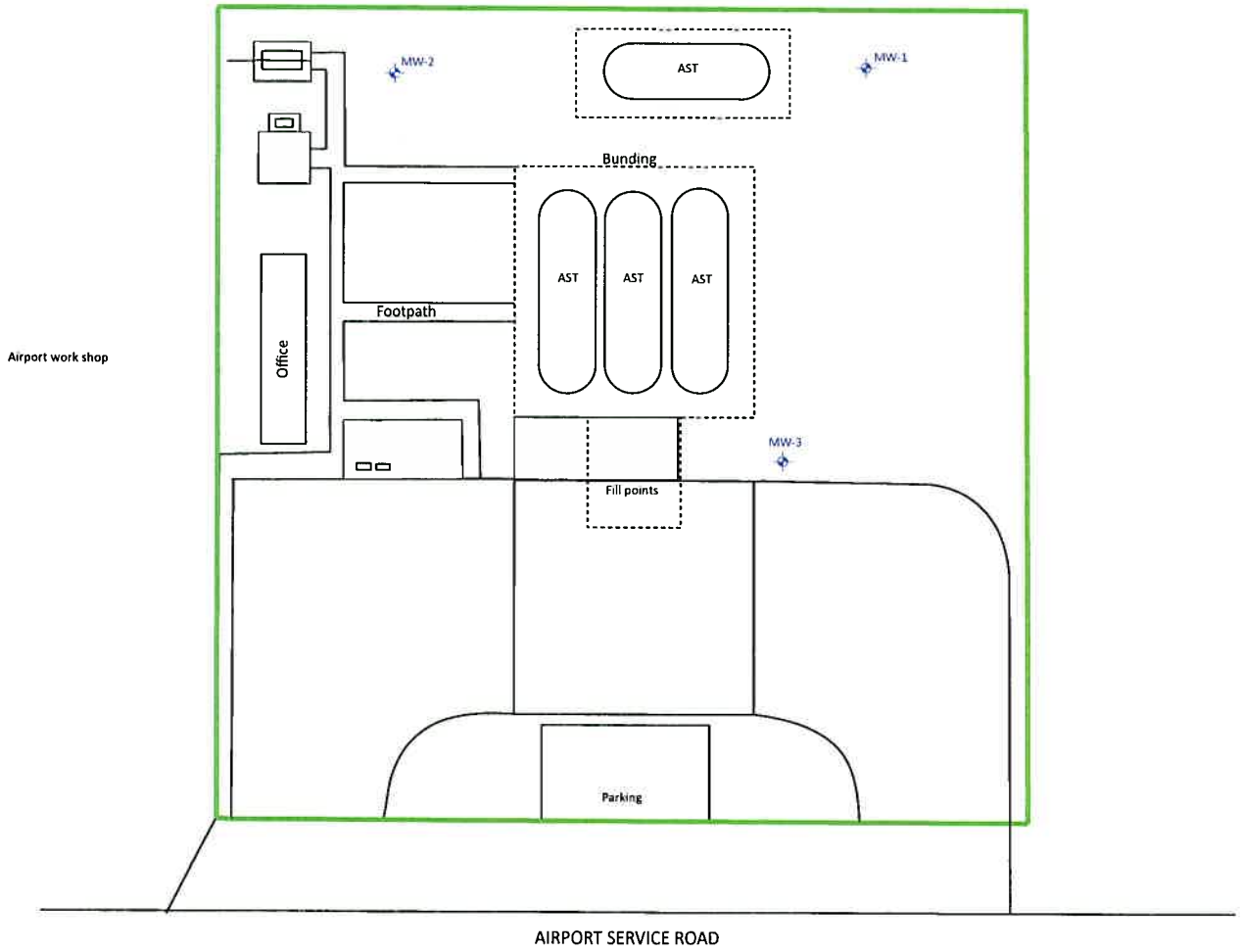
Job Number 32-17246
Revision 0
Date 29 Jul 2014

Groundwater Analytical Results (Summary)

Figure 4

G:\32\17246\GIS\Maps\Deliverables\3217246_004_Groundwater_Analytical_Results_A4P_FINAL.mxd Salamanca Square Hobart TAS 7000 Australia T 61 3 6210 0600 F 61 3 6210 0601 E hbamail@ghd.com.au W www.ghd.com.au

Data source: Site Boundary, Airservices Australia, 2014; Borehole Locations, GHD, 2014; Analytical Results, GHD, 2014; Aerial Imagery, Google Earth Pro, 2009 (captured 16/06/2014. Created by: bcoughlan



Legend

- Above ground storage tanks
- Groundwater well

Approx. Scale
metres
0 10

em&c
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Tel: +61(03)6231 5979
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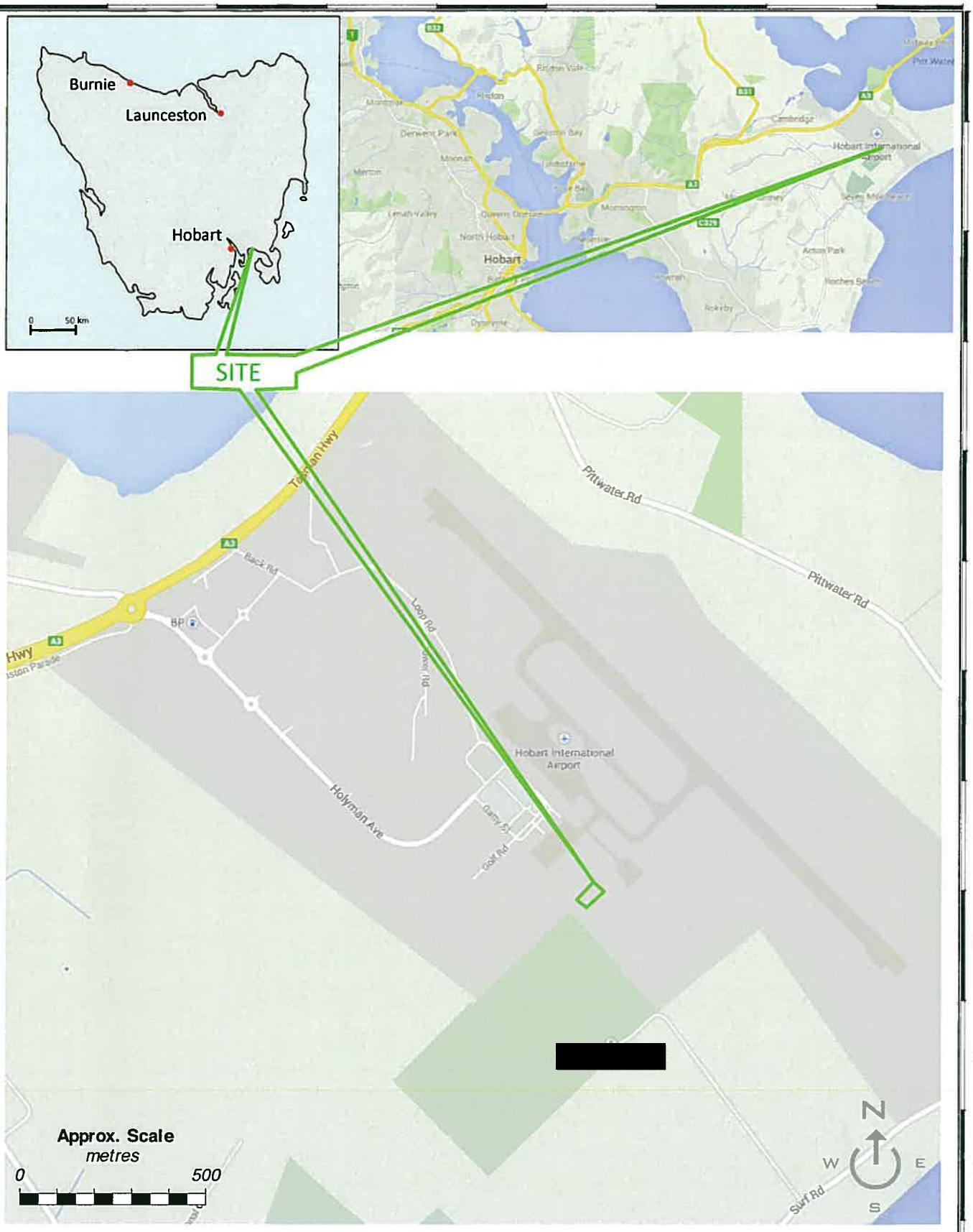
Mail: Level 2, 67 Letitia St,
North Hobart, Tasmania 7000

REV.: 001	Figure 2: Site Plan		
Date: 19/6/2014	Location: Air BP Hobart Airport, Cambridge, Tasmania		
Client: Air BP Australia	Project: May 2014 Groundwater Monitoring Event		
Drawn: MF	Designed: MF	Checked: SC	Approved:SC



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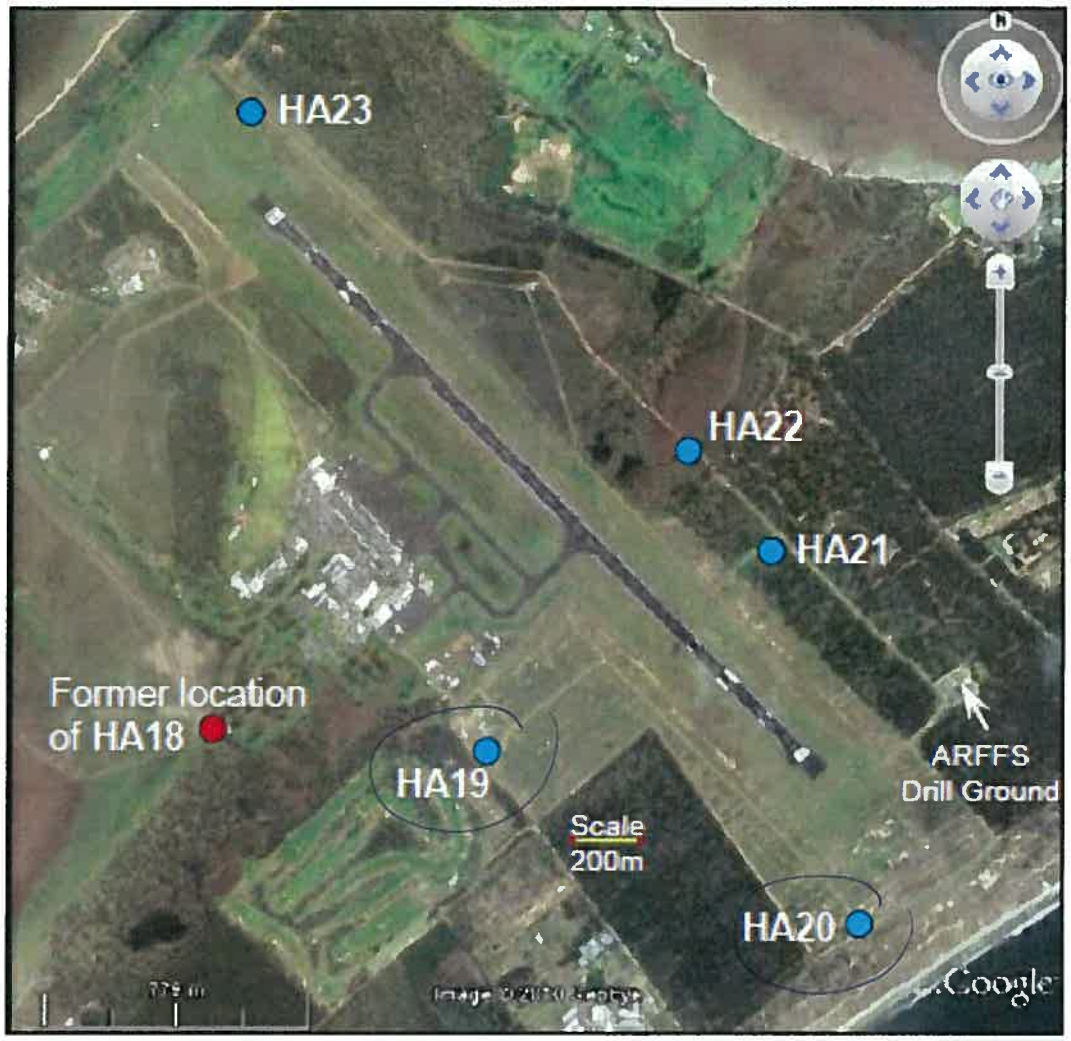
North Hobart, Tasmania 7000

REV.NO: 001	Figure 1: Site Location
Date: 19/6/2014	Site: Air BP Hobart Airport, Cambridge, Tasmania
Drawn: MF	Project: May 2014 Groundwater Monitoring Event
Approved: SC	Client: Air BP Australia



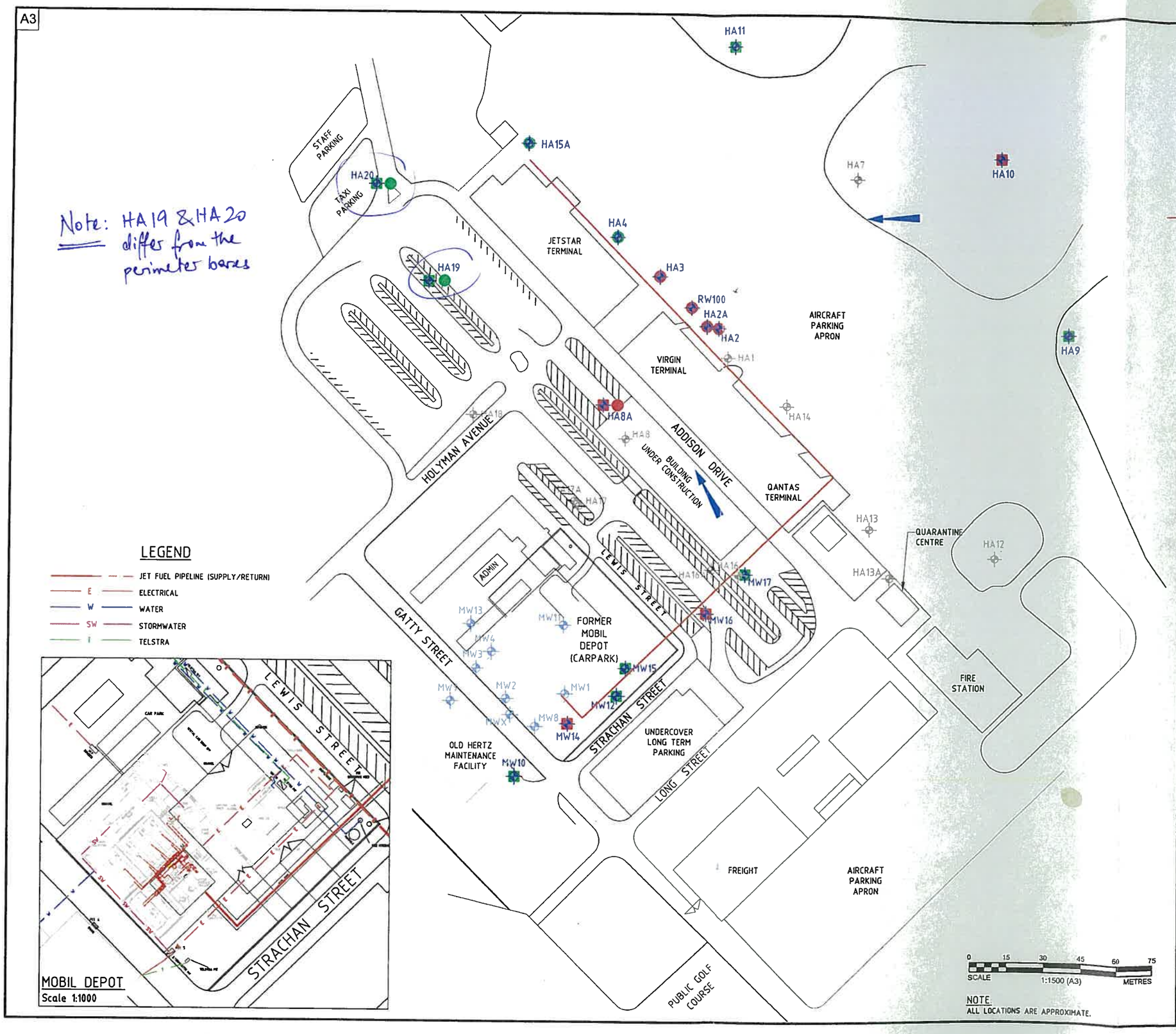
Source SGEO (March 2014 GME)

HIAPL Perimeter Groundwater Bore Locations

Note: HA19 & HA20 differ from those @ the terminal

A3

Note: HA19 & HA20 differs from the perimeter bores



NOTE
ALL LOCATIONS ARE APPROXIMATE.

LEGEND

- JET FUEL PIPELINE (SUPPLY/RETURN)
- E ELECTRICAL
- W WATER
- SW STORMWATER
- T TELSTRA

MOBIL DEPOT
Scale 1:1000

LEGEND

- GROUNDWATER MONITORING WELL LOCATIONS
- GROUNDWATER MONITORING WELL LOCATIONS
- GROUNDWATER MONITORING WELL (LOST)
- INFERRED GROUNDWATER FLOW DIRECTION
- JET FUEL PIPELINE (SUPPLY)
- TPH ANALYTE CONCENTRATIONS WERE < ILs (FEBRUARY 2006)
- TPH ANALYTE CONCENTRATIONS WERE < ILs (OCTOBER 2008)
- TPH ANALYTE CONCENTRATIONS WERE > ILs (FEBRUARY 2006)
- TPH ANALYTE CONCENTRATIONS WERE > ILs (OCTOBER 2008)

NOTE: ONLY ONE SYMBOL DENOTES WELL WAS ONLY SAMPLED IN MARCH OR OCTOBER BUT NOT BOTH.

Rev	Date	Revision Details	Drn
A	18.11.09	ENVIRONMENTAL REPORT ISSUE	CGT

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES
Suite 2, 31–33 Tower Road
New Town TAS 7008
Ph: (03) 6208 6860
Fax: (03) 6208 6869

Client:
MOBIL OIL AUSTRALIA PTY LTD

Project:
MOBIL HOBART AIRPORT FUEL LINE (ENVIRONMENTAL SUMMARY REPORT)

Location:
HOBART INTERNATIONAL AIRPORT CAMBRIDGE, TASMANIA

Drawing Title:
DETAILED SITE LAYOUT PLAN (OCTOBER 2008)

Drawn	Date	
CGT	18.11.09	
Project - Drawing No.	Figure No.	Rev.
ENVIHOBA6685VA-D02	2	A

Appendix J – Interim Assessment Criteria

Table J1: Guideline Criteria – Commonwealth Airports – Interim Soil Assessment Criteria

Analyte Suite	Analytes to be assessed	Exposure Scenario	Assessment Criteria	Reference
Full PFAS Suite (as commercially available from ALS)	PFOS	Human Health	Residential – 6 mg/kg	US EPA 2009; Refer GHD Guide June 2015[1].
			Low / High density residential - 22 mg/kg / 90 mg/kg (PFOS + PFHxS)	GHD, 2016[2]
			Recreational Public Open Space - 45 mg/kg (PFOS + PFHxS)	GHD, 2016[2]
			Commercial / Industrial - 640 mg/kg (PFOS + PFHxS)	GHD, 2016[2]
		Ecological	0.373 mg/kg (95% protection) 0.91 mg/kg (80% protection) 4.71 mg/kg (commercial/industrial 60% protection)	UK Environmental Agency 2009: Refer GHD Guide June 2015[1].
	PFOA	Human Health	Residential - 16 mg/kg	US EPA 2009; Refer GHD Guide June 2015[1].
			Low / High density residential - 220 mg/kg / 900 mg/kg	GHD, 2016[2]
			Recreational Public Open Space - 450 mg/kg	GHD, 2016[2]
			Commercial / Industrial - 6400 mg/kg	GHD, 2016[2]
		Ecological	3.73 mg/kg	Refer GHD Guide June 2015[1].
	8:2FtS	Human Health	16 mg/kg (Residential)	US EPA 2009; Refer GHD Guide June 2015[1].
		Ecological	3.73 mg/kg	Refer GHD Guide June 2015[1].
	6:2FtS	Human Health	60 mg/kg (Residential)	Refer GHD Guide June 2015[1].
		Ecological	3.73 mg/kg	As for 8:2FtS (based on being a sulphonate and not known to break down readily) - Refer GHD Guide June 2015[1].
Hydrocarbons (TRH / TPH)#	TRH C_6-C_{10}	Human Health	82,000 mg/kg	CRC CARE[3] HSL A Direct Contact – Intrusive / Maintenance Worker.
	TRH C_{10}-C_{16}		62,000 mg/kg	
	TRH C_{16}-C_{34}		85,000 mg/kg	
	TRH C_{34}–C_{40}		120,000 mg/kg	
	TPH (C_6-C_9)#	Ecological	800 mg/kg (Airport generally)	Commonwealth *Airports (Environment Protection) Regulations 1997*
			100 mg/kg (areas of Env. Significance)	
	TPH (>C9)#		5,000 mg/kg (Airport generally)	
			1,000 mg/kg (areas of Env. Significance)	
Volatile Monocyclic Aromatic Hydrocarbons (BTEXN)	Benzene	Human Health	1 mg/kg	Commonwealth *Airports (Environment Protection) Regulations 1997*
	Toluene		130 mg/kg	
	Ethyl-benzene		50 mg/kg	

Analyte Suite	Analytes to be assessed	Exposure Scenario	Assessment Criteria	Reference
	(o-, m-&p-)-xylenes		25 mg/kg	
	Naphthalene		-	
	Benzene	Ecological	0.5 mg/kg	Commonwealth *Airports (Environment Protection) Regulations 1997*
	Toluene		3 mg/kg	
	Ethyl-benzene		5 mg/kg	
	(o-, m-&p-)-xylenes		5 mg/kg	
	Naphthalene		-	
Polycyclic Aromatic Hydrocarbons (PAHs)	Benzo(a)pyrene	Human Health	5 mg/kg	Commonwealth *Airports (Environment Protection) Regulations 1997*
		Ecological	0.7 mg/kg~	National Environment Protection (Assessment of Site Contamination) Measure 1999, amended 2013
	Total PAH	Human Health	100 mg/kg	Commonwealth *Airports (Environment Protection) Regulations 1997*
		Ecological	5 mg/kg	Commonwealth *Airports (Environment Protection) Regulations 1997*

Notes:

There are no TRH criteria given in the referenced guidelines, hence only TPH criteria are provided in the above table.

'-' not given in guideline.

~ level is for areas of ecological significance, urban residential and public open space and commercial and industrial.

PFAS and TPH / TRH criteria were adopted from Preliminary Site Investigations (PSI) Screening Levels, Draft, Airservices 4 October 2016.

References:

1- *Interim Screening Levels from Managing PFC Contamination at Airports Interim Contamination Management Strategy and Decision Framework* (GHD, June 2015).

2- *PFAS Investigations – Derivation of PFAS Soil Criteria, (*GHD, 28 September 2016).

3- *Table B4, Intrusive Maintenance Worker and Direct Contact Health Screening Levels, in CRC Care Technical Report No. 10, Health Screening Levels for Petroleum Hydrocarbons in soil and groundwater, Part 2: Application Document, September 2011.*

Table J2: Guideline Criteria – Commonwealth Airports – Interim Surface Water Assessment Criteria

Analyte Suite	Analytes to be assessed	Exposure Scenario	Assessment Criteria	Reference
Full PFAS Suite (as commercially available from ALS)	PFOS	Human Health	0.07 µg/L (drinking water quality)	FSANZ April 2017[7] – toxicity reference values
			0.7 µg/L (recreational water quality)	
			0.2 µg/L (drinking water quality)	US EPA 2009; Refer GHD Guide June 2015[1].
			0.00065 µg/L (consumption of fish)	GHD Guide June 2015[1].
			0.5 µg/L (drinking water quality)	enhealth June 2016[2].
			5 µg/L (recreational water quality)	
		Ecological	6.66 µg/L [%]	GHD Guide June 2015[1].
	PFHxS	Human Health	0.07 µg/L (drinking water quality)	FSANZ April 2017[7] – toxicity reference values
			0.7 µg/L (recreational water quality)	
			0.5 µg/L (drinking water quality)	enhealth June 2016[2].
			5 µg/L (recreational water quality)	
		Ecological	6.66 µg/L [%]	Adopted from PFOS surface water level in GHD Guide June 2015[1]. Inclusion reflects enHealth identifying PFHxS and PFOS as toxicologically aligned.
	PFOS/PFHxS	Human Health	0.07 µg/L (drinking water quality)	FSANZ April 2017[7] – toxicity reference values
			0.7 µg/L (recreational water quality)	
			0.5 µg/L (drinking water quality)	enhealth June 2016[2].
			5 µg/L (recreational water quality)	
		Ecological	6.66 µg/L	Adopted from PFOS surface water level in GHD Guide June 2015[1]. Inclusion reflects enHealth identifying PFHxS and PFOS as toxicologically aligned.
	PFOA	Human Health	0.56 µg/L (drinking water quality)	FSANZ April 2017[7] – toxicity reference values
			5.6 µg/L (recreational water quality)	
			0.4 µg/L (drinking water quality)	US EPA 2009; Refer GHD Guide June 2015[1].
			0.3 µg/L (consumption of fish)	GHD Guide June 2015[1].
			5 µg/L (drinking water quality)	enhealth June 2016[2].
			50 µg/L (recreational water quality)	
		Ecological	2900 µg/L	GHD Guide June 2015[1].
	8:2FtS	Human Health	0.4 µg/L (drinking water quality)	US EPA 2009; Refer GHD Guide June 2015[1].
			0.3 µg/L (consumption of fish)	GHD Guide June 2015[1].
			5 µg/L (drinking water quality)	Adopting enHealth June 2016[2] level for PFOA on basis 8:2FtS is able to breakdown to PFOA (assume one to one ratio).
			50 µg/L (recreational water quality)	
		Ecological	2900 µg/L	GHD Guide June 2015[1].

Analyte Suite	Analytes to be assessed	Exposure Scenario	Assessment Criteria	Reference
	6:2FtS	Human Health	5 µg/L (drinking water quality)	Refer GHD Guide June 2015[1].
			0.0065 µg/L (consumption of fish)	GHD Guide June 2015[1].
		Ecological	2900 µg/L	As for 8:2FtS (based on being a sulphonate and not known to break down readily) - GHD Guide June 2015[1].
Hydrocarbons (TPH / TRH)#	TRH C_6-C_{10}	Human Health	15 µg/L	WHO, 2008[3] [Petroleum Products in Drinking Water]
	TRH C_{10}-C_{16}		0.09 µg/L	
	TRH C_{16}-C_{34}			
	TRH C_{34}–C_{40}			
	TPH (C_6-C_9)	Ecological	150 µg/L (freshwater)	Commonwealth *Airports (Environment Protection) Regulations 1997*
	TPH (>C9)		600 µg/L (freshwater)	
Volatile Monocyclic Aromatic Hydrocarbons (BTEXN)	Benzene	Ecological	300 µg/L (freshwater and marine water)	Commonwealth *Airports (Environment Protection) Regulations 1997*
	Toluene		300 µg/L (freshwater)	
	Ethyl-benzene		140 µg/L (freshwater)	
	Benzene	Human Health	10 µg/L (drinking water)	WHO, 2005[4]
	Toluene		700 µg/L (drinking water)	
	m, o & p-xylenes		300 µg/L (drinking water)	
	Benzene	Ecological	950 µg/L (freshwater); 700 µg/L (marine water)	ANZECC 95% of species protection[5]
	Toluene		-	
	Ethyl-benzene		-	
	o-xylene		350 µg/L (freshwater)	
	m-xylene		-	
	p-xylene		200 µg/L (freshwater)	
	Naphthalene		16 µg/L (freshwater); 70 µg/L (marine water)	
Polycyclic Aromatic	Benzo(a)pyrene		-	Commonwealth *Airports (Environment Protection) Regulations 1997*
	Benzo(a)pyrene		0.01 µg/L (drinking water)	NHMRC[6]

Analyte Suite	Analytes to be assessed	Exposure Scenario	Assessment Criteria	Reference
Hydrocarbons (PAHs)	Total PAH		3 µg/L (freshwater and marine water)	Commonwealth *Airports (Environment Protection) Regulations 1997*
Physical Parameters	pH (pH units)	Ecological	6.5-9.5 pH unit (accepted limit for fresh water) *	Commonwealth *Airports (Environment Protection) Regulations 1997*
			6.5-8.0 pH (fresh water) * 8.0-8.4 pH (marine water) *	ANZECC 95% of species protection[5]
	Conductivity		2,200 µS/cm (fresh & marine waters) *	ANZECC 95% of species protection[5]
	TSS (mS/cm)		Changes of >10% from seasonal mean~	Commonwealth *Airports (Environment Protection) Regulations 1997*
	TDS (mg/L)		Rises >1,000mg/L or by >5%~	Commonwealth *Airports (Environment Protection) Regulations 1997*
	Redox (mV)		-	
	DO (mg/L)		Falls <6mg/L or to 80% of average saturation level~	Commonwealth *Airports (Environment Protection) Regulations 1997*
			Falls below 85% of average saturation (fresh water)* Falls below 90% of average saturation (marine water)*	ANZECC 95% of species protection[5]
	Temperature (^{0}C)		Rises of >2^{0}C above seasonal average~	Commonwealth *Airports (Environment Protection) Regulations 1997*

Notes:

If TRH criteria are not given in the referenced guidelines, only TPH criteria are provided in the above table.

~ Seasonal surface water averages will need to be provided by Airservices for meaningful comparison of field parameters to guideline criteria.

* Fresh water means water containing Total Dissolved Solids of less than 1,000 mg/L (AEPR, 1997).

'-' not given in guideline.

References:

1- *US EPA Fact Sheet – PFOA & PFOS Drinking Water Health Advisories (US EPA, May 2016), referenced in Interim Screening Levels from Managing PFC Contamination at Airports Interim Contamination Management Strategy and Decision Framework (GHD, June 2015)..*

2- *enHealth Statement: Interim national guidance on human health reference values for per- and poly-fluoroalkyl substances for use in site investigations in Australia* (enHealth, June 2016).

3- Petroleum Products in Drinking Water – Background document for Development of WHO Guidelines for Drinking-water Quality, WHO, 2008

4- Petroleum Products in Drinking Water – Background document for Development of WHO Guidelines for Drinking-water Quality, WHO, 2005

5- *ANZECC National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000).

6- *National Health and Medical Research Council, Investigation Levels for Drinking Water (2011).*

7- *Food Standards Australia New Zealand, Toxicity Reference Values (PFOS, PFHxS and PFOA) in Drinking Water and Recreational Water (2017).*

Table J3: Guideline Criteria – Commonwealth Airports – Interim Groundwater Assessment Criteria

Analyte Suite	Analytes to be assessed	Exposure Scenario	Assessment Criteria	Reference
Full PFAS Suite as commercially available from ALS	PFOS	Human Health	0.07 µg/L (drinking water quality)	FSANZ April 2017[7] – toxicity reference values
			0.7 µg/L (recreational water quality)	
			0.2 µg/L (drinking water quality)	US EPA 2009; Refer GHD Guide June 2015[1].
			0.5 µg/L (drinking water quality)	enhealth June 2016[2].
			5 µg/L (recreational water quality)	
		Ecological	6.66 µg/L [%]	Adopted surface water level in GHD Guide June 2015[1].
	PFHxS	Human Health	0.07 µg/L (drinking water quality)	FSANZ April 2017[7] – toxicity reference values
			0.7 µg/L (recreational water quality)	
			0.5 µg/L (drinking water quality)	enhealth June 2016[2].
			5 µg/L (recreational water quality)	
		Ecological	6.66 µg/L [%]	Adopted from PFOS surface water level in GHD Guide June 2015[1]. Inclusion reflects enHealth identifying PFHxS and PFOS as toxicologically aligned.
	PFOS/PFHxS	Human Health	0.07 µg/L (drinking water quality)	FSANZ April 2017[7] – toxicity reference values
			0.7 µg/L (recreational water quality)	
			0.5 µg/L (drinking water quality)	enhealth June 2016[2].
			5 µg/L (recreational water quality)	
		Ecological	6.66 µg/L [%]	Adopted from PFOS surface water level in GHD Guide June 2015[1]. Inclusion reflects enHealth identifying PFHxS and PFOS as toxicologically aligned.
	PFOA	Human Health	0.56 µg/L (toxicity reference value – drinking water)	FSANZ April 2017[7] – toxicity reference values
			5.6 µg/L (recreational water quality)	
			0.4 µg/L (drinking water quality)	US EPA 2009; Refer GHD Guide June 2015[1].
			5 µg/L (drinking water quality)	enhealth June 2016[2].
			50 µg/L (recreational water quality)	
		Ecological	2900 µg/L [%]	Adopted from PFOA surface water level in GHD Guide June 2015[1].
	8:2FtS	Human Health	0.4 µg/L (drinking water quality)	US EPA 2009; Refer GHD Guide June 2015[1].
			5 µg/L (drinking water quality)	Adopting enHealth June 2016 level for PFOA on basis 8:2FtS is able to breakdown to PFOA (assume one to one ratio).
			50 µg/L (recreational water quality)	
		Ecological	2900 µg/L[%]	Adopted from 8:2FtS surface water level in GHD Guide June 2015[1].
	6:2FtS	Human Health	5 µg/L (drinking water quality)	Refer GHD Guide June 2015[1].
		Ecological	2900 µg/L [%]	As for 8:2FtS (based on being a sulphonate and not known to break down readily) Refer GHD Guide June 2015[1].

Analyte Suite	Analytes to be assessed	Exposure Scenario	Assessment Criteria	Reference
Hydrocarbons (TRH/TPH)#	TRH C_6-C_{10}	Human Health	15 µg/L	WHO, 2008 [Petroleum Products in Drinking Water]
	TRH C_{10}-C_{16}		0.09 µg/L	
	TRH C_{16}-C_{34}			
	TRH C_{34}–C_{40}			
	TPH (C_6-C_9)	Ecological	150 µg/L (freshwater)	Commonwealth *Airports (Environment Protection) Regulations 1997*
	TPH (>C_9)		600 µg/L (freshwater)	
Volatile Monocyclic Aromatic Hydrocarbons (BTEXN)	Benzene	Ecological	300 µg/L (freshwater and marine water)	Commonwealth *Airports (Environment Protection) Regulations 1997*
	Toluene		300 µg/L (freshwater)	
	Ethyl-benzene		140 µg/L (freshwater)	
	Benzene	Human Health	10 µg/L (drinking water)	WHO, 2005[4]
	Toluene		700 µg/L (drinking water)	
	m, o & p-xylenes		300 µg/L (drinking water)	
	Benzene	Ecological	950 µg/L (freshwater); 700 µg/L (marine water)	ANZECC 95% of species protection[5]
	Toluene		-	
	Ethyl-benzene		-	
	o-xylene		350 µg/L (freshwater)	
	m-xylene		-	
	p-xylene		200 µg/L (freshwater)	
	Naphthalene		16 µg/L (freshwater); 70 µg/L (marine water)	
Polycyclic Aromatic Hydrocarbons (PAHs)	Benzo(a)pyrene		-	Commonwealth *Airports (Environment Protection) Regulations 1997*
	Benzo(a)pyrene		0.01 µg/L (drinking water)	NHMRC[6]
	Total PAH		3 µg/L (freshwater and marine water)	Commonwealth *Airports (Environment Protection) Regulations 1997*
Physical Parameters	pH (pH units)	Ecological	6.5-9.5 pH unit (accepted limit for fresh water) *	Commonwealth *Airports (Environment Protection) Regulations 1997*
			6.5-8.0 pH (fresh water) * 8.0-8.4 pH (marine water) *	ANZECC 95% of species protection[5]
	Conductivity		2,200 µS/cm (fresh & marine waters) *	ANZECC 95% of species protection[5]
	TSS (mS/cm)		Changes of >10% from seasonal mean~	Commonwealth *Airports (Environment Protection) Regulations 1997*
	TDS (mg/L)		Rises >1,000mg/L or by >5%~	Commonwealth *Airports (Environment Protection) Regulations 1997*
	Redox (mV)		-	
	DO (mg/L)		Falls <6mg/L or to 80% of average saturation level~	Commonwealth *Airports (Environment Protection) Regulations 1997*

Analyte Suite	Analytes to be assessed	Exposure Scenario	Assessment Criteria	Reference
			Falls below 85% of average saturation (fresh water)* Falls below 90% of average saturation (marine water)*	ANZECC 95% of species protection[5]
	Temperature (^{0}C)		Rises of >2^{0}C above seasonal average~	Commonwealth *Airports (Environment Protection) Regulations 1997*

Notes:

If TRH criteria are not given in the referenced guidelines, only TPH criteria are provided in the above table.

~ Seasonal surface water averages will need to be provided by Airservices for meaningful comparison of field parameters to guideline criteria.

* Fresh water means water containing Total Dissolved Solids of less than 1,000 mg/L (AEPR, 1997).

'-' not given in guideline.

% Only given as reference level – assessment of environmental impact must relate to the discharge (including contamination mass flux) of impacted groundwater to a surface water body, and resultant likely impact on the aquatic/marine ecosystems. Refer to GHD Guide June 2015.

References:

1- *US EPA Fact Sheet – PFOA & PFOS Drinking Water Health Advisories (US EPA, May 2016), referenced in Interim Screening Levels from Managing PFC Contamination at Airports Interim Contamination Management Strategy and Decision Framework (GHD, June 2015)..*

2- *enHealth Statement: Interim national guidance on human health reference values for per- and poly-fluoroalkyl substances for use in site investigations in Australia* (enHealth, June 2016).

3- Petroleum Products in Drinking Water – Background document for Development of WHO Guidelines for Drinking-water Quality, WHO, 2008

4- Petroleum Products in Drinking Water – Background document for Development of WHO Guidelines for Drinking-water Quality, WHO, 2005

5- *ANZECC National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000).

6- *National Health and Medical Research Council, Investigation Levels for Drinking Water (2011).*

7- *Food Standards Australia New Zealand, Toxicity Reference Values (PFOS, PFHxS and PFOA) in Drinking Water and Recreational Water (2017).*

Appendix K – PSI Sampling and Past Results Summary Tables

SUMMARY RESULTS ISSUED FOR HOBART AIRPORT SAMPLING REPORT

Soil Samples: Sediments, Hand Auger, New Groundwater Wells and New FTG bores			Analyte Grouping		TPH					TRH							PAH		BTEXN								PFAS (Lowest)					
				Analyte	C6-C9	C10-C14	C15-C28	C29-C36	Sum (C10-C36)	C6-C10	C6-C10 minus BTEX	C10-C16	C16-C34	C34-C40	Sum (C10-C40)	C10-C16 minus Naphthalene	Benzo(a) pyrene	Total PAH	Benzene	Toluene	Ethyl-benzene	m-&p-Xylene	o-Xylene	Total Xylenes	BTEX Sum	Naphthalene	PFOS	PFOS	PFOA	6:2 FTS	8:2 FTS	PFHxS + PFOS
				Criteria Used Guideline Limit	Ecological - Areas of Environmental Significance, AER: 100				1,000	CRC Care - HSL A & Direct Contact - Intrusive / Maintenance Worker: 82,000		62,000	85,000	120,000			Ecological - NEPM: 0.7	Ecological - AER: 5	Ecological AER: 0.5	3	5			5		-		95% species protection, Ecological - UK EA in GHD, 2015: 0.373	Ecological, Commercial / Industrial, 60% protection, UK EA in GHD, 2105: 4.71	Ecological, GHD, 2015: 3.73	3.73	3.73	Low-density residential, HH, GHD, 2016: 22
PSI Site	**Sample ID**	**Sampling Event**	**Date Sampled**	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Site A- MFS	BH017-01	2016-17 PSI	15/02/2017		<10	<50	<100	**140**	**140**	<10	<10	<50	**160**	<100	**160**	<50	<0.5	**1.5**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0196**	**0.0196**	**0.0009**	<0.0005	<0.0005	**0.0571**
Site A- MFS	BH018-01	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.129**	**0.129**	**0.0016**	<0.0005	<0.0005	**0.171**
Site A- MFS	BH018-02	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**2.55**	**2.55**	**0.0233**	<0.0005	<0.0005	**2.97**
Site A- MFS	BH019-01	2016-17 PSI	15/02/2017		<10	<50	<100	**210**	**210**	<10	<10	<50	**230**	<100	**230**	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**1.47**	**1.47**	**0.0274**	<0.0005	**0.0037**	**1.86**
Site A- MFS	BH019-02	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**2.66**	**2.66**	**0.267**	<0.0005	<0.0005	**6.97**
Site A- MFS	BH020-01	2016-17 PSI	15/02/2017		<10	<50	<100	**210**	**210**	<10	<10	<50	**250**	<100	**250**	<50	<0.5	**1.8**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**1.62**	**1.62**	**0.0276**	<0.0005	**0.0088**	**1.66**
Site A- MFS	Duplicate 2	2016-17 PSI	15/02/2017	of BH020-01	<10	<50	**120**	**300**	**420**	<10	<10	<50	**350**	<100	**350**	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**1.42**	**1.42**	**0.0209**	<0.0005	**0.0058**	**1.47**
Site A- MFS	BH020-02	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**3.33**	**3.33**	**0.0047**	<0.0005	<0.0005	**3.36**
Site A- MFS	BH021-01	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.585**	**0.585**	**0.0036**	<0.0005	**0.0029**	**0.605**
Site A- MFS	BH021-02	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.141**	**0.141**	**0.016**	<0.0005	<0.0005	**0.228**
Site A- MFS	MW2 (3.3-3.4m)	GES/SEMF2014	3/12/2014		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.00148**	**0.0148**	<0.0005	<0.005	<0.001	----
Site A- MFS	MW2 (4.0-4.1m)	GES/SEMF2014	3/12/2014		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0032**	**0.0032**	<0.0005	<0.005	<0.001	----
Site A- MFS	MW3 (1.4-1.6)	GES/SEMF2014	3/12/2014		**81**	**6890**	**11100**	<100	**18000**	**164**	**156**	**10700**	**6920**	<100	**17600**	**10700**	<0.5	**26.5**	<0.2	<0.5	**0.8**	**6.8**	<0.5	**6.8**	**7.6**	**6**	----	----	----	----	----	----
Site A- MFS	MW3 (1.9-2.0)	GES/SEMF2014	3/12/2014		**31**	**2070**	**3460**	<100	**5530**	**64**	**60**	**3250**	**2140**	<100	**5390**	**3250**	<0.5	**12.4**	<0.2	<0.5	<0.5	**3.5**	<0.5	**3.5**	**3.5**	**2**	----	----	----	----	----	----
Site B-CFTG	BH028-01	2016-17 PSI	16/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0555**	**0.0555**	**0.0016**	<0.0005	**0.0037**	**0.0605**
Site B-CFTG	Duplicate 3	2016-17 PSI	16/02/2017	of BH028-01	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0296**	**0.0296**	**0.001**	<0.0005	**0.0009**	**0.0347**
Site B-CFTG	BH028-02	2016-17 PSI	16/02/2017		<10	<50	**110**	<100	**110**	<10	<10	<50	**150**	<100	**150**	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**4.93**	**4.93**	**0.0185**	<0.0005	**0.0017**	**5.06**
Site B-CFTG	BH029-01	2016-17 PSI	16/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.189**	**0.189**	**0.0023**	<0.0005	**0.007**	**0.194**
Site B-CFTG	BH029-02	2016-17 PSI	16/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.448**	**0.448**	**0.0067**	**0.0006**	**0.0034**	**0.484**
Site B-CFTG	BH030-01	2016-17 PSI	16/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0398**	**0.0398**	<0.0002	<0.0005	<0.0005	**0.0409**
Site B-CFTG	BH030-02	2016-17 PSI	16/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.063**	**0.063**	**0.0004**	<0.0005	<0.0005	**0.065**
Site B-CFTG	BH022-01	2016-17 PSI	15/02/2017		<10	<50	<100	**100**	**100**	<10	<10	<50	**160**	<100	**160**	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0107**	**0.0107**	**0.0004**	<0.0005	<0.0005	**0.0133**
Site B-CFTG	BH022-02	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0076**	**0.0076**	<0.0002	<0.0005	<0.0005	**0.0091**
Site B-CFTG	BH023-01	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.21**	**0.21**	**0.074**	**0.0044**	**0.181**	**0.236**
Site B-CFTG	BH023-02	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0399**	**0.0399**	**0.0297**	**0.0093**	**0.0344**	**0.0887**
Site B-CFTG	BH024-01	2016-17 PSI	15/02/2017		<10	<50	**150**	**130**	**280**	<10	<10	<50	**230**	**100**	**330**	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0105**	**0.0105**	**0.0003**	<0.0005	<0.0005	**0.0126**
Site B-CFTG	BH024-02	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0053**	**0.0053**	**0.0002**	<0.0005	<0.0005	**0.0066**
Site B-CFTG	BH025-01	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0137**	**0.0137**	**0.0005**	<0.0005	<0.0005	**0.0157**
Site B-CFTG	Triplicate 3	2016-17 PSI	15/02/2017	of BH025-01	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.01**	**0.01**	**0.0004**	<0.0005	<0.0005	**0.0132**
Site B-CFTG	BH025-02	2016-17 PSI	15/02/2017		<10	<50	**130**	<100	**130**	<10	<10	**80**	**110**	<100	**190**	**80**	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0176**	**0.0176**	**0.0004**	<0.0005	<0.0005	**0.0224**
Site B-CFTG	BH026-01	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	**110**	<100	**110**	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0886**	**0.0886**	**0.001**	<0.0005	<0.0005	**0.0976**
Site B-CFTG	BH026-02	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.156**	**0.156**	**0.0033**	<0.0005	<0.0005	**0.191**
Site B-CFTG	BH027-01	2016-17 PSI	15/02/2017		<10	<50	**120**	**120**	**240**	<10	<10	**60**	**180**	<100	**240**	**60**	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.045**	**0.045**	**0.0004**	<0.0005	<0.0005	**0.0484**
Site B-CFTG	BH027-02	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	**110**	<100	**110**	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0267**	**0.0267**	**0.0005**	<0.0005	<0.0005	**0.0327**
Site B-CFTG	DG-7 0.1m	2016-17 PSI&EAST of CFTG	12/01/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0008**	**0.0008**	<0.0002	<0.0005	<0.0005	**0.0008**
Site B-CFTG	Duplicate A-S	2016-17 PSI	12/01/2017	of DG-7 0.1m	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0009**	**0.0009**	<0.0002	<0.0005	<0.0005	**0.0009**
Site B-CFTG	DG-7 1.0m	2016-17 PSI&EAST of CFTG	12/01/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002
Site B-CFTG	DG-7 2.0m	2016-17 PSI&EAST of CFTG	12/01/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002
Site B-CFTG	DG-7 3.0m (beneath WT)	2016-17 PSI&EAST of CFTG	12/01/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002
Site B-CFTG	DG-7 4.0m (beneath WT)	2016-17 PSI&EAST of CFTG	12/01/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002
Site B-CFTG	DG-8 0.1m	2016-17 PSI&EAST of CFTG	12/01/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0028**	**0.0028**	**0.0005**	**0.0006**	<0.0005	**0.0034**
Site B-CFTG	DG-8 1.0m	2016-17 PSI&EAST of CFTG	12/01/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0004**	**0.0004**	**0.0006**	<0.0005	<0.0005	**0.0023**
Site B-CFTG	DG-8 2.0m	2016-17 PSI&EAST of CFTG	12/01/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	<0.0002	<0.0002	**0.0009**	<0.0005	<0.0005	**0.0177**

Soil Samples: Sediments, Hand Auger, New Groundwater Wells and New FTG bores				Analyte Grouping	TPH					TRH							PAH		BTEXN							PFAS (Lowest)					
				Analyte	C6-C9	C10-C14	C15-C28	C29-C36	Sum (C10-C36)	C6-C10	C6-C10 minus BTEX	C10-C16	C16-C34	C34-C40	Sum (C10-C40)	C10-C16 minus Naphthalene	Benzo(a) pyrene	Total PAH	Benzene	Toluene	Ethyl-benzene	m-&p-Xylene	o-Xylene	Total Xylenes	BTEX Sum	Naphthalene	PFOS	PFOS	PFOA	6:2 FTS	8:2 FTS	PFHxS + PFOS
				Criteria Used	Ecological - Areas of Environmental Significance, AER					CRC Care - HSL A & Direct Contact - Intrusive / Maintenance Worker							Ecological - NEPM	Ecological - AER	Ecological AER								95% species protection, Ecological - UK EA in GHD, 2015	Ecological, Commercial / Industrial, 60% protection, UK EA in GHD, 2105	Ecological, GHD, 2015			Low-density residential, HH, GHD, 2016
				Guideline Limit	100				1,000	82,000		62,000	85,000	120,000			0.7	5	0.5	3	5			5	-		0.373	4.71	3.73	3.73	3.73	22
Site B-CFTG	DG-8 3.0m (beneath WT)	2016-17 PSI&EAST of CFTG	12/01/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0022**	**0.0022**	**0.019**	<0.0005	<0.0005	**0.132**
Site B-CFTG	DG-8 4.0m (beneath WT)	2016-17 PSI&EAST of CFTG	12/01/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.239**	**0.239**	**0.011**	<0.0005	<0.0005	**0.364**
New FTG-North of Site B	SB01-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	**130**	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0008**	**0.0008**	<0.0005	<0.005	<0.001	**0.0008**
New FTG-North of Site B	SB02-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0006**	**0.0006**	<0.0005	<0.005	<0.001	**0.0006**
New FTG-North of Site B	SB04-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0007**	**0.0007**	<0.0005	<0.005	<0.001	**0.0007**
New FTG-North of Site B	SB05-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0015**	**0.0015**	<0.0005	<0.005	<0.001	**0.0015**
New FTG-North of Site B	SB06-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0014**	**0.0014**	<0.0005	<0.005	<0.001	**0.0018**
New FTG-North of Site B	SB07-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0012**	**0.0012**	<0.0005	<0.005	<0.001	**0.0012**
New FTG-North of Site B	SB08-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0008**	**0.0008**	<0.0005	<0.005	<0.001	**0.0008**
New FTG-North of Site B	SB09-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0018**	**0.0018**	<0.0005	<0.005	<0.001	**0.0021**
New FTG-North of Site B	SB10-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0017**	**0.0017**	<0.0005	<0.005	<0.001	**0.0026**
New FTG-North of Site B	SB11-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	**140**	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0015**	**0.0015**	<0.0005	<0.005	<0.001	**0.0019**
New FTG-North of Site B	SB11-0.5m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	**120**	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0012**	**0.0012**	<0.0005	<0.005	<0.001	**0.0012**
New FTG-North of Site B	SB12-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	**1500**	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0006**	**0.0006**	<0.0005	<0.005	<0.001	**0.0006**
New FTG-North of Site B	SB13-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	**120**	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0009**	**0.0009**	<0.0005	<0.005	<0.001	**0.0012**
New FTG-North of Site B	SB14-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	**110**	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0013**	**0.0013**	<0.0005	<0.005	<0.001	**0.0013**
New FTG-North of Site B	SB15-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0344**	**0.0344**	<0.0005	<0.005	<0.001	**0.037**
New FTG-North of Site B	SB15-0.5m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	-	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.062**	**0.062**	<0.0005	<0.005	<0.001	**0.062**
New FTG-North of Site B	SB16-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0246**	**0.0246**	<0.0005	<0.005	<0.001	**0.028**
New FTG-North of Site B	SB16-0.5m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	-	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.048**	**0.048**	<0.0005	<0.005	<0.001	**0.048**
New FTG-North of Site B	SB17-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	**100**	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0315**	**0.0315**	<0.0005	<0.005	<0.001	**0.0411**
New FTG-North of Site B	SB17-0.5m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0342**	**0.0342**	**0.0008**	<0.005	<0.001	**0.0342**
New FTG-North of Site B	SB18-0.1m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0079**	**0.0079**	<0.0005	<0.005	<0.001	**0.0096**
New FTG-North of Site B	SB18-0.5m	GHD ESI-New FTG	4/06/2014		----	----	----	----	----	<10	<10	<50	-	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0026**	**0.0026**	<0.0005	<0.005	<0.001	**0.0026**
New FTG-North of Site B	MW2-0.1m	GHD ESI-New FTG	3/06/2014		----	----	----	----	----	<10	<10	<50	**200**	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.01**	**0.01**	<0.0005	<0.005	<0.001	**0.0114**
New FTG-North of Site B	MW2-0.5m	GHD ESI-New FTG	3/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0049**	**0.0049**	<0.0005	<0.005	<0.001	**0.0054**
New FTG-North of Site B	MW3-0.1m	GHD ESI-New FTG	3/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0032**	**0.0032**	<0.0005	<0.005	<0.001	**0.0037**
New FTG-North of Site B	MW3-0.5m	GHD ESI-New FTG	3/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.002**	**0.002**	<0.0005	<0.005	<0.001	**0.002**
New FTG-North of Site B	MW1-0.1m	GHD ESI-New FTG	2/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0006**	**0.0006**	<0.0005	<0.005	<0.001	**0.0022**
New FTG-North of Site B	MW1-2.0m	GHD ESI-New FTG	2/06/2014		----	----	----	----	----	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	<0.0005	<0.0005	**0.0089**	<0.005	<0.001	**0.0377**
Site H -Landfill A	BH001/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0016**	**0.0016**	<0.0002	<0.0005	<0.0005	**0.0016**
Site H -Landfill A	BH001/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0234**	**0.0234**	**0.0007**	<0.0005	<0.0005	**0.0315**
Site H -Landfill A	BH002/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0108**	**0.0108**	<0.0002	<0.0005	<0.0005	**0.0112**
Site H -Landfill A	BH002/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.008**	**0.008**	<0.0002	<0.0005	<0.0005	**0.0096**
Site H -Landfill A	BH003/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0093**	**0.0093**	<0.0002	<0.0005	<0.0005	**0.0093**
Site H -Landfill A	BH004/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0184**	**0.0184**	**0.0005**	<0.0005	<0.0005	**0.0218**
Site H -Landfill A	BH004/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0033**	**0.0033**	<0.0002	<0.0005	<0.0005	**0.006**
Site I - NavAid Bldg	BH014-01	2016-17 PSI	15/02/2017		<10	<50	<100	**290**	**290**	<10	<10	<50	**290**	**330**	**620**	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0007**	**0.0007**	<0.0002	<0.0005	<0.0005	**0.0007**
Site I - NavAid Bldg	BH015-01	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0028**	**0.0028**	<0.0002	<0.0005	<0.0005	**0.003**
Site I - NavAid Bldg	BH016-01	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0011**	**0.0011**	<0.0002	<0.0005	<0.0005	**0.0013**
Site I - NavAid Bldg	BH016-02	2016-17 PSI	15/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0053**	**0.0053**	<0.0002	<0.0005	<0.0005	**0.0059**
Site F-UTAS Bldg	BH011/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0073**	**0.0073**	<0.0002	<0.0005	<0.0005	**0.0076**
Site F-UTAS Bldg	BH011/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0287**	**0.0287**	<0.0002	<0.0005	<0.0005	**0.0296**
Site F-UTAS Bldg	BH012/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0007**	**0.0007**	<0.0002	<0.0005	<0.0005	**0.0007**
Site F-UTAS Bldg	BH012/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0021**	**0.0021**	<0.0002	<0.0005	<0.0005	**0.0021**
Site F-UTAS Bldg	BH013/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0054**	**0.0054**	<0.0002	<0.0005	<0.0005	**0.0083**
Site F-UTAS Bldg	BH013/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0003**	**0.0003**	<0.0002	<0.0005	<0.0005	**0.0016**
Site L - Control Tower	BH005/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0032**	**0.0032**	<0.0002	<0.0005	<0.0005	**0.0032**
Site L - Control Tower	BH005/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0012**	**0.0012**	<0.0002	<0.0005	<0.0005	**0.0012**
Site L - Control Tower	BH006/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0002**	**0.0002**	<0.0002	<0.0005	<0.0005	**0.0002**
Site L - Control Tower	Duplicate 1	2016-17 PSI	14/02/2017	of BH006-01	<10	<50	<100	**150**	**150**	<10	<10	<50	**150**	<100	**150**	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0004**	**0.0004**	<0.0002	<0.0005	<0.0005	**0.0004**
Site L - Control Tower	BH006/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002
Site L - Control Tower	BH007/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	**0.0005**	**0.0005**	<0.0002	<0.0005	<0.0005	**0.0005**

Soil Samples: Sediments, Hand Auger, New Groundwater Wells and New FTG bores				Analyte Grouping	TPH					TRH							PAH		BTEXN								PFAS (Lowest)					
				Analyte	C6-C9	C10-C14	C15-C28	C29-C36	Sum (C10-C36)	C6-C10	C6-C10 minus BTEX	C10-C16	C16-C34	C34-C40	Sum (C10-C40)	C10-C16 minus Naphthalene	Benzo(a) pyrene	Total PAH	Benzene	Toluene	Ethyl-benzene	m-&p-Xylene	o-Xylene	Total Xylenes	BTEX Sum	Naphthalene	PFOS	PFOS	PFOA	6:2 FTS	8:2 FTS	PFHxS + PFOS
				Criteria Used	Ecological - Areas of Environmental Significance, AER					CRC Care - HSL A & Direct Contact - Intrusive / Maintenance Worker							Ecological - NEPM	Ecological - AER	Ecological AER								95% species protection, Ecological - UK EA in GHD, 2015	Ecological, Commercial / Industrial, 60% protection, UK EA in GHD, 2105	Ecological, GHD, 2015			Low-density residential, HH, GHD, 2016
				Guideline Limit	100				1,000	82,000		62,000	85,000	120,000			0.7	5	0.5	3	5			5	-		0.373	4.71	3.73	3.73	3.73	22
Site L - Control Tower	BH007/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002
Site L - Control Tower	BH008/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0317**	**0.0317**	<0.0002	<0.0005	<0.0005	**0.0323**
Site L - Control Tower	BH009/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.002**	**0.002**	<0.0002	<0.0005	<0.0005	**0.002**
Site L - Control Tower	BH009/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0004**	**0.0004**	<0.0002	<0.0005	<0.0005	**0.0004**
Site L - Control Tower	BH010/01	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0015**	**0.0015**	<0.0002	<0.0005	<0.0005	**0.002**
Site L - Control Tower	Triplicate 1	2016-17 PSI	14/02/2017	of BH010-01	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0004**	**0.0004**	<0.0002	<0.0005	<0.0005	**0.0023**
Site L - Control Tower	BH010/02	2016-17 PSI	14/02/2017		<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0004**	**0.0004**	<0.0002	<0.0005	<0.0005	**0.0008**
in lieu of surface water sample	HIA11-SED	2016-17 PSI	16/12/2016		<10	<50	<100	<100	<50	<10	----	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0059**	**0.0059**	<0.0002	<0.0005	<0.0005	**0.0072**
of HIA11-SED	Triplicate A-SED	2016-17 PSI	16/12/2016		<10	<50	<100	<100	<50	<10	----	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.010**	**0.010**	**0.0003**	<0.0005	<0.0005	**0.0117**
in lieu of surface water sample	HIA14-SED	2016-17 PSI	16/12/2016	(silica-gel cleanup)	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.013**	**0.013**	**0.0004**	<0.0005	<0.0005	**0.0143**
in lieu of surface water sample	HIA15-SED	2016-17 PSI	16/12/2016	(silica-gel cleanup)	<10	<50	**260**	**280**	**540**	<10	<10	<50	**460**	**130**	**590**	<50	<0.5	**3.8**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	**0.0048**	**0.0048**	**0.0004**	<0.0005	<0.0005	**0.0056**
in lieu of surface water sample	HIA20-SED	2016-17 PSI	16/12/2016	(silica-gel cleanup)	<10	<50	<100	<100	<50	<10	----	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	<0.0002	<0.0002	**0.0002**	<0.0005	<0.0005	<0.0002
in lieu of surface water sample	HIA21-SED	2016-17 PSI	16/12/2016	(silica-gel cleanup)	<10	<50	<100	<100	<50	<10	----	<50	<100	<100	<50	<50	----	----	----	----	----	----	----	----	----	----	**0.0034**	**0.0034**	<0.0002	<0.0005	<0.0005	**0.0034**
				Min	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002
				Max	<10	<50	11100	300	18000	<10	<10	10700	6920	330	17600	10700	<0.5	26.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	4.93	4.93	0.267	0.0093	0.181	6.97

Legend	
	grey shading indicates the specific criteria are not applicable to these sample locations
999	underline indicates concentration exceeds 95% species protection PFOS criteria
999	value exceeds nominated criterion
0.09	criterion value is lower than laboratory LOR
220	bold value indicates result is > LOR
<20	less than value indicates results is less than the LOR
LOR	Laboratory Limit of Reporting
NOTE:	Additional old soil hydrocarbon data exist at the MFS and CFTG - only the most recent data have been captured as part of this review as the focus of this PSI is PFAS, not hydrocarbons delineation
References:	AER = Airport (Environment Protection) Regulations 1997
	CRC Care = Table B4, Intrusive Maintenance Worker and Direct Contact Health Screening Levels, in CRC Care Technical Report No. 10, Health Screening Levels for Petroleum Hydrocarbons in soil and groundwater, Part 2: Application Document, September 2011.
	NEPM = National Environment Protection (Assessment of Site Contamination) Measure 1999, amended 2013
	GHD, 2015 = Interim Screening Levels from Managing PFC Contamination at Airports Interim Contamination Management Strategy and Decision Framework (GHD, June 2015)
	GHD, 2016 = PFAS Investigations – Derivation of PFAS Soil Criteria, (GHD, 28 September 2016).

SUMMARY RESULTS ISSUED FOR HOBART AIRPORT SAMPLING REPORT

Surface Water Results (Lowest Criteria) **Hydrocarbons**			Analyte Grouping	TPH					TRH						
		Date Sampled	Analyte	C6-C9	C10-C14	C15-C28	C29-C36	Sum (C10-C36)	C6-C10	C6-C10 minus BTEX (F1)	C10-C16	C16-C34	C34-C40	Sum (C10-C40)	C10-C16 minus Naphthalene (F2)
			Criteria used Guideline Limit (Lowest Criteria	Ecological - AER					WHO - Human Health - Drinking Water						
				150				600	15					0.09	
Sample ID	Common Sample ID		Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
HIA01-W	HIA01	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA01	HIA01	27/06/2016		----	<50	<100	<100	<100	----	----	----	----	----	----	----
HIA03A-W	HIA03A	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA03A	HIA03A	22/03/2016		**60**	----	----	----	----	----	**60**	----	----	----	----	----
HIA03A	HIA03A	27/06/2016		----	<50	<100	<100	<100	----	----	----	----	----	----	----
HIA04-W	HIA04	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA04	HIA04	27/06/2016		----	<50	<100	<100	<100	----	----	----	----	----	----	----
HIA05-W	HIA05	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA07-W	HIA07	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA07	HIA07	22/03/2016		**80**	----	----	----	----	----	**80**	----	----	----	----	----
HIA09-W	HIA09	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA09	HIA09	22/03/2016		<20	----	----	----	----	----	<20	----	----	----	----	----
HIA10-W	HIA10	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA12-W	HIA12	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA13-W	HIA13	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA16-W	HIA16	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA17-W	HIA06	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA06	HIA06	22/03/2016		<20	----	----	----	----	----	<20	----	----	----	----	----
HIA06	HIA06	27/06/2016		----	<50	<100	<100	<100	----	----	----	----	----	----	----
HIA18-W	HIA18	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
HIA19-W	HIA19	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
TB-A	trip blank	16/12/2016		<20	----	----	----	----	<20	<20	----	----	----	----	----
Triplicate A-W	HIA03A	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
Duplicate A-W	HIA01	16/12/2016		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
Min				<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100
Max				<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100

Legend

999	value exceeds nominated criterion
0.09	criterion value is lower than laboratory LOR
220	bold value indicates result is > LOR
<20	less than value indicates results is less than the LOR
LOR	Laboratory Limit of Reporting

References:

AER = Airport (Environment Protection) Regulations 1997

WHO = Petroleum Products in Drinking Water – Background document for Development of WHO Guidelines for Drinking-water Quality, WHO, 2008

FSANZ = Food Standards Australia New Zealand - Toxicity reference values in Health Based Guidance Values for PFAS, Department of Health, Australian Government, 2017

SUMMARY RESULTS ISSUED FOR HOBART AIRPORT PSI

Surface Water PFAS Results (all known data) - All Criteria

								PFAS (Human Health Drinking Water)												PFAS (Human Health Fish Consumption)						PFAS (Human Health Recreational) (also Workers exposure risk)									PFAS (Ecological)					
						Analyte Grouping																																		
						Analyte		PFHxS	PFOS	PFOA	PFHxS	PFOS	PFOA	8:2 FTS	PFHxS + PFOS	PFOS GHD	PFOA GHD	8:2 FTS GHD	6:2 FTS	PFHxS	PFOS	PFOA	6:2 FTS	8:2 FTS	PFHxS + PFOS	PFHxS	PFOS	PFOA	PFHxS	PFOS	PFOA	6:2 FTS	8:2 FTS	PFHxS + PFOS	PFHxS	PFOS	PFOA	6:2 FTS	8:2 FTS	PFHxS + PFOS
						Criteria Source		FSANZ, 2017			enHealth, 2016					GHD 2015 (USEPA, 2009)			GHD 2015	no criteria	GHD, 2015				no criteria	FSANZ, 2017			enHealth, 2016			no criteria	enHealth, 2016		GHD, 2015					
						Guideline Limit (lowest)		0.07	0.07	0.56	0.5	0.5	5	5	0.5	0.2	0.4	0.4	5		0.00065	0.3	0.0065	0.3		0.7	0.7	5.6	5	5	50		50	5	6.66	6.66	2900	2900	2900	6.66
Sample ID	Common Sample ID	On or off Airport	Location Description	Sampled by	Date	Sampling Rationale	poor/unacceptable drinking water (>1000mg/L TDS)	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
HIA01-W	HIA01	On Airport	Sinclair Ck entry to Airport	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	<0.002	0.007	<0.002	<0.002	0.007	<0.002	<0.005	0.007	0.007	<0.002	<0.005	<0.005	<0.002	0.007	<0.002	<0.005	<0.005	0.007	<0.002	0.007	<0.002	<0.002	0.007	<0.002	<0.005	<0.005	0.007	<0.002	0.007	<0.002	<0.005	<0.005	0.007
Duplicate A-W	HIA01-dup	On Airport	Sinclair Ck entry to Airport	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	<0.002	0.006	<0.002	<0.002	0.006	<0.002	<0.005	0.006	0.006	<0.002	<0.005	<0.005	<0.002	0.006	<0.002	<0.005	<0.005	0.006	<0.002	0.006	<0.002	<0.002	0.006	<0.002	<0.005	<0.005	0.006	<0.002	0.006	<0.002	<0.005	<0.005	0.006
HIA03A-W	HIA03A	On Airport	Sinclair Ck East of Airport Fence	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	5.98	9.41	0.121	5.98	9.41	0.121	<0.005	15.4	9.41	0.121	<0.005	<0.005	5.98	9.41	0.121	<0.005	<0.005	15.4	5.98	9.41	0.121	5.98	9.41	0.121	<0.005	<0.005	15.4	5.98	9.41	0.121	<0.005	<0.005	15.4
Triplicate A-W	HIA03A-tripl	On Airport	Sinclair Ck East of Airport Fence	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	7.58	11	0.13	7.58	11	0.13	<0.005	18.6	11	0.13	<0.005	<0.005	7.58	11	0.13	<0.005	<0.005	18.6	7.58	11	0.13	7.58	11	0.13	<0.005	<0.005	18.6	7.58	11	0.13	<0.005	<0.005	18.6
HIA04-W	HIA04	On Airport	NW of Runway	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	0.039	0.006	<0.002	0.039	0.006	<0.002	<0.005	0.045	0.006	<0.002	<0.005	<0.005	0.039	0.006	<0.002	<0.005	<0.005	0.045	0.039	0.006	<0.002	0.039	0.006	<0.002	<0.005	<0.005	0.045	0.039	0.006	<0.002	<0.005	<0.005	0.045
HIA05-W	HIA05	On Airport	Sinclair Creek East of Runway	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	9.58	17.1	0.151	9.58	17.1	0.151	<0.005	26.7	17.1	0.151	<0.005	<0.005	9.58	17.1	0.151	<0.005	<0.005	26.7	9.58	17.1	0.151	9.58	17.1	0.151	<0.005	<0.005	26.7	9.58	17.1	0.151	<0.005	<0.005	26.7
Sinclair 04	HIA05	On Airport	Sinclair Creek East of Runway	HIAPL/kl	18/11/2015	Once-off SW PFAS	yes	----	2.3	0.25	----	2.3	0.25	<0.1	----	2.3	0.25	<0.1	<0.5	----	2.3	0.25	<0.5	<0.1	----	----	2.3	0.25	----	2.3	0.25	<0.5	<0.1	----	----	2.3	0.25	<0.5	<0.1	----
HIA17-W	HIA06	On Airport	Sinclair Creek, landside, west of fence	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	0.345	0.3	0.015	0.345	0.3	0.015	<0.005	0.645	0.3	0.015	<0.005	<0.005	0.345	0.3	0.015	<0.005	<0.005	0.645	0.345	0.3	0.015	0.345	0.3	0.015	<0.005	<0.005	0.645	0.345	0.3	0.015	<0.005	<0.005	0.645
Sinclair 01	HIA06	On Airport	Sinclair Creek, landside, west of fence	HIAPL/kl	18/11/2015	Once-off SW PFAS	yes	----	1.2	0.32	----	1.2	0.32	<0.1	----	1.2	0.32	<0.1	<0.5	----	1.2	0.32	<0.5	<0.1	----	----	1.2	0.32	----	1.2	0.32	<0.5	<0.1	----	----	1.2	0.32	<0.5	<0.1	----
HIA07-W	HIA07	On Airport	Sinclair Creek, next to WWTP discharge	SEMF/fkp	16/12/2016	Limited PSI 2016-17	no	0.13	0.217	0.008	0.13	0.217	0.008	<0.005	0.347	0.217	0.008	<0.005	<0.005	0.13	0.217	0.008	<0.005	<0.005	0.347	0.13	0.217	0.008	0.13	0.217	0.008	<0.005	<0.005	0.347	0.13	0.217	0.008	<0.005	<0.005	0.347
Sinclair 03	HIA07	On Airport	Sinclair Creek, next to WWTP discharge	HIAPL/kl	18/11/2015	Once-off SW PFAS	no	----	5.1	0.31	----	5.1	0.31	<0.1	----	5.1	0.31	<0.1	<0.5	----	5.1	0.31	<0.5	<0.1	----	----	5.1	0.31	----	5.1	0.31	<0.5	<0.1	----	----	5.1	0.31	<0.5	<0.1	----
HIA10-W	HIA10	On Airport	West of Northern end of Runway	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	0.035	0.043	<0.002	0.035	0.043	<0.002	<0.005	0.078	0.043	<0.002	<0.005	<0.005	0.035	0.043	<0.002	<0.005	<0.005	0.078	0.035	0.043	<0.002	0.035	0.043	<0.002	<0.005	<0.005	0.078	0.035	0.043	<0.002	<0.005	<0.005	0.078
HIA12-W	HIA12	On Airport	Sinclair Creek between SW5 and HIA07	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	14	30.6	0.205	14	30.6	0.205	<0.005	44.6	30.6	0.205	<0.005	<0.005	14	30.6	0.205	<0.005	<0.005	44.6	14	30.6	0.205	14	30.6	0.205	<0.005	<0.005	44.6	14	30.6	0.205	<0.005	<0.005	44.6
HIA13-W	HIA13	On Airport	Sinclair Creek below buried pond and above SW5	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	4.1	1.79	0.09	4.1	1.79	0.09	<0.005	5.89	1.79	0.09	<0.005	<0.005	4.1	1.79	0.09	<0.005	<0.005	5.89	4.1	1.79	0.09	4.1	1.79	0.09	<0.005	<0.005	5.89	4.1	1.79	0.09	<0.005	<0.005	5.89
HIA16-W	HIA16	On Airport	North of Apron	SEMF/fkp	16/12/2016	Limited PSI 2016-17	no	0.382	0.353	0.029	0.382	0.353	0.029	<0.005	0.735	0.353	0.029	<0.005	<0.005	0.382	0.353	0.029	<0.005	<0.005	0.735	0.382	0.353	0.029	0.382	0.353	0.029	<0.005	<0.005	0.735	0.382	0.353	0.029	<0.005	<0.005	0.735
HIA18-W	HIA18	On Airport	Sinclair Creek below old FTG	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	0.12	0.045	<0.002	0.12	0.045	<0.002	<0.005	0.165	0.045	<0.002	<0.005	<0.005	0.12	0.045	<0.002	<0.005	<0.005	0.165	0.12	0.045	<0.002	0.12	0.045	<0.002	<0.005	<0.005	0.165	0.12	0.045	<0.002	<0.005	<0.005	0.165
HIA19-W	HIA19	On Airport	Sinclair Creek next to HIAPL Soil Stockpiles	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	0.003	0.005	<0.002	0.003	0.005	<0.002	<0.005	0.008	0.005	<0.002	<0.005	<0.005	0.003	0.005	<0.002	<0.005	<0.005	0.008	0.003	0.005	<0.002	0.003	0.005	<0.002	<0.005	<0.005	0.008	0.003	0.005	<0.002	<0.005	<0.005	0.008
SW1	SW1	On Airport	stormwater-west side of MFS	HIAPL/kl	27/06/2016	ARFFS Stormwater event	yes	0.463	1.06	0.031	0.463	1.06	0.031	0.02	1.523	1.06	0.031	0.02	<0.01	0.463	1.06	0.031	<0.01	0.02	1.523	0.463	1.06	0.031	0.463	1.06	0.031	<0.01	0.02	1.523	0.463	1.06	0.031	<0.01	0.02	1.523
SW2	SW2	On Airport	stormwater-north side of MFS	HIAPL/kl	27/06/2016	ARFFS Stormwater event	yes	4.21	2.84	0.421	4.21	2.84	0.421	0.07	7.05	2.84	0.421	0.07	<0.01	4.21	2.84	0.421	<0.01	0.07	7.05	4.21	2.84	0.421	4.21	2.84	0.421	<0.01	0.07	7.05	4.21	2.84	0.421	<0.01	0.07	7.05
SW3	SW3	On Airport	stormwater-truckwash slab area	HIAPL/kl	27/06/2016	ARFFS Stormwater event	yes	0.607	3.3	0.08	0.607	3.3	0.08	0.1	3.907	3.3	0.08	0.1	<0.01	0.607	3.3	0.08	<0.01	0.1	3.907	0.607	3.3	0.08	0.607	3.3	0.08	<0.01	0.1	3.907	0.607	3.3	0.08	<0.01	0.1	3.907
SW4	SW4	On Airport	stormwater-north of fire trucks garage	HIAPL/kl	27/06/2016	ARFFS Stormwater event	yes	5.17	4.4	0.418	5.17	4.4	0.418	0.06	9.57	4.4	0.418	0.06	<0.01	5.17	4.4	0.418	<0.01	0.06	9.57	5.17	4.4	0.418	5.17	4.4	0.418	<0.01	0.06	9.57	5.17	4.4	0.418	<0.01	0.06	9.57
SW5	SW5	On Airport	Sinclair Creek-next to MFS stormwater pipe outlet	HIAPL/kl	27/06/2016	ARFFS Stormwater event	yes	7	46.2	0.638	7	46.2	0.638	<0.01	53.2	46.2	0.638	<0.01	<0.01	7	46.2	0.638	<0.01	<0.01	53.2	7	46.2	0.638	7	46.2	0.638	<0.01	<0.01	53.2	7	46.2	0.638	<0.01	<0.01	53.2
Sinclair 02	SW5	On Airport	Sinclair Creek-next to MFS stormwater pipe outlet	HIAPL/kl	18/11/2015	Once-off SW PFAS	yes	----	330	8.7	----	330	8.7	<1	----	330	8.7	<1	<5	----	330	8.7	<5	<1	----	----	330	8.7	----	330	8.7	<5	<1	----	----	330	8.7	<5	<1	----
HIA09-W	HIA09	Off Airport	Sinclair Confluence with 5-Mile Beach (tidal)	SEMF/fkp	16/12/2016	Limited PSI 2016-17	yes	0.495	0.613	0.017	0.495	0.613	0.017	<0.005	1.11	0.613	0.017	<0.005	<0.005	0.495	0.613	0.017	<0.005	<0.005	1.11	0.495	0.613	0.017	0.495	0.613	0.017	<0.005	<0.005	1.11	0.495	0.613	0.017	<0.005	<0.005	1.11
Sinclair 05	HIA09	Off Airport	Sinclair Confluence with 5-Mile Beach (tidal)	HIAPL/kl	7/12/2015	Once-off SW PFAS	yes	----	0.34	0.06	----	0.34	0.06	<0.01	----	0.34	0.06	<0.01	<0.05	----	0.34	0.06	<0.05	<0.01	----	----	0.34	0.06	----	0.34	0.06	<0.05	<0.01	----	----	0.34	0.06	<0.05	<0.01	----
							Min	<0.002	0.006	<0.002	<0.002	0.006	<0.002	<0.005	0.006	0.005	<0.002	<0.005	<0.005	<0.002	0.005	<0.002	<0.005	<0.005	0.006	0.003	0.005	0.008	<0.002	0.005	<0.002	<0.005	<0.005	0.006	<0.002	0.005	<0.002	<0.005	<0.005	0.006
							Max	14	330	8.7	14	330	8.7	0.1	53.2	330	8.7	0.1	<5	14	330	8.7	<5	0.1	53.2	14	330	8.7	14	330	8.7	<5	0.1	53.2	14	330	8.7	<5	0.1	53.2

Legend

	grey shading indicates the specific criteria are not applicable to these sample locations
999	value exceeds nominated criterion
0.09	criterion value is lower than laboratory LOR
220	bold value indicates result is > LOR
<20	less than value indicates results is less than the LOR
LOR	Laboratory Limit of Reporting

References:

enHealth, 2016 =	enHealth Statement: Interim national guidance on human health reference values for per- and poly-fluoroalkyl substances for use in site investigations in Australia (enHealth, June 2016).
GHD, 2015 & USEPA, 2009 =	US EPA Fact Sheet – PFOA & PFOS Drinking Water Health Advisories (US EPA, May 2016), referenced in Interim Screening Levels from Managing PFC Contamination at Airports Interim Contamination Management Strategy and Decision Framework (GHD, June 2015)
FSANZ = 2017	FSANZ = Food Standards Australia New Zealand - Toxicity reference values in Health Based Guidance Values for PFAS, Department of Health, Australian Government, 2017

SUMMARY RESULTS ISSUED FOR HOBART AIRPORT SAMPLING REPORT

GW Samples - New Wells & Open Well plus recent FTG & Perimeter Wells GME, and 2014 new FTG GW			Analyte Grouping	TPH					TRH							PAH		BTEXN							
Hydrocarbons			Analyte	C6-C9	C10-C14	C15-C28	C29-C36	Sum (C10-C36)	C6-C10 minus C6-C10 minus BTEX	C10-C16	C16-C34	C34-C40	Sum (C10-C40)	C10-C16 minus Naphthalene	Benzo(a)pyrene	Total PAH	Benzene	Toluene	Ethyl-benzene	m-&p- Xylene	o-Xylene	Total Xylenes	BTEX Sum	Naphthalene
			Criteria	Ecological AER					WHO, Petroleum products in Drinking Water							NHMRC Drinking Water	Fresh & Marine Water, AER	WHO, 2005, drinking water	Ecological Freshwater AER		ANZECC Ecological 95% species protection (freshwater)		Drinking Water, WHO		ANZECC, Ecological, 95% species protection (freshwater)
			Guideline Limit (lowest)	150				600	15		0.09	0.09	0.09	0.09		0.01	3	10	300	140	200	350	300		16
Sample ID	Date Sampled	Location	Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-1 (MFS)	11/12/2014	on eastern side of MFS building (shallow well)		**20**	**310**	**460**	<50	**770**	<20	<20	**330**	**390**	<100	**720**	**330**	<0.5	<0.5	<1	**4**	<2	<2	<2	<2	**4**	<5
MW-2 (MFS)	11/12/2014	on eastern side of MFS building (deep well)		<20	**280**	**700**	70	**1050**	<20	<20	**320**	**650**	<100	**970**	**320**	<0.5	<0.5	<1	**4**	<2	<2	<2	<2	**4**	<5
MW-3 (MFS)	11/12/2014	on western side of MFS building (deep well)		<20	**350**	**330**	<50	**680**	<20	<20	**420**	**220**	<100	**640**	**420**	<0.5	1.4	<1	<2	<2	**3**	<2	**3**	**3**	<5
DG-7	19/01/2017	Northeast of CFTG, near Pittwater Rd		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	----	----	----	----	----	----	----	----	----	----
DUPLICATE W	19/01/2017	Northeast of CFTG, near Pittwater Rd (dup of DG-7)		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	----	----	----	----	----	----	----	----	----	----
DG-8	19/01/2017	Northeast of CFTG outside fence		<20	<50	**220**	<50	**220**	<20	<20	<100	**170**	<100	**170**	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
DG-2	23/09/2016	CFTG north of mock-up		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
DG-3	23/09/2016	CFTG southeast of mock-up and south of ponds		**60**	**260**	**280**	<50	**540**	**70**	**20**	**350**	**180**	<100	**530**	**350**	<0.5	<0.5	**3**	**14**	**4**	**13**	**15**	**28**	**49**	<0.5
DG-5	23/09/2016	CFTG south of mock-up		<20	<50	240	<50	**240**	<20	<20	<100	**230**	<100	230	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
DG-6	23/09/2016	South of CFTG on Surf Road		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
MW-1 (CFTG)	13/06/2014	North of CFTG in the potential new FTG area		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
MW-2 (CFTG)	13/06/2014	Northwest of CFTG in the potential new FTG area		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
MW-3 (CFTG)	13/06/2014	Further north of CFTG in the potential new FTG area		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
HIA well-01	16/12/2016	Site F - Utas Building - Open Well, east of HA19		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	----	----	----	----	----	----	----	----	----	----
HA-19	18/08/2015	Close to Site D (PSI), south of MFS		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
HA-20	18/08/2015	South of Airport, along Surf Rd, 700m SW of DG6		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
HA-21	18/08/2015	South of Site H (PSI)		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
HA-22	18/08/2015	North of Site H (PSI), south of Sinclair Ck, within saltmarsh		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	----	----	<1	<2	<2	<2	<2	<2	<1	<5
HA-23	18/08/2015	NE of airport, west of Site J (PSI)		<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	----	----	<1	<2	<2	<2	<2	<2	<1	<5
			Min	<20	<50	<100	<50	220	<20	<20	<100	<100	<100	<100	<100	<0.5	<0.5	<1	<2	<2	<2	<2	<2	<1	<5
			Max	60	260	280	<50	540	70	20	350	230	<100	530	350	<0.5	<0.5	3	14	4	13	15	28	49	<5

Legend	
	Setting / usage criteria not applicable to sample location
999	value exceeds nominated criterion
0.09	criterion value is lower than laboratory LOR
220	bold value indicates result is > LOR
<20	less than value indicates results is less than the LOR
LOR	Laboratory Limit of Reporting

References:	
GHD, 2015 =	US EPA Fact Sheet – PFOA & PFOS Drinking Water Health Advisories (US EPA, May 2016), referenced in Interim Screening Levels from Managing PFC Contamination at Airports Interim Contamination Management Strategy and Decision Framework (GHD, June 2015)
enHealth, 2016 =	enHealth Statement: Interim national guidance on human health reference values for per- and poly-fluoroalkyl substances for use in site investigations in Australia (enHealth, June 2016)
WHO, 2008 =	Petroleum Products in Drinking Water – Background document for Development of WHO Guidelines for Drinking-water Quality, WHO, 2008
WHO, 2005 =	Petroleum Products in Drinking Water – Background document for Development of WHO Guidelines for Drinking-water Quality, WHO, 2005
ANZECC =	ANZECC National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000)
NHMRC =	National Health and Medical Research Council, Investigation Levels for Drinking Water (2011)
FSANZ, 2017 =	FSANZ = Food Standards Australia New Zealand - Toxicity reference values in Health Based Guidance Values for PFAS, Department of Health, Australian Government, 2017

SUMMARY RESULTS ISSUED FOR HOBART AIRPORT SAMPLING REPORT

GW Samples - New Wells & Open Well plus recent FTG and Perimeter wells GMEs and 2014 new FTG GW				Analyte Grouping	PFAS (Human Health Drinking Water)												PFAS (Human Health Recreational) (also Workers exposure risk)										PFAS (Ecological)					
	PFAS			Analyte	PFHxS	PFOS	PFOA	PFHxS	PFOS	PFOS	PFOA	PFOA	6:2 FTS	8:2 FTS	8:2 FTS	PFHxS + PFOS	PFHxS	PFOS	PFOA	PFHxS	PFOS	PFOA	6:2 FTS	8:2 FTS	PFHxS + PFOS	PFHxS	PFOS	PFOA	6:2 FTS	8:2 FTS	PFHxS + PFOS
				Criteria	FSANZ, 2017			enHealth, 2016		USEPA, 2009 in GHD, 2015		enhealth, 2016	GHD, 2015		enHealth, 2016		FSANZ, 2017			enHealth, 2016			no criteria	Adopting enhealth, 2016	enHealth, 2016	GHD, 2015						
			poor/unacceptable drinking water (>1000mg/L TDS)	Guideline Limit (lowest)	0.07	0.07	0.56	0.5	0.5	0.2	0.4	5	5	0.4	5	0.5	0.7	0.7	5.6	5	5	50		50	5	6.66	6.66	2900	2900	2900	6.66
Sample ID	**Date Sampled**	**Location**		**Units**	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
MW-1 (MFS)	11/12/2014	on eastern side of MFS building (shallow well)	yes (EC 3,100mS/cm)		----	**32.3**	**0.76**	----	**32.3**	**32.3**	**0.76**	**0.76**	<0.1	<0.1	<0.1	----	----	**32.3**	**0.76**	----	**32.3**	**0.76**	<0.1	<0.1	----	----	**32.3**	**0.76**	<0.1	<0.1	----
MW-2 (MFS)	11/12/2014	on eastern side of MFS building (deep well)	yes (EC 5,260mS/cm)		----	**35.2**	**0.81**	----	**35.2**	**35.2**	**0.81**	**0.81**	<0.1	<0.1	<0.1	----	----	**35.2**	**0.81**	----	**35.2**	**0.81**	<0.1	<0.1	----	----	**35.2**	**0.81**	<0.1	<0.1	----
MW-3 (MFS)	11/12/2014	on western side of MFS building (deep well)	yes (EC 3,020mS/cm)		----	**12**	**0.52**	----	**12**	**12**	**0.52**	**0.52**	<0.1	<0.1	<0.1	----	----	**12**	**0.52**	----	**12**	**0.52**	<0.1	<0.1	----	----	**12**	**0.52**	<0.1	<0.1	----
DG-7	19/01/2017	Northeast of CFTG, near Pittwater Rd	no		**0.0089**	**0.0138**	<0.0005	**0.0089**	**0.014**	**0.0138**	<0.0005	<0.0005	<0.001	<0.001	<0.001	**0.0227**	**0.0089**	**0.0138**	<0.0005	**0.0089**	**0.0138**	<0.0005	<0.001	<0.001	**0.0227**	**0.0089**	**0.014**	<0.0005	<0.001	<0.001	**0.0227**
DUPLICATE W	19/01/2017	Northeast of CFTG, near Pittwater Rd (dup of DG-7)	no		**0.0079**	**0.0149**	<0.0005	**0.0079**	**0.015**	**0.0149**	<0.0005	<0.0005	<0.001	<0.001	<0.001	**0.0228**	**0.0079**	**0.0149**	<0.0005	**0.0079**	**0.0149**	<0.0005	<0.001	<0.001	**0.0228**	**0.0079**	**0.015**	<0.0005	<0.001	<0.001	**0.0228**
DG-8	19/01/2017	Northeast of CFTG outside fence	no		**329**	**205**	**28.4**	**329**	**205**	**205**	**28.4**	**28.4**	<0.200	<0.200	<0.200	**534**	**329**	**205**	**28.4**	**329**	**205**	**28.4**	<0.200	<0.200	**534**	**329**	**205**	**28.4**	<0.200	<0.200	**534**
DG-2	23/09/2016	CFTG north of mock-up	no		----	**1320**	**8.95**	----	**1320**	**1320**	**8.95**	**8.95**	<0.1	<0.1	<0.1	----	----	**1320**	**8.95**	----	**1320**	**8.95**	<0.1	<0.1	----	----	**1320**	**8.95**	<0.1	<0.1	----
DG-3	23/09/2016	CFTG southeast of mock-up and south of ponds	no		----	**3040**	**83.7**	----	**3040**	**3040**	**83.7**	**83.7**	**6.49**	**27.6**	**27.6**	----	----	**3040**	**83.7**	----	**3040**	**83.7**	**6.49**	**27.6**	----	----	**3040**	**83.7**	**6.49**	**27.6**	----
DG-5	23/09/2016	CFTG south of mock-up	no		----	**1440**	**63.8**	----	**1440**	**1440**	**63.8**	**63.8**	**1.44**	<0.1	<0.1	----	----	**1440**	**63.8**	----	**1440**	**63.8**	**1.44**	<0.1	----	----	**1440**	**63.8**	**1.44**	<0.1	----
DG-6	23/09/2016	South of CFTG on Surf Road	yes		----	**0.11**	<0.02	----	**0.11**	**0.11**	<0.02	<0.02	<0.05	<0.05	<0.05	----	----	**0.11**	<0.02	----	**0.11**	<0.02	<0.05	<0.05	----	----	**0.11**	<0.02	<0.05	<0.05	----
MW-1 (CFTG)	13/06/2014	North of CFTG in the potential new FTG area	to be confirmed		**104**	<0.02	**7.51**	**104**	<0.02	<0.02	**7.51**	**7.51**	<0.1	<0.1	<0.1	**104**	**104**	<0.02	**7.51**	**104**	<0.02	**7.51**	<0.1	<0.1	**104**	**104**	<0.02	**7.51**	<0.1	<0.1	**104**
MW-2 (CFTG)	13/06/2014	Northwest of CFTG in the potential new FTG area	to be confirmed		**0.14**	<0.02	<0.02	**0.14**	<0.02	<0.02	<0.02	<0.02	<0.1	<0.1	<0.1	**0.14**	**0.14**	<0.02	<0.02	**0.14**	<0.02	<0.02	<0.1	<0.1	**0.14**	**0.14**	<0.02	<0.02	<0.1	<0.1	**0.14**
MW-3 (CFTG)	13/06/2014	Further north of CFTG in the potential new FTG area	to be confirmed		**0.22**	<0.02	<0.02	**0.22**	<0.02	<0.02	<0.02	<0.02	<0.1	<0.1	<0.1	**0.22**	**0.22**	<0.02	<0.02	**0.22**	<0.02	<0.02	<0.1	<0.1	**0.22**	**0.22**	<0.02	<0.02	<0.1	<0.1	**0.22**
HIA well-01	16/12/2016	Site F - Utas Building - Open Well, east of HA19	no		**0.02**	**0.18**	<0.002	**0.02**	**0.18**	**0.18**	<0.002	<0.002	<0.005	<0.005	<0.005	**0.2**	**0.02**	**0.18**	<0.002	**0.02**	**0.18**	<0.002	<0.005	<0.005	**0.2**	**0.02**	**0.18**	<0.002	<0.005	<0.005	**0.2**
HA-19	18/08/2015	Close to Site D (PSI), south of MFS	no		----	**0.41**	<0.02	----	**0.41**	**0.41**	<0.02	<0.02	<0.1	<0.1	<0.1	----	----	**0.41**	<0.02		**0.41**	<0.02	<0.1	<0.1	----	----	**0.41**	<0.02	<0.1	<0.1	----
HA-20	18/08/2015	South of Airport, along Surf Rd, 700m SW of DG6	no		----	**1.13**	<0.02	----	**1.13**	**1.13**	<0.02	<0.02	<0.1	<0.1	<0.1	----	----	**1.13**	<0.02		**1.13**	<0.02	<0.1	<0.1	----	----	**1.13**	<0.02	<0.1	<0.1	----
HA-21	18/08/2015	South of Site H (PSI)	no		----	**0.28**	<0.02	----	**0.28**	**0.28**	<0.02	<0.02	<0.1	<0.1	<0.1	----	----	**0.28**	<0.02		**0.28**	<0.02	<0.1	<0.1	----	----	**0.28**	<0.02	<0.1	<0.1	----
HA-22	18/08/2015	North of Site H (PSI), south of Sinclair Ck, within saltmarsh	yes		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
HA-23	18/08/2015	NE of airport, west of Site J (PSI)	no		----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
				Min	0.0089	0.0138	<0.0005	0.0089	0.014	0.0138	<0.0005	<0.0005	<0.001	<0.001	<0.001	0.0227	0.0089	0.0138	<0.0005	0.0089	0.0138	<0.0005	<0.001	<0.001	0.0227	0.0089	0.014	<0.0005	<0.001	<0.001	0.0227
				Max	329	3040	83.7	329	3040	3040	83.7	83.7	6.49	27.6	27.6	534	329	3040	83.7	329	3040	83.7	6.49	27.6	534	329	3040	83.7	6.49	27.6	534

Legend	
	grey shading indicates the specific criteria are not applicable to these sample locations
999	value exceeds nominated criterion
0.09	criterion value is lower than laboratory LOR
220	bold value indicates result is > LOR
<20	less than value indicates results is less than the LOR
LOR	Laboratory Limit of Reporting

References:	
GHD, 2015 =	US EPA Fact Sheet – PFOA & PFOS Drinking Water Health Advisories (US EPA, May 2016), referenced in Interim Screening Levels from Managing PFC Contamination at Airports Interim Contamination Management Strategy and Decision Framework (GHD, June 2015)
enHealth, 2016	enHealth Statement: Interim national guidance on human health reference values for per- and poly-fluoroalkyl substances for use in site investigations in Australia (enHealth, June 2016)
WHO, 2008 =	Petroleum Products in Drinking Water – Background document for Development of WHO Guidelines for Drinking-water Quality, WHO, 2008
WHO, 2005 =	Petroleum Products in Drinking Water – Background document for Development of WHO Guidelines for Drinking-water Quality, WHO, 2005
ANZECC =	ANZECC National Water Quality Management Strategy – Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000)
NHMRC =	National Health and Medical Research Council, Investigation Levels for Drinking Water (2011)
FSANZ, 2017 =	FSANZ = Food Standards Australia New Zealand - Toxicity reference values in Health Based Guidance Values for PFAS, Department of Health, Australian Government, 2017

Appendix L – Photographs of Investigation Locations

Plates: Photographs of Sampling Locations

Photograph	Description
Surface Water Sampling – 16 December 2016	
	HIA01-W Water channel appears empty, however there was a depth of water within the grasses which was flowing and allowed for sampling.
	HIA03A-W
	HIA04-W
	HIA05-W

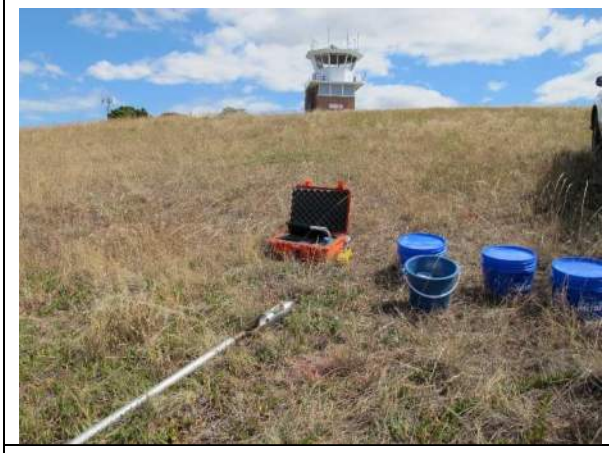
Photograph	Description
	HIA07-W Note Taswater wastewater discharge pipe with the yellow painted end, in the center of the photograph. Also note pink surface weed cover.
	HIA09-W Sinclair Creek discharge point to 5 Mile Beach
	HIA10-W Small white patches were noted floating on the water at this location.
	HIA12-W Note dense surface pink weed growth

Photograph	Description
	HIA13-W Note concrete slabs / blocks which frame the channel. This area is on the eastern end of the former large backfilled pond (Site E).
	HIA16-W Additional site sampled adjacent to a gravel roadway. Frogs and tadpoles were noted in the water and grasses.
	HIA17-W Note Sinclair Creek is in the foreground and the channel coming from the top right of the photograph is a 'tributary' to Sinclair Creek and drains from the car parking areas and hire car backup parking areas.
	HIA18-W Note, this sampling location was moved westwards due to disturbance to the channel of Sinclair Creek. Drainage along the creek had been blocked to capture possible sediment runoff from roadworks (visible in the background). Water from Sinclair Creek was being pumped from the up-gradient side of the temporary dam to the downgradient side. This sample was taken up-gradient of the temporary dam.
No photograph	HIA19-W

Photograph	Description
Sediment Sampling – 16 December 2016	
	HIA11-SED
	HIA14-SED
	HIA15-SED Sediment was taken from within the concrete stormwater channel.
	HIA20-SED

Photograph	Description
	HIA21-SED

Photograph	Description
Soil Sampling – 14 to 16 February 2017	
No photograph	BH001 to BH004 – Site H – (Former) Landfill A
	BH005 – Site L
	BH006 – Site L
No photograph	BH007 – Site L
	BH008 – Site L
No photograph	BH009 – Site L

Photograph	Description
	BH010 – Site L
	BH011 – Site F
No photograph	BH012 – Site F
	BH013 – Site F
	BH014 – Site I

Photograph	Description
	BH015 – Site I
	BH016 – Site I
	BH017 – Site A Immediately north-north-west of the MFS
	BH018 – Site A Immediately east-north-east of MFS and near the fire truck garage

Photograph	Description
	BH019 – Site A Immediately east-north-east of MFS
	BH020 – Site A Immediately south-south-east of MFS and next to firefighting practice tower.
	BH021 – Site A South east of MFS and across taxiway
	BH022 – Site B Outside the fenced area of the CFTG, in the forested area east of the CFTG and close to the previously used wastewater sprinkler area

Photograph	Description
	BH023 – Site B Note sprinkler in centre of photograph. It remains from the old network of wastewater disposal sprinklers used at the time for dispersal of excess water from the CFTG
	BH024 – Site B Outside the fenced area of the CFTG, in the forested area east of the CFTG
	BH025 – Site B Outside the fenced area of the CFTG, in the forested area east of the CFTG
	BH026 – Site B Outside the fenced area of the CFTG; Smoke House is visible to the RHS.
No photograph	BH027 – Site B

Photograph	Description
	BH028 – Site B South-western corner within the fenced area of the CFTG
	BH029 – Site B South-eastern corner within the fenced area of the CFTG
No photograph	BH030 – Site B

Photograph	Description
Open Well – Groundwater Grab Sample – 16 December 2016	
	HIA-Well01-W View from above.
	HIA-Well01-W View from the site; note well is 'uncapped' and as such also collects rainwater.
Groundwater Bores Waste Soil Disposal – 16 February 2017	
	Flush finished collar of new Groundwater Well DG-8. Sands spread and compacted around the perimeter of the collar consist of waste soils from drilling DG-8 and DG-7. Contractor Allscape Landscaping handled the disposal under SEMF instructions based on soil waste classification results and approval from the AEO and HIAPL.