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**PRELIMINARY SITE ASSESSMENT - CFA  
REGIONAL TRAINING GROUNDS**

**Independent Fiskville  
Investigation**

**Submitted to:**

Professor Robert Joy  
Chair - Independent Fiskville Investigation  
PO Box 915  
Gisborne  
VIC 3437

REPORT

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PSA

**Distribution:**

Professor Robert Joy - 1 copy  
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### **APPENDIX B**

CFA Bangholme Historical Information Review

### **APPENDIX C**

CFA Gippsland Historical Information Review

### **APPENDIX D**

CFA Wangaratta Historical Information Review

### **APPENDIX E**

CFA Northern District Historical Information Review

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CFA Wimmera Historical Information Review

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CFA Western District Historical Information Review

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Limitations



### 1.0 INTRODUCTION

Golder Associates Pty Ltd (Golder Associates) was engaged by the *Independent Fiskville Investigation* to undertake a Preliminary Site Assessment (PSA) at the following six Country Fire Authority (CFA) Regional Training Grounds (the Sites) across Victoria in April 2012.

- CFA Bangholme Campus;
- CFA Gippsland Fire Training Complex;
- CFA Wangaratta Training Ground;
- CFA Northern District Training Ground;
- CFA Wimmera Field Training Ground; and
- CFA Western District Training Ground.

The work undertaken was consistent with our proposal (P17613413-001-P-Rev0) dated 13 December 2011 and addendum letter (117613201-007-P-Rev0) dated 29 March 2012.

Your attention is drawn to the document - "Limitations", which is included in Appendix H of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

### 2.0 OBJECTIVE

The objective of the PSA was to assess potential sources of contamination on the Sites associated with current and historical activities and to undertake preliminary assessment of the risks posed by potential contamination.

### 3.0 SCOPE OF WORKS

In order to achieve our objective, the following scope of works was undertaken and is described within this report:

- Completion of a desktop study of information that was available at the time of the PSA, related to the Sites including regional topography, geology, hydrogeology and local planning scheme and zoning;
- Review of regulatory agency records and relevant historical documents that were available at the time of PSA, including previous reports completed for the Sites;
- Review of available historical aerial photography for the Sites;
- A site walkover by a Golder Associates representative at each of the Sites;
- Preparation of a report that summaries the findings of the desktop study and site walkover, and includes a preliminary conceptual site model (CSM) which describes potential contaminant sources, pathways and receptors at each of the Sites; and
- A summary of common themes observed across all of the Sites.



No intrusive sampling works were undertaken as part this PSA. The site walkovers were intended to provide an initial review of the potential for contamination at the Sites and were not intended to be a detailed review of site operations. A review of the history of each site and immediate surrounding land uses was conducted in general accordance with the requirements outlined in the Australian Standard AS4482.1-2005 "Guide to the sampling and investigation of potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds".

## **4.0 BANGHOLME CAMPUS**

### **4.1 General Site Details**

The general site details are listed in Table 1.

**Table 1: General Site Details; Bangholme**

<b>Summary Information</b>	<b>Details</b>
Property Name	Bangholme Campus (also known as South East Training Ground)
Site Address	Corner Thompsons Rd and Worsley Rd, Bangholme, Victoria
Legal Description	Lot 1 PS504590, 808 Thompsons Rd, Carrum Downs
GIS Coordinates of Site Centroid (MGA94,)	340290, 5784675
Site Area (Approximate)	8 Hectares
Site Owner	CFA
Site Age	CFA have operated a training ground at the Site since 1993.
Description of Key Site Activity	The Site operates as a training ground for emergency response and incident management. The Site is primarily used by members of the CFA. However personnel from other public organisations and private industry also receive training at the Site.

The Site is located on the corner of Thompsons Road and Worsley Road, Carrum Downs, Victoria, approximately 40 km south east of Melbourne, Victoria. A site location plan which includes the Site boundary is presented as Figure 1 - Site Location Plan in Appendix A.

### **4.2 Environmental Site Setting**

The environmental site setting is summarised in Table 2.



**Table 2: Environmental Site Setting; Bangholme**

Summary Information	Details
Topography	The land surface surrounding the Site is mostly flat, with an elevation of approximately 10 m above sea level. Port Phillip Bay is approximately 5.5 km west of the Site. No significant topographical features were identified within the vicinity of the Site. Generally, the landform for the area slopes westerly towards Port Phillip Bay.
Nearby Surface Water Bodies	The Site is within Carrum Swamp and there are number of drainage channels and stormwater culverts surrounding the Site. The following surface water bodies <sup>1</sup> were identified in the vicinity of the Site: <ul style="list-style-type: none"><li>■ Banyan Retarding basin, 2.3 km south east;</li><li>■ Boggy Creek, 2.3 km south west;</li><li>■ Edithvale-Seafood Wetland, 3.0km south west;</li><li>■ Patterson River, 3.7 km west; and</li><li>■ Port Phillip Bay 5.5 km west.</li></ul>
Surface Water Segment	The State Environment Protection Policy (SEPP) Waters of Victoria (WoV, 2003) indicates the Site is located within the Cleared Hills and Coastal Plains Segment and the beneficial uses to be protected within this Segment are outlined in the SEPP.
Regional Geology	The Site is underlain by Quaternary swamp deposits consisting of peaty clay and clay deposits <sup>2</sup> . This unit is likely to overlay the Baxter Sandstone formation, which is typically found to have ferruginous sandstone, sands, sandy clays and occasional gravels.
Regional Hydrogeology	The Baxter Sandstone Aquifer is considered to be the principle aquifer unit at the Site. Groundwater in this area is expected to be encountered between 3 m and 10 m below ground level (bgl) <sup>3</sup> . However it should be noted that the Site is within the Carrum Swamp and the watertable within the swamp deposits may be closer to the surface. Regional groundwater flow direction is inferred to be westerly towards Port Phillip Bay.
Groundwater Segment	Groundwater quality within the water table aquifer in the region of the Site is expected to be between 1,001 mg/L to 3,500 mg/L total dissolved solids (TDS) <sup>4</sup> . The SEPP Groundwaters of Victoria (GoV (1997)), classifies this TDS concentration as Segment B and states that the following Beneficial Uses will be protected within this segment: <ul style="list-style-type: none"><li>■ Maintenance of ecosystems;</li><li>■ Potable mineral water supply;</li><li>■ Irrigation and stock watering;</li><li>■ Industrial water use; and</li><li>■ Buildings and Structures.</li></ul>

<sup>1</sup> Department of Sustainability and Environment (DSE) *Water Resources Data Warehouse*.

<sup>2</sup> Geological Survey of Victoria, *Cranbourne*, 1:63,360 Mapsheet.

<sup>3</sup> Melbourne Groundwater Map

<sup>4</sup> Melbourne Groundwater Map





Summary Information	Details
Regional Groundwater Use	<p>A total of 9 groundwater bores are located within a 2 km radius of the Site<sup>5</sup>. The nearest bore is 1.2 km north east of the Site and is used for irrigation. A further 65 groundwater bores are located within 2 to 5 km radius of the Site. The bores within 5 km of the Site are registered for the following uses:</p> <ul style="list-style-type: none"><li>■ Domestic water supply;</li><li>■ Stock water supply;</li><li>■ Industry;</li><li>■ Irrigation;</li><li>■ Groundwater observation;</li><li>■ Fire fighting/sports/general; and</li><li>■ Public/town water supply.</li></ul>
Inferred Groundwater Flow	<p>The regional flow direction is inferred to be westerly, towards Port Phillip Bay.</p>

### 4.3 Historical Information Review

A review of available regulatory agency records and historical site information was undertaken to identify historical activities which had the potential to contaminate the Site.

Regulatory agency records reviewed included the EPA priority site register, statutory environmental audits and the Victorian Aboriginal Heritage Register. Historical site information reviewed included certificates of title, historical aerial photographs and previous assessment reports provided by CFA. A summary of the information which was reviewed as part of this PSA is provided in Appendix B.

### 4.4 Site Walkover

Golder Associates conducted a site walkover on 16 April 2012. The Site walkover was conducted by a representative from Golder Associates, who was accompanied a representative of the Independent Fiskville Investigation and CFA site representative's. Weather was dry and warm during the Site walkover.

The Site layout and infrastructure recorded during the Site walkover is summarised in Table 3. Information of chemical storage and use was also recorded during the Site walkover and is summarised in Table 4. Observed visual evidence of contamination was noted and potential contaminant sources, pathways and receptors were reviewed. The Site layout at the time of the site walkover is presented in Figure 2 – Current Site Layout Plan in Appendix A.

<sup>5</sup> Department of Primary Industries, Geovic Database



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**Table 3: Site Layout & Infrastructure; Bangholme**

Summary Information	Details		
Surrounding Land Use	North: Worsley Road beyond which is Thompson Road and Eastern Sward Golf Course. This golf course is adjacent to the Melbourne Water Eastern Treatment Plant.		
	South: Melbourne Water Eastern Treatment Plant.		
	East: East Link tollway, beyond which is open paddocks.		
	West: Melbourne Water Eastern Treatment Plant.		
Site Coverage (% Hard standing, gravel, grass etc)	The Site surface is covered by approximately 50% bitumen or concrete hard standing, 40% grass and 10% gravel.		
Site Description	<p>Administration and training buildings are located in the north eastern portion of the Site. The north western portion of the Site is understood to be leased to Driver Education Centre Australia (DECA). The Fire Training Area (FTA) occupies the central and southern portion of the Site. The Site was previously owned by Chelsea &amp; Frankston Sewer Authorities and therefore 12 water storage tanks are located in the centre of the Site. Two of these tanks are now used for recirculated water storage, 4 are used as training props and 5 are disused. Fire training props are stored along the western site boundary and in the south western corner of the Site. A storage building, 'rubble pile' and a train and train line (which are fire training props) are also located in this area. The main FTA is located in the south eastern portion of the Site and consists of a Gas Pad, Extinguisher Pad, Flammable Liquid Pad (FLP), Fire Attack Building, Confined Space Training Building and associated infrastructure. A number of Maintenance &amp; Storage Buildings are also located in this area of the Site. Key site infrastructure and features are described in detail below. The FTA, particularly where chemicals are stored and used, was focused on during this PSA as this area may contain potential sources of contamination</p>		
Key Site Infrastructure	Area Name	Use	
	Administration & Training Buildings	Offices, classrooms and amenities for staff and trainees.	
	Water Storage Tanks	2 tanks with a volume of 1 million litres used for the storage and treatment of recirculated water used in fire fighting training exercises.	
	Fire Training Area (FTA)	Gas Pad	Fire fighting training on props lit with LNG (liquid natural gas). Water is used to extinguish fires. The area is sealed with concrete.
		Extinguisher Pad	Small volumes of a petrol and Jet A1 fuel mix are used for fire fighting training on the Extinguisher Pad. The fuel mix is ignited in metal trays and fire extinguishers are used to extinguish the fires. The extinguishers are filled with Angus Fire Tridol ATF 3-6% (Tridol) foam. The material data sheet for this foam indicates this foam does not contain Perfluorooctyl Sulfonate (PFOS) or Perfluorooctanoic Acid (PFOA). The area is sealed with concrete.
		Flammable Liquid Pad (FLP)	Fire fighting training at props lit with a petrol and Jet A1 fuel mix. The props are plumbed into the fuel lines. Water is used to extinguish fires. The area is sealed with a concrete bund.
		Prop Storage Area	Area used for the storage of fire fighting props including cars.
Urban Search		Two disused water storage tanks are used for urban	



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	and Rescue	search and rescue. It is understood that no flammable liquids/gases or extinguisher foams are used in these tanks.			
	Props	Various fire training props are located around the FTA. The props are mainly on sealed areas however some props were observed to be on unsealed ground.			
	Train Prop	Train and Train Line prop used for training exercises. It is understood that no flammable liquids/gases or foams are used in this area.			
	Transformer Prop Area	A number of transformers which are training props are located on unsealed ground.			
	Fire Attack Building	Building used for fire training exercises. It is understood that straw is the only fuel used in this building and water is used to extinguish fires. The building base is sealed with concrete.			
	Tarr Pitt	Converted water storage tank used for fire fighting training purposes. Straw is the only fuel used in this building and water is used to extinguish fires. The building base is sealed with concrete.			
	Temple of Doom	Converted water storage tank used for breathing apparatus training. Only theatrical smoke is used in this building. It is understood that no flammable liquids/gases or extinguisher foams are used in this building. The building base is sealed with concrete.			
	Confined Space Training Building	Building used for confined space training. It is understood that no flammable liquids/gases or extinguisher foams are used in this building.			
	ASTs	Four Above Ground Storage Tanks (ASTs) are used to store flammable liquids (petrol, diesel & Jet A1) onsite and are located within a concrete bund. Further information is provided in Table 4.			
	Interceptor	Three oil/water interceptors are located within the FTA.			
	Hazmat Shed	Shed used for the storage of hazardous materials including flammable fuels, hydraulic oils and paints. The shed is located within a concrete bund.			
	Maintenance & Storage Buildings	Various buildings used for the maintenance and storage of equipment.			
	SES Building	Building used by the SES for training. No flammable liquids/gases or extinguisher foams are used in this building.			
	BA Building	Building used for the cleaning of breathing apparatus.			
	Amenities Building	Amenities building for staff and trainees on FTA.			
	First Aid Building	First Aid building for staff and trainees.			
Evidence of Staining	Hydrocarbon staining was evident in the bund surrounding the petrol and Jet A1 ASTs. Staining was also evident on the FLP which has a sealed concrete surface.				
Vegetation Condition	No issues identified.				
General Housekeeping	General site housekeeping appears to be good, although housekeeping in some areas such as the maintenance and storage buildings and prop storage area, such as general tidiness of the buildings and storage areas, could be improved.				
Oil/Water Interceptor Capacity	<b>No</b>	<b>Age</b>	<b>Capacity</b>	<b>Emptied</b>	<b>Discharge Point</b>
	1	1993	unknown	Annually	Re-circulated onto FLP



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	2	1993	unknown	Annually	Interceptor 3
	3	1993	unknown	Annually	Culvert on northern site boundary which flows in a westerly direction.
General Site Drainage System & Discharge Point	<p>Stormwater from the northern and south western portions of the Site and fire fighting water from the Gas Pad is collected and stored onsite in 2 water storage tanks which have a capacity of 1 million litres.</p> <p>Water in these tanks is recirculated as fire fighting water in the FTA.</p> <p>Both tanks have an automated treatment system which monitor the water's microbial levels and injects chlorine as required.</p> <p>Stormwater collected in the eastern portion of the Site (east of the FLP and Extinguisher Pad), drains directly offsite into roadside culverts along the eastern site boundary.</p>				
FTA Drainage System & Discharge Point	<p>Fire fighting water from the FLP and Extinguisher Pad, drains into an oil/water interceptor which is treated with chlorine before storage in a tank adjacent to the interceptor. Water in this storage tank is recirculated as fire fighting water on the FLP. When this storage tank is full, water can be directed through a second oil/water adjacent to the First Aid room and then through a third interceptor near the Administration Building before discharging into a roadside culvert along the northern site boundary.</p>				
Site Water Supply – General Use	Water in the Administration & Training Buildings is supplied by mains town water.				
Site Water Supply – FTA Use	Recirculated water from water storage tanks.				
Water Bores Onsite	No known water bores onsite.				
Props used in Fire Training	<p>Straw, untreated pallets and wood are used as props onsite.</p> <p>Debugged cars (chemicals (oil, hydraulic fuels etc)) have been drained from cars before use as fire fighting props. Miscellaneous props are stored in the Prop Storage Area onsite.</p>				
Waste Management	<p>Burnt out cars are collected by Sims Metals for scrap metal.</p> <p>All other props are fully burnt so no disposal required.</p>				

Areas where chemicals are stored and used were focused on during this PSA, as these areas may contain potential sources of contamination. Information provided by site representatives during the Site walkover, relating to chemical storage and use is summarised in Table 4.



**Table 4: Chemical Storage & Use; Bangholme**

Flammable Fuels Currently Used Onsite	LNG is the main fuel used in the FTA. Petrol, Jet A1 and diesel are also used onsite.							
Flammable Fuels Historically Used Onsite	A petrol and diesel mix was used in fire training exercises until the late 1990's but it was replaced by Jet A1 because Jet A1 was found to be a 'cleaner' fuel and diesel was reported to give trainees dermatitis.							
Areas where Flammable Liquids are used	Petrol (from AST 2&3) and Jet A1 (from AST 4) are mixed in a 2:1 ratio (in a tank within the bund) and are used in the FLP. Small volumes of Petrol and Jet A1 are placed in 10 L jerry cans and are poured into trays on the Extinguisher Pad. Diesel (from AST 1) is only used to fuel a water pump located south west of the water storage tanks and to fuel tractors onsite.							
Fuel Storage Information	<b>AST/UST</b>	<b>Tank No.</b>	<b>Fuel Type</b>	<b>Tank Volume (L)</b>	<b>Age (yr)</b>	<b>Tank Type</b>	<b>Concrete Bund Condition</b>	<b>Annual Vol Used (L)</b>
	AST	1	Diesel	1,200	1993	Metal	Good	unknown
	AST	2	Petrol	1,200	1993	Metal	Poor	9,000
	AST	3	Petrol	1,200	1993	Metal	Poor	
	AST	4	Jet A1	4,500	1993	Metal	Poor	9,000
Condition of Fuel Storage Areas	A hole was observed in the concrete bund surrounding the petrol and Jet A1 ASTs (ASTs 2,3&4). The bund was generally in poor condition.							
Evidence of Staining in Fuel Storage Areas	The concrete bund surrounding the petrol and Jet A1 ASTs was stained. The concrete base of the FLP was also stained. A hydrocarbon sheen was visible on water in the bund.							
Decommissioned UST/ASTs Used Onsite	No decommissioned Underground Storage Tanks (USTs) or ASTs were reported to be onsite.							
Fuel Lines (Above/Below Ground)	The Diesel AST (AST 1) is directly filled and an above ground fuel line runs to the diesel pump for the water reticulation system. Petrol AST (AST 2&3) and Jet A1 ASTs (AST 4) fuel lines are located underground to the fuel 'control booth' and then above ground to the props.							
Fuel Dispensing Pumps	No fuel dispensing pumps are located onsite.							
Fuel Storage System Testing	It was reported that Fuelquip pressure tests the fuel lines on an annual basis. The results of this testing were not reviewed in this preliminary assessment.							
Fire Fighting Foams Currently Used Onsite	Tridol is used in fire extinguishers on the Extinguisher Pad. However water is generally used to extinguish fires in the FTA.							
Fire Fighting Foams Historically Used Onsite	Extinguisher foams 3M AFFF, ATC and Protein were used approximately 6 years ago. The 3M AFFF extinguisher foam was withdrawn from the market in 2000 as it contained PFOS and PFOA.							
Chemicals Currently Stored & Used Onsite	Approximately 2 kg of sodium metal is stored in paraffin oil in the maintenance workshop. 'Bioguard' is used to sterilise breathing apparatus. Small volumes of vehicle maintenance chemicals (engine oils, brake fluid) and paints are stored onsite							
Chemicals Historically Stored & Used Onsite	Magnesium shavings were previously stored and used onsite.							
History of Chemical Spills Onsite	It was reported that the petrol and Jet A1 ASTs have been overfilled on occasion. Specific details of the incidents, volumes and responses were not available.							

## 4.5 Preliminary Conceptual Site Model

A preliminary CSM has been developed for the Site from the available desktop study information combined with site observations and is described below.



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### Potential Sources

Potential contamination sources observed at the Site are outlined in Table 5 and are shown on Figure 2 – Current Site Layout Plan in Appendix A.

**Table 5: Potential Contamination Sources; Bangholme**

Source	Number	Area of Interest	Details	Primary Contaminants of Interest
Potential leaks/spills from the flammable liquid fuel storage tanks and related infrastructure	1	ASTs	The petrol and Jet A1 ASTs were reportedly overfilled on occasion. Heavy staining and a hole were observed in the bund surrounding these ASTs.	Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylbenzene and Xylene (BTEX); Polycyclic Aromatic Hydrocarbons(PAH); Heavy metals
Potential spills of flammable liquids at fire training props	2	Flammable Liquid Pad	It was noted that flammable liquid training was conducted within a concrete bund, although contamination could potentially migrate through cracks in the concrete.	TPH, BTEX, PAH, heavy metals
Potential spills of fire fighting foams at fire training props	3	Extinguisher Pad	Tridol is now used as an extinguisher onsite, however 3M AFFF was previously used onsite. It was noted that extinguisher training was conducted on a sealed concrete surface, although contamination could potentially migrate through cracks in the concrete.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA
Potential spills of sump oil during 'debugging of cars' in prop area	4	Prop Storage Area	Car props are stored along the western site boundary in an unsealed area.	TPH, BTEX, PAH, heavy metals
Potential spill of contaminated oil from transformer props.	5	Transformer Prop Area	A number of transformer 'props' are located on unsealed ground near the FLP, it is unknown if these transformers have been tested for PCBs.	Polychlorinated biphenyls (PCBs), PAH, TPH
Potentially contaminated recirculated fire fighting water used on the FLP.	6	Fire fighting water on the FLP and Extinguisher Pad	Fire fighting water on the FLP and Extinguisher Pad is recirculated thus could potentially be impacted with Contaminants of Interest. It is noted that 3M AFFF foam is no longer used onsite but PFOS and PFOA may still be present as they are Persistent Organic Pollutants (POPs).	TPH, BTEX, PAH, heavy metals, PFOS and PFOA



### Potential Pathways

Potential exposure pathways identified at the Site are outlined in Table 6.

**Table 6: Potential Pathways; Bangholme**

Pathway	Details
<b>Human Health</b>	
Ingestion of contaminated soils/dust	It is noted that no stained soil was observed during the Site walkover. However heavy staining was observed in the petrol and Jet A1 bund. Therefore ingestion, dermal contact and inhalation are potential exposure pathways for this area.
Dermal contact with contaminated soils and dust	
Inhalation of contaminated dusts and vapours	
Ingestion of contaminated fire fighting water on FLP and Extinguisher Pad.	As fire fighting water on the FLP and Extinguisher Pad is recirculated; ingestion, dermal contact and inhalation of contaminated fire fighting water are potential pathways.
Dermal contact and ingestion of contaminated fire fighting water on FLP and Extinguisher Pad.	
Inhalation of contaminated fire fighting water on FLP and Extinguisher Pad.	
<b>Environmental</b>	
Vertical migration through soils in the vadose zone	Surface contamination could migrate vertically through soils in the vadose zone.
Lateral migration through groundwater	A potential pathway to groundwater may exist as groundwater is expected to be shallow in the vicinity of the Site.
Migration within stormwater culverts, drains, underground utility trenches	A potential pathway may exist along stormwater culverts located on the northern and eastern site boundaries and also along underground utility trenches onsite.
Stormwater runoff not collected in stormwater collection system	A potential pathway may exist in the eastern portion of the FLP, where stormwater drains are located directly to the adjacent culvert.



**Potential Receptors**

Potential receptors identified at the Site are outlined in Table 7.

**Table 7: Potential Receptors; Bangholme**

Receptor	Details
<b>Human Health - Onsite</b>	
Site staff	Staff who regularly work in the Fire Training Area are likely to be the primary potential human health receptors.
Training instructors and trainees	
Maintenance personnel	
<b>Human Health – Off-site</b>	
Residential	<p>The potential for migration to these receptors is considered low for the following reasons:</p> <ul style="list-style-type: none"> <li>■ No residential properties were identified within 50 m of the Site,</li> <li>■ The nearest surface water body (which could be used for consumption and primary contact recreation) is 2.3 km south west of the Site; and</li> <li>■ The nearest groundwater abstraction bore is 1.2 km north east of the Site.</li> </ul>
Users of nearby surface water	
Users of groundwater in the area	
<b>Environmental - Onsite</b>	
Groundwater underlying the Site;	Groundwater underlying the site may be a potential receptor as groundwater is expected to be shallow in the vicinity of the Site.
Terrestrial flora and fauna	Although on-site ecological receptors (such as terrestrial flora and fauna) may exist, the receptors are likely to be 'highly modified' considering the Site land use is Industrial.
<b>Environmental - Off-site</b>	
Nearby surface water bodies	Fire fighting water for the FLP is discharged into a roadside culvert along the northern site boundary, when the storage tank is full. This culvert will ultimately drain into nearby surface water bodies. The potential for contamination to migrate to these surface waters via the culvert is considered low as the nearest water course is 2.3 km south west of the Site.
Off-site ecological receptors (such as aquatic and terrestrial flora and fauna)	Although off-site ecological receptors (such as aquatic and terrestrial flora and fauna) may exist, the receptors are likely to be 'highly modified' considering the Melbourne Water Eastern Treatment Plant (Industrial land-use) is located to the north, south and west of the Site.





## **4.6 Conclusions**

Golder Associates has undertaken a PSA of the Bangholme Campus.

As the majority of the active chemical use areas of the FTA are sealed with concrete or bitumen, the potential for contaminated soil onsite to pose an unacceptable risk to human health and ecological receptors is considered low. However there is a risk that contaminated soil including material below pavements may act as a source of groundwater contamination.

Fire fighting water on the FLP and Extinguisher Pad is recirculated and thus could potentially be impacted with Contaminants of Interest. Whilst an assessment of human health risks associated with the use of recirculated fire fighting water at the Site was previously undertaken by Wynsafe (2005, 2007) this assessment did not include a consideration of Contaminants of Interest associated with flammable liquids and extinguisher foams. Further information of this assessment is provided in Appendix B.

## **4.7 Recommendations**

Golder Associates recommends that a targeted soil assessment is conducted in the vicinity of the Flammable Liquids Pad, ASTs, Extinguisher Pad, Prop Storage Area and Transformer Prop Area. The results of this assessment should be used to determine if a groundwater assessment is required at the Site.

It is recommended that fire fighting water quality on the FLP and Extinguisher Pad is assessed for Contaminants of Interest associated with flammable liquids and extinguisher foams.

As the oil/water interceptor discharges directly into a culvert along the northern site boundary, it is recommended that an assessment of water quality at the interceptor discharge point is undertaken to assess if there is the potential for adverse environmental impact.



## 5.0 GIPPSLAND FIRE TRAINING COMPLEX

### 5.1 General Site Details

The general site details are listed in Table 8.

**Table 8: General Site Details; Gippsland**

Summary Information	Details
Property Name	Gippsland Fire Training Complex (also known as East Central Zone Training Centre, West Sale Training Centre and West Sale Field Training Ground)
Site Address	Cnr Princess Hwy & Cowarr Rd, Fulham, Victoria
Legal Description	Lot 102 PS616255, Mortimer Drive, Fulham
GIS Coordinates of Site Centroid (MGA94, )	496295, 5783150
Site Area	11 Hectares
Site Owner	CFA currently lease the Site from Wellington Shire Council.
Site Age	CFA have operated a training ground at the Site since 1992. CFA used the Site jointly with National Safety Council of Australia (NSCA) between 1986 and 1991.
Description of Key Site Activity	The Site operates as a training ground for emergency response and incident management. The Site is primarily used by members of the CFA. However personnel from other public organisations and private industry also receive training at the Site.

The Site is located on the corner of Princess Highway and Cowarr Road, Fulham, Victoria, approximately 12 km west of Sale and 210 km east of Melbourne, Victoria. A site location plan which includes the Site boundary is presented as Figure 3 - Site Location Plan in Appendix A.

### 5.2 Environmental Site Setting

The environmental site setting is summarised in Table 9.



**Table 9: Environmental Site Setting; Gippsland**

Summary Information	Details
Topography	The land surface surrounding the Site slopes gently south to south east towards the La Trobe River, with an elevation of approximately 20 m above sea level. The Thompson River is located 4.5 km north east of the Site and runs from north west to south east. The La Trobe River is located 5.5 km south of the Site and runs from west to east. A quarry is located 2.3 km south west of the Site along the Princes Highway.
Nearby Surface Water Bodies	The following surface water bodies <sup>6</sup> were identified in the vicinity of the Site: <ul style="list-style-type: none"> <li>■ Thompson River, 4.5 km east – north east.</li> <li>■ La Trobe River, 5.5 km south</li> <li>■ Nambrok Creek (tributary of La Trobe River) 7km West</li> <li>■ 'Gippsland Central Drain No.4', which is assumed to be an artificial water body, is located 2.2 km north of the Site.</li> </ul>
Surface Water Segment	The State Environment Protection Policy (SEPP) Waters of Victoria (WoV, 2003) indicates Thompson River and La Trobe River are located within the 'Cleared Hills and Coastal Plains' Segment and the beneficial uses to be protected within this Segment are outlined in the SEPP.
Regional Geology	The site appears to be located in the vicinity of a geological interface between the Tertiary age 'Haunted Hills Gravels' formation and a Quaternary age fluvial gravels, sands and silts <sup>7</sup> . The Haunted Hills Gravels formation consists of bedded fluvial sediments, typically ferruginous sand, sands, silts and gravels. It is understood the geological base unit at the Site is of the La Trobe Valley Group which is found to predominantly consist of quartz and kaolinitic-deltaic sediments.
Regional Hydrogeology	The Haunted Hills formation is considered the principle aquifer for the region <sup>8</sup> . The La Trobe Valley group is also considered an aquifer unit at the Site. Groundwater is expected to be encountered within 5m bgl in the vicinity of the Site <sup>9</sup> . Regional groundwater beneath the Site is inferred to flow south easterly towards Bass Strait.
Groundwater Segment	Groundwater quality within the water table aquifer in the region of the Site is expected to be between 500 mg/L to 1,000 mg/L TDS <sup>10</sup> . The SEPP (GoV (1997)), classifies this TDS concentration as Segment A2 and states that the following Beneficial Uses will be protected within this segment: <ul style="list-style-type: none"> <li>■ Maintenance of ecosystems;</li> <li>■ Potable and mineral water supply;</li> <li>■ Irrigation and stock watering;</li> <li>■ Industrial water use; and</li> <li>■ Buildings and Structures.</li> </ul>

<sup>6</sup> Department of Sustainability and Environment (DSE) *Water Resources Data Warehouse*.

<sup>7</sup> Geological Survey of Victoria, Sale, 1:250,000 Mapsheet.

<sup>8</sup> Department of Conservation and Natural Resources DCNR (1995), "*Victorian Groundwater Beneficial Use Map Series, Eastern Victoria Water Table Aquifers*", 1995.

<sup>9</sup> Southern Rural Water, "*South Eastern Victoria Watertable Aquifer Depth to Groundwater*".

<sup>10</sup> Department of Conservation and Natural Resources DCNR (1995), "*Victorian Groundwater Beneficial Use Map Series, Eastern Victoria Water Table Aquifers*", 1995.



Summary Information	Details
Regional Groundwater Use	<p>A total of 13 groundwater bores are located within 2 km of the Site<sup>11</sup>. Three bores are located onsite; Bore 1 is used to supply fire fighting water to the Site, Bore 2 is a groundwater observation bore installed by the Department of Sustainability and Environment DSE and Bore 3 appears to be disused. The nearest bore to the Site is 1.1 km south west of the Site, the use of this bore is unknown. The next nearest bore to the Site is 1.3 km south west of the Site and is used for domestic and stock water supply</p> <p>A further 25 groundwater bores are located within 2- 5 km of the Site. The bores within 5 km of the Site are registered for the following uses:</p> <ul style="list-style-type: none"><li>■ Domestic and stock water supply;</li><li>■ Stock/poultry water supply;</li><li>■ Irrigation; and</li><li>■ Groundwater observation.</li></ul>
Inferred Groundwater Flow	The regional flow direction is inferred to be south easterly towards Bass Strait.

### 5.3 Historical Information Review

A review of available regulatory agency records and historical site information was undertaken to identify historical activities which had the potential to contaminate the Site.

Regulatory agency records reviewed included the EPA priority site register, statutory environmental audits and the Victorian Aboriginal Heritage Register. Historical site information reviewed included certificates of title, historical aerial photographs and previous assessment reports provided by CFA. A summary of the information which was reviewed as part of this PSA is provided in Appendix C.

### 5.4 Site Walkover

Golder Associates conducted a site walkover on 17 April 2012. The site walkover was conducted by a representative from Golder Associates, who was accompanied by a representative of the Independent Fiskville Investigation and CFA site representative's. Weather was dry and warm during the Site walkover.

The Site layout and infrastructure recorded during the Site walkover is summarised in Table 10. Information of chemical storage and use was also recorded during the Site walkover and is summarised Table 11. Observed visual evidence of contamination was noted and potential contaminant sources, pathways and receptors were reviewed. The site layout at the time of the site walkover is presented in Figure 4 – Current Site Layout Plan in Appendix A.

<sup>11</sup> Department of Primary Industries, Geovic Database



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 10: Site Layout & Infrastructure; Gippsland**

Summary Information	Details		
Surrounding Land Use	North: Agricultural land.		
	South: Mortimer Drive, with the Melbourne – Bairnsdale Railway, the Princess Highway and agricultural land beyond.		
	East: West Sale Airport and Gippsland Flight Centre.		
	West: Sale – Cowwarr Road with agricultural land beyond.		
Site Coverage (% Hard standing, gravel, grass etc)	The site surface is covered by approximately 40% grass, 30% forestry, 20% hard standing and 10% gravel.		
Site Description	<p>Administration and training buildings are located in the south western portion of the Site. A confined space training area and a number of maintenance and storage buildings are also located in this portion of the Site. The FTA generally occupies the eastern portion of the Site and consists of a Gas Pad, Extinguisher Pad, Fire Attack Building, Breathing Apparatus Building and associated infrastructure. Several fire training props are located within the FTA. A dam which is used to store recirculated fire fighting water is located within the FTA. A storage area for the storage of miscellaneous items and gravel is located in the north western corner of the Site. Grass paddocks with 2 dams are also located in the northern portion of the Site. A soft wood plantation and dam is located in the western portion of the Site. Soil mounds are located north west of the Administration building. Key site infrastructure and features are described in detail below. The FTA, particularly where chemicals are stored and used, was focused on during this PSA as this area may contain potential sources of contamination.</p>		
Site Infrastructure	<b>Area Name</b>	<b>Use</b>	
	Administration & Training Building	Offices, classrooms and amenities for staff and trainees.	
	Maintenance & Storage Buildings	Various buildings used for the maintenance and storage of equipment.	
	Fire Training Area	Gas Pad	Fire fighting training with props lit with Liquid Petroleum Gas (LPG). Water is used to extinguish fires in this area. The area is sealed with concrete.
		Extinguisher Pad	Small volumes of a petrol and Jet A1 fuel mix are used for fire fighting training on the Extinguisher Pad. The fuel mix is ignited in metal trays and fire extinguishers are used to extinguish the fires. The extinguishers are filled with Tridol foam. The area is sealed with concrete.
		Fire Attack Building	Building used for fire fighting training purposes. It is understood that straw is the only fuel used in this building and water is used to extinguish fires. The building is sealed with concrete.
BA Building		Building used for breathing apparatus training. It is understood that no flammable liquids/gases or extinguisher foams are used in this building. The	



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

			area is sealed with concrete. The building is sealed with concrete.			
		Interceptor	One oil/water interceptor is located within the FTA.			
		ASTs	Four ASTs are used to store flammable liquids/gases onsite. One disused diesel AST is also located onsite. Further details are provided in Table 11.			
		Hazmat Shed	Shed used for the storage of hazardous materials including flammable fuels, hydraulic oils and paints. The shed is located within a concrete bund.			
		Props	Various fire training props are located around the FTA. The props are mainly on sealed areas however some props were observed to be on unsealed ground.			
		Dam	A dam within the FTA used to store recirculated fire fighting water. The water is pumped from the dam by a diesel powered water pump located south of the dam.			
	Storage Area	Area used for the storage of miscellaneous items and gravel.				
	Paddocks	Cattle were observed in the paddock north of the Storage Area.				
	Dams	Two dams are located in the northern portions of the Site. It is understood that these dams are not connected to the FTA and are reportedly used for stock watering.				
	Soft Wood Plantation	Area where soft wood trees have been planted. A dam is located in this area but it is understood that it is not connected to the FTA.				
	Soil Mounds	Soil mounds are located north west of the Administration Building. It was reported that these are mounds of stockpiled soil which was excavated from the original FTA in approximately 1998.				
	Confined Space Training Area	Area used for confined space training.				
Evidence of Staining	<p>A small amount of staining was evident in the petrol AST bund.</p> <p>Staining was also evident around fire training props in the FTA, including on grass underlying metal trays and car props north of the BA Building.</p>					
Vegetation Condition	Generally vegetation onsite was in good condition although staining was noted on grass to the north of the BA Building.					
General Housekeeping	General site housekeeping appears to be good although housekeeping in some areas such as the Storage Area could be improved.					
Oil/Water Capacity	Interceptor	<b>No</b>	<b>Age</b>	<b>Capacity (L)</b>	<b>Emptied</b>	<b>Discharge Point</b>
		1	1998	3,500	When full (annually)	Adjacent Dam



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General Site Drainage System & Discharge Point	Stormwater collected onsite, drains offsite via a 6 inch stormwater drain which discharges into a paddock north of the Site near the Thompson River. The adjacent West Sale Airport also discharges to the same point.
FTA Site Drainage System & Discharge Point	Water collected on the FTA flows through the onsite oil/water interceptor before discharging into the dam, where it is recirculated for use on the FTA. It is understood that no water from FTA is discharged off-site.
Site Water Supply – General Use	Water in the Administration & Training Buildings is supplied by mains water from Sale.
Site Water Supply – FTA Use	Water on the FTA is pumped from the onsite dam using a diesel fuelled pump which is housed adjacent to the dam. The water in the dam is a combination of recirculated fire fighting water and bore water from the water bore no. 1 located north west of the BA Building.
Bores Onsite.	Three bores were observed onsite during the Site walkover. Bore 1, which is used to supply water to the FTA, is reportedly 30 m deep and was not installed by CFA. Bore 2 appears to be a groundwater observation bore, installed by the DSE. The depth and diameter of this bore is unknown. Bore 3 appeared to be disused, the depth and diameter of this bore is unknown.
Props used in Fire Training	Straw, untreated pallets and wood are used as props onsite. Debugged cars are also used as props onsite. It was noted that no miscellaneous props (such as cars) appeared to be stored onsite other than those in use as props.
Waste Management	Burnt out cars are removed from site by a scrap metal company. Generally other props are fully burnt so no disposal required, however municipal solid waste is occasionally brought to the local landfill.

Areas where chemicals are stored and used were focused on during this PSA, as these areas may contain potential sources of contamination. Information provided by site representatives during the Site walkover, relating to chemical storage and use is summarised Table 11.



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 11: Chemical Storage & Use; Gippsland**

Flammable Fuels Currently Used Onsite	LPG is mainly used onsite for fire training purposes. Petrol and Jet A1 are used for fire training purposes. Diesel is only used as fuel for the water pump & tractors.							
Flammable Fuels Historically Used Onsite	A petrol and diesel mix was used in fire training exercises until 1994. Small volumes of flammable liquids from various sources may have been used onsite prior to 1998. Since 1998, only hydrocarbons have been used for fire training purposes.							
Areas where Flammable Liquids are used	Small volumes of petrol (from AST 1) and Jet A1 (from 200L drums) are mixed in a 2:1 ratio in 10L jerry cans and are poured into metal trays on the Extinguisher Pad and trays within props around the FTA. e.g. cars and trays near the BA Building. Diesel (from AST 2) is only used to fuel a water pump located south west of the water storage tanks and to fuel tractors onsite. It is not used for fire training purposes.							
Fuel Storage Information	<b>AST/UST</b>	<b>Tank No.</b>	<b>Fuel Type</b>	<b>Tank Volume (L)</b>	<b>Age (yr)</b>	<b>Tank Type</b>	<b>Bund Present</b>	<b>Area Sealed</b>
	AST	1	Petrol	700	1991	Metal	Yes	Yes
	AST	2	Diesel	1,400	1991	Metal	No	No
	AST	3	LPG	unknown	1991	Metal	No	Yes
	AST	4	LPG	unknown	1991	Metal	No	Yes
AST	5	Diesel Disused	unknown	1991	Metal	Yes	Yes	
Condition of Fuel Storage Areas	Cracks were observed in the base of the concrete bund around the petrol AST (from AST 1). Jet A1 is stored in 200L drums on a concrete pad adjacent to the petrol AST bund. The diesel AST (from AST 2) which fuels the water pump is on a concrete slab but it is not within a concrete bund. No cracks or staining were observed on the concrete slab.							
Evidence of Staining in Fuel Storage Areas	A small amount of staining was evident on the concrete base of the petrol AST bund.							
Decommissioned UST/ASTs Used Onsite	No decommissioned USTs were reported to be onsite. One disused diesel AST (from AST 5) is located with the petrol AST bund.							
Dispensing Pumps	No fuel dispensing pumps are located onsite.							
Fuel Lines (Above/Below Ground)	LPG lines are below ground from the LPG AST to the Gas Pad. The petrol AST is directly filled and there are no underground fuel lines connected to this AST. The diesel AST is direct filled and an above ground fuel line runs to the water pump.							
Fuel Storage System Testing	It was reported that the LPG system is tested on an annual basis by ELGAS. The results of this testing were not reviewed in this preliminary assessment. As the remaining lines are above ground, they are not tested.							
Fire Fighting Foams Currently Used Onsite	Tridol is used in fire extinguishers on the Extinguisher Pad. Small volumes of the Class-A foam "First Class" are also used onsite. However, generally recirculated water from the dam is used to extinguish fires in the FTA.							
Fire Fighting Foams Historically Used Onsite	Class B foams - 3M AFFF, ATC and '4 X Span' were used historically onsite.							
Chemicals Currently Stored & Used Onsite	Approximately 20 L of 'Round-Up' which is a herbicide is stored onsite. It is used to control weeds in roadways and the FTA area. Small volumes of vehicle maintenance chemicals (engine oils, brake fluid) and paints are stored onsite.							
Chemicals Historically Stored & Used Onsite	No other chemicals are known to have been stored onsite.							
History of Chemical Spills Onsite.	There were no known chemicals spills onsite.							
Additional Information	It is understood the concrete pad in FTA has been replaced in the last 6 months, as the previous pad was in poor condition.							





It was reported during the site walkover, that when fire fighting training first commenced onsite, it was conducted on unsealed ground where the current FTA concrete pad is located. It is understood that flammable liquids were poured into two Fire Training Pits, which were 0.5 m deep and 6 m wide. One pit was round and the other was 'clover' shaped. The pits were originally clay lined but they were subsequently replaced with metal trays. Approximately 50m<sup>3</sup> of soil was excavated from the pits and the surrounding area in approximately 1998. The excavated soil was subsequently stockpiled in the mounds located north west of the Administration buildings. A further 50m<sup>3</sup> of soil was excavated from the FTA dam around this time and was stockpiled in the same area. However Golder Associates were not provided with a report which documented this soil excavation and stockpiling.

The stockpiled soils were reportedly recently sampled and analysed by Hazcon. However this report was not made available to Golder Associates during this assessment.

## **5.5 Preliminary Conceptual Site Model**

A preliminary CSM has been developed for the Site from the available desktop study information combined with site observations and is described below.

### **Potential Sources**

Potential contamination sources identified at the Site are outlined in Table 12 and are shown on Figure 4 – Current Site Layout Plan in Appendix A.



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 12: Potential Contamination Sources; Gippsland**

Source	Number	Area of Interest	Details	Contaminants of Interest
Potential leaks/spills from the flammable liquid fuel storage tanks and related infrastructure	1	ASTs	A small amount of staining was observed in the concrete bund surrounding the petrol AST and cracks were evident in the base of the bund. The diesel AST is not surrounded with a concrete bund.	TPH, BTEX, PAH, heavy metals
Potential spills of flammable liquids at fire training props	2	Flammable Liquid Props	Staining was observed around flammable liquid fire training props in the FTA including on grass underlying trays and car props north of the BA Building. It is noted that historical information indicates that the FTA was unsealed between 1991-1998. Soil from this original FTA was reportedly excavated and stockpiled in soil mounds north west of the Administration Buildings.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA
Potential spills of fire fighting foams at fire training props	3	Extinguisher Pad	Tridol is now used as an extinguisher onsite, however 3M AFFF was previously used onsite. It is noted that extinguisher training is conducted on a sealed concrete surface, however contamination could potentially migrate through cracks in the concrete. Also, flammable liquid training was conducted on an unsealed surface from 1991 until 1998.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA
Potentially contaminated mounds of soils, north west of the Administration buildings	4	Soil Mounds	These mounds consist of soil that was excavated from the FTA dam in approximately 1998. As flammable liquids from various sources may have been used onsite prior to 1998, several contaminants of interest may be present in this area.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA, Volatile Organic Compounds (VOC) and Semi-Volatile Organic Compounds (SVOC), PCB
Potentially contaminated recirculated fire fighting water.	5	Recirculated Fire Fighting Water from Dam.	Water collected on the FTA flows through the onsite oil/water interceptor before discharging into dam, where it is recirculated for use on the FTA. It is noted that only small volumes of flammable liquids are currently used on the FTA. Also 3M AFFF foam is no longer used onsite but residual contaminant of PFOS and PFOA may be present as they are POPs.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA



### Potential Pathways

Potential exposure pathways identified at the Site are outlined in Table 13.

**Table 13: Potential Pathways; Gippsland**

Pathway	Details
<b>Human Health</b>	
Ingestion of contaminated soils/dust	Stained soil was observed around several fire training props during the Site walkover. Therefore ingestion, dermal contact and inhalation are potential exposure pathways in these areas and soil mounds.
Dermal contact with contaminated soils and dust;	
Inhalation of contaminated dusts and vapours	
Ingestion of contaminated fire fighting water on FTA.	As fire fighting water on the FTA is recirculated; ingestion, dermal contact and inhalation of contaminated fire fighting water are potential pathways.
Dermal contact with contaminated fire fighting water on FTA.	
Inhalation of contaminated fire fighting water on FTA.	
<b>Environmental</b>	
Vertical migration through soils in the vadose zone.	Surface contamination and contaminants in the soil mounds could migrate vertically through soils in the vadose zone.
Lateral migration through groundwater.	A potential pathway to groundwater may exist as groundwater is expected to found within 5 m bgl in the vicinity of the Site and chemicals were historically used on sealed surfaces/pits. Three groundwater bores are also located onsite.
Migration within stormwater culverts, drains, underground utility trenches	A potential pathway may exist along the 6 inch stormwater drain which discharges into a paddock north of the Site near the Thompson River and also along underground utility trenches onsite.



**Potential Receptors**

Potential receptors identified at the Site are outlined in Table 14.

**Table 14: Potential Receptors; Gippsland**

Receptor	Details
<b>Human Health - Onsite</b>	
Site staff	Staff who work regularly in the Fire Training Area are likely to be the primary potential human health receptors.
Training instructors and trainees	
Maintenance personnel	
<b>Human Health – Off-site</b>	
Residential	<p>The potential for migration to these receptors is considered low for the following reasons:</p> <ul style="list-style-type: none"> <li>■ No residential properties were identified within 50 m of the Site,</li> <li>■ The nearest surface water body (which could be used for consumption and primary contact recreation) is 4.5 km north east of the Site; and</li> <li>■ The nearest identified off-site groundwater abstraction bore is 1.2 km north east of the Site.</li> </ul>
Users of nearby surface water	
Users of groundwater in the area	
<b>Environmental - Onsite</b>	
Groundwater underlying the Site;	Groundwater underlying the site may be a potential receptor as groundwater is expected to be found 5 m bgl in the vicinity of the Site.
On-site ecological receptors (such as terrestrial flora and fauna)	As there is a soft wood plantation, paddock and 2 dams on the Site, which may attract wildlife, there is the potential for onsite contamination to impact on flora and fauna. However any receptors are likely to be 'highly modified' considering the current land use is industrial.
<b>Environmental - Off-site</b>	
Nearby surface water bodies	Whilst stormwater systems discharge to the north of the Site near Thompson River, the potential for contamination to migrate to this receptor is considered low as the nearest surface water body is 4.5 km north east of the Site.
Off-site ecological receptors (such as terrestrial flora and fauna)	As the Site is located within a rural area, there is the potential for onsite contamination to impact on flora and fauna off-site. However any receptors are likely to be 'highly modified' considering the surrounding land use.



## **5.6 Conclusions**

Golder Associates has undertaken a PSA of the Gippsland Fire Training Complex.

As the majority of the operational areas of the FTA are sealed with concrete, the potential for contaminated soil in this area to pose an unacceptable risk to human health is considered low. However stained soil underlying fire training props and the soil mounds may pose a potential source of risk to human health and ecological receptors. Also as the FTA was unsealed between until 1998, the underlying soil may be impacted and could act as a source of groundwater contamination.

Fire fighting water on the FTA is recirculated and thus could potentially be impacted with Contaminants of Interest. Whilst an assessment of human health risks associated with the use of recirculated fire fighting water at the Site was previously undertaken by Wynsafe (2005, 2007), this assessment did not include a consideration of Contaminants of Interest associated with flammable liquids and extinguisher foams. Further information of this assessment is provided in Appendix C.

## **5.7 Recommendations**

Golder Associates recommends that a targeted soil assessment is conducted in the vicinity of the ASTs, Flammable Liquid Fire Training Props, Extinguisher Pad and Soil Mounds. The results of this assessment should be used to determine if a groundwater assessment is required at the Site. It is recommended that groundwater quality in the 3 groundwater bores is assessed for Contaminants of Interest associated with flammable liquids and extinguisher foams.

Finally it is recommended that fire fighting water quality on the FTA is assessed for the relevant Contaminants of Interest.



## 6.0 WANGARATTA TRAINING GROUND

### 6.1 General Site Details

The general site details are listed in Table 15.

**Table 15: General Site Details; Wangaratta**

Summary Information	Details
Property Name	Wangaratta Training Ground (as known as Wangaratta Field Training Ground and Region 23 Training Area)
Site Address	Shanley Street, Wangaratta, Victoria
Legal Description	Lot 2 PS436313, Shanley Street, Wangaratta
GIS Coordinates of Site Centroid (MGA94)	435490, 5974030
Site Area	1 Hectare
Site Owner	CFA lease the Site from Wangaratta Rural City Council.
Site Age	CFA have conducted fire training at the Site since 1986.
Description of Key Site Activity	The Site operates as a training ground for emergency response and incident management. The Site is primarily used by members of the CFA. However personnel from other public organisations and private industry also receive training at the Site.

The Site is located off Shanley Street, Wangaratta, Victoria, approximately 250km north east of Melbourne, Victoria. A site location plan which includes the Site boundary is presented as Figure 5 - Site Location Plan in Appendix A.



## 6.2 Environmental Site Setting

The environmental site setting is summarised in Table 16.

**Table 16: Environmental Site Setting; Wangaratta**

Summary Information	Details
Topography	The land surface surrounding the Site gently slopes towards Three Mile Creek, with an elevation of approximately 150 m above sea level. Three Mile Creek is located on the eastern and north eastern site boundary and flows in a south east to north west direction towards the Ovens River and the Murray River. Fifteen Mile Creek joins Three Mile Creek 1.2 km south east of the Site. Warby Range State Park is located 5 km south west of the Site.
Nearby Surface Water Bodies	The following surface water bodies <sup>12</sup> were identified in the vicinity of the Site: <ul style="list-style-type: none"> <li>■ Three Mile Creek is directly adjacent to the Site and flows from south to north;</li> <li>■ Fifteen Mile Creek, 1.2 km south east; and</li> <li>■ Ovens River, approximately 5 km north.</li> </ul>
Surface Water Segment	The SEPP (WoV, 2003) indicates the Ovens River is within the 'Murray and Western Plains' Segment and the beneficial uses to be protected within this Segment are outlined in the SEPP.
Regional Geology	The site is located on Quaternary age river sediments known as the Shepparton Formation <sup>13</sup> . This unit typically consists of clay, silt, sand and minor gravel deposits. It is understood that this unit is further underlain by Tertiary clays, Permian mudstone and sandstone and cross-bedded Lower Carboniferous sandstones and mudstones.
Regional Hydrogeology	The Shepparton Formation is considered to be the principle aquifer unit at the Site and for the surrounding area <sup>14</sup> . Local audit information from Wangaratta indicates groundwater was encountered between 8 m and 19 m bgl in the vicinity of the Site. Also the watertable underlying the site may be closer to the surface as Three Mile Creek is adjacent to the Site.
Groundwater Segment	Groundwater quality within the water table aquifer in the region of the Site is expected to be between 1,001 mg/L to 3,500 mg/L TDS <sup>15</sup> . The SEPP (GoV (1997)), classifies this TDS concentration as Segment B and states that the following Beneficial Uses will be protected within this segment: <ul style="list-style-type: none"> <li>■ Maintenance of ecosystems;</li> <li>■ Potable mineral water;</li> <li>■ Irrigation and stock watering;</li> <li>■ Industrial water use; and</li> <li>■ Buildings and Structures.</li> </ul>
Regional Groundwater Use	A total of 7 groundwater bores are located within 2 km radius of the Site <sup>16</sup> . The nearest bore is 1 km south west of the Site and is used for stock and poultry supply. A further 235 groundwater bores are located within a 2 to 5 km radius of the Site. The bores within 5 km of the Site are registered for the following uses:

<sup>12</sup> Department of Sustainability and Environment (DSE) *Water Resources Data Warehouse*.

<sup>13</sup> Geological Survey of Victoria, *Wangaratta*, 1:50,000 Mapsheet

<sup>14</sup> Department of Conservation and Natural Resources DCNR (1995), "*Victorian Groundwater Beneficial Use Map Series, Eastern Victoria Water Table Aquifers*", 1995.

<sup>15</sup> Department of Conservation and Natural Resources DCNR (1995), "*Victorian Groundwater Beneficial Use Map Series, Eastern Victoria Water Table Aquifers*", 1995

<sup>16</sup> Department of Primary Industries, Geovic Database.



Summary Information	Details
	<ul style="list-style-type: none"><li>■ Domestic (main use);</li><li>■ Stock/poultry water supply;</li><li>■ Public/town water supply;</li><li>■ Irrigation;</li><li>■ Industry;</li><li>■ Investigation; and</li><li>■ Fire fighting/sports/general.</li></ul>
Inferred Groundwater Flow	Shallow groundwater flow onsite is expected to be north easterly towards the Three Mile Creek. Deeper regional groundwater beneath the Site is expected to flow north towards the Ovens River.

### 6.3 Historical Information Review

A review of available regulatory agency records and historical site information was undertaken to identify historical activities which had the potential to contaminate the Site.

Regulatory agency records reviewed included the EPA priority site register, statutory environmental audits and the Victorian Aboriginal Heritage Register. Historical site information reviewed included certificates of title, historical aerial photographs and previous assessment reports provided by CFA. A summary of the information which was reviewed as part of this PSA is provided in Appendix D.

### 6.4 Site Walkover

Golder Associates conducted a site walkover on 18 April 2012. The site walkover was conducted by a representative from Golder Associates, who was accompanied by a representative of the Independent Fiskville Investigation and a CFA site representative. Weather was dry and warm during the Site walkover.

The Site layout and infrastructure recorded during the Site walkover is summarised in Table 17. Information of chemical storage and use was also recorded during the Site walkover and is summarised Table 18. Observed visual evidence of contamination was noted and potential contaminant sources, pathways and receptors were reviewed. The site layout at the time of the site walkover is presented in Figure 6 – Current Site Layout Plan in Appendix A.





## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 17: Site Layout & Infrastructure; Wangaratta**

Summary Information	Details		
Surrounding Land Use	North: MacKay Sausage Casing Factory is north west of the Site, Three Mile Creek to the north east.		
	South: Waste water treatment dams which are understood to be connected to the Livestock Yards.		
	East: Three Mile Creek, with the North-Eastern railway line beyond.		
	West: Livestock Yards of the Wangaratta Livestock Exchange		
Site Coverage (% Hard standing, gravel, grass etc)	The Site surface is covered in approximately 80% gravel, 10% hard standing and 10% grass and trees.		
Site Description	Administration and training buildings are located in the centre of the Site. The FTA generally occupies the southern portion of the Site and consists of a Gas Pad, Extinguisher Pad, Flammable Liquid Pad, BA Building, Fire Attack Buildings and associated infrastructure. Several fire training props are located within the FTA. Key site infrastructure and features are described in detail below. The FTA, particularly where chemicals are stored and used, was focused on during this PSA as this area may contain potential sources of contamination.		
Site Infrastructure	Area Name	Use	
	Administration & Training Buildings	Offices, classrooms and amenities for staff and trainees.	
	Fire Training Area	Gas Pad	Fire fighting training with props which are lit with LPG. Water is used to extinguish fires in this area. The area is sealed with concrete.
		Extinguisher Pad	Small volumes of a petrol and kerosene mix are used for fire fighting training on the Extinguisher Pad. The fuel mix is ignited in metal trays and fire extinguishers are used to extinguish the fires. The extinguishers are filled with Tridol foam. The area is unsealed.
		Fire Attack Buildings	Buildings used for fire fighting training purposes. It is understood that straw is the only fuel used in this building and water is used to extinguish fires. The building is sealed with concrete.
		BA Building	Building used for storage and cleaning of breathing apparatus.
		Interceptor	One oil/water interceptor is located within the FTA.
		Props	Various fire training props are located around the FTA. The props are mainly located on unsealed ground.
		ASTs	Two AST are used to store LPG onsite.
		Water Storage Tank	Underground tank for storing fire fighting water.
	Containers	A number of empty shipping containers are located on the FTA and in the northern portion of the Site.	
Storage & Maintenance Buildings	Various buildings used for the storage and maintenance of equipment.		
Hazmat Container	Container used for the storage of hazardous material, including flammable fuels, hydraulic oils and paints.		



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

	Storage Area	Yard used for the storage of miscellaneous items.			
Evidence of Staining	No visible evidence of staining onsite.				
Vegetation Condition	Generally vegetation onsite was in good condition, no issues were identified onsite.				
General Housekeeping	General site housekeeping appears to be good, although housekeeping in some areas such as the Storage Yard could be improved, such as general tidiness of the storage yard.				
Oil/Water Interceptor Capacity	<b>No</b>	<b>Age</b>	<b>Capacity (L)</b>	<b>Maintenance</b>	<b>Discharge Point</b>
	1	1999	3 x 1,000	Annually	Three Mile Creek
General Site Drainage System & Discharge Point	A drainage system is installed in the FTA. The remainder of the Site does not have a drainage system as the surface is unsealed.				
FTA Site Drainage System & Discharge Point	Water collected on the FTA flows through the oil/water interceptor before it is discharged into Three Mile Creek.				
Site Water Supply – General Use	Water to the Administration & Training Buildings is supplied by mains water from Wangaratta.				
Site Water Supply – FTA Use	Water in the FTA is supplied by mains water from Wangaratta. Water in the low pressure hydrant system is supplied directly by mains water. Water in high pressure hydrant system is stored in an underground water tank before pumping around the FTA under pressure.				
Water Bores Onsite	There are no known water bores onsite.				
Props used in Fire Training	Straw, untreated pallets and wood are used as props onsite. Debugged cars are also used.				
Waste Management	Burnt out cars are removed from the Site by a scrap metal company (Tomo's Scrap Metal). Empty fuel drums and foam containers are collected onsite before collection and disposal arranged by the CFA. Generally other props are fully burnt so no disposal is required.				

Areas where chemicals are stored and used were focused on during this PSA, as these areas may contain potential sources of contamination. Information provided by site representatives during the Site walkover, relating to chemical storage and use is summarised Table 18.



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 18: Chemical Storage & Use; Wangaratta**

Flammable Fuels Currently Used Onsite	<p>LPG is mainly used onsite for fire training purposes. Petrol and kerosene, which are stored in the Hazmat container, are mixed in a 1:1 ratio in 10L jerry cans and used for fire training purposes on the Extinguisher Pad and at other props around the FTA. Diesel is only used as fuel for pumps &amp; tractors. It is not used for fire training purposes. 2 LPG ASTs are located onsite; AST 1 fuels the Gas Pad, while AST 2 fuels the Administration Building.</p>							
Flammable Fuels Historically Used Onsite	<p>A petrol and diesel mix was used in fire training exercises until 2000. Unknown substances from a local dry cleaner and veterinarian laboratory may have been used onsite when it first opened.</p>							
Areas where Flammable Liquids are used	<p>Small volumes of petrol and kerosene are mixed in a 1:1 ratio in 10 L jerry cans and are poured into metal trays on the Extinguisher Pad. The Extinguisher Pad is on an unsealed area, although no staining was observed in this area.</p>							
Fuel Storage Information	<b>AST/UST</b>	<b>Tank No.</b>	<b>Fuel Type</b>	<b>Tank Volume (kg)</b>	<b>Age (yr)</b>	<b>Tank Type</b>	<b>Bund Present</b>	<b>Area Sealed</b>
	AST	1	LPG	4500	1999	Metal	No	No
	AST	2	LPG	2000	1999	Metal	No	No
	<p>Petrol, kerosene and diesel are stored onsite in 205 L drums in a Hazmat container. There are no flammable liquids ASTs onsite.</p>							
Condition of Fuel Storage Areas	<p>The Hazmat container which stores the 205 L drums of petrol, kerosene and diesel appeared to be in good condition. The LPG tank appeared to be in good condition.</p>							
Evidence of Staining	<p>No staining was observed around the fuel storage areas.</p>							
Decommissioned UST/ASTs Used Onsite	<p>No decommissioned USTs or ASTs were reported to be onsite. However a flammable liquid UST was reportedly installed onsite in 1987 and was removed in 1998. This UST was located in the south eastern corner of the Site. However Golder Associates were not provided with a report which documented this removal.</p>							
Dispensing Pumps	<p>There are no dispensing pumps onsite.</p>							
Fuel Lines (Above/Below Ground)	<p>LPG lines are below ground from the AST to the Gas Pad.</p>							
Fuel Storage System Testing	<p>It was reported that the LPG system is tested on an annual basis by ELGAS. The results of this testing were not reviewed in this preliminary assessment</p>							
Fire Fighting Foams Currently Used Onsite	<p>Tridol is currently used onsite in the fire extinguishers trays.</p>							
Fire Fighting Foams Historically Used Onsite	<p>3M AFFF was used historically onsite. Small volumes of Class A foam was used onsite in the 1990s.</p>							
Chemicals Currently Stored & Used Onsite	<p>Small volumes of vehicle maintenance chemicals (engine oils, brake fluid) and paints are stored onsite.</p>							
Chemicals Historically Stored & Used Onsite	<p>Magnesium filings and sodium metal were previously used in small quantities onsite.</p>							
History of Chemical Spills Onsite.	<p>No known chemical spills onsite.</p>							
Other Information.	<p>A transformer which is used as a prop is located onsite in the FTA. This transformer has reportedly never been tested for PCBs. However as this transformer is located on an 'electrical pole'. It is unlikely to impact on identified receptors in its current location.</p>							
	<p>Reportedly soil in the south eastern area of the FTA was removed between 1996 and 1998. It was reported that all topsoil removed from the training area and car park was removed and the UST was removed. A stockpile of removed soil reportedly required 'sterilisation'. No further information regarding the soil removal and 'sterilisation' was made available to Golder Associates during this investigation.</p>							
	<p>The site is liable to flooding during heavy rainfall.</p>							



## 6.5 Preliminary Conceptual Site Model

A preliminary CSM has been developed for the Site from the desktop study information combined with site observations and is described below.

### Potential Sources

Potential contamination sources identified at the Site are outlined in Table 19 and shown on Figure 6 – Current Site Layout Plan in Appendix A.

**Table 19: Potential Contamination Sources; Wangaratta**

Source	Number	Area of Interest	Details	Primary Contaminants of Interest
Potential leaks/spills from the flammable liquid fuel storage tanks and related infrastructure	1	Area of Decommissioned UST	A flammable liquid UST was installed in the south eastern corner of the Site in 1987 and was later removed in 1998. Soil was reportedly excavated from this area between 1996 and 1998. Unknown substances from a local dry cleaner and veterinarian laboratory may have been used on the Site in the 1980's, therefore VOCs, SVOCs and pesticides are potential contaminants of interest on the Site.	TPH, BTEX, PAH, heavy metals, VOC SVOC and pesticides.
Potential spills of flammable liquids at fire training props	2	Flammable Liquid Props	There was no evidence of staining around Flammable Liquids Props, however most props are on unsealed ground.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA
Potential spills of fire fighting foams at fire training props	3	Extinguisher Pad	Tridol is used as an extinguisher onsite, however 3M AFFF was previously used onsite. It is noted that extinguisher training is conducted on an unsealed surface.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA, VOC and SVOC
Potentially contaminated fire fighting water	4	Oil/Water Interceptor	Fire fighting water collected on the FTA flows through the onsite oil/water interceptor before it is discharged into Three Mile Creek.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA



**Potential Pathways**

Potential exposure pathways identified at the Site are outlined in Table 20.

**Table 20: Potential Pathways; Wangaratta**

Pathway	Details
<b>Human Health</b>	
Ingestion of contaminated soils/dust	It is noted that no stained soil was observed during the Site walkover. However as the FTA is unsealed, a potential pathway exists if contaminated soil is present.
Dermal contact with contaminated soils and dust	
Inhalation of contaminated dusts and vapours	
<b>Environmental</b>	
Vertical migration through soils in the vadose zone	Surface contamination could migrate vertically through soils in the vadose zone.
Lateral migration through groundwater	A potential pathway to groundwater may exist as groundwater may be shallow in the vicinity of the Site.
Migration within stormwater culverts, drains underground utility trenches	A potential pathway exists to Three Mile Creek as fire fighting water collected on the FTA flows through the onsite oil/water interceptor before it is discharged into Three Mile Creek. A potential pathway may also exist along underground utility trenches onsite.

**Potential Receptors**

Potential receptors identified at the Site are outlined in Table 21.



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 21: Potential Receptors; Wangaratta**

Receptor	Details
<b>Human Health - Onsite</b>	
Site staff	Staff who work regularly in the Fire Training Area are likely to be the primary potential human health receptors.
Training instructors and trainees	
Maintenance personnel	
<b>Human Health – Off-site</b>	
Recreational users of Three Mile Creek	Recreational users of Three Mile Creek are a potential receptor as the onsite oil/water interceptor discharges into Three Mile Creek.
Residential	<p>Although other off-site human health receptors may exist, the potential for migration to these receptors is considered low for the following reasons:</p> <ul style="list-style-type: none"> <li>■ No residential properties were identified within 50 m of the Site; and</li> <li>■ The nearest groundwater abstraction bore is 1 km south west of the Site.</li> </ul>
Users of groundwater in the area	
Recreational users of nearby surface water bodies	Three Mile Creek flows into the Ovens River approximately 5 km north of the Site. The potential for contamination to migrate to this receptor is considered low given the distance from the Site.
<b>Environmental - Onsite</b>	
Groundwater underlying the Site;	Groundwater may be a potential receptor as groundwater may be shallow in the area of the Site.
On-site ecological receptors (such as terrestrial flora and fauna)	As the Site is adjacent to a creek, which may attract wildlife, there is the potential for onsite contamination to impact on flora and fauna. However any receptors are likely to be 'moderately modified' considering the current land use is industrial.
<b>Environmental - Off-site</b>	
Nearby surface water bodies	Water collected on the FTA flows through the onsite oil/water interceptor before it is discharged into Three Mile Creek. The potential for contamination to migrate to this receptor is considered moderate given the close proximity to the Site. This creek subsequently flows into the Ovens River 5 km north of the Site. The potential for contamination to migrate to this receptor is considered low given the distance from the Site.
Off-site ecological receptors (such as terrestrial, aquatic flora and fauna)	As the Site is adjacent to a creek, which may attract wildlife, there is the potential for onsite contamination to impact on flora and fauna off-site via the defined pathways. However any receptors are likely to be 'moderately modified' considering the current land use is Industrial.



## 6.6 Conclusions

Golder Associates has undertaken a PSA of the Wangaratta Training Ground.

As the majority of the FTA is unsealed, the potential exists for site activities to have resulted in contamination of soil, surface water and groundwater.

The oil/water interceptor discharges directly into Three Mile Creek, therefore there is a direct pathway from the site wastewater treatment system to the creek.

## 6.7 Recommendations

Golder Associates recommends that a targeted soil assessment is conducted in the vicinity of the Decommissioned UST, Flammable Liquid Props and Extinguisher Pad. The results of this assessment should be used to determine if a groundwater assessment is required at the Site.

As the oil/water interceptor discharges directly into Three Mile Creek, it is recommended that an assessment of water quality at the interceptor discharge point is undertaken for Contaminants of Interest.

As fire fighting water is not recirculated onsite, an assessment of fire fighting water quality has not been recommended.

## 7.0 NORTHERN DISTRICT TRAINING GROUND

### 7.1 General Site Details

The general site details are listed in Table 22.

**Table 22: General Site Details; Northern District**

Summary Information	Details
Property Name	Northern District Training Ground (as known as Huntly Training Ground and Bendigo Field Training Ground)
Site Address	29 Caellis Road, Huntly, Victoria
Legal Description	Allotment 5, TP286380, 29 Caellis Road, Huntly
GIS Coordinates of Site Centroid (MGA94)	264030, 5943120
Site Area	18.5 Hectares
Site Owner	CFA
Site Age	CFA have operated a training ground at the Site since 1994.
Description of Key Site Activity	The Site operates as a training ground for emergency response and incident management. The Site is primarily used by members of the CFA. However personnel from other public organisations and private industry also receive training at the Site.

The Site is located at 29 Caellis Road, Huntly, Victoria, approximately 20 km north of Bendigo, Victoria and 170 km north of Melbourne, Victoria.

A site location plan which includes the Site boundary is presented as Figure 7 - Site Location Plan in Appendix A.

### 7.2 Environmental Site Setting

The environmental site setting is summarised in Table 23.



**Table 23: Environmental Site Setting; Northern District**

Summary Information	Details
Topography	The land surface on the Site slopes gently in a southerly direction towards Bendigo Creek, with an elevation of approximately 200 m above sea level.
Nearby Surface Water Bodies	<p>The following surface water bodies<sup>17</sup> were identified in the vicinity of the Site:</p> <ul style="list-style-type: none"> <li>■ Bendigo Creek 200 m south of the Site.</li> </ul> <p>An unnamed stream enters the Site at the north east corner. Topographical maps indicate that this creek previously ran through the Site towards Bendigo Creek. However the stream now drains into an onsite dam created by the CFA. Thus this stream no longer connects to Bendigo Creek except in high rainfall events when the dam may overflow into the adjacent paddock.</p>
Surface Water Segment	The SEPP (WoV, 2003) indicates that creeks and rivers around Huntly are within the 'Murray and Western Plains' Segment, the beneficial uses to be protected within this Segment are outlined in the SEPP.
Regional Geology	The Site is likely to be underlain by three geological units; the Ordovician age Castlemaine Group, the Tertiary age Parilla Sands and the Quaternary age Shepparton Formation <sup>18</sup> . The fluvial stream deposits associated with the Shepparton Formation is inferred to be the main geological unit on site. This formation consists of fine grain sandy clays and silt, and minor gravel deposits. The Parilla Sands underlie the Shepparton Formation and are inferred to outcrop in the north eastern corner of site. This unit typically consist of fluvial deposits; weakly cemented quartz sandstone, pebbly sandstone and mudstone. It is understood this unit is further underlain by the Castlemaine Group and is understood to consist of turbiditic marine sandstone, mudstone, black shale and minor granule quartz conglomerates. This unit is inferred to outcrop at the north western and south eastern corners of the Site.
Regional Hydrogeology	The Shepparton Formation aquifer is considered to be the principle regional water table aquifer underlying the Site <sup>19</sup> . Regional groundwater information from groundwater bores at Ascot indicates groundwater is expected between 5 m and 25 m bgl. Shallow groundwater flow onsite is expected to be south towards the Bendigo Creek. However, the deeper regional groundwater beneath the Site is expected to flow north towards the Murray – Darling basin.
Groundwater Segment	<p>Groundwater quality within the water table aquifer in the region of the Site is expected to be greater than 13,000 mg/L TDS<sup>20</sup>. This TDS concentration classifies underlying groundwater as Segment D for Beneficial Uses and should be protected for the following:</p> <ul style="list-style-type: none"> <li>■ Maintenance of ecosystems;</li> <li>■ Industry; and</li> <li>■ Buildings and Structures.</li> </ul>
Regional Groundwater Use	A total of 2 groundwater bores are located within a 2 km radius of the Site <sup>21</sup> . The nearest bore is 1.3 km south east of the Site and is registered as abandoned. The second bore is 1.7 km south west of the Site and is used for domestic supply. A further 63 groundwater bores are located within a 2 to 5 km radius of the Site. Almost all of the bores within 5 km of the Site are registered for gold mining activities.

<sup>17</sup> Department of Sustainability and Environment (DSE) *Water Resources Data Warehouse*.

<sup>18</sup> Geological Survey of Victoria, *Huntly*, 1:50,000 Mapsheet

<sup>19</sup> Department of Conservation and Natural Resources DCNR (1995), "*Victorian Groundwater Beneficial Use Map Series, North Western Victoria Water Table Aquifers*", 1995.

<sup>20</sup> Department of Conservation and Natural Resources DCNR (1995), "*Victorian Groundwater Beneficial Use Map Series, North Western Victoria Water Table Aquifers*", 1995.

<sup>21</sup> Department of Primary Industries, Geovic Database.





### **7.3 Historical Information Review**

A review of available regulatory agency records and historical site information was undertaken to identify historical activities which had the potential to contaminate the Site.

Regulatory agency records reviewed included the EPA priority site register, statutory environmental audits and the Victorian Aboriginal Heritage Register. Historical site information reviewed included certificates of title, historical aerial photographs and previous assessment reports provided by CFA. A summary of the regulatory agency records and historical information which were reviewed as part of this PSA is provided in Appendix E.

### **7.4 Site Walkover**

Golder Associates conducted a site walkover on 18 April 2012. The site walkover was conducted by a representative from Golder Associates, who was accompanied by a representative of the Independent Fiskville Investigation and CFA site representative's. Weather was dry and warm during the Site walkover.

The Site layout and infrastructure recorded during the Site walkover is summarised in Table 24. Information of chemical storage and use was also recorded during the Site walkover and is summarised Table 25. Observed visual evidence of contamination was noted and potential contaminant sources, pathways and receptors were reviewed. The site layout at the time of the site walkover is presented in Figure 7 – Current Site Layout Plan in Appendix A.



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 24: Site Layout & Infrastructure; Northern District**

Summary Information	Details		
Surrounding Land Use	North: Bush land with a piggery approximately 0.5 km north of the Site.		
	South: Agricultural land		
	East: Agricultural land		
	West: Bush land.		
Site Coverage (% Hard standing, gravel, grass etc)	The site surface is covered in approximately 60% gravel, 30% forestry and 10% hard standing.		
Site Description	<p>Administration and training buildings are located in the eastern portion of the Site. The FTA generally occupies the central portion of the Site and consists of a Gas Pad, Extinguisher Pad, FLP, Fire Attack Buildings, Confined Space Training Buildings, SES Building, Urban Search and Rescue Area and associated infrastructure. Several fire training props are located within the FTA. Props are stored in the south western corner of the Site. Various Maintenance &amp; Storage Buildings and a Hazmat Shed are also located within the FTA. A dam and several water storage tanks are also located onsite. The Site also includes bush land west of the FTA, however this area has not yet been developed. Key site infrastructure and features are described in detail below. The FTA, particularly where chemicals are stored and used, was focused on during this PSA as this area may contain potential sources of contamination.</p>		
Site Infrastructure	Area Name	Use	
	Administration & Training Buildings	Offices, classrooms and amenities for staff and trainees.	
	Fire Training Area	Gas Pad	Fire fighting training with props which are lit with LPG. Water is used to extinguish fires in this area. The area is unsealed.
		Extinguisher Pad	Small volumes of a petrol and Jet A1 fuel mix are used for fire fighting training on the Extinguisher Pad. The fuel mix is ignited in metal trays and fire extinguishers are used to extinguish the fires. The extinguishers are filled with Tridol foam. The area is unsealed.
		FLP	Fire fighting training on props lit with a petrol/Jet A1 fuel mix. The props are plumbed into the fuel lines. Water is used to extinguish fires. The props area is sealed with concrete but the remainder of the FLP is unsealed.
		Fire Attack Building	Building used for fire fighting training purposes. It is understood that straw is the only fuel used in this building and water is used to extinguish fires. The building is sealed with concrete.
		Confined Space Training Building	Confined Space Training only. It is understood that no flammable liquids/gases or extinguisher foams are used in this building.
		Urban Search and Rescue	Area used for urban search and rescue. It is understood that no flammable liquids/gases or extinguisher foams are used in this area.
		Interceptors	Three oil/water interceptors are located within the FTA.
		ASTs	Three ASTs are used to store flammable liquids/gases onsite.
Maintenance &		Various buildings used for the maintenance	



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

	Storage Buildings	and storage of equipment.			
	Storage Area	Area used for the storage of miscellaneous items.			
	Props	Various fire training props are located around the FTA. The props are mainly on unsealed ground.			
	SES Building	Building used by SES for training purposes. It is understood that no flammable liquids/gases or extinguisher foams are used in this building.			
	Hazmat Shed	Shed used for the storage of hazardous materials including flammable fuels, hydraulic oils and paints.			
	Dam	Dam used to supply recirculated fire fighting water.			
	Water Tanks	A number of water tanks are used to store fire fighting water.			
Evidence of Staining	A small amount of staining was evident on gravel adjacent to the FLP. No staining was evident around the fuel storage areas.				
Vegetation Condition	Generally vegetation onsite was in good condition.				
General Housekeeping	General housekeeping onsite was good, although housekeeping around prop storage areas could be improved, such as general tidiness of the storage areas.				
Oil/Water Interceptor Capacity	<b>No</b>	<b>Age</b>	<b>Capacity</b>	<b>Maintenance</b>	<b>Discharge Point</b>
	1	unknown	unknown	When full	Interceptor 2
	2	unknown	unknown	When full	Interceptor 3
	3	unknown	unknown	When full	Onsite Dam
General Site Drainage System & Discharge Point	Stormwater collected onsite drains into the onsite dam. When the dam is full, which was reported to occur only rarely, the dam overflows into a paddock south of the Site. The dam also receives water from a stream north of the Site.				
FTA Site Drainage System & Discharge Point	Water collected on the FTA flows through a series of 3 oil/water interceptors before discharging into the onsite dam, where it is recirculated for use on the FTA. It is understood that no water from FTA is discharged from the Site.				
Site Water Supply – General Use	Water to the Administration & Training Buildings is supplied by mains water from Bendigo.				
Site Water Supply – FTA Use	Water on the FTA is supplied from the onsite dam.				
Water Bores Onsite	There are no known bores onsite.				
Props used in Fire Training	Straw, untreated pallets and wood are used as props onsite. Debugged cars.				
Waste Management	Burnt out cars are collected a scrap metal company. All other props are fully burnt so no disposal required.				

Areas where chemicals are stored and used were focused on during this PSA, as these areas may contain potential sources of contamination. Information provided by site representatives during the Site walkover, relating to chemical storage and use is summarised Table 25.



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 25: Chemical Use & Storage; Northern District**

Flammable Fuels Currently Used Onsite	<p>LPG is mainly used onsite for fire training purposes</p> <p>Petrol from <i>AST 1</i> is plumbed directly into props on the FLP via underground fuel lines.</p> <p>Petrol and diesel (<i>from AST 2</i>) are mixed in a 4:1 ratio in 10 L jerry cans and used for fire training purposes on the Extinguisher Pad and in props around the FTA.</p> <p>Diesel from <i>AST 2</i> is also used as a fuel for water pumps &amp; tractors.</p> <p>Small quantities of Jet A1 and Kerosene are used onsite.</p>							
Flammable Fuels Historically Used Onsite	<p>Only petroleum products. Sometime small volumes of Jet A1 or Kerosene were used onsite.</p>							
Areas where Flammable Liquids are used	<p>Petrol and diesel are mixed in a 4:1 ratio in 10 L jerry cans and poured into trays on the Extinguisher Pad. Small volumes of petrol and diesel are used in trays within props around the Site. Petrol is plumbed directly into the props on the FLP. A small amount of staining was evident on gravel adjacent to the FLP.</p>							
Fuel Storage Information	<b>AST/UST</b>	<b>Tank No.</b>	<b>Fuel Type</b>	<b>Tank Volume (L)</b>	<b>Age (yr)</b>	<b>Tank Type</b>	<b>Bund Present</b>	<b>Area Sealed</b>
	AST	1	Petrol	1,500	2006	Metal	No	No
	AST	2	Diesel	900	2006	Metal	No	No
	AST	3	LPG	unknown	1991	Metal	No	No
Condition of Fuel Storage Areas	<p>The diesel and petrol ASTs are on concrete pads but are not banded and the surrounding areas are unsealed.</p>							
Evidence of Staining	<p>No staining was evident around the fuel storage areas.</p>							
Decommissioned UST/ASTs Used Onsite	<p>No decommissioned USTs or ASTs were reported to be onsite.</p>							
Dispensing Pumps	<p>There is a dispensing pump directly adjacent to the petrol AST.</p>							
Fuel Lines (Above/Below Ground)	<p>LPG fuel lines are below ground from <i>AST 3</i> to the Gas Pad.</p> <p>The petrol (<i>AST 1</i>) is direct filled; an underground fuel line connects the petrol AST to the Flammable Liquid Pad.</p> <p>The diesel (<i>AST 2</i>) is direct filled; an above ground fuel line connects the diesel AST to the water pump which is adjacent to the tank.</p>							
Fuel Storage System Testing/Reconciliation	<p>It was reported that the LPG system is tested annually by ELGAS. The results of this testing were not reviewed in this preliminary assessment. It was reported that the diesel and petrol tanks and lines have not been tested since installation.</p>							
Fire Fighting Foams Currently Used Onsite	<p>Tridol is used onsite. However, generally recycled water from the dam is used to extinguish fires in the FTA.</p>							
Fire Fighting Foams Historically Used Onsite	<p>3M AFFF, ATC and protein were used historically onsite.</p>							
Chemicals Currently Stored & Used Onsite	<p>Approximately 5kg of sodium metal and 2kg of magnesium filings is stored onsite.</p> <p>Approximately 20 L of methanol and kerosene is stored onsite.</p> <p>Small volumes of vehicle maintenance chemicals (engine oils, brake fluid) and paints are stored onsite.</p>							
Chemicals Historically Stored & Used Onsite	<p>No other chemicals were reportedly stored onsite.</p>							
History of Chemical Spills Onsite.	<p>No known chemical spills onsite.</p>							



## 7.5 Preliminary Conceptual Site Model

A preliminary CSM has been developed for the Site from the desktop study information combined with site observations and is described below.

### Potential Sources

Potential contamination sources identified at the Site are outlined in Table 26 and are shown on Figure 8 – Current Site Layout Plan in Appendix A.

**Table 26: Potential Contamination Sources; Northern District**

Source	Number	Area of Interest	Details	Primary Contaminants of Interest
Potential leaks/spills from the flammable liquid fuel storage tanks and related infrastructure	1	ASTs	The diesel and petrol ASTs are on concrete pads but are not banded and the surrounding areas are unsealed. An underground fuel line connects the petrol AST to the FLP. There was no evidence of staining around the ASTs.	TPH, BTEX, PAH, heavy metals
Potential spills of flammable liquids at fire training props	2	Flammable Liquid Pad	Flammable liquid training is conducted on a concrete pad, however staining was observed on gravel adjacent to the FLP.	TPH, BTEX, PAH, heavy metals
Potential spills of flammable liquids at fire training props	3	Flammable Liquid Props	There was no evidence of staining around Flammable Liquids Props, however most props are on unsealed ground.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA
Potential spills of fire fighting foams at fire training props	4	Extinguisher Pad	Tridol is now used as an extinguisher onsite, however 3M AFFF was used previously. The extinguisher area is unsealed. It is noted that there was no evidence of staining on the Extinguisher Pad.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA
Potentially contaminated recirculated fire fighting water.	5	Hydrant water on the FTA. Water in Dam.	Water collected on the FTA flows through the onsite oil/water interceptor before discharging into dam, where it is recirculated for use on the FTA.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA

### Potential Pathways

Potential exposure pathways identified at the Site are outlined in Table 27.



**Table 27: Potential Pathways; Northern District**

<b>Pathway</b>	<b>Details</b>
<b>Human Health</b>	
Ingestion of contaminated soils/dust	Stained gravel was observed around the FLP during the Site walkover. Therefore ingestion, dermal contact and inhalation are potential pathways.
Dermal contact with contaminated soils and dust;	
Inhalation of contaminated dusts and vapours	
Ingestion of contaminated fire fighting water on FTA.	As fire fighting water on the FTA is recirculated; ingestion, dermal contact and inhalation of contaminated fire fighting water are potential pathways.
Dermal contact of contaminated fire fighting water on FTA;	
Inhalation of contaminated fire fighting water on FTA;	
<b>Ecological</b>	
Vertical migration through soils in the vadose zone	Surface contamination could migrate vertically through soils in the vadose zone.
Lateral migration through groundwater	A potential pathway to groundwater may exist as groundwater is expected between 5 m and 25 m bgl in the area of the Site.
Migration within stormwater culverts, drains, underground utility trenches	A potential pathway to Bendigo Creek may exist because overflow from the onsite dam will enter Bendigo Creek during heavy rainfall. Bendigo Creek is 200 m down-gradient of the Site. A potential pathway may also exist along underground utility trenches onsite.



**Potential Receptors**

Potential receptors identified at the Site are outlined in Table 28.

**Table 28: Potential Receptors; Northern District**

Receptor	Details
<b>Human Health - Onsite</b>	
Site staff	Staff who work regularly in the Fire Training Area are likely to be the primary potential human health receptors.
Training instructors and trainees	
Maintenance personnel	
<b>Human Health – Off-site</b>	
Recreational Users of Bendigo Creek	Bendigo Creek may be a potential receptor because overflow from the onsite dam will enter Bendigo Creek during heavy rainfall.
Residential	Although other off-site human health receptors may exist, the potential for migration to these receptors is considered low for the following reasons: <ul style="list-style-type: none"> <li>■ No residential properties were identified within 50 m of the Site; and</li> <li>■ The nearest groundwater abstraction bore is 1.1 km south west of the Site.</li> </ul>
Users of groundwater in the area	
<b>Environmental - Onsite</b>	
Groundwater underlying the Site;	Groundwater may be a potential receptor as groundwater is expected to be found 5-25 m bgl in the area of the Site.
On-site ecological receptors such as (aquatic and terrestrial flora and fauna)	As the Site is located within bush land and there is an onsite dam which attracts wildlife, there is the potential for onsite contamination to impact on flora and fauna. However any receptors are likely to be 'moderately modified' considering the current land use is industrial.
<b>Environmental - Off-site</b>	
Nearby surface water bodies	Bendigo Creek is a potential receptor because overflow from the onsite dam will enter Bendigo Creek during heavy rainfall.
Terrestrial and aquatic flora and fauna	There is the potential for contamination to adversely impact on flora and fauna off-site.

**7.6 Conclusions**

Golder Associates has undertaken a PSA of the Northern District Training Ground.

As the majority of the FTA is unsealed, the potential exists for site activities to have resulted in contamination of soil and groundwater.

Fire fighting water on the FTA is recirculated and thus could potentially be impacted with Contaminants of Interest. Whilst an assessment of human health risks associated with the use of recirculated fire fighting water at the Site was previously undertaken by Wynsafe (2005, 2007), this assessment did not include a consideration of Contaminants of Interest associated with flammable liquids and extinguisher foams. Further information of this assessment is provided in Appendix E.

**7.7 Recommendations**

Golder Associates recommends that a targeted soil assessment is conducted in the vicinity of the ASTs, Flammable Liquid Pad, Flammable Liquid Props and Extinguisher Pad. The results of this assessment should be used to determine if a groundwater assessment is required at the Site.

It is recommended that the water quality in the onsite dam is assessed for Contaminants of Interest associated with flammable liquids and extinguisher foams.



## 8.0 WIMMERA FIELD TRAINING GROUND

### 8.1 General Site Details

The general site details are listed in Table 29.

**Table 29: General Site Details; Wimmera**

Summary Information	Details
Property Name	Wimmera Field Training Ground (also known as Longerenong Training Ground)
Site Address	Centre Road, Longerenong Agricultural Training College, Victoria
Legal Description	Part of Lot 3 on TP632514E
GIS Coordinates of Site Centroid (MGA94, )	616270, 5941520
Site Area	3.5 Hectares
Site Owner	The Site is leased from the adjacent Agricultural Training College.
Site Age	CFA have operated a training ground at the Site since 1994.
Description of Key Site Activity	The Site operates as a training ground for emergency response and incident management. The Site is primarily used by members of the CFA. However personnel from other public organisations and private industry also receive training at the Site.

The Site is located adjacent to the Agricultural Training College, Longerenong, Victoria, approximately 12 km north east of Horsham, Victoria and 320 km north west of Melbourne, Victoria. A site location plan which includes the Site boundary is presented as Figure 9 - Site Location Plan in Appendix A.





## 8.2 Environmental Site Setting

The environmental site setting is summarised in Table 30.

**Table 30: Environmental Site Setting; Wimmera**

Summary Information	Details
Topography	The land surface on the Site is generally flat, with an elevation of approximately 130 m above sea level.
Nearby Surface Water Bodies	<p>The following surface water bodies<sup>22</sup> were identified in the vicinity of the Site:</p> <ul style="list-style-type: none"> <li>■ Two Mile Creek, 1.5 km east;</li> <li>■ Dooen Swamp, 3.5 km west;</li> <li>■ Wimmera River, 3.8 km south west; and</li> <li>■ Darlot Swamp, 3.8 km north east.</li> </ul> <p>College Channel, which is reportedly an open water drainage channel for the area, runs along the eastern site boundary.</p>
Surface Water Segment	The SEPP (WoV, 2003) indicates that the Wimmera River is within the 'Murray and Western Plains' Segment, the beneficial uses to be protected within this Segment are outlined in the SEPP.
Regional Geology	The Site is likely to be underlain by Tertiary Parilla Sand that is comprised of marine sands and silts <sup>23</sup> .
Regional Hydrogeology	The Parilla Sand and Calvic Formation aquifer are considered the principle regional water table aquifer underlying the Site <sup>24</sup> . The depth to groundwater in the area is unknown.
Groundwater Segment	<p>Groundwater quality within the water table aquifer in the area of the Site is expected to be between 3,501 mg/L to 13,000 mg/L TDS<sup>25</sup>. The SEPP (GoV (1997)), classifies this TDS concentration as Segment C and states that the following Beneficial Uses will be protected within this segment:</p> <ul style="list-style-type: none"> <li>■ Maintenance of ecosystems;</li> <li>■ Stock watering;</li> <li>■ Industrial water use; and</li> <li>■ Buildings and Structures.</li> </ul>
Regional Groundwater Use	A total of 15 groundwater bores are located within a 2 km radius of the Site <sup>26</sup> . The nearest bore is 0.8 km south west of the Site and is registered as abandoned. All but two of the bores within 2 km of the Site are registered as abandoned; the use of the 2 remaining wells is unknown. A further 37 groundwater bores are located within a 2 to 5 km radius of the Site. The majority of the bores within 5 km of the Site are registered as abandoned and were originally installed for 'heavy mineral sand exploration'.
Inferred Groundwater Flow	The regional flow direction is expected to be south westerly towards the Wimmera River.

<sup>22</sup> Department of Sustainability and Environment (DSE) *Water Resources Data Warehouse*.

<sup>23</sup> Geological Survey of Victoria, *Horsham*, 1:250,000 Mapsheet.

<sup>24</sup> Department of Natural Resources and Environment, Victorian Groundwater Beneficial Use Map Series - North Western Victoria Water Table Aquifers.

<sup>25</sup> Department of Natural Resources and Environment, Victorian Groundwater Beneficial Use Map Series - North Western Victoria Water Table Aquifers.

<sup>26</sup> Department of Primary Industries, Geovic Database.



### **8.3 Historical Information Review**

A review of available regulatory agency records and historical site information was undertaken to identify historical activities which had the potential to contaminate the Site.

Regulatory agency records reviewed included the EPA priority site register, statutory environmental audits and the Victorian Aboriginal Heritage Register. Historical site information reviewed included certificates of title, historical aerial photographs and previous assessment reports provided by CFA. A summary of the information which was reviewed as part of this PSA is provided in Appendix F.

### **8.4 Site Walkover**

Golder Associates conducted a site walkover on 19 April 2012. The site walkover was conducted by a representative from Golder Associates, who was accompanied by a representative of the Independent Fiskville Investigation and a CFA site representative. Weather was dry and warm during the Site walkover.

The Site layout and infrastructure recorded during the Site walkover is summarised in Table 31. Information of chemical storage and use was also recorded during the Site walkover and is summarised Table 32. Observed visual evidence of contamination was noted and potential contaminant sources, pathways and receptors were reviewed. The site layout at the time of the site walkover is presented in Figure 9 – Current Site Layout Plan in Appendix A.



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 31: Site Layout & Infrastructure; Wimmera**

Summary Information	Details		
Surrounding Land Use	North: Agricultural land (wheat paddock)		
	South: Longerenong Agricultural Training College		
	East: Dams which are part of Longerenong Agricultural Training College are north east of the Site. Houses which are used for temporary accommodation for trainees on the CFA are southeast of the Site.		
	West: Agricultural land (wheat paddocks)		
Site Coverage (% Hard standing, gravel, grass etc)	The site surface is covered in approximately 75% gravel, 15% hard standing and 10% grass.		
Site Description	Administration and training buildings are located in the southern portion of the Site. The FTA generally occupies the central and northern portion of the Site and consists of a Gas Pad, Extinguisher Pad, FLP, Fire Attack Building, BA Building and associated infrastructure. Various Maintenance & Storage Buildings and a Hazmat Shed are located along western site boundary. A dam and several water storage tanks are also located onsite. Key site infrastructure and features are described in detail below. The FTA, particularly where chemicals are stored and used, was focused on during this PSA as this area may contain potential sources of contamination.		
Site Infrastructure	Area Name	Use	
	Administration & Training Buildings	Offices, classrooms and amenities for staff and trainees.	
	Fire Training Area (FTA)	Gas Pad	Fire fighting training on props lit with LPG. Water is used to extinguish fires. The area is unsealed.
		Extinguisher Pad	Small volumes of petrol are used for fire fighting training on the Extinguisher Pad. The fuel mix is ignited in metal trays and fire extinguishers are used to extinguish the fires. The extinguishers are filled with Tridol foam. The area is sealed with concrete.
		Flammable Liquid Pad	Fire fighting training on props lit with a petrol. The props are plumbed into underground fuel lines. Water is used to extinguish fires. The props area is sealed with concrete but the remainder of the FLP is unsealed.
		Fire Attack Building	Building used for fire fighting training purposes. It is understood that straw is the only fuel used in this building and water is used to extinguish fires. The building is sealed with concrete.
		BA Building	Building used for breathing apparatus training. It is understood that no flammable liquids/gases or extinguisher foams are used in this building.
		ASTs	Two ASTs are used to store flammable liquids/gases onsite.
		USTs	One UST is used to store petrol onsite.
		Interceptors	One oil/water interceptor is located within the FTA.
Maintenance & Storage		Various buildings used for the maintenance and storage of equipment.	



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

	Buildings				
	Storage Area	Area used for the storage of miscellaneous items.			
	Props	Various fire training props are located around the FTA. The props are mainly on unsealed ground.			
	Hazmat Shed	Shed used for the storage of hazardous materials, including flammable fuels, hydraulic oils and paints.			
	Water Storage Tanks	Three tanks used for the storage of water for fire training purposes.			
	Dam	The onsite dam is used as a back-up supply for fire fighting water.			
Evidence of Staining	Small area of staining around the FLP.				
Vegetation Condition	Generally vegetation onsite was in good condition.				
General Housekeeping	General housekeeping onsite was good, although housekeeping around prop storage areas could be improved, such as general tidiness of the storage areas.				
Oil/Water Interceptor Capacity	<b>No</b>	<b>Age</b>	<b>Capacity</b>	<b>Maintenance</b>	<b>Discharge Point</b>
	1	1994	unknown	When full (every 2 years)	Water storage tanks for reuse as fire fighting water.
General Site Drainage System & Discharge Point	Water from the Administration Buildings drains into an open channel along the eastern site boundary and subsequently into adjacent paddock.				
FTA Site Drainage System & Discharge Point	Stormwater & fire fighting water on the Gas Pad is collected and stored in water tanks onsite. Water from the Extinguisher Pad and FLP drains through an oil/water interceptor before storage in the water tanks. When the water tanks are full they overflow into the dam.				
Site Water Supply – General Use	Water in the Administration Building is sourced from Wimmera Mallee Water. However as this water is not suitable for potable use bottled water is used for drinking onsite.				
Site Water Supply – FTA Use	Water on the FTA is supplied from the water storage tanks. Approximately 75% of all water on the FTA is recirculated. If water levels in the tanks are low, dam water can be used to top up the water tanks.				
Water Bores Onsite	No known bores onsite.				
Props used in Fire Training	Straw, untreated pallets and wood are used as props onsite. Debugged cars are also used as props.				
Waste Management	Burnt out cars are collected for scrap metal. Generally other props are fully burnt so no disposal is required.				

Areas where chemicals are stored and used were focused on during this PSA, as these areas may contain potential sources of contamination. Information provided by site representatives during the Site walkover, relating to chemical storage and use is summarised Table 32.



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 32: Chemical Storage & Use; Wimmera**

Flammable Fuels Currently Used Onsite	<p>LPG is mainly used onsite for fire training purposes.</p> <p>Petrol from <i>UST 1</i> is plumbed directly into props on the FLP via underground fuel lines. Petrol is also placed in 10 L jerry cans and used for fire training purposes on the Extinguisher Pad and at other props around the FTA.</p> <p>Diesel from <i>AST 2</i> is only used as a fuel for water pumps &amp; tractors. It is not used for fire training purposes.</p>							
Flammable Fuels Historically Used Onsite	Only petrol and LPG have been used for fire training purposes since the Site opened.							
Areas where Flammable Liquids are used	<p>Petrol is plumbed into props on the FLP.</p> <p>Small volumes of petrol are placed in 10 L jerry cans and are poured into trays on the Extinguisher Pad. The pad is sealed.</p> <p>Small volumes of the petrol are poured into trays within props around the FTA. e.g. cars.</p>							
Fuel Storage Information	<b>AST/UST</b>	<b>Tank No.</b>	<b>Fuel Type</b>	<b>Tank Volume (L)</b>	<b>Age (yr)</b>	<b>Tank Type</b>	<b>Bund Present</b>	<b>Area Sealed</b>
	UST	1	Petrol	2,500	1994	Metal	NA	NA
	AST	2	Diesel	400	1994	Metal	Yes	No
	AST	3	LPG	1,400 (kg)	1991	Metal	No	No
	AST	4	Diesel Disused	unknown	1991	Metal	Yes	Yes
Condition of Fuel Storage Areas	The bund around the diesel AST appeared to be in good condition.							
Evidence of Staining	No staining was evident around the fuel storage areas but a small bit of staining was evident on the FLP concrete slab.							
Decommissioned UST/ASTs Used Onsite	No decommissioned USTs or ASTs were reported to be onsite. Note 1 disused diesel AST is located in the north western corner of the Site.							
Dispensing Pumps	A dispensing pump is located adjacent to the petrol UST.							
Fuel Lines (Above/Below Ground)	<p>LPG lines are below ground from <i>AST 3</i> to Gas Pad.</p> <p>The petrol UST (<i>UST 1</i>) is direct fill and there are underground fuel lines from the UST to FLP and the dispensing pump. The diesel AST (<i>AST 2</i>) is direct fill and it is understood that an above ground fuel line runs to the diesel pump which is adjacent to the tank.</p>							
Fuel Storage System Testing/Reconciliation	ELGAS test the LPG storage system on an annual basis. The results of this testing were not reviewed in this preliminary assessment. It is reported that AMCAH test the diesel and petrol fuel storage system on an annual basis							
Fire Fighting Foams Currently Used Onsite	Generally recycled water from the water storage tanks are used to extinguish fires in the FTA. Tridol extinguishers are used on the Extinguisher Pad. Approximately 50 x 9 L extinguishers are used each year.							
Fire Fighting Foams Historically Used Onsite	3M AFFF may have been used as an extinguisher foam onsite over 6 years ago.							
Chemicals Currently Stored & Used Onsite	<p>A small volume of Round-Up which is a herbicide is stored onsite and is used to spray weeds in roadways and the FTA area.</p> <p>Small volumes of vehicle maintenance chemicals (engine oils, brake fluid) and paints are stored onsite.</p>							
Chemicals Historically Stored & Used Onsite	No other chemicals were used onsite.							
History of Chemical Spills Onsite?	No known chemical spills onsite.							
Other Information	<p>A transformer which is used as a prop is located onsite in the FTA. This transformer has reportedly never been tested for PCBs. However as this transformer is located on an 'electrical pole', it is unlikely to impact on identified receptors in its current location.</p> <p>Longerenong Agricultural Training College has periodically collected and analysed soils samples from the FLP. The results of this analysis have not been made available to the CFA.</p>							



## 8.5 Preliminary Conceptual Site Model

A preliminary CSM has been developed for the Site from the desktop study information combined with site observations and is described below.

### Potential Sources

Potential contamination sources identified at the Site are outlined in Table 33 and are shown on Figure 10 – Current Site Layout Plan in Appendix A.

**Table 33: Potential Contamination Sources; Wimmera**

Source	Number	Area of Interest	Details	Primary Contaminants of Interest
Potential leaks/spills from the flammable liquid fuel storage tanks and related infrastructure	1	USTs, ASTs	A petrol UST is located in the north western corner of the Site. Underground fuel lines run from the UST to FLP and dispensing pump. The bund surrounding the diesel AST appeared to be in good condition and there was no evidence of staining.	TPH, BTEX, PAH, heavy metals
Potential spills of flammable liquids at fire training props	2	Flammable Liquid Pad	A small amount of staining was evident around the FLP. The FLP is sealed but the majority of the FTA is unsealed.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA
Potential spills of fire fighting foams at fire training props	3	Extinguisher Pad	Tridol is now used as an extinguisher onsite, however 3M AFFF was previously used. The Extinguisher Pad is unsealed. It is noted that there was no evidence of staining on the Extinguisher Pad.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA
Potentially contaminated recirculated fire fighting water.	4	Hydrant water on the FTA.	Water collected on the FTA flows through the onsite oil/water interceptor before collection in water storage tanks, where it is recirculated for use on the FTA. It is noted that only small volumes of flammable liquids are currently used on the FTA. Also 3M AFFF foam is no longer used onsite but residual PFOS and PFOA contamination may be present.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA

### Potential Pathways

Potential exposure pathways identified at the Site are outlined in Table 34.



**Table 34: Potential Pathways; Wimmera**

Pathway	Details
<b>Human Health</b>	
Ingestion of contaminated soils/dust	A localised amount of stained soil was observed around the FLP during the Site walkover. Therefore ingestion, dermal contact and inhalation are potential pathways.
Dermal contact with contaminated soils and dust;	
Inhalation of contaminated dusts and vapours	
Ingestion of contaminated fire fighting water on FTA.	As fire fighting water on the FTA is recirculated, ingestion, dermal contact and inhalation of contaminated fire fighting water are potential pathways.
Dermal contact with contaminated fire fighting water on FTA;	
Inhalation of contaminated fire fighting water on FTA;	
<b>Ecological</b>	
Vertical migration through soils in the vadose zone	Shallow contamination could migrate vertically through soils in the vadose zone.
Lateral migration through groundwater	The depth to groundwater in the area is unknown.
Migration within stormwater culverts, drains, underground utility trenches	A potential pathway may exist along underground utility trenches onsite.
Stormwater runoff not collected in stormwater collection system	The majority of stormwater onsite is collected into water storage tanks however a preferential pathway could exist along open stormwater drains along the eastern site boundary in the event of heavy rainfall.

### Potential Receptors

Potential receptors identified at the Site are outlined in Table 35.



**Table 35: Potential Receptors; Wimmera**

Receptor	Details
<b>Human Health - Onsite</b>	
Site staff	Staff who work regularly in the Fire Training Area are likely to be the primary potential human health receptors.
Training instructors and trainees	
Maintenance personnel	
<b>Human Health – Off-site</b>	
Residential	<p>The potential for migration to these receptors is considered low for the following reasons:</p> <ul style="list-style-type: none"> <li>■ No residential properties were identified within 50 m of the Site; (House to the east of the Site is used for temporary accommodation)</li> <li>■ The nearest surface water body (which could be used for consumption, primary contact recreation) is 1.5 km east of the Site; and</li> <li>■ Groundwater does not appear to be used in the vicinity of the Site as the majority of registered groundwater bores in a 5 km radius of the Site are reported as abandoned.</li> </ul>
User of nearby surface water	
User of groundwater in the area	
<b>Environmental - Onsite</b>	
Groundwater underlying the Site;	The depth to groundwater underlying the Site is unknown, but groundwater may be a potential receptor if groundwater is shallow.
On-site ecological receptors such as (aquatic and terrestrial flora and fauna)	As there is an onsite dam which is may attract wildlife, there is the potential for onsite contamination to impact on flora and fauna. However any receptors are likely to be 'highly modified' considering the surrounding area is used for intensive wheat production.
<b>Environmental - Off-site</b>	
Nearby surface water bodies	The nearest surface water body (which could be used for consumption, primary contact recreation) is 1.5 km east of the Site. The potential for contamination to migrate to this receptor is considered low given the distance from the Site.
Off-site ecological receptors such as (aquatic and terrestrial flora and fauna)	Although off ecological receptors (such as terrestrial flora and fauna) may exist, the receptors are likely to 'highly modified' considering the surrounding area is used for intensive wheat production.

## 8.6 Conclusions

Golder Associates has undertaken a PSA of the Wimmera Field Training Ground.

As the majority of the FTA is unsealed, the potential exists for site activities to have resulted in contamination of soil and groundwater.

Fire fighting water on the FTA is recirculated and thus could potentially be impacted with Contaminants of Interest. Whilst an assessment of human health risks associated with the use of recirculated fire fighting water at the Site was previously undertaken by Wynsafe (2005, 2007), this assessment did not include a consideration of Contaminants of Interest associated with flammable liquids and extinguisher foams. Further information of this assessment is provided in Appendix F.





## 8.7 Recommendations

Golder Associates recommends that a targeted soil assessment is conducted in the vicinity of the ASTs, UST, Flammable Liquid Pad and Extinguisher Pad. The results of this assessment should be used to determine if a groundwater assessment is required at the Site.

It is recommended that fire fighting water quality on the FTA is assessed for Contaminants of Interest associated with flammable liquids and extinguisher foams.

## 9.0 WESTERN DISTRICT TRAINING GROUND

### 9.1 General Site Details

The general site details are listed in Table 36.

**Table 36: General Site Details; Western District**

Summary Information	Details
Property Name	Western District Training Ground (also known as Penshurst Training Ground)
Site Address	14 Penshurst-Dunkeld Road, Penshurst, Victoria
Legal Description	Allotment 22, 14 Penshurst-Dunkeld Road, Penshurst
GIS Coordinates of Site Centroid (MGA94, )	614230, 5807908
Site Area	5.7 Hectares
Site Owner	The Site is Crown Land owned by VicTrack. The Site is currently leased by CFA from Vic Track.
Site Age	CFA have operated a training ground at the Site since November 1993.
Description of Key Site Activity	The Site operates as a training ground for emergency response and incident management. The Site is primarily used by members of the CFA. However personnel from other public organisations and private industry also receive training at the Site.

The Site is located at 14 Penshurst-Dunkeld Road, Penshurst, Victoria, approximately 275 km west of Melbourne, Victoria. A site location plan which includes the Site boundary is presented as Figure 11 - Site Location Plan in Appendix A.

### 9.2 Environmental Site Setting

The environmental site setting is summarised in Table 37.



**Table 37: Environmental Site Setting; Western District**

Summary Information	Details
Topography	The land surface on the Site and in the surrounding areas slopes gently in a northerly direction towards Murdum Creek. The Site is at an elevation of approximately 220 m above sea level.
Nearby Surface Water Bodies	The following surface water bodies <sup>27</sup> were identified in the vicinity of the Site: <ul style="list-style-type: none"> <li>■ Murdum Creek, 1.7 km north east;</li> <li>■ Keilars swamp, 3 km north;</li> <li>■ Spring creek, 4.5 km east; and</li> <li>■ Milligans dam, 4.5 km north east.</li> </ul> <p>The area around Murdum Creek is subject to flooding.</p>
Surface Water Segment	SEPP (WoV, 2003) indicates that creeks and rivers around Peshurst are within the 'Murray and Western Plains' Segment, the beneficial uses to be protected within this Segment are outlined in the SEPP.
Regional Geology	The Site is likely to be underlain by Quaternary age Newer Volcanics, comprised of extrusive, valley-filling basalts in the Peshurst areas <sup>28</sup> .
Regional Hydrogeology	The Newer Volcanics aquifer is considered the principle regional water table aquifer underlying the Site <sup>29</sup> . Groundwater in the area is inferred to be encountered between 5 to 10 m bgl <sup>30</sup> .
Groundwater Segment	Groundwater quality within the water table aquifer in the region of the Site is expected to be between 1,001 mg/L to 3,500 mg/L (TDS) <sup>31</sup> . The SEPP Groundwaters of Victoria (GoV (1997)), classifies this TDS concentration as Segment B and states that the following Beneficial Uses will be protected within this segment: <ul style="list-style-type: none"> <li>■ Maintenance of ecosystems;</li> <li>■ Potable mineral water supply;</li> <li>■ Irrigation and stock watering;</li> <li>■ Industrial water use; and</li> <li>■ Buildings and Structures.</li> </ul>
Regional Groundwater Use	A total of 12 groundwater bores are located within a 2 km radius of the Site <sup>32</sup> . The nearest bore is 0.5 km south east of the Site and is registered for public/town water supply. A further 23 groundwater bores are located within a 2 to 5 km radius of the Site. The bores within 5 km of the Site are registered for the following uses: <ul style="list-style-type: none"> <li>■ Domestic supply;</li> <li>■ Stock/poultry water supply;</li> <li>■ Public/town water supply; and</li> <li>■ Fire fighting/sports/general.</li> </ul>

<sup>27</sup> Department of Sustainability and Environment (DSE) *Water Resources Data Warehouse*.

<sup>28</sup> Geological Survey of Victoria, *Hamilton*, 1:250,000 Mapsheet.

<sup>29</sup> Department of Conservation and Natural Resources DCNR (1995), "*Victorian Groundwater Beneficial Use Map Series, South Western Victoria Water Table Aquifers*", 1995

<sup>30</sup> Southern Rural Water, *South Western Victoria Watertable Aquifer Depth to Groundwater*.

<sup>31</sup> Department of Conservation and Natural Resources DCNR (1995), "*Victorian Groundwater Beneficial Use Map Series, South Western Victoria Water Table Aquifers*", 1995

<sup>32</sup> Department of Primary Industries, *Geovic Database*.



### **9.3 Historical Information Review**

A review of available regulatory agency records and historical site information was undertaken to identify historical activities which had the potential to contaminate the Site.

Regulatory agency records reviewed included the EPA priority site register, statutory environmental audits and the Victorian Aboriginal Heritage Register. Historical site information reviewed included certificates of title, historical aerial photographs and previous assessment reports provided by CFA. A summary of the information which was reviewed as part of this PSA is provided in Appendix G.

### **9.4 Site Walkover**

Golder Associates conducted a site walkover on 22 April 2012. The site walkover was conducted by a representative from Golder Associates, who was accompanied by a representative of the Independent Fiskville Investigation and a CFA site representative. Weather was wet and cool during the Site walkover.

The Site layout and infrastructure recorded during the Site walkover is summarised in Table 38. Information of chemical storage and use was also recorded during the Site walkover and is summarised Table 39. Observed visual evidence of contamination was noted and potential contaminant sources, pathways and receptors were reviewed. The site layout at the time of the site walkover is presented in Figure 12 – Current Site Layout Plan in Appendix A.



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 38: Site Layout & Infrastructure; Western District**

Summary Information	Details		
Surrounding Land Use	North: Racecourse Road with residential houses and agriculture land beyond.		
	South: Hamilton Highway with residential houses and a sports ground beyond.		
	East: Agricultural Land (grazing paddocks)		
	West: Penshurst-Dunkeld Road with a residential house and agricultural land beyond.		
Site Coverage (% Hard standing, gravel, grass etc)	The site surface is covered in approximately 65% gravel, 25% grass, 10% hard standing.		
Site Description	<p>Administration and training buildings are located in the western portion of the Site. The FTA generally occupies the central and eastern portion of the Site and consists of a Gas Pad, Extinguisher Pad, FLP, Fire Attack Building, Urban Search and Rescue Area, BA Building and associated infrastructure. Various Maintenance &amp; Storage Buildings and a Hazmat Shed are located within the FTA. A dam and several water storage tanks are also located onsite. Fire training props are stored at several locations in the FTA (cars are debugged and stored in the eastern portion of the Site). Key site infrastructure and features are described in detail below. The FTA, particularly where chemicals are stored and used, was focused on during this PSA as this area may contain potential sources of contamination.</p>		
Site Infrastructure	Area Name	Use	
	Administration & Training Buildings & Fire Station	Offices, classrooms and amenities for staff and trainees. The local CFA Fire Station is adjacent to the classrooms.	
	Fire Training Area	Gas Pad	Fire fighting training with props which are lit with LPG. Water is used to extinguish fires in this area. The main pad area is sealed with concrete, however the surrounding areas are unsealed.
		Extinguisher Pad	Small volumes of a petrol and diesel fuel mix are used for fire fighting training on the Extinguisher Pad. The fuel mix is ignited in metal trays and fire extinguishers are used to extinguish the fires. The extinguishers are filled with 'Training' foam, which is a surfactant. The main pad area is sealed with concrete, however the surrounding area is unsealed.
		Flammable Liquid Pad	Fire fighting training on props lit with a petrol and diesel fuel mix. The props are plumbed into underground fuel lines. Two 'Fire Training Tanks' on are located on the FLP. Water is used to extinguish fires. The main pad area is sealed with concrete, however the surrounding areas are unsealed.
		Fire Attack Building	Building used for fire fighting training purposes. It is understood that straw is the only fuel used in this building and water is used to extinguish fires. The building is sealed with concrete.
		Urban Search and Rescue	Area used for urban search and rescue. It is understood that no flammable liquids/gases or extinguisher foams are used in this building.
		Props	Various fire training props are located



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

			around the FTA. Several are on unsealed ground.		
		Prop Storage Areas	Areas used for the storage of fire fighting props including cars.		
		Maintenance & Storage Buildings	Various building used for the maintenance and storage of equipment.		
		Hazmat Shed	Shed used for the storage of hazardous materials including flammable fuels, hydraulic oils and paints.		
		BA Building	Used for the cleaning and storage of breathing apparatus.		
		ASTs	Four ASTs are used to store flammable liquids/gases onsite.		
		Water Storage Tanks	Tanks used for storage of fire fighting water.		
		Interceptors	One oil/water interceptor is located within the FTA.		
Evidence of Staining	Some staining was evident around Fire Training Tanks on the FLP and at props around the Extinguisher Pad.				
Vegetation Condition	Generally vegetation onsite was in good condition.				
General Housekeeping	General housekeeping onsite was good. Although housekeeping in some areas such as the prop storage areas could be improved, such as general tidiness of the prop storage areas. .				
Oil/Water Interceptor Capacity	<b>No</b>	<b>Age</b>	<b>Capacity</b>	<b>Maintenance</b>	<b>Discharge Point</b>
	1	unknown	unknown	Annually	Settling Dam onsite
General Site Drainage System & Discharge Point	Stormwater collected onsite drains into an open drain onsite which subsequently discharges offsite into the "Chinese Gardens" which are paddocks located west of the Site.				
FTA Site Drainage System & Discharge Point	Water collected on the FTA flows through an oil/water interceptor before discharging into the onsite dam. It is understood that this dam does not discharge offsite.				
Site Water Supply – General Use	Water in the Administration Building is supplied by mains town supply from Penshurst.				
Site Water Supply – FTA Use	Water on the FTA is supplied by mains town supply from Penshurst.				
Water Bores Onsite	No known bores onsite.				
Props used in Fire Training	Straw, untreated pallets and wood are used as props onsite. Debugged cars are also used. The cars are debugged in the eastern portion of the Site.				
Waste Management	Burnt out cars are collected for scrap metal. Generally other props are fully burnt so no disposal required, however sometimes waste is goes to the Municipal Solid Waste (MSW) landfill.				

Areas where chemicals are stored and used were focused on during this PSA, as these areas may contain potential sources of contamination. Information provided by site representatives during the Site walkover, relating to chemical storage and use is summarised Table 39.



## PRELIMINARY SITE ASSESSMENT - CFA REGIONAL TRAINING GROUNDS

**Table 39: Chemical Storage & Use; Western District**

Flammable Fuels Currently Used Onsite	LPG is mainly used onsite for fire training purposes. Petrol and diesel are used in the FLP.								
Areas where Flammable Liquids are used	<p>The petrol and diesel fuel mix (from AST 1&amp;2) is plumbed directly into props on the FLP via underground fuel lines.</p> <p>Small volumes of petrol and diesel are mixed in a 1:1 ratio in 10 L jerry cans and are poured into trays on the Extinguisher Pad and trays within props around the FTA. e.g. cars.</p> <p>A second diesel AST (AST 3) is located adjacent to the water storage tanks and is used to fuel the water pump.</p>								
Flammable Fuels Historically Used Onsite	No other fuels have been used onsite.								
Fuel Storage Information	<b>AST/UST</b>	<b>Tank No.</b>	<b>Fuel Type</b>	<b>Tank Volume (L)</b>	<b>Age (yr)</b>	<b>Tank Type</b>	<b>Bund Present</b>	<b>Area Sealed</b>	
	AST	1	Petrol	1500	1993	Metal	Yes	No	
	AST	2	Diesel	1500	1993	Metal	Yes	No	
	AST	3	Diesel	1500	1993	Metal	Yes	No	
	AST	4	LPG	1,400	1993	Metal	No	No	
Condition of Fuel Storage Areas	The bunds around the petrol and diesel ASTs appeared to be in good condition. The areas around the bunds are unsealed.								
Evidence of Staining around Fuel Storage Areas	No staining was evident around the fuel storage areas.								
Decommissioned UST/ASTs Used Onsite	No decommissioned USTs or ASTs were reported to be onsite.								
Dispensing Pumps	There are no separate fuel dispensing pumps onsite.								
Fuel Lines (Above/Below Ground)	<p>LPG lines are below ground from AST 4 to the Gas Pad.</p> <p>Petrol and diesel ASTs (AST 1&amp;2) are directly filled and underground lines run from the ASTs to the FLP.</p> <p>The diesel AST (AST 3) is connected to the water pump via an above ground line.</p>								
Fuel Storage System Testing/Reconciliation	It is reported that the LPG system is tested by ELGAS on an annual basis. The petrol and diesel systems are tested by Matthew's Petroleum on an annual basis. The results of this testing were not reviewed in this preliminary assessment								
Fire Fighting Foams Currently Used Onsite	'Training Foam' which is a surfactant is used as an extinguisher foam onsite. Powder extinguishers are also used.								
Fire Fighting Foams Historically Used Onsite	3M AFFF may have been used as an extinguisher foam onsite over 6 years ago.								
Chemicals Currently Stored & Used Onsite	<p>A small volume of Round-Up is stored onsite and is used to control weeds onsite.</p> <p>Small volumes of vehicle maintenance chemicals (engine oils, brake fluid) and paints are stored onsite.</p> <p>Small volumes of magnesium filings and sodium metal are used onsite for training purposes.</p>								
History of Chemical Spills Onsite	<p>The south western portion of the Site was reportedly used for the storage and mixing of the pesticides and herbicides between 1968 and 1999. Kilpatrick &amp; Associates Pty Ltd undertook a soil contamination assessment of the area in 2005. Reported concentrations of sodium fluoroacetate in 2 soil samples collected from a maximum depth of 0.3 metres, exceeded the US EPA <i>Region 9 Preliminary Remediation Goals assessment criteria</i>. Kilpatrick recommended that impacted soils be excavated to a depth of 0.5 m bgl and that the soils are treated onsite. Further information of this assessment is provided in Appendix G.</p> <p>During the site walkover, it was reported that the impacted soils were not excavated and that the area was covered with gravel.</p> <p>Practical Safety conducted an asbestos audit at the Site in 2011. They reported that a number of items were identified as asbestos containing material during the audit. It is unknown if the asbestos containing material has been removed from site. Further</p>								



information of this audit is provided in Appendix G.

## 9.5 Preliminary Conceptual Site Model

A preliminary CSM has been developed for the Site from the desktop study information combined with site observations and is described below.

### Potential Sources

Potential contamination sources identified at the Site are outlined in Table 40 and are shown on Figure 12 – Current Site Layout Plan in Appendix A.

**Table 40: Potential Contamination Sources; Western District**

Source	Number	Area of Interest	Details	Primary Contaminants of Interest
Potential leaks/spills from the flammable liquid fuel storage tanks and related infrastructure	1	ASTs (1&2)	Underground fuel lines run from the ASTs to the FLP. No staining was evident around the fuel storage areas.	TPH, BTEX, PAH, heavy metals
Potential spills of flammable liquids at fire training props	2	Flammable Liquid Pad	Some staining was evident around Fire Training Tanks on the FLP.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA
Potential spills of fire fighting foams at fire training props	3	Extinguisher Pad	'Training Foam' which is a surfactant is used onsite. However 3M AFFF was previously used as an extinguisher foam onsite. The Extinguisher Pad is sealed with concrete. However staining was observed on unsealed ground around the Extinguisher Pad.	TPH, BTEX, PAH, heavy metals, PFOS and PFOA
Potentially leaks/spills of pesticide and herbicides	4	Pesticide and Herbicide Storage Area.	The south western portion of the Site was reportedly used for the storage and mixing of the pesticides and herbicides between 1968 and 1999.	Pesticides and Herbicides
Potential spills of sump oil during 'debugging of cars' in prop area	5	Prop Storage Area	Car props are debugged in the eastern portion of the Site in an unsealed area.	TPH, BTEX, PAH, heavy metals

### Potential Pathways

Potential exposure pathways identified at the Site are outlined in Table 41.



**Table 41: Potential Pathways; Western District**

Pathway	Details
<b>Human Health</b>	
Ingestion of contaminated soils/dust	Stained soil was observed around the FLP and Extinguisher Pad during the Site walkover. Therefore ingestion, dermal contact and inhalation are potential pathways.
Dermal contact with contaminated soils and dust;	
Inhalation of contaminated dusts and vapours	
<b>Ecological</b>	
Vertical migration through soils in the vadose zone	Shallow contamination could migrate vertically through soils in the vadose zone.
Lateral migration through groundwater	According to regional groundwater information, groundwater is expected between 5 m and 10 m bgl in the area of the Site, thus a potential pathway may exist.
Migration within stormwater culverts, drains, underground utility trenches	A potential pathway may exist via the open stormwater drain which discharges to the "Chinese Gardens" located west of the Site and also along underground utility trenches onsite. The 'Chinese Gardens' are reportedly a local name for the area west of the Site.

**Potential Receptors**

Potential receptors identified at the Site are outlined in Table 42.

**Table 42: Potential Receptors; Western District**

Receptor	Details
<b>Human Health - Onsite</b>	
Site staff	Staff who regularly work in the Fire Training Area are likely to be the primary potential human health receptors.
Training instructors and trainees	
Maintenance personnel	
<b>Human Health – Off-site</b>	
Residents on neighbouring properties	Residents in houses north, south and west of the Site may be receptors for potential contamination.
Users of groundwater in the area	Groundwater users in the vicinity of the Site may be a receptor for potential contamination as the nearest bore (0.5 km south east of the Site) and is registered for public/town water supply.
Users of nearby surface water	The nearest surface water body (which could be used for consumption, primary contact recreation) is 1.7 km north east of the Site. It is noted that there are ornamental lakes south west of the Site, but these lakes are fed by a natural spring.
<b>Environmental - Onsite</b>	
Groundwater underlying the Site;	Groundwater may be a potential receptor as groundwater is expected to found 5-10 m bgl in the area of the Site.
On-site ecological receptors such as (aquatic and terrestrial flora and fauna)	As there is a dam on the Site, which may attract wildlife, there is the potential for onsite contamination to impact on flora and fauna. However any receptors are likely to be 'highly modified' considering the current land use is industrial.
<b>Environmental - Off-site</b>	
Nearby surface water bodies	The nearest surface water body is 1.7 km north east of the Site. The potential for contamination to migrate to this receptor is considered low given the distance from the Site. It is noted that there are ornamental lakes south west of the Site, but these lakes are fed by a natural spring.





Receptor	Details
Off-site ecological receptors such as (terrestrial flora and fauna)	As the Site is located within a rural area, there is the potential for onsite contamination to impact on flora and fauna off-site.

## 9.6 Conclusions

Golder Associates has undertaken a PSA of the Western District Training Ground.

As the majority of the FTA is unsealed, the potential exists for site activities to have resulted in contamination of soil and groundwater.

## 9.7 Recommendations

Golder Associates recommends that a targeted soil assessment is conducted in the vicinity of the ASTs, Flammable Liquid Pad, Extinguisher Pad, Pesticide and Herbicide Storage Area and Prop Storage Area. The results of the soil assessment should be used to determine if a groundwater assessment is required at the Site.

As fire fighting water is not recirculated onsite, an assessment of fire fighting water quality has not been recommended.



## **10.0 OVERALL CONCLUSIONS AND RECOMMENDATIONS**

Whilst conducting site walkovers at the Sites, Golder Associates observed a range of operational procedures and standards at each of the regional training grounds. It appeared that while the Sites had implemented procedures to manage the potential risks for environmental contamination to arise from site activities, these procedures were not consistent across the training grounds. The following inconsistencies were observed on the Sites:

- Design of the Fire Training Area (concrete sealed, unsealed);
- Storage of flammable liquids (ASTs surrounded by concrete bunds, no bund present);
- Fuels used for fire training exercises (petrol, diesel, kerosene, Jet A1);
- Source of fire fighting water (mains, recirculated); and
- Discharge of fire fighting water off-site (recirculated onsite, discharged offsite).

Wastewater and run-off discharges were typically passed through an oil/water interceptor on the Sites before discharge. It is noted that whilst the oil/water interceptors would address gross or insoluble hydrocarbons, they would not be expected to remove dissolved phase organic chemicals.

Golder Associates therefore recommends that consideration be given to the development of an overall environmental management plan for the regional fire training ground which sets standard design and operational procedures for each the Sites.



## 11.0 REFERENCES

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## Report Signature Page

**GOLDER ASSOCIATES PTY LTD**

Niamh McCormack  
Environmental Scientist

Bruce Dawson  
Principal Environmental Consultant

NMC/MP/nmc

A.B.N. 64 006 107 857

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Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

[solutions@golder.com](mailto:solutions@golder.com)  
[www.golder.com](http://www.golder.com)

**Golder Associates Pty Ltd**  
**Building 7, Botanicca Corporate Park**  
**570 – 588 Swan Street**  
**Richmond, Victoria 3121**  
**Australia**  
**T: +61 3 8862 3500**

