ECO Aviation Fuel Services Limited

PERMANENT AVIATION FUEL FACILITY

ANNUAL AUDIT REPORT

as required by

THE ENVIRONMENTAL PERMIT

Report Title: Annual Audit Report

Date: March 2013

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*** with cross references to the conditions of the Environmental Permit (No. EP-262-2007/B) and the recommendations laid down in Section 10.10.2 of the EIA Report (Register No. AEIAR – 107/2007)**

Introduction

The Permanent Aviation Fuel Facility (PAFF), located on about 9.28 ha of land at Tuen Mun Area 38, consists of a tank farm, a two berth jetty and associated pipelines for receipt of Aviation Fuel from ships to the tank farm, and twin submarine pipelines from the tank farm to the existing pipelines located at the aviation fuel receipt facility at Sha Chau for transfer of Aviation Fuel from the tank farm to the Hong Kong International Airport (HKIA). PAFF was also accredited for ISO 14001:2004 certificates in 2010.

The tank farm has eight storage tanks each providing a storage capacity of between 22,000m^3 to 35,000m^3 with a total capacity of 264,000m^3. The ultimate design capacity of the tank farm is 388,000m^3. The tank farm is provided with bundwalls and contained drainage system.

Other facilities within the PAFF include a pump platform where the pumps, filters and recovery system are located. A service and administration building houses the control room, security control, backup power generator, firefighting equipment, transformers, switch rooms, workshop and store rooms. The building includes basic infrastructure, telecommunications, power supply and lighting.

Aviation Fuel is offloaded at a twin berth jetty sited approximately 200m offshore in about 17m depth of water. The jetty has been constructed on tubular piles. Tankers with capacity ranging from 10,000 to 80,000 dwt berth at the jetty.

Aviation Fuel is transferred to HKIA by means of buried 500mm diameter twin subsea pipelines which connect to the existing facility at Sha Chau. The length of the twin subsea pipelines is about 4.8km. The pipeline system is protected with a Cathodic Protection system and equipped with a permanent leak detection system.

In summary, the PAFF is a Project for delivery and storage of aviation fuel into the PAFF and transfer of the fuel to HKIA to meet the forecast demand of aviation fuel from the immediate future to the operational life time of the HKIA.

Purpose and Scope

This **Annual Audit** examines the Project in operations in order to evaluate whether it complies with the conditions set out in Clause 4.2 of the Environmental Permit (No. EP-262/2007/B) granted by the Director of Environmental Protection and the relevant recommendations laid down in Section 10.10.2 of the EIA Report (Register No. AEIAR-107/2007).

The audit has reviewed the relevant performances of the design arrangements and measures mentioned in Condition 3.5 of the Environmental Permit. As there are a huge number of photos and inspection records made available for review, the photos and inspection records that have been attached are representative of the facilities and/or operation process.

Conclusion

The results of the audit reveal that the PAFF has been operated to internationally recognized standards and to the best practices for aviation fuel delivery and storage. The design arrangements, the operation procedures and the work instructions to prevent risk to life, fuel spill, land contamination and water quality impact during operations of the Project have been properly and effectively implemented, as far as practical, in accordance with the stipulated requirements in the afore-mentioned EIA Report and Environmental Permit.

Audit Details

(Results are designated **C** for conformance, **NC** for non-conformance, **O** for Observation)

I Conditions Set Out in the Environmental Permit

A. Containment Systems of Aviation Fuel Storage Tank Farm

A.1 All aviation fuel storage tanks shall be located in bunded compounds with capacity of more than 110% of the contents of the largest aviation fuel storage tank in the bunded compounds.

Findings	Result
It was confirmed in the last Design Audit Report dated October 2010 that :- " The tank farm storage consists of two bunds each designed to have six tanks, of which 4 tanks in each bund (a total of 8 tanks) have been built. The calculation of bund wall containment volume in Drawing PAFF/RJ/02/DWG/G/3015(EX) shows that the current containment capacities of each of the two bunds are 195% and 188% respectively, far greater than 110% of the largest aviation fuel storage tank in the bunded compounds. Moreover, both bunds are interconnected for the overflow so that in normal circumstances, the overall containment capacity is double the size of a single bunded compound, or greater than 300% of the largest tank for the 8 tank facility. This meets the I.P. Code Part 19 "Fire Precautions at Petroleum Refineries and Bulk Storage Installations" item 3.4.2.5.5 and the Hong Kong "Code of Practice for Oil Storage Installation" item 4.1. " There has been no changes made since the completion of construction in October 2010. Photograph No. 1 shows that all eight numbers of tanks are located within a bunded compound.	**C**

A.2 The bunds shall be partly sunken below the level of ground outside the bunds.

It was confirmed in the last Design Audit Report dated October 2010 that :- "Drawings PAFF/BA/02/DWG/C/1721-1724 reflect that the bunds have been designed to be partly sunken below ground level outside the bunds in the EVA." There has been no changes made since the completion of construction in October 2010. Photographs No. 2 & 3 show that both bunded areas are partly sunken below the level of ground outside the bunds.	**C**

A.3 Wave Deflector shall be used at the bunds.

It was confirmed in the last Design Audit Report dated October 2010 that :- "Drawings PAFF/BA/02/DWG/C/1721-1724 show designed installation of wave deflectors on the bund walls." There has been no changes made since the completion of construction in October 2010. Photograph No. 4 shows wave deflectors at top of the bunds.	**C**

A.4 Fire-retardant joints shall be used at the bunds.

It was confirmed in the last Design Audit Report dated October 2010 that :- "Drawings PAFF/BA/02/DWG/C/1722-1724 show designed installation of special fire-retardant joints at the bunds. The components consist of Flexcell Compressible Filler and Nelson Fire Stop Product ES1399 Joint Sealant (capable of 4 hours of fire resistance). All visible parts of the joints are covered by stainless steel plates on the inside." There has been no changes made since the completion of construction in October 2010. The external steel plates are only fixed in the phase 1a bunds. For phase 1b bunds, the steel plates are embedded in the concrete and span the construction joint. Photographs No. 5 & 6 show that visible parts of the joints are covered by stainless steel plates on the inside at phase 1a and maintenance has been performed on the joints as well.	**C**

A.5 Intermediate bund walls shall be designed and constructed within the bunded compounds for each aviation fuel storage tanks.

It was confirmed in the last Design Audit Report dated October 2010 that :- Drawings PAFF/BA/02/DWG/C/1452 & PAFF/LC/02/DWG/C/0551 show the construction of internal bund (intermediate bund) walls within the bunded compounds for each aviation fuel storage tank. It meets the I.P. Code Part 19 "Fire Precautions at Petroleum Refineries and Bulk Storage Installations" item 3.4.2.5.4." There has been no changes made since the completion of construction in October 2010. Photographs No. 7 & 8 show that intermediate bund walls are completed in place.	**C**

A.6 Two impervious security walls shall be designed and constructed outside the bunded compounds.

It was confirmed in the last Design Audit Report dated October 2010 that :- "Drawings PAFF/BA/02/DWG/C/1721-1724 show the construction of two impervious security walls outside the bunded compounds as the tertiary and fourth containments after the tank itself as the primary containment and bund wall as the secondary containment." There has been no changes made since the completion of construction in last October. Photographs No. 9 & 10 show that two impervious security walls outside the bunded compounds are completed in place and maintained well.	**C**

A.7 A landscaped berm of at least 1.5m high shall be designed and constructed outside the bunded compounds.

It was confirmed in the last Design Audit Report dated October 2010 that :- "Drawing PAFF/BA/02/DWG/C/1481 shows a landscaped berm of at least 1.5m high outside the outer security wall." There has been no changes made since the completion of construction in October 2010. Photographs No. 11 & 12 show that a landscaped berm of at least 1.5m high outside the outer security wall is provided and maintained well.	**C**

A.8 Gates at the security walls shall be properly designed and constructed to provide sealing in case of any fuel spillage within the aviation fuel storage tank farm.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawing PAFF/BA/02/DWG/C/1727 shows that solid gates at the security walls would provide sealing in case of any fuel spillage outside the bunded areas within the aviation fuel storage tank farm." There has been no changes made since the completion of construction in October 2010. Photographs No. 13 & 14 show that the gates at security walls are maintained in good condition.	**C**

A.9 All the bund and security walls shall be properly designed and constructed using reinforced concrete to provide sufficient structural strength to withstand any liquid surge load in case of any accidents.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawings PAFF/BA/02/DWG/C/1726, 1728, and 1730 show that all the bund and security walls are constructed by reinforced concrete to provide sufficient structural strength to withstand any liquid surge load in case of any accidents." There has been no changes made since the completion of construction in October 2010. Photographs No. 15 & 16 show that all the bund and security walls are completed in place.	**C**

B. <u>Drainage Isolation and Lining System for Aviation Fuel Storage Tank Farm</u>

B.1 Drainage system shall be properly designed and constructed for the aviation fuel storage tank farm to collect aviation fuel in case of spillage.

It was confirmed in the last Design Audit Report dated October 2010 that : "The drainage layout plans in Drawings PAFF/BA/02/DWG/C/1452 & PAFF/LC/02/DWG/C/0551 show the construction of the drainage systems with appropriate falls and gradients to collect aviation fuel in case of spillage. It meets the Hong Kong "Code of Practice for Oil Storage Installation" item 6.2.1." There has been no changes made since the completion of construction in October 2010. Photographs No. 17 & 18 show that the impervious lining are maintained in good condition and the drainage fall to interceptor for final collection.	**C**

B.2 Valves and oil interceptors shall be properly designed and constructed at the drainage system to prevent any oily discharge to the sea.

It was confirmed in the last Design Audit Report dated October 2010 that : "The drainage layout plans in Drawings PAFF/BA/02/DWG/C/1452 & PAFF/LC/02/DWG/C/0551 show the installation of valves at the drainage outlets of bunded compounds. These valves are normally in closed positions to contain any spillage. They will only be opened under close monitoring by competent persons to release any storm waters inside the bunded areas. The effluent from the drainage outlet has been designed to pass through the oil interceptors which will capture any aviation fuel present in the effluent to prevent any oily discharge to the public drainage system and then to the sea. This is meeting the Hong Kong "Code of Practice for Oil Storage Installation" item 7.1." There has been no changes made since the completion of construction in October 2010. Photographs No. 19 & 20 show that there are valves at drainage outlets of bunded areas and they are kept in normally closed position all the time.	**C**

B.3 Impermeable lining shall be installed underneath all aviation fuel storage tanks to prevent seepage of aviation fuel to ground.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawing PAFF/BA/02/DWG/C/1705 shows the installation of impermeable lining underneath all aviation fuel storage tanks and within the bunded areas to prevent seepage of aviation fuel to the ground due to leakage from the storage tanks. This meets the I.P. Code Part 19 "Fire Precautions at Petroleum Refineries and Bulk Storage Installations" item 3.4.2.5.2. " There has been no changes made since the completion of construction in October 2010. Photographs No. 21 & 22 show the records of the impermeable lining at different locations being installed.	**C**

C. Overfilling Monitoring Systems and Leakage Detection Systems

C.1 Tank overfilling monitoring systems shall be properly designed and constructed for the Project.

It was confirmed in the last Design Audit Report dated October 2010 that : "Appendix 2 reflects the setting of the high and high-high levels alarms on each storage tank. The high level alarm has been set by means of the level gauge of each tank and will trigger an alarm on the SCADA system for operations alert. The high-high level alarm has been designed to mitigate the reliance on one single system. A stand-alone device, a vibrating fork level limit switch, will be installed for detecting the high-high level and which will trigger an ESD for the closure of all inlet valves of the tank and the stoppage of all pumps immediately together with the sounding of an audible alarm siren to alert operating personnel through an independent routing system. Thus the tank overfilling monitoring systems has been properly designed at a high integrity level." There has been no changes made since the completion of construction in October 2010. PAFF performed regular inspection on the functionality of the level alarms with record kept in the maintenance system. Photographs No. 23, 24 & 25 show that the high level alarm setting in the SCADA system, the regular testing on the high-high level alarm and the testing record of the High-High level alarm.	**C**

C.2 Pipeline leakage detection system shall be properly designed and constructed for the Project.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawings PAFF/LC/01/DWG/M/0202-3 & 0207 show the installation of pipeline leakage detection system in the subsea pipelines using COWI Stat Leak System. The testing is by closing the sections of pipelines and by detecting any pressure drop within a specified period inside the pipelines. A pressure drop not due to thermal effect may indicate a possible leak in the pipeline. It will generate an alarm and activate the opening of the motor-operated valves to de-pressurize relevant pipeline section first and re-closing of them to isolate the problem section pending for immediate investigation. If leakage is confirmed, urgent repair will be arranged. The instrumentation has been installed for the subsea pipelines." There has been no changes made since the completion of construction in October 2010. The COWI Stat Leak System instrumentation has been installed. The modification of the leak detection pump and piping is in progress but not yet commissioned. Photograph No. 26 shows the COWI Stat Leak System has been installed into computer.	**O**

C.3 Impermeable lining leakage detection system shall be properly designed and constructed for the Project.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawing PAFF/BA/02/DWG/C/1705 shows the installation of an 80mm dia. leak detection pipe, in accordance with API 650, underneath the sump of each storage tank. The head of the pipe, which is perforated, is designed to situate above the containment membrane of the tank base and the pipe descending to the end outside the tank ring base. Thus the pipe will collect and drain out fuel, if any, to a designated containment well at the tank side. In this way, any leakage from the bottom of the storage tank can be detected. Also, the bunded areas are laid with impervious membrane to contain any spillage of fuel. The construction of this design has been completed for all tanks." There has been no changes made since the completion of construction in October 2010. Photographs No. 27 & 28 show the tell-tale pipe installed and the fuel collection chamber built.	**C**

C.4 Emergency shutdown (ESD) systems shall be properly designed and constructed for the Project. All ESD systems shall be equipped with manual initiating devices.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawings PAFF/KG/02/DWG/E/7437 & PAFF/LC/03/DWG/M/0251 show the installation of manual-operated emergency shut down (ESD) buttons at the strategic points in the tank farm and on the jetty for emergency use. As soon as ESD is activated, all valves and delivery pumps will automatically shut down to isolate the fuel lines and stop the flow of fuel. The installation of ESD has been completed." There has been no changes made since the completion of construction in October 2010. PAFF perform regular inspection on the functionality of the ESD with records kept in the maintenance system. Photographs No. 29 & 30 show the regular testing on the ESD systems and the testing record of the same.	**C**

C.5 The ESD system shall be initiated automatically in case of actuation of fire alarm system, overfilling monitoring system of aviation fuel storage tanks and leakage detection system of sub-sea pipelines.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawings PAFF/LC/01/DWG/M/0202 – 0203 & 0207 show the installation of ESD system which will be triggered automatically in case of actuation of fire alarm system, overfilling monitoring system of aviation fuel storage tanks and leakage detection system of sub-sea pipelines. The installation work has been completed." There has been no changes made since the completion of construction in October 2010. PAFF perform regular inspection on the functionality of the ESD interaction with records kept in the maintenance system. Photographs No. 31, 32, 33 & 34 show the regular testing on the ESD interaction and the testing record of the same.	**C**

D. <u>Installations at the Jetty</u>

D.1 The jetty shall be installed with defensive fenders.

It was confirmed in the last Design Audit Report dated October 2010 that : "Besides the fendering systems engineered to suit the full range of vessel sizes and types expected to use the berth, drawings PAFF/MA/03/DWG/C/2807-2808 show the installation of defensive fenders on the shore side of the jetty and end protection units to protect against possible collision from small craft straying into the area. The installation of the fenders has been completed." There has been no changes made since the completion of construction in October 2010. Photographs No. 35, 36 & 37 show that the fendering system installed both at sea side and shore side of the jetty.	**C**

D.2 The jetty shall be installed with coupling points with slop collection utilities connecting to oil interceptors.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawing PAFF/LC/03/DWG/M/0251 shows the provision of oil interceptors and bunded areas to contain any dripping from the coupling equipment after disconnection from the ships and the minor spill will go into the slop collection utilities connecting to the oil interceptors. On the other hand, coupling points on the vessels would be provided with slop trays to catch minor spills of aviation fuel during coupling and decoupling. The installation work has been completed." There has been no changes made since the completion of construction in October 2010. Photographs No. 38 & 39 show that the slop trays were used to catch minor spills of aviation fuel during coupling and de-coupling.	**C**

E. <u>Sub-sea Pipelines Protective Measures</u>

E.1 The sub-sea aviation fuel transfer pipelines shall be properly designed and constructed to prevent or minimize any damage or leakage risk. The sub-sea pipelines shall be protected in accordance with the arrangement as shown in Figure 5 of the Environmental Permit No. EP-262/2007/B. The sub-sea pipelines shall be buried at least 3m below the seabed level and covered with protective armour rock layer of at least 1.2m thick. No protective armour rock layer shall be protruded above the seabed.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawing PAFF/LC/04/DWG/C/0408 shows the sub-sea pipelines in accordance with the arrangement as shown in Figure 5 of the Environmental Permit No. EP-262/2007/B. The sub-sea pipelines have been installed in a dredged trench and have been buried at least 3m below the seabed level and covered with protective armour rock layer of at least 1.2m thick. The protective armour rock layer does not protrude above the seabed. The installation work has been completed. There has been no changes made since the completion of construction in October 2010. According to our recent hydrographic survey result (attached in Appendix 4), there is no evidence of damage to our rockfill protection layer covering the pipelines.	**C**

II Conditions Recommended in the EIA Report

F.1 The marine jetty risk is dominated by impact, i.e. caused by the approaching vessel striking the jetty resulting in spill and fire. A number of measures are already proposed in the design – fenders designed for impact loads, use of tugs, use of pilots aboard every vessel, restriction on maximum velocity for approach, etc. Further measures to minimize the risks from impact events should be examined. These may include the use of a berthing aid system as a good practice measure. Under this system, two radar sensors located on the jetty would provide continuous information (ships position relative to the jetty, speed of ship and angle of ship related to berthing line) about the ships. Such advanced berthing aid systems are known to reduce the likelihood of berthing impact incidents.

Findings	Result
It was confirmed in the last Design Audit Report dated October 2010 that : "The two offloading platforms of PAFF Jetty are equipped with a docking aid system, SMARTDOCK DAS, manufactured by Harbour Marine. The system provides real time data of the vessel's distance and speed of approach relative to the jetty, in the critical 0 to 300 metres zone. With this data, the Pilot and vessel's Master can better direct tug and shipboard personnel can safely maneuver the vessel towards the jetty and therefore minimize any potential for damage to the berth or ship. Also the system has drift-warning monitoring capability after the mooring of the vessel. Besides, there are devices for measuring real time wind and current speeds and directions." There has been no changes made since the completion of construction in October 2010. PAFF perform regular inspection on the functionality of the docking aid system with records kept in the maintenance system. Photographs No. 40, 41, 42, 43, 44 & 45 show that the berthing aid being installed and used for berthing activities and the weather information being captured and stored in the system.	**C**

F.2 The storm water drainage system for the PAFF site includes a fail-safe final shutdown valve at the outlet that is actuated automatically on high-high level in the interceptor. The reliability of this system should be checked to ensure it complies with at least a SIL 1 specification (maximum probability of failure on demand 0.1) and this system should be included in the regular testing programme for safety critical systems.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawing PAFF/LC/02/DWG/M/0875 shows that there are High Level Switch and High-high Level Switch installed at the interceptor. The High Level Switch will raise an alarm in the Control Room while the High-high Level Switch will trigger the shutdown of the final outlet of the drainage system. Such shutdown valve is operated by a UPS system and is a failsafe device and will be closed when any ESD is actuated or when a failure of supply of electricity occurs, besides the activation of a high-high level alarm. The High-high Level Switch is certified as a SIL 2 specification. The system will be under regular testing programme by the contractor." There has been no changes made since the completion of construction in October 2010. PAFF perform regular inspection on the functionality of the fail-safe shutdown system for drainage with records kept in the maintenance system. Photograph No. 46 shows that the record of the system being tested on its functionalities.	**C**

F.3 It should be ensured in the final design, if practical at negligible cost that the limited area of pipe work between the tank and pump platform bunds is contained and drains via the interceptor, rather than the storm water system.

It was confirmed in the last Design Audit Report dated October 2010 that : "Drawing PAFF/LC/02/DWG/M/0266 shows that the pipelines between the tank and pump platform bunds are rigid pipes laid underground inside pipe sleeves with link seal in between and internally coated with epoxy to prevent corrosion. There is also 150mm concrete surrounding the pipe sleeve. It is considered that there will be no likelihood of spillage that requires drainage into the interceptor." There has been no changes made since the completion of construction in October 2010.	**C**

F.4 A regular checking procedure should be developed to ensure that bund valves for all contained areas are normally kept closed and only opened specifically to drain accumulated water and closed promptly afterwards..

It was confirmed in the last Design Audit Report dated October 2010 that : "The PAFF Terminal Operating Procedures Section 2.2 – Tank Operations, item 2.3.6 Tank Bund Water Management has incorporated procedures to ensure that bund valves for all contained areas are normally kept closed and only opened specifically to drain accumulated water and closed promptly afterwards." There has been no changes made since the completion of construction in October 2010. Operations according to procedures being observed. A copy of the procedure is attached in Appendix 6.	**C**

F.5 The operational procedures for storm water drainage should be prepared in the case of any spill or fire incident at the tank farm.

It was confirmed in the last Design Audit Report dated October 2010 that : "It is understood that due to the huge containment volume in PAFF, its operational procedures confirm that the outlet valve from the tank farm area to the public drainage is a fail-safe device and is normally kept closed and only be opened under instructions and close attendance. This applies even to spill or fire incident. In case of risk of over-flooding ultimately from spill or fire incident, the valve can be decided to open remotely by the instruction of the authority who will have the right to allow contaminated effluent out flowing into the public drainage." There has been no changes made since the completion of construction in October 2010. Operations according to procedures being observed. A copy of the procedure is attached in Appendix 6.	**C**

F.6 If practical, the access road to the PAFF should be designated a no waiting/parking area to facilitate fire service access and evacuation of the area in an emergency.

It was confirmed in the last Design Audit Report dated October 2010 that : "The access road of PAFF has been designated a no waiting/parking area." There has been no changes made since the completion of construction in October 2010. Photographs No. 47 & 48 show that no vehicle waiting/parking on the access road to the PAFF.	**C**

F.7 The onsite and offsite Emergency Plans for PAFF should be developed and tested on a regular basis. Offsite emergency plans including evacuation plans and communication arrangements should be developed in conjunction with the Fire Services Department (FSD), Police, Marine Department and other agencies. Offsite emergency plans for the neighbouring sites will be prepared in order to have an effective evacuation within a short period of time. These will be submitted by the project proponent during detailed design of the facility.

It was confirmed in the last Design Audit Report dated October 2010 that : "The PAFF emergency plans already cover the evacuation plans and regular drills. The communication arrangement with the authorities and the neighbouring sites are being developed. It is worth mentioning that, as indicated in Figures 10.6 & 10.8 of the EIA Report, although the LSIR is predicted to be finite over the neighbouring sites, SWS mill building and Phase I of the Eco Park, the risk levels predicted are extremely small." There has been no changes made since the completion of construction in October 2010. Copies of figures 10.6 & 10.8 of the EIA report are attached in Appendix 5.	**C**

F.8 The off-site emergency plan should include procedures for the Police including the Marine Police, including cordoning-off the access roads, evacuating the neighbouring sites, and cordoning-off the sea lanes adjoining the site.

It was confirmed in the last Design Audit Report dated October 2010 that : "Emergency plans have been developed which include providing warning, evacuating and cordoning-off procedures." There has been no changes made since the completion of construction in October 2010. A list of the procedures is attached in Appendix 6.	**C**

F.9 The onsite and off-site emergency plans should consider tank to tank fire escalation, bund fire escalation and smoke effects from fires in developing suitable emergency response measures.

It was confirmed in the last Design Audit Report dated October 2010 that : "As in items 7 and 8 above, emergency plans have been developed which include providing warning, evacuating and cordoning-off procedures." There has been no changes made since the completion of construction in October 2010. A list of the procedures is attached in Appendix 6.	**C**

F.10 The operating procedures for unloading fuel from tankers at the jetty and for tank farm operations should include procedures in the event of thunderstorm warning, typhoon and lightning. Onsite emergency procedures should include actions to be taken in the unlikely event of ignition of vents due to lightning.

It was confirmed in the last Design Audit Report dated October 2010 that : The PAFF Terminal Information Book Section 9.6 – Adverse Weather has incorporated procedures in the event of thunderstorm warning, typhoon and lightning. Event of ignition of vents due to lightning can be grouped into tank fire incident which has been addressed in the emergency response manual." There has been no changes made since the completion of construction in October 2010. A list of the procedures is attached in Appendix 6.	**C**

F.11 Since the tank farm will be constructed in phases, suitable measures should be adopted for ignition control, for restricting access to operating areas and for tie-in with operating facilities. In particular, leak tight bund segregation between operational and construction areas will be necessary.

It was confirmed in the last Design Audit Report dated October 2010 that : "The Drawing PAFF/LC/02/DWG/C/0340 shows that the operating areas and the construction areas were separated by each bund walls. For the overlapping EVA areas, they were condoned off by temporary security fence and temporary end wall. Security guards were deployed at this divide line for security control. Any hot work and tie-in operations within the operating areas are controlled by a permit system. " There has been no more tank construction conducted after the completion in October 2010.	**C**

F.12 It is assumed that any future buildings immediately adjacent to the site boundary will not be high rise to avoid the impact of any smoke ingress. Should high rise buildings be proposed in these areas in the future, incorporation of appropriate mitigation measures and an assessment of the residual risks would be recommended.

It was confirmed in the last Design Audit Report dated October 2010 that : "PAFF will monitor that no high rise buildings are planned immediately adjacent to the site boundary, and if there are, PAFF will request incorporation of appropriate mitigation measures and assessment of the residual risks." PAFF will continue monitor and ensure no high rise buildings are planned immediate adjacent to the site boundary.	**C**

F.13 Following the Buncefield incident in the UK, a detailed investigation is underway and initial recommendations have been made. Although there are very important differences between the PAFF and Buncefield, specific recommendations (e.g. tank overfill prevention, fail safe shut-off valves, shift handover and containment measures) should be reviewed and implemented as appropriate where they are not already in place.

It was confirmed in the last Design Audit Report dated October 2010 that : "PAFF has much larger containment volume, with tertiary containment, and equipped with independent high-high level automatic shut off device to prevent overfill. PAFF also has various fail safe ESD valves at strategic locations to shut-off the system in emergency. On the other hand, the shift handover system of supervisors incorporates a sign off log book on duty events during the handover between supervisors on each shift." There has been no changes made since the completion of construction in October 2010. PAFF will continue the effectiveness of the shift handover system.	**C**

Appendices

Appendix 1 – The Auditor – Mr. Mark CS Lo

Mark Lo holds a Bachelor Degree in Mechanical Engineering from Sunderland University of UK. He joined the Hong Kong and China Gas Co. Ltd. in 1982 and started as technical trainee and has since spent over 30 years in the engineering field.

Mark had held various positions from Assistant Engineer, Engineer and Senior Engineer after his formal training, covering gas distribution, gas transmission as well as gas network operation and maintenance within the Hong Kong and China Gas Company Limited.

Mark is a trained Internal Auditor of the Hong Kong and China Gas Company Limited providing internal audit services for over 100 subsidiaries of the Towngas group of companies from 2010 to 2012.

Mark joined ECO Aviation Fuel Services Limited at PAFF in August 2012 as the Operations Superintendent overseeing aviation fuel daily operation at the Permanent Aviation Fuel Facility (PAFF).

Appendix 2 – Level Alarms Settings for Each Storage Tank

Leighton Contractors (Asia) Limited
Permanent Aviation Fuel Facility, Area 38 (H2104)
Tank Detector Level and Fill Level Work Sheet

Tank Detector Level and Fill Level Work Sheet

Facility : Permanent Aviation Fuel Facility, Area 38
Tank No. : Tank No. 2, 4, 5, 6, 8 and 11 (43.5m diameter)
Location : Area 38, Tuen Mun
Code : Shell document: Storage Tank Level Instrumentation Systems "Recommended Engineering Practice"
Prepared By : Leighton Contractors (Asia) Limited
Date : 4 December 2008

I. Background Information

1. Maximum fill rate = 3,500 m^3/ hr (A)

Minimum Response time
(i)High High Level to Overfill Level = 15 minutes (B)
(ii) High Level to High High Level = 10 minutes (C)

3. Minimum Fill level (Suction head limits for pump referred to the Steady State Analysis, Mar 08) = 1.5m (D)

II. Detector and Fill Level Setting

1. Volume (Depth mm) received during Response Time
(i) 15minutes = 875 m^3 (589mm) (E)
(ii) 10minutes = 583 m^3 (392mm) (F)

2. Maximum Capacity (Gross Volume) = 36,708 m^3 (G)
Overfill Level = 24.7 m (H)

3. Capacity at High-high Level = (G) – (E)
= 35,833m^3 (I)
High-high Level = 24.111 m (J)

4. Capacity at High Level = (I) – (F)
= 35,250 m^3 (K)
High Level = 23.719 m (L)

5. Capacity at Normal Fill Level = (K) – (F)
= 34,667 m^3 (M)
Normal Fill Level = 23.327 m (N)

6. Minimum Capacity = 2,229 m^3 (O)
Minimum Fill level (Suction head limits for pump) = 1.5 m (P)
Top of the Floating Suction Arm Level = 0.718m (Q)

7. Capacity at Low-low Level (Minimum Capacity) = 2,229 m^3 (R)

Leighton Contractors (Asia) Limited
Permanent Aviation Fuel Facility, Area 38 (H2104)
Tank Detector Level and Fill Level Work Sheet

Low-low Level (Suction head limits for pump) = 1.5 m (S)

8. Capacity at Low Level

100mm (1.65minutes) above the suction head limits for pump) = 1.539 m^3 (T)

Low Level = 1.60m (U)

Appendix 3 – Photos No. 1 to 48

(1) All eight tanks are located within bunded compounds

(2) Phase 1a bunded compound is partly sunken below the level of ground outside the bunds

(3) Phase 1b bunded compound is partly sunken below the level of ground outside the bunds

(4) Wave deflector provided at top of the bunds

(5) Visible parts of the joints are covered by stainless steel plates on the inside at phase 1a bund

(6) Maintenance works have been performed on sealant at joints

(7) Intermediate bund walls are provided in place near T-01-002

(8) Intermediate bund walls are provided in place near T-01-002

(9) Two impervious security walls are provided outside the bunded compounds

(10) Two impervious security walls are provided outside the bunded compounds

(11) Landscaped berm is maintained at least 1.5m high

(12) Landscaped berm is maintained at least 1.5m high

(13) Gates at security walls with sealant are maintained in good condition

(14) Gates at security walls with sealant are maintained in good condition

(15) This shows the thickness of the security wall provided

(16) This shows the thickness of the bund wall provided

(17) Impervious lining are maintained in good condition

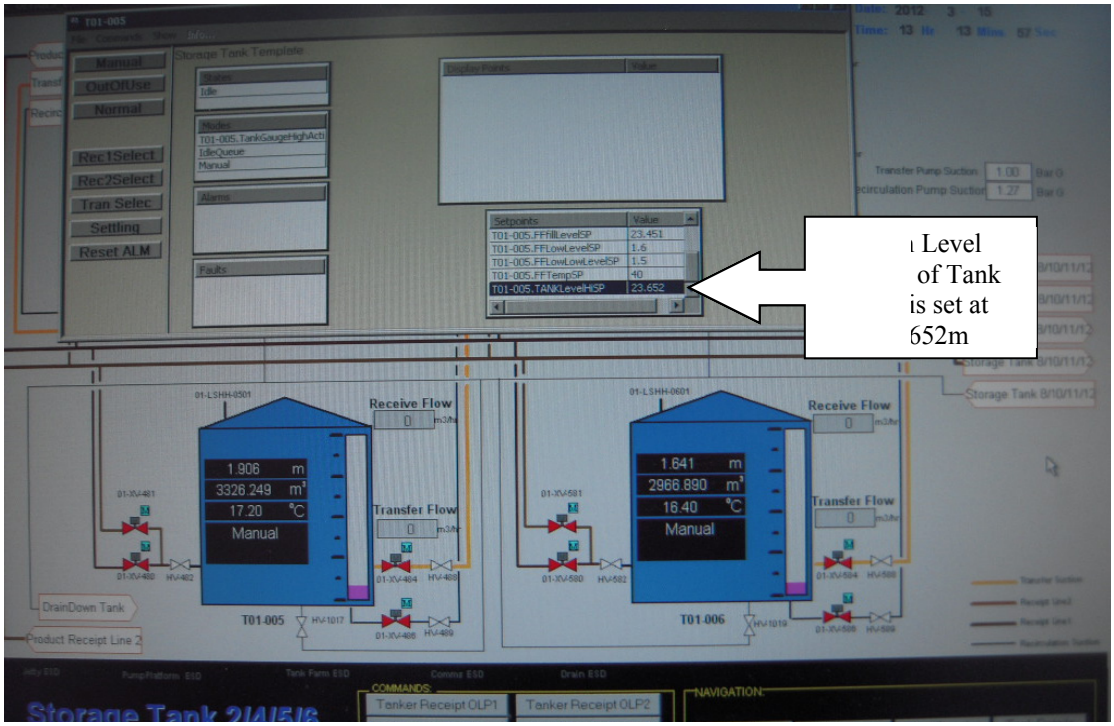
(18) Tank farm is with appropriate gradient and the drainage falls to interceptor for collection

(19) Outlet valve provided for Phase 1a Interceptor with instruction sign to keep "normally closed"

(20) Outlet valve provided for Phase 1b Interceptor with instruction sign to keep "normally closed"

(21) Record photo shows impervious membrane being installed on top of tank foundation

(22) Record photo shows imperious membrane laid at tank center sump with tell-tale pipe embedded for leak detection



(23) High Level Alarm being set in the SCADA System

(24) Regular inspection performed on overfilling monitoring device (HH Level Alarm)

Aviation Fuel Facility — ECO Aviation Fuel Services Ltd

Tank No.	T—01—012			
		Compliance ✓		
Item No	Item	Acceptance Criteria/Ref. Standard	Yes	No	Note Fault & Rectification Completed/Action Required.
4.0	**Fire Protection**				
4.1	Cooling sprays & deflector plates	Any blockage with debris or any visible corrosion?		✓	
4.2	Base foam injection valve	Is the valve open?	✓		
4.3	Top foam pourer	Are there any signs of corrosion or blockage to the pourer, aerator or supply piping? Are pipe brackets to tank secure?	N/A		
5.0	**Overfill Protection**				
5.1	Independent hi-hi level alarm	Does the alarm operate correctly?	✓		
5.2	Tank hi level alarm	Does the alarm operate correctly?	✓		
6.0	**Other**				
6.1	Floating Suction	By using the position indicator to confirm the floating suction free to operate?	✓		
		Are lifting cable bonding wires fitted correctly and free from damage.	N/A		
6.2	Auto Level Gauges	Is the Auto-level gauge functioning? Is the temperature device functioning? Are the still pipe bellows or fittings in good condition? Is all cabling in good condition?	✓		
6.3	Bund	Is the bund valve closed and free to operate? Is the bund area sound?	✓		

Surveillance conducted by:	Surveillance form reviewed by:
Name CHAN KAN JOHN	Name Henry Chu
Signature	Signature
Function: Terminal Technician	Function: Maintenance Coordinator

(25) Record for regular inspection performed on overfilling monitoring device (HH Level Alarm)

(26) Leak detection “COWI Stat Leak System” installed into computer

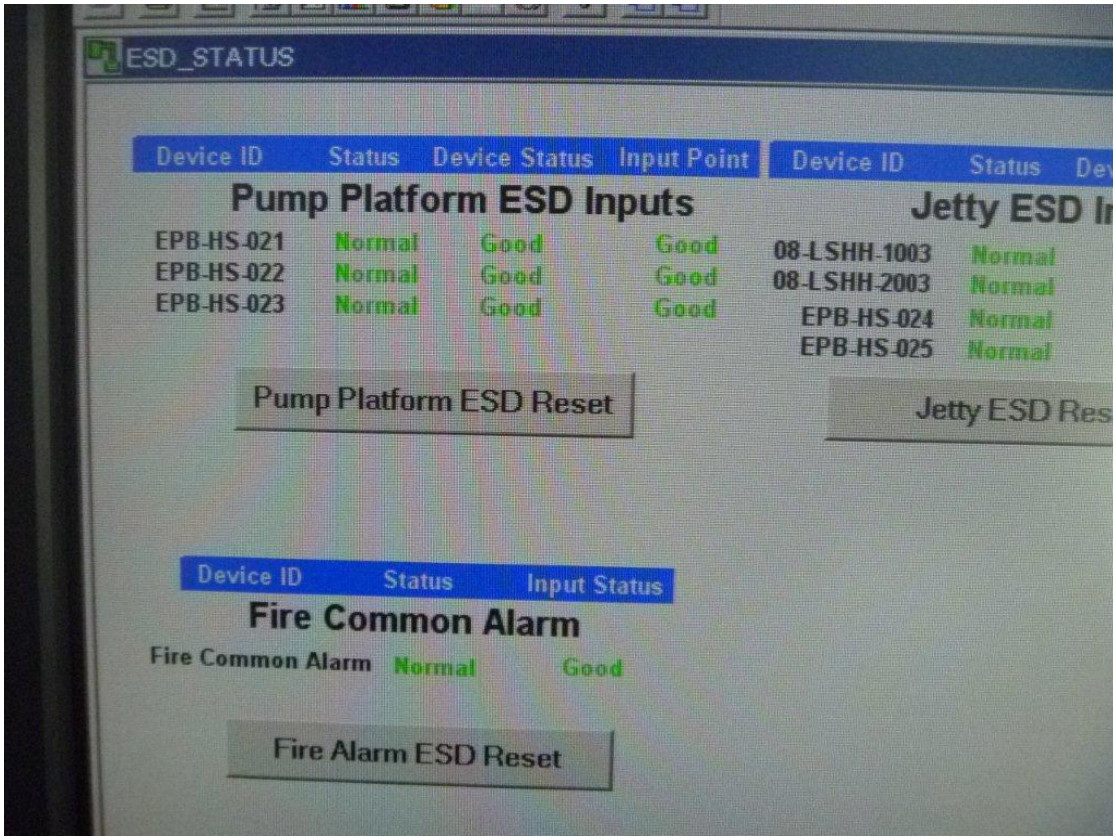
(27) Leak detection tell-tale pipe underneath the storage tank opening out to a collection chamber

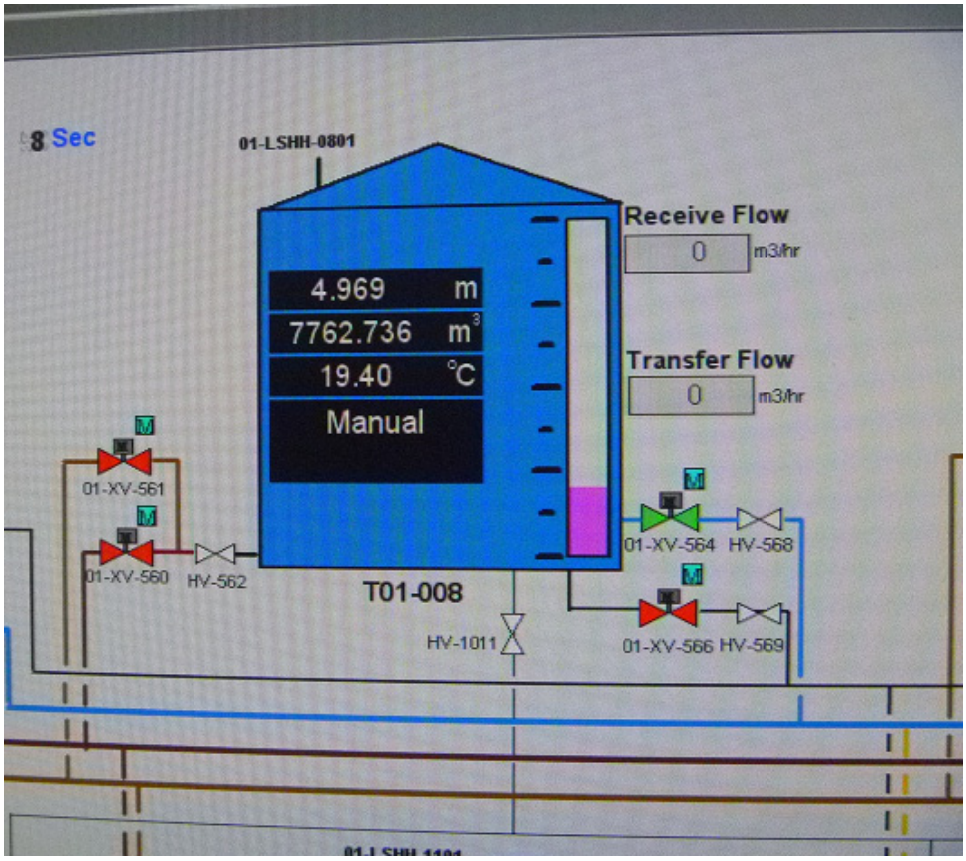
(28) Collection chamber located adjacent to tank foundation is maintained in good condition with periodic inspection

(29) ESD is maintained in good condition and being tested periodically

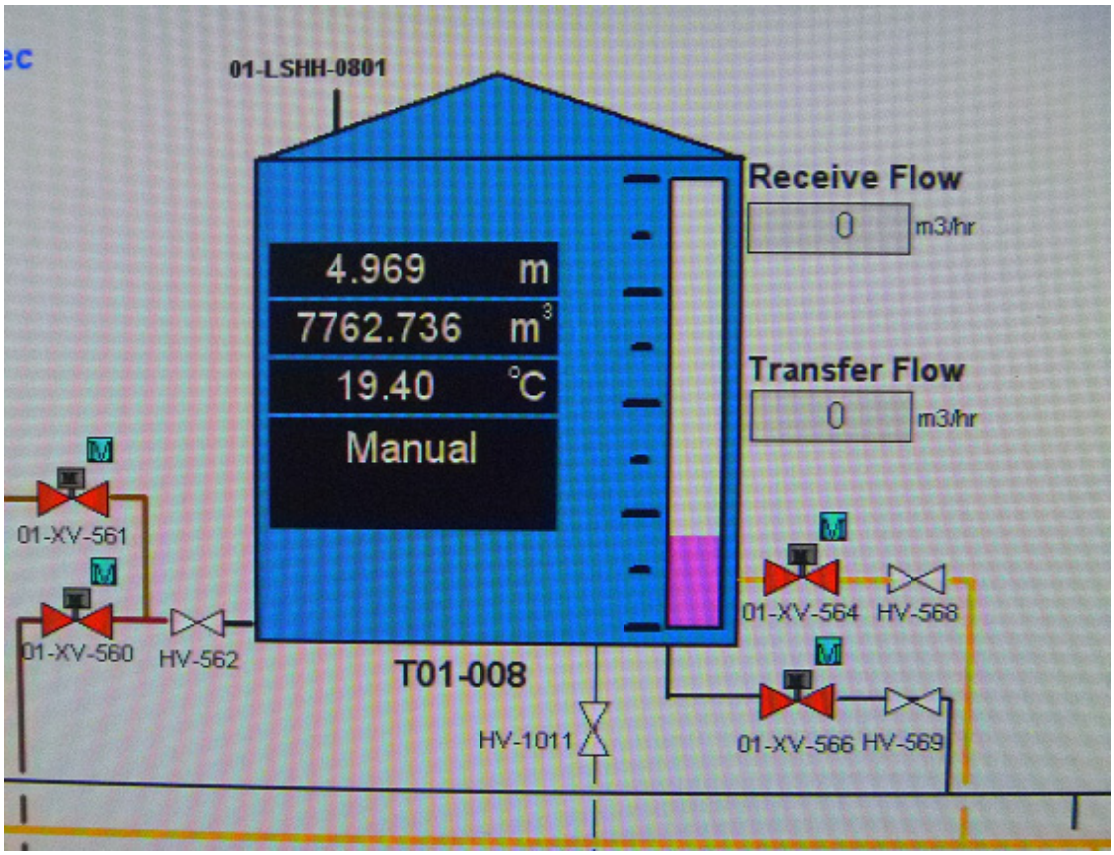
(30) The ESD regular test shown in SCADA System

(31) The ESD regular test shown in SCADA System





(32) The ESD test signal shown in SCADA System



(33) Once the system received ESD test signal, the valves will close automatically and shut down the operation shown in SCADA System

PAFF Emergency Shutdown Devices (ESD) Testing Report

Pump Platform ESD Inputs

Device ID	Task	Condition
EPB-HS-021	C/R	N/F
EPB-HS-022	C/R	N/F
EPB-HS-023	C/R	N/F

Jetty ESD Inputs

Device ID	Task	Condition
08-LSHH-1003	C/R	N/F
08-LSHH-2003	C/R	N/F
EPB-HS-024	C/R	N/F
EPB-HS-025	C/R	N/F

Tank Farm ESD Inputs Phase 1A

Device ID	Task	Condition
38-LSHH-3003	C/R	N/F
38-LSHH-4003	C/R	N/F
EPB-HS-004	C/R	N/F
EPB-HS-006	C/R	N/F
EPB-HS-007	C/R	N/F
EPB-HS-009	C/R	N/F
EPB-HS-010	C/R	N/F
EPB-HS-011	C/R	N/F
EPB-HS-012	C/R	N/F
EPB-HS-026	C/R	N/F
EPB-HS-028	C/R	N/F
EPB-HS-031	C/R	N/F
EPB-HS-033	C/R	N/F
EPB-HS-035	C/R	N/F

Tank Farm ESD Inputs Phase 1B

Device ID	Task	Condition
EPB-HS-036	C/R	N/F
EPB-HS-013	C/R	N/F
EPB-HS-014	C/R	N/F
EPB-HS-015	C/R	N/F
EPB-HS-016	C/R	N/F
EPB-HS-017	C/R	N/F
EPB-HS-018	C/R	N/F
EPB-HS-019	C/R	N/F
EPB-HS-020	C/R	N/F

Status Definitions : C = Check, R = Repair/Replace, N = Normal, F = Failure

Company Name	ECO Aviation Fuel Services Limited	Location	Permanent Aviation Fuel Facility
Test Performed	Pong Hoi Yin	Signature	
Date	26-1-13		

(34) Record for regular testing performed on ESD device

(35) Fenders installed at sea side of the jetty

(36) Fenders installed at sea side of the jetty.

(37) Fenders installed at shore side of the jetty

(38) Slop trays being used for coupling and de-coupling of the loading arms

(39) Slop trays being used for coupling and de-coupling of the loading arms

(40) Berthing aid laser box installed at Breasting Dolphin

(41) Berthing aid display board installed on LP1

(42) Record photo of the Doppler Current Sensor

(43) Record photo of the Oceanographic Sensor Interface

(44) Record photo of the Oceanographic Sensor Interface (2)

Quick Release Hook, Docking Aid System, Central & Environmental Monitoring System Maintenance Service Report

Date: 2-10-12

Work Ref.:

Customer: ECO Aviation Fuel Services Limited

Location: 9 Lung Hong Street, Area 38, Tuen Mun, Tap Shek Kok, N.T., HKSAR

Item	Sub-Group	Type	Description	Interval	Task	Condition
Quick Release Hook	Each Mechanical Hook Unit	Visual Inspection	For mechanical damage	6 Month	C	N
			For surface treatment damage	6 Month	C	N
			Hook Sensor condition	6 Month	C	N
			Load cell cable condition	6 Month	C	N
			Impact blocks condition	6 Month	C	N
		Operational Inspection (No load)	Rotational freedom all parts	6 Month	C	N
			Resetting operation	6 Month	C	N
			Release operation	6 Month	C	N
		Lubrication	To all greasing points	6 Month	C	N
	Support/Structure Bolts	Visual Inspection	For mechanical damage	6 Month	C	N
			For surface treatment damage	6 Month	C	N
			For base plate grout cracking	6 Month	C	N
			Holding down bolt tightening	12 Month	C	N
	Capstan	Visual Inspection	Capstan head	6 Month	C	N
			capstan fairlead/rope guide	6 Month	C	N
			For direct on-line (DOL) enclosure damage	6 Month	C	N
			For direct on-line (DOL) external switches damage	6 Month	C	N
			Footswitch unit operation	6 Month	C	N
			For footswitch cable damage	6 Month	C	N
			Check for moisture in direct on-line (DOL) box	6 Month	C	N
			Desiccant bag condition (change desiccant if required)	6 Month	C	N
			For capstan cable & glands damage	6 Month	C	N
		Operational Inspection	Test includes: forward, reverse, brake, footswitch, etc.	6 Month	C	[illegible] N
			Thermal overload test	6 Month	C	N
Remote Release	Electric Remote Release	Visual Inspection	Inspect remote release cable for damage	6 Month	C	N
			Check cable fitting	6 Month	C	N
			Check actuator operation	6 Month	C	N
			Check enclosure for corrosion	6 Month	C	N
		Operational Inspection	Check limit switch operation	6 Month	C	N
			Check release operation	6 Month	C	N
Docking Aid System	Laser Sensor Unit	Visual Inspection	For enclosure damage	6 Month	C	N
			Inspection for moisture ingress (change desiccant if required)	6 Month	C	N
			Inspect cable for damage	6 Month	C	N
			Clean lens	6 Month	C	N
		Operational Inspection	Run central system test diagnostic routine	6 Month	C	N
			Check laser interface unit using the debug utility tool diagnostics	6 Month	C	N
	Main Display Board	Visual Inspection	Check enclosure for damage	6 Month	C	N
			Window integrity and clean	6 Month	C	N
			Effective door locking and condition of door seals	6 Month	C	N
			Inspection for moisture ingress (replace desiccant bags if required)	6 Month	C	N
			Replace burnt out globes	6 Month	C	N
		Operational Inspection	Perform self testing sequence to each flapper segment & warning lights	6 Month	C	N
			Perform rotator test locally & remote using the test sequence	6 Month	C	N
Central Monitoring System	Server, Software	Visual Inspection	Check user login operation	6 Month	C	N
			Check error message files	6 Month	C	N
		Operational Inspection	Using the testing procedure and the diagnostics program, check communications to all field devices	6 Month	C	N
			Docking system	6 Month	C	N
			Remote release system	6 Month	C	N
			Review logged data history file for consistency and errors	6 Month	C	N
			Check display screens for correct operation of each software application	6 Month	C	N
	Telemetry	Operational Inspection	Perform communication testing sequence/test procedure for hand hold pagers	6 Month	C	N
			Check pager unit for operation	6 Month	C	N
			Replace pager batteries	6 Month	C	N
Environmental Monitoring System	Weather Station	Visual Inspection	Check the power supply for sensor, interface units and its module	6 Month	C	N
			Internal inspection of junction box for moisture ingress (change desiccants if required)	6 Month	C	N
		Operational Inspection	Check sensor readings	6 Month	C	N
			Calibrate each sensors if necessary (Optional)	6 Month	C	N
	DCS Series Current Sensor	Visual Inspection	Inspect cable for any visual damage	6 Month	C	N
			Internal inspection of junction box for moisture ingress (change desiccants if required)	6 Month	C	N
		Operational Inspection	Clean the sensor surface (remove barnacles) sensor retrieval and deployment by others	6 Month	C	N

Remark: C = Check, R = Repair, RL = Replace, RF = Refill, N = Normal, F = Failure, N/A = Not Applicable

Recommendation:

Conducted by: Maintenance Technician — Signature

Reviewed by: Maintenance Coordinator — Signature

(45) Record for regular inspection & maintenance performed on Quick Release Hook, Docking Aid System, Central & Environment Monitoring System

ECO Aviation Fuel Services Limited

Appendix B: Interceptor Maintenance & Inspection Form

Ref No: D00-INFD004-01

Site Name	Surveillance Conducted By	Surveillance Date
Permanent Aviation Fuel Facility	Organisation: ECO Aviation Fuel Services Limited Name:	10 / 01 / 2013

Interceptor Number/Identification. Interceptor 1 (Phase 1A) ~~/ Interceptor 2 (Phase 1B)~~	Record N A for item not applicable Compliance ✓	

Item No	Item	Acceptance Criteria/Reference Standard	Yes	No	Note Fault & Rectification Completed/Action Required.
1.0	**Interceptor**				
1.1	Sludge/sediment build up 污泥/沉积物堆积	Check each compartment and determine extent of any sediment build up and confirm if satisfactory or if clean out is required. Maximum level of sludge or grit = 150mm (6 inches). 检查每个隔间沉积物/污泥的堆积程度，并确定情况是否满意，或者是否需要清理。 最高沉积物 = 150mm (6英寸)。	✓		
1.2	Inlet Chamber 入口室	Check there is no evidence of significant quantities of oil products in the inlet chamber. If found notify and investigate immediately. 检查有没有显著数量的人类的油脂/石油产品的入口室，如发现立即通知和调查。	✓		
		Check and remove any debris from the inlet chamber 检查并清除任何污染物或碎片从入口室	✓		
		Check position of inlet valve is correctly set. Set position may be required to regulate flow. 检查进水阀的位置是否正确设置。 设定位置可能是要调节流量。	✓		
1.3	Process chamber 处理室	Inspect process chamber(s) ensure any oil can be recovered. 检查处理室确保可以回收任何油脂/石油产品。	✓		
		Remove any debris that may have entered the chamber 清除可能已进入腔室的任何碎片	✓		
		Check the level in any oil recovery tank or pit and arrange for it to be emptied if necessary. 检查任何油回收罐或坑/槽里的液位水平，并安排它被清空，如果必要的。	✓		
1.4	Outlet Chamber 出口室	Inspect outlet chamber, ensure there is no evidence of oil products. If any is evident report and investigate immediately. 检查出口室，确保没有任何油脂/石油产品，如有明显的应即时立即报告和调查。	✓		
		Check outlet valve, ensure it is in correct position under normal operation, and free to operate. 检查出口阀，确保其在正确的位置，在正常操作，并自由地操作。	✓		
1.5	Outfall at site boundary 场地界限水口	Confirm there is no new evidence of any oil products having been released from site. 通过检查确定没有任何油脂/石油产品被释放在场地界。	✓		
		Is the outfall clear and unobstructed? 出口是否畅通无阻？	✓		
1.6	Signs 指示牌/告示牌	Are any operating and instructional signs easy to read and correctly describe in local language) any operation? 是否有任何易于阅读和正确地描述操作/指导的标志（包括当地语言）	✓		

ECO Aviation Fuel Services Limited

1.7	Hi/Lo Level alarms 高/低液位警报	Check operation of any hi/lo level alarm or device installed in oil recovery tank or pit. 检查安装在油回收罐或坑/槽里的任何高/低水位警报装置操作	✓		
		Check operation of any hi/lo level alarm or device installed in any of the interceptor chambers 检查安装在隔断室的水位高/低水位警报或设备操作	✓		
1.8	Liquid Levels 液位	Check that the Interceptor has correct liquid levels. (If required, run water into in-ground Interceptor pits to retain vapour seals) 检查隔离室有正确的液体水平。（如果需要，进行水输送至地面隔离坑保留蒸汽密封件）。	✓		
1.9	Drain valves 排水阀	Check the Interceptor drain valves are in good condition, accessible & operating freely. 检查隔离排水阀门良好状态，正常操作和自由操作。	✓		

Inspected by: Technician	Reviewed by: Maintenance Coordinator

Note 1. The location of items identified for correction or having deficiencies shall be referenced to their position in the terminal or compound.

Note 2. A 'No' answer (non-compliance) to any of the above questions requires a comment regarding corrective action to be taken and/or a brief description of the extent of the problem.

Note 3. If any corrective action or deficiency requires further assessment or evaluation, then contact the PAFF Operations & Safety Manager for recommendations on a course of action.

(46) Record for regular inspection performed on Interceptor

(47) Access road to PAFF designated a no waiting/parking area

(48) Access road to PAFF designated a no waiting/parking area

Appendix 4 - Seabed Level Survey Result

John Barrett & Associates Ltd.
Authorised Land Surveyors

Land – Engineering - Hydrographic

2B 1/F Wo Tong Kong
Mang Kung Uk Road
Clearwater Bay
Hong Kong

Tel: 23583452
Fax: 23583452
E-mail: enquiries@jba-surveys.com
Website: www.jba-surveys.com

Aviation Fuel Facility Submarine Pipelines
Report for Hydrographic Survey

The Project

The Aviation Fuel Facility offshore facilities include twin submarine pipelines running from Tap Shek Kok to Sha Chau and from Tap Shek Kok to the nearby off-loading jetty. The pipelines are protected by a minimum of 3 metres of rockfill cover.

Scope of Works

The objective of the hydrographic surveys was to determine the condition of the rockfill cover to the submarine pipelines and to assess any damage caused by anchoring, fishing activities or any other means. The last survey was carried out in October 2011 and the first survey was carried out in 2007 before construction works.

Methodology

A dual-frequency (38/200kHz) precision hydrographic echo sounder was used to survey the seabed. The equipment was mounted on the survey vessel using an over-the-side mount fixed midships. Navigation data was input directly into the logging software from a Differential GPS mounted directly over the echo sounder.

Bathymetric surveys were carried out to show seabed levels and levels of fill over the pipelines and around the jetties. Contour plots have been produced for use in determining the extent of any siltation or damage which may have occurred.

Surveys conducted above the pipelines to give seabed levels were carried out at 25m spacing of lines perpendicular to the direction of the pipeline routes and extending 50m each side of the pipe centre-lines. Five nos. check lines were also run parallel to the direction of the pipe routes with one line run along the centre-line and one each at 15m and 30m each side. Maximum vessel speed was 5 knots and soundings were recorded at a minimum of one every second. A total of approximately 1.1 million soundings were recorded for each fequency

Bar checks were conducted before and after each survey to determine the Velocity of Sound and the Transducer Draft. The correction data from the Bar Checks were input into the logging software before the commencement of each survey.

High frequency data (200kHz) from the echo sounder was used to determine the seabed levels, although data from both frequencies was recorded and archived.

John Barrett MNZIS MHKIS ALS Robert Schemmuly MRICS MHKIS

Survey Periods

The survey was carried out over two days, 25th March and 27th March 2013. No survey work was carried out on the 26th March 2013 due to adverse weather conditions (Strong Monsoon with winds of Force 5 to 6).

Monday 25th March 2013
Winds: Easterly force 3 to 4
Sea-State: Calm near-shore (Tap Shek kok & Sha Chau, max, 0.5m wave height in Urmston Road

Wednesday 27th March 2013
Winds: Easterly force 3 to 4
Sea-State: Calm

Equipment

Kongsberg EA400 Dual Frequency Single Beam Echo Sounder
Hypack Navigation and Surveying Software
Trimble SPS351 DGPS System
InRoads SelectCAD Software
AutoCad Software

Results & Conclusions

The survey results have been plotted in a manner to be directly comparable with previous survey data, specifically the intial survey of the seabed carried out before commencement of construction works for the installation of the submarine pipelines in 2007.

The results, shown as contour plots, cross-sections and long-sections do not show any evidence of damage or major disturbance to the rockfill protection layer covering the pipelines. The current seabed bathymetry is similar to the original seabed profile (2007) and also to the last survey carried out in 2011.

END OF REPORT

Signed:

Robert Schermuly
MRICS MHKIS

John Barrett MNZIS MHKIS ALS

Robert Schermuly MRICS MHKIS

Appendix 5 – Figures 10.6 & 10.8 of EIA Report

10.9 Comparison of Risk Levels With Criteria

10.9.1.1 Risk levels in terms of identified potential numbers of fatalities and frequencies have been summed for comparison with the criteria in the Technical Memorandum [20], as reproduced in Appendix H1. These cover both individual risk and societal risk criteria.

10.9.2 Individual Risk

10.9.2.1 Location specific individual risk (LSIR) levels have been evaluated using the ESR Rifle risk contouring package. LSIR contours make no allowance for the amount of time someone would be present at the location and risk levels for any individual or group (sometimes referred to as Individual Risk Per Annum or IRPA) will always be less than the LSIR.

10.9.2.2 An overview of the LSIR for the PAFF is shown in Figure 10.6. This shows no off-site risk levels that exceed the criterion of 1×10^{-5} /yr in the Technical Memorandum [20]. The highest identified risk levels are on the sea, associated with the jetty and the storm water outlet, peaking at 6×10^{-6} /yr.

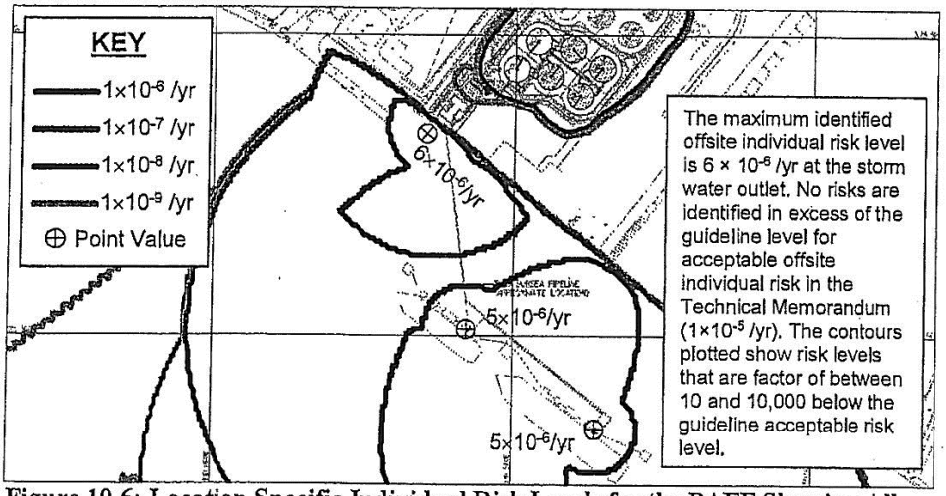


Figure 10.6: Location Specific Individual Risk Levels for the PAFF Showing All Identified Scenarios for the Final Development (12 Tanks)

10.9.2.3 The LSIR levels around the submarine pipeline are included in Figure 10.6 and contribute to the straight 10^{-9} /yr contour extending out along the pipe route to the West. The risk levels for the submarine pipeline to the AFRF at Sha Chau are shown on their own in Figure 10.7. These peak at 4×10^{-9} /yr immediately above the pipeline.

10.9.2.4 Individual risk levels from the existing pipeline from the AFRF to the airport will be similar to the those identified for the pipeline to the AFRF. They are not predicted to change due to the operation of the PAFF and are therefore not plotted in Figure 10.7.

10.9.2.5 The predicted LSIR values on land around the tank farm are much lower than for the jetty and storm water outlet, as shown in more detail in Figure 10.8.

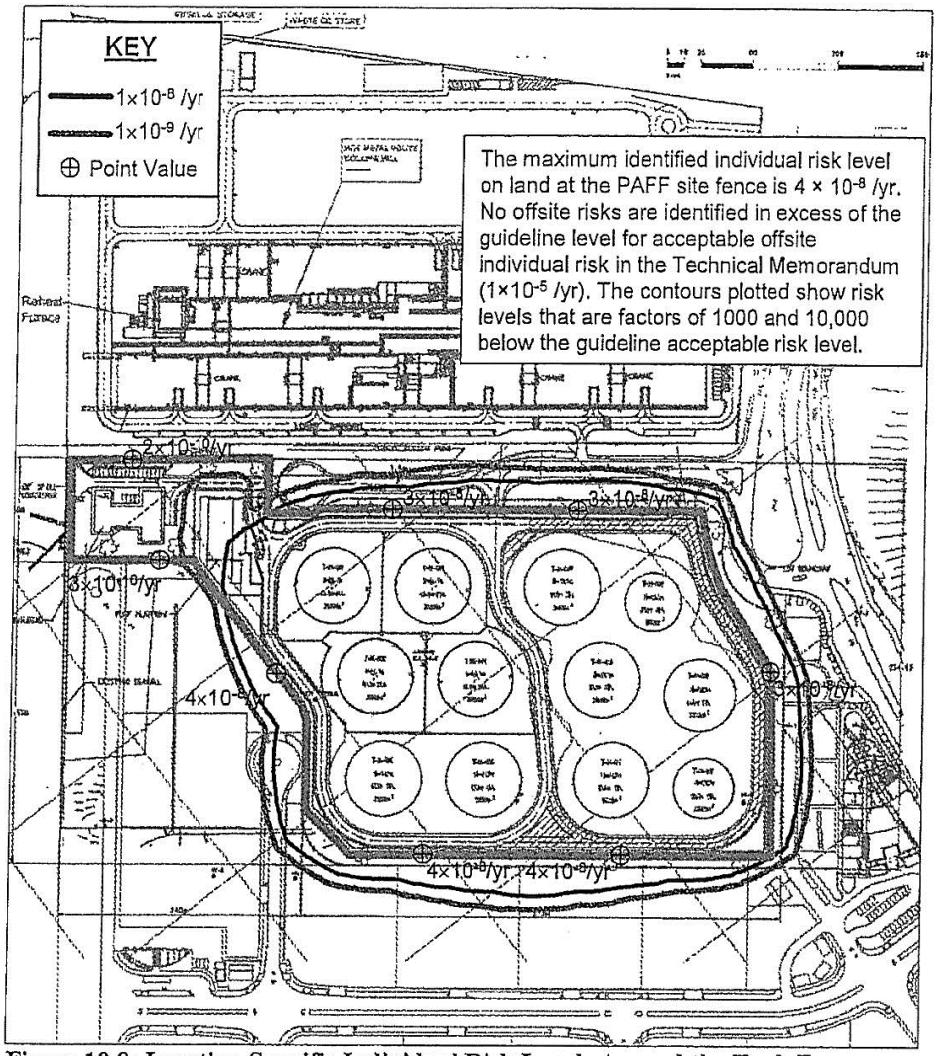
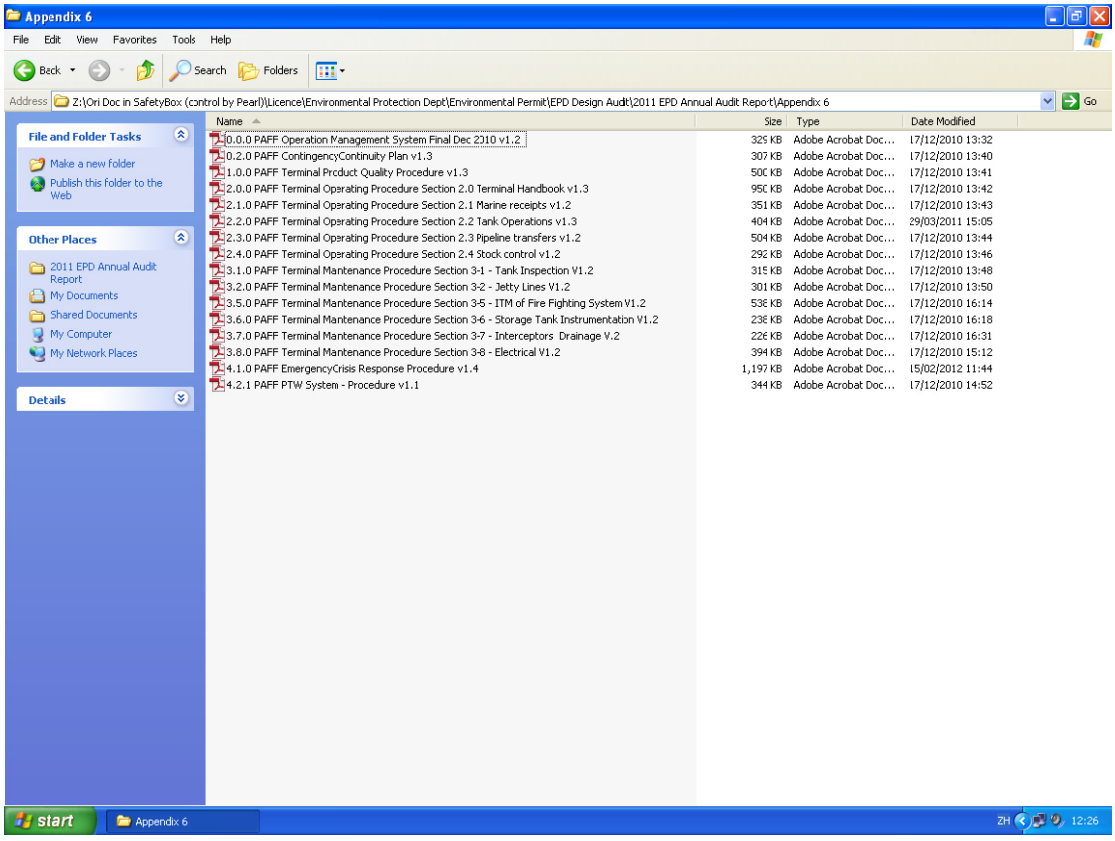


Figure 10.8: Location Specific Individual Risk Levels Around the Tank Farm From All Tank Farm Scenarios for the Final Development (12 Tanks)

10.9.2.6 Peak LSIR values on the PAFF boundary on land are predicted to be 4×10^{-8} /yr, with risk levels dropping to below 1×10^{-8} /yr on the public access road and a similar distance into the EcoPark areas. These risks are due primarily to Jet A1 releases retained within the site boundary, but where flame drag may impinge areas off-site. Since no allowance for escape is made in these areas, to avoid being optimistic, the risk here may in practice be overstated. However, the risk levels are well below the criterion of 1×10^{-5} /yr in the Technical Memorandum [20].

10.9.2.7 Although the LSIR is predicted to be finite over the SWS mill building and Phase I of the EcoPark, the risk levels predicted are extremely small. None of the off-site risks on land, for example, exceed typical estimates for the individual risk due to being struck by lightning (~10^{-7} /yr).

Appendix 6 – PAFF Operations, Maintenance, Quality Control & HSSE Procedures



Appendix 7 – Drawings

List of Drawings

PAFF/BA/02/DWG/C/1452
PAFF/BA/02/DWG/C/1481
PAFF/BA/02/DWG/C/1705
PAFF/BA/02/DWG/C/1721
PAFF/BA/02/DWG/C/1722
PAFF/BA/02/DWG/C/1723
PAFF/BA/02/DWG/C/1724
PAFF/BA/02/DWG/C/1726
PAFF/BA/02/DWG/C/1727
PAFF/BA/02/DWG/C/1728
PAFF/BA/02/DWG/C/1730
PAFF/KG/02/DWG/E/7437
PAFF/LC/01/DWG/M/0202
PAFF/LC/01/DWG/M/0203
PAFF/LC/01/DWG/M/0207
PAFF/LC/02/DWG/M/0266
PAFF/LC/02/DWG/C/0340
PAFF/LC/02/DWG/C/0551
PAFF/LC/02/DWG/M/0875
PAFF/LC/03/DWG/M/0251
PAFF/LC/04/DWG/C/0408
PAFF/MA/03/DWG/C/2807
PAFF/MA/03/DWG/C/2808
PAFF/RJ/02/DWG/G/3015(EX)