

8A LAND CONTAMINATION ASSESSMENT

8A.1 Introduction

This *Section* identifies the potential land contamination problem due to historical land use of the Site. The assessment was undertaken in accordance with the criteria set out in *Annexes 19* of the *EIAO-TM*.

8A.2 Legislation Requirements and Evaluation Criteria

The following legislation covers the handling, treatment and disposal of wastes in Hong Kong, and has been considered in the assessment.

- *Annex 19* of the *Technical Memorandum on Environmental Impact Assessment* (Annex 19 of *EIAO-TM*);
- *Guidance Manual for Use of Risk-based Remediation Goals for Contaminated Land Management* (The RBRGs Guidance Manual);
- *Guidance Note for Contaminated Land Assessment and Remediation* (The Guidance Note); and
- *The Practice Guide for Investigation and Remediation of Contaminated Land* (The Practice Guide).

Annex 19 of the *EIAO-TM* provides the legislative framework for the land contamination assessment for designated projects in Hong Kong. This legislation framework remains valid.

Apart from the abovementioned, the following legislation, documents and guidelines may cover or have some bearing upon the assessment of contamination and the handling, treatment and disposal of contaminated materials for the Project:

- Water Pollution Control Ordinance (WPCO) (Cap 358);
- Waste Disposal Ordinance (WDO) (Cap 354);
- Waste Disposal (Chemical Waste) (General) Regulation (Cap 354C); and
- Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.

8A.3 Project Design and Site Setting

The Project can be divided into three main components, comprising the construction of a seawater desalination plant at Tseung Kwan O Area 137 (TKO137) with a fresh water supply capacity of 135 million liter per day (MLD) (hereinafter referred as 'the Plant Area'), a dedicated trunk feed system which connects the future desalination plant to the Tseung Kwan O Primary Fresh Water Service Reservoir (TKOPFWSR) (hereinafter referred as 'the Feed Area') and slope mitigation work on the natural slope within the Clear Water Bay Country Park (hereinafter referred as 'the Slope Area'). The trunk feed

system consists of pumping station (within desalination plant site), treated water storage tank (within desalination plant site) and about 9km of fresh water mains along Wan Po Road, Po Hong Road and Tsui Lam Road. There are also other minor works such as pipeline fittings and flow monitoring. **Figure 1.1** shows the three main components and minor works of the Project.

The current and historical land use covered by the abovementioned three main project components are presented by using Standard Form 3.1 and 3.2 of the RBRGs Guidance Manual (**Tables 8A.1 and 8A.2**) below:

Table 8A.1 Standard Form 3.1 Summary of On-Site Land Use - Current Use

Proposed Works Area	Type of Existing Facility/Business	On-site Property Land Use	Date Began/Period	Description of Site Walkover Findings	Owner or Occupier	Approximate Size of On-site Property (m²)	Off-site Property Affected ?
The Plant Area	Public Fill/ Temporary Magazine Storage Site (TMS Site)	Industrial	1995 - 2015 2012 - 2015 for TMS Site	Part of the Plant Area was used as the public fill bank for inert construction materials under the Civil Engineering and Development Department (CEDD). The remaining part of the Plant Area was used as TMS Site since 2012.	CEDD	100,000	No
The Feed Area	Vehicle Access Road	Public Roads	1995- 2015	The proposed trunk feed system is located along Wan Po Road and Po Hong Road, which are vehicle access roads.	Highways Department	11,400	No
The Slope Works Area	Country Park	Green Belt	NA - 2015	The Slope Area is part of the Clear Water Bay Country Park	Agriculture, Fisheries and Conservation Department	4,900	No

Table 8A.2 Standard Form 3.2 Summary of On-Site Land Use - Past Use

Proposed Works Area	Type of Existing Facility/Business	On-site Property Land Use	Date Began/Period	Description of Site History	Owner or Occupier	Approximate Size of On-site Property (m ²)	Off-site Property Affected ?
The Plant Area	Public Fill/ Temporary Magazine Storage Site (TMS Site)	Industrial	Prior to 1995	The Plant Area was part of the sea.	CEDD	100,000	No
			1995 - 2012	Part of the Plant Area was developed into the public fill bank, while the TMS Site was still green area.			
			2012 - 2014	No change of land use was observed within the area occupied by public fill bank. The TMS Site was developed in 2012 and no change of operation was identified since then.			
The Feed Area	Vehicle Access Road	Public Roads	Prior to 1995	The Feed Area was part of the sea.	Highways Department	11,400	No
			1995 - 2014	Reclamation for the development of Tseung Kwan O Industrial Park commenced and vehicle access roads were developed alongside with it.			
The Slope Works Area	Country Park	Green Belt	NA	The Slope Area is part of the Clear Water Bay Country Park and was not developed for other land use.	Agriculture, Fisheries and Conservation Department	4,900	No

A review of land use history reveals that a majority of the areas are reclaimed land, except for the Slope Area which has always been a green belt area of the Clear Water Bay Country Park. After reclamation, the future Feed Area was developed as road networks such as Wan Po Road, Po Hong Road and Tsui Lam Road and the Plant Area was used as a public fill bank for the dumping of inert construction materials. Both the Slope Area and Feed Area are not of industrial land use. In 2012, part of the southern Plant Area was developed into a temporary magazine storage to provide service for the South Island Line Project of Mass Transit Railway Corporation (MTRC). In accordance with *Annex 19* of EIAO-TM, the Slope Area, the Feed Area and the public fill bank within the Plant Area are not regarded as land uses with potential contaminated activities and are therefore not covered in this assessment. However, operations performed within the temporary magazine storage (hereinafter referred as 'the TMS Site') may involve potential land contamination activities (e.g. transfer and storage of explosive chemicals). This section assesses the potential land contamination due to operation of the TMS Site.

The TMS Site comprised the following facilities:

- Nine individual temporary magazine storages aligned in L shape, with six storages in a line to the north and three storages to the south, fenced off from access;
- A container office and a mobile toilet for the contractor operating the temporary magazine storage;
- A generator room housing four diesel-fired generators;
- A fire hydrant tank;
- A fire hydrant pump room;
- A jetty; and
- A vehicle access road connecting the above facilities.

The layout of the TMS Site is illustrated in **Figure 8A.1**.

8A.4 Identification of Sensitive Receivers

Future users of the Project and construction workers are likely to be exposed to any potential contaminated soil/ groundwater within the Site.

Future users of the Project can be exposed to potential contamination during the operation stage of the Project. As there will be green area around access roads, part of these areas will not be paved and therefore allow direct contact between potential contaminated soil and site users.

Owing to the nature of the construction work, workers can be temporarily exposed to potential contamination during excavation and preparation of foundation works. The principal exposure routes for future site users and construction workers include:

- Direct ingestion of contaminated soils through eating, drinking or smoking on site;
- Dermal contact with contaminated spoil; and
- Inhalation of contaminations via fugitive emissions/ volatile chemicals.

8A.5 Assessment Methodology

The assessment of potential land contamination impact within the Site was conducted by:

- A desktop study to review the hydrogeology of the Site from the Civil Engineering and Development Department (CEDD);
- A desktop study to review the current and historical land use information from Lands Department (LandsD); and
- A site reconnaissance to identify the existing land uses.

8A.5.1 Site Geological Profile

The geological profile of the TMS Site was reviewed by collating past site investigation records and survey maps from the CEDD. Copies of relevant site investigation records are attached as *Annex 8A.1*. Past conducted borehole/ trial pits were located at the existing Public Fill Area of TKO137 under the project 'Fill Bank at Tseung Kwan O Area 137, Ground Investigation'. The general soil profiles are summarised in **Table 8A.3** below:

Table 8A.3 Summary of Ground Elevation and Underground Geology

Depth (m below ground level)	General Soil Profile
0 - 9.0m	Mainly medium to coarse gravel with occasional concrete, metal, wood and brick fragments
9.0 - 11.5m	Marine deposit
11.5m and below	Alluvium and tuff

As from the record of past site investigations, the general site geology comprises a unified layer of fill at the surface, immediately followed by marine sediment and alluvium. This suggested that the area is reclaimed and not part of the naturally occurring land.

8A.5.2 Site Hydrogeology Profile

The hydrogeological profile of the TMS Site was reviewed by collating past site investigation records and survey maps from the CEDD. Shallow groundwater level was recorded with groundwater typically encountered at 3 – 4m below ground level (m bgl). The vulnerability of groundwater to potential land contamination activities performed within the TMS Site is high.

8A.5.3 Historical Aerial Photographs

A review of historical aerial photographs from the LandsD showing the past land use of the Site was reviewed. The aerial photographs of the TMS Site taken in 1990, 1995, 1998, 2000, 2005, 2009, 2012 and 2014 were reviewed and illustrated in **Figure 8A.2**. **Table 8A.4** below summarizes the type of land use within the Site.

Table 8A.4 Summary of Historical Land Use Information from Aerial Photographs

Referenced Year	Referenced Aerial Photographs	Land Use Description
1990	A23785	Prior to 1990, the TMS Site was part of the sea (Junk Bay).
1995	CN11830	Between 1990 and 1995, reclamation of the Tseung Kwan O Industrial Estate and part of the public fill can be observed to the north of the TMS Site. The TMS Site was still part of the sea.
1998	CN21155	Between 1995 and 1998, the reclamation work was extended towards south up to Fat Tong Chau, an outlying island immediate to the west of the TMS Site. Most of the public fill can be observed, but the TMS Site was still part of the sea.
2000	CN27340	Between 1998 and 2000, the reclamation work already extended to cover the TMS Site. In 2000, the TMS Site was vacant and surrounded by construction work of road networks. A concrete jetty was observed at the southern part of the Site.
2005	CW66157	The TMS Site was left vacant and vegetation was observed growing within the Site.
2009	CS22996	The TMS Site was observed with thick vegetation growth. No activity was observed being conducted within the Site.
2012	CS36650	The temporary magazine storages were constructed in 2012. Concrete pavement was observed within the TMS Site, except part of the access roads.
2014	CS47482	No change was observed compared to that of 2012.

8A.5.4 Site Reconnaissance

A site reconnaissance was conducted at the Site on 7 August 2014 to obtain updated information of land use within the TMS Site as well as to identify areas with possible soil and groundwater contamination activities. The site reconnaissance was accompanied by representative from the CEDD and an interview was conducted with the site contractor representative who managed the magazine storage to understand the operations conducted within the TMS Site. A site reconnaissance checklist is attached as *Annex 8A.2*.

Findings from the magazine storage

The nine magazine storages were located on a concrete paved ground and fenced off from rest of the TMS Site. Access into the magazine storages was not permitted due to health and safety concern. As observed from the outside of the fence, the magazine storages were one-storey concrete structures surrounded by sand bags covered by tarpaulin sheets. The sand bags were reportedly used to minimize the impact in case of accidental explosion.

According to the interview with the site contractor (Nishimatsu Construction Company Limited), both explosives and detonators were stored within the magazine storages and the ground was concrete paved. Explosives and detonators were reportedly in solid form and stored within paper boxes. The package of an individual explosive or detonator unit includes a paper wrap enclosed by another layer of plastic wrap. No information regarding the number of individual explosive or detonator unit stored within the magazine storages was provided.

The logistics practice of the explosives and detonators could not be observed at the time when the site reconnaissance was conducted. As reported by the site contractor, explosives and detonators were transported to the TMS Site by ships and were loaded onto the Jetty and further transferred to the magazine storages. The explosives and detonators were supplied to the South Island Railway Line project of the MTRC of Hong Kong. When needed, the explosives and detonators were loaded onto concealed trucks and transport away from the Site.

During the site reconnaissance, no chemicals were observed being stored within the magazine storages and no aboveground/ underground storage tanks was observed/ reportedly present. The concrete ground surface was maintained in good condition and the structure of the magazine storages can provide cover to explosives and detonators from adverse weather. No sign of leakage or spillage of explosive or detonator was observed. Therefore, it is anticipated the risk of land contamination due to activities performed within the magazine storages is minimal. The indicative location of the magazine storages is shown in **Figure 8A.1**. Photos taken at the magazine storages are included in **Figure 8A.3**.

Findings from the generator room

The generator room was located approximately 20m southeast of the magazine storages, separated by an unpaved vehicle access road. The generators inside the generator room provide electricity for the site office of magazine storages and were managed by the site contractor. The generator room occupied an approximate area of 10m X 20m, housing a total of 4 diesel-fired generator sets. The generator room was

concrete paved and enclosed from surrounding by corrugated metal sheets.

The generator sets were provided with secondary containments. However, oil stains were observed on the paved ground inside the generator room. Approximately 10 diesel oil drums (with capacity of 2 Liters) were stored within the generator room and no secondary containment was provided.

Although the generator room is paved, obvious signs of spillage of diesel oil were observed within the generator room. Also, the surrounding area of the generator house was not paved with concrete. The possibility of spilled diesel oil leak out from the generator room and cause land contamination cannot be ruled out. The indicative location of the generator room is shown in **Figure 8A.1**. Photos taken at the generator room are included in **Figure 8A.3**.

Findings from the vehicle access road

The vehicle access road connecting the magazine storages, the jetty, the fire hydrant tank and the generator room was not concrete paved. During the Site reconnaissance, approximately 30 waste chemical drums with the label of 'bituminous waterproofing emulsion' were observed being stored at the side of the vehicle access road southwest of the magazine storages. No secondary containment was provided for these chemical drums and potential leakage from these waste chemical drums could impact the underlying soil. The location of the waste chemical drums storage is shown in **Figure 8A.1**. Photos taken at the vehicle access road are included in **Figure 8A.3**.

8A.6 Land Contamination Impact Evaluation and Mitigation Measures

Based on the review of historical aerial photographs, the TMS Site was once part of the sea prior to reclamation finished in 2000. After the completion of the reclamation work, the TMS Site was left vacant until the magazine storages and other associated facilities were constructed in 2012. Therefore the risk of potential land contamination due to land use prior to the 2012 is anticipated to be low.

Since 2012, the TMS Site was used as a temporary magazine storage facility, which comprised the main magazine storages and supporting facilities such as site office, generator room and fire hydrant tank. Based on the observation from the Site reconnaissance, potential risks of land contamination due to operation activities of the magazine storages were identified at the generator room and the waste chemical drums storage at the side of the vehicle access road.

The TMS Site operates under the Environmental Permit EP-438/2012/G of the Shatin to Central Link (SCL) Project and was currently under the control of the Contractor of the SCL Project. It is anticipated that under its EP conditions and current Environmental Monitoring & Audit (EM&A) programme of the SCL Project, if soil and groundwater contamination occurred during the occupancy period, the owner of TMS Site and/or its contractor(s) shall ensure the TMS site is properly cleaned up before handover to CEDD.

After the TMS Site is handed over to WSD and before the commencement of any construction work at the TMS Site, the contractor of WSD shall prepare a Contamination Assessment Plan (CAP) for EPD endorsement prior to the commencement of site investigation. A Contamination Assessment Report (CAR) shall

be prepared to summarise the results of the site investigation. If land contamination is identified, a Remediation Action Plan (RAP) shall be prepared to identify feasible remediation methods and a Remediation Report (RR) shall be prepared to demonstrate completion of remedial actions for EPD endorsement.

In order to minimize the potential adverse effect to the environment due to the handling of contaminated materials, the following environmental mitigation measures are proposed during the course of site remediation.

- Excavation profiles shall be properly designed and executed;
- An impermeable surfacing shall be placed under the stockpile and a cover should be employed to prevent dust emission and possible cross contamination. If not applicable, regular watering shall be applied; and
- Trucks carrying contaminated materials shall be enforced with speed control.

In order to confirm that the construction Contractor(s) has(have) implemented the recommendations of the EIA Report, regular site inspections and audits during construction phase will be conducted in accordance with the approved procedures in CAP. The visual inspections/audits will look at all aspects of construction activities that disturb soil. The first inspection/audit will be conducted at the commencement of the construction works.

8A.7 Conclusion

A land contamination assessment has been conducted for the Project. The Project comprised the construction of a desalination plant (the Plant Area); a trunk feed system (the Feed Area) connecting the plant to the TKOPFWSR and other associate supporting facilities as well as the slope mitigation work (the Slope Area) at part of the Clear Water Bay Country Park. Based on a review of historical information, only the area covered by the TMS Site was identified with low risk of potential land contamination.

The TMS Site was part of the sea prior to 2000 and was left vacant after the completion of reclamation until 2012. It was then used as a magazine storage facility. A site reconnaissance was conducted on 7 August 2014 and potential land contaminating risks were identified at the generator room and the waste chemical drum storage at the side of the vehicle access road.

Before the hand-over of the TMS Site to WSD for further development, the owner of TMS Site and its contractor shall ensure the TMS site is properly cleaned up before handover to CEDD. After the TMS Site is handed over to WSD and before the commencement of any construction work, the contractor of WSD shall prepare a Contamination Assessment Plan (CAP) for EPD endorsement prior to the commencement of site investigation. A Contamination Assessment Report (CAR) shall be prepared to summarise the results of the site investigation. If land contamination is identified, a Remediation Action Plan (RAP) shall be prepared to identify feasible remediation methods and a Remediation Report (RR) shall be prepared to demonstrate completion of remedial actions for EPD endorsement

With the above mitigation measures in place, the overall impact due to land

contamination, if identified, of the Site is considered to be insignificant after the site investigation and remediation (if necessary). No contamination causing insurmountable impacts to the environment is expected.