

**Chapter 10**

**SUMMARY OF ENVIRONMENTAL  
OUTCOMES**

## 10. SUMMARY OF ENVIRONMENTAL OUTCOMES

### Land Contamination

- 10.1 According to the SI for land contamination assessment, the subject shipyard was found to be contaminated with heavy metals, TPH, SVOCs and dioxins.
- 10.2 The volumes of contaminated soils in Areas 1, 2 and 3 are estimated to be 10,150m<sup>3</sup>, 15,250m<sup>3</sup>, and 61,600m<sup>3</sup> respectively. The contaminated soil will be excavated and treated on site for metal-contaminated soil or off site at TKW for other types of contaminated soil according to their nature of contamination. The contamination level of groundwater was considered acceptable according to the risk-based standard, therefore no *in situ* nor off-site treatment of groundwater is required except that there is a small hot spot area which was shown to have notable free product.
- 10.3 Remediation systems will be effectively mitigated to prevent any potential negative impacts. No contaminated soil will remain after remediation to the agreed cleanup standards. Free product encountered during excavation will be bailed out as much as possible, and will be disposed of as chemical waste. As such, land contamination at CLS will not adversely affect the Theme Park development and will not pose significant health threat to the future users of the site.
- 10.4 Compared to the future land users, construction workers will be more exposed to the contaminated material during excavation and remediation works. The principal exposure routes for workers are ingestion, inhalation, and dermal contact. However, with the strict implementation and enforcement of safety measures, no excessive health risk will be posed on the workers.
- 10.5 The transport of contaminated soil is covered under waste management.
- 10.6 Upon completion of the remediation works, all the contaminated soil excavated from the CLS will be decontaminated to the relevant cleanup standards. With proper implementation of proposed mitigation measures, there will be no adverse environmental impacts on site workers and other sensitive receivers.

### Air Quality Impact

- 10.7 Dust will be generated during building demolition, slope improvement and remediation of CLS, handling of general contaminated soil process at TKW and truck haulage. The predicted hourly and daily TSP concentrations at the worst affected elevation (1.5m above ground) are in the range of 73 – 192 µg m<sup>-3</sup> and 71 – 94 µg m<sup>-3</sup>, respectively. It has been predicted that Penny's Bay GTP at CLS and dockyard building at TKW will receive higher hourly and daily TSP levels.
- 10.8 Cumulative air quality impact from the decommissioning of CLS and other activities from the construction of the theme park at Penny's Bay were predicted. Maximum hourly and daily TSP concentrations are predicted at Penny's Bay GTP and are about 266 µg m<sup>-3</sup> and 125 µg m<sup>-3</sup>, respectively. Thus, exceedances of the TSP criteria are not predicted.
- 10.9 Dioxins have been measured at the burn pit areas of CLS. Modelling results indicated that the impacts at the ASRs satisfy the hourly criteria with the proposed excavation rates.

- 10.10 TOC and TAPs including dioxins would be emitted from the treatment facilities, their air quality impacts would comply with the air quality standards, with the control measures incorporated.
- 10.11 Air quality impacts associated with the decommissioning of treatment facilities at TKW site will be low and will comply with the air quality criteria.
- 10.12 The risk level associated with the operation of the treatment facilities has been assessed to be insignificant, and comply with international criteria.

### **Waste Management**

- 10.13 C&D material will be generated during the demolition of the shipyard facilities and the estimated quantity is about 10,000m<sup>3</sup>. In addition, about 1,000 tonnes of steel and 5,000 m<sup>3</sup> of general refuse will also be generated. It is considered that adverse waste impacts will not be generated provided that good site practices and waste handling procedures are strictly followed.
- 10.14 During slope improvement phase, around 40,000m<sup>3</sup> uncontaminated soil and 2,100m<sup>3</sup> uncontaminated rock will be generated during excavation and soil nailing. Such excavated material will be reused/ recycled as much as practical or transported to public filling areas (PFAs) for public fill. As such, no residue waste impact is anticipated.
- 10.15 During remediation, about 39,000m<sup>3</sup> contaminated material will be excavated from Cheoy Lee Shipyard and will be transported to To Kau Wan for off-site treatment whereas 48,000m<sup>3</sup> metal-contaminated soil will be treated on-site at CLS. Environmental and safety measures have been recommended to minimise secondary environmental impacts and health risks during collection and transportation of contaminated soils from CLS to TKW. After both on-site and off-site treatment, around 100,000m<sup>3</sup> clean inert materials suitable for public filling will be generated. The condensate of around 600m<sup>3</sup> as the end product of the treatment and other chemical wastes will be collected and disposed of at the Chemical Waste Treatment Centre. Thus, no residual waste impact and health risk concerns are expected.
- 10.16 During decommissioning of TKW, around 5,000m<sup>3</sup> C&D material and 500 tonnes steel will be generated. C&D material will be transported to PFAs and metal will be recycled, therefore, no residue impact is envisaged.
- 10.17 The overall total of C&D material to be generated by this Project is estimated around 0.4Mm<sup>3</sup>. The C&D material will be reused and recycled as far as practicable in the land formation works within CLS site so as to minimise the amount of C&D material to be disposed of at PFAs.
- 10.18 Incident rate of road accidents for transportation of waste has been estimated to be acceptably low. Notwithstanding this, mitigation measures have been proposed to minimise the impact of spillage of waste during transit.

### **Water Quality Impact**

- 10.19 Contaminants with levels higher than the discharge standards as stipulated in the *TM-ES* are found in groundwater at the CLS site. Thus, direct discharge of groundwater collected from

the dewatering process during excavation of contaminated soil shall not be allowed. Where necessary, groundwater should be recharged back into the ground within the CLS site.

- 10.20 Any seepage of contaminated groundwater from CLS site into the adjacent drainage channel will be diluted by 88 times prior to discharge into the marine water. The water quality within the drainage channel will still comply with the UK Water Quality Standards. In addition, the high installation level of the drainage channel than the watertable and the concrete channel wall will act as additional barriers to prevent CLS groundwater from seeping to the drainage channel. It is therefore considered that the water quality of the identified water sensitive receivers in the vicinity of the CLS site will comply with the relevant water quality guidelines. The remediation of CLS site will have an overall environmental benefit where after excavating CLS soils for treatment, the contamination source will be removed and stopped from polluting the groundwater.
- 10.21 Any surface runoff and on-site discharge from the CLS site, slope work construction site and treatment site at TKW will be readily controlled by good site management practices and implementation of appropriate on-site measures. For potentially contaminated effluents, such as plant leachate, runoff from the thermal desorption plant, wheel wash water and decontamination water, centralised wastewater treatment units shall be provided at each of the Project site to get rid of the contaminant from the effluent before being discharged. Therefore, no adverse water quality is expected on the identified water quality sensitive receivers.

### **Ecological Impact**

- 10.22 The main potential ecological impacts resulting from the project were identified as:
- Direct impacts to tall shrub/freshwater wetland habitats and associated restricted and protected plant species near MTHS;
  - Direct impacts to Rice Fish habitats and potentially Rice Fish populations;
- 10.23 Measures to mitigate impacts upon ecologically sensitive receivers are detailed in Section 8. With the successful implementation of mitigation measures, residual impacts arising from the project will be ecologically acceptable.

### **Impact on Cultural Heritage**

- 10.24 The archaeological survey of CLS revealed that the area has high archaeological values. Many artifacts of different periods, including the Late Neolithic period, Bronze Age, Tang Dynasty, Song Dynasty, Ming Dynasty and Ching Dynasty have been recovered in the three demarcated zones along the ancient coastal area. As Penny's Bay is blocked by the surrounding hills and is remote from the city centre, the cultural heritage would not be damaged easily. The recovered cultural remains therefore have high archaeological value.
- 10.25 Infrastructure works at the three archaeological zones shall be avoided to ensure the potential impact to any surviving archaeological remains is kept in an absolute minimum. The CLS have been contaminated with the shipyard activities, and decontamination works are required. The potential archaeological site where are not subject to rescue excavation shall be covered

by impermeable sheeting before filling. Detailed design of filling work or ground level adjustment work should consider diversion of site runoff to prevent any waterlogged conditions. For areas where preservation in situ is not possible, the impact on the heritage resources should be mitigated by rescue excavation. All rescue works have to be completed prior to the decontaminated works of CLS.