

## CONTENT

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
<b>2</b>	<b>PROJECT DESCRIPTION .....</b>	<b>1</b>
2.1	NEED OF THE PROJECT.....	1
2.2	PROJECT LOCATION AND STUDY AREA.....	2
2.3	PROJECT SCOPE .....	2
2.4	PROJECT PROGRAMME .....	2
2.5	CONSIDERATION OF ALTERNATIVES .....	3
<b>3</b>	<b>KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT .....</b>	<b>4</b>
3.1	AIR QUALITY .....	4
3.2	HUMAN HEALTH RISK ASSESSMENT.....	4
3.3	WASTE MANAGEMENT IMPLICATIONS .....	5
3.4	WATER POLLUTION .....	5
3.5	ECOLOGY .....	6
3.6	NOISE IMPACT .....	7
3.7	LANDSCAPE AND VISUAL IMPACT ASSESSMENT .....	7
3.8	LANDFILL GAS HAZARD.....	8
3.9	ENVIRONMENTAL MONITORING AND AUDIT .....	8
3.10	CONCLUSION .....	8

### List of Figures

- Figure 1      Location Plan of Proposed Sludge Treatment Facilities  
Figure 2      Project Area Boundary of Sludge Treatment Facilities

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## **1 INTRODUCTION**

1.1.1 The Project is to build the Sludge Treatment Facilities (STF), which are designed to treat 2,000 wet tonnes/day of the dewatered sludge generated after the sewage treatment process in the Stonecutters Island Sewage Treatment Works (STW) and 10 other regional sewage treatment works (STWs) by the fluidized bed incineration technology, in the pulverized fuel ash (PFA) lagoon area in Tsang Tsui (as shown in **Figure 1**).

1.1.2 The Project is a Designated Project according to Item G.3 Part I Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO) (i.e. construction and operation of an incinerator with an installed capacity of more than 50 tonnes per day) and Item 8 of Part II Schedule 2 of the EIAO (i.e. decommissioning of a waste disposal facility for pulverized fuel ash, furnace bottom ash or gypsum). An environmental permit is required for the implementation of the Project under the EIAO. The EIA Study Brief (No. ESB-169/2007) for an Environmental Impact Assessment (EIA) study for the Project was issued by the Environmental Protection Department (EPD) in October 2007.

1.1.3 The EIA study was conducted based on the reference design of the STF in order to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities that take place concurrently.

## **2 PROJECT DESCRIPTION**

### **2.1 Need of the Project**

2.1.1 Currently, the sludge produced after sewage treatment process is dewatered in the STWs and then delivered to landfills for disposal. Due to its high water content, the dewatered sludge has to be co-disposed with municipal solid waste (MSW) and construction waste in a ratio of 1:10 to maintain the stability of the landfills.

2.1.2 However, this current practice is considered not sustainable due to the following reasons:

- Sludge takes up precious space of the existing landfills, which are anticipated to reach their capacities in early to mid 2010.
- Disposal of biodegradable waste to landfill is not in line with international trend.
- The disposal ratio of dewatered sludge to MSW (1:10) would not be achieved due to the decrease in MSW with the implementation of various waste management measures in accordance with “A Policy Framework for the Management of Municipal Solid Waste (2005-2014)”, and increase in sludge production after the commissioning of Harbour Area Treatment Scheme Stage 2A and expansions of some existing STWs.

2.1.3 There is an urgent need for an alternative sludge disposal mean.

## 2.2 Project Location and Study Area

2.2.1 The STF is proposed to be located in the eastern part of the existing PFA lagoon area in Tsang Tsui near Nim Wan on the north-western coast of the New Territories. The proposed site is on a coastal area immediately northeast of the Black Point Power Station and adjacent to the West New Territories (WENT) Landfill site. The open water of Deep Bay is located north of the proposed site. The project area boundary of the STF is shown in **Figure 2**. It is estimated that the STF will occupy an area of approximately 7 hectares. The STF site will be assessed through a temporary vehicular bridge spanning across the existing channel between existing WENT Landfill site and the PFA lagoon. Alternative temporary and permanent access to the STF site to suit the phased development of the WENT Landfill Extension project will be investigated and proposed under the WENT Landfill Extension project.

## 2.3 Project Scope

2.3.1 The Project mainly includes the following components:-

### Incineration Plant

- Sludge receiving, storage and feeding system
- Fluidized bed incinerators
- Waste heat recovery and power generation system
- Flue gas treatment system
- Ash storage and handling system
- Residue storage and handling system
- Fluidized bed sand storage and handling system
- Reagent reception and storage system
- Process control and monitoring system

### Ancillary and Supporting Facilities

- Administration building, education centre and laboratory
- Weighbridge
- Maintenance workshop and utility yard
- Sewerage system & sewage treatment works
- Water supply system & desalination plant
- Drainage system
- Deodorization system
- Vehicle washing facilities
- Site security
- Access road

### Decommissioning of Pulverized Fuel Ash lagoon at Tsang Tsui

- Works associated with the decommissioning of the PFA lagoon at Tsang Tsui

## 2.4 Project Programme

2.4.1 It is intended to construct, operate and maintain the STF under design-built-operate (DBO) contract arrangement. The construction is currently scheduled to commence in early 2010 for completion by the end of 2012. The STF will have a design life of 20 years.

## **2.5 Consideration of Alternatives**

### Technology Selection

2.5.1 A review of the findings of the previous studies on sludge treatment and the information of the latest sludge treatment technologies was carried out, and a comprehensive evaluation on the shortlisted options, including incineration and heat drying, was conducted in respect of environmental, engineering and financial considerations for selecting the preferred option for the STF. It was concluded that incineration was the most preferable option with the following merits:-

- Low total costs;
- Large reduction in volume of end product to be disposed to landfill; and
- Reuse of energy from the incineration process.

### Site Selection

2.5.2 The potential sites for the STF in the following areas were identified and evaluated:-

- Quarry Site, Lamma Island;
- Shek Kwu Chau;
- Ha Pak Nai;
- Tuen Mun Port;
- Stonecutters Island;
- West Lamma Island;
- Siu Ho Wan;
- Tit Cham Chau; and
- Nim Wan.

2.5.3 The proposed site in Nim Wan was considered as the most suitable site for the STF when taking into consideration the followings:-

- The site is remote from residential areas. The Black Point Power Station and the WENT landfill are located in the vicinity of this proposed site.
- At present, there is no land use designation and no major strategic consideration for this area.
- The site is accessible by means of road and marine transportations resulting in its middle rank for both engineering feasibility and operation convenience aspects.
- The STF in the proposed site would unlikely result in unacceptable water quality impact, marine ecological & fisheries impact, terrestrial ecological impact and landscape & visual impact.

### **3 KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT**

#### **3.1 Air Quality**

##### Construction Phase

- 3.1.1 The potential air quality impacts from the construction of the Project would mainly be related to construction dust from excavation, materials handling, filling activities and wind erosion. With the implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation, dust impact on nearby air sensitive receivers would be minimal.

##### Operation Phase

- 3.1.2 During the operation of the STF, the potential sources of air quality impacts would be the air emissions from the stacks of incineration process and the odour nuisance from the on-site wastewater treatment plant and the sludge reception hall.
- 3.1.3 There would also be cumulative air quality impacts contributed from other existing and planned emission sources in Tuen Mun, including the Black Point Power Station, Castle Peak Power Station, Green Island Cement Plant, WENT landfill and the proposed WENT landfill extension, EcoPark, Shiu Wing Steel Mill, etc.
- 3.1.4 Air pollution control and stack monitoring system will be installed for the STF to ensure that the emissions from the STF stacks will meet the stringent target emission limits equivalent to those stipulated in Hong Kong and the European Commission for waste incineration. Besides, all the potential odour emissions associated with the operation of the STF will be collected and destroyed by the incineration process or ventilated to deodorizer before discharge to the atmosphere.
- 3.1.5 With the implementation of practicable air pollution control, the STF would not cause adverse cumulative air quality impact at all the air sensitive receivers in the vicinity of the Project site and those further away in the Tuen Mun new town area.

#### **3.2 Human Health Risk Assessment**

- 3.2.1 Apart from the general air quality impacts, the cancer risk arising from exposure to carcinogenic contaminants of concern (COCs) associated with the emissions of STF was also evaluated in the EIA. In terms of lifetime individual excess cancer risks, the highest cancer risk associated with the STF emission is predicted to be at the level of “As Low As Reasonably Practicable (ALARP)”.
- 3.2.2 Cumulative acute and long term non-carcinogenic health impact of the STF imposed to the worst impacted human receptors were assessed and compared with local and overseas guideline levels. It was concluded that the levels of non-carcinogenic chemicals were found to be insignificant when compared to the adopted/derived reference levels.

- 3.2.3 Microbes from dewatered sewage sludge during their transportation, storage and handling in the STF operation were assessed. Twenty-five hazards concerning microbial emissions associated with the STF operations were identified. With consideration of existing/expected safeguards, the risk levels of all the 25 hazards were found to be tolerable and were at the level of “As Low As Reasonably Practicable”.
- 3.2.4 The potential health risk induced by radon emissions associated with PFA arising from the construction and operation was also evaluated. The estimation indicated that there would be no significant radiological hazard to workers working outdoors in the STF or in the restored/operating ash lagoon area adjacent to the STF. The annual effective dose equivalent to a worker spending 2000 hours outdoors on an ash filled lagoon would be about 0.19 mSv, which is insignificant comparing to annual limit of 1 mSv for general public suggested by the International Commission on Radiological Protection (ICRP). Since the risk imposed on workers with direct radon exposure is not significant and that there will be no off-site disposal of PFA under this Project, the risk on off-site air sensitive receivers will also be insignificant as well. From various literature researches, the radon health risk for construction and operation of the proposed STF would be negligible.

### **3.3 Waste Management Implications**

- 3.3.1 The types of waste would be generated during the construction phase of the Project include construction and demolition (C&D) materials from the construction activities, general refuse from the workforce and chemical wastes from the construction plant and equipment. Adverse environmental impact is not be expected during the construction phase with the approved methods to handle, transport and dispose the waste and the recommended good site practices being strictly followed.
- 3.3.2 The end product from the incineration process would include incinerator ash (bottom ash and fly ash) and flue gas cleaning residue. The incinerator ash and flue gas cleaning residue will be disposed of at the landfill after checked for compliance with the proposed incineration residue pollution control limits. Pre-treatment may be required for flue gas cleaning residue prior to disposal.
- 3.3.3 Limited amount of chemicals or chemical wastes would be used or generated for the operation of the STF. With proper implementation of the recommended practices and response procedures for contamination prevention, the potential for contamination due to the STF operation would be minimal.

### **3.4 Water Pollution**

- 3.4.1 The potential sources of water quality impact arising during the construction phase of the Project include construction site runoff and drainage, wastewater generated from general construction activities, and sewerage from the workforce. With implementation of the recommended mitigation measures and site practices

outlined in ProPECC PN 1/94, no unacceptable residual impacts on water quality are expected.

- 3.4.2 During the operation phase of the Project, wastewater will be generated from sanitary facilities used by plant personnel, commercial activities and sludge treatment activities in the STF. An on-site wastewater treatment plant will be provided. All generated wastewater will be discharged to the on-site wastewater treatment plant and treated by the process of Membrane Bioreactor (MBR). The treated effluent from the wastewater treatment plant will be reused in the STF and there would be no wastewater effluent discharged to the coastal waters of Deep Bay.
- 3.4.3 Saline water would be discharged from the proposed desalination plant in a low discharge rate. The saline water discharged from the desalination plant will comply with the standards for effluents discharging into the coastal waters of Deep Bay Water Control Zone. Adverse impacts on water quality would not be expected.
- 3.4.4 To prevent potential emission of microbes during transportation, storage and handling of dewatered sewage sludge into surrounding waterbodies, proper design of the STF will be conducted and the recommended “risk control measures” will be implemented. No unacceptable water quality impacts are expected.

### **3.5 Ecology**

- 3.5.1 A literature review supplemented by comprehensive ecological survey covering dry and wet seasons was undertaken to establish the ecological profile of the Assessment Area. Nine habitat types were identified within the Assessment Area including ash lagoons, secondary woodland, grassland / shrubland, plantation, watercourse, developed area / disturbed area, orchard, seawall and coastal waters. Three species of flora and 27 fauna of conservation interest were recorded in the Assessment Area.
- 3.5.2 Most of the identified habitats in the Assessment Area have low ecological value, except two watercourses (W1 and W2), the East Lagoon, and secondary woodland were ranked as low to moderate. The Middle Lagoon was considered of moderate ecological value.
- 3.5.3 A total of approximately 7.8 ha of habitats would be permanently lost under this Project. Over 79% of the affected habitats are man-made habitats including approximately 6 ha ash lagoon, 0.1 ha developed area/disturbed area, 0.02 ha plantation and 1.6 ha grassland/shrubland. A very small area of an estuary would probably be affected during the construction of vehicular bridge temporarily. As the proposed Project is a land based project, no marine ecological habitats would be affected.
- 3.5.4 The construction of the STF would affect the potential breeding ground of Little Grebe in the East Lagoon of low to moderate ecological value. The impact is anticipated to be minor as the East Lagoon is not the main foraging and breeding



ground for the species and alternative similar habitat for Little Grebe is available in the adjacent Middle Lagoon.

- 3.5.5 Potential indirect construction and operation impacts to the habitats and associated wildlife adjacent to the proposed STF would be resulted from increased human disturbance / activities and noise due to vehicles entering and exiting the site.
- 3.5.6 Mitigation measures such as provision of 3m high hoarding along the boundary of the works areas and site access, screening (i.e. fencing with climbers or plantation) along the STF site boundary and the two sides of access road, good site practices, use of quiet construction methods and machinery, measures to control potential sedimentation / water quality impacts as well as habitat enhancement (i.e. tree planting and creation of pond(s) for Little Grebe) have been recommended to minimize potential indirect impacts to wildlife. As a precautionary measure, the works area will be thoroughly inspected by experience ecologist(s) to confirm no breeding activities of Little Grebe would be affected by the construction activities before commencement of any site works.
- 3.5.7 With the implementation of the recommended mitigation measures, it is anticipated that the construction and operation for the proposed works would not result in unacceptable impacts on ecological resources. The implementation of all mitigation measures would be subject to regular audit as part of the EM&A programme.

### **3.6 Noise Impact**

- 3.6.1 No existing or planned noise sensitive receivers (NSRs) were identified within 300m from the site boundary of the Project. Potential impacts due to noise generated from the construction of the Project and fixed plant noise from the operation of STF are not expected.
- 3.6.2 With regards to the potential traffic noise impact due to the off-site traffic generated from the operation of the proposed STF, a traffic noise impact assessment was carried out for the prevailing scenario (Year 2012 before commencement of the proposed STF) and scenarios with and without the operation of the STF in 2027.
- 3.6.3 The assessment results indicated that the predicted traffic noise due to the off-site traffic generated from the proposed STF would not result in significant increase in traffic noise impact on the NSRs along Lung Kwu Tan Road.

### **3.7 Landscape and Visual Impact Assessment**

- 3.7.1 Seven landscape resources and five landscape character areas were identified within 500m from the site area. The impact to these landscape resources and landscape character areas would be insubstantial, except for ash-lagoon and seashore. Mitigation measures, such as aesthetic design of the proposed STF matching with adjacent landscape setting of the site, greening along the site boundary to provide screening and enhance the waterfront area, would be implemented. After the implementation of the mitigation measures, the long-term

residual impact to the landscape resources / landscape character areas would be reduced to insubstantial or slight.

- 3.7.2 Ten visual sensitive receivers (VSRs) were identified within the zone of visual influence. Most of these VSRs have low sensitivity to change, and the magnitude of impact to them would be negligible or small. Therefore, the visual impact to seven VSRs would be insubstantial or slight during construction and operation phase. However, the visual impact to the residents in Shekou and the travelers of the future access road adjacent to the STF would be moderate, while that to the residents in Pak Nai would be substantial. Mitigation measures would be implemented during the construction and operation phase to reduce the potential visual impacts to the VSRs. After the implementation of the mitigation measures, the long-term residual impact to the VSRs would be reduced to insubstantial or slight.
- 3.7.3 Overall, it is considered that the residual landscape and visual impacts of the proposed development would be acceptable with mitigation measures during construction and operation phase.

### **3.8 Landfill Gas Hazard**

- 3.8.1 A source-pathway-target analysis was conducted to assess the risk of landfill gas hazard from the existing WENT Landfill and the proposed WENT Landfill Extensions to this Project. The overall risk level for both construction and operation phase of the Project associated with the existing WENT Landfill was assessed to be low, while the risk level associated with the WENT Landfill Extensions was assessed to be medium.
- 3.8.2 A number of protection measures have been recommended for the Project to safeguard the safety of the site workers and all personnel presence at the Project site. No adverse impact of landfill gas hazard on this Project is anticipated.

### **3.9 Environmental Monitoring and Audit**

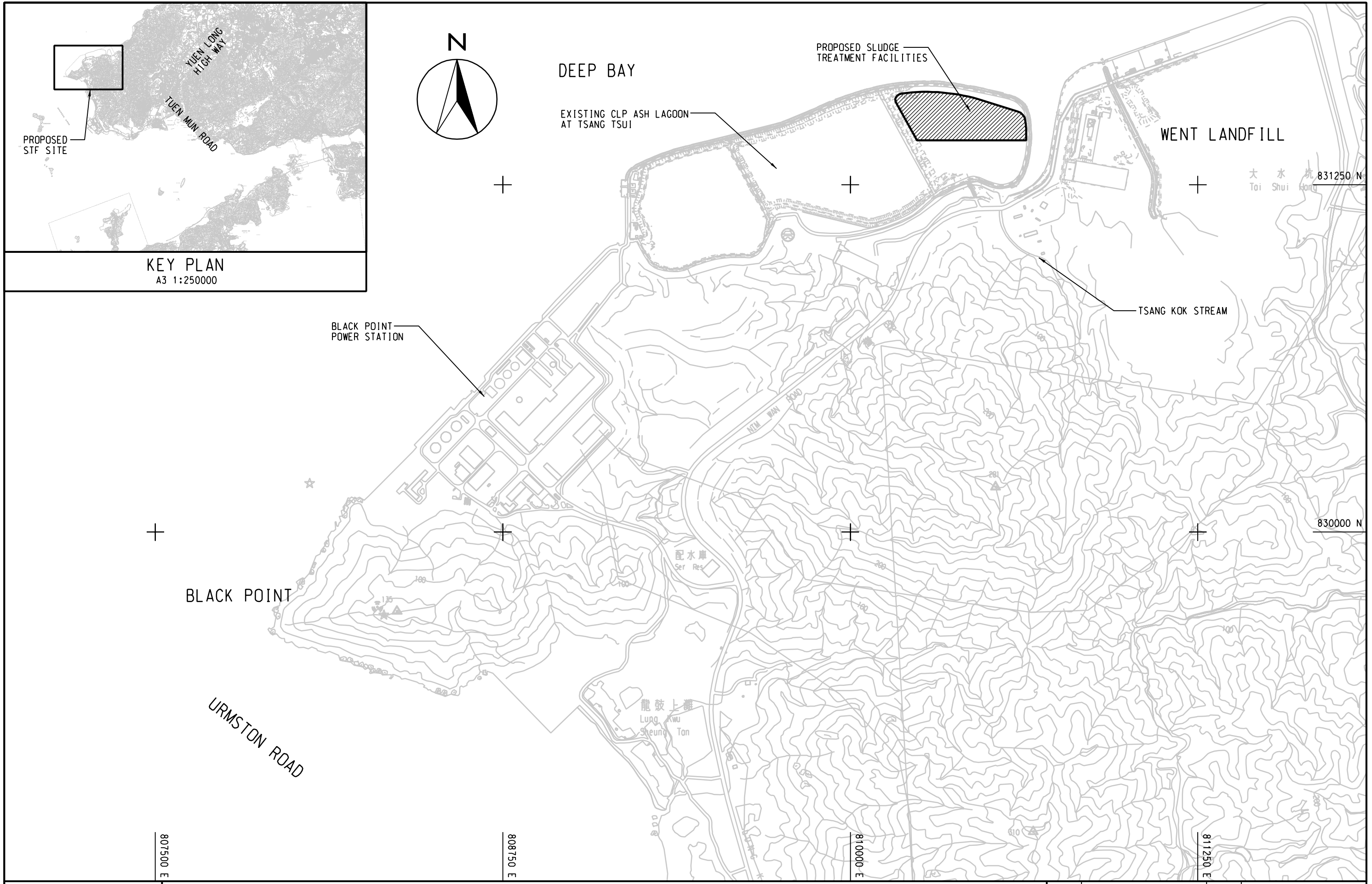
- 3.9.1 Environmental monitoring and audit (EM&A) requirements for the Project have been specified in an EM&A Manual. The EM&A Manual contains details of proposed baseline and compliance monitoring programme, implementation schedule of the environmental protection / mitigation measures, EM&A reporting procedures and compliant handling procedures.

### **3.10 Conclusion**

- 3.10.1 The EIA has determined the likely nature and extent of environmental impacts predicted to arise from the Project. Where necessary and practicable, the EIA has specified mitigation and control measures to reduce the environmental impacts to acceptable levels.
- 3.10.2 With the recommended mitigation measures applied, the Project would be environmentally acceptable and no unacceptable residual impacts are anticipated. The schedule of implementation of the recommended mitigation measures has

been provided in the EIA report. Monitoring requirements have also been specified in a separate EM&A Manual to ensure proper implementation of the recommended mitigation measures.

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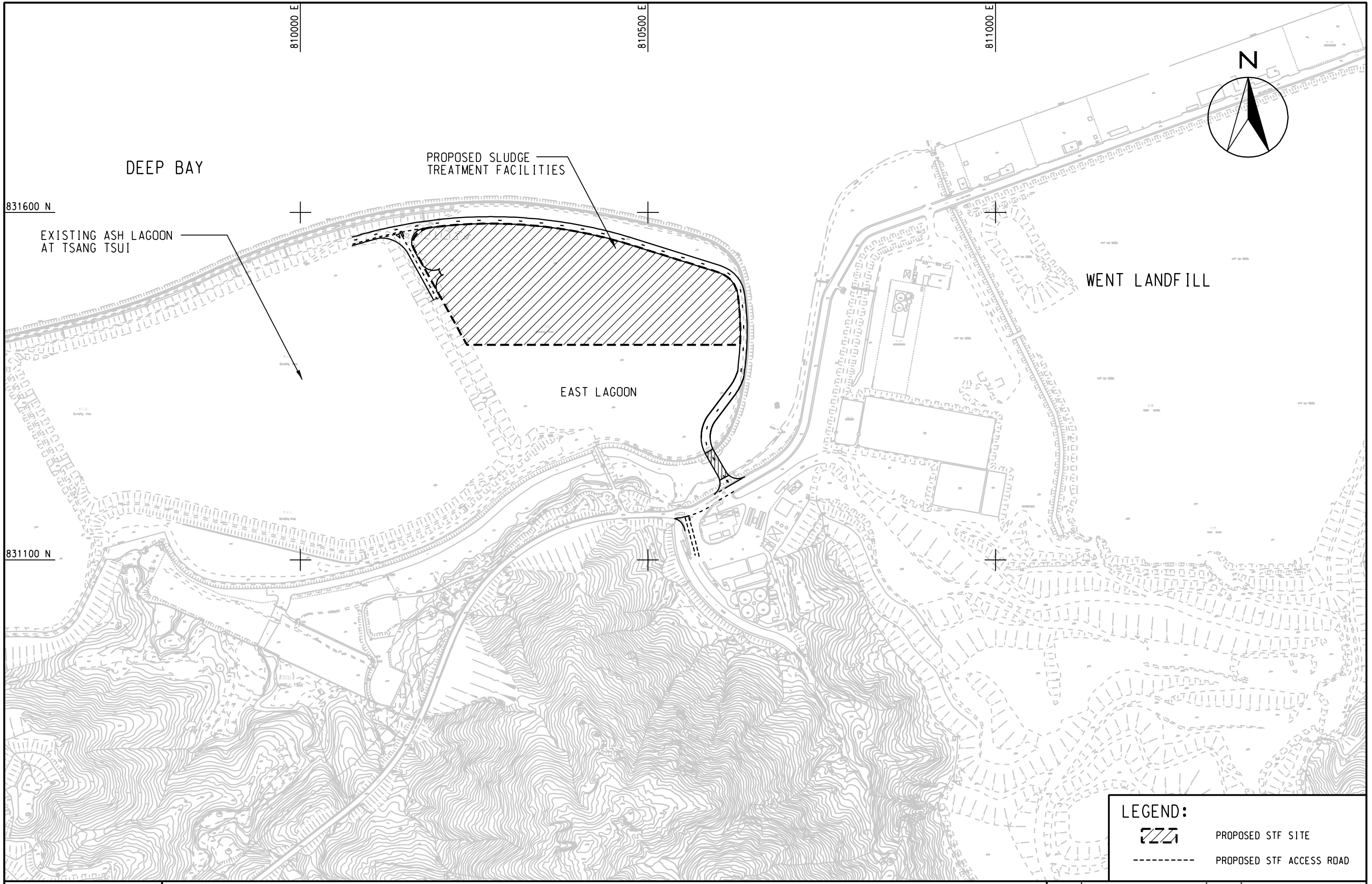



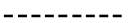
**MAUNSELL | AECOM**  
Metcalf & Eddy Ltd.

AGREEMENT NO. CE 28/2003 (EP)  
SLUDGE TREATMENT FACILITIES - FEASIBILITY STUDY  
**LOCATION PLAN OF PROPOSED SLUDGE TREATMENT FACILITIES**

SCALE	A3 1:12500	DATE	SEP. 2008
CHECK	PPMY	DRAWN	XCF
JOB No.	60015756	DRAWING No.	FIGURE 1
		REV	-

DATE: GUOXH 2008-9-30



<b>LEGEND:</b>	
	PROPOSED STF SITE
	PROPOSED STF ACCESS ROAD

DATE: GUOXH 2008-9-30

**MAUNSELL | AECOM**  
Metcalf & Eddy Ltd.

AGREEMENT NO. CE 28/2003 (EP)  
SLUDGE TREATMENT FACILITIES - FEASIBILITY STUDY  
**PROJECT AREA BOUNDARY OF SLUDGE TREATMENT FACILITIES**

SCALE	A3 1:5000	DATE	SEP. 2008
CHECK	PPMY	DRAWN	CL
JOB No.	60015756	DRAWING No.	FIGURE 2
		REV	-