Annex E1

Sediment Sampling and Testing Plan

CONTENTS

ANNEXES

1 INTRODUCTION

1.1 BACKGROUND TO THE STUDY

The Shenzhen River Regulation Office (SzRRO) of the Shenzhen Municipal Government and the Drainage Services Department (DSD) of the HKSAR will train an approximately 4 km long section of the Shenzhen River to facilitate development of the proposed Liantang/Heung Yuen Wai (LT/HYW) Border Control Point (BCP) to meet the required flood prevention standard of the BCP (hereafter referred to as "the Project"). The Project is expected to involve dredging and excavation of river sediment.

In July 2009, ERM-Hong Kong, Ltd (ERM) was commissioned by the SzRRO and the DSD to carry out an Environmental Impact Assessment of the Project, in accordance with the EIA Study Brief No. ESB-200/2009 dated January 2009. As part of the EIA Study, a river sediment quality assessment is required.

This Sediment Sampling and Testing Plan (SSTP) had been prepared to describe the additional investigation required to complete a river sediment quality assessment of the Project area. The SSTP describes the sampling and analysis programme to be carried out in order to classify the river sediments to be excavated during the construction of the Project.

It is noted that the potential contamination of soil and groundwater within the Project area is addressed separately in a Contamination Assessment Plan (CAP).

1.2 OBJECTIVES OF THE RIVER SEDIMENT SAMPLING AND TESTING PLAN

The purpose of the SSTP is to provide details of the sampling, storage, preparation, analyses, quality assurance/quality control and reporting protocols to be followed in the sampling and testing programme for the river sediment at the Project site. The sediment sampling programme is for the estimation of the river sediment to be excavated during the construction of the Project as part of the EIA study only and is not intended for the application of the Dumping Permit under the *Dumping at Sea Ordinance (Cap 466*). The sediment quality assessment for the application of the Dumping Permit will be carried out at a later stage of this Project. This SSTP makes reference to the sampling and testing procedures outlined in the *Technical Circular No 34/2002: Management of Dredged/Excavated Sediment – ETWBTC (W) No. 34/2002*.

1.3 DESCRIPTION OF THE PROJECT

This Project comprises Stage IV of the Shenzhen River Regulation Project (SRRP). The SRRP was commissioned by the governments of the Shenzhen Special Economic Zone and the Hong Kong SAR which the primary objective

of floor protection, with associated benefits including pollution control and navigation improvement.

Stage IV consists of training an approximately 4 km long section of the Shenzhen River in order to facilitate development of the proposed LT/HYW BCP to meet the required flood protection standard of the BCP. Additionally, the border road and border security fence of approximately 4 km in length running alongside the relevant river section will be re-aligned. Associated drainage and landscaping works is also included within the Project scope. It is anticipated that excavation and disposal of river sediment is required for training of the river section. The Project location, general layout and typical cross section of the design of re-aligned river channel are presented in *Annex A*.

The Project is a designated project under Item I "Waterways and Drainage Works" of Schedule 2, Part 1 of the EIAO : *A drainage channel or river training and diversion works which discharges or discharge into an area which is less than 300 m from the nearest boundary of an existing site of special scientific interest (SSSI), i.e., Mai Po Marshes and Inner Deep Bay SSSI.*

1.4 STRUCTURE OF THE SSTP

The remainder of the SSTP is structured as follows:

- *Section 2* reviews the existing information on river sediment quality in the Project area;
- *Section 3* presents the sediment sampling and testing plan based on the current design of the Project;
- *Sections 4* to *6* outline the procedures for sample collection, analysis and quality assurance / quality control; and
- *Section 7* describes the reporting requirements and timetable.

The report contains the following Annexes:

- *Annex A* Site location map;
- *Annex B* Reference historical information from the Spoil Impact Assessment of the Shenzhen River Regulation Project Stage III Environmental Impact Assessment, 1998;
- *Annex C* Reference historical information from the Planning and Feasibility Study for Training of Upstream Section of Shenzhen River, 2009*;*
- *Annex D* Proposed river sediment sampling locations; and
- *Annex E* Dredged/Excavated Sediment Assessment Criteria in *ETWB TC(W) No. 34/2002*.

2 REVIEW OF EXISTING INFORMATION

2.1 SITE GEOLOGY AND HYDROGEOLOGY

With reference to the solid and superficial geology maps published by the CEDD(1), the Study Area is anticipated to be underlain by undivided Holocene estuarine silty clays, and marine muds of the Hang Hau Formation. The thickness of the superficial silty clay deposits are a maximum of 10 to 20 m. The solid geology underlying the superficial deposits comprises undivided rocks (metasiltstones and metasandstone, phyllite, and schist) of the Lower Carboniferous Lok Ma Chau Formation.

The downward movement of contaminants is likely to be limited by the low permeability of the clayey alluvial sediments; however the potential for contaminants to migrate through the soil horizon is greater where coarser grained alluvial sediments are encountered.

Due to the close proximity to the Shenzhen River and the Deep Bay, the depths of the shallow groundwater along the River bank are expected to be shallow and in continuity with the River water. However, specific depths to shallow groundwater in this area are unknown. The groundwater direction is likely to be towards Shenzhen River and Deep Bay to the north and northwest.

2.2 HISTORICAL RIVER SEDIMENT INFORMATION

Two historical investigations were available for review which provided information on the depths and contamination levels of the river sediment in the Project vicinity.

2.2.1 *Spoil Impact Assessment of the Shenzhen River Regulation Project Stage III Environmental Impact Assessment, 1998*

The following section provides a review of contamination investigations carried out for the *Spoil Impact Assessment of the Shenzhen River Regulation Project Stage III Environmental Impact Assessment,* dated 1998.

The 1998 EIA study for the Shenzhen River Regulation Project Stage III comprises a section of the Shenzhen River downstream from the Project area, from the upper reach of the meander in Liu Pok to the mouth of the River Ganges, as presented in *Annex B*.

As part of the study, river bank soils and bottom material were sampled at 57 sampling locations, including fifty (50) locations for river bed sediment and seven (7) for bank soil. At each location, samples were collected at depths of

(1) The Geology of Hong Kong, Civil Engineering and Development Department (CEDD) (http://www.cedd.gov.hk/eng/about/organisation/csl.htm)

0.9 m, 1.9 m and 2.9 m and thereafter at an interval of 3 m to a maximum depth of 6m. The results were compared against the Hong Kong *Classification Standard for Heavy Metal Pollution in Dredged Silt (Technical Circular No. (TC) No. 1-1-92)*.

The sediments were categorised into Classes A, B or C in accordance with the criteria stipulated in the EPD's *Technical Circular No. 11/92 Classification of Dredging Sediments for Marine Disposal* (see *Table 2.1*).

Table 2.1 Classification of Sediments by Metal Contents (in mg/kg dry weight) According to EPD TC No. 1-1-92

Class	Cd	Cr	Cu	Hg	Ni	Pb	Zn
A	0.0 - 0.9	0 - 49	0 - 54	0.0 - 0.7	0 - 34	0 - 64	0 - 140
B	1.0 - 1.4	50 - 79	55 - 64	0.8 - 0.9	35 - 39	65 - 74	150 - 190
C	1.5 or more	80 or more	65 or more	1.0 or more	40 or more	75 or more	200 or more

The results indicated that of the 237 groups of samples, 27.8% were classified as Class C sediment, 17.4% were Class B sediment and 46.8% were Class A sediment (1). Results indicated that the majority of the Class C sediment samples were contaminated with heavy metals and they were largely concentrated within the surface layer of river sediment samples.

The chemical test results were compared against the current sediment quality criteria for classification of the sediment in accordance with Appendix A of *ETWB TC(W) No. 34/2002*. Results indicated that Category H sediment was found at twenty five (25) of the sampling locations, while Category M sediment was identified at thirteen (13) locations. Category L sediment was found at the remaining nineteen (19) sample locations. These classifications are described in *Section 5.1.*

Heavy metals, particularly Copper (Cu), Lead (Pb), Zinc (Zc), and Nickel (Ni), were found to exceed both the Lower Chemical Exceedance Level (LCEL) and Upper Chemical Exceedance Level (UCEL).

Full results from the study are presented in *Annex B*.

2.2.2 Planning and Feasibility Study for Training of Upstream Section of Shenzhen River, 2009

The construction of the Project will require excavation and disposal of river sediments. Under the *Planning and Feasibility Study for Training of Upstream Section of Shenzhen River*, five (5) river sediment samples within the Study Area were collected along the river and tested in accordance with the requirements

(1) According to the *Technical Circular (TC) No. 1-1-92*, spoil contaminated by hazardous metals is divided into three classes, as follows: Class A: Contaminated, no special measures are needed in dredging, transporting and discarding; Class B: Medium level of contamination, special notice needs to be made during its dredging and transportation, and special attention should also be paid to potential pollutant releasing through dissolving and re-suspension in the discarding process; and Class C: Heavily contaminated, must be effectively isolated before disposal. The TC No. 1-1-92 has now been replaced.

stipulated in the *ETWB TC(W) No. 34/2002* for an initial assessment of the nature of contaminated materials in the river sediment and the locations of the contaminated sediments.

Sediment sampling works were carried out from 9 February 2009 to 19 February 2009 and chemical testing occurred from 13 February to 3 of March 2009. The sampling locations are shown in *Figure C1, Annex C.*

Chemical analysis of the samples was carried out for the following parameters: Heavy metals (Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), Zinc (Zn), Silver (Ag), Arsenic (As) and Mercury (Hg)), Total PCBs, LPAHs, HPAHs, and TBTs.

When compared against the criteria for classification of the sediment (*ETWB TC(W) No. 34/2002*), the results showed that sediments at drillholes SD3 (at 1.9 m) and SD5 (at 2.9m) were classified as Category M sediment while Category H sediments were identified at three (3) drillholes, one at the surface layer of SD2, one within SD4 (1.9m depth) and three (3) at SD5 (0.0m, 0.9m and 1.9m depth). The remaining sediment samples were classified as Category L. Biological testing was conducted for samples retrieved from drillholes SD3 (at 1.9 m depth) and SD5 (at 2.9 m depth). Sediment from drillhole SD3 was found to fail biological testing.

Heavy metals, particularly Lead (Pb), Cadmium (Cd), Copper (Cu) and Zinc (Zc), were found to exceed both the LCEL and UCEL. The results indicated that apart from metals, chemical concentrations within the collected samples were below the LCEL. All sediment analytical results are presented in *Table 2.2*.

Table 2.2 Results from Chemical Screening

Sampling Location	Sampling Depth (m)	Cd mg/kg	Cr mg/kg	Cu mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Hg mg/kg	As mg/kg	Ag mg/kg	TBT µg TBT/L	Category	Biological Test [c][d]	Classification
LCEL		1.5	80	65	40	75	200	0.5	12	1				
UCEL		4	160	110	40	110	270	1	42	2				
SD1	0.0	0.42	10	<7.0	5.9	46	52	<0.05	2.8	0.18	<0.015	L	NR	Type 1
SD1	0.9	0.21	<8.0	9.0	<4.0	26	20	<0.05	3.5	<0.10	<0.015	L	NR	Type 1
SD1	1.9	<0.20	<8.0	<7.0	<4.0	16	<20	<0.05	<1.0	<0.10	<0.015	L	NR	Type 1
SD1	2.9	<0.20	<8.0	<7.0	<4.0	12	<20	<0.05	<1.0	<0.10	<0.015	L	NR	Type 1
SD2	0.0	1.3	52	**82**	24	**120**	**430**	0.21	1.1	**1.3**	<0.015	H	NR	Type 2
SD2	0.9	0.25	<8.0	12	<4.0	52	40	<0.05	3.1	0.23	<0.015	L	NR	Type 1
SD2	1.9	<0.20	<8.0	<7.0	<4.0	22	<20	<0.05	1.2	<0.10	<0.015	L	NR	Type 1
SD2	2.9	0.48	<8.0	9.0	5.9	<8.0	91	<0.05	12	0.12	<0.015	L	NR	Type 1
SD2	5.9	0.35	<8.0	8.7	<4.0	19	44	<0.05	6.5	<0.10	<0.015	L	NR	Type 1
SD3	0.0	0.25	<8.0	9.9	4.3	37	45	<0.05	2.0	0.10	<0.015	L	NR	Type 1
SD3	0.9	<0.20	<8.0	8.6	<4.0	31	22	<0.05	2.4	<0.10	<0.015	L	NR	Type 1
SD3	1.9	**1.7**	26	14	<4.0	50	93	<0.05	8.5	<0.10	<0.015	M	Fail	Type 2
SD3	2.9	0.27	9.6	14	7.3	<8.0	21	<0.05	<1.0	<0.10	<0.015	L	NR	Type 1
SD4	0.0	<0.20	<8.0	<7.0	<4.0	34	28	<0.05	2.0	<0.10	<0.015	L	NR	Type 1
SD4	0.9	0.31	<8.0	11	4.0	50	48	<0.05	6.0	<0.10	<0.015	L	NR	Type 1
SD4	1.9	**1.6**	12	40	15	**170**	180	<0.05	11	0.34	<0.015	H	NR	Type 2
SD4	2.9	0.26	<8.0	42	4.4	62	56	<0.05	2.5	0.14	<0.015	L	NR	Type 1
SD5	0.0	**1.9**	71	**130**	**84**	**120**	**560**	**1.4**	**45**	**1.4**	<0.015	H	NR	Type 2
SD5	0.9	0.71	<8.0	30	11	**160**	72	<0.05	12	0.20	<0.015	H	NR	Type 2
SD5	1.9	0.35	<8.0	14	<4.0	**120**	48	<0.05	5.1	<0.10	<0.015	H	NR	Type 2
SD5	2.9	0.42	<8.0	14	<4.0	**100**	61	<0.05	5.3	0.10	<0.015	M	Pass	Type 1
Reference Sediment	N/A	<0.20	26	14	20	36	72	0.05	5.8	0.13	<0.015	-	-	-

Notes:

a) The bold figure is the contaminant level exceeding the Lower Chemical Exceedance Level (LCEL).

b) The underlined figure is the contaminant level exceeding the Upper Chemical Exceedance Level (UCEL).

c) NR = Not required

d) Sediment deemed to have failed biological test if it fails any one of the three toxicity tests.

3 SURVEY PLANNING

3.1 PROPOSED SEDIMENT SAMPLING AND ANALYSIS

3.1.1 Samples

To delineate the locations of the contaminated sediment and enable subsequent estimation of different types of sediments (ie contaminated and uncontaminated sediments) to be disposed of for the purpose of the EIA Study, it is proposed to conduct further sediment sampling and testing within the Study Area. The sampling stations and the elements of the sampling programme described in this SSTP are selected with reference to the guidelines described in *ETWB TC(W) No. 34/2002*.

The proposed sediment sampling arrangements are as follows:

- River bed sediment samples will be collected at eight (8) locations and tested in accordance with the requirements stipulated in the *ETWB TC(W) No. 34/2002*.

- The proposed dredging activity for the Project is anticipated to be between approximately <1 to 5 m. In most areas, dredging will be limited to 1 m. Where dredging will be limited to 1 m or less, a grab sampling method will be used to collect surface sediment.

- Where excavation is expected to go down to 5 m (sampling location RS4), sediment samples will be collected along the vertical profile of the proposed dredging layers (ie the top of the sediment layer, 0.9 m, 1.9m, 2.9 m below the seabed, and at the maximum excavation depth, upon refusal or when rock head is encountered). The sampling pattern is to be implemented in accordance with the *ETWB TC(W) No. 34/2002* guidelines, and;

- The river sediment samples will be analysed for contaminants and in accordance to methodology stated in *ETWB TC(W) No. 34/2002*.

3.2 SAMPLING DESIGN

Co-ordinates of proposed locations for river sediment sampling are presented in *Table 3.1*. These sampling locations are proposed to be located in between the sediment sampling locations for the *Planning and Feasibility Study for Training of Upstream Section of Shenzhen River*, and are shown in *Figure D1, Annex D*.

At sampling location RS4, sediment samples will be collected at the top of the sediment layer and then at 0.9m, 1.9m, 2.9m below the river bed and the maximum excavation depth or upon refusal or when encountering rock head.

At the remaining sample locations, dredging is expected to be limited to 1 m or less, therefore a grab sample will be collected.

The sampling locations are to provide indicative information of the quality of the underlying river sediment in the area as well as information on the depths of the sediment horizons.

Table 3.1 ***Proposed Sampling Scheme for River Sediment***

#	Sampling Location	Proposed Sampling Depth (m below river bed)	Easting	Northing
1.	SR1	-	832788	844706
2.	SR2	-	833177	844631
3.	SR3	-	833448	845047
4.	SR4	0.9, 1.9, 2.9 & bottom of excavation depth	833646	845256
5.	SR5	-	833646	845751
6.	SR6	-	834150	846165
7.	SR7	-	834362	846569
8.	SR8	-	834796	846782
	Reference Sample		850234	820057

3.3 MOBILISATION AND EQUIPMENT

All necessary excavating and drilling equipment will be moved to the sampling locations. The co-ordinates of the sampling locations will be confirmed prior to sampling.

3.4 ANTICIPATED TIMETABLE

Sediment samples will be taken from the locations shown in *Table 3.1*. Adequate quantities of sediment will be collected for chemical testing as well as the next tier of biological testing (if required). The volume of sediment required for chemical screening and biological testing will be confirmed with the testing laboratory prior to the commencement of the sampling programme.

Samples will be delivered as soon as possible after collection to the testing laboratory, ALS Technichem (HK) Pty Ltd (ALS), which the chemical and biological tests required under this study have been accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS). Chemical screening of the sediment will commence immediately the samples are processed at the laboratory.

After 10 working days of receipt of the sampling samples at the laboratory, it is envisaged that chemical testing results for the sediment will be available.

Once the results are available, they will be compared against the LCEL and UCEL. Should the results indicate that the sediment should be classified as

Category L material (all contaminant levels are below LCEL) then no further testing is required.

However, should the results indicate that one or more of the samples contains material that is either Category M (one of more results exceeds the LCEL) or Category H (where one or more results exceed 10 times the LCEL), then biological testing will be required.

After both chemical and biological results have been received, the quantities of different categories (ie categories L, M and H) will be estimated. After consideration of the practicality of on-site treatment and disposal, the quantities of sediment required for off-site disposal will be estimated. The proposed disposal arrangements (ie Type 1 (Open Sea Disposal), Type I (Open Sea Disposal (Dedicated Site)), Type 2 (Confined Marine Disposal) or Type 3 (Special Treatment and Disposal) disposal) will be recommended to agreement with the Marine Fill Committee (MFC) of CEDD.

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4 SAMPLE COLLECTION

4.1 SAMPLING OPERATIONS

4.1.1 Sample Collection

The proposed dredging activity for the Project is anticipated to be between approximately <1 to 5 m below the existing river bed. Sediment samples will be collected using a combination of borehole drilling and grab sampling methods. For areas where dredging will be limited to 1 m or less, a grab sampling method will be used to collect surface sediment. For sampling location SR4, where excavation will be down approximately 5m, it is proposed that a borehole drilling device be used for sediment collection.

Borehole drilling is expected to comprise a rotary drilling method, or similar drilling method. When the drilling reaches the sediment layer, samples will be retrieved using U76 stainless steel cores at the sediment surface, and then along a vertical profile at 0.9 m, 1.9m and 2.9 m below the seabed. Thereafter, sediment samples will be collected at the maximum excavation depth or upon refusal or when encountering rock head.

From each sample, sub-samples will be extracted at the laboratory for chemical and biological testing (if required) respectively.

The sampling method at each location is shown in *Table 4.1.*

Table 4.1 ***Proposed Sampling Methods***

#	Sampling Location	Proposed Sampling Depth (m below river bed)	Sampling Method
1.	SR1	-	Grab
2.	SR2	-	Grab
3.	SR3	-	Grab
4.	SR4	0.9, 1.9, 2.9 & bottom of excavation depth	Borehole
5.	SR5	-	Grab
6.	SR6	-	Grab
7.	SR7	-	Grab
8.	SR8	-	Grab

Adequate sample will be collected to allow for both chemical screening and subsequent biological testing (if required) from each sediment layer, based on the laboratory requirement, as presented in *Table 4.2*. The size of the samples required for chemical screening and biological testing shall be confirmed with the testing laboratory prior to the commencement of the sampling programme.

Table 4.2 Proposed Samples Size

Tests	Sample Size
Metals and Metalloids	0.5 litre
Organic	0.5 litre
Biological Response	6.0 litre

Source: *ETWB TC(W) No. 34/2002*

It is noted that samples for biological testing (if required) may comprise composite samples prepared from up-to 5 sub-samples of the same category (ie sediment classified under *ETWB TC(W) No. 34/2002* as (Category M or H), which are continuous in vertical or horizontal profile.

4.1.2 Sample Handling and Storage

Sampling equipment that comes into direct contact with the samples will be stainless steel. The equipment used for sample collection will not be the same as that used to advance the borehole. Clean latex gloves will be worn and will be changed before each new sample is collected. The equipment will be decontaminated between each sampling event, as described in *Section 4.1.3*.

All sediment samples will be placed either directly into laboratory supplied pre-cleaned sample bottles or doubled bagged in laboratory supplied PE plastic bags/wrapping which will then be sealed with heavy duty rubber bands and labeled with a permanent waterproof marker.

During sediment sampling and collection, a proforma entitled Record of Sediment Sampling and Collection will be completed, thus documenting information on every sample taken.

All sample containers will be labelled with the sample location, the sample length, diameter and depth. In addition, the sample label will detail the sampling date, time and a description of the sample.

All samples will be kept in the dark and transported under appropriate chain-of-custody documentation, in clean coolers with ice packs at a temperature of approximately +4°C. Samples will be delivered to the testing laboratory as soon as possible after collection and within the recommended holding times.

At the laboratory, if the samples are delivered in PE bags/wrapping, samples shall be removed from the PE bags and the material will be mixed in order to produce a homogeneous composite. A stainless steel or glass spoon and bowl will be used and the mixing will be done rapidly to reduce the sediment exposure to the air. The homogeneous sample will then be split up according to the requirements of *Table 4.2.*

Each sub-sample for chemical testing shall contain approximately 1 litre of sediment, of which 0.5 litre will be analysed for metals and metalloid and 0.5 litre analysed for organic contaminants. The proposed sample container for each test is described in *Table 4.3* below.

Table 4.3 Proposed Sample Container

Tests	Sampling Container	Pretreatment Procedure [b]
Metals and Metalloids	High density polyethylene container [a]	US EPA SW-846 [c] Chapter 3
Organic	Wide mouth borosilicate glass jar with Teflon-lined lid	US EPA SW-846Chapter 4
Biological Response	Wide mouth borosilicate glass jar with Teflon-lined lid or high density polyethylene container [a]	US EPA SW-846Chapter 3 or Chapter 4

Note:

a) Heavy duty plastic bags may be used for the storage of sediment sample for testing of metals, metalloid and biological response.
b) Other equivalent methods may be used subject to approval of EPD.
c) Test Methods for evaluating solid wastes: physical/chemical methods, SW-846, 3rd edition, United States Environmental Protection Agency.

Each container containing a sediment sample will be put into a polypropylene plastic bag. All samples will be double bagged and labelled internally and externally with indelible ink. They will then be inventoried and logged on chain of custody forms. Samples will be stored in the dark and at 4°C prior to testing.

The sub-samples for biological testing (6 litres in total) shall also be handled in the same manner as described above (including for ancillary parameters).

Samples for chemical testing shall be extracted and analysed within 14 days. The laboratory shall ensure that the chemical screening results are ready as soon as possible after the sampling finished so that a Tier III biological testing programme (if required) can be developed and commenced within 8 weeks from the date of sampling.

4.1.3 Decontamination Procedures

Sampling equipment used during the course of the sediment sampling will be thoroughly decontaminated, to minimize the potential for cross-contamination. All equipment will be decontaminated using a non-phosphate soap solution and water, with a distilled water rinse to clean all smaller pieces of equipment, in particular those used to sample materials such as sampling cores, hand excavation and grab samples.

Larger equipment and materials may be steam cleaned using mains water, where possible, or at a minimum pressure jet washed with mains water. This cleaning procedure will be repeated after use at each borehole to avoid potential cross contamination between boreholes, and during sampling, to ensure that any contamination from the surface of the site does not affect deeper substrata or the groundwater.

During sampling and decontamination activities, disposable latex/nitrile gloves will be worn to prevent transfer of contaminants from other sources. Any disposable equipment will be disposed as general waste after each use.

Decontamination fluids shall be handled and disposed of in accordance with *Water Pollution Control Ordinance (WPCO)* requirements.

4.1.4 Reference Sample

As some of the sediments in the Study Area are expected to be contaminated and Tier III biological testing programme is anticipated, samples for reference sediment shall be taken, prior to the initiation of the programme. The proposed site for collecting reference sediment is in Port Shelter (E850234, N820057).

All samples shall be tested for all the contaminants stated in the Table 1 - Analytical Methodology in Appendix B of the *ETWB TC(W) No. 34/2002*, as presented in *Annex E*. The composite samples for biological testing will be tested (if required) for ancillary parameters, including moisture content, grain size distribution, pH, TOC, ammonia and salinity of pore water. The parameters to be analysed, methodology used and detection limits are presented in *Table 5.1.*

Table 5.1 Chemical Testing Parameters

Parameters	**Reporting Limit** [a]	**Preparation Method** [b] *US EPA Method*	**Determination Method** [b] *USEPA Method*
Metal (mg/kg dry weight)			
Cadmium	0.2	3050B	6020A or 7000A or 7131A
Chromium	8	3050B	6010C or 7000A or 7190
Copper	7	3050B	6010C or 7000A or 7210
Mercury	0.05	7471A	7471A
Nickel	4	3050B	6010C or 7000A or 7520
Lead	8	3050B	6010C or 7000A or 7420
Silver	0.1	3050B	6010C or 7000A or 7761
Zinc	20	3050B	6010C or 7000A or 7950
Metalloid (mg/kg dry weight)			
Arsenic	1	3050B	6010C or 7000A or 7061A
Organic-PAHs (mg/kg dry weight)			
Low Molecular Weight PAHs [c]	55	3550B or 3540C and 3630C	8260B or 8270C
High Molecular Weight PAHs [d]	170	3550B or 3540C and 3630C	8260B or 8270C
Organic-non-PAHs (µg/kg dry weight)			
Total PCBs [e]	3	3550B or 3540C and 3665A	8082
Organometallics (ηg TBT/L in Interstitial Water)			
Tributyltin	15	Krone et al. (1989)[c] GC/MS/UNEP /IOC/IAEA [g]	Krone et al. (1989) [g] GC/MS/UNEP/IOC/ IAEA [h]
Ancillary Parameters [f]			
Grain size distribution	2mm-63µm	-	BS1377 (1975)
Total Organic Carbon	0.05%	-	APHA 5310B
Ammonia	20 mg kg^{-1} dry weight	1:5 water extractable	APHA 17e 4500 NH_3-B,E
Moisture Content		Drying at 105°C	AS1289.1-1991, test 2.3.2A
Salinity of Pore Water	0.1 gL^{-1}		

Notes:

(a) The final required limits shall be specified by DEP.

(b) Any methodology for which the laboratory is accredited that will produce equivalent or better results/reporting limits are required may be used subject to approval by DEP.

(c) Low molecular weight PAHs = acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene and phenanthrene.

(d) High molecular weight PAHs = benzo(a)anthracene, benzo(a)pyrene, chrysene,

Parameters	Reporting Limit [a]	Preparation Method [b] *US EPA Method*	Determination Method [b] *USEPA Method*

dibenzo(a,h)anthracene, fluoranthene, pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, ideno(1,2,3-c,d)pyrene and benzo(g,h,i)perylene.

(e) The reporting limit is for individual PCB congeners. Total PCBs include 2,4′ diCB, 2,2′,5 triCB, 2,4,4′ triCB, 2,2′,3,5′ tetraCB, 2,2′,5,5′ tetraCB, 2,3′,4,4′ tetraCB, 3,3′,4,4′ tetraCB, 2,2′,4,5,5′ pentaCB, 2,3,3′,4,4′ pentaCB, 2,3′,4′4′,5 pentaCB, 3,3′,4′4′,5 pentaCB, 2,2′,3,3′,4′4′ hexaCB, 2,2′,3,3′,4′4′,5′ hexaCB, 2,2′,4,4′,5,5′hexaCB, 3,3′,4,4′,5,5′hexaCB, 2,2′,3,3′,4,4,5′ heptaCB, 2,2′,3,4,4′,5,5′ heptaCB, 2,2′,3,4′,5,5′,6 heptaCB (ref. The "summation" column of the Table 9.3 of *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Testing Manual* (*the Inland Testing Manual*) published by USEPA).

(f) Analysis of ancillary parameters will be carried out for composite samples of biological testing only.

(g) Krone et al. (1989) A method for analysis of butyltin species and measurement of butyltins in sediment and English Sole livers from Puget Sound, Marine Environmental Research 27 (1989) 1-18. Interstitial water to be obtained by centrifuging sediment and collecting the overlying water.

(h) UNEP/ICO/IAEA refers to the IAEA/s Marine Environmental laboratory reference methods. These methods are available free of charge from UNE/Water or Marine Environmental Studies Laboratory at IAEA's Marine Environment Laboratory. Interstitial water to be obtained by centrifuging sediment and collecting the overlying water.

Analysis of samples will be carried out by ALS, a HOKLAS accredited laboratory. All analysis will be conducted according to standard procedures set by the US EPA, APHA, ASTM along with internal QA/QC procedures.

5.1 SEDIMENT CLASSIFICATION

The tested sediment samples will be classified according to their level of contamination of metals (eight priority metals, including Cd, Cr, Cu, Hg, Ni, Pb, Ag and Zn), metalloid (arsenic), organic–PAHs (low molecular and high molecular weight PAHs), organic-non-PAHs (total polychlorinated biphenyls) and organometallics (tributyltin in interstitial water) as stipulated in *ETWB TC(W) No. 34/2002*. The Chemical Exceedance Levels (CEL) specified in Appendix A of *ETWB TC(W) No. 34/2002* serve as criteria for determining the testing and disposal requirements of marine dredged sediments. These include:

Category L: Sediment with all contaminant levels not exceeding the Lower Chemical Exceedance Level (LCEL). The material must be dredged, transported and disposed of in a manner, which minimizes the loss of contaminants either into solution or by resuspension.

Category M: Sediment with any one or more contaminant levels exceeding the Lower Chemical Exceedance Level (LCEL) and none exceeding the Upper Chemical Exceedance Level (UCEL). The material must be dredged and transported with care, and must be effectively isolated from the environment upon final disposal

unless appropriate biological tests demonstrate that the material will not adversely affect the marine environment.

Category H: Sediment with any one or more contaminant levels exceeding the Upper Chemical Exceedance Level (UCEL). The material must be dredged and transported with great care, and must be effectively isolated from the environment upon final disposal.

5.2 NECESSITY TO PROCEED TO TIER III BIOLOGICAL SCREENING

There is no need to proceed to Tier III for Category L material. However, the Tier III biological testing must be implemented for further analysis of Category M and certain Category H material. For the latter, Tier III screening is only required if one or more contaminant levels exceed 10 times the LCEL. Decision on the necessity to proceed with biological testing will be made after examining chemical screening results of sediment samples. The testing requirement is stated in items 3(a) and 3(b) in Appendix B of the *ETWB TC(W) No. 34/2002*, as presented in *Annex E*.

5.3 ELUTRIATE TEST

In order to assess the potential for a release of heavy metals and micro-organic pollutants from the dredged marine mud into the water column during dredging works, appropriate laboratory analyses such as elutriate tests of sediment samples collected on site at SR1, SR3, SR5, SR6 and SR8 will be required.

The elutriate will be prepared by using water obtained from the Study Area of the Shenzhen River in accordance with *USEPA 823/B-98-004 Dredged Material - Inland Testing Manual*.

The elutriate will be prepared by 4kg of sediment from each grab sample. The sediment and unfiltered water will be combined in a sediment-to-water ratio of 1:4 on a volume basis at room temperature (22± 2°C). After the correct ratio is achieved, the mixture will be stirred vigorously for 30 min with a mechanical or magnetic stirrer. At 10-minute intervals, the mixture will be also stirred manually to ensure complete mixing. After the 30-minute mixing period, the mixture will be allowed to settle for 1 hour. The supernatant will be then siphoned off without disturbing the settled material, and centrifuged to remove particulates (approximately 2,000 rpm for 30 min, until visually clear) prior to chemical analysis.

The parameters to be analysed for elutriate samples includes:

- Metals (Cd, Cr, Cu, Hg, Ni, Pb, Ag and Zn);
- Metalloid (As);

- Organic-PAHs (low molecular weight PAHs (including Naphthalene,Acenaphtylene, Acenaphtene, Fluorene, Phenanthrene, Anthracene) and high molecular weight PAHs (including Benzo[a]anthracene,Benzo[a]pyrene, Chrysene, Dibenz[a,h]anthracene, Fluoranthene, Pyrene,Benzo[b]fluoranthene, Benzo[k]fluoranthene, Indeno[1,2,3-c,d]pyrene andBenzo[g,h,i]perylene));

- Total PCBs (including 2,4' dichlorobiphenyl (PCB 8), 2,2',5trichlorobiphenyl (PCB 18), 2,4,4' trichlorobiphenyl (PCB 28), 2,2',3,5'tetrachlorobiphenyl (PCB 44), 2,2',5,5' tetrachlorobiphenyl (PCB 52), 2,3',4,4'tetrachlorobiphenyl (PCB 66), 3,3',4,4' tetrachlorobiphenyl (PCB 77),2,2',4,5,5' pentachlorobiphenyl (PCB 101), 2,3,3',4,4' pentachlorobiphenyl(PCB 105), 2,3',4,4',5 pentachlorobiphenyl (PCB 118), 3,3',4,4,5pentachlorobiphenyl (PCB 126), 2,2',3,3',4,4' hexachlorobiphenyl (PCB 128),2,2',3,4,4',5' hexachlorobiphenyl (PCB 138), 2,2',4,4',5,5' hexachlorobiphenyl(PCB 153), 3,3',4,4',5,5' hexachlorobiphenyl (PCB 169), 2,2',3,3',4,4',5heptachlorobiphenyl (PCB 170), 2,2',3,4,4',5,5' heptachlorobiphenyl (PCB180), 2,2',3,4',5,5',6 heptachlorobiphenyl (PCB 187);

- TBT;

- Chlorinated pesticides; and

- Other parameters relating to water quality impact assessment (including ammonia, TKN, nitrate, nitrite, ammonia nitrogen, ortho-phosphate, total phosphorus, biological and chemical oxygen demand).

5.4 ACID VOLATILE SULPHIDS

The levels of acid volatile sulphide (AVS) will be measured for the sediment samples taken from SR1, SR5 and SR8 to assess the potential odour impact from the dredged sediment. In general, high AVS concentrations in sediment indicate that odorous hydrogen sulphide gas is likely to be generated from the sediment. Care shall be taken in collection of the samples to prevent contact with air or excessive mixing. The sample containers shall be immediately sealed after collection to prevent leakage of odour and liquids and to minimize the amount of air inside the containers. The testing method should refer to *Environmental Toxicology and Chemistry, Vol. 13, No. 8; pp.1273-1275. 1974A* or equivalent and the detection limit for AVS should be 1 mg/kg or better.

As mentioned in earlier Sections, the tests shall be conducted by ALS, a laboratory accredited by HOKLAS for sediment laboratory testing.

The laboratory will ensure that all equipment and instruments to be used for analysis meet the requirements and specifications of the reference method procedures. The laboratory shall set upper and lower control limits based on statistical analysis of historical performance data to monitor the acceptability of the QA/QC sample data. All instruments shall be calibrated prior to analysis to monitor sensitivity and precision.

The following QA/QC samples shall be analysed.

- *Laboratory blanks* - an analyte free matrix to which all reagents are added in the same volumes or proportions as used in the standard sample preparation to monitor contamination introduced in the laboratory (inorganics and organics).

- *Batch duplicates* - an intra laboratory split sample randomly selected from the sample batch to monitor method precision (intra batch) in a given sample matrix (inorganics only). It is proposed that duplicate samples of 5% from each batch shall be analysed.

- *Reference Materials* - analysis of a material with a known concentration of contamination to determine the accuracy of results in a given matrix (inorganics only) (eg CASS 3).

- *Single Control Samples* - a known, interference-free matrix spiked with target analytes used to monitor laboratory preparation techniques (organics only).

- *Duplicate Control Samples* - multiple single control samples designed to monitor preparation technique reproducibility (organics only).

- *Matrix Spike* - An intra laboratory split sample spiked with the target analytes prior to sample preparation and analysis to determine method bias in a given sample matrix (organics only).

A laboratory blank, a batch duplicate (5% of each batch) and a suitable reference material shall be analysed with batch of samples. For organics, a method spike shall also be analysed with each batch of samples. Each batch will contain a maximum of 20 samples. Results of instrument calibration checks and QA/QC results shall be included in each laboratory report. Data Quality Objectives (DQOs) have been developed to address precision, accuracy and analyte recovery, as described below.

6.1 *PRECISION*

Duplicates will be used to monitor the precision of the analysis. Results will be flagged for reference when:

- For all analytes, except metals, with concentration >4x Method Detection Limit (MDL), the duplicate results have more than a 20% Relative Percentage Deviation (RPD);
- For metals with a concentration >4x MDL, the duplicate results have more than a 25% RPD; and
- For all analytes with concentration <4x MDL, the duplicate results will be reported as analysed and no bounds will be quoted.

6.2 *ACCURACY*

Standard and certified reference material (CRM) shall be used to monitor accuracy and precision within and between batches. Results should be flagged for reference if:

- The variation of the standard from its true value is more than 15% (for mercury: 20%).

6.3 *RECOVERY*

Post digest spikes are used to determine the recovery of determinants in complex sample matrices. Results should be rejected if:

- Spike recoveries are more than 25% from the theoretical recovery for waters, sediment and marine biota. An exceptional case would be if the sample concentration is greater than four times the spike value, the spike may be disregarded.

The chemical screening and biological testing results will be presented in the EIA Report. After both chemical and biological results have been received, the quantities of different categories (ie categories L, M and H) will be estimated. After consideration of the practicality of on-site treatment and disposal, the quantities of sediment required for off-site disposal will be estimated. The proposed disposal arrangements (ie Type 1 (Open Sea Disposal), Type I (Open Sea Disposal (Dedicated Site)), Type 2 (Confined Marine Disposal) or Type 3 (Special Treatment and Disposal) disposal) will be recommended to agreement with the Marine Fill Committee of CEDD.

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Annex A

Site Location Map

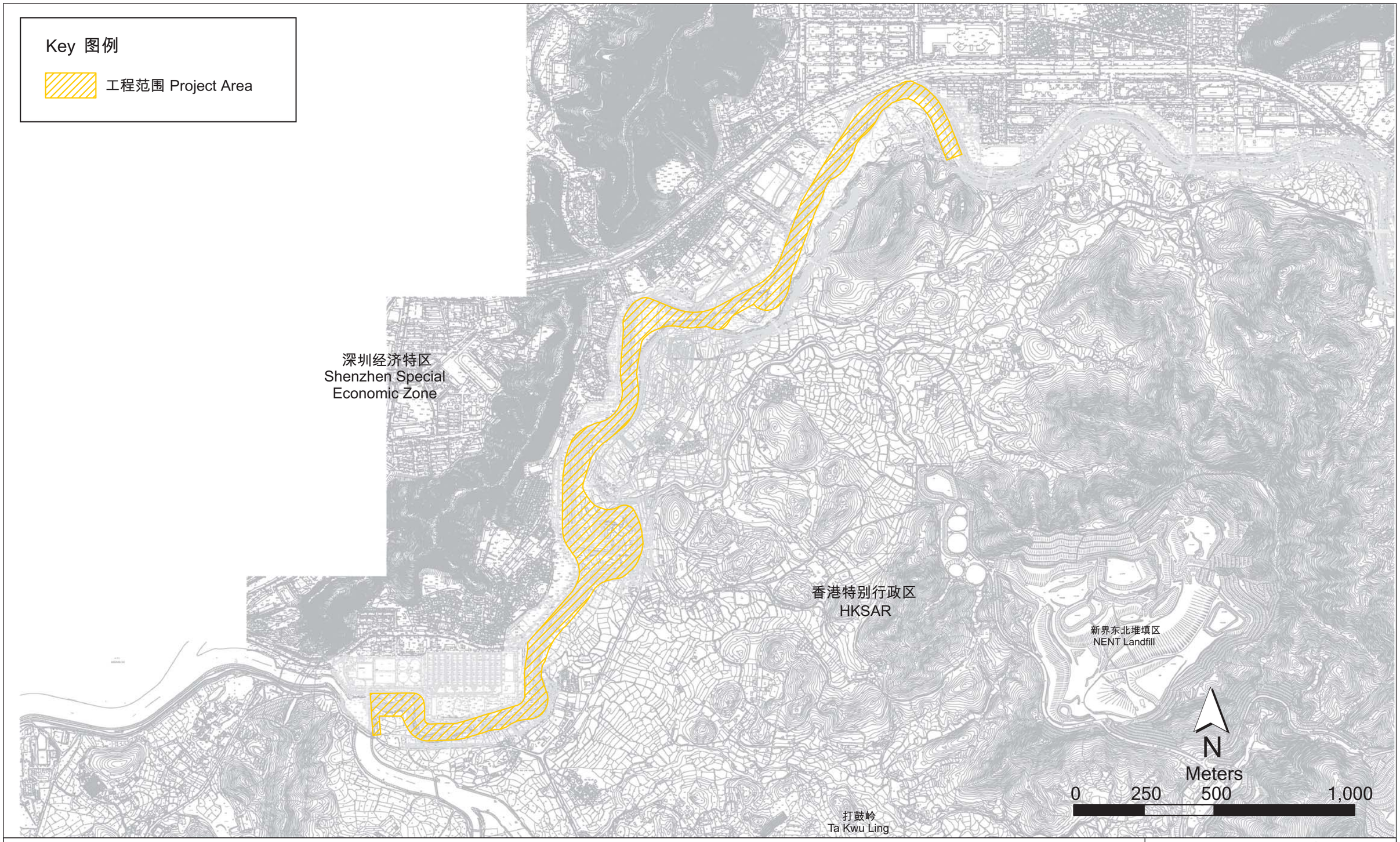

Figure A1

Locations of Project Site

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DATE: 17/09/2009

Environmental
Resources
Management

ERM

Annex B

Reference historical information from the Spoil Impact Assessment of the Shenzhen River Regulation Project Stage III Environmental Impact Assessment, 1998

Appendix 7 Monitoring Result of the Spoil Baseline

The location of the sampling hole is shown in Figure 7. 1.

The monitoring results of the bottom material and the bank soil are shown in Table A7. 1.

Table A7. 1 Monitoring Result of the Bottom Material in River Channel and the Bank Soil

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
szk101－1	7.4	2.0	99.8	117	935	1.09	27.7	64.6	19.6	0.4377	4.4	424	125	174
2	7.5	2.1	123	129	1188	1.64	49.6	76.8	18.6	0.6341	5.6	136	123	230
3	7.5	2.0	113	131	1083	1.50	32.4	67.0	21.2	0.3734	5.2	116	90.4	184
4	7.4	2.2	148	117	1628	1.44	54.7	91.5	20.2	0.8075	4.6	97.0	277	254
5	6.3	0.71	7.75	27.6	40.5	0.070	9.84	15.7	11.2	0.0244	1.8	—	—	24.7
szk102－1	6.7	2.5	229	83.2	913	2.08	57.1	106	17.4	1.1654	7.0	187	58.2	321
2	6.5	2.2	31.6	68.6	155	0.370	25.0	56.6	16.4	0.1907	2.4	13.3	45.7	82.4
3	6.3	0.43	8.85	14.7	52.5	0.090	5.70	11.7	3.70	0.0684	1.9	—	—	22.8
4	6.0	0.85	19.0	40.5	86.5	0.260	7.37	25.0	10.0	0.1063	2.2	—	—	48.9
5	6.9	0.93	8.85	24.6	47.5	0.150	7.20	16.8	8.51	0.0441	1.5	—	—	27.5
szk103－1	6.5	0.30	9.65	25.8	64.5	0.170	5.55	18.5	2.52	0.0339	1.0	10.3	—	23.1
2												10.4		
3	5.8	0.58	10.0	26.1	42.5	0.160	12.4	36.8	10.6	0.0286	1.6	10.5	—	27.8
4	6.8	0.54	11.8	27.1	44.5	0.110	11.7	48.6	3.79	0.0384	1.8	10.2	—	24.2
szk104－1	6.3	0.23	6.65	21.2	92.5	—	4.02	8.90	2.01	0.0332	0.81	16.2	29.0	15.6
2	6.0	0.37	27.4	41.8	98.5	0.260	32.9	23.3	2.94	0.0470	1.3	—	—	36.0
3	6.1	0.77	19.1	58.9	130	0.580	9.54	30.2	6.58	0.1000	2.3	—	44.7	62.1
4	6.3	0.30	7.80	90.1	20.0	0.005	7.90	9.15	1.21	0.0151	1.3	—	—	36.7
szk107－1	6.7	1.2	18.9	66.6	94.0	0.580	14.9	30.2	8.29	0.0629	1.7	61.5	—	59.9
2	6.4	1.5	164.0	63.9	301	0.470	25.8	51.5	8.92	0.5551	1.7	283	740	151
3	7.4	2.5	100.2	94.6	495	0.870	33.5	151	18.0	0.1430	2.1	98.0	133	111
4	5.2	0.38	5.15	21.2	13.5	0.100	5.14	7.40	3.85	0.0100	2.1	115	134	15.5
5	6.3	0.36	10.2	32.9	19.5	0.050	5.43	12.6	3.70	0.0212	1.4	42.9	—	20.5

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
szk108—1	7.6	2.9	124	94.0	447	0.620	46.6	145	22.5	0.4170	5.4	67.6	—	152
2	7.4	2.0	53.4	125	277	0.840	23.4	108	15.9	0.2218	2.5	21.9	24.2	125
3	6.9	0.26	5.15	16.7	22.0	0.020	3.40	4.23	1.93	0.0616	0.37	45.3	—	18.4
4	5.9	0.24	4.95	13.4	37.0	0.040	13.2	4.55	2.84	0.0268	0.41	—	—	13.0
szk109—1	6.4	0.27	7.90	36.2	51.0	0.230	8.41	10.9	2.01	0.0202	2.1	50.3	—	25.7
2	7.0	1.0	14.1	30.6	25.5	0.070	12.7	36.8	4.91	0.0619	2.1	—	45.1	28.6
3	6.8	0.32	6.00	17.0	2.50	0.050	2.98	8.80	2.16	0.0139	1.3	12.4	—	12.0
4	6.7	0.67	8.55	40.7	15.5	0.007	7.20	18.6	4.48	0.0060	1.3	—	—	20.0
5	7.0	0.30	8.80	31.6	6.50	—	4.02	10.6	2.20	0.0066	1.6	—	—	15.0
szk111—1	5.7	1.1	33.8	123	136	0.420	15.6	30.7	3.82	0.0809	1.5	43.1	19.0	76.9
2	6.7	0.38	9.75	27.8	26.5	0.060	5.14	14.7	0.116	0.0392	0.90	—	—	19.5
3	6.1	0.56	9.25	31.4	34.5	0.030	9.47	18.9	2.88	0.0208	1.5	—	—	18.9
4	5.6	0.26	6.95	21.0	17.5	—	5.11	9.05	0.980	0.0174	0.79	—	—	11.9
5	7.4	0.66	49.6	46.6	213	0.570	1.96	34.7	0.904	0.0600	1.4	—	—	50.9
szk112—1	6.9	1.1	9.85	39.5	54.0	0.350	4.50	5.55	1.55	0.0405	0.50	74.4	—	33.5
2	6.6	1.7	19.1	50.4	73.5	0.400	6.30	10.9	3.26	0.0508	1.6	40.9	20.4	42.9
3	6.8	1.7	6.80	22.7	29.5	0.150	2.90	6.10	0.994	0.0395	2.0	—	—	20.6
4	4.7	0.27	9.15	23.7	23.0	—	4.35	8.40	2.76	0.0303	2.1	—	—	16.4
5	6.4	0.17	9.00	12.4	19.5	0.100	3.30	4.10	1.25	0.0250	1.6	—	—	13.4
szk113—1	7.2	0.49	36.0	79.9	142	0.800	11.7	23.3	7.09	0.0711	0.92	50.5	—	73.6
2	6.6	0.65	24.6	460	78.5	0.490	7.82	23.5	16.4	0.0542	1.6	42.2	—	202
3	4.2	0.28	4.60	15.4	20.0	0.080	2.96	8.40	3.88	0.0155	0.92	41.4	—	13.7
4	5.8	0.20	4.95	42.1	21.5	0.030	3.01	9.00	2.49	0.0134	1.1	21.8	—	20.6

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
5	6.2	0.16	5.80	16.2	18.0	0.050	6.24	8.60	3.13	0.0198	0.91	—	—	13.4
szk114—1	7.3	0.27	14.7	55.3	73.5	0.630	5.53	12.3	3.73	0.0324	0.97	41.7	—	48.5
2	7.3	0.41	4.65	23.2	24.0	0.130	4.50	11.8	4.49	0.0280	0.56	21.4	—	20.5
3	6.7	0.34	4.30	17.0	86.0	0.720	6.36	13.6	6.84	0.0285	1.2	—	8.65	38.0
4	6.4	0.24	6.80	16.1	40.0	0.160	4.84	10.2	3.79	0.0212	0.95	—	—	17.6
5	7.0	0.23	7.45	31.8	26.5	0.080	4.93	15.7	0.861	0.0226	0.67	—	—	19.2
szk115—1	7.0	0.36	29.0	73.7	139	0.800	10.7	13.5	4.08	0.0708	1.0	52.1	17.4	68.3
2	7.4	0.22	6.00	17.5	37.5	0.190	3.01	2.90	1.67	0.0256	0.97	94.7	—	18.0
3	7.4	0.27	6.11	25.4	35.5	0.060	2.95	7.90	2.34	0.0169	0.74	73.5	—	16.1
4	6.8	0.59	9.35	27.7	36.5	—	6.38	21.6	1.55	0.0378	1.3	42.4	—	18.6
5	6.8	0.34	7.35	48.3	31.0	0.040	8.97	23.3	1.18	0.0214	0.89	10.3	—	24.1
szk116—1	6.5	0.37	26.1	74.8	116	0.080	10.2	9.75	3.96	0.0399	1.9	44.0	—	41.6
2	6.9	0.26	4.90	18.0	36.5	0.110	3.07	6.90	1.06	0.0275	1.7	—	—	15.7
3	7.3	0.27	5.00	24.8	30.0	0.080	3.02	9.70	0.901	0.0303	0.56	—	—	17.6
4	7.1	0.22	5.80	29.5	25.5	0.030	5.10	5.60	0.622	0.0146	0.58	—	—	15.1
[illegible] 5	7.1	0.31	10.3	39.3	26.5	0.080	157	7.10	0.988	0.0199	0.59	—	5.13	21.6
szk117—1	6.0	0.35	35.4	68.2	146	1.09	18.1	20.8	4.07	0.0459	1.2	—	—	71.9
2	7.0	0.25	7.95	38.9	43.5	0.300	3.77	8.20	1.24	0.0254	0.74	—	—	29.0
3	6.9	0.18	5.65	19.7	26.5	0.110	2.32	7.80	0.774	0.0262	1.3	20.6	—	16.0
4	7.1	0.30	8.15	46.5	26.5	0.050	7.28	8.05	1.89	0.0217	1.0	10.1	—	24.0
5	7.0	0.30	8.80	20.9	27.0	0.020	7.15	10.5	0.614	0.0227	0.84	—	—	13.3
[illegible] 1	4.5	0.32	37.9	96.0	243	0.930	50.3	20.2	5.30	0.0251	0.19	39.0	—	75.4
[illegible] 2	6.3	0.22	23.3	76.1	68.0	0.790	13.8	9.80	3.19	0.0297	0.49	10.3		60.7

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
3	7.0	0.19	6.75	32.5	21.0	0.050	2.17	1.70	0.867	0.0212	0.60	—	—	17.9
4	7.3	0.15	4.60	22.3	15.5	0.030	1.77	2.50	—	0.0105	1.5	—	—	11.1
5	7.1	0.06	5.35	11.7	11.5	0.010	0.91	—	—	0.0437	0.35	—	—	12.1
szk120—1	7.2	0.29	34.5	99.9	212	1.02	43.3	18.2	2.97	0.0267	3.1	28.0	—	77.6
2	6.6	0.20	19.3	63.4	79.0	0.650	21.0	7.85	3.86	0.0295	1.4	—	—	52.0
3	4.9	0.35	6.45	23.4	51.5	0.560	10.7	6.20	4.34	0.0338	0.49	—	—	34.5
4	5.7	0.15	5.15	19.1	21.5	0.030	2.22	1.50	1.59	0.0284	1.8	—	—	14.0
5	6.0	0.22	5.05	28.6	14.5	0.030	2.93	4.80	1.69	0.0162	1.4	—	—	15.5
szk121—1	8.7	2.1	41.6	137	165	0.750	21.4	23.1	6.50	0.0228	1.9	61.0	—	85.0
2	8.9	1.0	94.9	233	204	1.20	34.6	75.3	13.8	0.1402	1.8	33.8	—	163
3	8.7	0.59	7.20	68.9	92.5	1.70	5.35	11.5	4.37	0.0281	1.3	—	—	84.5
4	8.2	0.15	2.75	21.6	9.50	0.200	2.35	1.45	0.839	0.0077	1.0	—	—	15.9
szk202—1	7.4	1.4	82.5	102	348	0.850	27.4	63.2	8.62	0.2883	2.6	101	98.3	125
2	7.6	0.54	23.9	35.6	99.0	0.330	9.79	21.4	3.63	0.0880	0.63	17.3	—	42.5
3	7.1	0.47	19.0	40.0	71.0	0.200	7.37	15.4	7.33	0.0486	1.2	17.7	—	35.6
4	7.8	0.34	19.1	18.1	28.0	0.030	12.7	29.8	28.8	0.1455	1.0	37.1	34.5	52.6
5	7.3	0.55	34.3	111	140	0.730	19.7	102	15.4	0.1732	1.3	10.4	15.1	106
szk205—1	3.8	1.1	6.55	14.5	23.5	0.070	10.1	29.5	7.35	0.0235	2.6	31.2	27.8	17.4
2	4.4	2.2	14.5	32.3	55.0	0.180	19.0	41.2	11.1	0.0331	3.0	—	6.76	32.3
3	5.9	0.32	4.80	10.8	14.0	0.080	6.73	33.5	2.65	0.0235	1.5	—	—	13.1
szk210—1	6.2	0.33	11.9	33.2	58.0	0.220	6.74	16.5	1.75	0.0331	1.2	20.8	—	26.8
2	5.9	0.49	6.50	18.4	10.5	0.060	3.54	10.5	3.18	0.0191	1.3	—	—	14.5
3	5.6	0.58	5.60	23.4	10.5	0.100	4.60	12.5	4.66	0.0189	1.0	—	—	18.4

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
4	6.3	0.39	10.7	34.6	36.5	0.300	6.21	14.0	2.85	0.0279	1.3	—	—	29.3
5	6.6	0.26	7.65	29.8	27.0	0.070	2.84	6.90	1.17	0.0107	1.3	—	—	16.3
szk218—1	6.5	0.57	46.9	107	294	1.59	55.3	35.0	7.50	0.0090	2.5	—	—	99.6
2	6.6	0.37	32.4	93.3	163	1.09	30.0	23.5	4.88	0.0278	1.3	—	—	78.4
3	6.9	0.32	11.9	80.6	45.0	0.420	4.79	16.0	5.77	0.0162	1.0	—	—	49.6
4	4.4	0.39	4.15	9.48	15.5	0.790	6.38	14.6	16.1	0.0196	2.0	—	—	41.8
5	6.3	0.35	4.85	37.2	4.50	0.040	3.93	13.8	0.746	0.0256	0.71	—	—	19.9
szk229—1	7.4	2.1	265	110	504	0.760	45.3	72.3	12.3	0.4232	5.9	318	—	169
2	7.0	1.8	54.9	108	355	0.880	21.5	89.6	17.9	0.1704	2.1	34.2	—	114
3	6.5	0.36	6.00	17.6	33.0	0.060	17.6	9.00	3.85	0.0318	0.91	—	—	16.7
4	6.6	0.29	6.55	18.3	25.0	0.040	4.10	7.25	3.05	0.0294	0.30	—	—	15.4
5	6.9	0.25	7.00	27.3	22.5	0.020	2.71	3.50	1.58	0.0255	0.26	—	—	16.4
szk230—1	4.9	0.19	8.95	30.6	67.0	0.240	9.10	6.30	1.76	0.0262	1.8	21.2	—	24.9
2	5.2	0.79	30.2	125	187	0.880	48.1	109	11.9	0.1319	2.2	30.1	19.0	107
3	5.5	0.78	11.2	33.3	47.0	0.140	10.3	21.5	9.14	0.0362	2.5	17.6	—	29.8
4	5.0	0.39	8.45	26.7	39.0	0.050	6.57	9.00	4.08	0.0291	0.62	—	—	19.7
szk401—1	8.8	0.37	11.9	24.7	25.5	0.130	4.73	11.2	3.19	0.0398	0.82	22.2	—	22.8
2	8.6	0.65	18.0	32.1	61.0	0.200	8.69	20.3	4.89	0.0700	1.6	13.3	28.3	34.5
3	7.8	0.53	4.05	16.7	9.50	0.030	12.3	49.8	4.01	0.0274	2.4	34.0	—	15.5
szk402—1	7.4	1.2	39.0	78.3	128	0.480	16.8	63.3	8.68	0.1011	1.7	101	11.0	70.4
2	7.7	0.61	8.95	25.0	31.0	0.610	10.8	21.4	7.99	0.0261	2.4	—	—	38.3
3	7.1	0.23	5.50	53.1	25.5	0.140	3.00	6.20	2.14	0.0206	1.1	—	—	28.7
4	6.4	0.33	4.70	17.1	34.0	0.140	6.14	18.6	4.47	0.0178	2.1	—	—	17.2

Table A7. 1 Monitoring Result of the Bottom Material in River Channel and the Bank Soil

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
5	8.5	0.54	7.05	26.9	28.0	0.040	6.32	15.3	1.22	0.0244	1.8	—	—	16.7
szk403－1	6.7	1.0	16.8	31.1	29.9	0.120	13.7	49.0	5.50	0.0934	0.74	30.9	—	36.2
2	5.9	0.85	13.9	12.3	14.8	—	11.4	72.5	3.77	0.0210	0.76	10.3	—	13.3
[illegible]	6.8	0.54	19.1	276	86.2	0.230	8.65	30.5	8.81	0.2235	0.37	—	—	150
4	7.0	1.0	9.05	39.2	36.6	0.010	8.25	28.0	6.92	0.0171	0.39	—	—	23.4
5	4.0	2.4	15.1	11.3	93.1	0.013	22.7	47.5	10.0	0.0452	4.8	—	—	21.4
szk404－1	7.9	1.4	19.4	26.3	83.0	0.095	11.2	62.6	6.02	0.0297	1.5	116	—	24.8
2	7.4	1.1	18.1	27.3	37.5	0.045	15.2	61.1	6.20	0.0491	0.42	—	19.6	26.5
3	6.8	1.0	18.5	16.1	19.6	—	13.0	75.6	4.18	0.0202	0.63	—	19.5	15.4
4	6.5	0.92	8.90	30.8	27.8	0.215	12.2	22.3	6.85	0.0234	0.56	—	—	27.3
5	3.4	3.0	14.1	25.0	83.2	0.105	23.7	52.6	12.5	0.0544	5.3	—	20.4	32.2
[illegible]	5.5	1.4	40.1	116	174	0.615	20.0	44.4	11.5	0.1329	2.0	466	29.6	94.8
2	5.6	1.3	16.9	68.6	85.4	0.510	13.0	41.1	10.5	0.0798	1.6	10.1	—	62.6
3	7.0	0.23	2.65	18.1	21.4	0.180	1.50	8.20	0.946	0.0110	0.59	—	—	14.8
4	7.5	0.18	2.25	15.9	13.5	—	0.80	6.55	1.13	0.0018	0.52	—	—	7.10
szk406－1	6.5	0.34	9.20	23.3	55.7	0.135	2.85	10.7	3.20	0.0396	0.34	115	—	22.3
2	6.5	0.19	2.55	12.8	21.4	0.015	2.65	6.65	2.91	0.0180	0.59	20.7	—	10.4
3	4.8	0.29	3.00	22.1	21.8	—	2.00	9.00	3.33	0.0131	0.34	31.5	—	12.8
4	6.6	1.8	8.50	26.5	51.8	—	12.1	33.8	6.45	0.0312	1.4	65.7	—	20.6
5	7.2	3.2	14.1	39.5	75.8	0.095	21.5	53.8	9.85	0.0411	2.6	15.7	—	33.1
[illegible]	6.2	1.8	39.3	137	156	0.880	12.3	56.5	13.6	0.1265	2.0	35.4	—	111
2	6.3	0.29	5.80	20.5	18.5	0.280	4.23	7.95	2.20	0.0173	0.85	—	—	20.8
3	6.5	0.27	5.70	23.5	20.0	0.290	4.55	8.40	2.12	0.0135	0.82	—	—	21.5

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
4	6.6	0.25	6.35	21.4	16.5	0.360	3.78	5.25	1.66	0.0131	0.67	—	—	22.5
5	6.4	0.32	5.55	12.2	6.50	0.050	3.26	7.55	1.79	0.0115	0.78	—	—	9.70
szk409－1	6.9	0.36	7.20	24.1	26.5	0.160	4.20	17.2	2.71	0.0262	1.2	38.0	—	20.7
2	6.6	0.35	3.05	19.3	24.0	0.030	4.47	4.55	1.39	0.0114	2.2	25.9	20.7	11.1
3	6.6	0.25	5.80	14.5	29.5	0.030	2.70	3.05	1.77	0.0061	0.89	10.4	19.8	9.10
4	5.7	0.22	3.50	13.1	26.5	—	3.19	4.60	2.21	0.0080	1.3	48.6	19.6	8.00
5	7.7	0.14	6.30	19.0	12.5	0.060	4.81	13.2	2.53	0.0139	0.82	23.7	19.6	13.5
szk410－1	6.6	0.48	10.9	34.5	47.2	0.085	4.35	14.1	2.02	0.0457	1.3	187	26.1	25.2
2	6.2	0.56	25.2	44.2	90.3	—	7.90	18.8	3.12	0.1733	0.94	—	—	49.0
3	6.8	0.21	3.35	14.2	30.3	0.095	2.15	11.0	0.736	0.0037	1.1	—	—	9.70
4	7.0	0.16	3.10	13.9	19.2	0.140	1.25	5.75	0.514	0.0042	1.3	—	—	10.7
5	4.9	0.95	10.1	22.9	29.6	0.225	5.25	25.0	5.14	0.0209	1.9	—	—	23.4
szk411－1	7.2	1.6	50.1	79.5	264	0.375	18.3	51.6	12.4	0.3539	0.63	86.2	12.2	112
2	7.4	2.6	68.3	89.1	287	0.625	34.0	86.8	—	0.3731	3.0	79.0	417	121
3	5.8	0.80	9.40	35.9	46.3	0.205	8.25	27.9	1.08	0.0400	2.9	21.2	7.1	27.9
4	6.4	0.55	6.00	19.2	39.5	0.275	7.60	23.7	3.83	0.0282	2.2	21.1	5.6	23.5
szk412－1	6.4	0.34	13.4	26.8	78.0	0.220	12.8	9.45	2.00	0.0319	0.32	—	—	24.6
2	6.3	0.37	11.1	40.0	69.5	0.250	9.13	7.60	2.67	0.0283	0.91	56.1	—	29.8
3	7.0	0.17	5.60	17.6	14.5	0.040	0.98	1.90	0.596	0.0153	0.50	—	—	11.0
4	6.7	0.27	7.30	20.4	17.5	0.040	4.48	8.25	0.648	0.0141	1.0	—	—	12.2
5	6.9	0.32	4.70	25.0	30.0	—	2.65	7.55	1.41	0.0205	0.72	—	—	13.9
szk413－1	6.1	1.1	12.7	37.9	91.0	0.050	11.3	27.4	9.87	0.0545	1.2	—	—	32.7
2	6.6	0.96	19.4	21.7	40.0	0.150	16.8	35.6	9.45	0.0522	1.5	18.3	—	29.8

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
3	6.3	0.47	18.3	26.2	55.0	—	15.8	45.0	6.16	0.0360	1.4	12.1	—	22.4
4	8.6	0.60	15.8	20.2	10.5	—	13.1	69.2	2.13	0.0052	1.3	11.4	—	12.6
5	6.4	0.26	16.0	38.4	21.5	—	13.4	56.1	9.70	0.0701	1.1	—	—	34.4
szk414—1	8.7	1.1	23.5	26.0	73.0	0.300	14.6	46.1	9.69	0.0093	1.5	—	—	30.0
2	8.5	1.0	24.4	23.9	30.0	0.100	14.0	54.3	7.51	0.0435	1.5	49.3	—	27.3
3	8.6	0.83	17.2	20.5	29.5	0.150	14.2	44.4	5.30	0.0178	0.74	10.3	—	21.1
4	8.4	1.2	36.6	16.1	16.5	—	11.4	58.5	4.91	0.0662	0.79	—	—	24.7
5	5.3	1.1	13.7	30.5	72.0	—	10.7	32.1	6.52	0.1938	0.60	10.5	—	48.7
szk415—1	5.9	1.3	19.7	67.9	19.0	0.150	12.2	33.2	9.88	0.0726	1.6	—	—	49.7
2	3.6	1.3	9.55	26.7	5.00	—	8.60	24.9	6.63	0.0315	0.63	—	—	20.5
3	4.3	1.6	15.7	37.3	33.0	—	13.2	45.5	8.71	0.0807	2.2	—	5.34	34.8
[illegible]	5.3	0.60	13.8	148	29.0	—	5.50	11.5	6.95	0.0400	0.52	10.4	—	65.8
5	6.3	3.8	2.10	14.5	16.0	—	1.95	—	0.561	0.0021	0.31	—	—	6.20
szk416—1	4.9	1.3	14.8	36.2	35.5	—	11.3	50.4	6.69	0.0730	1.0	36.6	—	31.9
2	4.2	1.1	12.9	39.1	29.0	—	10.8	47.4	3.42	0.1486	0.92	—	—	42.5
3	4.1	1.2	16.6	35.8	31.0	—	14.0	50.4	5.70	0.0462	0.49	—	—	26.9
[illegible]	4.0	1.2	12.3	80.8	37.0	—	8.50	20.8	8.52	0.0536	1.2	—	—	45.0
5	4.8	0.29	4.15	20.1	12.5	—	3.96	1.15	2.55	0.0235	0.69	—	—	13.1
szk417—1	4.5	1.1	14.9	48.7	41.3	—	11.2	46.9	4.37	0.1433	0.70	23.7	—	46.0
2	3.5	1.2	12.9	33.5	34.2	0.080	11.9	45.9	5.85	0.0694	0.99	27.0	—	31.9
[illegible]	3.8	1.2	14.0	169	50.3	—	6.30	25.2	7.08	0.0581	1.5	—	—	76.6
[illegible]	4.0	0.95	14.0	172	40.3	0.060	8.85	21.1	7.92	0.0472	0.63	10.2	—	78.2
5	5.8	0.19	1.80	11.7	12.7	—	0.50	4.20	2.23	0.0013	0.71	—	—	6.20

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
szk418—1	7.2	0.26	8.10	26.7	34.5	0.220	5.52	7.55	1.67	0.0224	1.2	10.2	—	22.0
2	6.6	0.26	10.9	36.4	55.5	0.350	10.6	10.9	1.75	0.0223	0.56	25.3	13.7	29.9
3	5.0	0.78	7.95	27.1	10.0	0.150	6.29	17.0	7.83	0.0207	2.1	15.4	—	23.9
4	7.2	0.46	7.70	28.1	18.0	0.070	2.99	43.1	4.35	0.0820	1.3	—	9.81	30.0
5	7.0	0.35	10.8	74.6	1.50	—	5.61	11.7	0.855	0.0121	1.1	—	—	30.5
szk419—1	7.0	0.29	8.80	35.6	57.5	0.220	6.69	7.80	1.86	0.0221	1.3	40.8	—	25.5
2	7.1	0.33	13.9	38.4	58.5	0.270	8.19	10.7	1.98	0.0275	1.5	75.0	44.3	29.5
3	7.3	0.38	8.85	41.7	56.5	0.270	8.17	17.1	2.72	0.0225	1.5	18.8	6.91	30.0
4	7.2	0.35	11.4	34.2	45.5	0.190	16.3	10.5	1.58	0.0169	1.4	—	19.1	23.3
5	5.9	0.39	5.50	24.0	21.0	0.100	4.68	8.75	4.86	0.0115	1.3	—	—	17.5
szk420—1	6.8	0.35	15.6	26.3	56.0	0.060	8.10	9.10	4.06	0.1111	1.3	86.3	—	33.8
2	7.2	0.58	17.6	37.4	73.5	0.200	12.7	30.6	4.95	0.2595	1.7	18.3	—	67.0
3	3.5	0.59	7.50	27.2	35.0	—	5.60	13.2	4.59	0.0175	1.6	—	—	16.8
4	4.1	0.38	7.45	33.2	35.5	—	6.35	13.8	5.80	0.0363	1.8	—	—	22.8
5	6.8	1.5	9.20	62.0	18.5	—	6.25	11.8	0.456	0.0122	1.7	—	—	25.7
szk421—1	6.1	0.34	17.3	70.0	94.5	0.650	8.15	18.8	6.28	0.0339	1.3	—	—	56.8
2	6.6	0.24	7.35	58.9	83.5	1.50	4.78	13.2	5.92	0.0235	1.1	—	—	75.2
3	6.9	0.22	5.00	23.2	29.5	0.040	3.44	12.2	2.88	0.0154	1.1	—	—	14.8
[redacted]	6.1	0.28	5.90	21.8	33.0	2.36	34.9	14.1	9.15	0.0215	1.2	—	—	89.2
5	6.7	0.23	7.90	24.2	88.5	0.060	6.52	10.5	4.35	0.0226	0.82	—	—	18.5
szk422—1	6.3	0.33	11.6	39.5	68.0	0.130	6.10	17.9	18.0	0.0503	1.3	36.8	—	40.0
2	6.5	0.32	12.4	51.5	46.5	0.040	5.01	16.9	10.3	0.0311	1.4	—	—	33.3
3	6.9	0.24	4.45	22.4	16.5	—	2.30	12.0	2.05	0.0201	0.85	—	—	13.4

Table A7. 1 Monitoring Result of the Bottom Material in River Channel and the Bank Soil

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
4	6.5	0.29	4.60	26.9	20.0	0.040	1.92	14.0	3.45	0.0332	0.67	—	—	19.3
5	7.0	0.21	10.3	35.0	23.0	0.140	8.24	24.8	2.86	0.0180	0.82	—	—	23.2
szk423—1	6.8	0.40	25.0	66.0	107	0.740	10.3	19.7	3.74	0.0588	1.1	63.1	—	61.2
2	7.0	0.25	5.70	16.6	19.0	0.050	5.01	7.75	1.82	0.0214	0.33	20.8	5.22	12.9
3	7.0	0.23	4.20	15.9	23.0	0.070	2.85	5.15	2.28	0.0216	0.95	10.3	—	13.4
4	6.5	0.22	4.35	16.6	41.0	0.140	4.76	6.50	3.47	0.0319	1.4	—	—	18.4
5	7.2	0.29	5.40	15.2	29.5	0.030	3.92	6.50	0.676	0.0326	0.67	—	—	12.9
szk424—1	7.6	0.57	28.1	68.9	138	1.12	11.9	10.9	3.14	0.0303	2.3	45.2	—	69.0
2	7.3	0.08	8.85	24.1	51.5	0.890	3.49	10.7	0.703	0.0141	1.5	—	—	39.4
3	7.4	0.23	7.65	13.2	44.0	0.250	5.81	11.0	4.67	0.0172	2.3	—	—	19.4
4	7.1	0.27	5.25	16.6	31.5	0.150	3.78	8.10	2.81	0.0231	1.1	—	—	16.9
5	7.2	0.15	7.00	52.1	31.0	0.060	6.76	8.80	0.702	0.0174	1.1	—	—	24.7
szk425—1	6.4	0.64	12.0	91.7	50.0	0.230	7.23	18.1	9.35	0.0477	0.83	10.3	—	55.4
2	6.2	0.70	14.6	111	61.5	0.310	6.44	20.7	10.3	0.0669	0.93	—	—	68.8
3	6.3	0.64	11.4	103	48.5	0.320	7.59	20.0	7.48	0.0454	0.97	—	—	60.3
4	6.4	0.62	10.0	40.3	37.5	0.120	2.50	25.0	8.44	0.0559	1.0	—	—	34.3
5	6.7	0.26	2.75	18.2	27.5	0.210	21.9	10.0	6.39	0.0160	0.56	—	—	20.3
szk426—1	6.7	1.7	84.2	213	196	1.02	23.0	34.8	22.8	0.0798	1.5	—	—	145
2	6.7	1.2	37.8	412	64.5	0.090	6.72	21.1	19.5	0.0960	1.3	—	—	183
3	6.0	1.1	19.3	245	62.0	0.100	9.12	34.5	13.5	0.0883	1.7	—	—	117
4	6.2	1.1	14.6	191	95.5	0.860	8.57	25.5	10.4	0.0990	1.7	—	—	119
5	6.2	0.29	3.65	20.5	26.5	0.240	2.93	6.25	6.01	0.0168	1.2	—	—	21.9
szk427—1	6.4	1.3	55.9	310	173	0.680	14.8	29.8	19.8	0.1256	2.0	—	49.9	172

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
[illegible] 2	6.3	0.76	23.3	441	47.5	0.100	5.28	16.1	16.6	0.0621	2.0	—	—	185
[illegible] 3	6.2	0.90	15.3	266	36.5	0.060	6.00	15.7	10.7	0.0710	1.9	—	—	117
[illegible] 4	6.3	0.92	19.0	241	44.0	0.060	8.93	23.6	8.48	0.0180	1.6	—	—	99.1
[illegible] 5	6.4	0.33	5.40	108	31.5	0.120	3.93	10.0	5.25	0.0679	1.1	—	—	57.6
sdk429—1	6.6	1.4	40.2	263	153	0.660	12.2	28.0	19.8	0.0686	2.0	—	—	144
[illegible] 2	6.6	1.0	46.7	451	119	0.440	8.64	18.7	27.7	0.0612	1.6	20.6	—	208
[illegible] 3	6.4	0.93	172	7156	243	0.140	2.23	13.6	117	0.1017	1.2	10.7	—	2673
[illegible] 4	6.3	0.95	56.4	989	90.0	0.140	7.74	20.4	33.4	0.0916	1.6	—	—	401
[illegible] 5	6.4	0.45	11.7	201	37.0	0.100	3.86	13.7	7.99	0.0207	1.5	—	—	85.2
sdk429—1	6.2	0.61	72.2	86.3	213	1.25	28.0	35.0	4.13	0.0758	2.2	131	68.2	92.4
[illegible] 2	6.3	0.26	9.55	75.9	58.0	0.520	4.54	13.7	3.07	0.0280	1.8	25.0	—	50.8
3	6.6	0.25	5.75	25.1	25.0	—	2.66	7.20	0.881	0.0271	0.81	20.9	—	14.8
4	7.0	0.53	8.90	25.4	30.0	0.080	9.70	16.2	0.657	0.0227	1.1	—	—	17.0
sdk430—1	6.6	0.39	28.1	83.7	141	1.07	19.7	15.8	4.81	0.0281	1.4	48.9	—	73.7
[illegible] 2	7.0	0.39	10.8	76.9	46.5	0.840	4.23	16.5	2.50	0.0096	1.7	—	—	57.6
3	6.8	0.54	9.60	38.1	1.00	—	9.57	11.5	0.553	0.0067	1.7	—	—	16.3
4	7.1	0.25	4.50	16.8	18.5	0.180	2.47	5.25	2.24	0.0050	1.7	—	—	14.4
5	7.0	0.31	16.0	32.3	11.5	0.020	10.3	12.0	0.534	—0	1.7	—	—	14.4
sdk431—1	6.9	0.29	26.0	80.2	188	0.980	26.3	11.0	4.32	0.0205	0.76	28.1	—	68.1
[illegible] 2	6.8	0.33	12.6	52.6	66.5	2.060	4.41	7.05	3.61	0.0116	0.93	42.5	—	86.7
3	6.6	0.40	6.90	16.9	21.5	0.110	5.82	13.7	1.59	0.0071	0.86	71.3	—	12.7
4	6.9	0.28	9.15	20.8	23.0	0.040	3.32	9.30	1.29	0.0048	1.9	61.6	—	11.5
5	6.9	0.23	12.0	22.2	18.0	0.050	3.35	14.0	3.69	0.0058	1.2	20.2	—	14.4

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	pH	Water Content	Total Cu	Total Pb	Total Zn	Total Cd	Total Ni	Total Cr	Total As	Total Hg	Organic Matter	Oily	Sulfide	Hakanson Index
		%	mg/kg								%	mg/kg		
szk432—1	6.4	0.51	56.2	122	298	1.30	57.8	32.4	6.80	0.0357	1.4	31.0	—	101
2	7.0	0.54	19.3	114	107	1.29	9.06	18.6	4.63	0.0191	1.7	39.3	6.83	88.3
3	5.7	0.84	8.35	22.1	25.0	0.240	7.78	24.1	3.43	0.0183	1.8	36.7	—	21.8
4	6.5	0.25	6.35	21.4	4.00	0.030	1.89	10.8	1.07	0.0142	1.7	—	—	12.4
5	6.9	0.23	8.15	52.9	1.00	0.040	6.12	15.6	1.35	0.0088	1.3	—	—	23.6
szk433—1	7.1	0.32	36.1	85.7	210	0.870	37.2	19.5	5.10	0.0289	1.2	131	17.1	70.0
2	7.6	0.30	25.6	75.5	172	0.790	37.4	13.4	5.39	0.0354	0.21	—	19.2	63.8
3	6.7	0.15	8.10	37.5	27.0	0.260	2.55	0.45	1.33	0.0177	0.77	—	—	25.9
4	6.9	0.17	6.95	41.6	13.5	0.050	2.80	1.25	1.07	0.0429	0.84	—	—	24.7
5	6.7	0.25	14.8	69.6	16.5	—	7.88	9.30	9.15	0.0263	1.5	—	19.2	36.9
szk434—1	6.1	0.26	31.9	88.1	188	0.910	34.8	15.3	2.29	0.0212	1.6	577	25.3	68.3
2	6.7	0.38	35.2	93.9	242	1.00	42.1	6.05	4.42	0.0330	1.5	—	22.6	76.8
3	7.1	0.12	6.55	25.4	12.0	0.050	6.34	3.35	0.873	0.0168	1.5	—	—	14.6
4	5.9	0.34	7.05	41.1	37.5	0.330	3.17	5.85	3.94	0.0564	1.4	—	—	37.3
5	7.2	0.26	11.1	35.7	58.0	0.040	13.1	3.55	3.55	0.0403	0.25	—	—	24.3
szk435—1	7.4	2.4	155	96.7	860	1.50	55.5	114	15.6	1.0538	5.5	2116	80.2	282
2	7.5	0.64	27.4	25.5	153	0.260	10.7	22.3	8.00	0.1221	2.4	124	253	45.9
3	7.8	1.5	68.8	76.4	343	0.760	28.5	63.1	17.6	0.3241	3.8	84.0	681	124
4	6.2	0.58	8.35	25.9	40.0	0.050	6.36	21.3	6.20	0.0427	2.0	10.5	—	23.2
5	7.4	0.39	7.20	23.3	37.5	0.160	4.22	14.1	3.56	0.1454	0.70	10.2	—	40.0

Note: (1) The sample No. with shadow is belong to Class C contaminated soil.

(2) The sampling hole that number szk403, szk404, szk413, szk414, szk415, szk416 and szk417 is the bank soil sampling hole. The others are all bottom material sampling hole.

(3) "—" means the value of the monitoring is less than the detection limit.

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	Organic Chlorine(mg/Kg)								PCBs(mg/Kg)						
	BHC				DDT										
	α−BHC	γ−BHC	β−BHC	δ−BHC	4,4'−DDE	4,4'−DDD	o,p−'DDT	4,4'−DDT	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260
szk101−1	—	—	—	0.0029	—	—	—	—	0.2427	—	—	—	—	—	0.0940
2	—	—	—	0.0026	—	—	—	—	0.1259	—	—	—	—	—	0.0821
3	—	—	—	0.0024	—	—	—	—	0.0851	—	—	—	—	—	0.0905
4	—	—	—	0.0004	—	—	—	—	—	—	—	—	—	—	—
5	—	0.0009	—	0.0005	—	—	—	—	—	—	—	—	—	—	—
szk102−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk103−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	0.0041	—	0.0217	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk104−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk107−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	0.0012	—	0.0015	0.0003	0.0014	—	—	—	—	—	—	—
3	—	—	—	0.0002	—	0.0007	0.0021	0.0009	—	—	—	—	—	—	—
4	—	—	—	0.0001	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	0.0007	—	—	—	—	—	—	—	—	—	—	—
szk108−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	Organic Chlorine(mg/Kg)								PCBs(mg/Kg)						
	BHC				DDT										
	α−BHC	γ−BHC	β−BHC	δ−BHC	4,4'−DDE	4,4'−DDD	o,p−'DDT	4,4'−DDT	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260
szk109−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	0.0017	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk111−1	—	—	0.0006	0.0006	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk112−1	—	—	0.0004	0.0006	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk113−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk114−1	—	—	—	0.0015	—	—	0.0001	0.0001	—	—	—	—	—	—	—
2	—	—	—	0.0004	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	0.0001	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	0.0002	—	—	—	—	—	—	—	—	—	—	—
szk115−1	—	—	—	—	—	—	0.0002	0.0004	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	Organic Chlorine (mg/Kg)								PCBs (mg/Kg)						
	BHC				DDT										
	α−BHC	γ−BHC	β−BHC	δ−BHC	4,4'−DDE	4,4'−DDD	o,p−'DDT	4,4'−DDT	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk116−1	—	0.0016	—	0.0016	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	0.0006	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk117−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	0.0016	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	0.0031	—	—	—	—	—	—	—	—	—	—	—
szk119−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk120−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk121−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	Organic Chlorine(mg/Kg)								PCBs(mg/Kg)						
	BHC				DDT										
	α−BHC	γ−BHC	β−BHC	δ−BHC	4,4'−DDE	4,4'−DDD	o,p−'DDT	4,4'−DDT	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260
szk202−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	0.0003	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	0.0003	—	—	—	0.0004	—	—	—	—	—	0.0068	—
5	—	—	—	—	—	0.0003	—	0.0008	—	—	—	—	—	—	—
szk205−1	—	—	0.0112	0.0004	—	0.0002	—	—	—	—	—	—	—	—	—
2	—	0.0029	—	0.0012	—	—	—	—	—	—	—	—	—	—	—
3	—	0.0010	—	0.0003	—	—	—	—	—	—	—	—	—	—	—
szk210−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk218−1	—	—	—	—	—	0.0123	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	0.0031	—	0.0014	—	—	—	—	—	—	—	—	—	—	—
szk229−1	—	—	—	—	—	0.0013	—	0.0001	—	—	—	—	—	—	—
2	—	—	—	0.0017	—	0.0006	—	0.0003	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk230−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	Organic Chlorine (mg/Kg)								PCBs (mg/Kg)						
	BHC				DDT										
	α−BHC	γ−BHC	β−BHC	δ−BHC	4,4'−DDE	4,4'−DDD	o,p−'DDT	4,4'−DDT	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260
szk401−1	—	—	—	0.0008	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	0.0009	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk402−1	—	—	0.0008	0.0005	—	—	—	—	—	—	—	—	—	—	—
2	—	—	0.0004	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	0.0001	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	0.0004	—	—	—	—	—	—	—	—	—	—	—
szk403−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk404−1	—	0.0003	—	—	—	0.0001	—	0.0001	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	0.0007	—	—	—	—	—	—	—	—	—	—	—
szk405−1	—	—	—	—	—	0.0001	0.0001	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk406−1	—	—	0.0004	0.0004	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	0.0005	—	0.0002	—	—	—	—	—	—	—	—	—	—	—
4	—	0.0008	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	Organic Chlorine (mg/Kg)								PCBs (mg/Kg)						
	BHC				DDT										
	α−BHC	γ−BHC	β−BHC	δ−BHC	4,4'−DDE	4,4'−DDD	o,p−'DDT	4,4'−DDT	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260
szk408−1	—	—	0.0042	—	—	0.0004	—	—	—	—	—	—	—	—	—
2	—	—	0.0020	—	—	0.0005	—	—	—	—	—	—	—	—	—
3	—	—	0.0009	—	—	0.0001	—	—	—	—	—	—	—	—	—
4	—	—	0.0003	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk409−1	—	—	0.0004	0.0007	—	—	—	—	—	—	—	—	—	—	—
2	—	0.0002	—	0.0001	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	0.0008	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk410−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk411−1	—	—	—	—	—	0.0002	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk412−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk413−1	—	0.0001	—	0.0001	—	0.0001	—	0.0001	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	0.0007	—	0.0003	—	—	—	0.0002	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	Organic Chlorine (mg/Kg)								PCBs (mg/Kg)						
	BHC				DDT										
	α−BHC	γ−BHC	β−BHC	δ−BHC	4,4'−DDE	4,4'−DDD	o,p−'DDT	4,4'−DDT	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260
4	—	—	—	0.0003	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk414−1	—	—	0.0007	0.0001	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk415−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	0.0001	—	—	0.0011	0.0003	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk416−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk417−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk418−1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	0.2332	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 Monitoring Result of the Bottom Material in River Channel and the Bank Soil

Sample No.	Organic Chlorine (mg/Kg)								PCBs (mg/Kg)						
	BHC				DDT										
	α—BHC	γ—BHC	β—BHC	δ—BHC	4,4'—DDE	4,4'—DDD	o,p—'DDT	4,4'—DDT	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260
szk419—1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	0.0005	0.0003	0.0012	—	0.0024	—	0.0003	—	—	—	—	—	—	—
4	—	0.0013	—	0.0004	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk420—1	—	—	—	0.0007	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	0.0034	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	0.0005	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	0.0002	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	0.0010	—	—	—	—	—	—	—	—	—	—	—
szk421—1	—	—	0.0004	0.0008	—	—	0.0002	0.0001	—	—	—	—	—	—	—
2	—	—	—	0.0004	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	0.0018	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	0.0001	—	—	—	—	—	—	—	—	—	—	—
szk422—1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	0.0009	—	—	—	—	—	—	—	—	—	—	—
3	—	0.0025	—	0.0023	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk423—1	—	—	—	—	—	—	0.0041	0.0005	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk424—1	—	—	—	0.0041	—	0.0003	—	0.0039	—	—	—	—	—	—	—
2	—	—	—	0.0005	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	Organic Chlorine (mg/Kg)								PCBs (mg/Kg)						
	BHC				DDT										
	α—BHC	γ—BHC	β—BHC	δ—BHC	4,4'—DDE	4,4'—DDD	o,p—'DDT	4,4'—DDT	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260
3	—	—	—	0.0015	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	0.0002	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk425—1	—	—	—	0.0006	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	0.0006	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk426—1	—	0.0012	—	0.0009	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	0.0021	—	0.0034	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk427—1	—	—	—	0.0004	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	0.0009	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	0.0016	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	0.0009	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk428—1	—	0.0009	—	0.0006	—	—	—	—	—	—	—	—	—	—	—
2	—	0.0010	—	0.0005	—	—	—	—	—	—	—	—	—	—	—
3	—	0.0006	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	0.0002	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	0.0008	—	—	—	—	—	—	—	—	—	—	—	—	—
szk429—1	—	—	—	—	—	—	0.0003	0.0005	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	Organic Chlorine(mg/Kg)								PCBs(mg/Kg)						
	BHC				DDT										
	α—BHC	γ—BHC	β—BHC	δ—BHC	4,4'—DDE	4,4'—DDD	o,p—'DDT	4,4'—DDT	PCB1016	PCB1221	PCB1232	PCB1242	PCB1248	PCB1254	PCB1260
szk430—1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk431—1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk432—1	—	0.0001	—	0.0006	—	0.0002	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	0.0016	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	0.0395	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk433—1	—	—	—	—	—	0.0001	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk434—1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk435—1	—	—	—	0.0046	—	0.0002	0.0004	0.0003	—	—	—	—	—	—	0.0078
2	—	—	—	—	—	0.0002	0.0002	0.0002	—	—	—	—	—	—	0.0047
3	—	—	—	0.0006	—	0.0002	0.0003	0.0011	—	—	—	—	—	—	0.0036
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Notice: "—"means the value of the monitoring is less than the detection limit.

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	PAHs (mg/Kg)															
	Naphth-alene	Acenaphthylene	Acecaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]Anthrancene	Chrysene	Benzo[b]Fluoranthene	Benzo[k]Fluoranthene	Benzo[a]Pyrene	Dibenzo[a,h]Anthracene	Benzo[g,h,i]Pyrene	Indeno[1,2,3-cd]Pyrene
szk101—1	2.8595	0.9170	14.080	0.3341	1.0570	0.4358	3.8095	1.1440	2.9985	0.1522	0.0338	0.0138	0.0083	—	—	—
2	0.1330	0.3909	0.1592	0.1761	0.0339	0.1179	1.9675	0.7945	0.6865	0.1975	0.2452	0.8395	0.2770	—	—	—
3	0.1253	—	—	0.1394	0.1465	0.1245	0.8700	1.4290	0.5250	—	—	—	—	—	—	—
4	0.2562	0.0168	0.2915	1.2255	0.8260	0.5880	504150	3.4235	2.1575	0.3634	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk102—1	0.0357	0.0454	0.3376	0.0282	0.2254	0.0135	1.3420	0.7690	0.1256	0.0059	—	—	—	—	—	—
2	—	—	—	0.0145	0.0130	0.0036	0.0227	0.0169	0.0250	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk103—1	0.0045	0.3613	0.0158	0.4146	0.0006	0.1018	0.0005	0.4849	0.0830	0.0804	—	—	—	—	—	—
2	1.7200	0.5810	0.0072	—	0.0017	0.0208	0.0222	0.0054	0.0222	0.0008	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk104—1	0.1684	0.3991	2.0035	0.0211	0.0206	0.0318	0.0343	0.1887	0.0337	0.0081	0.0181	0.0024	0.0058	—	—	—
2	0.0005	0.0190	0.0064	0.0027	0.0119	0.0028	0.0028	0.0065	—	0.0004	—	—	—	—	—	—
3	0.9505	—	0.0021	0.0050	0.0007	0.0092	0.0263	0.0624	0.0519	—	—	—	—	—	—	—
4	0.0039	—	0.4813	0.0111	0.0028	0.0111	0.0161	0.0154	—	—	—	—	—	—	—	—
szk107—1	0.0317	0.8460	0.0120	0.0242	0.0577	0.0330	0.0016	0.0034	0.0252	0.0074	—	—	0.0032	—	—	—
2	0.0453	0.0730	—	0.0548	0.0848	—	—	0.0361	—	0.2141	—	—	0.0119	—	—	—
3	0.1556	—	—	0.0161	0.1362	—	0.0126	—	—	0.2264	—	—	0.0035	—	—	—
4	0.0286	0.0188	0.0831	0.0211	0.0148	0.0204	—	0.0517	0.0097	0.0219	—	—	—	—	—	—
5	0.0626	0.0087	0.0760	0.0013	0.0005	0.0021	0.0041	0.0039	0.0148	—	—	—	0.0041	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	PAHs(mg/Kg)															
	Naphth-alene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]Anthracene	Chrysene	Benzo[b]Fluoranthene	Benzo[k]Fluoranthene	Benzo[a]Pyrene	Dibenzo[a,h]Anthracene	Benzo[g,h,i]Pyrene	Indeno[1,2,3-cd]Pyrene
szk108—1	—	0.0311	0.0328	—	0.2060	—	0.0025	0.1431	—	—	—	—	0.0044	—	—	—
2	—	0.0462	—	—	0.0639	0.0712	0.3641	0.2755	0.1838	—	0.0259	0.0751	0.0739	—	—	—
3	—	0.0289	0.0115	—	—	0.0037	0.0010	0.0175	—	—	—	—	—	—	—	—
4	—	—	0.1648	—	0.0264	—	—	0.0303	0.0289	—	—	—	—	—	—	—
szk109—1	—	0.0096	—	0.0027	0.0034	0.0027	—	0.0018	0.0015	—	—	—	—	—	—	—
2	0.0221	—	0.0750	0.0277	0.0042	0.0026	0.0105	0.0033	0.0017	0.0367	—	—	—	—	—	—
3	0.0424	0.0189	0.0374	0.0156	0.0047	0.0052	0.0053	0.0067	0.0738	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk111—1	0.0022	0.0012	0.0271	0.0025	0.0108	0.0096	0.0306	0.0069	0.0097	0.0074	0.0023	0.0011	—	0.0052	0.0047	—
2	0.0874	0.0388	0.0402	—	0.0209	0.0047	—	—	—	—	—	—	—	—	—	—
3	—	—	0.0261	—	—	—	0.0105	0.0052	—	—	—	—	—	—	—	—
4	0.0106	0.0070	0.0178	0.0015	0.0061	0.0014	0.0007	0.0050	—	—	—	—	—	—	—	—
5	0.1919	—	0.2060	0.0440	0.0213	—	0.0453	0.0058	0.0013	—	—	—	—	—	—	—
szk112—1	0.0057	—	—	—	0.0015	0.0163	0.0355	0.0028	0.0006	0.0029	0.0005	—	—	—	—	—
2	—	—	—	—	—	0.0315	0.0832	0.0815	0.0056	0.0316	—	—	—	—	—	—
3	—	—	—	—	—	—	0.0385	0.0174	—	—	—	—	—	—	—	—
4	—	—	—	—	—	0.0212	0.0408	—	0.0182	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk113—1	0.0004	0.0024	0.0008	0.0012	0.0119	0.0052	0.0286	—	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	PAHs (mg/Kg)																
	Naphth-alene	Acenaphthylene	Acecaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]Anthrancene	Chrysene	Benzo[b]Fluoranthene	Benzo[k]Fluoranthene	Benzo[a]Pyrene	Dibenzo[a,h]Anthracene	Benzo[g,h,i]Pyrene	Indeno[1,2,3 cd]Pyrene	
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
szk114—1	0.0024	0.0643	0.0135	0.0024	—	0.0038	0.0235	0.0044	0.0180	—	—	—	—	—	—	—	
2	0.0225	—	0.0107	0.0056	—	0.0014	0.0088	0.0028	0.0091	—	—	—	—	—	—	—	
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
szk115—1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
szk116—1	0.0122	—	0.0917	0.0001	—	0.0023	0.0102	0.0044	0.0035	0.0057	—	—	—	—	—	—	
2	0.0982	—	1.0065	—	—	0.0042	0.0048	0.0597	0.0155	0.0072	—	—	—	—	—	—	
3	0.1055	—	0.0085	—	—	0.0391	0.0107	0.0162	0.0036	—	—	—	—	—	—	—	
4	—	—	—	—	—	—	—	—	0.0375	—	—	—	—	—	—	—	
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
szk117—1	0.0076	0.0003	0.0249	0.0020	0.0094	0.0045	0.0239	0.0672	0.0036	0.0110	0.0010	—	0.0098	—	—	—	
2	0.0010	0.0328	0.0349	0.0108	0.0096	0.0052	0.0131	0.0093	—	—	—	—	—	—	—	—	
3	0.0188	—	0.0251	—	—	0.0046	0.0173	0.0427	0.0116	—	—	—	—	—	—	—	
4	0.0018	0.0106	0.0097	0.0015	0.0028	—	0.0072	0.0128	—	—	—	—	—	—	—	—	
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
szk119—1	0.0022	0.0066	—	0.0081	0.0071	0.0062	—	0.1534	0.0110	0.0001	0.0055	—	—	—	—	—	
2	0.0805	0.0066	0.0092	0.0066	0.0004	0.0002	—	0.0112	0.0119	—	—	—	—	—	—	—	

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	PAHs(mg/Kg)															
	Naphth-alene	Ace-naphthy-lene	Ace-caph-thene	Fluorene	Phenan-threne	An-thracene	Fluoran-thene	Pyrene	Benzo [a] An thrancene	Chry-sene	Benzo [b] Fluoran thene	Benzo [k] Fluoran thene	Benzo [a] Pyrene	Dibenzo [a,h] An thracene	Benzo [g,h,i] Pyrene	Indeno [1,2,3 cd] Pyrene
3	—	—	0.0969	0.0173	0.0042	0.0081	—	0.1111	0.5118	0.0019	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk120—1	0.0153	0.0336	—	0.0216	0.0266	0.0210	—	0.1105	—	0.0206	0.0016	0.0008	0.0073	—	0.0209	—
2	0.0176	0.0103	—	0.0077	0.0013	0.0041	—	0.0186	—	0.0095	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk121—1	0.0008	—	—	—	0.0015	0.0049	0.0051	0.0004	0.0009	—	0.0315	—	—	—	—	—
2	0.0094	0.0149	0.1335	0.0186	0.0577	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	0.0019	0.0190	0.0086	0.0026	—	—	—	—	—	—	—
4	0.0020	—	—	—	0.0123	0.0161	0.0218	—	—	—	—	—	—	—	—	—
szk202—1	0.0005	0.0008	0.3260	0.2375	0.0016	0.0005	0.0011	0.0011	0.0009	0.0332	0.0031	—	0.0057	—	—	—
2	—	—	—	—	—	0.0038	—	0.0474	—	—	—	—	—	—	—	—
3	—	—	—	—	—	0.0001	0.0221	0.0265	—	—	—	—	—	—	—	—
4	0.1509	0.0362	0.0975	0.0779	—	0.0070	0.2718	0.7440	0.0474	0.0064	—	—	0.0154	—	—	—
5	0.0878	0.1070	0.1064	0.0288	—	0.0088	0.0136	0.1109	0.0054	0.0141	—	—	—	—	—	—
szk205—1	0.0312	0.2989	0.0004	0.0055	0.0051	0.0115	0.0026	0.0207	0.0161	0.0016	0.0004	0.0047	0.0014	—	—	—
2	0.0455	0.0262	—	0.0161	0.0134	—	0.0625	0.0362	0.0118	0.0006	—	—	—	—	—	—
3	0.0174	0.0120	—	—	0.0071	—	0.0117	0.0142	0.0062	—	—	—	—	—	—	—
szk210—1	0.0208	—	—	—	—	—	—	—	0.0180	—	—	—	—	—	—	—
2	0.0291	0.0280	—	—	—	—	—	—	0.0177	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	0.0216	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	PAHs(mg/Kg)															
	Naphth-alene	Acenaphthylene	Acecaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]Anthrancene	Chrysene	Benzo[b]Fluoranthene	Benzo[k]Fluoranthene	Benzo[a]Pyrene	Dibenzo[a,h]Anthracene	Benzo[g,h,i]Pyrene	Indeno[1,2,3-cd]Pyrene
4	0.1109	0.0506	—	—	—	—	—	—	0.0015	—	—	—	—	—	—	
5	0.0549	0.0144	—	—	—	—	—	—	0.0066	—	—	—	—	—	—	
szk218—1	0.0021	0.0032	0.0360	0.0024	0.0015	0.0005	0.0038	0.0039	0.0018	0.0020	0.0011	0.0007	0.0013			
2	—	—	0.1981	—	0.0070	0.0038	0.0202	0.0159	0.0015	—	—	—	—	—	—	
3	—	—	0.2360	—	0.0123	—	0.0257	0.0243	—	—	—	—	—	—	—	
4	—	—	0.2759	—	—	—	—	—	—	—	—	—	—	—	—	
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
szk229—1	—	0.0035	0.0155	0.0222	0.0183	0.0465	0.0341	0.0687	0.0006	0.2589	0.0144	0.0033	0.0169	0.0372		0.0129
2	—	—	—	0.0165	0.0088	0.0009	0.0136	0.0059	0.0086	0.4019	—	—	—	—	—	
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
szk230—1	0.0012	—	—	0.0010	0.0015	0.0001	0.0025	0.0004	0.0025	0.0359	—	—	—	—	—	
2	0.0643	—	—	0.0276	0.0024	0.0048	0.0007	0.0024	0.0005	0.4703	0.1321	—	0.0028	0.0055	—	
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
szk401—1	0.0122	—	0.3042	0.0068	0.0069	—	0.0927	0.0315	0.0310	0.0122	0.0017	0.0038	—	—	—	
2	0.0051	—	0.0227	0.0053	0.0027	—	0.0140	0.0233	0.0022	0.0133	0.0013	—	—	—	—	
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
szk402—1	0.0049	0.0538	0.0045	0.0024	—	0.0240	0.0007	0.0538	0.8720	0.6675	0.0046	0.0063				
2	—	—	—	—			—	—	—	—	—	—				
3	0.1812	0.0577	0.0007	—				0.0049	—	—	—					
4	—	—	—	—	—	—	—	—	—	—	—					

Table A7. 1 Monitoring Result of the Bottom Material in River Channel and the Bank Soil

Sample No.	PAHs(mg/Kg)															
	Naphth-alene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]Anthrancene	Chrysene	Benzo[b]Fluoranthene	Benzo[k]Fluoranthene	Benzo[a]Pyrene	Dibenzo[a,h]Anthracene	Benzo[g,h,i]Pyrene	Indeno[1,2,3-cd]Pyrene
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk403—1	0.0076	0.0182	—	0.0057	0.0005	0.0040	0.0096	0.0563	0.0003	0.0030	0.0037	0.0002	0.0012	0.0050	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	0.0986	0.0153	—	0.0400	0.0228	0.0100	—	0.0404	—	0.0406	0.0046	0.0065	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk404—1	0.0028	—	—	—	0.0015	0.0106	0.0536	0.0040	0.0004	0.0001	0.0030	—	0.0224	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk405—1	0.0323	0.0295	0.3358	—	0.0178	0.0480	0.1675	0.1765	0.1773	0.0003	0.0043	0.0073	—	—	—	—
2	—	0.0028	0.0029	—	0.0009	0.0008	0.0017	0.0017	0.0016	0.0005	0.0002	—	—	—	—	—
3	0.0007	0.0029	0.0027	—	0.0012	0.0001	0.0003	—	0.0001	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk406—1	—	—	—	—	0.0008	0.0118	0.0347	0.0016	0.0010	0.0003	0.0173	0.0012	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk408—1	0.0244	0.0058	—	0.0053	0.0023	0.0023	0.0124	0.0022	0.0076	0.0013	—	—	0.0010	—	—	—
2	—	—	—	—	—	—	—	0.0596	—	0.0021	—	—	—	—	—	—
3	0.0038	0.0028	—	—	—	0.0022	0.0120	0.0175	0.0086	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	PAHs(mg/Kg)															
	Naphth-alene	Ace-naphthy-lene	Ace-caph-thene	Fluorene	Phenan-threne	An-thracene	Fluoran-thene	Pyrene	Benzo [a] An thrancene	Chry-sene	Benzo [b] Fluoran thene	Benzo [k] Fluoran thene	Benzo [a] Pyrene	Dibenzo [a,h] An thracene	Benzo [g,h,i] Pyrene	Indeno [1,2,3 cd] Pyrene
4	—	0.0001	—	—	—	0.0008	0.0033	—	—	—	—	—	—	—	—	—
5	0.0184	—	—	—	—	—	—	0.0607	0.0719	0.0156	—	—	—	—	—	—
szk409—1	0.0021	0.0050	0.0005	0.0002	0.0043	0.0060	0.0139	0.0018	0.0580	0.0001	—	0.0027	0.0036	—	—	—
2	0.0093	0.0122	0.0106	0.0060	—	0.0043	0.0142	0.0025	0.0046	—	—	—	—	—	—	—
3	0.1261	0.0436	0.2003	—	0.0121	0.0053	0.0149	0.0128	0.0088	0.0032	—	—	—	—	—	—
4	—	0.0381	0.2421	—	0.1009	—	0.0276	0.0152	0.0172	0.0048	—	—	—	—	—	—
5	—	0.0231	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk410—1	0.0010	0.0005	0.0185	0.0034	0.0011	0.0001	0.0002	0.0128	—	0.1440	—	—	—	—	—	—
2	0.0984	0.0245	0.0177	0.0034	0.0022	0.0845	0.0037	0.0778	0.0167	0.0120	—	—	—	—	—	—
3	0.0277	—	0.0752	—	0.0140	0.0833	0.0123	0.0516	0.0085	0.0095	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	0.0448	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	0.0053	—	—	—	—	—	—
szk411—1	0.0047	0.0035	0.0028	0.0018	0.0033	0.0030	0.0018	16.950	0.0901	0.0121	0.0016	0.0017	0.0041	—	—	—
2	0.0027	0.0035	—	0.0038	0.0010	0.0014	0.0037	—	—	—	—	—	—	—	—	0.0003
3	—	0.0034	—	—	0.0014	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk412—1	0.0068	0.0003	0.1123	0.0002	0.0017	0.0001	0.0054	—	0.0004	0.0042	—	—	—	—	—	—
2	0.0420	0.0296	0.0719	—	—	0.0026	0.0275	—	—	—	—	—	—	—	—	—
3	0.0250	0.0451	0.0364	—	0.0047	0.0384	0.0262	—	—	—	—	—	—	—	—	—
4	—	—	0.1052	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	0.0207	—	—	—	—	—	—	—	—	—	—	—	—	—
szk413—1	0.0130	0.0199	0.0025	0.0023	0.0113	0.0105	0.0571	0.0409	0.0072	0.0155	0.0039	0.0029	0.0024	0.0607	0.0058	0.0068
2	0.1812	0.1427	0.4541	—	0.1111	0.0862	0.3251	0.4036	0.0596	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	PAHs (mg/Kg)															
	Naphth-alene	Acenaphthylene	Acecaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]Anthrancene	Chrysene	Benzo[b]Fluoranthene	Benzo[k]Fluoranthene	Benzo[a]Pyrene	Dibenzo[a,h]Anthracene	Benzo[g,h,i]Pyrene	Indeno[1,2,3-cd]Pyrene
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	0.2721	—	—	0.1520	0.0174	0.0172	0.0605	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk414—1	—	0.0561	—	0.0152	0.0051	0.0057	0.0373	0.0301	0.0186	0.0011	0.0029	0.0090	0.0004	0.0082	0.0128	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk415—1	0.0069	0.0007	0.0050	0.0013	0.0032	0.0051	0.0019	0.0005	0.0001	0.0017	0.0152	0.0027	0.0036	—	—	—
2	0.0561	0.0510	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	0.0492	0.0709	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk416—1	—	0.0144	—	0.0024	0.0015	0.0022	0.0043	0.0083	0.0011	0.0005	0.0041	0.0037	0.0005	0.0033	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk417—1	0.0070	—	—	0.0142	—	0.0072	—	0.0055	0.0007	0.0012	0.0065	0.0010	0.0094	0.0176	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

Sample No.	PAHs(mg/Kg)															
	Naphth-alene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]Anthrancene	Chrysene	Benzo[b]Fluoranthene	Benzo[k]Fluoranthene	Benzo[a]Pyrene	Dibenzo[a,h]Anthracene	Benzo[g,h,i]Pyrene	Indeno[1,2,3 cd]Pyrene
szk418—1	0.0007	—	—	—	0.0034	0.0021	0.0105	—	0.0186	—	—	—	—	—	—	—
2	—	—	—	—	0.0138	0.0072	0.0557	0.0442	0.4749	—	—	—	—	—	—	—
3	—	—	—	—	0.0129	0.0104	—	0.0339	0.0019	0.0103	—	—	—	—	—	—
4	—	—	—	—	—	0.0118	0.0214	—	0.0230	0.0199	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	0.0131	—	—	—	—	—	—	—
szk419—1	0.0118	1.0160	0.0183	0.0443	—	0.0670	0.1477	0.1973	0.8285	0.0059	0.0022	0.0081	0.0003	0.0105	—	—
2	0.0273	0.1654	—	0.0121	—	0.0055	0.0217	0.0396	0.0746	0.0058	0.0021	—	—	—	—	—
3	0.0029	0.1215	—	0.0054	—	0.0024	0.0239	0.0352	0.0057	0.0019	0.0006	—	—	—	—	—
4	0.0142	0.0141	—	0.0082	—	0.0030	0.0131	0.0289	0.0114	0.0476	—	—	—	—	—	—
5	0.0231	—	—	0.0077	—	0.0050	0.0121	0.0267	0.0056	0.0189	—	—	—	—	—	—
szk420—1	0.0049	—	—	0.0009	0.0013	0.0068	0.0045	0.0055	0.0038	0.0002	0.0053	0.0036	0.0015	0.0132	0.0045	—
2	0.0101	—	—	—	—	0.0334	0.0167	0.0487	0.0170	0.0239	0.0663	0.0257	—	—	—	—
3	—	—	—	0.0047	0.0080	0.0114	0.0207	0.0036	0.0188	0.0087	0.0411	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk421—1	—	—	0.0479	—	0.0013	—	—	—	0.0008	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk422—1	0.0017	—	0.0113	0.0028	0.0007	—	0.0022	0.0008	—	0.0407	—	—	—	—	—	—
2	0.0181	1.8125	0.0081	—	—	—	0.0060	0.0077	0.0012	0.0237	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 Monitoring Result of the Bottom Material in River Channel and the Bank Soil

Sample No.	PAHs(mg/Kg)															
	Naphth-alene	Acenaphthylene	Acecaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]Anthrancene	Chrysene	Benzo[b]Fluoranthene	Benzo[k]Fluoranthene	Benzo[a]Pyrene	Dibenzo[a,h]Anthracene	Benzo[g,h,i]Pyrene	Indeno[1,2,3 cd]Pyrene
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk423—1	—	0.0124	—	—	—	—	—	—	0.0348	—	—	—	0.0013	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	0.1594	0.0158	—	0.0049	—	0.0531	0.0102	—	—	—	—	—	—	—
4	—	—	0.0716	—	—	—	—	—	0.0010	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk424—1	0.0145	0.0085	—	—	0.0046	0.0055	0.0156	0.0015	0.0322	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	0.0640	0.0152	0.0205	0.0017	0.0160	0.0012	0.0424	0.0521	0.0218	0.0116	0.0010	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk425—1	0.0139	0.1323	0.0249	0.0079	—	—	—	0.0088	0.0333	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk426—1	0.0014	0.0430	0.0013	0.0008	—	—	—	—	0.0534	—	—	—	—	—	—	—
2	0.0156	0.0310	0.0227	0.0014	—	—	—	—	0.0234	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk427—1	0.0035	0.0289	0.0170	0.0509	0.0119	—	0.0430	0.0481	0.0317	—	—	—	—	—	—	—

Table A7. 1 **Monitoring Result of the Bottom Material in River Channel and the Bank Soil**

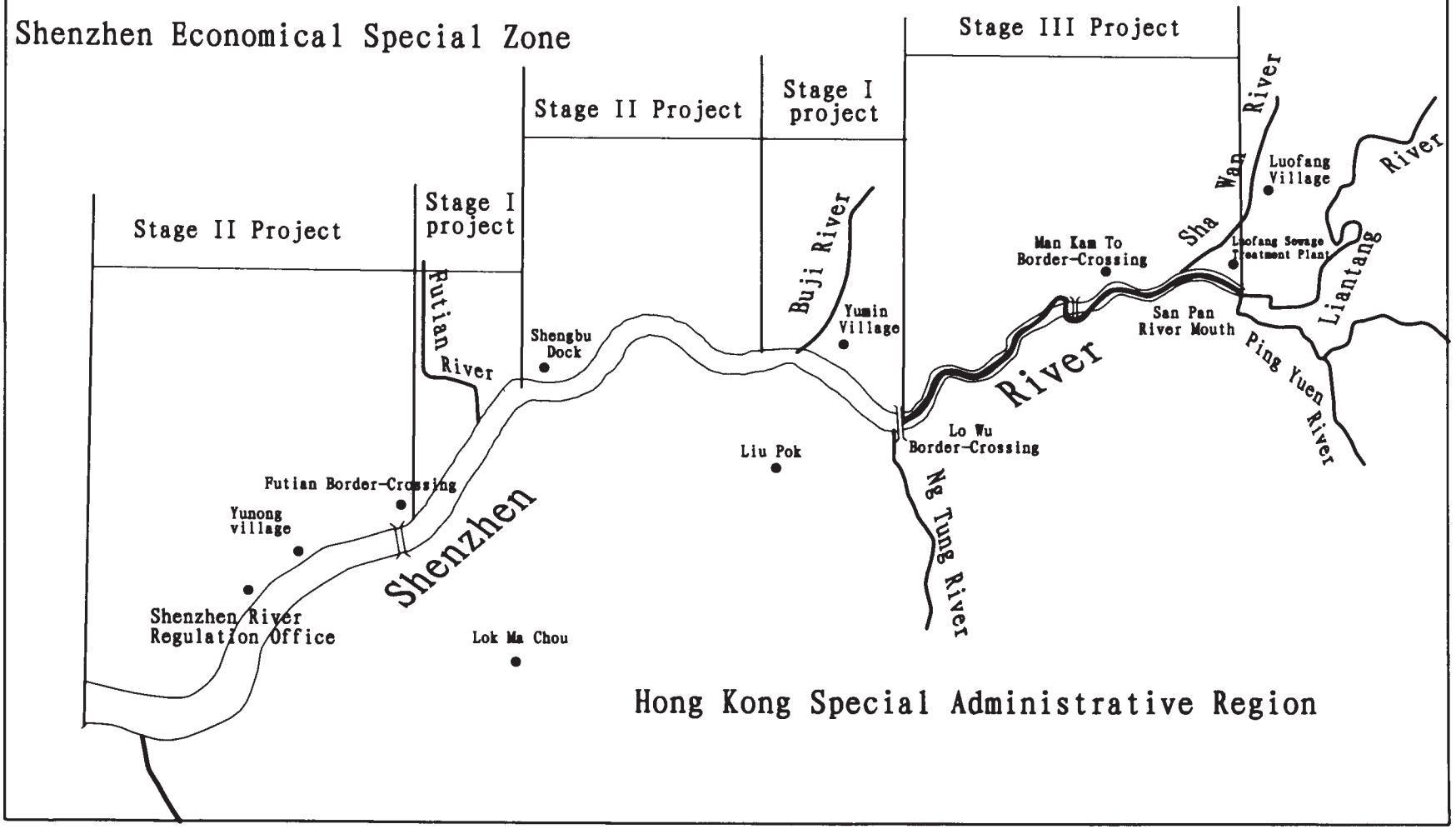
Sample No.	PAHs(mg/Kg)															
	Naphth-alene	Ace-naphthy-lene	Ace-caph-thene	Fluorene	Phenan-threne	An-thracene	Fluoran-thene	Pyrene	Benzo [a] An-thrancene	Chry-sene	Benzo [b] Fluoran thene	Benzo [k] Fluoran-thene	Benzo [a] Pyrene	Dibenzo [a,h] An thracene	Benzo [g, h,i] Pyrene	Indeno [1, 2,3-cd] Pyrene
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk428—1	0.0047	—	0.0036	0.0029	—	—	—	—	0.0042	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	0.1212	0.0690	0.0423	0.0103	0.0140	0.0100	0.0139	0.0212	—	—	—	—	—	—	—	—
4	—	—	—	—	0.0083	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk429—1	0.0006	0.0065	0.1002	0.0054	0.0006	0.0020	0.0203	0.0018	0.0004	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4																
szk430—1	0.0019	0.0008	0.0059	—	0.0015	—	—	—	0.0061	—	—	—	—	—	—	—
2	—	—	0.0679	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk431—1	0.0028	0.0029	0.0014	—	0.0006	0.0001	0.0047	0.0136	0.0032	0.0024	—	—	—	—	—	—
2	0.0469	0.0167	0.0273	0.0263	0.0313	—	0.0452	—	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table A7. 1 Monitoring Result of the Bottom Material in River Channel and the Bank Soil

Sample No.	PAHs(mg/Kg)															
	Naphth-alene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benzo[a]Anthrancene	Chrysene	Benzo[b]Fluoranthene	Benzo[k]Fluoranthene	Benzo[a]Pyrene	Dibenzo[a,h]Anthracene	Benzo[g,h,i]Pyrene	Indeno[1,2,3-cd]Pyrene
szk432—1	0.0043	0.0008	0.0575	0.0021	0.0077	0.0018	0.0125	0.0266	0.0048	0.0004	—	—	—	—	—	—
2	0.0022	0.0099	0.0199	0.0046	0.0023	0.0009	0.0132	0.0631	0.0145	3.3430	—	—	0.0008	—	—	—
3	0.0189	0.0099	0.0221	0.0135	0.0103	—	0.0413	0.0529	0.1522	0.0186	0.2124	0.0131	0.0194	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	0.0598	0.0412	0.0496	0.0167	0.0084	0.0052	0.0103	0.0133	—	—	—	—	—	—	—	—
szk433—1	0.0017	0.0083	0.1030	—	0.0137	0.0166	0.0825	0.0786	0.0005	0.0020	0.0007	0.0111	0.0026	0.0062	—	—
2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3	—	—	—	—	0.0016	0.0143	1.0547	0.0189	0.0044	0.0015	0.0054	0.0038	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
szk434—1	—	—	—	—	—	0.0084	0.0020	0.0004	0.0018	—	0.0242	—	—	—	—	—
2	0.0534	0.2809	0.0091	0.0049	0.0013	0.0021	0.0070	0.0055	0.0086	0.0085	0.0015	—	0.0019	—	—	—
3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5	0.0123	0.0073	0.0733	0.0023	0.0014	0.0001	0.0072	—	—	—	—	—	—	—	—	—
szk435—1	0.9240	0.1446	0.3655	0.0350	0.4665	0.2365	0.2390	0.2663	0.3226	—	0.0309	—	—	—	—	—
2	—	—	0.1006	0.0109	0.0462	0.0042	0.0476	0.0439	0.4286	—	—	—	—	—	—	—
3	0.0024	0.0059	0.3045	0.0432	0.0168	0.0362	0.3159	1.4382	0.1883	—	—	—	—	—	—	—
4	0.0008	0.0015	0.2097	0.0204	0.0010	0.0014	0.0203	0.0210	0.8880	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Notice: "—" means the value of the monitoring is less than the detection limit.

Figure1.1 Stage Sketch Map of the Shenzhen River Regulation Project



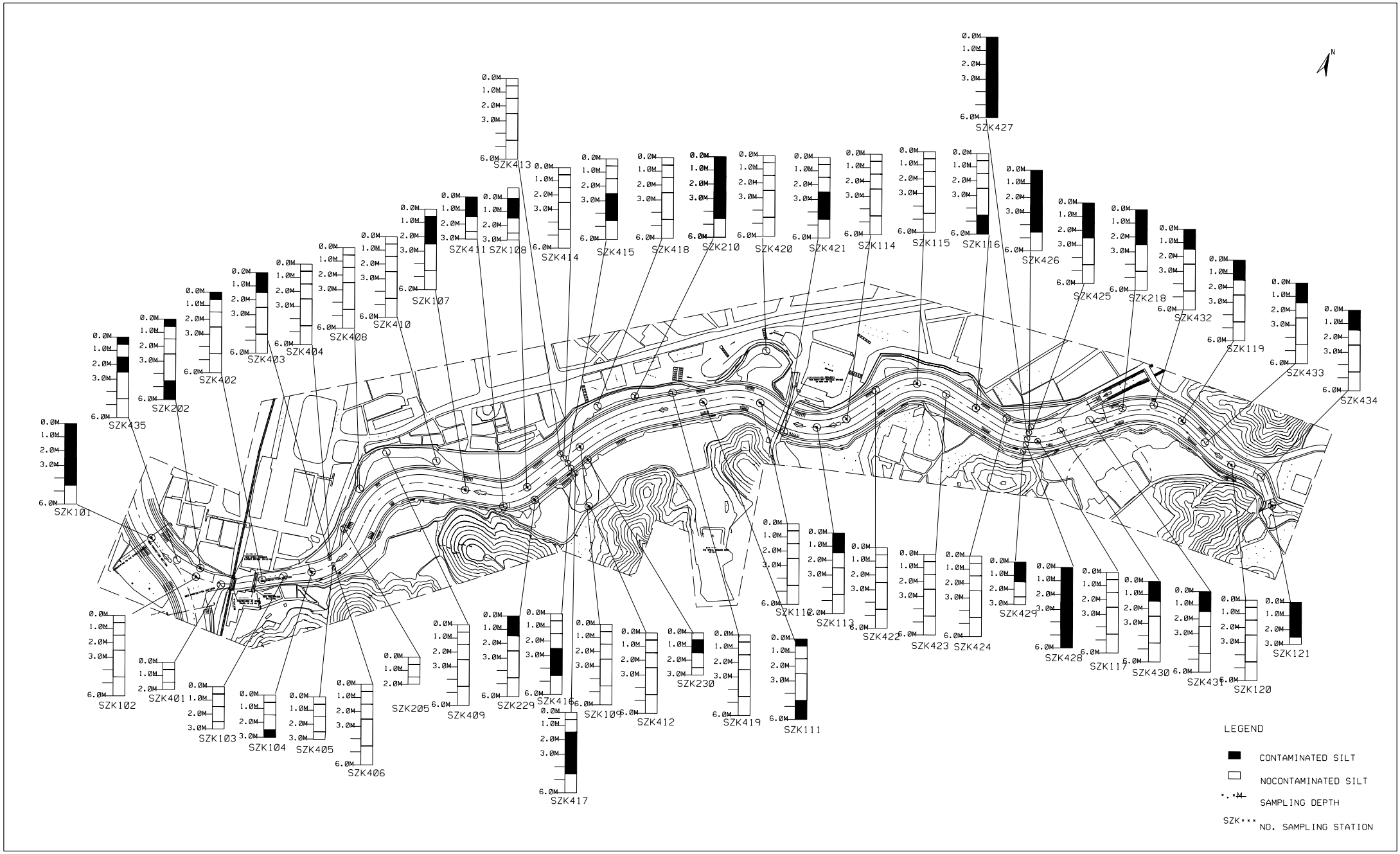


FIG.7.1 SAMPLING LOCATION AND ANALYSIS RESULT FOR BANK SOIL AND BOTTOM MATERIAL

Annex C

Reference historical information from the Planning and Feasibility Study for Training of Upstream Section of Shenzhen River, 2009

Key 图例

在"治理深圳河第四期工程规划及可行性研究"中的采样位置
Sample Location in "Planning and Feasibility Study for Training of Upstream Section of Shenzhen River"

工程范围 Project Area

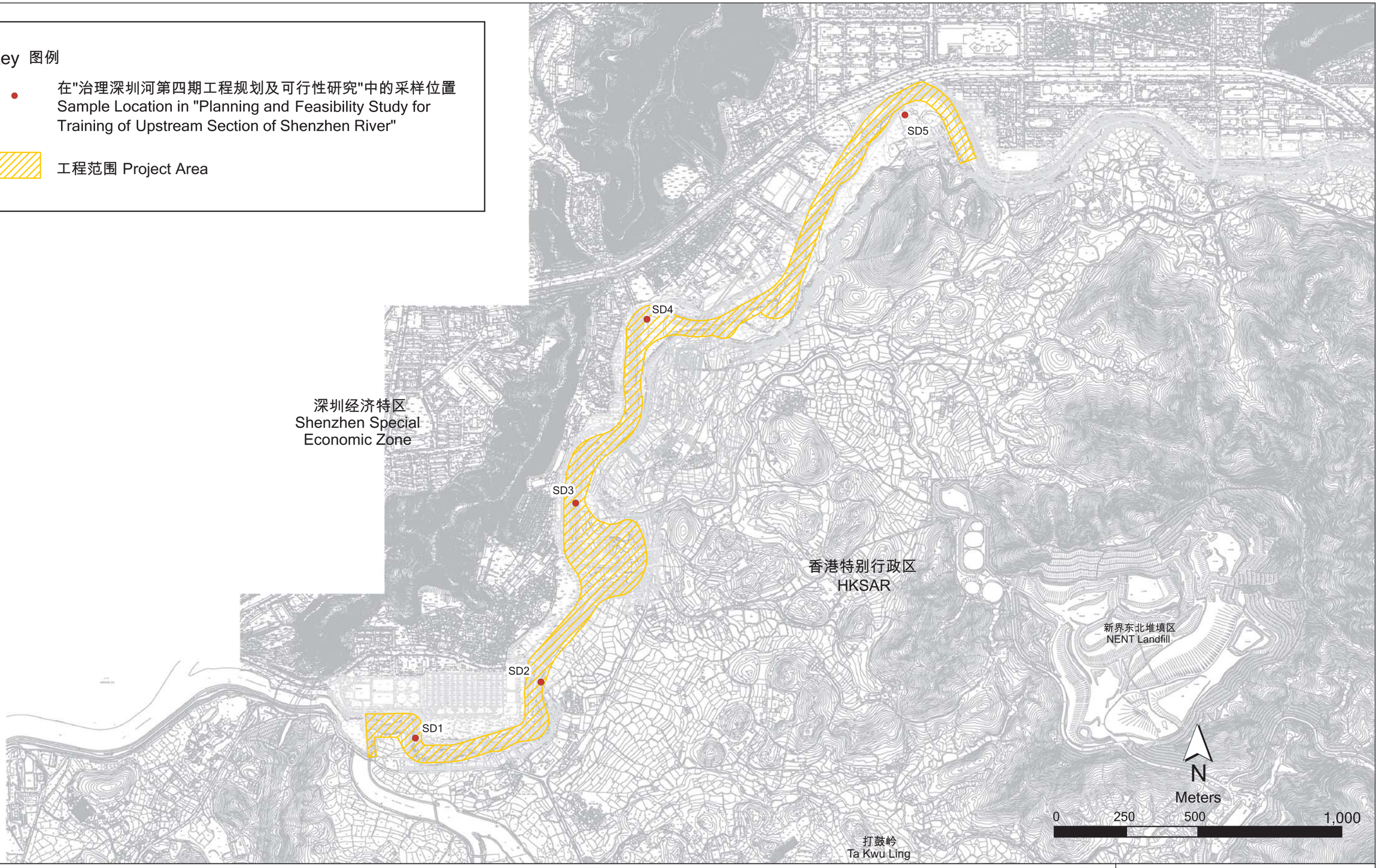


Figure C1

Sediment Sampling Location Plan

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DATE: 17/09/2009

Environmental Resources Management

ERM

1. INTRODUCTION

1.1 The Shenzhen Water Resources Planning & Design Institute and its sub-consultant Black & Veatch Hong Kong Limited (B&V) were commissioned by the Shenzhen River Regulation Office (SzRRO) of the Shenzhen Municipal Government and the Drainage Services Department (DSD) of the Government of the HKSAR & to undertake the study entitled "Planning and Feasibility Study for Training of Upstream Section of Shenzhen River". The layout plan of the project is provided in Figure No. 382841/SQR/001.

1.2 The scope of the consultancy consists of:

- Evaluation of different schemes and recommending an optimum scheme for training of an approximately 3.5Km long section of the Shenzhen River to facilitate development of the proposed Liantang / Heung Yuen Wai Border Control Point (LT/HYWBCP);
- Assessment of flood protection capacity of an approximately 3.5Km of existing river upstream of the LT/HYWBCP;
- Assessment of effects on downstream sections of Shenzhen River of LT/HYWBCP section upon training of the existing rivers; and
- Feasibility study & preliminary design for the recommended river training scheme and determining land requirement.

1.3 Excavation and disposal of river sediment is anticipated for the training of the 3.5Km of the LT/HYWBCP section of Shenzhen River. In accordance with the Environmental, Transport and Works Bureau Technical Circular (Works) No. 34/2002 (ETWB TCW No. 34/2002), a sediment assessment report is required for obtaining approval from the Director of Environmental Protection (DEP) for marine dumping. During the planning and feasibility study stage, an initial assessment of the extent of contaminated materials in the river sediment will be carried out by means of taking samples and carrying laboratory testing for 5 sampling points along the river.

1.4 An Environmental Impact Assessment (EIA) for the proposed river training works will be carried out under separate consultancy. In the EIA, a detailed sediment quality testing will be carried out. This report classifies the findings of the initial assessment of the sediment so that detail sediment quality testing proposal in the EIA stage can be proposed for DEP's approval.

1.5 This report covers the results of biological testing to determine the quality of sediment and classify the sediment according to their suitability for open sea disposal.

2. SAMPLING DETAILS

General

2.1 According to the agreed schedule of sampling included in the Proposal for Sampling and Testing of Sediments (Issue 2) [Doc. Ref No. 382841/SQ/001/Issue 2], a site sampling collection works and chemical testing were carried out.

2.2 Reference was made to the ETWB TCW No. 34/2002 regarding the sediment sampling and testing requirements.

2.3 The sampling handling process (retrieval of sub-samples from the sleeves) was carried out entirely under controlled laboratory conditions to avoid cross contamination from the drilling grease/metal rust from the ground investigation.

Details of Sampling

2.4 Site sampling collection works was carried out from 9 February 2009 to 19 February 2009.

2.5 There are six locations, including a reference sample at Port Shelter near Sai Kung, identified for sample collection. The sampling locations are shown in Figure No. 382841/SQR/002, and the approximate coordinates of the sampling points are presented in Table 2.1.

Table 2.1 Grid Coordinates of Sampling Points

Sampling Point	Easting	Northing
SD1	832908	844648
SD2	833345	844844
SD3	833466	845467
SD4	833714	846107
SD5	834612	846819
RS1 (Reference sediment)	850234	820057

Method of Sample Handling, Storage and Transportation

2.6 All samples were sealed and capped, labelled, stored in a dark environment in a cool box below 4°C immediately after collection on site. On transfer from site to laboratory, all samples were kept at below 4°C, by regular replacing the ice packs.

Quality Assurance for Sample Collection

2.7 The sampling programme was undertaken using appropriate procedures to minimize the potential cross contamination between sampling locations. Field sampling was performed by a qualified mainland ground investigation subcontractor of this project. Samples were dispatched to the testing laboratory for analysis as soon after sampling as possible. All samples were handled under chain of custody protocols and relinquished to the laboratory representatives at locations specified by the laboratory.

3. CHEMICAL SCREENING

3.1 The chemical testing was carried out from 13 February 2009 to 3 March 2009 by designated Laboratory – Lam Laboratories Limited, an accredited laboratory by the Hong Kong Laboratory Accreditation Scheme (HOKALAS).

Analytical Methodology

3.2 Details of the testing methods are provided in Table 3.1 below.

Table 3.1 Analytical Methodology

Parameter	Method reference	Reporting limits
Cd	S/M/DIG-RAR&M/ICP-MS	0.2 mg/kg
Cr	S/M/DIG-RAR&M/ICP-MS	8 mg/kg
Cu	S/M/DIG-RAR&M/ICP-MS	7 mg/kg
Ni	S/M/DIG-RAR&M/ICP-MS	4 mg/kg
Pb	S/M/DIG-RAR&M/ICP-MS	8 mg/kg
Zn	S/M/DIG-RAR&M/ICP-MS	20 mg/kg
Hg	S/M/DIG-RAR&M/ICP-MS	0.05 mg/kg
As	S/M/DIG-RAR&M/ICP-MS	1 mg/kg
Ag	S/M/DIG-RAR&M/ICP-MS	0.1 mg/kg
Total PCB	S/O/PCB	3 µg/kg
LPAHs	S/O/PAH	55 µg/kg
HPAHs	S/O/PAH	170 µg/kg
TBT	W/O/TBT	0.015 µg TBT/L

4. CHEMICAL TESTING RESULT OF SEDIMENT

4.1 The final report on chemical and biological testing from Lam Laboratories Limited is enclosed in Appendix A.

4.2 The results of the chemical tests were checked against the sediment quality criteria for the classification of sediment according to Appendix A of ETWB TCW No. 34/2002. All contaminants from the collected sediments were below the Lower Chemical Exceedance Level (LCEL) except for the metals criteria. The results of chemical testing are listed in Table 4.1:

Table 4.1 Results of Chemical Testing

Drillhole No.	Sample Depth, m	Cd mg/kg	Cr mg/kg	Cu mg/kg	Ni mg/kg	Pb mg/kg	Zn mg/kg	Hg mg/kg	As mg/kg	Ag mg/kg	TBT ug TBT/L
SD1	0.0	0.42	10	<7.0	5.9	46	52	<0.05	2.8	**0.18**	< 0.015
SD1	0.9	0.21	<8.0	9.0	<4.0	26	20	<0.05	3.5	<0.10	< 0.015
SD1	1.9	<0.20	<8.0	<7.0	<4.0	16	<20	<0.05	<1.0	<0.10	< 0.015
SD1	2.9	<0.20	<8.0	<7.0	<4.0	12	<20	<0.05	<1.0	<0.10	< 0.015
SD2	0.0	1.3	52	**82**	24	**120**	**430**	0.21	11	**1.3**	< 0.015
SD2	0.9	0.25	<8.0	12	<4.0	52	40	<0.05	3.1	0.23	< 0.015
SD2	1.9	<0.20	<8.0	<7.0	<4.0	22	<20	<0.05	1.2	<0.10	< 0.015
SD2	2.9	0.48	<8.0	9.0	5.9	<8.0	91	<0.05	12	0.12	< 0.015
SD2	5.9	0.35	<8.0	8.7	<4.0	19	44	<0.05	6.5	<0.10	< 0.015
SD3	0.0	0.25	<8.0	9.9	4.3	37	45	<0.05	2.0	0.10	< 0.015
SD3	0.9	<0.20	<8.0	8.6	<4.0	31	22	<0.05	2.4	<0.10	< 0.015
SD3	1.9	**1.7**	26	14	<4.0	50	93	<0.05	8.5	<0.10	< 0.015
SD3	2.9	0.27	9.6	14	7.3	<8.0	21	<0.05	<1.0	<0.10	< 0.015
SD4	0.0	<0.20	<8.0	<7.0	<4.0	34	28	<0.05	2.0	<0.10	< 0.015
SD4	0.9	0.31	<8.0	11	4.0	50	48	<0.05	6.0	<0.10	< 0.015
SD4	1.9	**1.6**	12	40	15	**170**	180	<0.05	11	0.34	< 0.015
SD4	2.9	0.26	<8.0	42	4.4	**62**	56	<0.05	2.5	0.14	< 0.015
SD5	0.0	**1.9**	71	**130**	**84**	**120**	**560**	**1.4**	**45**	**1.4**	< 0.015
SD5	0.9	0.71	<8.0	30	11	**160**	72	<0.05	12	0.20	< 0.015
SD5	1.9	0.35	<8.0	14	<4.0	**120**	48	<0.05	5.1	<0.10	< 0.015
SD5	2.9	0.42	<8.0	14	<4.0	**100**	61	<0.05	5.3	0.10	< 0.015
Ref. Sediment	NA	<0.20	26	14	20	36	72	0.05	5.8	0.13	< 0.015

Notes:
1. The bold figure is the contaminant level exceeding the Lower Chemical Exceedance Level (LCEL).
2. The underlined figure is the contaminant level exceeding the Upper Chemical Exceedance Level (UCEL).
3. The figure marked with ** is the contaminant level exceeding 10 times the LCEL.

4.3 According to the results of chemical testing and Appendices A and B of the ETWB TCW No. 34/2002, the classification of sediments and the necessity for biological testing are listed in Table 4.2 below:

Table 4.2 Classification of Sediments

Sample location / Investigation Station No.	Sample Depth (m)	Category	Category H with one or more contaminant levels exceeding 10 times the LCEL	Biological Testing Required
SD1	0.0	L	-	-
SD1	0.9	L	-	-
SD1	1.9	L	-	-
SD1	2.9	L	-	-
SD2	0.0	H	X	-
SD2	0.9	L	-	-
SD2	1.9	L	-	-
SD2	2.9	L	-	-
SD2	5.9	L	-	-
SD3	0.0	L	-	-
SD3	0.9	L	-	-
SD3	1.9	M	-	√
SD3	2.9	L	-	-
SD4	0.0	L	-	-
SD4	0.9	L	-	-
SD4	1.9	H	X	-
SD4	2.9	L	-	-
SD5	0.0	H	X	*
SD5	0.9	H	X	-
SD5	1.9	H	X	-
SD5	2.9	M	-	√

Notes:
X: Category H without any contaminant levels exceeding 10 times the LCEL
√: Category H with one or more contaminant levels exceeding 10 times LCEL, and
√: Biological Testing required.
-: Biological Testing not required.
*: Biological test was conducted, but not required under ETWB TCW No. 34/2002.

4.4 Category M sediments were found at 2 drillholes, while Category H sediments were found at 4 drillholes. The contamination is high in terms of Lead (Pb), Cadmium (Cd), Copper (Cu) and Zinc (Zc).

5. BIOLOGICAL TESTING RESULT OF SEDIMENT

5.1 Lam Laboratories Limited confirmed that the samples required for biological testing have sufficient sample volume.

5.2 The sample numbers, sample locations, and sample depths, as well as the biological testing schedule are shown in Table 5.1.

Table 5.1 Biological Testing Schedule

Composite Sample No.	Sample Location / Investigation Station No.	Sample Depth (m)	Biological Test on Sediment Sample			
			Biological Test			Ancillary Test
			10-day Burrowing Amphipod Toxicity Test	20-day Burrowing Polychaete Toxicity Test	48-96 Hour Larvae (Bivalve or Echinoderm) Toxicity Test	Moisture Content, Particle Size Distribution, TOC, Ammonia, Salinity
1	SD3	1.9	√	√	√	√
3	SD5	2.9	√	√	√	√

5.3 Biological testing commenced on 16 March 2009 and was completed on 5 April 2009 by Lam Laboratories Limited.

5.4 The following three toxicity tests (to be considered as one set) had been carried out on each sample:

i. A 10-day burrowing amphipod toxicity test;
ii. A 20-day burrowing polychaete toxicity test; and
iii. A 48-96 hour larvae (bivalve or echinoderm) toxicity test.

5.5 The final report on the chemical and biological testing from Lam Laboratories Limited is attached in Appendix A.

5.6 The results of biological testing were checked against the sediment quality criteria for the classification of sediment according to Appendices B and C of ETWB TCW No. 34/2002.

5.7 The analysis of the results for biological testing on Amphipod, Polychaete, and Bivalve Larvae sediment tests are listed in Table 5.2 to 5.4. The determination of

whether the samples passed or failed the biological tests was based on the decision criteria listed in Appendix B of ETWB TCW No. 34/2002 and are also shown in the following tables:

Table 5.2
Summary of the Amphipod Survival on Day 10 in Relation to the Reference Sediments

Sample ID	Survival Percentage of Amphipod on Day 10 (%)									
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5	Mean	SD	Survival in Relation to Reference Site (%)	Difference between Sample and Reference Sediment (t-test)	Decision (Pass / Fail)
Negative Control with Sediment	90	90	90	95	95	92.0	2.7	-	-	-
Composite Sample No. 1	65	95	85	70	75	78.0	12.0	89.7	NA (Note 1)	Pass
Composite Sample No. 3	75	90	80	85	95	85.0	7.9	97.7	NA (Note 1)	Pass
Reference Sediment	90	90	90	85	80	87.0	4.5	-	-	-
NA (Note 1) As the average survival of the amphipods for the test sediment was no less than 80% of that of the reference sediment, statistical analysis is not required.										

Table 5.3
Summary of the Total Dry Weight of Polychaetes on Day 20 in Relation to the Reference Sediments

Sample ID	Total Dry Weight of Polychaete on Day 10 (mg)									
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5	Mean	SD	Total Dry Weight in Relation to Reference Site (%)	Difference between Sample and Reference Sediment (t-test)	Decision (Pass / Fail)
Negative Control with Sediment	44.64	70.02	29.13	63.53	39.38	49.3	17.0	-	-	-
Composite Sample No. 1	55.13	66.82	53.76	64.94	43.16	56.4	9.7	132.7	NA (Note 1)	Pass
Composite Sample No. 3	47.14	51.38	38.50	40.33	40.84	43.6	5.4	102.7	NA (Note 1)	Pass
Reference Sediment	41.26	56.16	43.59	33.81	37.60	42.5	8.5	-	-	-

NA (Note 1) As the average total dry weight for the test sediment was no less than 90% of that of the reference sediment, statistical analysis is not required.

Table 5.4
Summary of the Normality Survival of the Bivalve Larvae in Relation to the Reference Sediments

Sample ID	Normality Survival of the Bivalve Larvae at Test Termination (%)									
	Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5	Mean	SD	Normality Survival in Relation to Reference Site (%)	Difference between Sample and Reference Sediment (t-test)	Decision (Pass / Fail)
Negative Control with Seawater I	107.4	80.7	86.0	101.8	81.1	91.4	12.4	-	-	-
Negative Control with Seawater II	95.8	98.6	97.2	82.5	77.2	90.3	9.7	-	-	-
Composite Sample No. 1	60.7	59.0	57.9	59.7	61.4	59.8	1.4	72.5	$p<0.05$ Unequal variance	Fail
Composite Sample No. 3	73.7	71.6	74.1	75.8	71.3	73.3	1.2	88.9	NA (Note 1)	Pass
Reference Sediment	70.2	93.0	75.5	89.9	83.6	82.4	1.9	-	-	-

NA (Note 1) As the average normality survival for the bivalve larvae for the test sediment was no less than 80% of that of the reference sediment, statistical analysis is not required.

5.8 The biological testing results of the two sediments taken out from watercourses are summarised in Table 5.5 below.

Table 5.5 Summary of Biological Testing Results

Sample No.	Drillhole No.	Sample Depth, m	Category	Biological Test (Note 1)
1	SD3	1.9	M	Fail
3	SD5	2.9	M	Pass

Note:
1. The sediment is deemed to have failed to the biological test if it fails in any one of the three toxicity tests.

6. QUALITY CONTROL

Chemical and Biological Testing

6.1. The results for quality control (QC) of metals and metalloid testing for the sediment samples are outlined in the Appendix A – Final report for chemical and biological tests. The chemical testing results of the collected reference sediment samples concluded that the reference sediment is uncontaminated.

6.2. Details of the quality control procedures for the biological testing are also given in Appendix A.

7. SEDIMENT CLASSFICATION AND DISPOSAL

7.1 According to ETWB TCW No. 34/2002, the sediments from various locations along the section of the LT/HYWBCP section of Shenzhen River deviated from Categories L, M and H.

7.2 From chemical testing results, the sediments which were classified as Category L shall be defined as Type 1 – open sea disposal according to Appendix C of ETWB TCW No. 34/2002.

7.3 Subsequent biological tests were carried out for the sediments which were classified as Categories M and H with one or more contaminant levels exceeding 10 times the LCEL from chemical testing.

7.4 The details of the sediment classification are summarised in Table 7.1.

Table 7.1 Summary of Sediments Classification

Sample Location / Investigation Station No.	Sample Depth (m)	Category	Classification
SD1-1	0.0	L	Type 1
SD1-2	0.9	L	Type 1
SD1-3	1.9	L	Type 1
SD1-4	2.9	L	Type 1
SD2-1	0.0	H	Type 2
SD2-2	0.9	L	Type 1
SD2-3	1.9	L	Type 1
SD2-4	2.9	L	Type 1
SD2-5	5.9	L	Type 1
SD3-1	0.0	L	Type 1
SD3-2	0.9	L	Type 1
SD3-3	1.9	M	Type 2
SD3-4	2.9	L	Type 1
SD4-1	0.0	L	Type 1
SD4-2	0.9	L	Type 1
SD4-3	1.9	H	Type 2
SD4-4	2.9	L	Type 1
SD5-1	0.0	H	Type 2
SD5-2	0.9	H	Type 2
SD5-3	1.9	H	Type 2
SD5-4	2.9	M	Type 1

[#] Insufficient sample for biological screening, the result has been conservatively assumed to fail.

7.5 In accordance with Appendix C of ETWB TCW No. 34/2002, Type 2 – confined marine disposal is suitable for all of above Category M and H sediment, except sediment sample SD5 (2.9m) in which it is classified as Type 1 – open sea disposal (Dedicated Sites). Advice will need to be sought from the Marine Fill Committee on the allocation of disposal site for this project.

7.6 The construction works of this Project is programmed to commence in August 2013. With an estimated average excavation depth of 0.5m along the existing riverbed of the 3.5 Km proposed river training section, the estimated total volume of dredged Type 1 – open sea disposal (uncontaminated sediment) and Type 2 – confined marine disposal (contaminated sediment) is 47,999 m^3 and 42,876 m^3, respectively. Estimation on volume of dredged material required disposal is enclosed in Appendix B.

8. CONCLUSION

8.1 All sediment samples were tested for chemical contaminants by Lam Laboratories Limited. Inspection of the sediment testing results identified the existence of Category L, M and H sediments in the LT/HYWBCP section of Shenzhen River.

8.2 In accordance with ETWB TCW No. 34/2002, the majority of the sediment at the Project site was classified as Type 1 sediment. There were some Type 2 sediment found only at drillholes SD2, SD3 SD4 and SD5. Based on the current preliminary design, the estimated average excavation depth along the existing riverbed of the 3.5 Km proposed river training section is 0.5m. The volume of excavated sediment suitable for open sea disposal is 47,999 m^3. The volume of contaminated sediment requiring confined marine disposal is estimated to be 42,876 m^3. This estimated volume of sediment to be excavated is to be further determined and subject to change during detailed design of the training of upstream section of Shenzhen River.

8.3 This report summarises the initial assessment on the sediment quality along the proposed upstream section of the Shenzhen River to be trained. A detailed sediment quality assessment will be carried in the EIA, which is under separate consultancy.

END OF TEXT

Annex D

Proposed River Sediment Sampling Locations

Key 图例

在"治理深圳河第四期工程规划及可行性研究"中的采样位置
Sample Location in "Planning and Feasibility Study for Training of Upstream Section of Shenzhen River"

建议的采样位置
Proposed Sampling Locations in Regulation of Shenzhen River Stage IV EIA

工程范围 Project Area

深圳经济特区
Shenzhen Special Economic Zone

香港特别行政区
HKSAR

新界东北堆填区
NENT Landfill

打鼓岭
Ta Kwu Ling

SD1
SD2
SD3
SD4
SD5

SR1
SR2
SR3
SR4
SR5
SR6
SR7
SR8

N
Meters
0 250 500 1,000

Figure D1

Sediment Sampling Location Plan

FILE: 0101759f (0101759_sediment sampling.mxd)
DATE: 17/09/2009

Environmental Resources Management

ERM

Annex E

Dredged/Excavated Sediment Assessment Criteria in ETWB TC(W) No. 34/2002

Sediment Quality Criteria for the Classification of Sediment

Contaminants	Lower Chemical Exceedance Level (LCEL)	Upper Chemical Exceedance Level (UCEL)
Metals ***(mg/kg dry wt.)***		
Cadmium (Cd)	1.5	4
Chromium (Cr)	80	160
Copper (Cu)	65	110
Mercury (Hg)	0.5	1
Nickel (Ni)*	40	40
Lead (Pb)	75	110
Silver (Ag)	1	2
Zinc (Zn)	200	270
Metalloid ***(mg/kg dry wt.)***		
Arsenic (As)	12	42
Organic-PAHs ***(μg/kg dry wt.)***		
Low Molecular Weight PAHs	550	3160
High Molecular Weight PAHs	1700	9600
Organic-non-PAHs ***(μg/kg dry wt.)***		
Total PCBs	23	180
Organometallics ***(μg TBT/L in Interstitial water)***		
Tributyltin*	0.15	0.15

**** The contaminant level is considered to have exceeded the UCEL if it is greater than the value shown.***

The sediment is classified into 3 categories based on its contaminant levels :

Category L: Sediment with all contaminant levels not exceeding the Lower Chemical Exceedance Level (LCEL). The material must be dredged, transported and disposed of in a manner which minimizes the loss of contaminants either into solution or by resuspension.

Category M: Sediment with any one or more contaminant levels exceeding the Lower Chemical Exceedance Level (LCEL) and none exceeding the Upper Chemical Exceedance Level (UCEL). The material must be dredged and transported with care, and must be effectively isolated from the environment upon final disposal unless appropriate biological tests demonstrate that the material will not adversely affect the marine environment.

Category H: Sediment with any one or more contaminant levels exceeding the Upper Chemical Exceedance Level (UCEL). The material must be dredged and transported with great care, and must be effectively isolated from the environment upon final disposal.

3. TIER III - Biological Screening

The purpose of Tier III screening is to identify the most appropriate disposal option for Category M and certain Category H sediments.

(a) Submission requirements

The project proponent shall submit for approval a test proposal to DEP and copy to the Secretary of MFC. The proposal should contain the following information :

(i) the number of biological tests;

(ii) the arrangement for preparing the composite samples; and

(iii) the test species and test conditions.

In general, all biological tests should be conducted on composite samples. Composite sample is prepared by mixing up to 5 samples of the same category (M or H) which are continuous in vertical or horizontal profile.

Sediment classified as Category M shall be subjected to the following three toxicity tests (to be considered as one set) on each composite sample:

a 10-day burrowing amphipod toxicity test ; and

a 20-day burrowing polychaete toxicity test; and

a 48-96 hour larvae (bivalve or echinoderm) toxicity test.

Sediment classified as Category H and with one or more contaminant levels exceeding 10 times LCEL shall also be subjected to the above three toxicity tests but in a diluted manner (dilution test). The samples shall be prepared prior to toxicity testing as follows:

Sediment characteristics	Preparation method
Category H sediment (> 10 x LCEL)	Sample to be mixed with 9 portions of reference sediment
Category M sediment or Category H sediment (> 10 x LCEL) suspected of ammonia contamination	Additional set of sample (after dilution for Cat. H sediment) to be purged# for ammonia removal (for amphipod test only).

If the ammonia concentration in the overlying water of the test system is ≥ 20 mg/L, purging of sediment is required. This is performed by replacing the overlying water at a rate of 6 volume replacements/24 h for 24 hours, and repeated once only if the ammonia level still exceeds 20 mg/L.

(b) Testing requirements

The test endpoints and decision criteria are summarized in Table 2 at the end of this Appendix. The sediment is deemed to have failed the biological test if it fails in any one of the three toxicity tests.

Only ecologically relevant species should be used for carrying out the biological screening tests. The species to be used for each type of test can be selected from the following:

Test Types	Species	Reference Test Conditions*
10-day burrowing amphipod toxicity test	*Ampelisca abdita*	U.S.EPA(1994)/PSEP(1995)
	Leptocheirus plumulosus	U.S.EPA(1994)
	Eohaustorius estuarius	U.S.EPA(1994)/PSEP(1995)
20-day burrowing polychaete toxicity test	*Neanthes arenaceodentata*	PSEP(1995)
48-96 hour larvae (bivalve or echinoderm) toxicity test	Bivalve:	
	Mytilus spp.	PSEP(1995)
	Crassostrea gigas	PSEP(1995)
	Echinoderm :	
	Dendraster excentricus	PSEP(1995)
	Strongylocentrotus spp.	PSEP(1995)

*U.S.EPA (U.S. Environmental Protection Agency) 1994. Methods for assessing the toxicity of sediment-associated contaminants with estuarine and marine amphipods. Office of Research and Development. U.S. Environmental Protection Agency, Cincinnati, OH. EPA/600/R94/025.

PSEP (Puget Sound Estuary Program) 1995. Recommended guidelines for conducting laboratory bioassays on Puget Sound sediments.

(c) Quality assurance/quality control (QA/QC) requirements

All biological tests must be conducted by laboratories with appropriate accreditation.

The biological test shall include appropriate quality assurance/quality control such as:

(i) Negative Control

(ii) Positive Control

Table 1 - Analytical Methodology

Parameters	Preparation Method *US EPA Method*	Determination Method *US EPA Method*	Reporting Limit
Metals ***(mg/kg dry wt.)***			
Cadmium (Cd)	3050B	6020A or 7000A or 7131A	0.2
Chromium (Cr)	3050B	6010C or 7000A or 7190	8
Copper (Cu)	3050B	6010C or 7000A or 7210	7
Mercury (Hg)	7471A	7471A	0.05
Nickel (Ni)	3050B	6010C or 7000A or 7520	4
Lead (Pb)	3050B	6010C or 7000A or 7420	8
Silver (Ag)	3050B	6020A or 7000A or 7761	0.1
Zinc (Zn)	3050B	6010C or 7000A or 7950	20
Metalloid ***(mg/kg dry wt.)***			
Arsenic (As)	3050B	6020A or 7000A or 7061A	1
Organic-PAHs ***(μg/kg dry wt.)***			
Low Molecular Weight PAHs+	3550B or 3540C and 3630C	8260B or 8270C	55
High Molecular Weight PAHs++	3550B or 3540C and 3630C	8260B or 8270C	170
Organic-non-PAHs ***(μg/kg dry wt.)***			
Total PCBs+++	3550B or 3540C and 3665A	8082	3
Organometallics ***(μg TBT/L in interstitial water)***			
Tributyltin	Krone et al. (1989)* - GC/MS UNEP/IOC/IAEA**	Krone et al. (1989)* - GC/MS UNEP/IOC/IAEA**	0.015

Footnotes: (i) The reporting limits shown in this table are the most stringent limits which will be specified by DEP. Project proponents should consult DEP on the required limits in the preparation of proposals for sampling and chemical testing of the sediment.

(ii) Other equivalent methods may be used subject to the approval of DEP.

\+ Low molecular weight PAHs include acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene

++ High molecular weight PAHs include benzo[a]anthracene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluoranthene, pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, indeno[1,2,3-c,d]pyrene and benzo[g,h,i]perylene

+++ The reporting limit is for individual PCB congeners. Total PCBs include 2,4' diCB, 2,2',5 triCB, 2,4,4' triCB, 2,2',3,5' tetraCB, 2,2',5,5' tetraCB, 2,3',4,4' tetraCB, 3,3',4,4' tetraCB, 2,2',4,5,5' pentaCB, 2,3,3',4,4' pentaCB, 2,3',4,4',5 pentaCB, 3,3',4,4',5 pentaCB, 2,2',3,3',4,4' hexaCB, 2,2',3,4,4',5' hexaCB, 2,2',4,4',5,5' hexaCB, 3,3',4,4',5,5' hexaCB, 2,2',3,3',4,4',5 heptaCB, 2,2',3,4,4',5,5' heptaCB, 2,2',3,4',5,5',6 heptaCB (ref: the "summation" column of Table 9.3 of *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual (The Inland Testing Manual)* published by USEPA).

* Krone et al. (1989), A method for analysis of butyltin species and measurement of butyltins in sediment and English Sole livers from Puget Sound, Marine Environmental Research 27 (1989) 1-18. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.

** UNEP/ICO/IAEA refers to IAEA's Marine Environment Laboratory reference methods. These methods are available free of charge from UNEP/Water or Marine Environmental Studies Laboratory at IAEA's Marine Environment Laboratory. Interstitial water to be obtained by centrifuging the sediment and collecting the overlying water.

Table 2 - Test Endpoints and Decision Criteria for Tier III Biological Screening

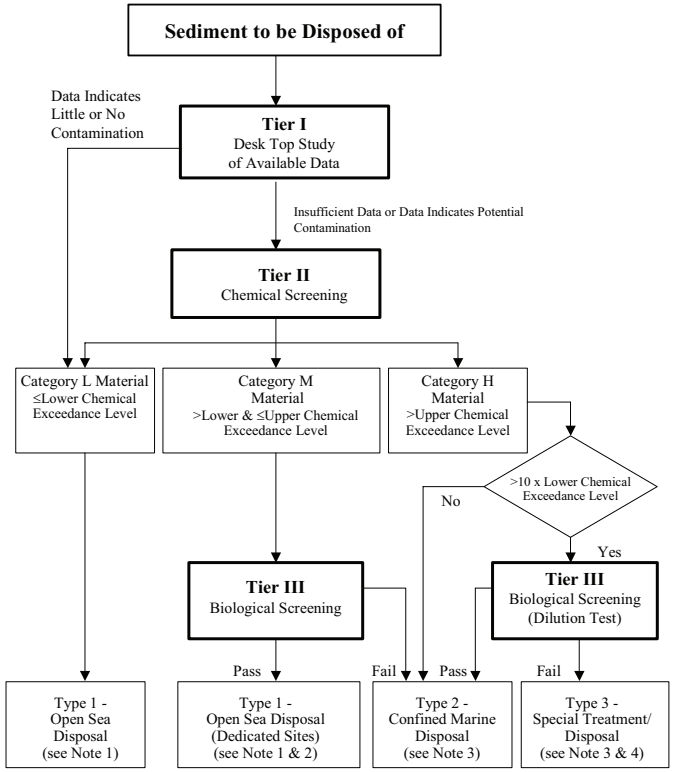
Toxicity test	Endpoints measured	Failure criteria
10-day amphipod	Survival	Mean survival in test sediment is significantly different ($p \leq 0.05$)[1] from mean survival in reference sediment **and** mean survival in test sediment < 80% of mean survival in reference sediment.
20-day polychaete worm	Dry Weight[2]	Mean dry weight in test sediment is significantly different ($p \leq 0.05$)[1] from mean dry weight in reference sediment **and** mean dry weight in test sediment < 90% of mean dry weight in reference sediment.
48-96 hour larvae (bivalve or echinoderm)	Normality Survival[3]	Mean normality survival in test sediment is significantly different ($p \leq 0.05$)[1] from mean normality survival in reference sediment **and** mean normality survival in test sediment < 80% of mean normality survival in reference sediment.

[1] Statistically significant differences should be determined using appropriate two-sample comparisons (e.g., *t-tests*) at a probability of $p \leq 0.05$.

[2] Dry weight means total dry weight after deducting dead and missing worms.

[3] Normality survival integrates the normality and survival end points, and measures survival of only the normal larvae relative to the starting number.

Management Framework for Dredged/Excavated Sediment



Notes

(1) Most open sea disposal sites are multi-user facilities and as a consequence their management involves a flexibility to accommodate varying and unpredictable circumstances. Contract documents should include provisions to allow the same degree of flexibility should it be necessary to divert from one disposal site to another during the construction period of a contract.

(2) Dedicated Sites will be monitored to confirm that there is no adverse impact.

(3) For sediment requiring Type 2 or Type 3 disposal, contract documents should state the allocation conditions of MFC and DEP. At present, East Sha Chau mud pits are designated for confined marine disposal.

(4) If any sediment suitable for Type 3 disposal (Category H sediment failing the biological dilution test) is identified, it is the responsibility of the project proponent, in consultation with DEP, to identify and agree with him/her, the most appropriate treatment and/or disposal arrangement. Such a proposal is likely to be very site and project specific and therefore cannot be prescribed. This will not preclude treatment of this sediment to render it suitable for confined marine disposal.

(5) The allocation of disposal space may carry a requirement for the project proponent to arrange for chemical analysis of the sediment sampled from 5% of the vessels en-route to the disposal site. For Category M and certain Category H sediment, the chemical tests will be augmented by biological tests. Vessel sampling will normally entail mixing five samples to form a composite sample from the vessel and undertaking laboratory tests on this composite sample. All marine disposal sites will be monitored under the general direction of the Civil Engineering Department. However, exceptionally large allocations might require some additional disposal site monitoring. These will be stipulated at the time of allocation.

(6) Trailer suction hopper dredgers disposing of sediment at East Sha Chau must use a down-a-pipe disposal method, the design of which must be approved in advance by DCE. The dredging contractor must provide equipment for such disposal.