Contract No. 1/WSD/13
Improvement of Fresh Water Supply to Cheung Chau

CR-CPJV

DETAILED DRAINAGE PLAN (Rev B; 12.Feb.14)

Prepared by: The CR-CP JV (The Contractor)

Name: Raymond Suen
Date: 12th February 2014

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Appendix

1. Introduction

The project is located in the southeastern coast of Chi Ma Wan Peninsula at South Lantau, in the northwestern coast of Cheung Chau near Tai Kwai Wan and the Adamasta Channel.

The project is to construct and operate a new submarine water main across Adamasta Channel from Lantau to Cheung Chau to replace the existing 10" submarine water main, which is serving as emergency backup, to improve the reliability of water supply to Cheung Chau. The Project will comprise the following:

- Laying of a submarine water main of approximately 1,400m in length and 500mm in diameter across Adamasta Channel;
- Construction of landfall and associated works within Lantau South Country Park, Lantau island; and
- Construction of landfill and associated works near Tai Kwai Wan, Cheung Chau.

2. Purpose:

This plan is developed to address the requirements as stipulated in Environmental Permit – 392/2010 condition 3.10 and to be submitted one month prior to the commencement date, 13 March 2014, of the project. This plan includes the detailed design, layout, capacity, stockpiling and wastewater treatment arrangements at the works areas.

3. Existing Drainage Condition:

Existing streams and surface runoff are collected by channels along Chung Kwai Road, and then transported to two existing outfalls for discharge into nearby water bodies. Both of the said outfalls are located on the northeastern side outside the site area.

4. Scope:

The plan details the Contractor's intend and arrangement to manage the site drainage systems within Portion A, B and D consisting of:

- ✧ Temporary Site Drainage System in Portion A and B
- ✧ Arrangement of Domestic Wastewater in Portion B

- ✧ Mitigation Measures to the Management of Drilling Fluid in Portion A and B
- ✧ Temporary Site Drainage System in Portion D

5. General Description of Site Area:

5.1 Portion A

Portion A, called the "Dirty Area", is part of the worksite area in Cheung Chau for horizontal directional drilling (HDD) operations. It has coverage of approximately 1,447 m2.

5.2 Portion B

Portion B, called the "Dirty Area", is part of the worksite area in Cheung Chau for site personnel accommodations and general site storage. It has coverage of approximately 1,014 m2.

5.3 Portion D

Portion D is part of the worksite area in Lantau Island. The site is designated for exit point of the HDD operations.

The location of Portion A, B and D are shown on drawing number TDMP/1WSD13/01 and TDMP/1WSD/13/02 in Appendix A.

6. Mitigation Measures

This section mainly discusses the mitigation measures on the site runoff. Management of drilling fluid, equipment layout for HDD operation and mitigation measures will be dealt separately in Drilling Fluid management Plan (DFMP) and submit later.

This Plan will follow the guideline of the Practice Note for Professional Persons (ProPECC Note) PN 1/94 – "Construction Site Drainage" which provide guidelines for the handling and disposal of construction discharges. This ProPECC Note is generally applicable for control of site runoff and wastewater generated during the construction phase of the Project. All mitigation measures are shown on drawing TDMP/1WSD13/01 and TDMP/1WSD/13/02 in Appendix A.

6.1 Mitigation Measures to be implemented in Portion A & B

6.1.1 Temporary Site Drainage System in Portion A and B

The system is designed to collect the surface runoff, primary treated by the proprietary WETSEP system prior to discharge to the sea. The attached sketch details the layout of the following elements.

The system consists of:

a. A 300mm perimeter open u-channel surrounding the "Clean Area";
b. 500mm concrete bund surrounding the "Dirty Area";
c. A catch-pit with 3"submersible pump;
d. 300mm high concrete bund would be constructed around the entry pit;
e. A proprietary WETSEP system with a treatment capacity of 10 m3/hour (Please refer to Appendix B for the catalogue of the system and Appendix C for the design);
f. A wheel washing facility to clean village vehicle (VV) prior to leaving the site. The wastewater will be collected by the temporary u-channel and pumped into the WETSEP system for treatment;
g. Silt removal facilities and diversion channels shall be regularly maintained and the deposited silt and grit would be removed weekly, especially at the onset of and after each rainstorm to ensure proper functioning of these facilities at all times;
h. A person will be appointed to inspect de-silting facilities daily to ensure no blockage resulting from the construction activities;
i. Silt curtain will be provided to contain cuttings and drilling fluid from HDD works.

6.1.2 Arrangement of Domestic Wastewater in Portion B

Domestic wastewater (effluent) generated from site personnel will be stored in the underground holding tank. Effluent will be transported and disposed off to DSD facility properly through a licensed carrier.

6.1.3 Mitigation Measures to the Site Runoff in Portion A and B

In this document we have allowed for mitigation measures and they are listed as below:

a. The works area at Cheung Chau will be paved with a slight fall towards land to prevent site runoff from directly flowing to the sea;
b. 500mm high concrete bund surrounding the Dirty Area will provide about 100m^3 in volume storage for the site runoff and/or in the event of spillage/leakage of drilling fluid. This is adequate for spillage/leakage of drilling fluid from either the holding tank or the mud tank;
c. In order to control site runoff and drainage, and thereby prevent high sediment loadings from reaching nearby water bodies, site runoff and wastewater will not be discharged into nearby water bodies without proper treatment;
d. Turbid water from construction sites would be treated to minimize the solids content before being discharged. Surface runoff from construction sites would be discharged into water bodies via adequately silt removal facilities such as catchpit and WETSEP system. Channels or earth bunds or sand bag barriers would be provided on site to properly direct stormwater to such silt removal facilities. Sufficient numbers of pumps and tanks of adequate capacity would be provided onsite. Perimeter channels at site boundaries would be provided to intercept storm runoff from outside the site so that it will not wash across the site. Catchpits and perimeter channels would be constructed in advance of earthworks;
e. Adequate numbers of tank with sufficient capacity would be provided on-site to collect, store and treat drilling fluids, cuttings and/or chemicals. These tanks should be surrounded by bunds and regularly inspected and maintained to avoid leakage;
f. During directional drilling, excavated spoil (cuttings) will be carried as a slurry with the drilling fluid to emerge at Cheung Chau. The slurry would be treated to remove the cuttings and recycled as drilling fluid. Cuttings would be stored in containers prior to removal and disposal as construction & demolition material to public fill reception facilities;
g. If cuttings necessary to store onsite, the storage area would be covered and bunded to prevent silty runoff entering water bodies especially during the wet season (April – September);

h. Mitigation measures would be taken to prevent the washing away of construction materials, soil, silt or debris into the water bodies. Open stockpiles susceptible to erosion would be covered with tarpaulin or similar fabric and provided with containment such as bunds, sand bag barriers or equivalent measures, especially during the wet season (April – September) or when heavy rainstorm is predicted. Runoff to water courses would be intercepted by minimizing flat exposed areas of permeable soil, and forming pits or diversion channels into which runoff can flow to suitable treatment facilities before discharge.
i. Additional silt curtain will be installed as shown in the attached Appendix A;
j. 300mm perimeter open u-channel will be constructed surrounding the "Clean Area";
k. 500mm concrete bund will be provided surrounding the "Dirty Area";
l. 300mm high concrete bund should be provided at the entry pit in the "Dirty Area".

6.2 Mitigation Measure to be implemented in Portion D

6.2.1 Temporary Site Drainage System in Portion D

No HDD works will be carried out in Portion D. Minor civil works such as erection of a temporary steel platform and excavation of the proposed temporary exit pit will be carried out to facilitate the HDD works.

The site drainage system for the collection and treatment of the surface runoff will be relatively simple and consists of:

a. 300mm concrete bund surrounding the exit pit;
b. Silt curtain will be provided to contain cuttings and drilling fluid from HDD works;
c. Peripheral sand bag bund;
d. A sump-pit with 3"submersible pump;
e. A sedimentation tank with aggregate filter.

6.2.2 Mitigation Measures to the Management of Site Runoff in Portion D

In this document we have allowed for mitigation measures and they are listed as below:

a. The use of containment structure such as earth bund, sand bag barriers wrapped with geotextile fabric or similar material, diversion channels or other similar techniques would be installed surrounding the site boundary at Lantau during the wet season to intercept storm runoff from outside the site so that it will not wash across the site (or into the exit pit);
b. To minimize water quality impact, silt curtain will be installed in before the works commencement. The silt curtain would be regularly inspected and maintained by the Main-contractor to ensure its effectiveness.

7 Emergency Contingency Plan

This Plan is to contain and remove accidental spillage of drilling fluids, chemical and all hazardous materials on-site including fuels at short notice and to prevent or to minimize the quantities of contaminants from entering the nearby water bodies. The Plan includes the following:

- Potential emergency situations
- Chemicals or hazardous materials used on site
- Emergency response team
- Emergency action plans and procedures
- List of emergency telephone hotlines
- Location and types of emergency response equipment
- Training plan and emergency drill

7.1 Potential Emergency Situations

Typhoons, heavy rainstorms and chemical spillage are potential environmental emergencies identified for the Project sites. Typhoons and heavy rainstorms may cause solids, debris, and construction materials to be washed down and plug the storm drains.

7.2 Chemicals or Hazardous Materials used on Site

Lubricated oil, fuel

7.3 Emergency Response Team

The emergency response team members include:

- Construction Manager
- Site Agent
- Safety Officer
- Environmental Officer
- Safety Supervisor
- Environmental Supervisor
- Foremen
- Labour, Plant Operator

7.4 Emergency Action Plans and Procedures

Procedures in the event of typhoons and rainstorms are detailed in the Project Safety Plan. The following actions are taken when a rainstorm is imminent or forecast:

- Silt removal facilities, channels and manholes shall be checked to ensure that they can function properly;
- Open stockpiles of construction materials (e.g. aggregates, sand and fill materials) on site shall be covered with tarpaulin or similar fabric;
- All temporary covers to slopes and stockpiles shall be secured.

In the event of a chemical spillage, the following procedures shall be carried out:

- Instruct untrained personnel to keep at a safe distance well away from the spillage area;
- Oil leakage or spillage should be contained and cleaned up immediately. Waste oil should be collected and stored for recycling or disposal in accordance with Waste Disposal Ordinance;
- If the spillage / leakage is severe or is causing hazard to life, initiate emergency evacuation and call the emergency services;

- Only trained persons equipped with suitable protective clothing and equipment shall be allowed to enter and clean up the chemical spillage area;
- Where the spillage is contained in the enclosed storage area, the liquid can be transferred into suitable chemical waste containers by suitable handheld equipment, such as hand operated pumps, scoops and shovels. If the spillage quantity is small, it can be covered and mixed with suitable absorbing materials such as tissue paper, dry soft sand or vermiculite. The resultant slurry shall be treated as chemical waste and transferred to suitable containers for disposal;
- For spillage / leakage into nearby water bodies, immediate action is required to contain the spillage / leakage. Appropriate structural, physical barrier or secondary containment should be deployed to contain the spill and if possible to prevent contaminated water from dispersing away from the source. Suitable liquid absorbing materials such as absorbent tissue paper, pads or rolls should be used to recover the spilt substances. The resultant slurry should be treated as chemical waste and transferred to suitable containers for disposal;
- For spillage in other areas, immediate action is required to contain the spillage. Suitable liquid absorbing materials such as tissue paper, dry soft sand or vermiculite shall be used to cover the spill. The resultant slurry shall be treated as chemical waste and transferred into containers for proper disposal;
- In incidents where the spillage / leakage may result in significant contamination of an area or risk of pollution, the EPD and other relevant departments shall be informed immediately.

7.5 Procedures for Unforeseen Environmental Emergencies

The possibility exists for environmental emergencies of an unforeseen nature to occur during the course of the works. By definition, the nature of such emergencies cannot be known. Therefore, the Environmental Officer shall respond on a case-by-case basis to such emergencies and shall initiate event-specific measures in terms of notifications and reactions.

Environmental Officer shall prepare a report on the incident detailing

the accident, clean up actions taken, any pollution problems and suggested measures to prevent similar accidents from happening again in future.

7.6 List of Emergency Telephone Hotlines

Cheung Chau Hospital	2981 9441
Ambulance (Central Control)	2735 3355
Cheung Chau Fire Services Dept.	2981 9158
Cheung Chau Police Station	3661 1712
China Light Power	2678 2678
Town Gas	2880 6988
Water Supplies Department	2824 5000
Drainage Department	2877 0660
PCCW	2888 2888
Typhoon Enquiry	2835 1473
Weather Enquiry	1878200
FEHD(Islands District)	2852 3215
Electrical & Mechanical Services Dept.	1823
Environmental Protection Department	2516 1718

7.7 Location and Types of Emergency Response Equipment

The emergency response equipment is located at the site office for easy access purpose, and the types of equipment include:

Tools and Clothing

- Hardhats, gumboots, coats and leggings for each emergency response team member;
- 5 nos. picks, shovels, axes, hammers, wheelbarrows, handsaws and yard brushes;
- 1 no. chain saw;
- 1 no. 200mm diameter wire rope;
- 2 nos. 12mm diameter nylon ropes 30m long.

Materials

- 50 nos. empty sandbags, 10 nos. tissue paper
-

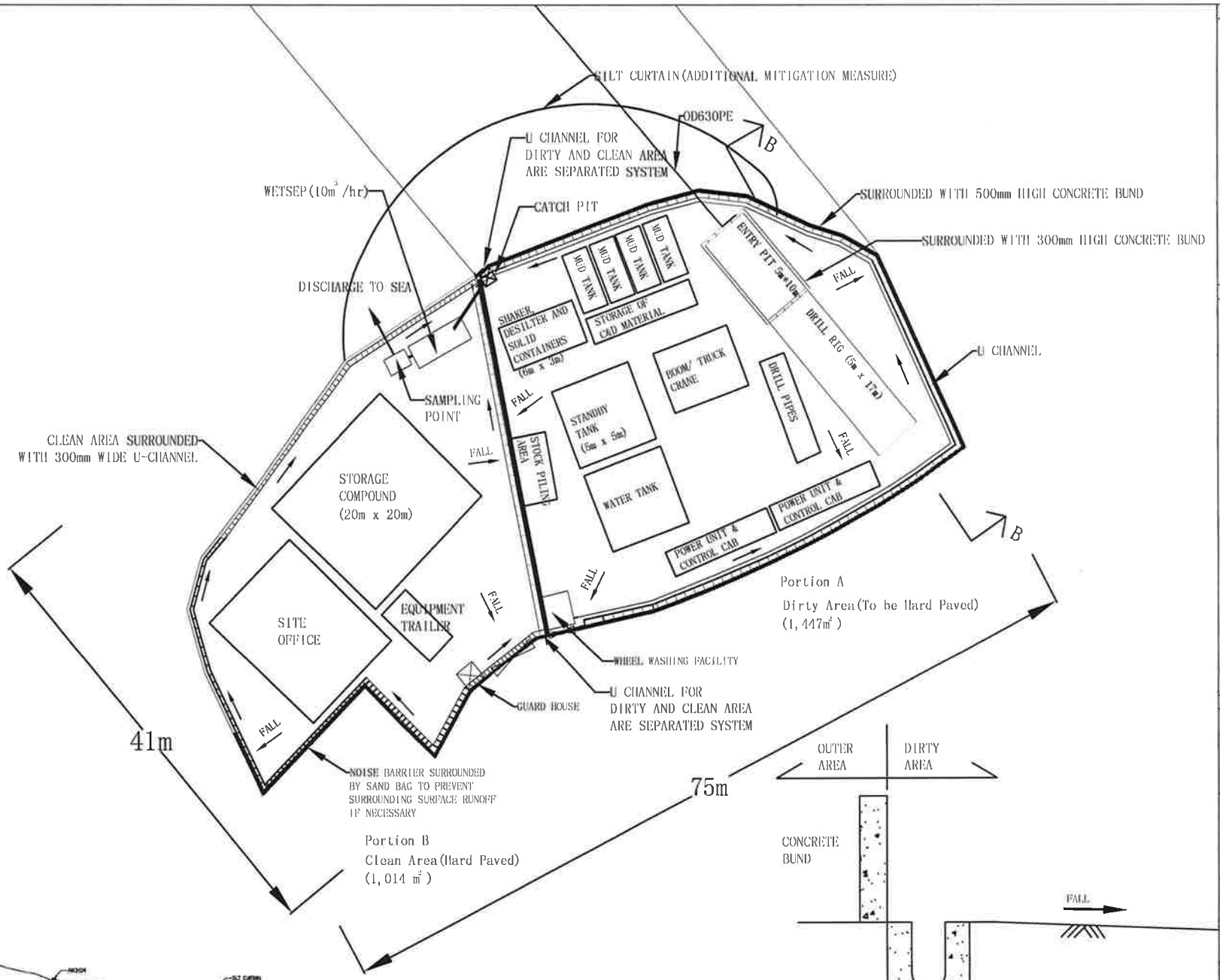
Plants

- 1 no. backhoe;
- 1 no. crane lorry;
- 2 nos. pumps.

7.8 Training Plan and Emergency Drill

Training plan and emergency drill are detailed in the Safety Plan and Environmental Management Plan.

Appendix A
Temporary Drainage Layout



Key Plan:

Key to symbols:

Rev	Date	Drawn	Description	Ch'k'd	Appr'd

Client

香港特別行政區政府水務署
WATER SUPPLIES DEPARTMENT
GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

Main Contractor

Project

CONTRACT NO. 1/WSD/13
IMPROVEMENT OF FRESH WATER SUPPLY TO CHEUNG CHAU

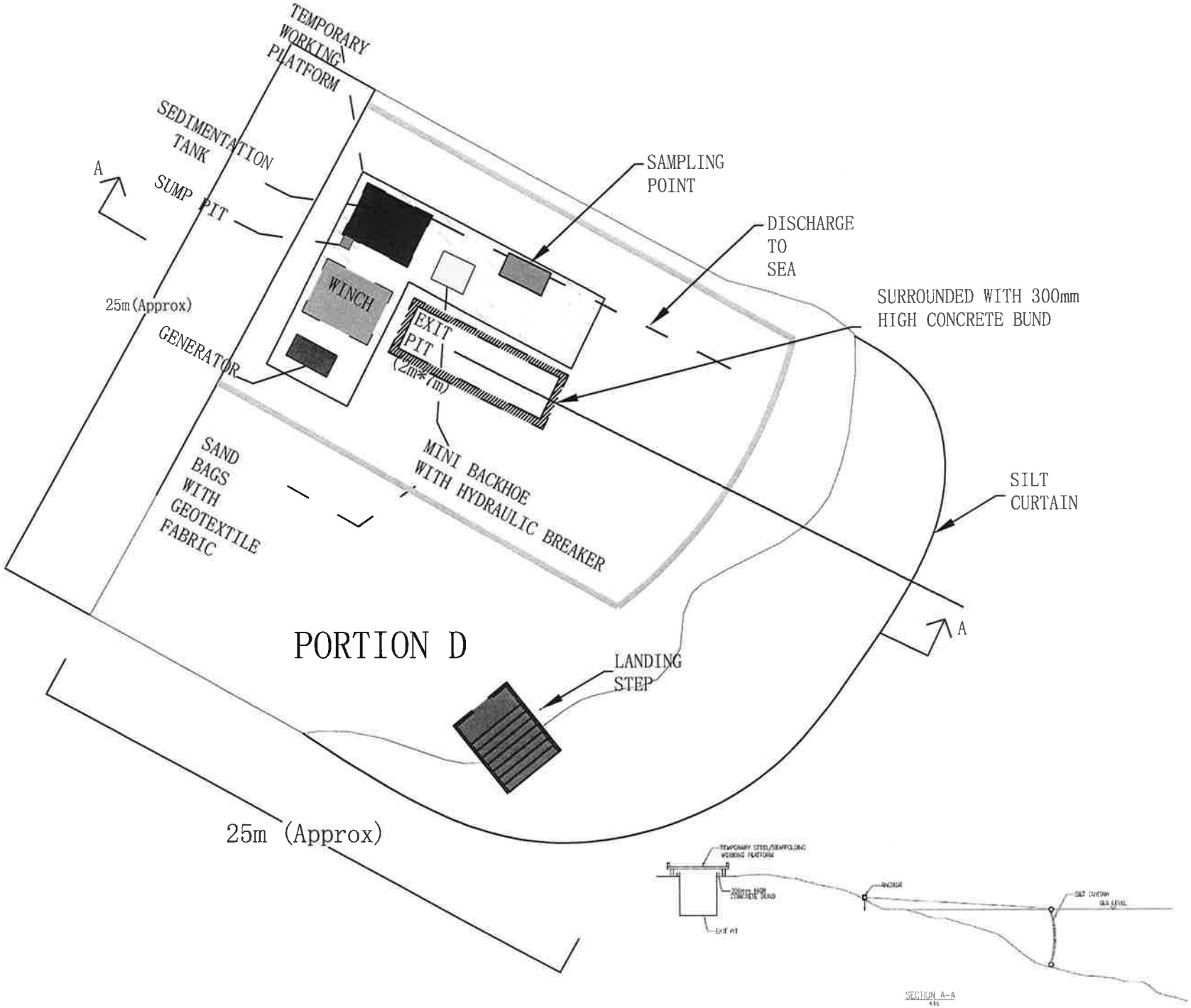
Title

Site Layout Plan at Cheung Chau Side

Designed			Eng check		
Drawn			Calculation		
Dwg check			Approved		

Sizes at A0: N.T.S | Status | Rev

Drawing Number: TDMP/1WSD13/01



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Main Contractor

Project

CONTRACT NO. 1/WSD/13
IMPROVEMENT OF FRESH WATER SUPPLY TO CHEUNG CHAU

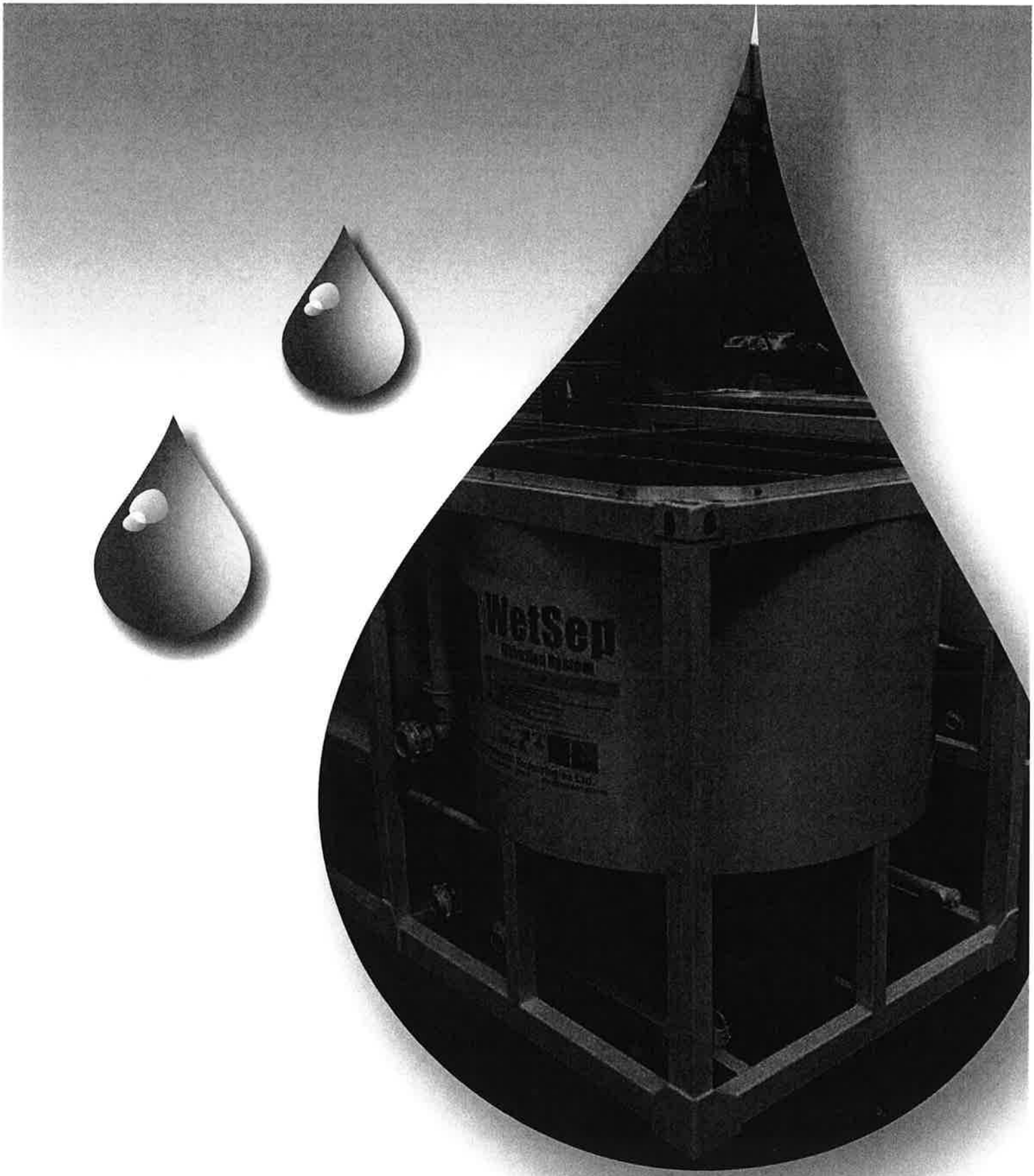
Title

Site Layout Plan at Chi Ma Wan Side

Designed			Eng check		
Drawn			Coordination		
Dwg check			Approved		
Scale at A3 N.T.S		Status		Rev	

Drawing Number TDMP/1WSD13/02

Appendix B
Catalogue of WetSep



WetSep

Water & Wastewater Filtration System

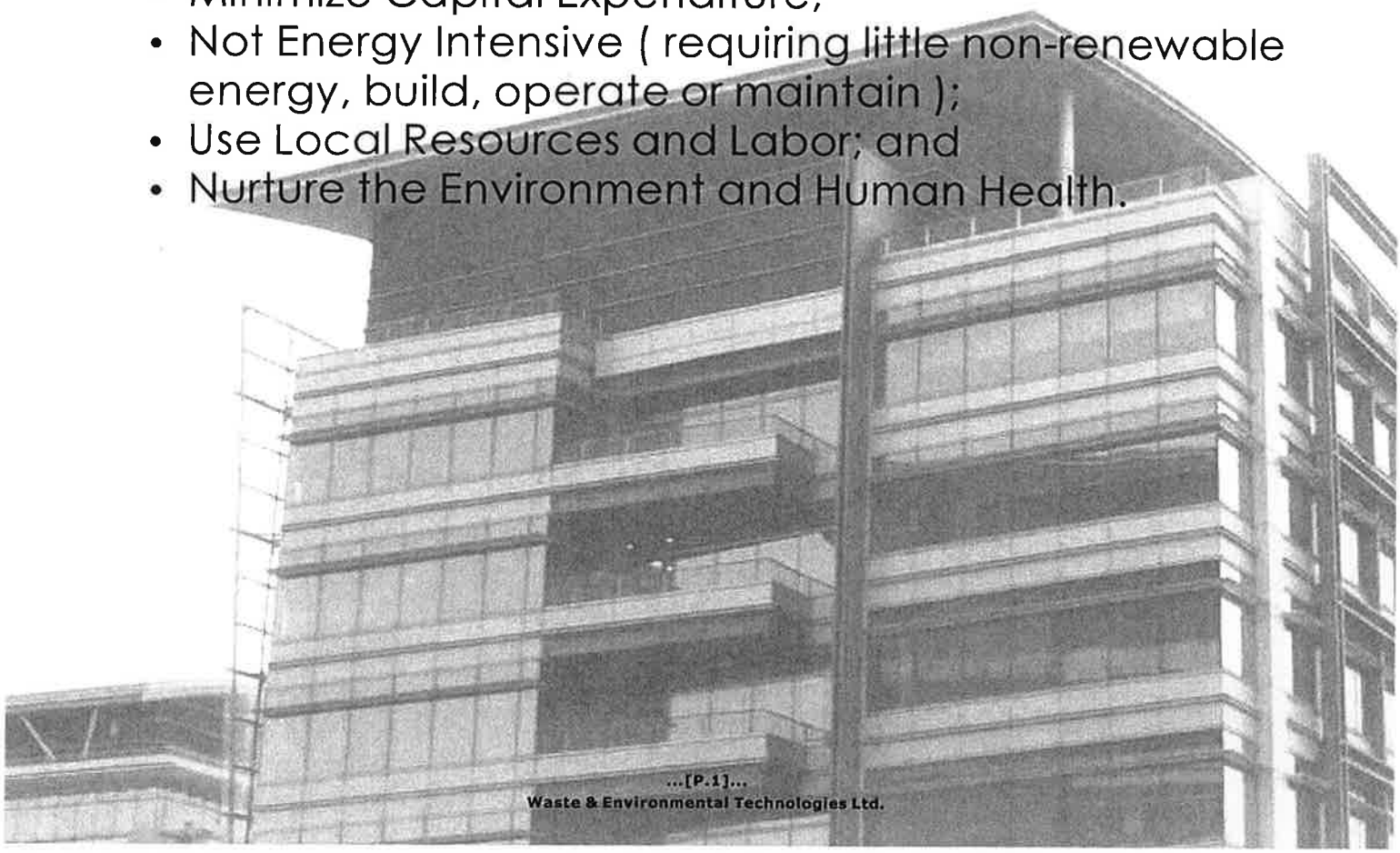
Waste & Environmental Technologies (WET) is a green technology entrepreneur with innovation as its guiding principle.

Since 1998, WET has innovated new technologies in the field of Low Impact Construction and Sustainable Development. We are one of the few companies that have international experience in construction runoff treatment. We have completed projects on 5 continents.

Our Vision is to explore, pioneer and innovate in environmental technologies that people can benefit for a better quality of life and a sustainable future.

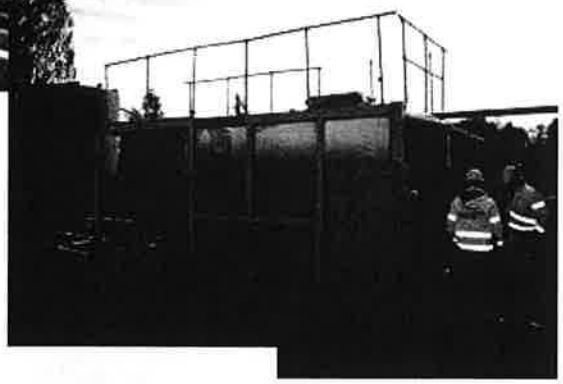
To achieve **our Mission**, we focus on the

- Simple to Apply / Use;
- Minimize Capital Expenditure;
- Not Energy Intensive (requiring little non-renewable energy, build, operate or maintain);
- Use Local Resources and Labor; and
- Nurture the Environment and Human Health.

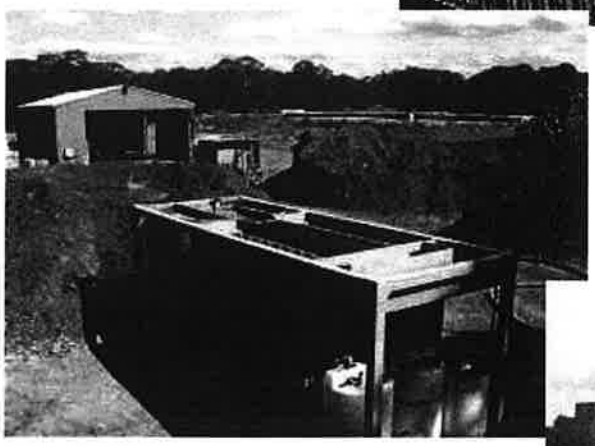


Global Experience

Singapore



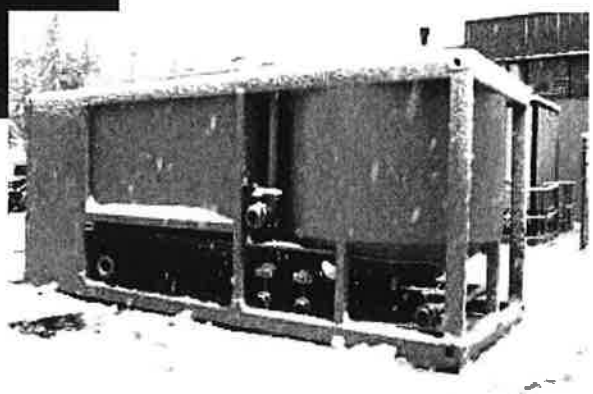
Sweden



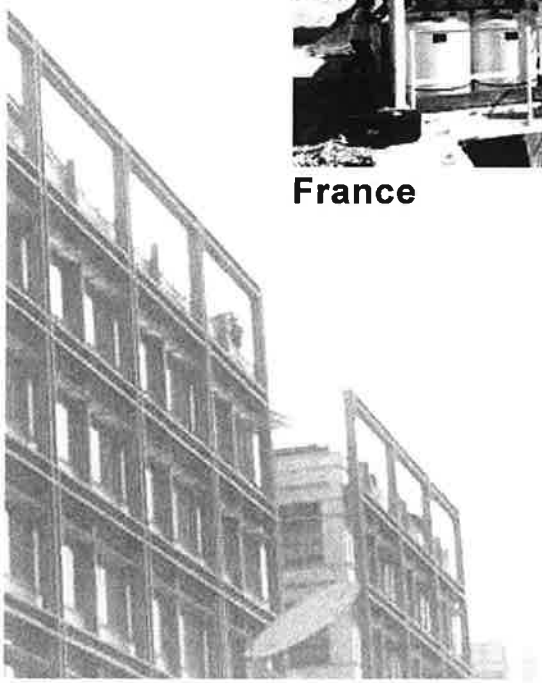
Australia

Hong Kong

France

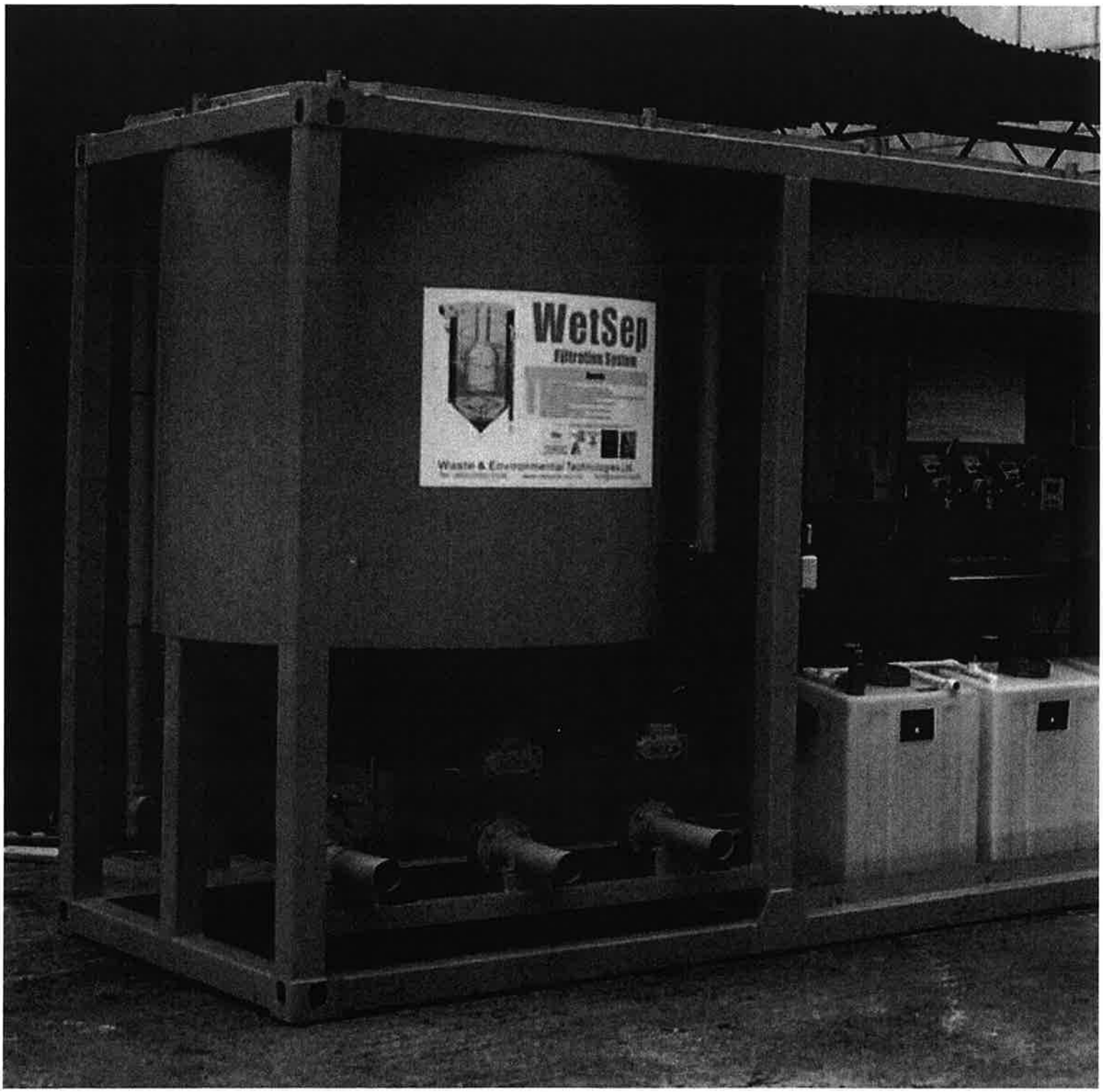


USA



WetSep

Water & Wastewater Filtration System



Mobile

Modular

Multi-functional

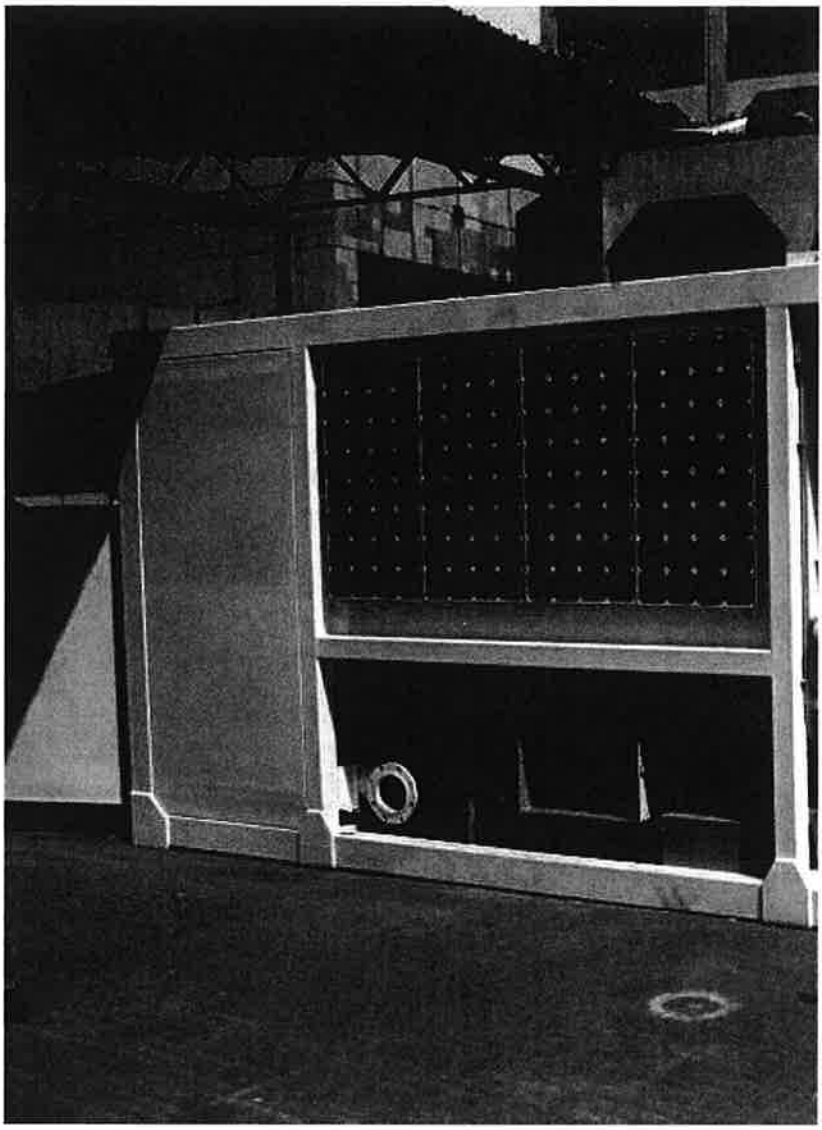
Introduction

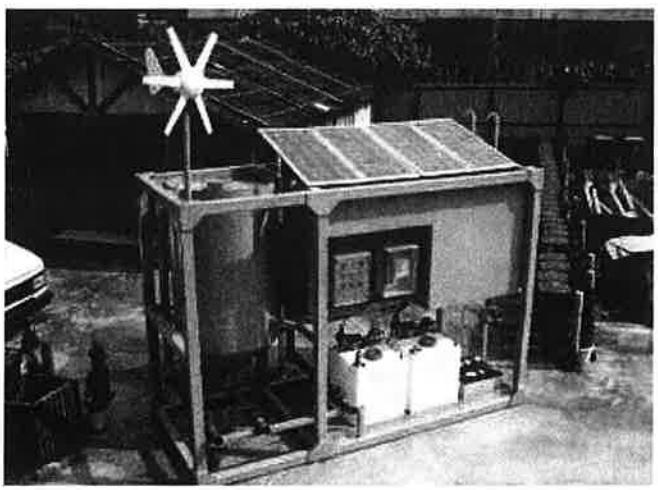
The WetSep System is a patented product providing a turn-key solution for wastewater treatment. The WetSep is a versatile system and can be applied in various types of industries and applications.

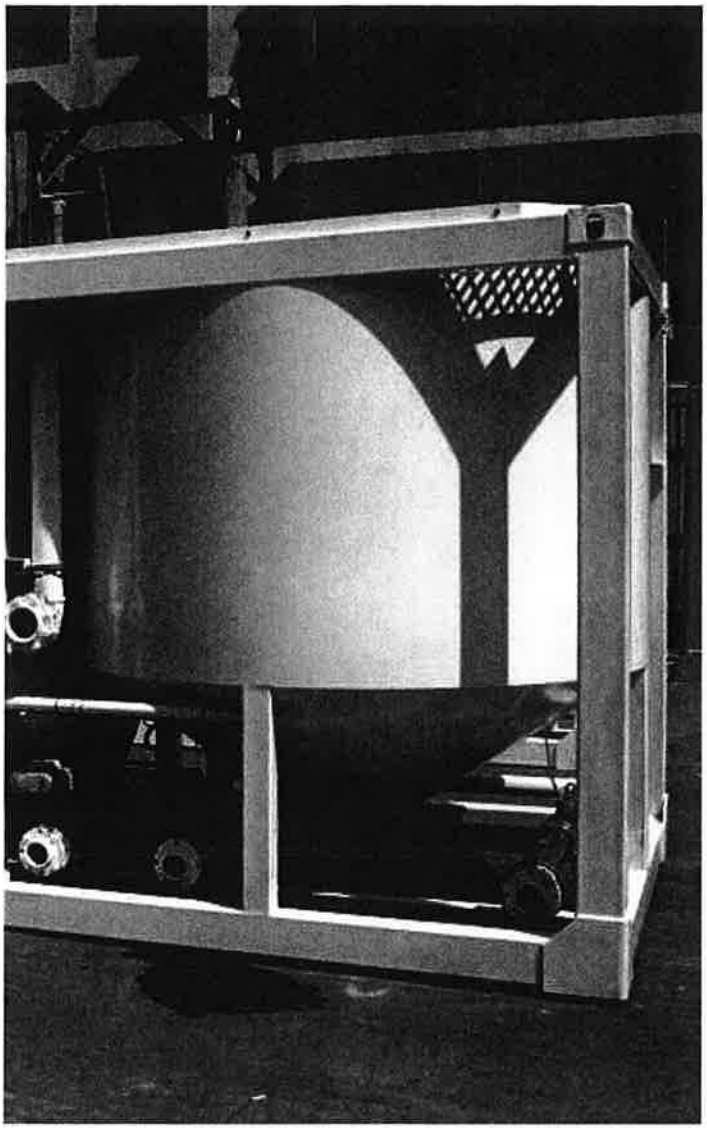
WetSep has established itself as good maintenance system and has satisfied the requirements of many clients around the world.

Surface runoff such as grit, suspended particle and sewage from temporary sanitary facilities will produce wastewater. The wastewater usually contains high concentration of suspended solid, BOD, ammonia and E.coli.

In 1998 Waste & Environmental Technologies Ltd. innovated WetSep system, and we have delivered WetSep to 16 different countries including USA, Canada, Singapore and Taiwan.





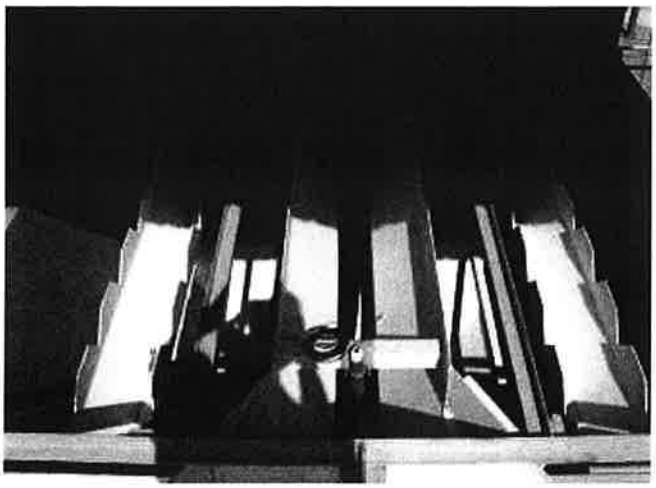


• Features / Benefits

- Process guarantee ensures specified effluent requirements are met
- Environmental-friendly, compact design for small footprint requirement
- Standard shipping containing sized, factory assembled and tested to ensure trouble-free installation
- No power driven mechanical parts, all done by gravity
- Simple operation that requires minimal training
- Low capital, operation and maintenance cost
- PLC control for low operating costs and safety interlocks
- ISR tank with Conical Filters for mixing and settling
- Lamella Plate Settlers for enhanced settlings
- Epoxy coated steel body frame for superior corrosion resistance

• Performance

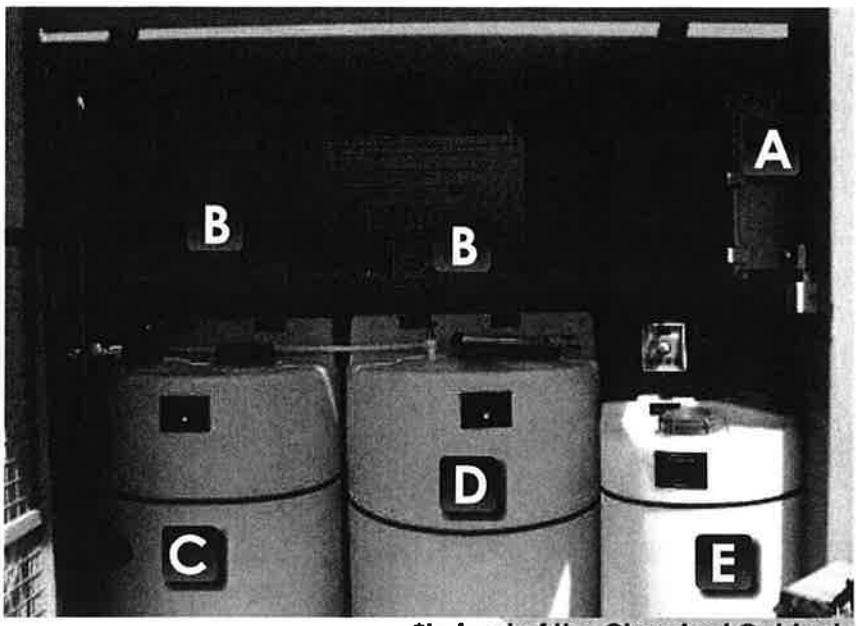
- 70–75% BOD and COD removal
- 99.5 % suspended solids removal with effluent SS level < 30 mg /L conditions



• Typical Applications

- Tunneling
- Bore Piling
- Food Industry
- Sewage Treatment
- Textile Industry
- Construction Runoff

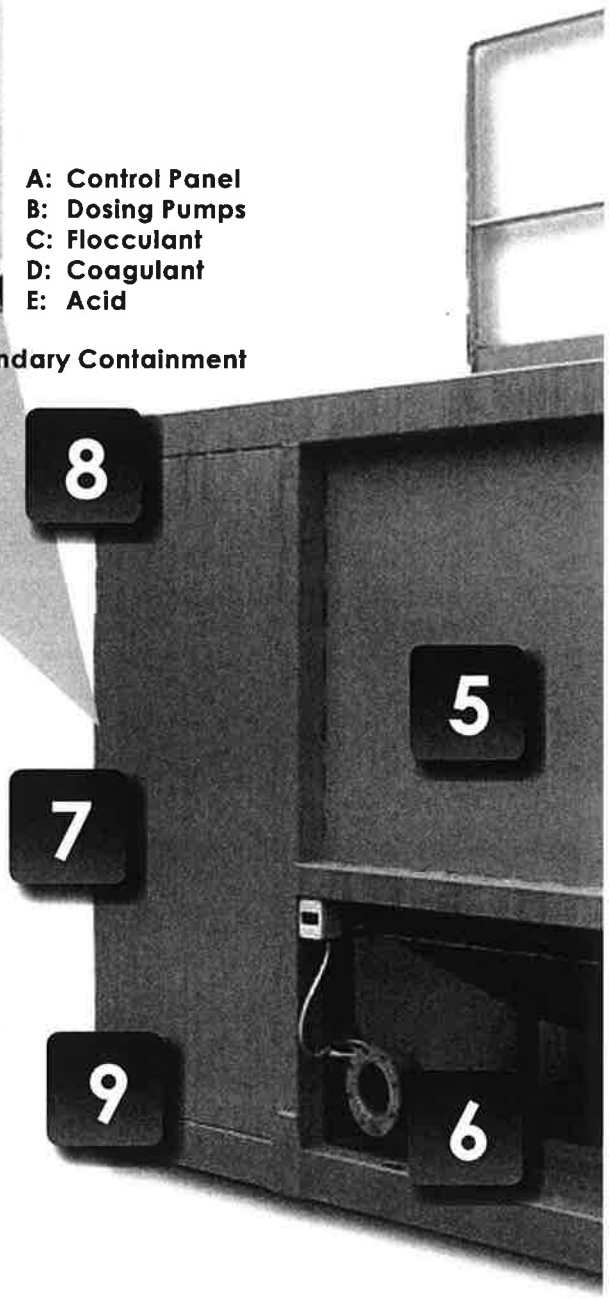
WetSep



Level Sensor

A: Control Panel
B: Dosing Pumps
C: Flocculant
D: Coagulant
E: Acid

***In front of the Chemical Cabinet**
Chemical Preparation c/w Secondary Containment



1. Inlet Connection

pH and flow meter instrument locate in the inlet piping

2. Impinging Stream Reactor (ISR)

The ISR combines the process of coagulation, flocculation and sedimentation in one system, by using conical filters inside

3. Oil Drain

Allow scum, oil and floatables to be accumulated at the top and pushing out to the oil drain gravity. An optional oil cartridge system can be installed to capture the oil grease

4. Sludge Disposal

Accessible from top to discharge for cleaning

5. Universal Processing Chamer (UPC)

The UPC is designed to be modular unit that allows different treatment systems to be installed to treat various wastewaters, such as lamella blocks, zeolite, silica sand and activated carbon

6. Outlet

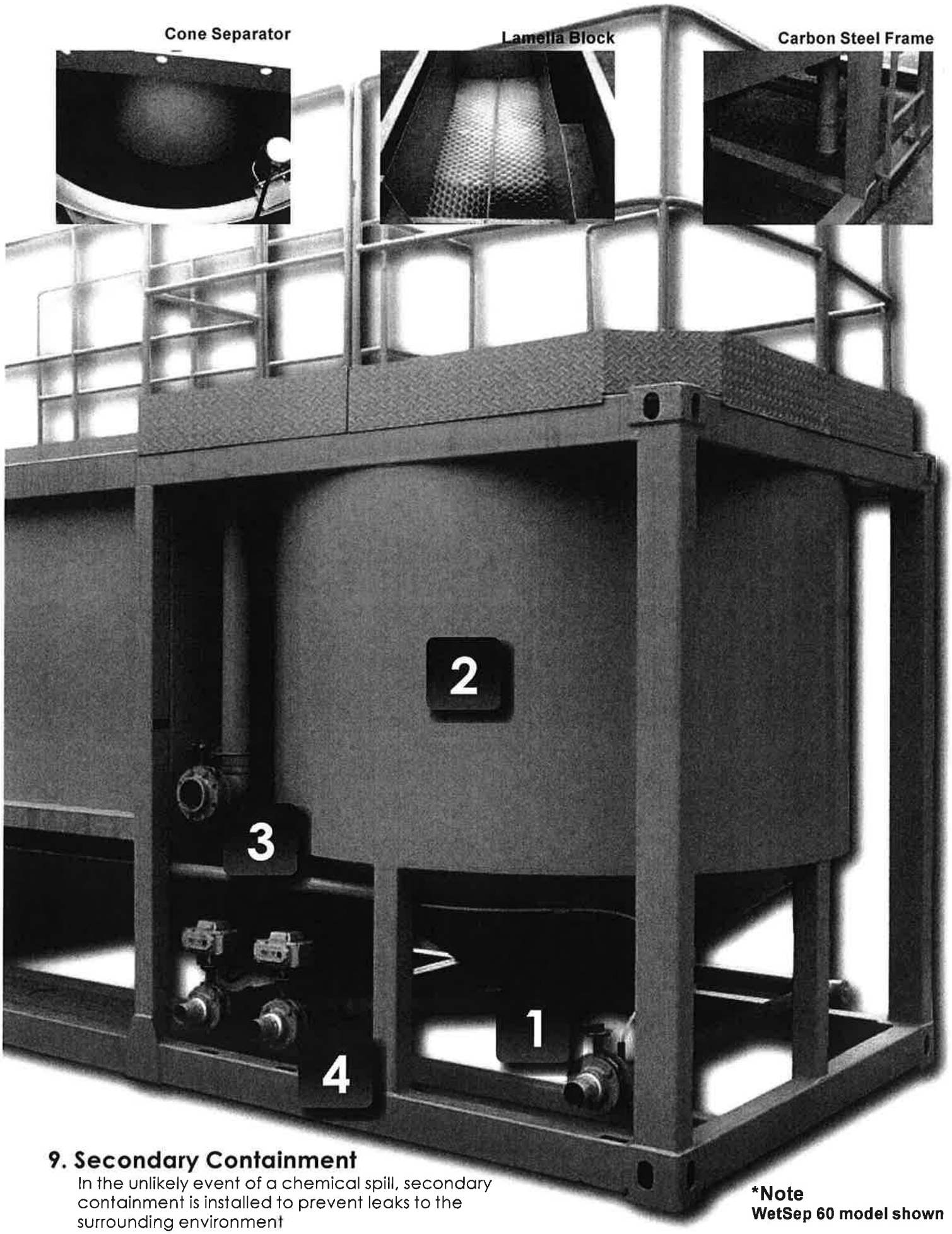
For effluent piping connection

7. Control System

Varies system (PLC, Relay, SMS & GMS) are available to provide an easy control and monitoring.

8. Chemical Preparation Unit

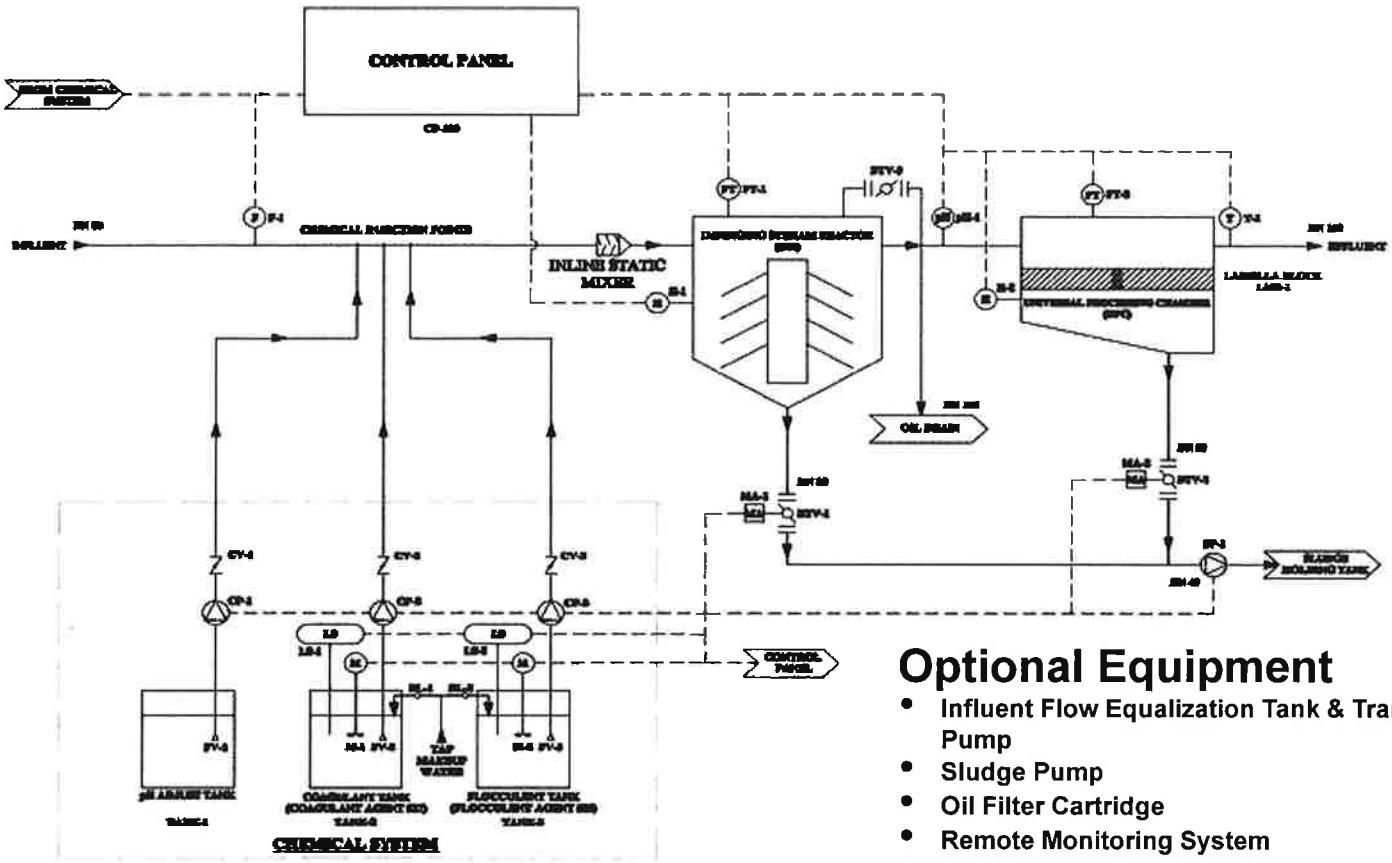
A complete package for chemical preparation, such as coagulant, flocculent and pH control. Automatic controls are present to maintain the proper chemical dosing rate



9. Secondary Containment

In the unlikely event of a chemical spill, secondary containment is installed to prevent leaks to the surrounding environment

***Note**
WetSep 60 model shown



*Typical arrangement subject to change

Optional Equipment

- **Influent Flow Equalization Tank & Transfer Pump**
- **Sludge Pump**
- **Oil Filter Cartridge**
- **Remote Monitoring System**
- **Stainless steel for Body Frame: enhanced corrosion protection**
- **Renewable Energy Source: Solar, Wind**

Process Description

Chemical enhanced Precipitation Treatment (CEPT) is recommended by World Bank as the most effective and energy efficient methods of water and waste water treatment because of the high treatment efficiency

The WetSep system uses the concept of CEPT. The first part of treatment is the Impinging Stream Reactor (ISR) . The ISR does not require any driven motors and thus reduces the requirement for energy and simplifies the entire system. It combines the process of coagulation, flocculation and sedimentation in one system. By precise engineering of the flow path, flow rate, pressure differential and empirical data, the treatment can be completed in one single vessel.

Using Computational Fluid Dynamics (CFD) modeling, the performance of the WetSep system has been optimized to meet the needs a wide range influent water quality.

The influent water first passes into the ISR for the first stage of treatment. The ISR removes between 80-85% of the suspended solids (SS), oil and grease from the influent water.

The secondary stage component of the WetSep system is the Universal Processing Chamber (UPC). It is designed to be modular to allow for flexibility to treat various wastewaters.

The UPC is designed to be modular unit that allows different treatment systems to be installed such as: lamella plates, coalescing plates, membrane or rapid sand filtration. The choice of module depends on the requirements of the treatment which various from project to project.

Effluent from the ISR and UPC treatment processes removes more than 99.5% suspend solid.

Glossary

Biochemical Oxygen Demand (B.O.D.)

Biochemical Oxygen Demand is the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material present. It is measured in a given water sample at certain temperature over a specific time period. The BOD value is most commonly expressed in milligrams of oxygen consumed per liter (mg/L) of sample during 5 days of incubation at 20 °C and is often used as a robust surrogate of the degree of organic

Chemical Enhanced Primary Treatment (CEPT)

CEPT is recommended by World Bank as the most effective and energy efficient methods of water and wastewater treatment. Chemical reagents such as flocculent and coagulant are applied to allow the suspended solids to settle faster thereby

Chemical Oxygen Demand (C.O.D.)

The chemical oxygen demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water (e.g. lakes and rivers) or wastewater, making COD a useful measure of water quality. It is expressed in milligrams per liter (mg/L), which indicates the mass of oxygen consumed per liter of solution.

Coagulation

Wastewater contains small particles that suspend in water forming a colloid. They carry same charges and oppose each other, this preventing the formation of larger particles. coagulant is added to neutralize the charge in order to allow the particle easier to flocculate which results faster sedimentation performance

Flocculation

Particles settle down faster if they are heavier. By dosing the flocculant to the water the particles from flocs that increases the particle size. This lead to a faster sedimentation by gravity.

Oil and Grease

Oil and grease (O&G) is a measure of a variety of substances including fuels, motor oil, lubricating oil, hydraulic oil, cooking oil, and animal-derived fats. The concentration of these substances is typically measured within a body of water. Lakes, river, stormwater runoff, and wastewater are all monitored for oil and grease. Sources of oil and grease are mainly anthropogenic. Oil and greases need to contained and/or recycled typically to keep them from entering the environment.

pH

pH is a measure of the acidity or basicity of an aqueous solution. Pure water is said to be neutral, with a pH close to 7.0 at 25 °C (77 °F). Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are basic or

Suspended Solids (S.S.)

Suspended solids refers to small solid particles which remain in suspension in water as a colloid or due to the motion of the water. It is used as an indicator of water quality.

Total Petroleum Hydrocarbon (T.P.H.)

Total petroleum hydrocarbon (TPH) is a term used for any mixture of hydrocarbons that are found in crude oil. There are several hundred of these compounds, but not all occur in any one sample. Because there are so many different chemicals in crude oil and in other petroleum products, it is not practical to measure each one separately. However, it is useful to measure the total amount

Turbidity

Turbidity is the cloudiness or haziness of a fluid caused by individual particles (suspended solids) that are generally invisible to the naked eye, similar to smoke in air. The measurement of

Technical Information

WetSep 10

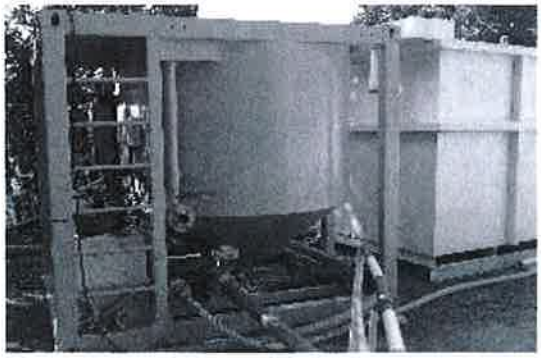
Overall dimensions (L x W x H):
2.3 m x 1.6 m x 2.5 m

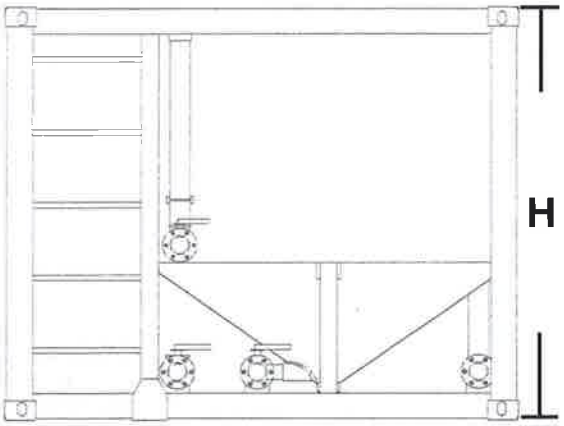
Net Weight: Approx. 1,300 kg
Capacity: 10 m^3/hour

Inlet: DN 80 (3")
Outlet: DN 80 (3")

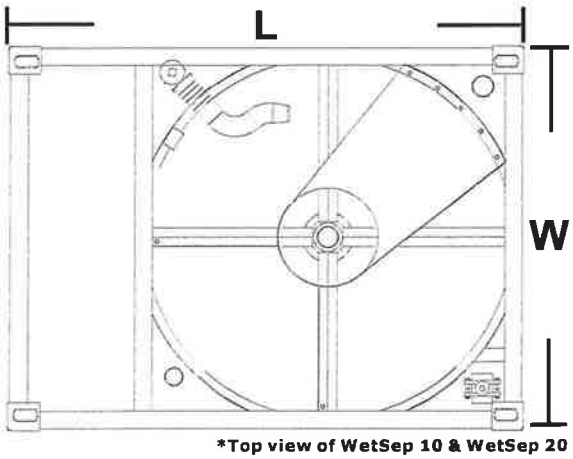
Sludge Outlet: DN 80 (3")

***Carbon Steel Frame with Epoxy Coating**





*Side view of WetSep 10 & WetSep 20



*Top view of WetSep 10 & WetSep 20

WetSep 20

Overall dimensions (L x W x H):
2.9 m x 2.2 m x 2.5 m

Net Weight: Approx. 1,850 kg
Capacity: 20 m^3/hour

Inlet: DN 80 (3")
Outlet: DN 100 (4")

Sludge Outlet: DN 80 (3")

***Carbon Steel Frame with Epoxy Coating**

Appendix C
Assessment of Surface Runoff

Assessment of Surface Runoff

Based on Hong Kong Observatory record (past 10 years), we adopt the maximum monthly rainfall of 1,346mm in June 2008 for our design.

Monthly rainfall 1,346mm
Average daily rainfall = 1,346/30 = 44.9mm/day
Average hourly rainfall = 44.9/24 = 1.87mm/hr
Allow a factor of safety = 2
The designed hourly rainfall = **3.74mm**

Assessment of catchment area
Portion A 1,447m2
Portion B 1,014m2

Giving a total of **2,461m2**

Designed surface runoff flow = 9.20m3/hr

Deploy WETSEP with flow rate of 10m3/hr