

Dong Hoi City, Quang Binh Providence

Central Vietnam



Ho Chi Minh Trail



Administrative Divisions



Population ~200,000, Area 60 square miles

100,000 live in the urban center



Well-developed Urban infrastructure such as airport, railways and sea port



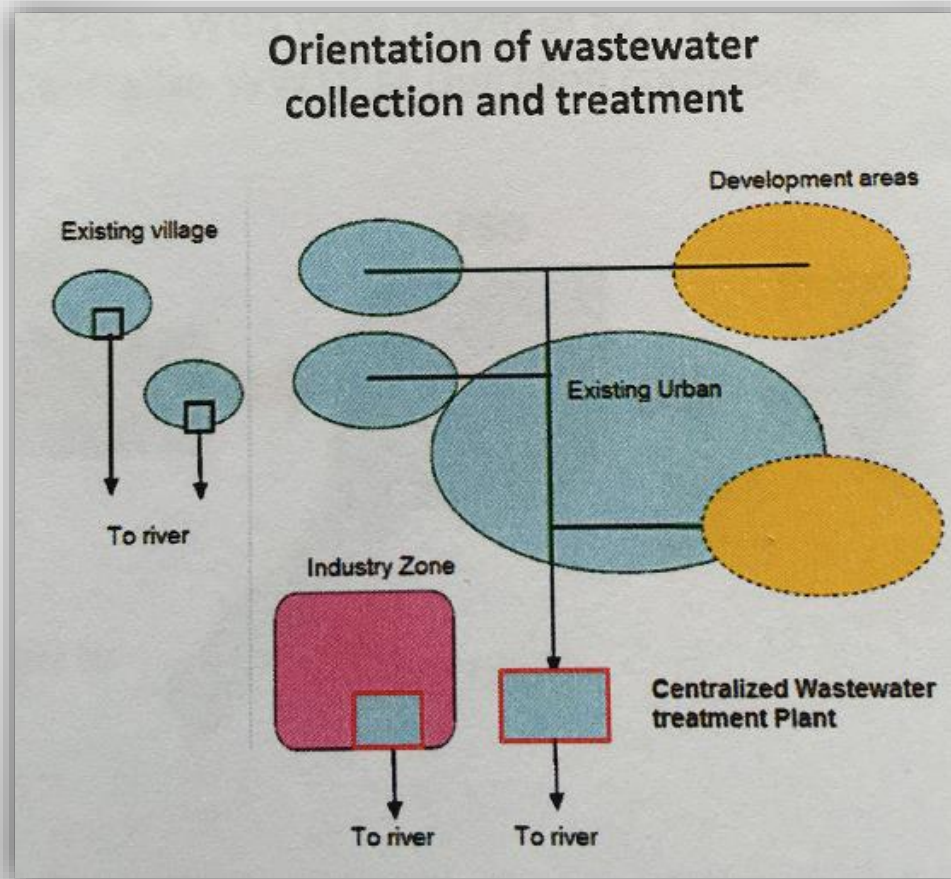
Master Planning of Dong Hoi Established with help from Nikken Sekkei (Japan)

approved in 2012

Nikken Sekkei was the primary architectural firm for the [Tokyo Skytree](#), the tallest self supporting tower in the world @2080' tall.

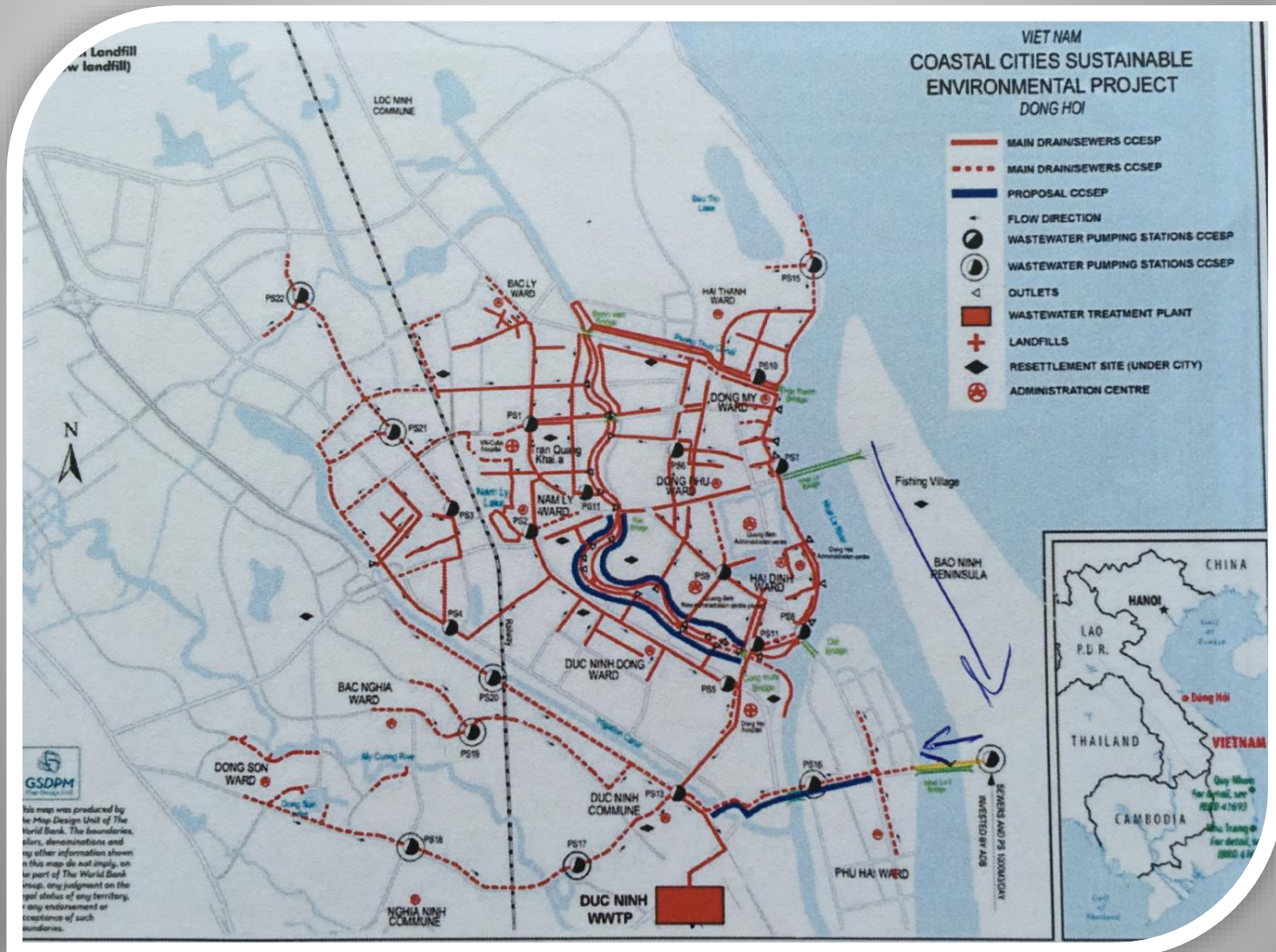


For sanitation Dong Hoi chooses to build one central treatment plant (6.6 MGD) to serve the urban area and up to 7 smaller plants (0.5-1.5 MGD) to serve the rural areas.



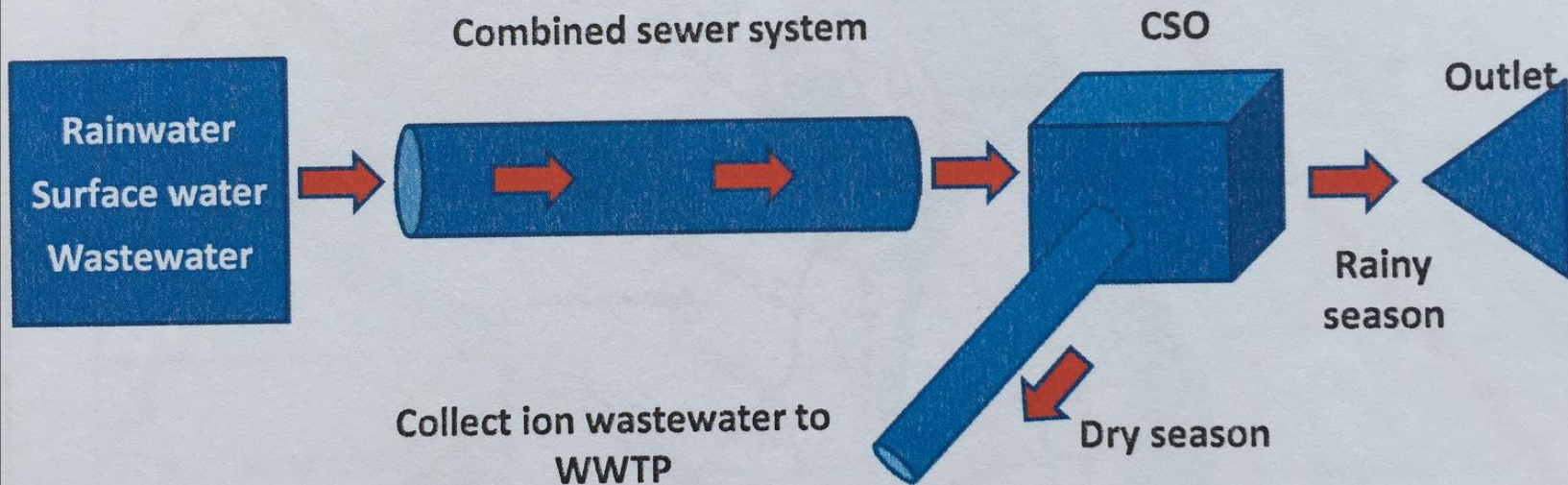
Full Time Employees (23)

Drainage & Wastewater Collection – 102 miles, 6,892 manholes, combined and separated systems



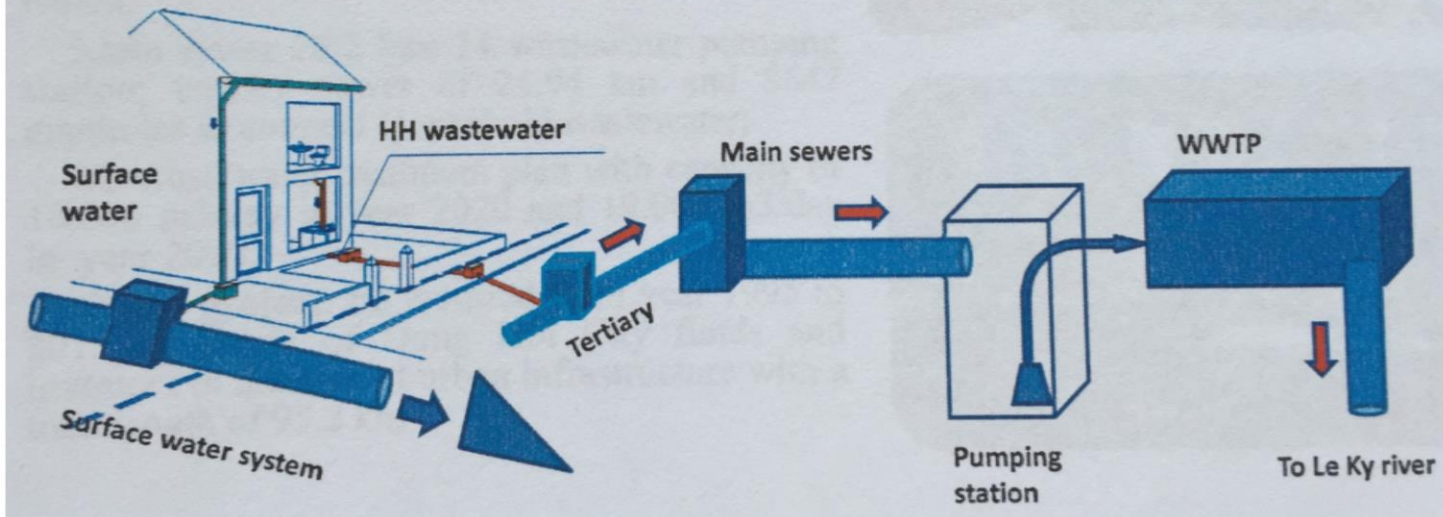
Combined System – Old Central Area, 39 miles

1. **Combined system:** Was built at the old central areas of Dong Hoi city, as wards: Dong My, Hai Dinh, Dong Phu... With total length of 62,6 km. Used CSO to transfer wastewater to Centralize WWTP at Duc Ninh commune.

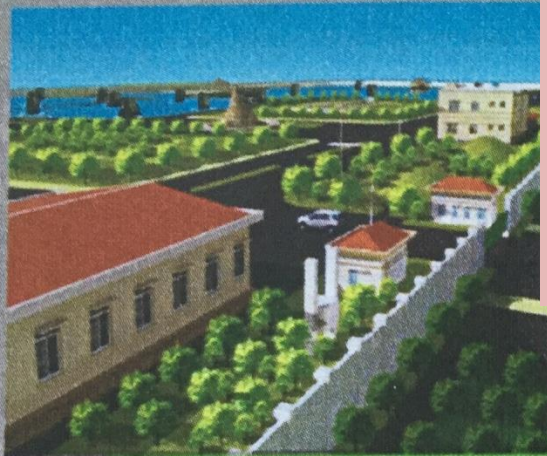


Separated Wastewater System – 40 miles

- a. **Wastewater system** is length of 64 km. Households wastewater collected through tertiary system, flow to main sewers, pumping station to move wastewater to WWTP to treat ensuring environmental sanitation .
- b. **Surface water system** is length of 36.8 km, to collect surface water at roads and discharge to rivers, lakes through outlets.

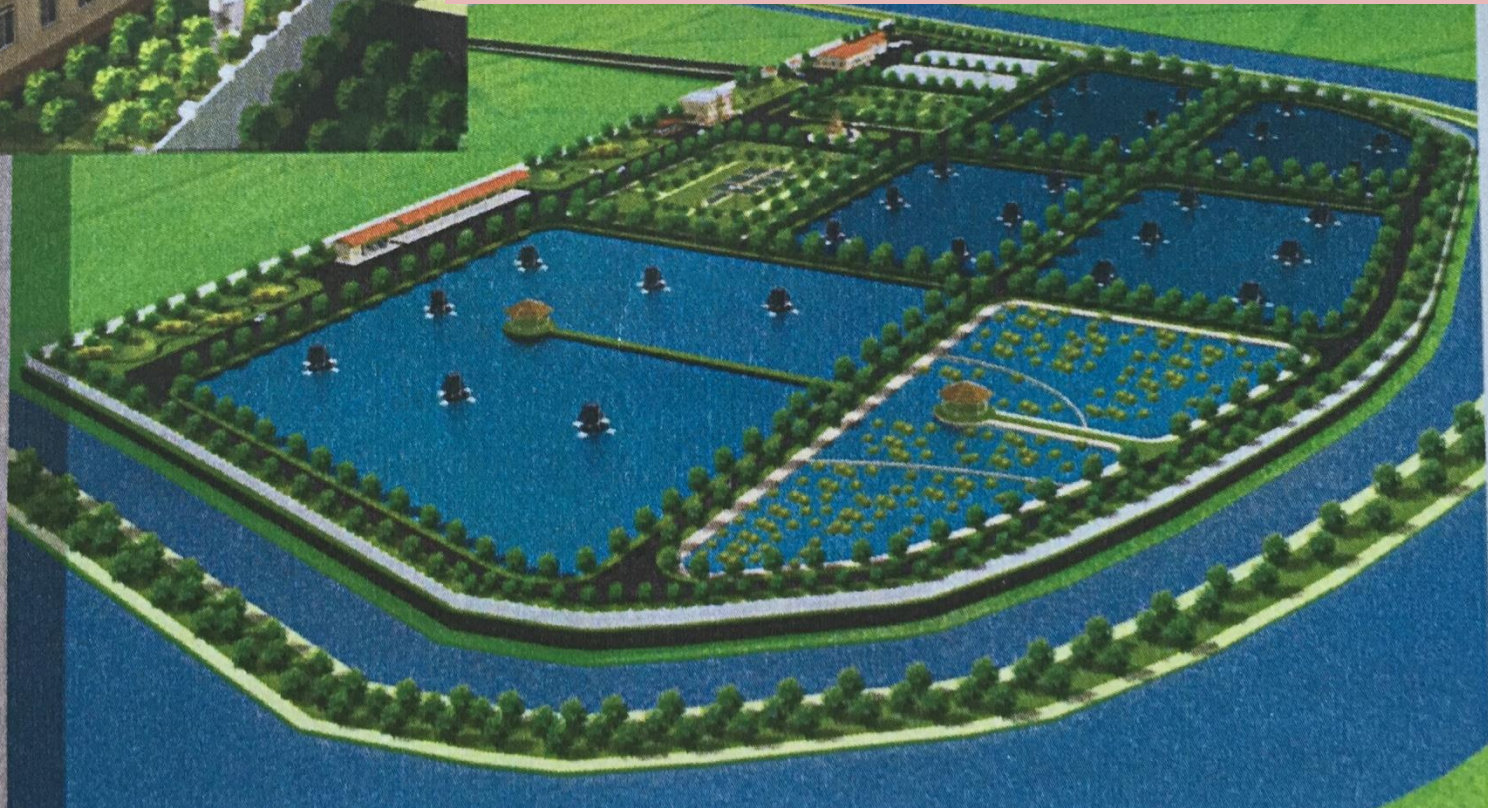


Separated Surface Water System – 23 miles



Treatment type Biological Lagoons:

1. Less chemical
2. Simple operation
3. Low O&M cost
4. Influent BOD 70-168 mg/l Effluent 27-30 mg/l



Commercial, Industrial and Medical wastewater not connected to system



Project Funded by World Bank USD 78.5 million

Combined System –

- 10 miles pipe,
- 12 CSO to separate wastewater

Separate System –

- sewer main 32.5 miles,
- tertiary 16 miles,
- 8,647 manholes to connect household wastewater,
- wastewater treatment plant (2.6 MGD 2020 buildout to 5 MGD 2030)

Results of Invested projects:

- Reduced Flooding of Central Area
- Enhanced WW and SW Collection
- Enables Economic Development

Tariffs used to fund operation of the system

- Solid Waste \$0.89/family/month
- Wastewater \$0.12/m³ (1000L or 264 gallons)

\$100 USD = 2,220,000 VND



=\$22.50 USD



=\$9.00 USD



=\$0.02 USD



=\$0.45 USD

PICTURE BEFORE AND AFTER CONSTRUCTION

NAM LY LAKE



PHONG THUY CANAL





CAU RAO RIVER



SCHOOL TOILET

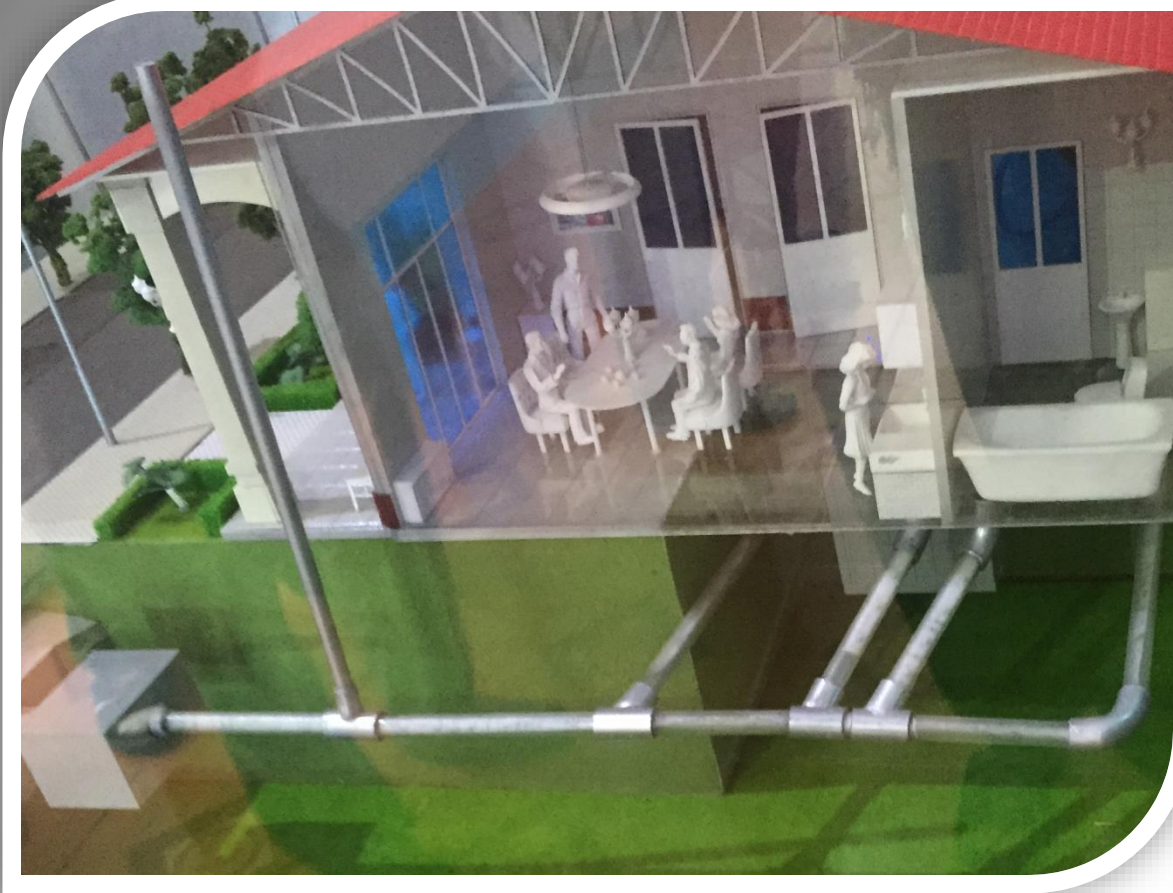


Collection system





Collection System Off-Site Crew



Home Owners

Gray Water Inflow Direct Connection

Black Water → Septic Tank → Sewer



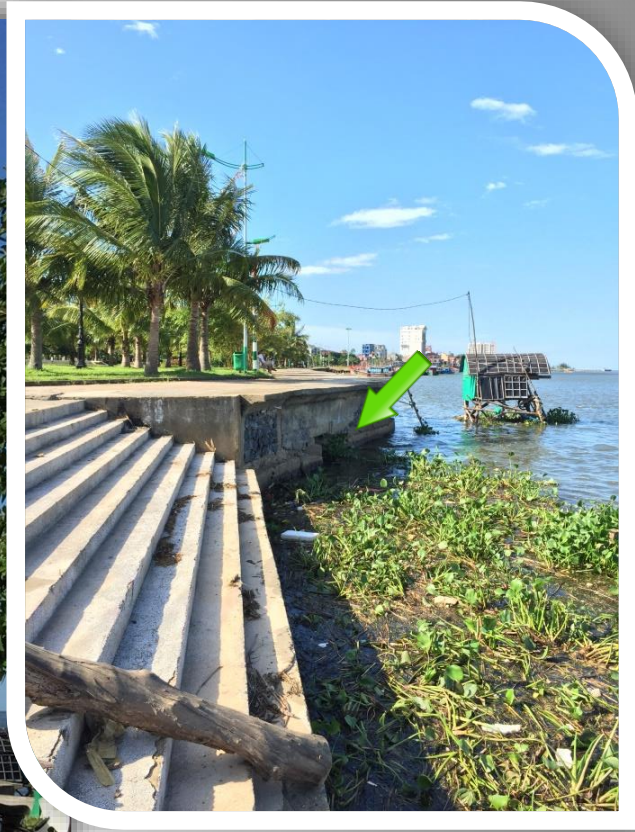


Solid Waste Landfill/Lagoon



**New future use
Infrastructure:**

**Fifteen lined Hazardous
Waste Storage Vaults
~10'x20'**



CSO Structure, CSO Outfall (12)



CSO Structure with Bar Screen (12)



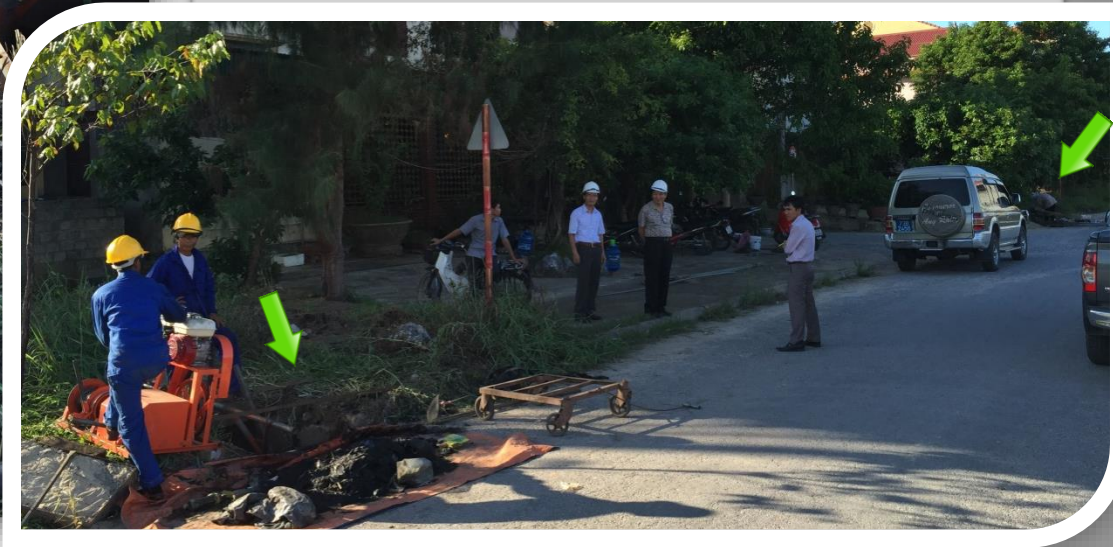
CSO Flap Gate and/or Manual Gate (12)



Pump station influent strainer baskets (12)



Pump Stations (13), each with 3 pumps (2 duty 1 standby)



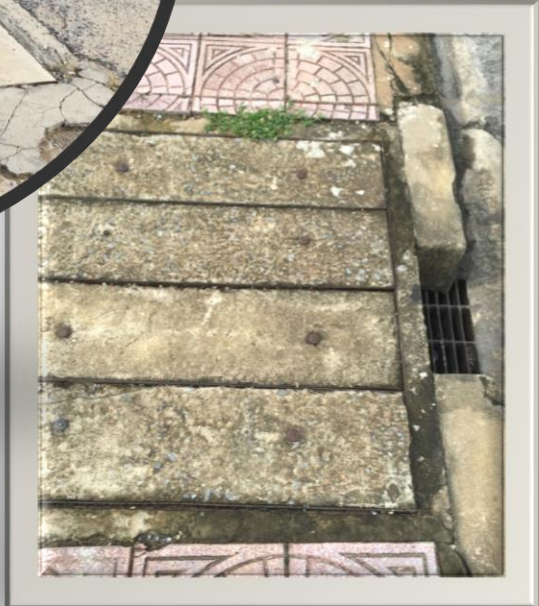
**Old pipe cleaned however in unknown condition (no CCTV)
Four Pipe Cleaning Machines, Six Workers/Crew (contract labor)**



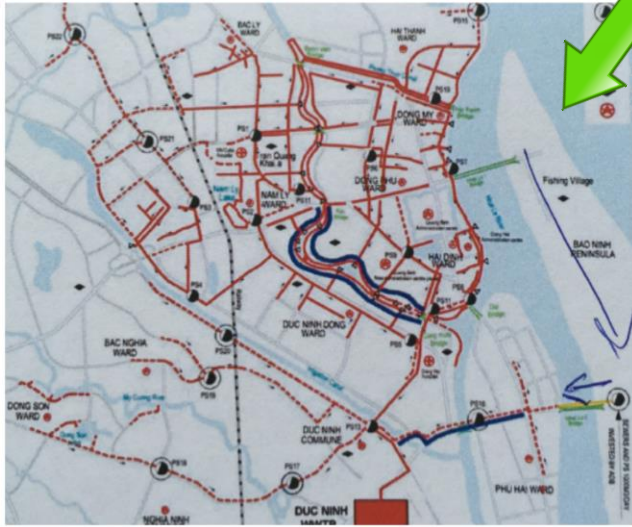
New pipe was added to route flow to the treatment plant.



BỘ Y TẾ
TRƯỜNG TRUNG CẤP Y DƯỢC HỒ CHÍ MINH



Combined Area Access



Current and Future development



Current and Future development

**THE WASTEWATER TREATMENT PROJECT
CELEBRATES THE ELEVENTH VIETNAM LABOUR UNION CONGRESS**

**COASTAL CITIES ENVIRONMENTAL SANITATION PROJECT
DONG HOI CITY SUB-PROJECT**

DUC NINH WASTEWATER TREATMENT PLANT

DONOR : THE WORLD BANK
TASK TEAM LEADER Mr. LE DUY HUNG

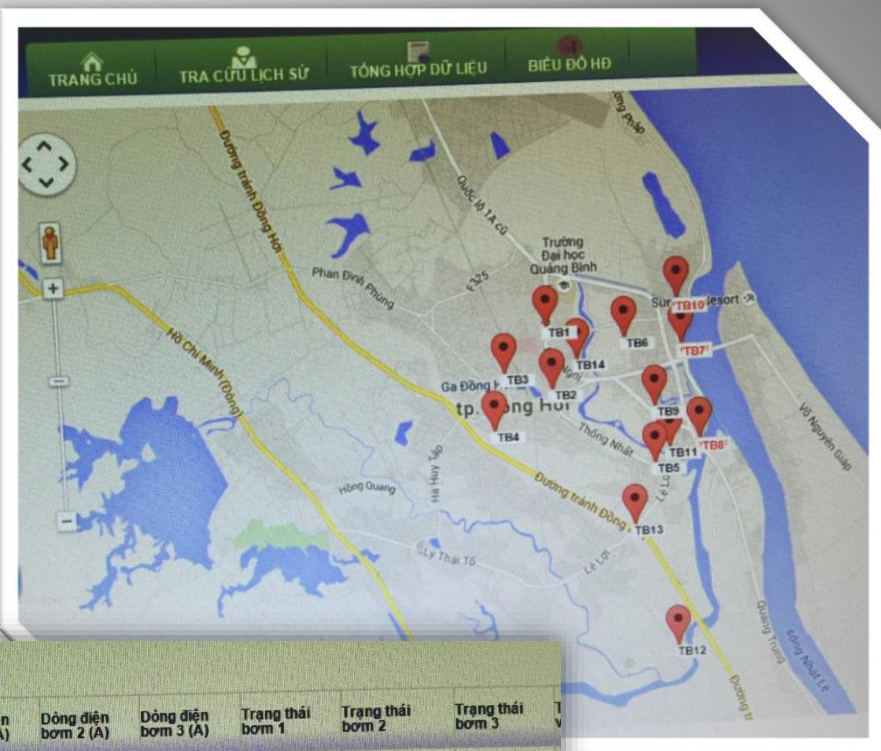
CLIENT : QUANG BINH ENVIRONMENT & URBAN DEVELOPMENT ONE MEMBER LIMITED COMPANY
DIRECTOR Mr. NGUYEN VAN THUAN

CONTRACTOR : JOINT VENTURE OF CONSTREXIM HOLDINGS AND TRUONG XUAN
CONSTRUCTION JOINT STOCK COMPANY
CONTRACT MANAGER Mr. HOANG MINH NGU

C.S CONSULTANT : EPTISA (SPAIN) - EMI VIET NAM
TEAM LEADER Mr. JOHN RICHARD BLOCK

DESIGN CONSULTANT : LES CONSULTANT LBCD - TROW (CANADA)
TEAM LEADER Dr. NGUYEN VAN KIET





STT	Ngày	Trạm bơm số	Mã thiết bị	Chiều cao (m)	Điện áp (v)	Dòng điện bơm 1 (A)	Dòng điện bơm 2 (A)	Dòng điện bơm 3 (A)	Trạng thái bơm 1	Trạng thái bơm 2	Trạng thái bơm 3
1	22/09/2015 11:10:08	TB13	73111123	0,00	406,50	0,00	0,40	0,20	OFF	OFF	OFF
2	22/09/2015 11:10:08	TB10	73111126	1,10	416,40	0,00	0,20	-	ON	OFF	-
3	22/09/2015 11:10:07	TB5	73111115	2,70	406,10	0,20	0,10	0,10	OFF	OFF	OFF
4	22/09/2015 11:10:07	TB2	73111112	2,90	387,40	0,00	0,00	0,00	OFF	OFF	OFF
5	22/09/2015 11:09:54	TB3	73111113	1,40	403,50	0,00	0,00	0,00	OFF	OFF	OFF
6	22/09/2015 11:10:05	TB8	73111118	1,50	399,90	9,80	8,80	0,00	ON	ON	OFF
7	22/09/2015 11:09:54	TB6	73111116	4,30	407,40	0,00	0,00	0,00	OFF	OFF	OFF
8	22/09/2015 11:09:54	TB2	73111112	2,90	387,70	0,00	0,00	0,00	OFF	OFF	OFF

23.25.116.26:85/vi-VN/2/0/tra-cuu-lich-su.aspx

Supervisory Control & Data Acquisition (SCADA)



IPS Pumps (3), Actuated Isolation Valve (3), Flow Meter (3)



Screening (2) – 1 Manual, 1 Automatic



Grit Train (2)



Grit Pump Air (2)





Grit Basin Air Blowers (3) VFD (3)



Grit Washer (1)





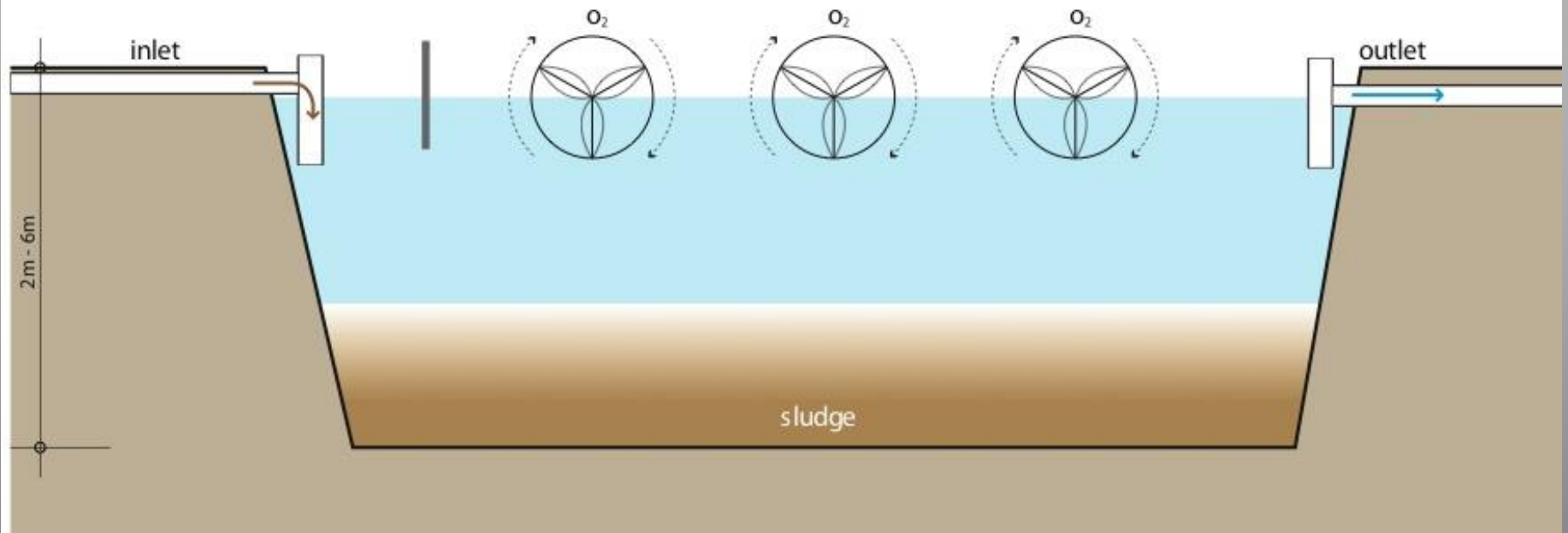
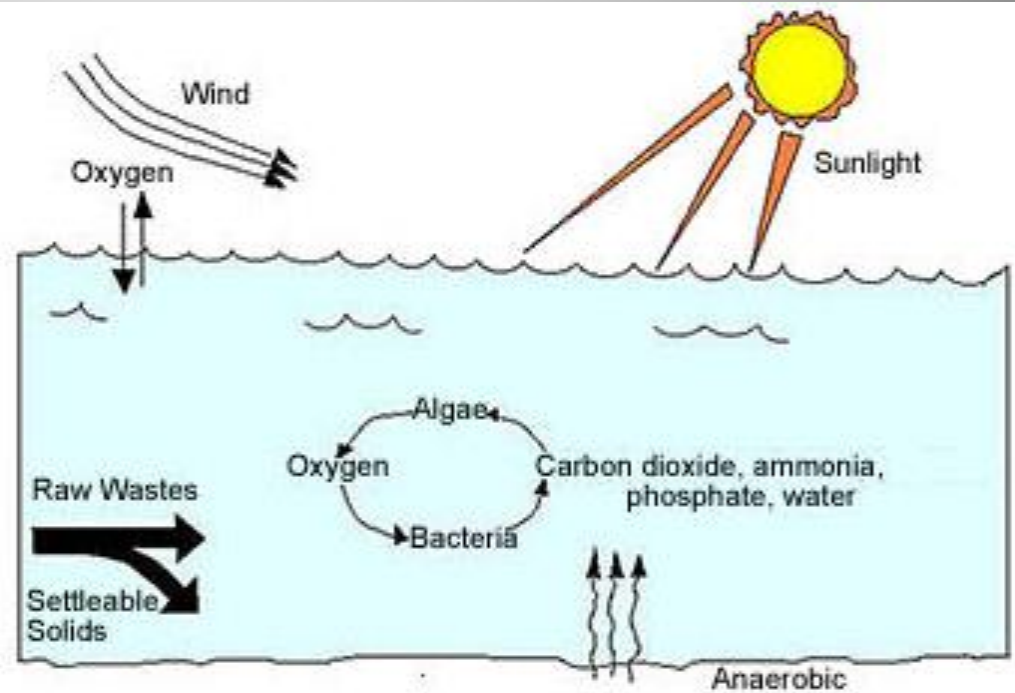
Aeration Blowers (3)



Covered Aeration Lagoon (1) note: aeration diffuser center basin only

Facultative Pond

Future Aerators next phase



Maturation Pond

Maturation pond follows the primary and secondary facultative pond,

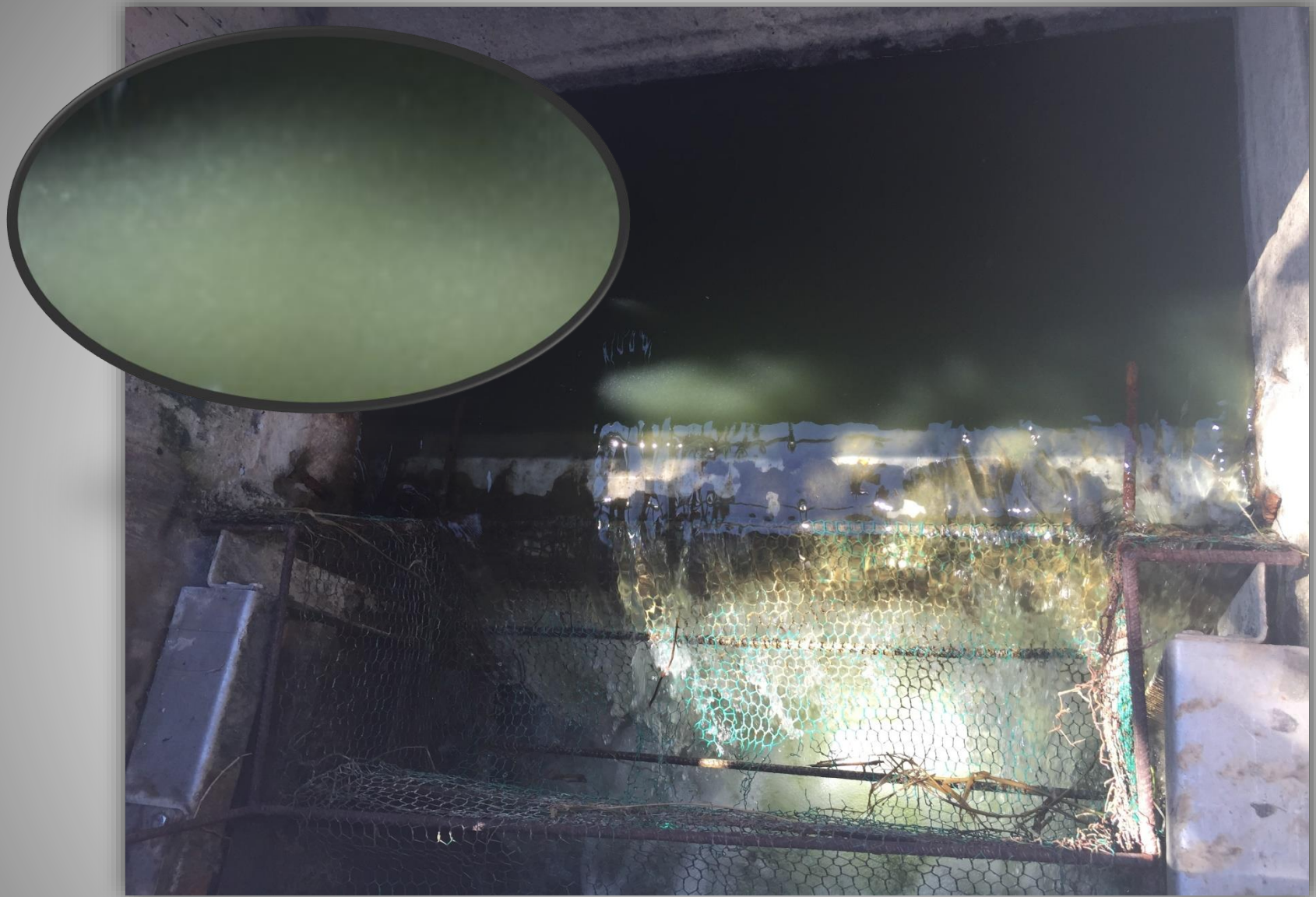
Designed for tertiary treatment, i.e., the removal of pathogens, nutrients and possibly algae.

Shallow to allow light penetration to the bottom and aerobic conditions throughout the whole depth. +/-1 m



Loading on the maturation pond is typically calculated on the assumption that 80% of the BOD has been removed in the preceding treatment.

Maturation pond is the third pond in the multi- cell series designed for fecal coliform removal.



Lagoon Outlet – concerned about amount of algae leaving the pond



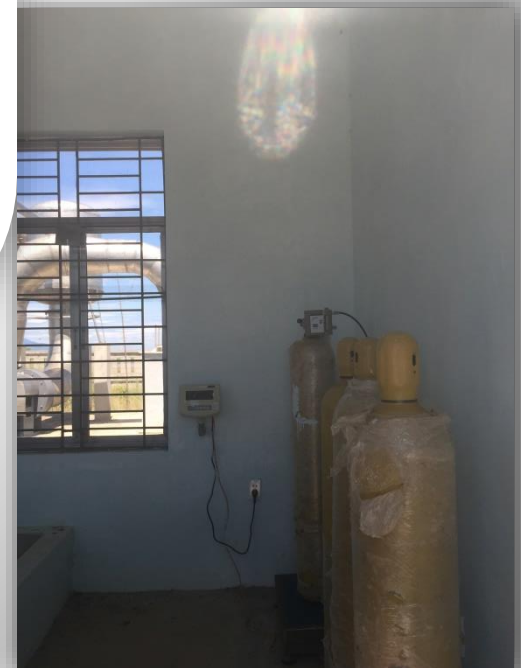
Odor Control



Deodorizer makeup and application



Chemical Building – Chlorine gas diffused into water, solution used in the odor control scrubber





Backup Power Supply

Septage Off-Load Ramp

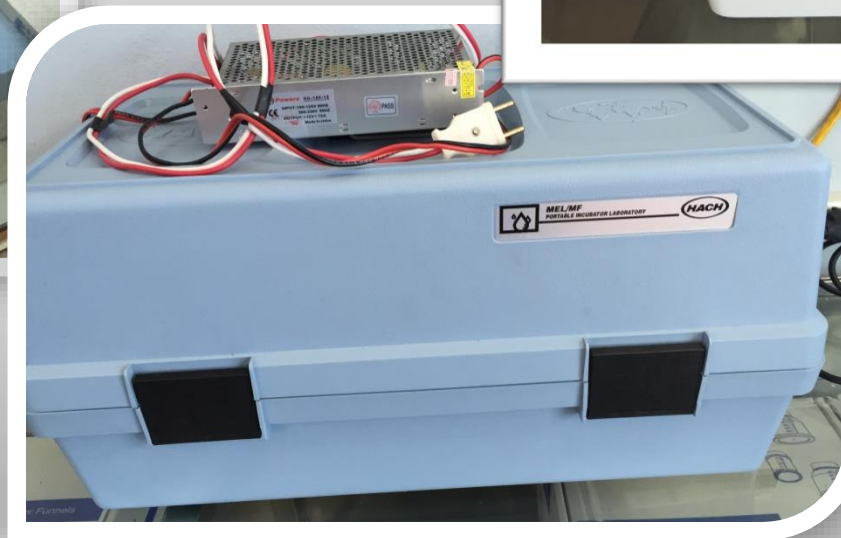
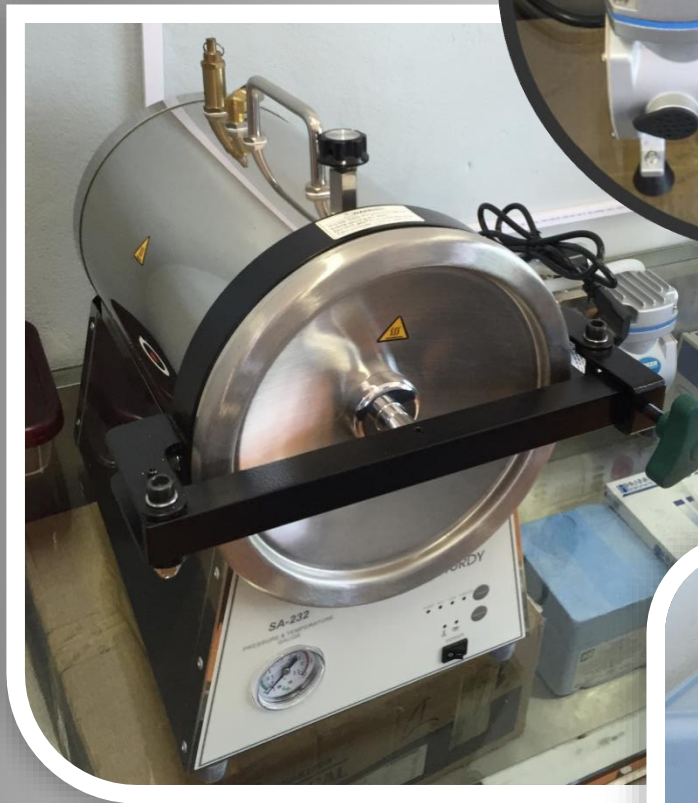
Septage Receiving Tank

Septage Drying Beds





Lab



Lab Equipment



Lab Equipment



Lab Staff

FOR STEM VALVE # 100

II. VẬN HÀNH CÁC THIẾT BỊ NHÀ MÁY XỬ LÝ NƯỚC THẢI:

Vận hành máy thổi khí hút cát				Vận hành máy sục khí lắng cát				Vận hành máy sục khí hồ hiếu khí			
Máy số	B/đầu	T/gian (phút)	Khối lượng	Máy số	B/đầu	K/thúc	T/gian (phút)	Máy số	B/đầu	K/thúc	T/gian (phút)
1	7h30	9h30	100kg	1				1			
2	7h30	9h30	100kg	2				2			
				3				3	7h30	8h30	60'

Vận hành máy Phát điện			Vận hành Máy khử mùi Gia Minh				Vận hành Tháp xử lý mùi			
Máy số	B/đầu	K/thúc	Máy số	B/đầu	K/thúc	T/gian (phút)	Máy số	B/đầu	K/thúc	T/gian (phút)
1			1				1			

III. THIẾT BỊ ĐO LƯU LƯỢNG:
 1. Lưu lượng bắt đầu ca (lúc 7 giờ 30): 975, 664
 2. Lưu lượng cuối ca (lúc 17 giờ):

- IV. KẾT QUẢ THÍ NGHIỆM PHÂN TÍCH:**
- Kết quả phân tích chất lượng nước đầu vào (trạm bơm 12):
 BOD: COD: 242 mg/l SS: 102, 0,22 N-NH₃: 2,16 P-Tổng: 0,79 Coliform:
 PH: 8,12 DO: 2,12 Độ mặn: 0,6; NO₃: 0,30
 - Kết quả phân tích chất lượng nước thải đầu ra Hồ hiếu khí: pH: 8,03; DO: 2,39; Sal: 0,6; NO₃: 0,9
 BOD: COD: 173 mg/l SS: 101, 0,22 N-NH₃: 2,5 P-Tổng: 0,61 Coliform:
 - Kết quả phân tích chất lượng nước thải đầu ra Hồ Tùy tiện: NH₄⁺: 2,06; NO₃: 0,15
 BOD: COD: 169 mg/l SS: 101, 0,18 DO: 8,30 PH: 10,34; Sal: 1; PO₄³⁻: 0,48
 - Kết quả phân tích chất lượng nước thải đầu ra Hồ xử lý Triệt để: pH: 10,59; DO: 10,12; Sal: 1,3
 BOD: COD: 158 mg/l SS: 102, 0,09 N-NH₃: 2,06 P-Tổng: 0,25 Coliform:
 - Kết quả phân tích chất lượng nước thải đầu ra Hồ Wetland (cửa xả):
 BOD: COD: 126 mg/l SS: 103, 0,13 N-NH₃: 1,07 P-Tổng: 0,078 Coliform:
 PH: 10,19 DO: 8,58 Độ mặn: 1,3; NO₃: 0,096.

V. GHI CHÚ:
 1. Chưa có dữ liệu về...
 2. Chưa có dữ liệu về...
 Bên giao ca: [Signature]
 Bên nhận ca: [Signature]

NHẬT KÝ VẬN HÀNH CÁC TRẠM BƠM, NHÀ MÁY XỬ LÝ NƯỚC THẢI ĐỨC NINH
 Cà: 2 - Hợp - Nhật.
 Từ 12 giờ 00 - Đến 19 giờ 00, thời tiết: nắng/mưa. Thời gian mưa: ... phút.
 Quảng Bình, ngày 2 tháng 7 năm 2015.

I. VẬN HÀNH CÁC TRẠM BƠM:

Trạm bơm	Bơm số	Điện áp/Dòng điện (V/A)	Tình trạng bơm	Chế độ v/hành A-O-M	Thời gian vận hành Bơm			Vận hành Van			Ghi chú
					B/đầu	K/thúc	T/gian (phút)	Van số	Tình trạng	Lỗi	
số 01	1		BT	A	296.22	286.22	0'	1	x		
	2	299.56			300.06	10'	2	x			
	3	269.02			268.12	10'	3	x			
số 02	1		BT	A	429.12	429.12	0'	1	x		
	2	466.46			467.16	30'	2	x			
	3	463.56			404.28	30'	3	x			
số 03	1		BT	M	15.13	15.16	3'	1	x		
	2	16.07			16.07	0'	2	x			
	3	9.05			9.08	3'	3	x			
số 04	1		BT	A	68.29	68.28	3'	1	x		
	2	69.42			64.42	0'	2	x			
	3	56.47			66.48	0'	3	x			
số 05	1		BT	A	1099.82	1099.84	12'	1	x		
	2	1069.49			1065.21	34'	2	x			
	3	989.58			990.35	30'	3	x			
số 06	1		BT	A	493.21	493.21	0'	1	x		
	2	465.58			475.37	0'	2	x			
	3	339.11			339.11	0'	3	x			
số 07	1		BT	A	1523.50	1302.55	2'42"	1	x		
	2	1300.14					2	x			
	3						3				
số 08	1		BT	Tắt nguồn	1624.05			1	x		
	2	1622.49					2	x			
	3	516.22					3	x			
số 09	1		BT	A	980.23	980.97	24'	1	x		
	2	1107.42			1108.03	21'	2	x			
	3	637.37			638.00	23'	3	x			
số 10	1		BT	A	1392.00	1383.52	51'	1	x		
	2	502.35			502.57	22'	2	x			
	3	969.38			970.12	34'	3	x			
số 11	1		BT	A	1006.19	1007.03	39'	1	x		
	2	906.11			906.37	26'	2	x			
	3	481.06			482.29	1'18"	3	x			
số 12	1		BT	A	1042.32	1042.32	0'	1	x		
	2	"			"	0'	2	x			
	3	"			"	0'	3	x			
số 13	1		BT	A	1270.19	1271.17	58'	1	x		
	2	650.33			650.38	0'	2	x			
	3	1055.58			1056.54	56'	3	x			
số 14	1		BT	A	509.51	509.51	0'	1	x		
	2	"			"	0'	2	x			

Plant Data ~ 5 months of operation



Supervisors: Collection System, Treatment Plant, Pump Stations



Fleet

Small Excavator (1)

Large Excavator (1)

Front End Loader (1)

Backhoe (1)





Fleet

Septic hauler (3)

Dump Trucks (4)



Fleet

Street Sweeper (1)

Trash Compactors (4)

Wheeled Trash Bins (600)





Fleet – Boom Truck (1)

Topics for consideration of assistance:

1. How to protect assets from salt water corrosion
2. Optimization of O&M activities
3. **Community relations**
4. Making fertilizer from sludge
5. **Asset management**
6. **Staffing structure (O&M)**
7. Operator training
8. Heat protection of equipment
9. **Collection system maintenance – CCTV, Jetting, pump around procedures**
10. Requested detain for connecting small pipe to large pipe
11. **Operation of lagoon system – algae a problem**
12. **Safety**

Asset management

Developing asset identification numbering/naming convention

- The key to registry is assigning a unique identification number (or string a mixture of letters and numbers) to each asset.

Numbering Systems

- Unintelligent
 - Random, often sequential
- Semi-intelligent
 - Indicates type of asset or location followed by unintelligent sequential number
- Fully intelligent
 - Detailed structure indicating type of asset, location and other attributes deemed important

Components that make up a numbering system

- Hierarchical
 - The relationship the asset has in the hierarchy of the system e.g. manhole on a sewer system
- Zonal or Location
 - An assets location relationship within their total asset group. For a city it can be the way in which a utility splits the asset groups in terms of it's O&M zones.

Location Code

NHC	Chemical house	Nhà hóa chất
KVNM	Plant wide	Khuôn viên nhà máy
NBV	Guard	Nhà bảo vệ
NX	Garage	Nhà xe
NKX	Storage and maintance workshop	Nhà kho và xưởng sửa chữa
TB01	01 Sewage pumping station	Trạm bơm nước thải 01
TB02	02 Sewage pumping station	Trạm bơm nước thải 02
TB03	03 Sewage pumping station	Trạm bơm nước thải 03

Process Code

00	Plant wide	Khuôn viên nhà máy
01	Water supply	Hệ thống cấp nước
02	Screening	Song chắn rác
03	Grit removal	Tách rác
04	sand removal	Bể tách cát
05	Maturation lagoon	Hồ hiếu khí
06	Facultative lagoon	Hồ tùy tiện
07	Manhole	Hồ xử lý triệt để
08	Chemical house	Nhà hóa chất

Equipment Code

SCR	Screening	Song chắc rác
VCP	Sluice gate	Van cửa phai
MTK	Air blower	Máy thổi khí
VHC	Screw valve	Van hai chiều
VMC	Screw check valve	Van một chiều
VP	Float valve	Van phao
DPK	Air diffuser	Đĩa phân phối khí
OPK	Coarse diffuser	Ống phân phối khí
VHMB	Gate valve	Van hai mặt bích

Asset Data Sheet

ID number, facility - location - process code, equipment - number Số hiệu: Xác định vị trí - địa điểm - mã dây chuyền - thiết bị - số lượng	Category Hạng mục	Equipment Thiết bị	Size Kích thước	Power Điện năng (kW)	Power Công suất điện (HP)	Capacity Công suất
NMXL-NTXL-02-SCR-01	MECHANICAL Cơ khí	Automatic SCREEN Song chắn rác	950mm	0.55		667m3/hour
NMXL-NTXL-02-SCR-02	MECHANICAL	Manual SCREEN	950mm			

Manufacturer Nhà sản xuất	Serial Number Số sê ri	Location Vị trí lắp đặt	Installation Date Ngày lắp đặt	Condition Tình trạng	Comments Ghi chú	
ABB	3GE13837110497	Pretreatment	July 2014	new	Automatic Tự động	process codes: mã dây chuyền
ESTRUAGUA		Pretreatment	July 2014	new	Manual Thủ công	00- Plant-wide khuôn viên nhà máy

Pros and Cons

- Each numbering system has its advantages and disadvantages when selecting:
 - Involve impacted divisions in your organization including financial and administrative staff.
 - Technical staff will be required to carry out O&M on assets and system should serve those functions
 - Once consensus is reached implement across all divisions to ensure consistency

Primary task - Asset management



From the classroom



And into the field



A	B	C	D	E	F	G	H	I	J	K	L	M
ID number, facility - location - process code, equipment - number Số hiệu: Xác định vị trí - địa điểm - mã dây chuyền - thiết bị - số lượng	Category Hạng mục	Equipment Thiết bị	Size Kích thước	Power Điện năng (kW)	Power Công suất điện (HP)	Capacity Công suất	Manufacturer Nhà sản xuất	Serial Number Số sê ri	Location Vị trí lắp đặt	Installation Date Ngày lắp đặt	Condition Tình trạng	Comments Ghi chú
1 NM-XL-NT-XL-02-SCR-01	MECHANICAL Cơ khí	Automatic SCREEN Sàng chắn rác	950mm	0.55		667m ³ /hour	ABB	3GE1383710497	Pretreatment	July 2014	new	Automatic Tự động
2 NM-XL-NT-XL-02-SCR-02	MECHANICAL	Manual SCREEN	950mm				ESTRUAGUA		Pretreatment	July 2014	new	Manual Thủ công
3 NM-XL-NT-XL-03-VCP-0108	MECHANICAL	Sluice gate Van cửa phai	950x1200mm				BINH NGUYEN - VN		Pretreatment	July 2014	new	Manual Thủ công
4 NM-XL-NT-XL-03-VCP-02	MECHANICAL	Valve	950x1200mm				BINH NGUYEN - VN		Pretreatment	July 2014	new	Manual Thủ công
5 NM-XL-NT-XL-03-VCP-03	MECHANICAL	Valve	950x1200mm				BINH NGUYEN - VN		Pretreatment	July 2014	new	Manual Thủ công
6 NM-XL-NT-XL-03-VCP-04	MECHANICAL	Valve	950x1200mm				BINH NGUYEN - VN		Pretreatment	July 2014	new	Manual Thủ công
7 NM-XL-NT-XL-04-MTK-0102	MECHANICAL	Air blower Máy thổi khí		5.5	50	1.8m ³ /min	Longtech Roots Blower TECO - Taiwan	13160 M13080121	Pretreatment	July 2014	new	Manufacture date: 10Dec 2013; Pressure: 6000; mmAq; 1200 R/Min; inlet conn. 6 in
8 NM-XL-NT-XL-04-VCP-0104	MECHANICAL	Sluice gate Van cửa phai	950x1200mm				Binh Nguyen - Việt Nam		Pretreatment	July 2014	new	Manual Thủ công
9 NM-XL-NT-XL-04-VCP-07	MECHANICAL	Sluice gate Van cửa phai	950x1200mm				Binh Nguyen - Việt Nam		Pretreatment	July 2014	new	Manual Thủ công
10 NM-XL-NT-XL-04-VCP-08	MECHANICAL	Van cửa phai	950x1200mm				Binh Nguyen - Việt Nam		Pretreatment	July 2014	new	Manual Thủ công
11 NM-XL-NT-XL-04-VCP-0102	MECHANICAL	Sluice gate Van cửa phai	750x1200mm			3m ³ /H2O	Binh Nguyen - Việt Nam		Pretreatment	July 2014	new	Tay quay; VL: SUS304 ; Gioang EPDM
12 NM-XL-NT-XL-04-VCP-10	MECHANICAL	Valve	750x1200mm			3m ³ /H2O	Binh Nguyen - Việt Nam		Pretreatment	July 2014	new	Tay quay; VL: SUS304 ; Gioang EPDM
13 NM-XL-NT-XL-04-MTK-01	Electrical-mechanical Cơ điện	Air blower Máy thổi khí		5.5kw		0.8m ³ /min	Teco - Đài Loan	1401007 - M13080119	Pretreatment	July 2014	new	code: AEEVUKV; 1440 RPM; Frane: 132S; Rating: St; IP: 55; IEC: 60034+60072;
14 NM-XL-NT-XL-04-MTK-02	Electrical-mechanical Cơ điện	Air blower Máy thổi khí		5.5	7.48	0.8m ³ /min	Teco - Đài Loan	1401008 - M13080120	Pretreatment	July 2014	new	code: AEEVUKV; 1440 RPM; Frane: 132S; Rating: St; IP: 55; IEC: 60034+60072;
15 NM-XL-NT-XL-04-VHC-0116	MECHANICAL	Screw valve Van 2 chiều	DN40mm				Minh Hoà - Việt Nam		Pretreatment	July 2014	new	PN16
16 NM-XL-NT-XL-04-VMC-0116	MECHANICAL	Check valve Van 1 chiều	DN40mm				Minh Hoà - Việt Nam		Pretreatment	July 2014	new	200
17 NM-XL-NT-XL-04-VHC-0102	MECHANICAL	Screw valve Van 2 chiều	DN40mm				SANWA		Pretreatment	July 2014	new	ống cấp nước sạch
18 NM-XL-NT-XL-04-MTK-0103	Electrical-mechanical Cơ điện	Air blower Máy thổi khí		4	5.44	1.8m ³ /min	Longtech - Tecco	1315997 M130911-6776;	Pretreatment	July 2014	new	cột áp 40kPa; code: AEEVUKV-SF115; 1440 RPM; Frane: 112M; Rating: St; IP: 55; IEC: 60034+60072;
19 NM-XL-NT-XL-04-DPK-0124	MECHANICAL	Air diffuser Đĩa phân phối khí					Binh Nguyen - Việt Nam		Pretreatment	July 2014	new	
20 NM-XL-NT-XL-04-OPK-0124	MECHANICAL	Course diffuser Ống phân phối khí	24inch/D168-3mm				Kanzentestw - Malaysia	N170140878508				LR 6x4 SCH 10S. AISA4403wP304/304H

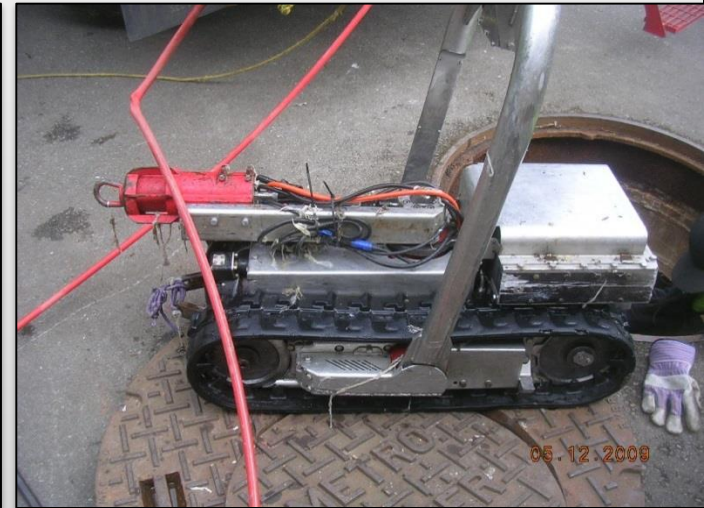
Asset Inventory – Partial List



Works Shop #1 - Dong Hoi & King County

Conveyance Inspection Programs

Closed-Circuit Television (CCTV) Inspection Program



Camera in the pipe on a pontoon boat

Deploying the camera through a manhole (Triển khai máy ảnh qua một hố ga)

Criticality Workshop

- Illustrated Main Concepts for assigning “importance” levels to equipment / facility assets
 - Individual Asset Assignment Standards
 - Visibility on throughout organization
 - Criticality level distribution – benchmark
- - Gave overview on Process Flow development and demonstrated simple process flow that could be utilized for Dong Hoi maintenance





TRẠM XỬ LÝ NƯỚC THẢI ĐỨC NINH
DUC NINH WASTEWATER TREATMENT PLANT
NHÀ ĐIỀU HÀNH VÀ TRUNG TÂM TRUYỀN THÔNG CỘNG ĐỒNG VỀ MÔI TRƯỜNG
ADMINISTRATION BUILDING AND COMMUNICATION CENTER FOR ENVIRONMENT







Next Step.....

Develop work plan for next visit