CHAPTER 7 URBAN FACILITIES RESTORATION PLAN (STORM WATER DRAINAGE SECTOR)

7.1 Strategy for Storm Water Drainage Plan

For storm water drainage sector, the scope of the development plan is defined in the restoration plan of the planning horizon 2014. The goals are set up as follows:

Goal :

- To strengthen the capacity of operation and maintenance by supply of cleaning vehicle of underground drainage and preparation of operation and maintenance manual
- To strengthen the drainage capacity by drainage channel construction
- To recover the drainage structures damaged by the civil conflict

Following strategy are envisaged to attain goals.

- To minimize frequent inundated area by the drainage system improvement
- To improve the drainage system in collaboration with the road sector development
- To demolish the sludge, debris and floating material in the drainage system

7.2 Storm Water Drainage Plan

7.2.1 Priority Area

For the restoration plan of the storm water drainage, the recovery of fundamental function of drainage system is primary. The priority areas of the restoration are the old districts of Central Monrovia, Bushrod Island and Sinkor damaged by the civil friction. In those areas, the underground drainage pipes are blocked or broken, forcing the storm water onto the surface in the rainy season. Lakpazee and Old Road are also added to the priority area because of the serious inundation.

Figure 7.1 Priority Area for Restoration Plan

7.2.2 Proposed Plan Component

The Liberia Urban Infrastructure Rehabilitation Programme (LIRP) and Urban Rehabilitation and Sanitation Project (URSP) have been implementing the works for the cleaning and construction of open drainages, and new box culverts installation. In addition, MPW has implemented the drainage cleaning and box culverts installation in Monrovia using its own budget of 0.4 million USD in the year 2008/2009. On condition of culverts installation by MPW in the future, the restoration plan excludes the new installation of the culverts.

(1) Improvement of Underground Drainage Structures

This improvement works are composed of the followings;

- Cleaning and replace/repair of drainage pipes,
- Furnishing of locally made inlet grating,
- Cleaning and repair of manholes, and
- Replacement of broken or missing concrete manhole covers

The total length of the underground pipes in Monrovia is 27,374m and the length of pipes is 18,920m for Central Monrovia, 3,180m for Bushrod Island and 5,274m for Sinkor. The length for replace/repair of the pipes and the number of pieces for furnishing inlet grating, manholes, repair/construction manhole inlet and new manhole covers is 550m, 970 pc, 950 pc, 380 pc 370 pc respectively.

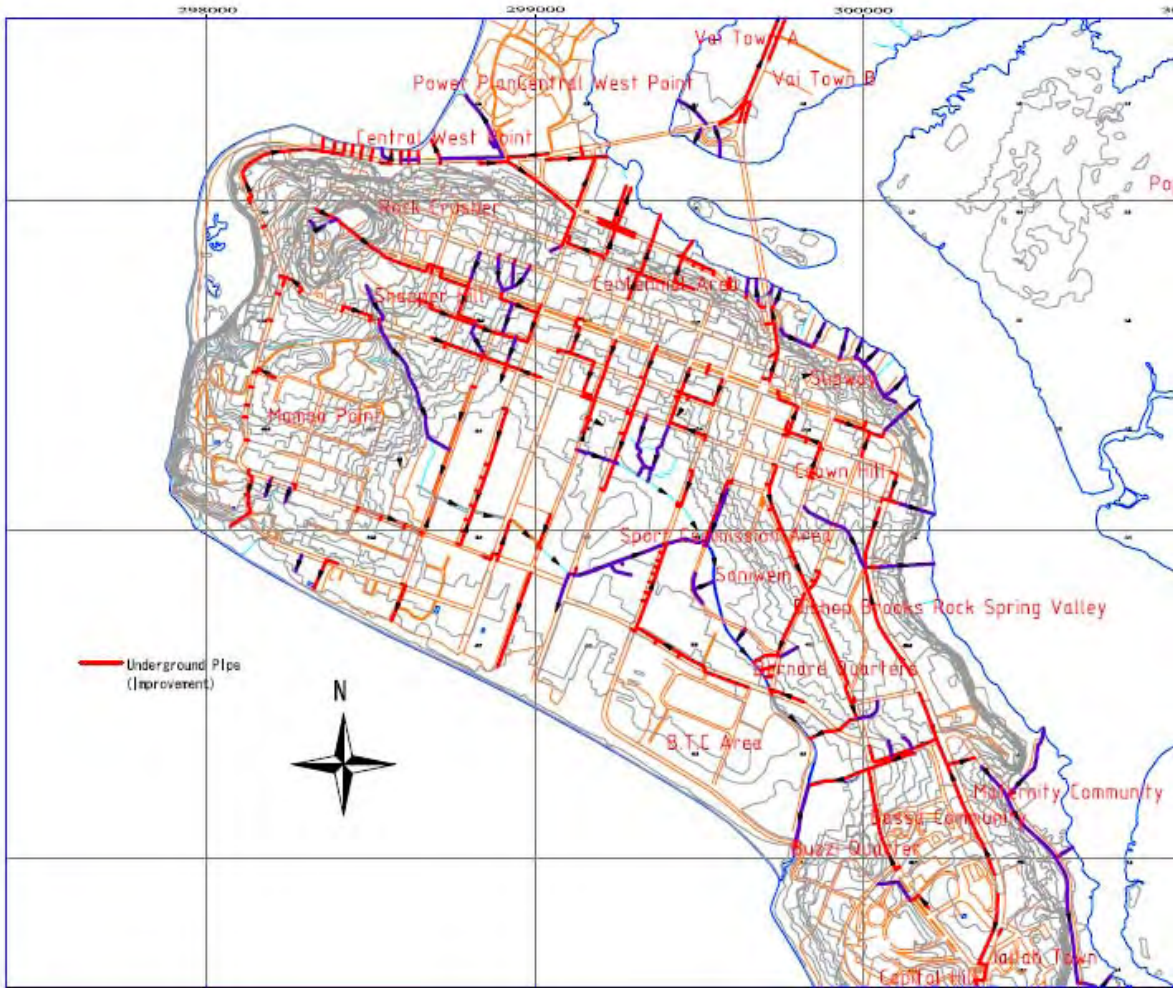


Figure 7.2 Location of Underground Drainage Pipes (Central Monrovia Zone A, B)

(2) Improvement of Open Drainage Channels

During or after LIRP, some drainage channels in Bush Island of the Freeport/Somalia Drive area, and the section of the Soniwein drainage channel in Central Monrovia, have been upgraded to concrete lining channel. Therefore, additional channels on Bushrod Island and in Sinkor including Lakpazee and Old Road shall require concrete lining or new concrete channels for the Restoration Plan.

Table 7.1 Improvement of Open Drainage Channel

Drainage Channel	Unit	Total	Bushrod Island	Central Monrovia	Sinkor
Concrete Channel (2.0 m top)	m	4,500	1,500	1,500	1,500
Concrete Lining (1.5 m base)	m	4,200	0	0	4,200
Concrete Lining (3.0 m base)	m	1,100	0	0	1,100
Concrete Channel (1.5 m base)	m	5,900	3,800	0	2,100
Concrete Channel (3.0 m base)	m	1,800	1,400	0	400

(3) Equipment Supply of Underground Drainage Pipes Cleaning

The necessary unit numbers is developed on the assumption of each total length of 9,000m, the sediment rate of 60 % and total working day of 260 days.

Table 7.2 Equipment Summary of Underground Pipes Cleanings

No.	Equipment name	Specification	Q'ty	
1)	4tons water jet cleaner	219L/min x 19.6MPa	1	unit
2)	4tons vacuum cleaner (lift type)	$21m^3$/min x -97KPa	1	unit
3)	4tons water tank	$4.5m^3$	2	units
4)	4tons sludge hauling dump truck		2	units
5)	4tons truck for equipment transport	with 3tonnes crane	1	units
6)	Submersible pump	50mm dia.	2	sets
7)	Diesel generator	20kVA	2	sets

(4) Establishment of Operation and Maintenance Management System

There is still no manual or guideline on operation and maintenance in MPW. Therefore, the establishment of operation and maintenance management system shall be required all together with the equipment supply for underground drainage pipes cleanings.

Operation and maintenance manual shall include general affairs related to drainage, budget execution, and asset management, etc., guidance for drainage connections, monitoring and guidance on storm water drainage, operation and maintenance of drainage including culverts, inventory management, recording, environmental conservation, emergency measures, and public relations activities.

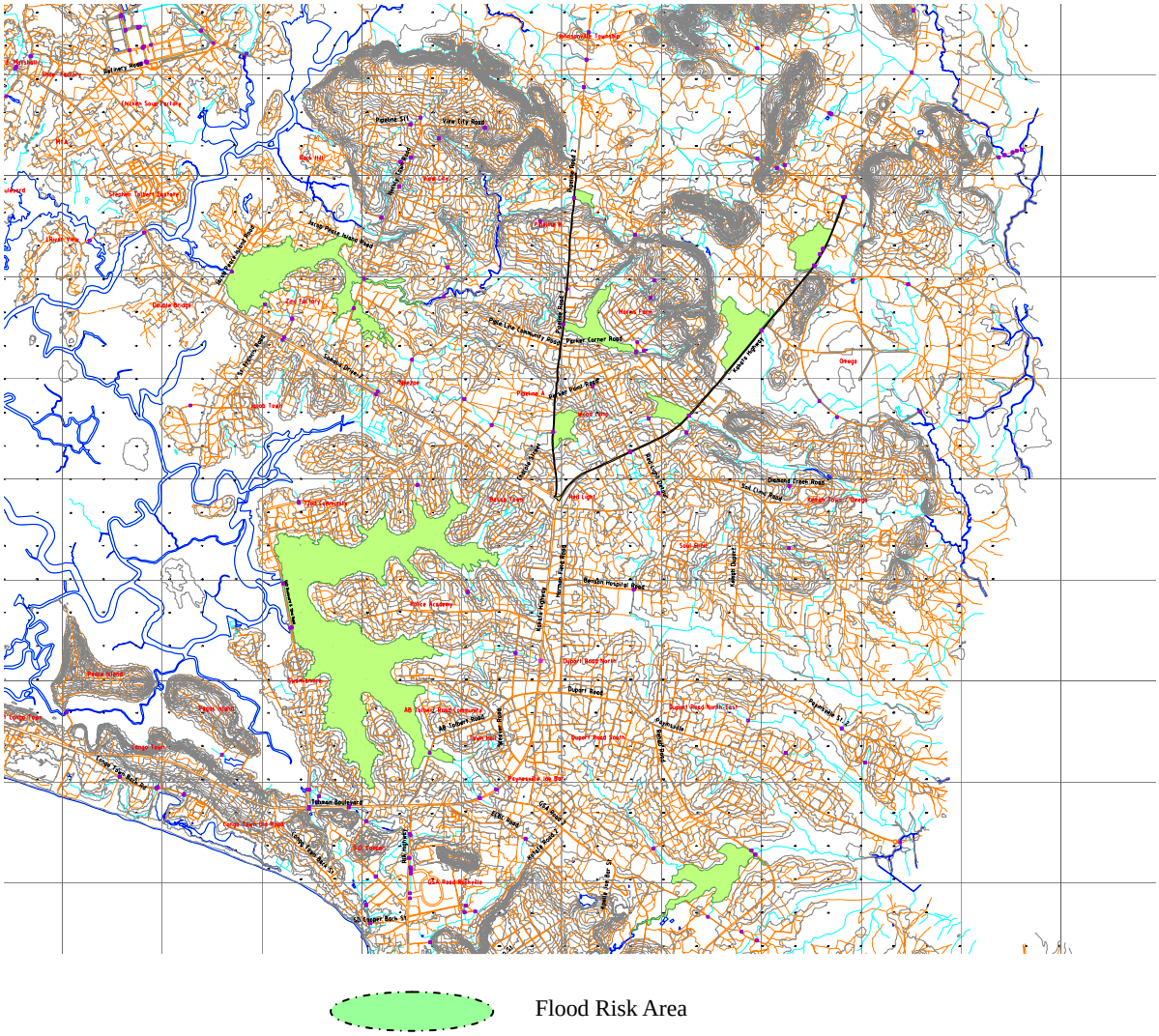
7.2.3 Recommendation on Other Flood Risk Area

Through the site survey, the inundation areas are identified based on the information interviewed from local residents and the GIS maps. The countermeasure of additional culverts arrangement or maintenance of the culverts increases flow capacity, reducing the inundated water level.

7.3 Recommendation on Institutional Measures

The recommendation on the institutional measures reaches as follows:

- To set up the operation and maintenance unit for storm water drainage
- To transfer drainage management mandate to Monrovia City Corporation
- To establish semi-public enterprise for operation and maintenance work
- To transfer cleaning work to the community near the drainage
- To prepare the penalty provision for dumping of solid waste into the drainage



Flood Risk Area

Figure 7.3 Flood Risk Area

Table 7.3 Summary of Project Cost

No	Description	Cost (1,000 USD)
1	Direct Cost	9,587
	(1) Improvement Drainage System	8,657
	(2) Equipment Supply	930
2	Administration Cost	871
3	Engineering Services	1,237
4	Contingency	1623
5	Total of Cost	13,318
6	Value Added Tax (5%)	665
Grand Total		**13,983**