

FINAL YEAR PROJECT

To Develop The Best Possible Solutions For Rain Water Management (RWM) System For Qaddafi Stadium Lahore.



Supervised by:

Dr. Shahid Iqbal

Submitted by:

Fawad Javed & Murad Rana

(M.B.A 2 Year Program)

62

BAHRIA UNIVERSITY LAHORE CAMPUS

SUBMISSION FORM FOR PROJECT REPORT

FOR

(MBA – MASTERS IN BUSINESS ADMINISTRATION)

BAHRIA UNIVERSITY LAHORE

Candidate Names : Fawad Javed & Murad Khan Rana

We submit Fawad / Murad copies for the examination for the degree of MBA Project title.

"To Develop the Best Possible Solutions of Rain Water Management (RWM) System For Qaddafi Stadium Lahore"

Candidate Signatures:



Date: 24-2-2018

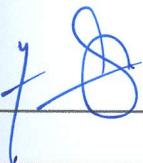
Certificate of Supervisor

I, Dr. Shahid Sabzal being the supervisor for the above students certify the project that project report is in a suitable structure for examination and these candidates has pursued their courses in accordance with the MBA as per the policies of the universities.

Statement by the Head of Department

I supported the submission of the project report of the above named students for examination under the university MBA thesis rule for MBA degree.

Signature:



Date: 26/2/2018

ABSTRACT

During monsoon, surrounding roads of Qaddafi stadium have been identified as sore points, by WASA, due to excessive ponding of storm water. Considering this scenario, the project has been developed with objective to eliminate/reduce ponding. The project boundary includes all the Nishtar Park Supports Complex and some adjoining areas covering 137 Acres.

In first stage key factors responsible for ponding problem were identified In second stage Rainfall data for last 63 years (from 1953 to 2016) was obtained from Met Department. Topography and soil quality data was obtained from Institute of Environmental Engineering (IEER), UET, Lahore. The whole project area was divided in to 23 sub catchment areas.

In the third stage all the data was inserted in Storm Water Management Model (SWMM) software developed by United States Environmental Protection Agency (USEPA).

Rainwater harvesting (RWH) has been used throughout the world as a water conservation measure, particularly in regions where other water sources are scarce or difficult to access.

In recent years, researchers and policy makers have shown renewed interest in water reuse strategies due to rising water demand and declining water resources.

In fourth stage all the options were analyzed keeping in mind the overall objective and technical constraints.

These options include

1. No project option
2. Lying of sewage and connecting it to WASA system.

3. Installation of Rain Water Harvesting system
4. Installation of Rain Water Harvesting system along with storage facility

All the above options were analyzed. Water Harvesting option was selected as best possible option.

Table of Contents

LIST OF FIGURES	iii
LIST OF TABLES	iv
CHAPTER 1: INTRODUCTION	1
1.1 Problem Statement	1
1.2 Project Boundary.....	2
1.3 Ponding Problem in Project Boundary - Situation Analysis and Causes.....	4
1.4 Sore Points with Excessive Ponding	10
1.5 Objectives of the Project.....	11
CHAPTER 2: METHODOLOGY ADOPTED.....	12
2.1 Site Visit during Rainfall	13
2.2 Topographic Survey	13
2.3 Development of Land use Map.....	13
2.4 Collection of Available Data.....	13
2.5 Analysis and Design for Rain Water using SWMM Software	14
2.6 Generation of Options	15
CHAPTER 3: DATA ANALYSIS.....	18
3.1 Topographic Data.....	19
3.1.1 Division of Project Area into Sub-catchments	21
3.2 Application of Strom water management Model (SWMM) Software and Results.	22
3.2.1 Storm water management Model (SWMM)	22
3.3 Low Impact Development (LID) Controls in SWMM	22
3.3.1 Bio-Retention Cells (BRC).....	23
3.3.2 Infiltration Trenches (IT).....	23
3.3.3 Rain Barrels (RB)	23
3.3.4 Vegetative Swales (VS)	23
3.3.5 Selection of Most Feasible LIDs for the Project	23
3.3.6 Description of Bio retention cells (BRC)	25

3.3.7	Description of Infiltration Trench.....	27
3.4	SWMM Input Parameters	30
3.4.1	Rain Gauge Input Data (Rainfall Time Series).....	33
3.5	Analysis of Run Off Development in Sub Catchments	37
3.5.1	Depth of Ponding at Sore Points (10 minutes rainfall).....	37
3.5.2	Depth of Ponding at Sore Points (30 minutes rainfall).....	37
CHAPTER 4: OPTIONS FOR MANAGING STROM WATER.....	39	
4.1	Options for Managing Strom Water in Project Area	40
4.2	Option 1: No Project Option	40
4.3	Option-2: Zero ponding using Storm Sewer Network	40
4.4	Storm Sewer Network (10-Yr Return Period)	41
4.5	Is Option-2 Applicable?	43
4.6	Option-3: Zero Ponding Using Rainwater Harvesting through LIDs	43
4.7	Explanation of Term Used in IT Properties (Table 09)	46
4.8	Results of LID Application (10-Year Return Period).....	46
4.9	Conclusions for Option-3	48
4.10	Option-4: RWH through Combination of LIDs and Water Storage Tank	48
4.11	Storm Sewer Network and Storage Tank for Option-4 (10-yr return period).....	48
4.11.1	Conclusions for Option-4	50
4.12	Option-5: Reduce Ponding using LIDs at Available Space.	51
CHAPTER 5: CONCLUSION	52	
5.1	Conclusion	53
5.2	Way Forward.....	53
References.....	55	
Annexure 1: Project Location.....	56	
Annexure 2: Autographic Rainfall Data.....	57	

LIST OF FIGURES

FIGURE 1: PROJECT BOUNDARY MARKED IN RED	3
FIGURE 2: STORM WATER PONDING AT HAFEEZ KARDAR ROAD IN FRONT OF HOCKEY STADIUM	4
FIGURE 3: EXCESSIVE STANDING WATER IN FRONT OF THE DERA RESTAURANT	5
FIGURE 4: PONDING BECAUSE OF ELEVATED GREEN SPACES BEING UNABLE TO DRAIN	5
FIGURE 5: AREAL VIEW OF THE PONDING AFTER RAIN IN THE PROJECT SITE (COURTESY: CITY42)	6
FIGURE 6: PICTURE (A) & (B) SHOW THE WATER COLLECTING STRUCTURE CALLED HODI (3 X 3 FEET) .	7
FIGURE 7: SUCTION PUMP INSTALLED TO DRAIN WATER	7
FIGURE 8: A WIDE GREEN BELT IN FRONT OF ALHAMRAH COMPLEX SLOPING TOWARDS THE ROAD	8
FIGURE 9: AROUND 15 FEET WIDE ROADSIDE SPACE SLOPING TOWARDS THE MAIN ROAD	9
FIGURE 10: GREENBELT SLOPING TOWARDS THE ROAD.....	9
FIGURE 11: SORE PONDING POINTS IN THE PROJECT AREA	10
FIGURE 12: AN INTERFACE OF SWMM.....	16
FIGURE 13: PROJECT METHODOLOGY	17
FIGURE 14: GIS MAP SHOWING CONTOURS AND LAND USE OF THE PROJECT AREA	20
FIGURE 15: PROJECT AREA DIVIDED INTO SUB-CATCHMENTS BASED ON TOPOGRAPHIC MAO	21
FIGURE 16: CONCEPTUAL DIAGRAM OF BIO RETENTION CELL.....	25
FIGURE 17: BIO RETENTION CELL AT WATER STREET (PLYMOUTH CENTER, MASSACHUSETTS).....	26
FIGURE 18: WALLED BIO RETENTION CELL (PLYMOUTH CENTER, MASSACHUSETTS).....	27
FIGURE 19: SCHEMATIC OF INFILTRATION TRENCH.....	28
FIGURE 20: INFILTRATION TRENCH ON THE ROADSIDE	29
FIGURE 21 REQUIRED SEWER SIZES AND DEPTHS FOR MAX STORM RUNOFF (10-YR RETURN PERIOD)	42
FIGURE 22: LIDs LOCATIONS IN SUB-CATCHMENTS S5, S7 & S13	44
FIGURE 23: REQUIRED SEWER SIZES AND INVERTS FOR OPTION-4 (10-YR RETURN PERIOD).....	49
FIGURE 24: COMPARISON OF EACH OPTION.....	54

LIST OF TABLES

TABLE 1: LAND USE DISTRIBUTION OF THE PROJECT SITE	19
TABLE 2: HYDROLOGIC FUNCTIONS OF LIDs	24
TABLE 3: COMPONENTS OF SWMM AND THEIR INPUT PROPERTIES.....	30
TABLE 4: INPUT DATA FOR THE SUB-CATCHMENTS	32
TABLE 5: INPUT DATA TO RAIN GAUGE.....	34
TABLE 6: DEPTH OF PONDING AT SORE POINTS (10 MINUTES RAINFALL; 10-YR RETURN PERIOD) .	37
TABLE 7: DEPTH OF PONDING AT SORE POINTS (30 MINUTES RAINFALL; 10-YR RETURN PERIOD).	38
TABLE 8: UNPAVED AREA AVAILABLE AND AREA USED FOR LIDs	45
TABLE 9: SWMM INPUT PROPERTIES FOR INFILTRATION TRENCHES (IT).....	45
TABLE 10: REDUCTION IN PEAK RUNOFF AND PONDING DEPTHS WITH APPLICATION OF LIDs	47
TABLE 11: LINE STATEMENT OF REQUIRED STORM SEWERS FOR OPTION-4	50