



HURON-CLINTON
metroparks

Delhi Metropark
Stormwater Management Plan

September 2019



Table of Contents

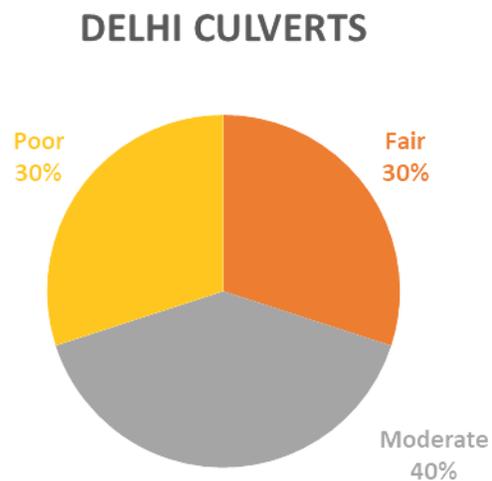
❖ Stormwater Structure Recommendations	3
❖ Stormwater Structure Maps	5
❖ Streambank Summary	7
❖ Green Infrastructure Concepts and Maps	8
❖ Recommendation Summary Tables	10

Delhi Metropark Stormwater Structure Recommendations

Table 1. Summary of Delhi Culvert Inspection and Maintenance Needs.

Culvert Rating	Number of Culverts	Culverts Needing Immediate Cleanout	Culverts Needing Future Cleanout	Culverts Needing Replacement or Repair
New	0	0	0	0
Fair	3	0	2	0
Moderate	4	3	0	0
Poor	3	2*	0	3
Failing	0	0	0	0
Total:	10	5*	2	3
Repair Cost:		\$870	\$157	\$52,095

*Culvert may be replaced before it needs to be cleaned out.



Left: Poor culvert in Delhi Metropark. Right: Proportion of culverts in each condition category.

Table 2. Individual Culvert Replacement Costs

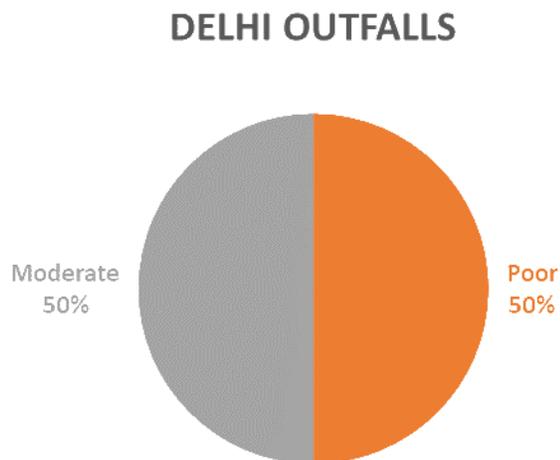
Culvert ID	Diameter (in)	Length (ft)	Condition	Maintenance Need	Cost Opinion
CUL-DEL-001	24	42	Moderate	Immediate Cleanout	\$211
CUL-DEL-002*	24	45	Poor	Replacement	\$8,986
CUL-DEL-003*	24	41	Poor	Replacement	\$8,255
CUL-DEL-004	12	39	Moderate	Immediate Cleanout	\$136
CUL-DEL-007	36	70	Moderate	Immediate Cleanout	\$522
CUL-DEL-008	12	24	Fair	Future Cleanout	\$83
CUL-DEL-009	10	21	Fair	Future Cleanout	\$74
CUL-DEL-010	72	45	Poor	Replacement	\$34,855
Total:					\$53,122

*Culvert may be replaced before it needs to be cleaned out.

Table 3. Summary of Delhi Outfall Inspection and Maintenance Needs

Outfall Rating	Number of Outfalls	Outfalls Needing Immediate Cleanout	Outfalls Needing Future Cleanout	Outfalls Needing Replacement or Repair
New	0	0	0	0
Fair	0	0	0	0
Moderate	1	0	0	0
Poor	1	1*	0	1
Failing	0	0	0	0
Total:	2	1	0	1
Repair Cost:		\$0	\$0	\$7,500

*Outfall may be replaced before it needs to be cleaned out.



Left: Proportion of outfalls in each condition category. Right: Blocked outfall in poor condition.

Table 4. Individual Outfall Replacement Costs

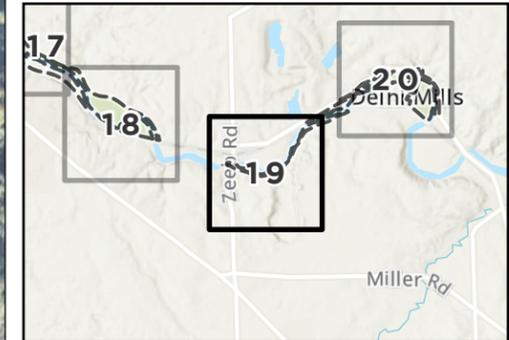
Outfall ID	Diameter (in)	Condition	Maintenance Need	Cost Opinion
SDC-DEL-001*	18	Poor	Replacement	\$7,500
Total:				\$7,500

*May be replaced before it needs to be cleaned out.

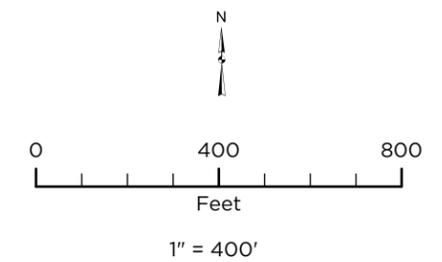
Stormwater Structure Ratings

Delhi Metropark

Map Sheet: 19 of 48



- | | |
|--|---|
| Outfalls
(Field Rating) | Gravity Main
(Pipe Rating Index) |
| <ul style="list-style-type: none"> Failing Poor Moderate Fair New | <ul style="list-style-type: none"> 1 2 3 4 5 |
| Culverts
(Field Rating) | Gravity Main (Other) |
| <ul style="list-style-type: none"> Failing Poor Moderate Fair New (Not Rated) | <ul style="list-style-type: none"> Gravity Main (Other) Culvert (Other) |
| | Roads |
| | <ul style="list-style-type: none"> Roads Park Boundary |



Source: Data provided by Huron-Clinton Metroparks, State of Michigan, OHM Advisors, NearMap and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

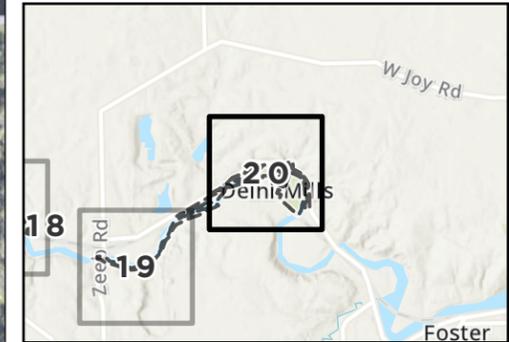
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl.

Map Published: October 23, 2019

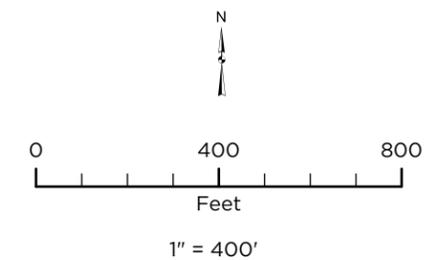
Stormwater Structure Ratings

Hudson Mills Metropark

Map Sheet: 20 of 48



- | | |
|--|--|
| Outfalls
(Field Rating) | Gravity Main
(Pipe Rating Index) |
| <ul style="list-style-type: none"> Failing Poor Moderate Fair New | <ul style="list-style-type: none"> 1 2 3 4 5 |
| Culverts
(Field Rating) | Gravity Main (Other) |
| <ul style="list-style-type: none"> Failing Poor Moderate Fair New (Not Rated) | <ul style="list-style-type: none"> Gravity Main (Other) Culvert (Other) |
| | Roads |
| | <ul style="list-style-type: none"> Roads Park Boundary |



Source: Data provided by Huron-Clinton Metroparks, State of Michigan, OHM Advisors, NearMap and ESRI. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl.

Map Published: October 23, 2019

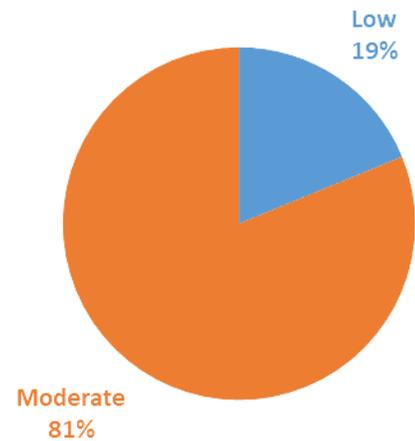
Delhi Metropark Streambank Summary and Recommendations

Table 5. Streambank Inspection Summary

Erosion Condition	Feet of Streambank (miles)	Cost of Restoration
Very High	0.0 (0.0)	
High	0.0 (0.0)	
Moderate	10,875 (2.06)	
Low	2,519 (0.48)	
Very Low	0.0 (0.0)	
Total:	13,394 (2.54)	\$0



DELHI EROSION SEVERITY



Left: Proportion of stream bank in each erosion severity category. Right: Moderate erosion on a bank in Delhi Metropark.

Based on our assessment, we are recommending no streambank restoration within Delhi Metropark at this time.

Delhi Metropark Green Infrastructure Recommendations

In Delhi, the green infrastructure practices listed in Table 1 are recommended to improve water quality and ameliorate flooding issues in the park where feasible. These practices are also outlined on the attached green infrastructure maps.

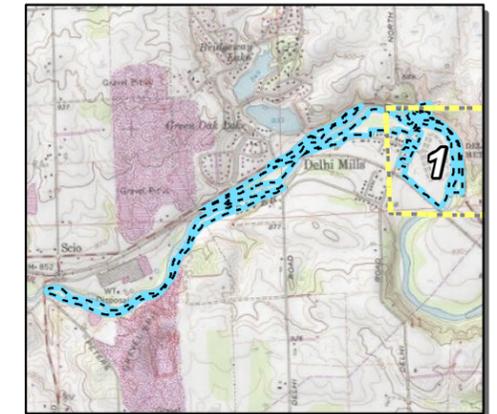
Table 6. Delhi Green Infrastructure Recommendations

Site ID	Site	Practice Type	Treatment Surface Area (ft ²)	Cost Opinion	Cost per sq ft of Treatment Area (\$/ft ²)
GI-DEL-01	East Delhi	Naturalized Swale	5,444	\$9,255	\$1.70
GI-DEL-02	East Delhi	Naturalized Swale	5,343	\$9,083	\$1.70
GI-DEL-03	East Delhi	Bioswale	5,400	\$42,900	\$7.94
GI-DEL-04	East Delhi	Native Prairie	27,118	\$31,638	\$1.17
GI-DEL-05	East Delhi	Naturalized Swale	2,205	\$3,749	\$1.70
GI-DEL-06	East Delhi	Naturalized Swale	2,682	\$4,559	\$1.70
GI-DEL-07	East Delhi	Bioswale	2,080	\$16,524	\$7.94
Total:			50,272	\$117,708	

Delhi Metropark

Green Infrastructure
Recommendation Areas

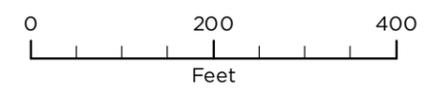
Area: 1 of 1



Recommendation Area

GSI Type

- Bioswale (2)
- Native Prairie (1)
- Naturalized Swale (4)
- Stormwater Gravity Main
- Culvert (5)
- HCMA Park Boundary
- Roads



1" = 200'

Source: Data provided by OHM Advisors, Huron Clinton Metroparks and Near Map. OHM Advisors does not warrant the accuracy of the data and/or the map. This document is intended to depict the approximate spatial location of the mapped features within the Community and all use is strictly at the user's own risk.

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 IntlFeet

Map Published: October 3, 2019



Delhi Metropark Recommendation Prioritization

Each table in this section is prioritized, with the most urgent projects listed first. Projects with **red** Site IDs need immediate attention. Projects with **green** Site IDs can be accomplished by HCMA staff. **Bold** projects may be eligible for grant funding. Underlined projects may be good volunteer or education opportunities. All other projects will likely require annual budget allocations to complete.

Table 7. Delhi Culvert Repair Priorities

Culvert ID	Diameter (in)	Length (ft)	Condition	Maintenance Need	Cost Opinion
CUL-DEL-010	72	45	Poor	Replacement	\$34,855
CUL-DEL-002	24	45	Poor	Replacement	\$8,986
CUL-DEL-003	24	41	Poor	Replacement	\$8,255
CUL-DEL-007	36	70	Moderate	Immediate Cleanout	\$522
CUL-DEL-001	24	42	Moderate	Immediate Cleanout	\$211
CUL-DEL-004	12	39	Moderate	Immediate Cleanout	\$136
CUL-DEL-008	12	24	Fair	Future Cleanout	\$83
CUL-DEL-009	10	21	Fair	Future Cleanout	\$74
Total:					\$53,123

Table 8. Delhi Outfall Repair Priorities

Outfall ID	Diameter (in)	Condition	Maintenance Need	Cost Opinion
SDC-DEL-001	18	Poor	Replacement	\$7,500
Total:				\$7,500

Table 9. Delhi Green Infrastructure Installation Priorities

Site ID	Site	Practice Type	Treatment Surface Area (ft ²)	Cost Opinion	Cost per sq ft of Treatment Area (\$/ft ²)
<u>GI-DEL-07</u>	<u>East Delhi</u>	<u>Bioswale</u>	<u>2,080</u>	<u>\$16,524</u>	<u>\$7.94</u>
<u>GI-DEL-05</u>	<u>East Delhi</u>	<u>Naturalized Swale</u>	<u>2,205</u>	<u>\$3,749</u>	<u>\$1.70</u>
GI-DEL-04	East Delhi	Native Prairie	27,118	\$31,638	\$1.17
GI-DEL-01	East Delhi	Naturalized Swale	5,444	\$9,255	\$1.70
GI-DEL-02	East Delhi	Naturalized Swale	5,343	\$9,083	\$1.70
GI-DEL-06	East Delhi	Naturalized Swale	2,682	\$4,559	\$1.70
GI-DEL-03	East Delhi	Bioswale	5,400	\$42,900	\$7.94
Total:			50,272	\$117,708	