



HURON-CLINTON
metroparks

Hudson Mills Metropark Stormwater Management Plan

September 2019



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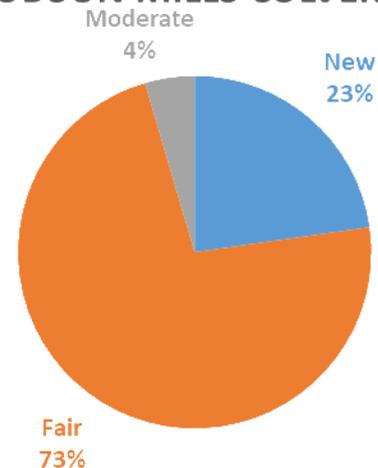
Hudson Mills Metropark Stormwater Structure Recommendations

Table 1. Summary of Hudson Mills Culvert Inspection and Maintenance Needs.

| Culvert Rating | Number of Culverts | Culverts Needing Immediate Cleanout | Culverts Needing Future Cleanout | Culverts Needing Replacement or Repair |
|---------------------|--------------------|-------------------------------------|----------------------------------|--|
| New | 5 | 0 | 0 | 0 |
| Fair | 16 | 0 | 2 | 0 |
| Moderate | 1 | 0 | 0 | 0 |
| Poor | 0 | 0 | 0 | 0 |
| Failing | 0 | 0 | 0 | 0 |
| Total: | 22 | 0 | 2 | 0 |
| Repair Cost: | | \$0 | \$358 | \$0 |



HUDSON MILLS CULVERTS



Left: Moderate culvert in Hudson Mills 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-HUD-011 | 36 | 22 | Fair | Future Cleanout | \$167 |
| CUL-HUD-017 | 36 | 25 | Fair | Future Cleanout | \$191 |
| Total: | | | | | \$358 |

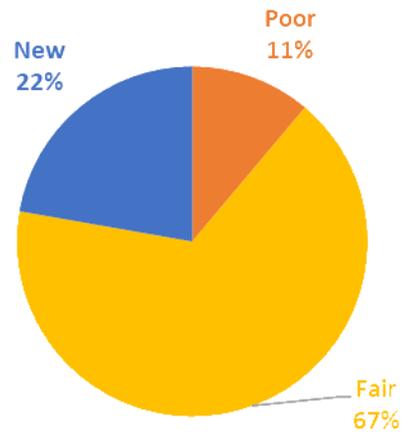
Table 3. Summary of Hudson Mills Outfall Inspection and Maintenance Needs

| Outfall Rating | Number of Outfalls | Outfalls Needing Immediate Cleanout | Outfalls Needing Future Cleanout | Outfalls Needing Replacement or Repair |
|---------------------|--------------------|-------------------------------------|----------------------------------|--|
| New | 2 | 0 | 0 | 0 |
| Fair | 7 | 0 | 1 | 0 |
| Good | 0 | 0 | 0 | 0 |
| Poor | 1 | 1* | 0 | 1 |
| Failing | 1 | 1* | 0 | 1 |
| Total: | 11 | 2* | 1 | 2 |
| Repair Cost: | | \$0 | \$250 | \$13,750 |

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



HUDSON MILLS OUTFALLS



Left: Fair outfall in Hudson Mills Metropark. Right: Proportion of outfalls in each condition category.

Table 4. Individual Outfall Replacement Costs

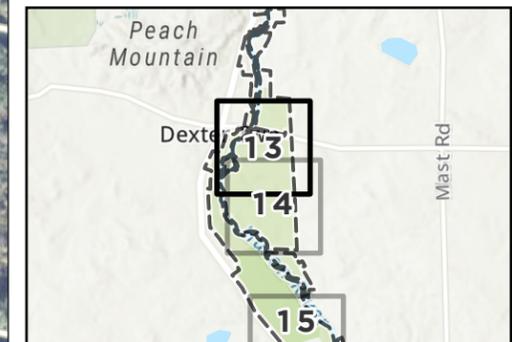
| Outfall ID | Diameter (in) | Condition | Maintenance Need | Cost Opinion |
|---------------|---------------|-----------|------------------|-----------------|
| SDC-HUD-001 | 24 | Fair | Future Cleanout | \$250 |
| SDC-HUD-009* | 12 | Poor | Replacement | \$6,250 |
| SDC-HUD-016* | 20 | Failing | Replacement | \$7,500 |
| Total: | | | | \$14,000 |

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

Stormwater Structure Ratings

Hudson Mills Metropark

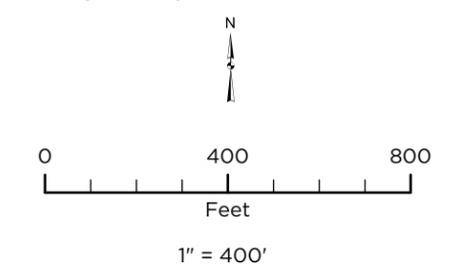
Map Sheet: 13 of 48



| Outfalls (Field Rating) | Gravity Main (Pipe Rating Index) |
|----------------------------|-------------------------------------|
| Failing | 1 |
| Poor | 2 |
| Moderate | 3 |
| Fair | 4 |
| New | 5 |

| | |
|-------------|----------------------|
| Failing | Gravity Main (Other) |
| Poor | Culvert (Other) |
| Moderate | |
| Fair | |
| New | |
| (Not Rated) | |

| Roads | |
|---------------|--|
| Roads | |
| Park Boundary | |



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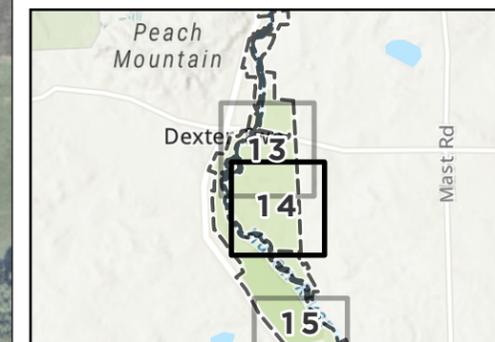
Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl.

Map Published: October 23, 2019

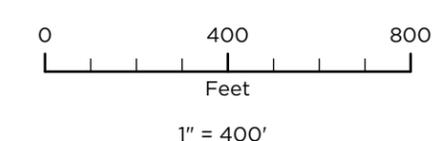
Stormwater Structure Ratings

Hudson Mills Metropark

Map Sheet: 14 of 48



| | |
|-----------------------------------|--|
| Outfalls (Field Rating) | Gravity Main (Pipe Rating Index) |
| Failing | 1 |
| Poor | 2 |
| Moderate | 3 |
| Fair | 4 |
| New | 5 |
| Culverts (Field Rating) | Gravity Main (Other) |
| Failing | Culvert (Other) |
| Poor | Roads |
| Moderate | Roads |
| Fair | Park Boundary |
| New | |
| (Not Rated) | |



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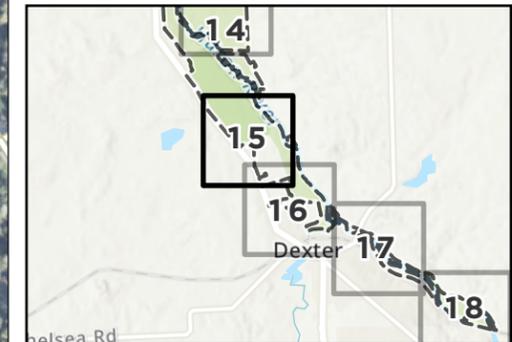
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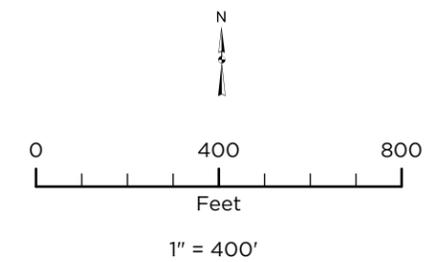
Stormwater Structure Ratings

Hudson Mills Metropark

Map Sheet: 15 of 48



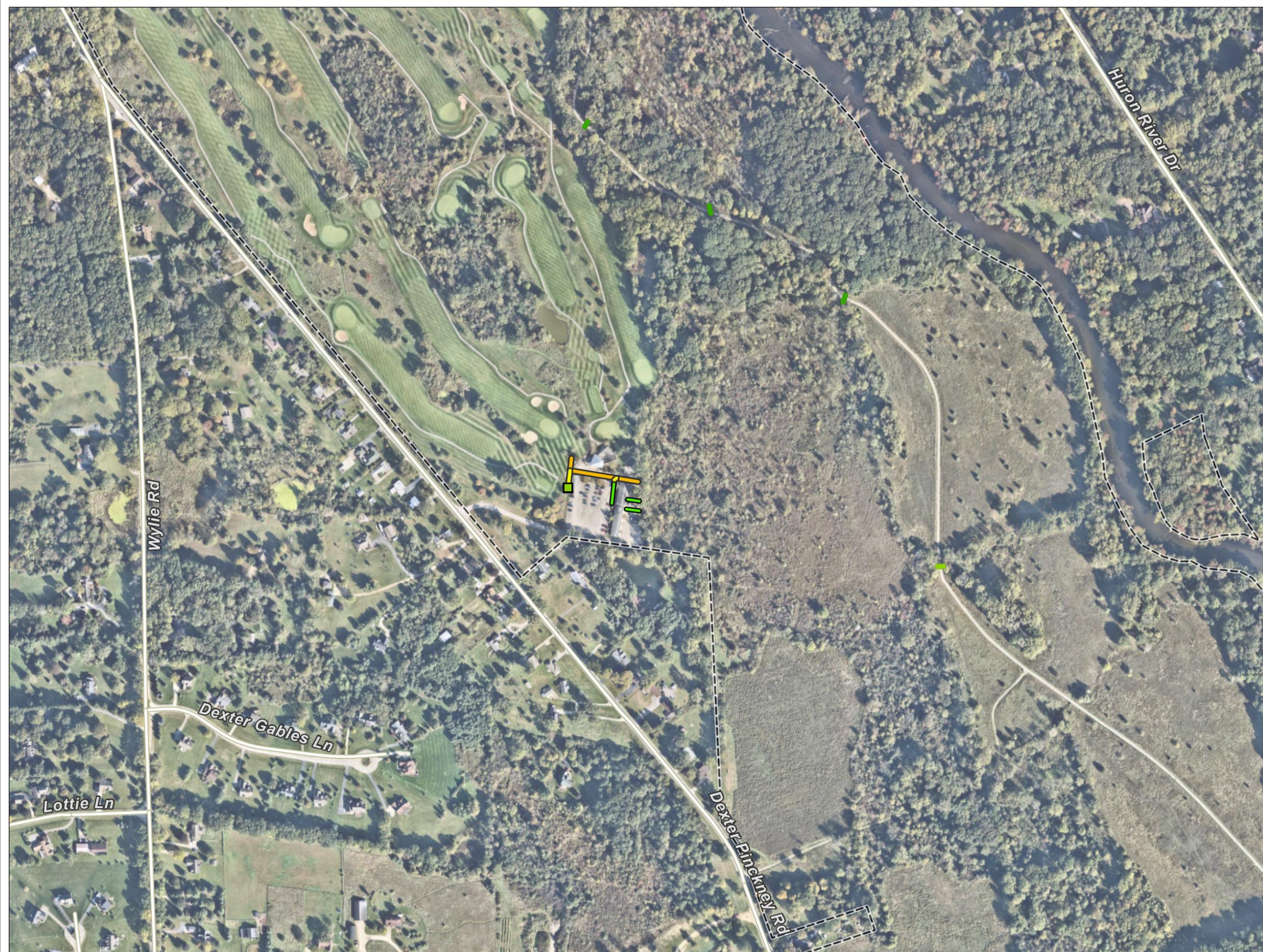
| | |
|--|---|
| Outfalls (Field Rating) | Gravity Main (Pipe Rating Index) |
| <ul style="list-style-type: none"> Failing Poor Moderate Fair New | <ul style="list-style-type: none"> 1 2 3 4 5 |
| Culverts (Field Rating) | Gravity Main (Other) |
| <ul style="list-style-type: none"> Failing Poor Moderate 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 |



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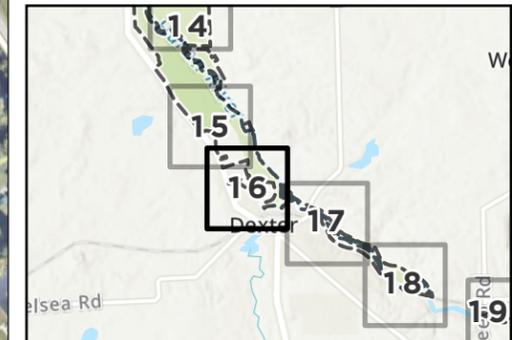
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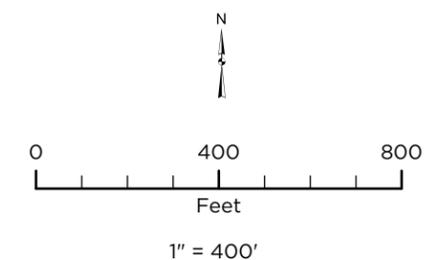
Stormwater Structure Ratings

Hudson Mills Metropark

Map Sheet: 16 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) | Gravity Main (Other) |
| | Culvert (Other) |
| | Roads |
| | Roads |
| | Park Boundary |



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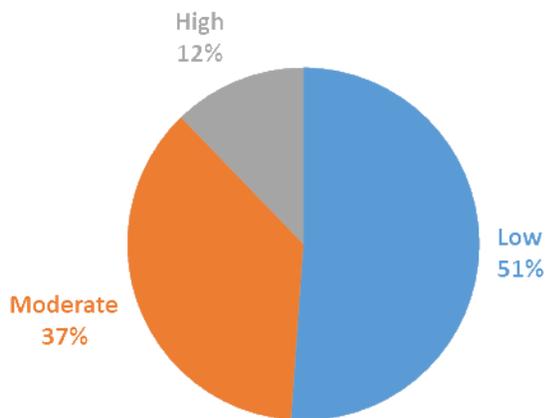
Map Published: October 23, 2019

Hudson Mills Metropark Streambank Summary and Recommendations

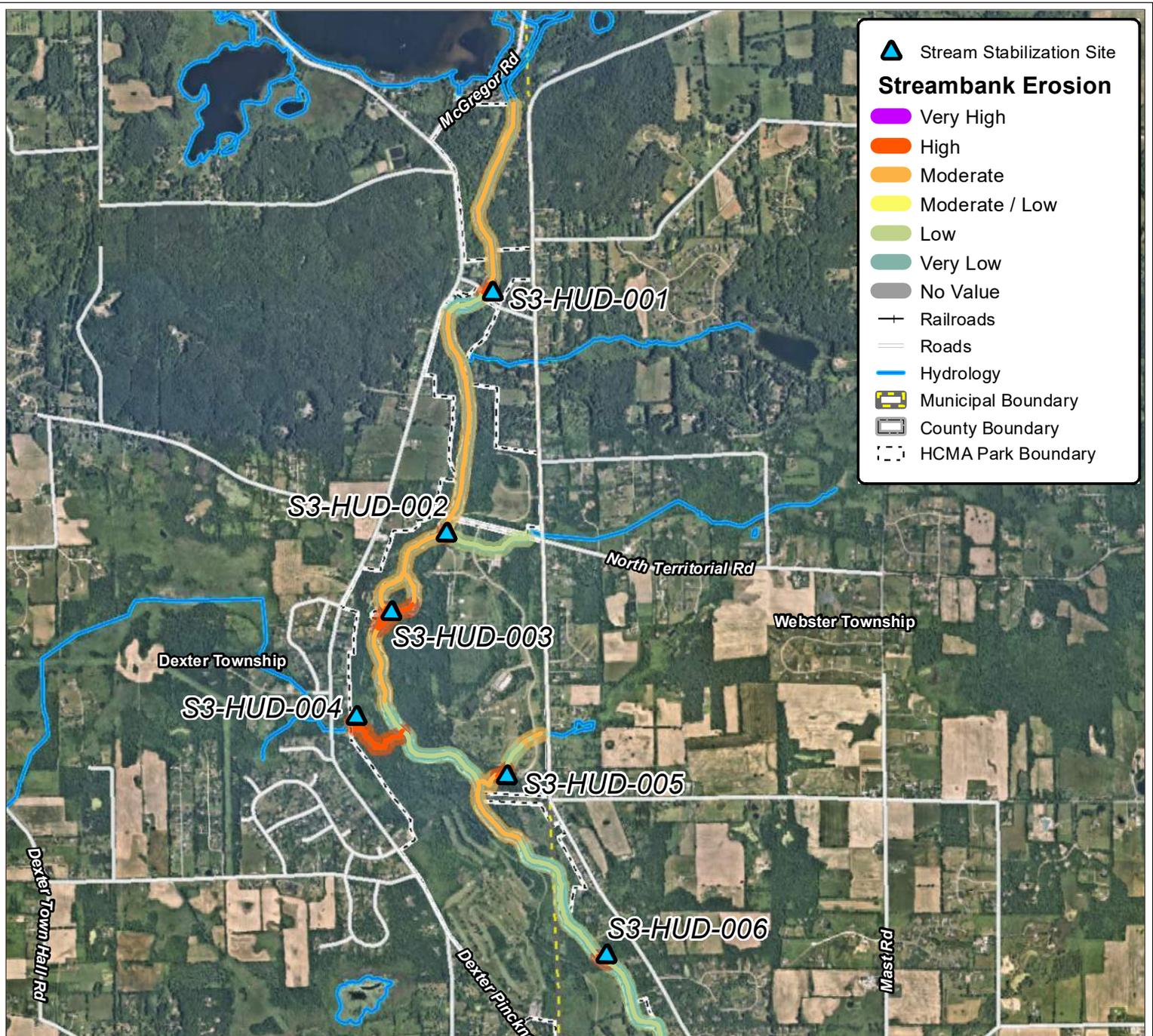
Table 5. Streambank Inspection Summary

| Erosion Condition | Feet of Streambank (miles) | Cost of Restoration |
|-------------------|----------------------------|---------------------|
| Very High | 0.0 (0.0) | |
| High | 4,572 (0.87) | \$2,874,000 |
| Moderate | 13,685 (2.59) | |
| Low | 19,105 (3.62) | |
| Very Low | 0.0 (0.0) | |
| Total: | 37,362 (7.08) | \$2,874,000 |

HUDSON MILLS EROSION SEVERITY



Left: Proportion of stream bank in each erosion severity category. Right: Severe erosion on a bank in Hudson Mills Metropark.



▲ Stream Stabilization Site

Streambank Erosion

- Very High
- High
- Moderate
- Moderate / Low
- Low
- Very Low
- No Value

— Railroads

— Roads

— Hydrology

▭ Municipal Boundary

▭ County Boundary

▭ HCMA Park Boundary

Hudson Mills Metropark - Recommended Streambank Stabilization

| Site | Length, ft | Streambank Erosion | Rec Treatment | Unit Price, \$/ft | Cost |
|------|------------|--------------------|-----------------------------|-------------------|----------------|
| 001 | 266.34 | High | Soil Lifts with Live Stakes | 678 | \$181,000.00 |
| 002 | 131.53 | High | Coir Block with Live Stakes | 172 | \$23,000.00 |
| 003 | 1,554.08 | High | Soil Lifts with Live Stakes | 678 | \$1,054,000.00 |
| 004 | 2,025.57 | High | Soil Lifts with Live Stakes | 678 | \$1,374,000.00 |
| 005 | 320.39 | High | Coir Block with Live Stakes | 172 | \$56,000.00 |
| 006 | 274.13 | High | Soil Lifts with Live Stakes | 678 | \$186,000.00 |

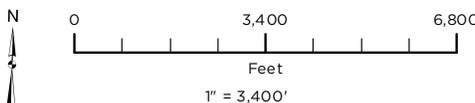
Note: Includes cost to stabilize both banks **\$2,874,000.00**

**Hudson Mills Metropark
Streambank Stabilization Siting**

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.

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Map Published: September 4, 2019



S3-HUD-001

Length: 266.34 ft

Recommended Treatment: Soil Lifts with Live Stakes

Construction Cost: \$181,000

S3-HUD-001

▲ Stream Stabilization Site

Streambank Erosion

Very High

High

Moderate

Moderate / Low

Low

Very Low

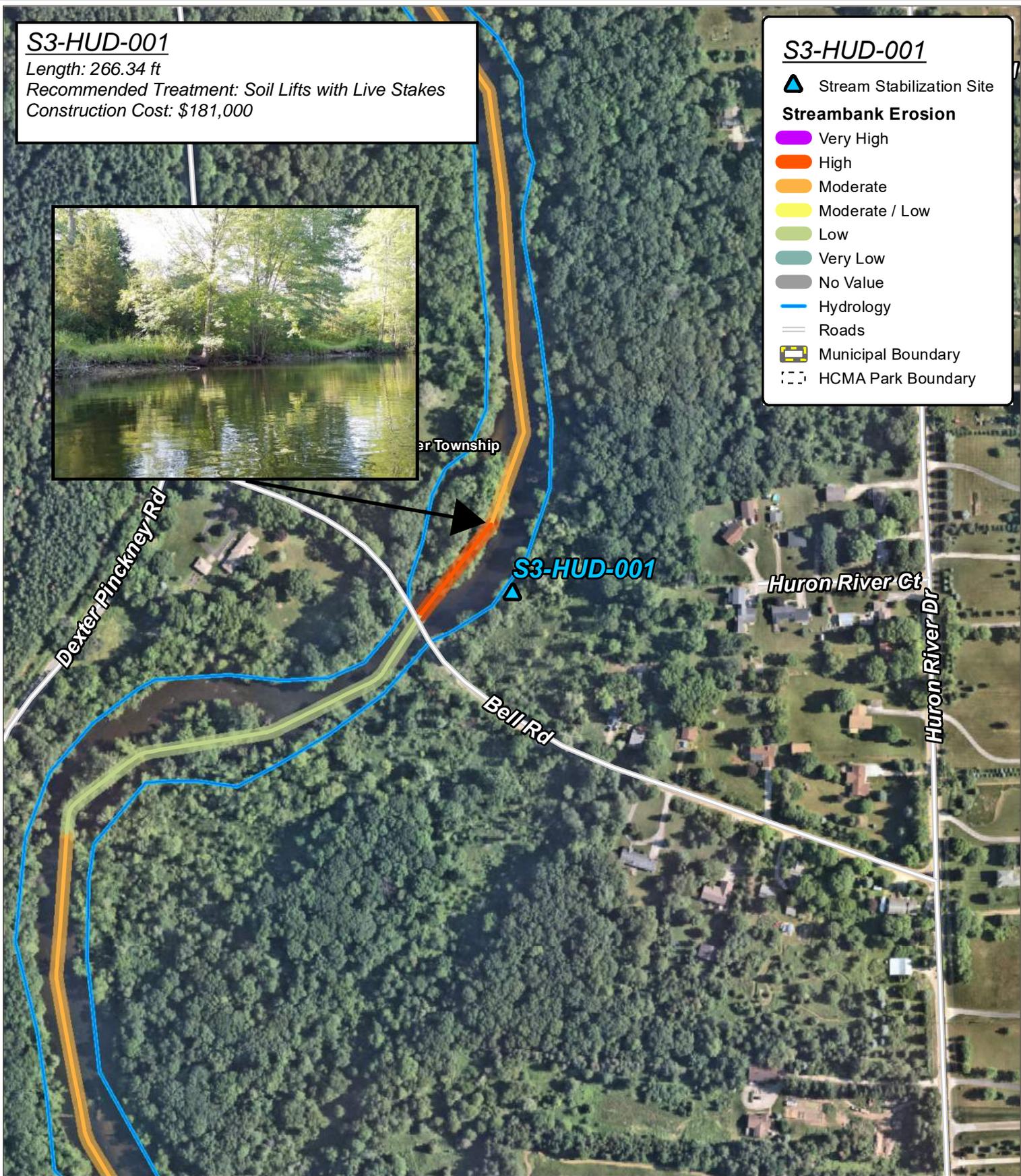
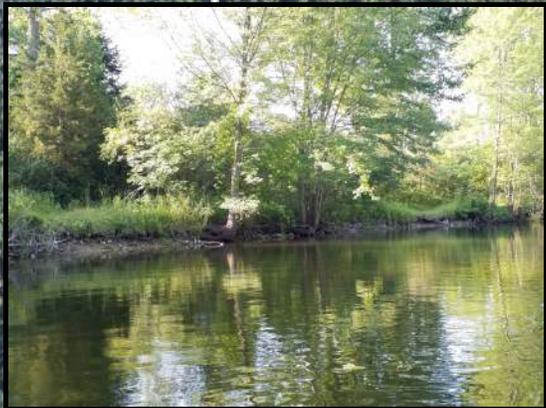
No Value

Hydrology

Roads

Municipal Boundary

HCMA Park Boundary

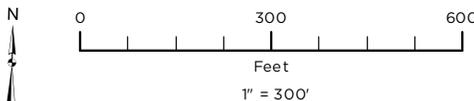


Hudson Mills Metropark Streambank Stabilization Siting

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

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S3-HUD-002

Length: 131.53 ft

Recommended Treatment: Coir Block with Live Stakes
Construction Cost: \$23,000

S3-HUD-002

▲ Stream Stabilization Site

Streambank Erosion

Very High

High

Moderate

Moderate / Low

Low

Very Low

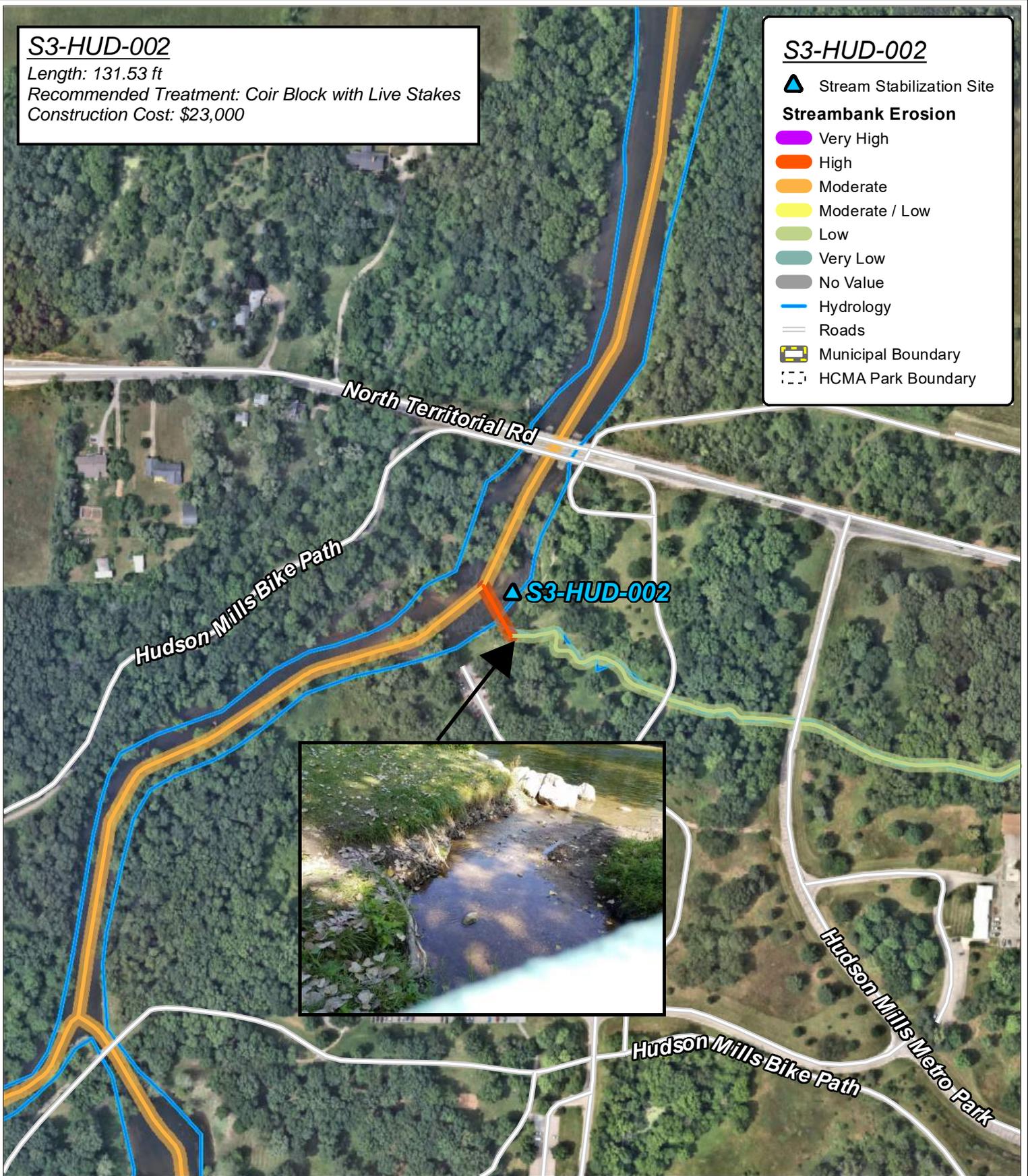
No Value

Hydrology

Roads

Municipal Boundary

HCMA Park Boundary

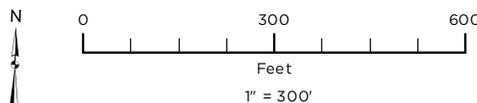


Hudson Mills Metro Park Streambank Stabilization Siting

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.

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Map Published: September 4, 2019

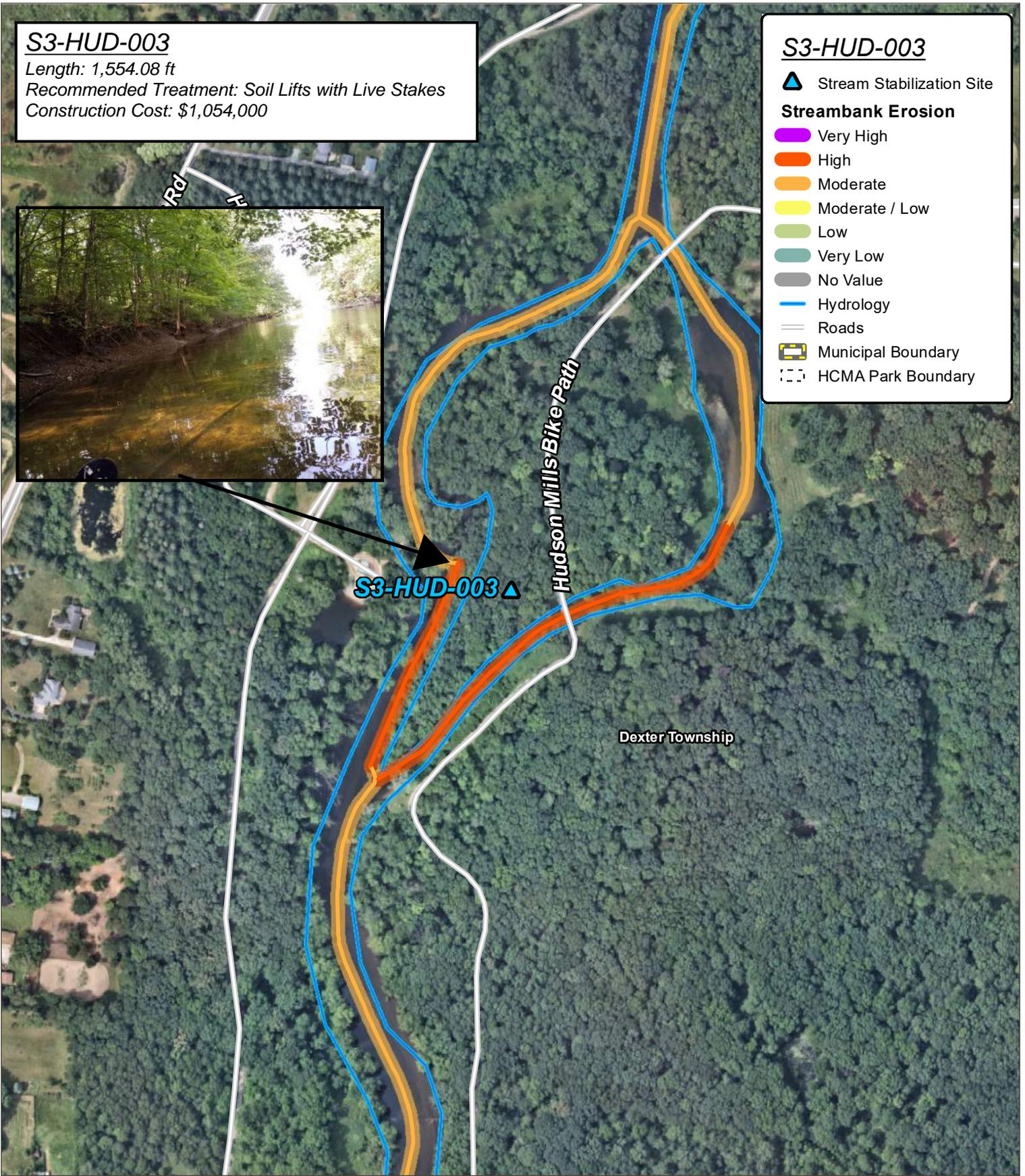


S3-HUD-003

Length: 1,554.08 ft
Recommended Treatment: Soil Lifts with Live Stakes
Construction Cost: \$1,054,000

S3-HUD-003

- ▲ Stream Stabilization Site
- Streambank Erosion**
- Very High
- High
- Moderate
- Moderate / Low
- Low
- Very Low
- No Value
- Hydrology
- Roads
- Municipal Boundary
- HCMA Park Boundary

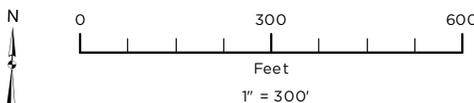


Hudson Mills Metropark Streambank Stabilization Siting

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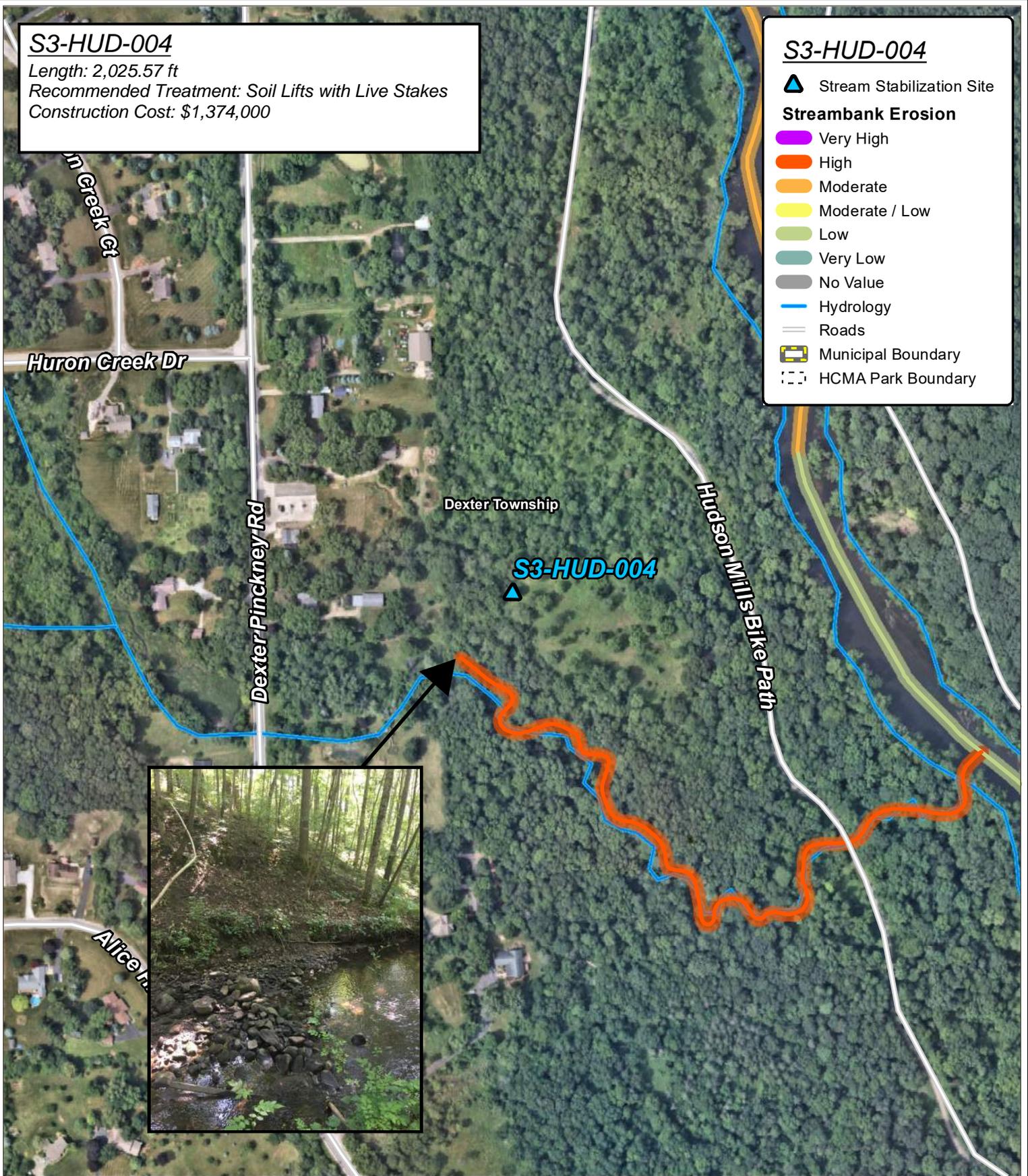


S3-HUD-004

Length: 2,025.57 ft
Recommended Treatment: Soil Lifts with Live Stakes
Construction Cost: \$1,374,000

S3-HUD-004

- ▲ Stream Stabilization Site
- Streambank Erosion**
- Very High
- High
- Moderate
- Moderate / Low
- Low
- Very Low
- No Value
- Hydrology
- Roads
- Municipal Boundary
- HCMA Park Boundary

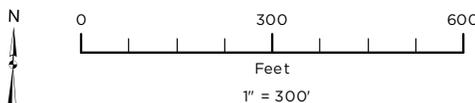


Hudson Mills Metropark Streambank Stabilization Siting

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S3-HUD-005

Length: 320.39 ft

Recommended Treatment: Coir Blocks with Live Stakes
Construction Cost: \$56,000

S3-HUD-005

▲ Stream Stabilization Site

Streambank Erosion

Very High

High

Moderate

Moderate / Low

Low

Very Low

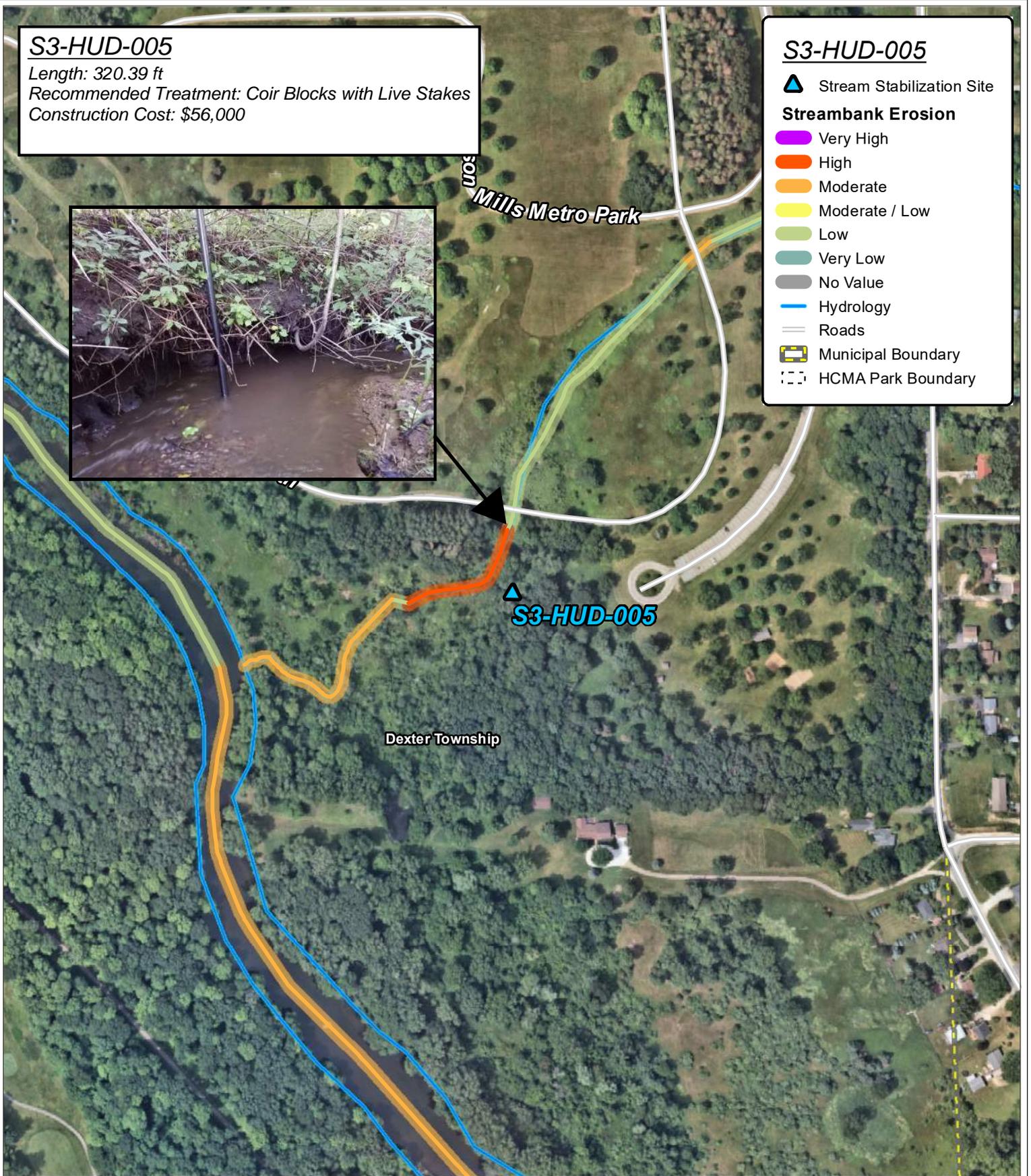
No Value

Hydrology

Roads

Municipal Boundary

HCMA Park Boundary

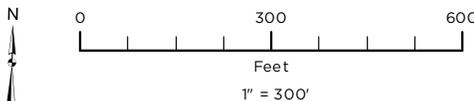


Hudson Mills Metropark Streambank Stabilization Siting

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Map Published: September 4, 2019



S3-HUD-006

Length: 274.13 ft

Recommended Treatment: Soil Lifts with Live Stakes

Construction Cost: \$186,000

S3-HUD-006

▲ Stream Stabilization Site

Streambank Erosion

Very High

High

Moderate

Moderate / Low

Low

Very Low

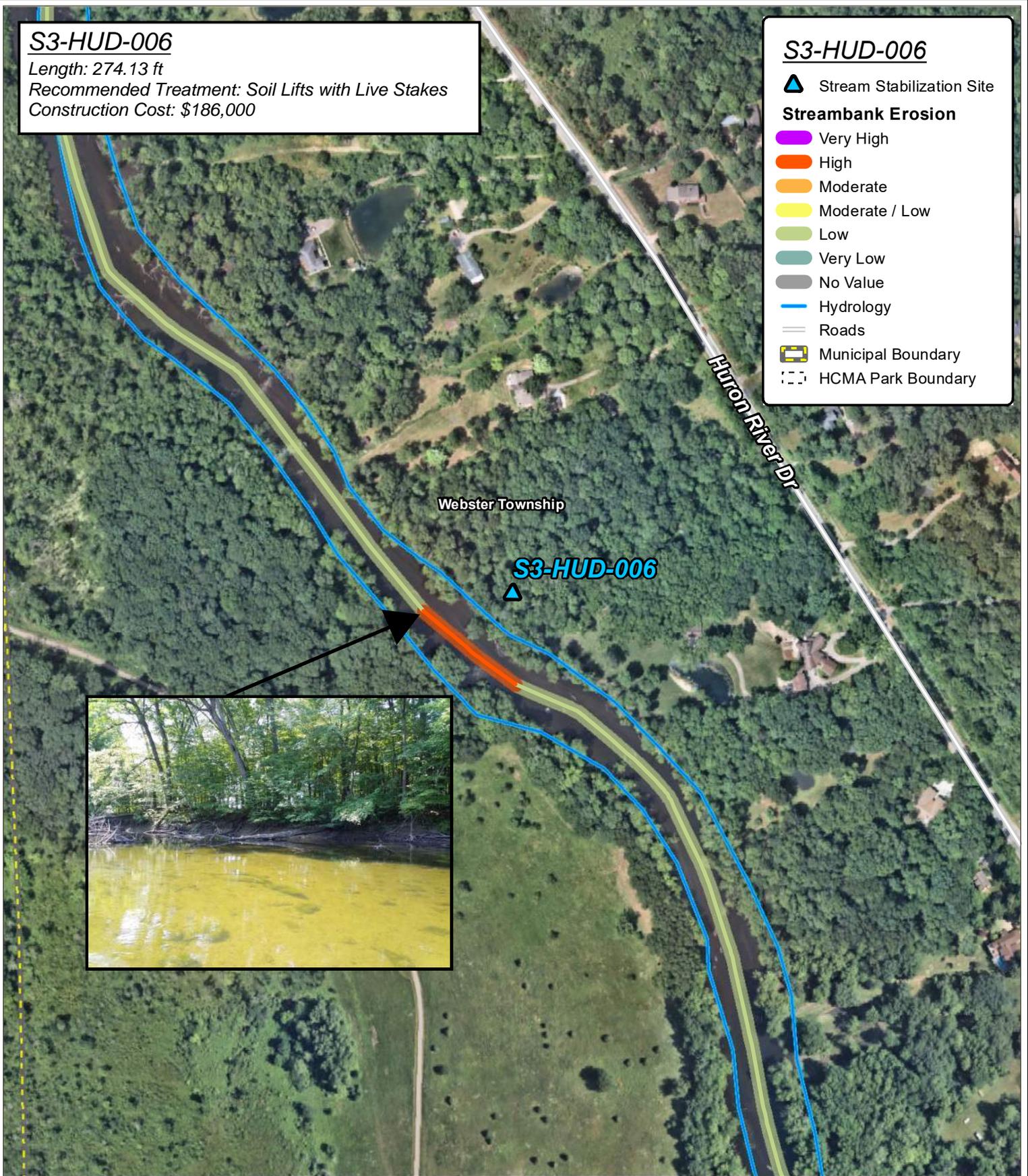
No Value

Hydrology

Roads

Municipal Boundary

HCMA Park Boundary

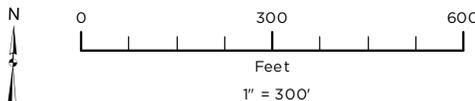


Hudson Mills Metropark Streambank Stabilization Siting

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Hudson Mills Metropark Green Infrastructure Recommendations

In Hudson Mills, 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.

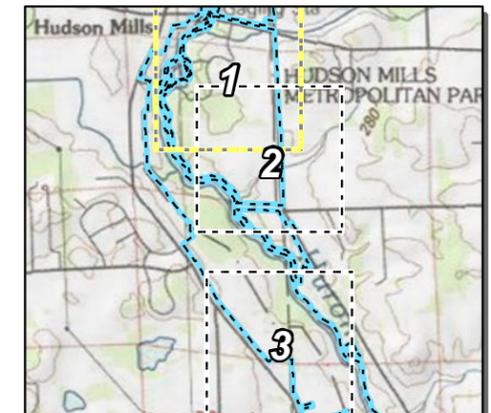
Table 6. Hudson Mills Green Infrastructure Recommendations

| Site ID | Site | Practice Type | Treatment Surface Area (ft ²) | Cost Opinion | Cost per sq ft of Treatment Area (\$/ft ²) |
|---------------|--------------|---------------------|---|------------------|--|
| GI-HUD-01 | Shelter A | Naturalized Swale | 150 | \$255 | \$1.70 |
| GI-HUD-02 | Shelter A | Bioswale | 3,340 | \$26,534 | \$7.94 |
| GI-HUD-03 | Shelter A | No-Mow | 38,016 | \$0 | \$0 |
| GI-HUD-04 | Service Area | Pavement Removal | 6,508 | \$33,764 | \$5.19 |
| GI-HUD-05 | Park Office | Naturalized Swale | 13,171 | \$22,391 | \$1.70 |
| GI-HUD-06 | Park Office | Naturalized Swale | 6,216 | \$10,567 | \$1.70 |
| GI-HUD-07 | Park Office | Rain Garden | 2,960 | \$23,516 | \$7.94 |
| GI-HUD-08 | Park Office | Rain Garden | 1,840 | \$14,618 | \$7.94 |
| GI-HUD-09 | Shelter B | Native Prairie | 17,931 | \$20,920 | \$1.17 |
| GI-HUD-10 | Shelter C | Bioswale | 2,760 | \$21,927 | \$7.94 |
| GI-HUD-11 | Shelter C | Bioswale | 3,560 | \$28,282 | \$7.94 |
| GI-HUD-12 | Golf Course | Bioswale | 5,020 | \$39,881 | \$7.94 |
| GI-HUD-13 | Golf Course | Porous Pavement | 6,000 | \$149,644 | \$24.94 |
| GI-HUD-14 | Shelter B | Native Prairie | 12,471 | \$14,550 | \$1.17 |
| GI-HUD-15 | Shelter C | Pavement Removal | 46,575 | \$278,519 | \$5.98 |
| GI-HUD-16 | Golf Course | Other- Berm Removal | | \$0 | \$0 |
| Total: | | | 166,518 | \$685,368 | |

Hudson Mills Metropark

Green Infrastructure Recommendation Areas

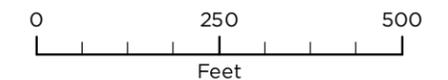
Area: 1 of 3



Recommendation Area

GSI Type

-  Bioswale (1)
-  No-Mow (1)
-  Naturalized Swale (2)
-  Other (1)
-  Stormwater Gravity Main
-  Culvert (3)
-  HCMA Park Boundary
-  Roads

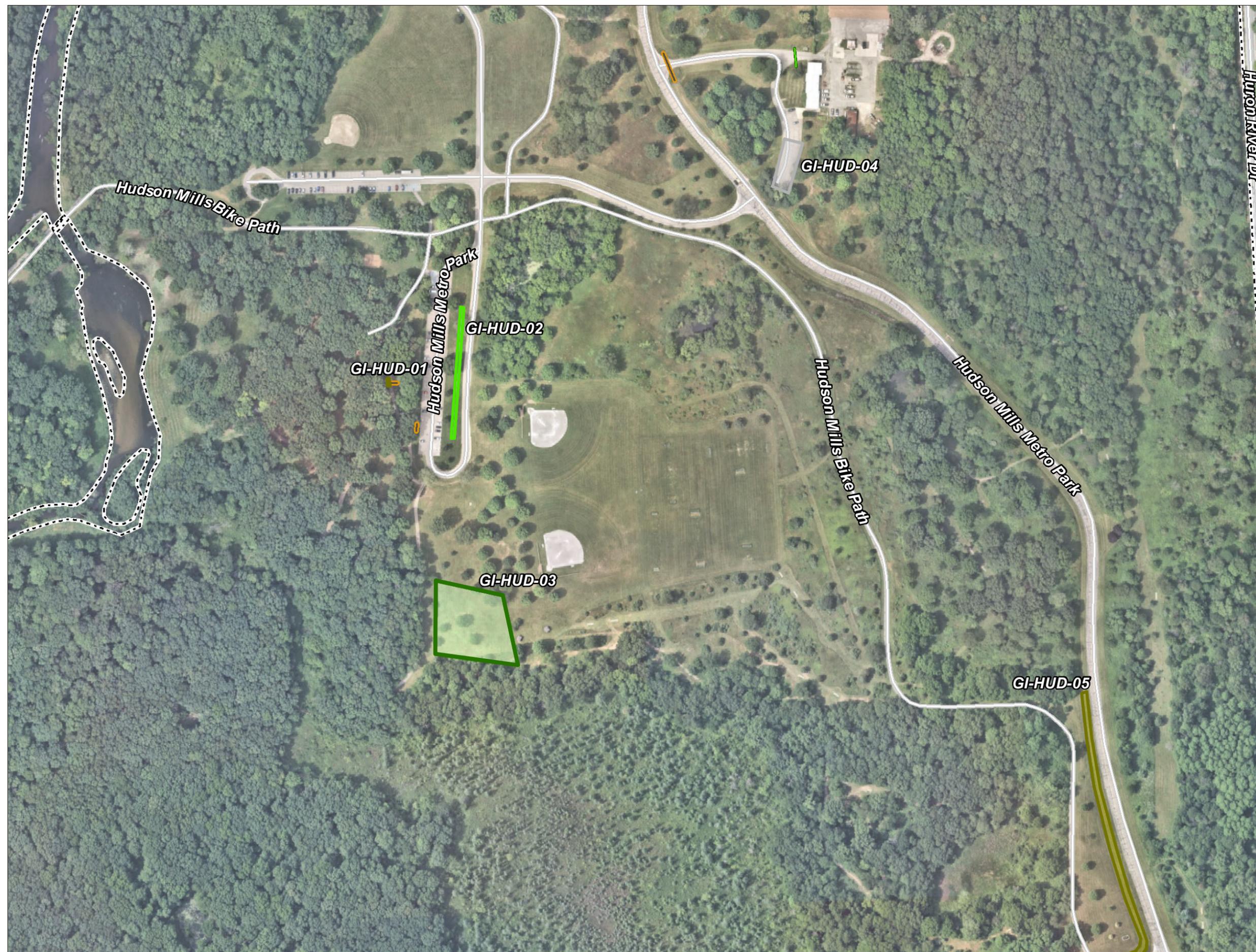


1" = 250'

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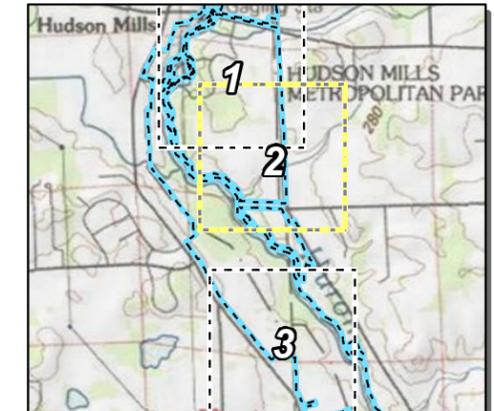
Map Published: October 1, 2019



Hudson Mills Metropark

Green Infrastructure Recommendation Areas

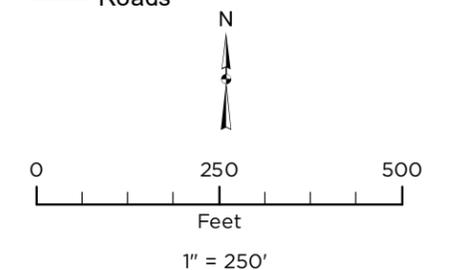
Area: 2 of 3



Recommendation Area

GSI Type

- Bioswale (2)
- Native Prairie (2)
- Naturalized Swale (1)
- Rain Garden (2)
- Pavement Removal (1)
- Stormwater Gravity Main
- Culvert (6)
- HCMA Park Boundary
- Roads



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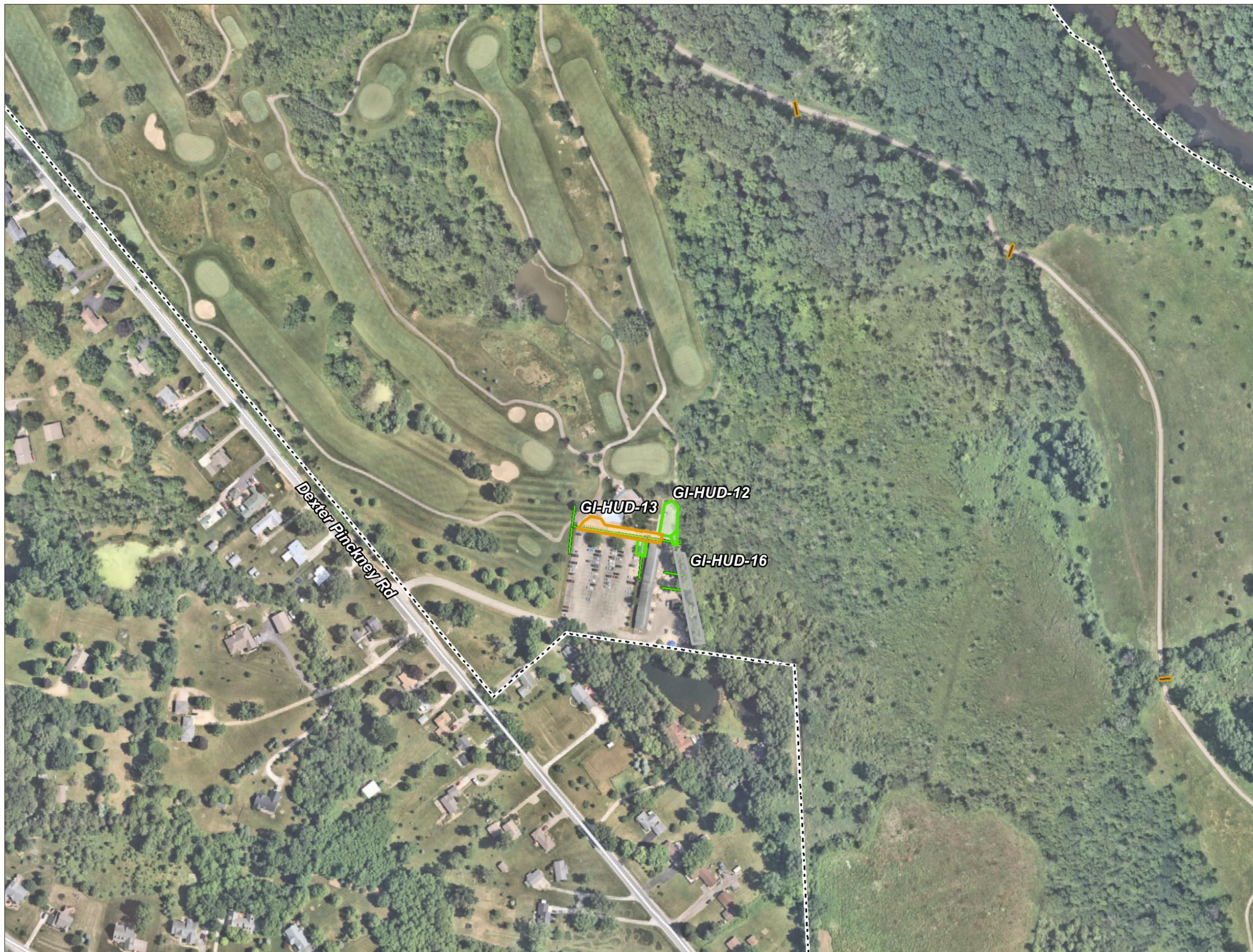
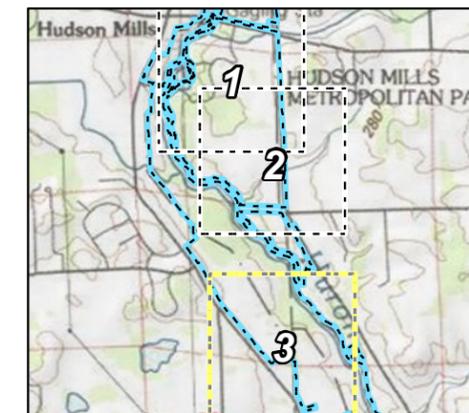
Map Published: October 1, 2019



Hudson Mills Metropark

Green Infrastructure Recommendation Areas

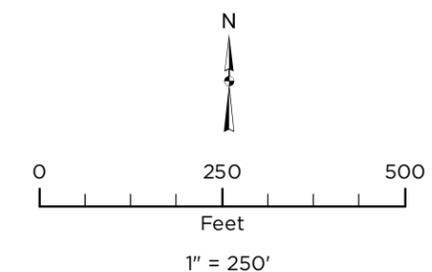
Area: 3 of 3



Recommendation Area

GSI Type

-  Bioswale (1)
-  Porous Pavement (1)
-  Other (1)
-  Stormwater Gravity Main
-  Culvert (3)
-  HCMA Park Boundary
-  Roads



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 1, 2019

Hudson Mills 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. Hudson Mills Culvert Repair Priorities

| Culvert ID | Diameter (in) | Length (ft) | Condition | Maintenance Need | Cost Opinion |
|---------------|---------------|-------------|-----------|------------------|--------------|
| CUL-HUD-017 | 36 | 25 | Fair | Future Cleanout | \$191 |
| CUL-HUD-011 | 36 | 22 | Fair | Future Cleanout | \$167 |
| Total: | | | | | \$358 |

Table 8. Hudson Mills Outfall Repair Priorities

| Outfall ID | Diameter (in) | Condition | Maintenance Need | Cost Opinion |
|--------------------|---------------|-----------|------------------|-----------------|
| SDC-HUD-016 | 20 | Failing | Replacement | \$7,500 |
| SDC-HUD-009 | 12 | Poor | Replacement | \$6,250 |
| <u>SDC-HUD-001</u> | 24 | Fair | Future Cleanout | \$250 |
| Total: | | | | \$14,000 |

Table 9. Hudson Mills Stream Stabilization Priorities

| Stream Stabilization Site ID | Length (ft) | Erosion Severity | Recommended Treatment | Unit Cost (\$/ft) | Cost Opinion |
|------------------------------|---------------|------------------|------------------------------------|-------------------|--------------------|
| <u>S3-HUD-005</u> | <u>320.39</u> | <u>High</u> | <u>Coir Block with Live Stakes</u> | <u>172</u> | <u>\$56,000</u> |
| <u>S3-HUD-002</u> | <u>131.53</u> | <u>High</u> | <u>Coir Block with Live Stakes</u> | <u>172</u> | <u>\$23,000</u> |
| S3-HUD-004 | 2,025.57 | High | Soil Lifts with Live Stakes | 678 | \$1,374,000 |
| S3-HUD-003 | 1,554.08 | High | Soil Lifts with Live Stakes | 678 | \$1,054,000 |
| S3-HUD-006 | 274.13 | High | Soil Lifts with Live Stakes | 678 | \$186,000 |
| S3-HUD-001 | 266.34 | High | Soil Lifts with Live Stakes | 678 | \$181,000 |
| Total: | | | | | \$2,874,000 |

Table 10. Hudson Mills 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) |
|------------------|---------------------|--------------------------|---|------------------|--|
| GI-HUD-01 | Shelter A | Naturalized Swale | 150 | \$255 | \$1.70 |
| GI-HUD-08 | Park Office | Rain Garden | 1,840 | \$14,618 | \$7.94 |
| GI-HUD-03 | Shelter A | No-Mow | 38,016 | \$0 | \$0 |
| GI-HUD-16 | Golf Course | Other- Berm Removal | | \$0 | \$0 |
| GI-HUD-09 | Shelter B | Native Prairie | 17,931 | \$20,920 | \$1.17 |
| GI-HUD-14 | Shelter B | Native Prairie | 12,471 | \$14,550 | \$1.17 |
| GI-HUD-05 | Park Office | Naturalized Swale | 13,171 | \$22,391 | \$1.70 |
| GI-HUD-06 | Park Office | Naturalized Swale | 6,216 | \$10,567 | \$1.70 |
| GI-HUD-12 | Golf Course | Bioswale | 5,020 | \$39,881 | \$7.94 |
| GI-HUD-11 | Shelter C | Bioswale | 3,560 | \$28,282 | \$7.94 |
| GI-HUD-02 | Shelter A | Bioswale | 3,340 | \$26,534 | \$7.94 |
| GI-HUD-10 | Shelter C | Bioswale | 2,760 | \$21,927 | \$7.94 |
| GI-HUD-07 | Park Office | Rain Garden | 2,960 | \$23,516 | \$7.94 |
| GI-HUD-15 | Shelter C | Pavement Removal | 46,575 | \$278,519 | \$5.98 |
| GI-HUD-04 | Service Area | Pavement Removal | 6,508 | \$33,764 | \$5.19 |
| GI-HUD-13 | Golf Course | Porous Pavement | 6,000 | \$149,644 | \$24.94 |
| Total: | | | 166,518 | \$685,368 | |