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Green Infrastructure Rapid Assessment Plan: Thomas Creek Watershed

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Green Infrastructure Rapid Assessment Plan

Thomas Creek Watershed

Prepared by:

The Stormwater Coalition of Monroe County and

Monroe County

Department of Environmental Services

Prepared for:

New York State Environmental Protection Fund — Round 10

December 2013

Special acknowledgement needs to be given to the Center for Watershed Protection. Staff conducting this Report relied heavily on the concepts and strategies provided by the Center in its Urban Subwatershed Restoration Manual Series (CWP, 2004) and other reports and studies conducted by the Center

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List of Abbreviations

cfs	cubic feet per second
CWP	Center for Watershed Protection
EPA	US Environmental Protection Agency
GI	Green Infrastructure
GIS	Geographic Information System
GPS	Global Positioning System
IC	Impervious Cover
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
POC	Pollutant of Concern
SWAAP	Stormwater Assessment and Action Plan
Wq	Water Quality
WS	Watershed
USGS	US Geological Survey

Section 1. Assessment Overview

1.1 PROBLEM STATEMENT:

Similar to many developing areas, growth in Monroe County has caused some unfortunate consequences to water quality. One consequence is that developed areas shed larger volumes of stormwater from impervious surfaces (roads, buildings and parking lots) than natural landscapes. Because there is more volume, there is more pollution. Typical pollutants include: petroleum products and heavy metals from vehicles; fertilizers, chemicals and animal waste from lawns; and, sediment from eroded streambanks, construction sites and roadways.

A second consequence is that streams more frequently flow full or overtop their banks. High stormwater flows can cause flooding, damage property, and harm fish and wildlife habitat. Common damages from high flows include eroded stream banks, wider and deeper stream channels, and excessive sediment deposition. This degradation results in poor water quality and added maintenance costs to municipalities and property owners. In Monroe County, stormwater pollution and associated wet weather flows have harmed virtually all urban streams, the Genesee River and Lake Ontario's shoreline.

1.2 PURPOSE:

Developing plans to improve our impacted water resources is the objective of the Green Infrastructure Rapid Assessment Plan (Plan). A method was devised to quickly evaluate multiple watersheds for stormwater retrofit potential. The main product is a ranked inventory of retrofit projects that, if constructed, may substantially improve water quality and stream health. Also, flow attenuation may reduce erosive storm flows and localized drainage problems. The Plan is a simplified version of more detailed Stormwater Assessment and Action Plans being done in other parts of Monroe County. These larger studies include water quality sampling as well as modeling the effects of the current watershed's condition and the potential improvement from proposed retrofits. The field work completed for this report was kept to a minimum and only a summary report is produced (herein). The project was conducted with funding from New York's Environmental Protection Fund, the Monroe County Department of Environmental Services, and the Stormwater Coalition of Monroe County.

1.3 SETTING:

The Thomas Creek watershed is located on the eastern side of Monroe County along the border with Wayne County. The topography of the watershed is consistent with the region which is characterized by past glacial activity, namely drumlins. From its head waters in the Town of Penfield the creek and its tributaries flows south and into the Town of Perinton. Upon reaching the Erie Barge Canal, Thomas Creek turns and flows west and through the Village of Fairport. It then continues on until emptying into the Irondequoit Creek (Figure 1). Approximately 60% of the Thomas Creek watershed is contained within the Town of Penfield with the remaining 40% in the Town of Perinton. The Village of Fairport lies entirely within the Thomas Creek watershed.

The watershed is dominated by residential land use, particularly in the Town of Perinton (Figure 2). Further north the land use gives way to more agricultural activity. The small amount of industrial and commercial land use is concentrated along the Erie Barge Canal area. Residential land use accounts for 46% of the overall watershed land use, with Vacant Land and Agricultural land use making up 20% and 18% of the watershed, respectively (Table 1).

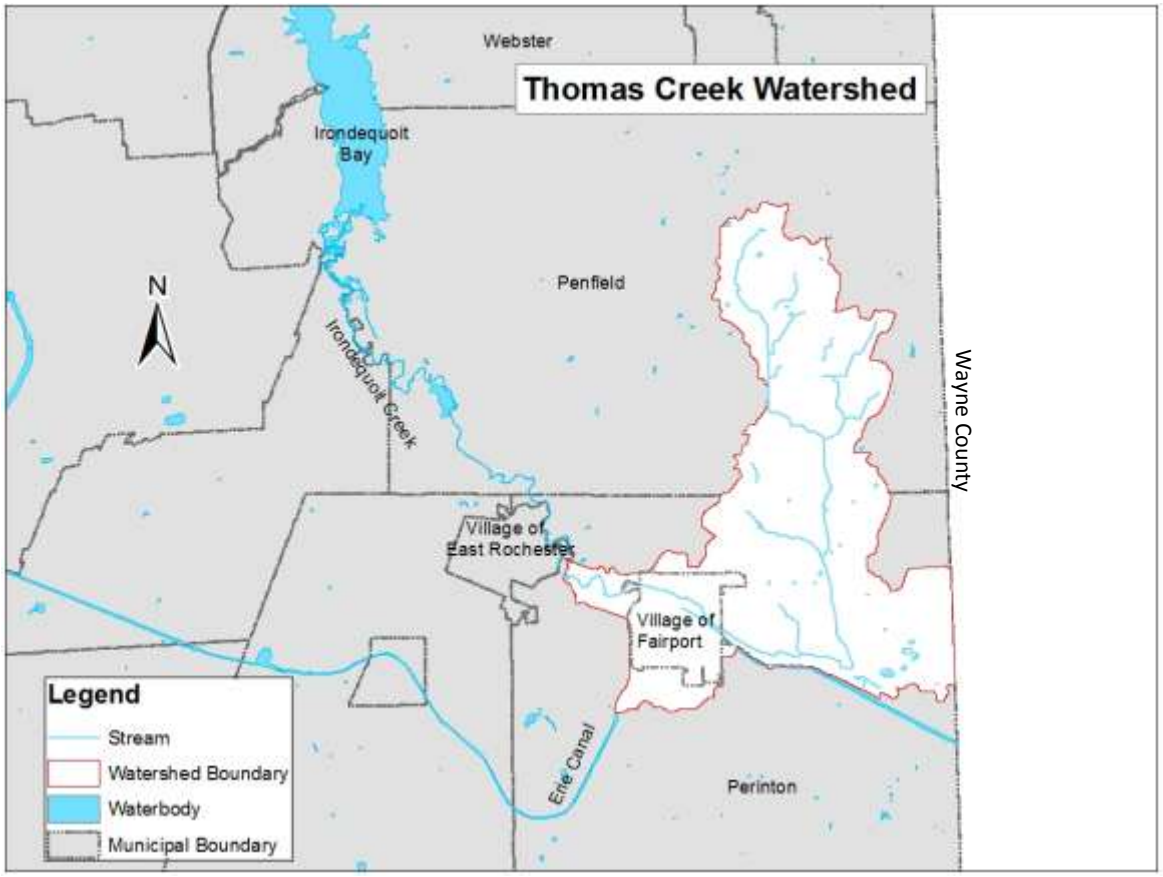

Figure 1: Thomas Creek watershed area.

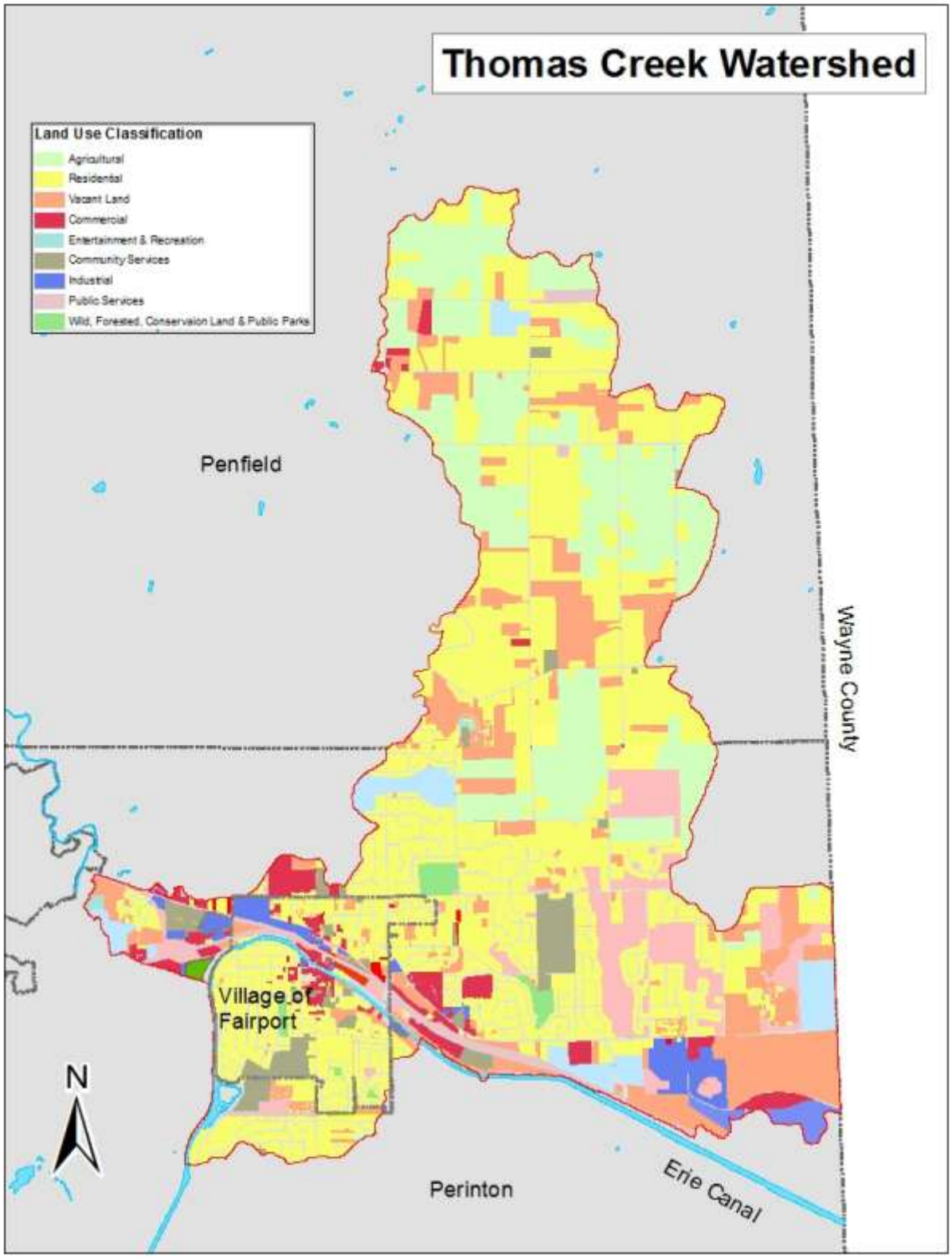

Figure 2: Land use in the Thomas Creek watershed based upon parcel data.

Table 1. Watershed Data for Thomas Creek	
Metric	**Value**
Area	9438 acres (within Monroe County limits)
Mapped Stream Length	28.7 Miles
Percent of Stream Channelized	16.41%
Primary/secondary land use	Residential/Vacant Land/Agricultural
Land Use (percent of watershed)	
Agricultural	18
Residential	46
Vacant Land	20
Commercial	3
Recreation & Entertainment	3
Community Service	3
Industrial	3
Public Services	2
Wild, Forested, Conservation Lands & Public Parks	1
# of Stormwater Treatment Ponds	≈21
# of Stormwater Outfalls	181
Current Impervious Cover (%)	19.5%
Estimated Future Impervious Cover (%)*	25%
Wetland acres	≈1022
Municipal Jurisdiction	Perinton 60%, Penfield 40%

*Based on current zoning, future impervious cover (over the next 10 years) will increase by approximately5 percent.

1.4 WATERSHED CHARACTERISTICS:

1.4.1 Water Quality Concerns According to the New York State Department of Environmental Conservation's "Lake Ontario Basin Waterbody Inventory and Priority Waterbodies List" (NYSDEC 2004), Thomas Creek is impaired for public bathing, aquatic life and recreation. Silt/sediment is a known pollutant, while nutrients and toxicity are suspected and pathogens are possible. Other sources of known pollutants include; sanitary discharge, urban/stormwater runoff, and construction. Agriculture and streambank erosion are suspected pollutants. A biological (macro-invertebrate) assessment of Thomas Creek in 1999 indicated that water quality was moderately impacted, most likely by an unknown source of toxicity. Furthermore, due to the amount of impervious surface area within the watershed, urban and stormwater runoff has been identified as the primary source of nutrients and other pollutants such as pathogens, oil, grease, and floatables. The full (two page) waterbody datasheet is included in Appendix A.

The west-to-east flowing Erie Canal intersects many north flowing streams in Monroe County, with most being conveyed underneath the Canal via large culverts. The Canal has siphon discharges to several streams in Monroe County including Thomas Creek. Since Canal water quality is generally very poor, these discharges contribute significant pollutant loads to the receiving streams. Sampling the Canal discharge to the creek from the siphon for aproximately 15 years has shown elevated turbidity, suspended solids, and volatile suspended solids. This resulted in elevated concentrations and overall higher pollutant loads in Thomas Creek. Removing these discharges is a recommendation of this report.

USGS also developed a precipitation-runoff model of Irondequoit Creek watershed to simulate the effects of land-use changes and stormflow-detention basins on flooding and stormwater pollution. Results of model simulations indicated that peak flows and loads of sediment and total phosphorus would increase in the upper (rural) watershed if it became developed. Discussions between Monroe County and USGS to update the model took place in late 2012 and are a recommendation of this report as well.

1.4.2 Impervious Cover Analysis The Center for Watershed Protection created the "Impervious Cover Model" (ICM) to predict a typical stream's health using the relationship between subwatershed impervious cover and stream quality indicators. The models accuracy has have been confirmed by nearly 60 peer-reviewed stream research studies (Figure 3) . The ICM shows stream quality decline becomes evident when the watershed impervious cover exceeds ten percent. Thomas Creek has an average of 19.5% impervious cover, placing stream quality somewhere between poor/fair and good, indicating that the stream is impacted.

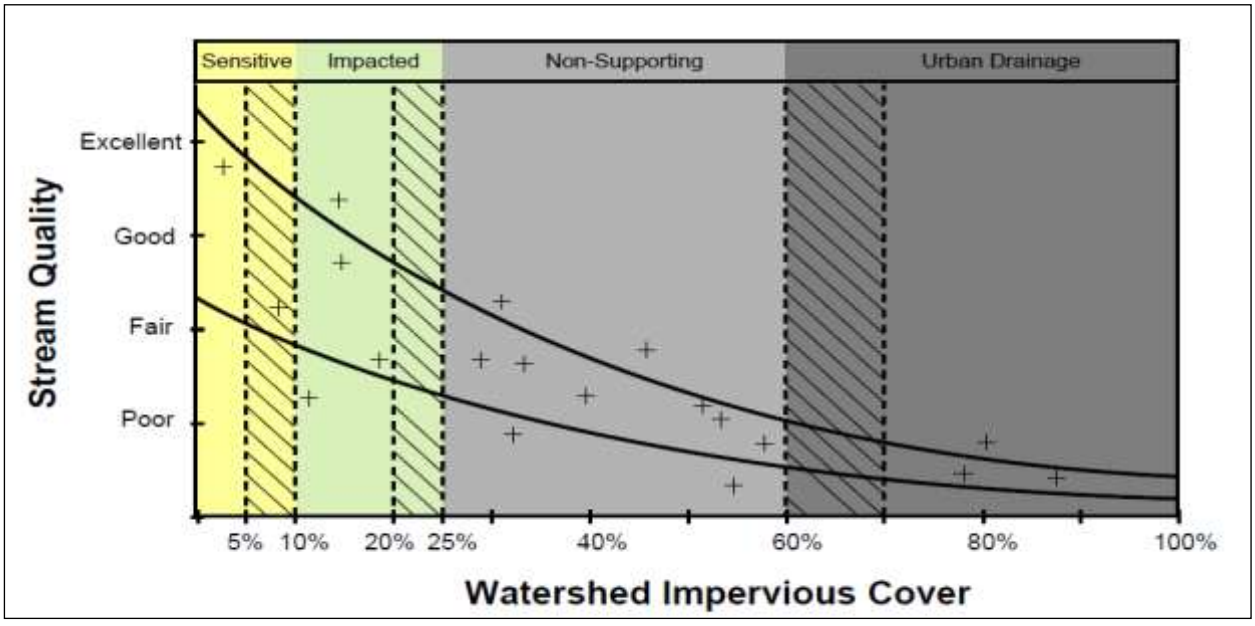

Figure 3: Impervious Cover Model

1.4.3 Streambank Erosion The limited field work involved with conducting rapid assessments means that it is difficult to identify potential erosion sites based on GIS data alone. Reports on other watersheds that do contain streambank erosion sites are partly a result of a Monroe County Soil and Water Conservation District assessment of known or recently discovered erosion sites throughout the County. Within the Thomas Creek watershed, streambank erosion was a suspected pollutant, according to the Priority Waterbodies List (NYSDEC 2004). Therefore it is likely that there are streambank erosion sites within the watershed however, they still need to be located, which would require additional procedures separate from the GIS rapid assessment methodology. It is the recommendation of this report to reach out to Towns within the Thomas Creek watershed to ask for assistance in identifying these sort of problem areas.

1.4.4 Soils A simplistic yet useful way to define how much stormwater runs off the pervious land surface is to determine soils' infiltration capabilities, or their ability to absorb stormwater. Soil scientists have categorized soils into four categories, A through D. A and B soils are well drained and absorb much of the stormwater that drains on or over them. C and D soils are more poorly drained. Figure 4 shows the hydrologic soils in Thomas Creek watershed. The soils in some parts of the watershed are not categorized, denoting areas that have been so altered by land development that grouping a specific soil type is not feasible. The amount of each soil type within the Thomas Creek watershed is: A soils 3%; B soils 61%; C soils 16%; D soils or not verified 20% .

The predominance of B soils will allow for infiltration-type stormwater retrofits. These practices, installed in the upper parts of the watershed, may prevent and reduce flooding, drainage problems, and streambank erosion down stream. Preventing or reducing these types of issues can improve water quality in the Thomas Creek watershed.

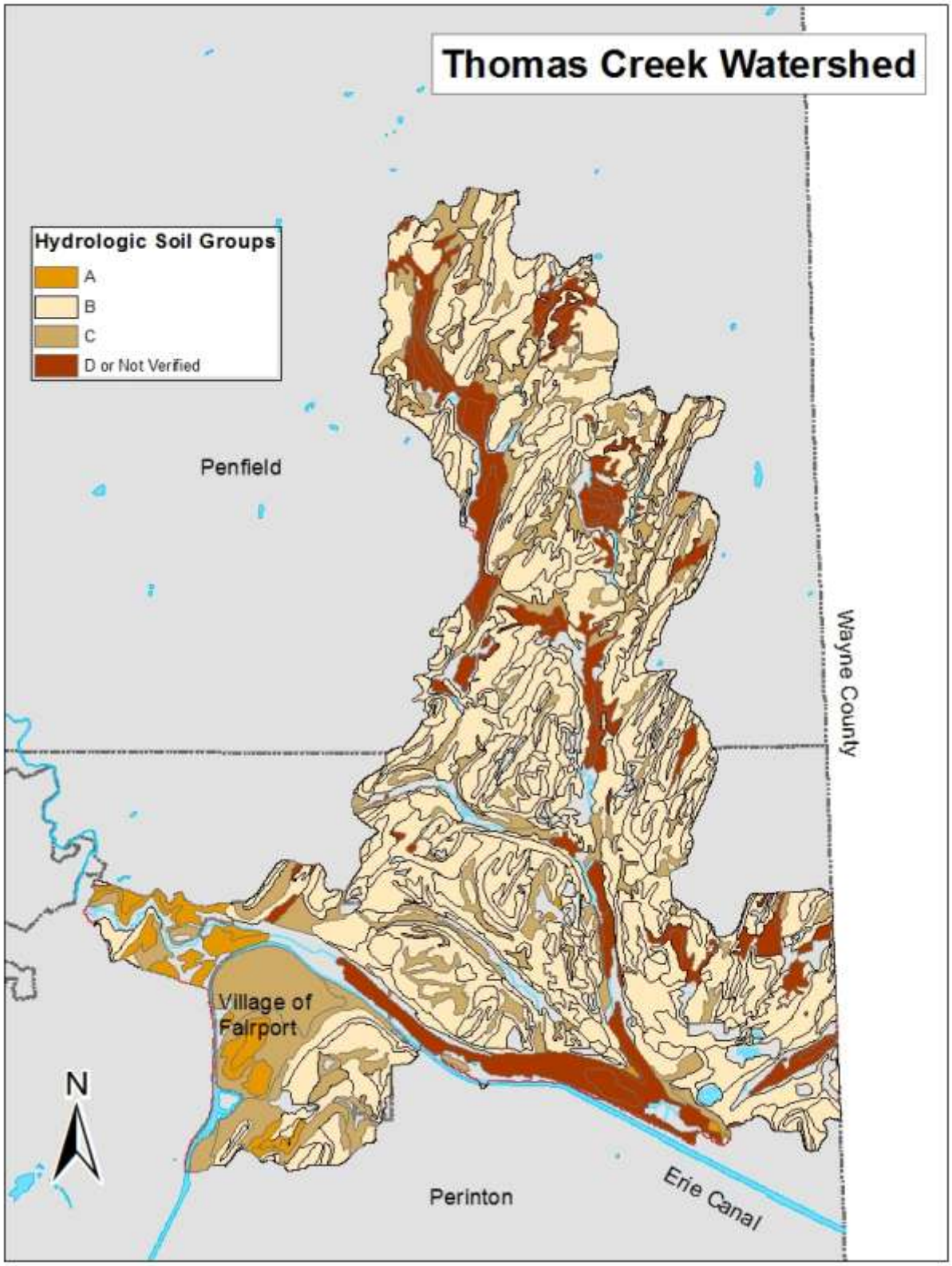

Figure 4: Thomas Creek hydrologic soils

Section 2. Retrofit Inventory

An inventory of potential retrofit sites was generated using GIS to locate public properties, stormwater practices like ponds, old urban areas (built before stormwater management requirements) and, pervious soil areas. Next, the appropriate stormwater management practice was determined for the properties identified. These were then ranked based on their feasibility, how much they would improve water quality and, their cost effectiveness. While the stormwater management practice types focused on green infrastructure (stormwater volume-reducing practices such as infiltration), project types include retrofitting stormwater ponds as a highly cost-effective practice. Stormwater pond projects rank well and are a recommended component of watershed restoration. Complete details of methods used to complete the rapid assessment and retrofit ranking are explained in a reference document titled "Assessment Methodology, Project Descriptions, and Retrofit Ranking Criteria For Monroe County Green Infrastructure Rapid Assessment Plans".

Two broad categories of retrofit project types were considered:

1. New stormwater ponds, upgrades to existing stormwater ponds and adding stormwater storage to existing drainage channels.

2. Green Infrastructure (GI). This category was divided and ranked by where a GI project might be installed and includes:
   - Public Right of Ways,
   - Older Residential Neighborhoods, and
   - Other Locations (such as areas with large impervious surfaces ie shopping malls)

Green infrastructure projects can be installed on private property as well as in the right of way on neighborhood streets, major roadways, and highways. These types of projects involve the modification of concrete channels and stormwater conveyance systems. Green infrastructure projects on private property involve the installation of rain gardens to capture and retain roof runoff. Figure 5 shows project locations within the watershed. Table 2a and 2b lists project addresses and how they scored.

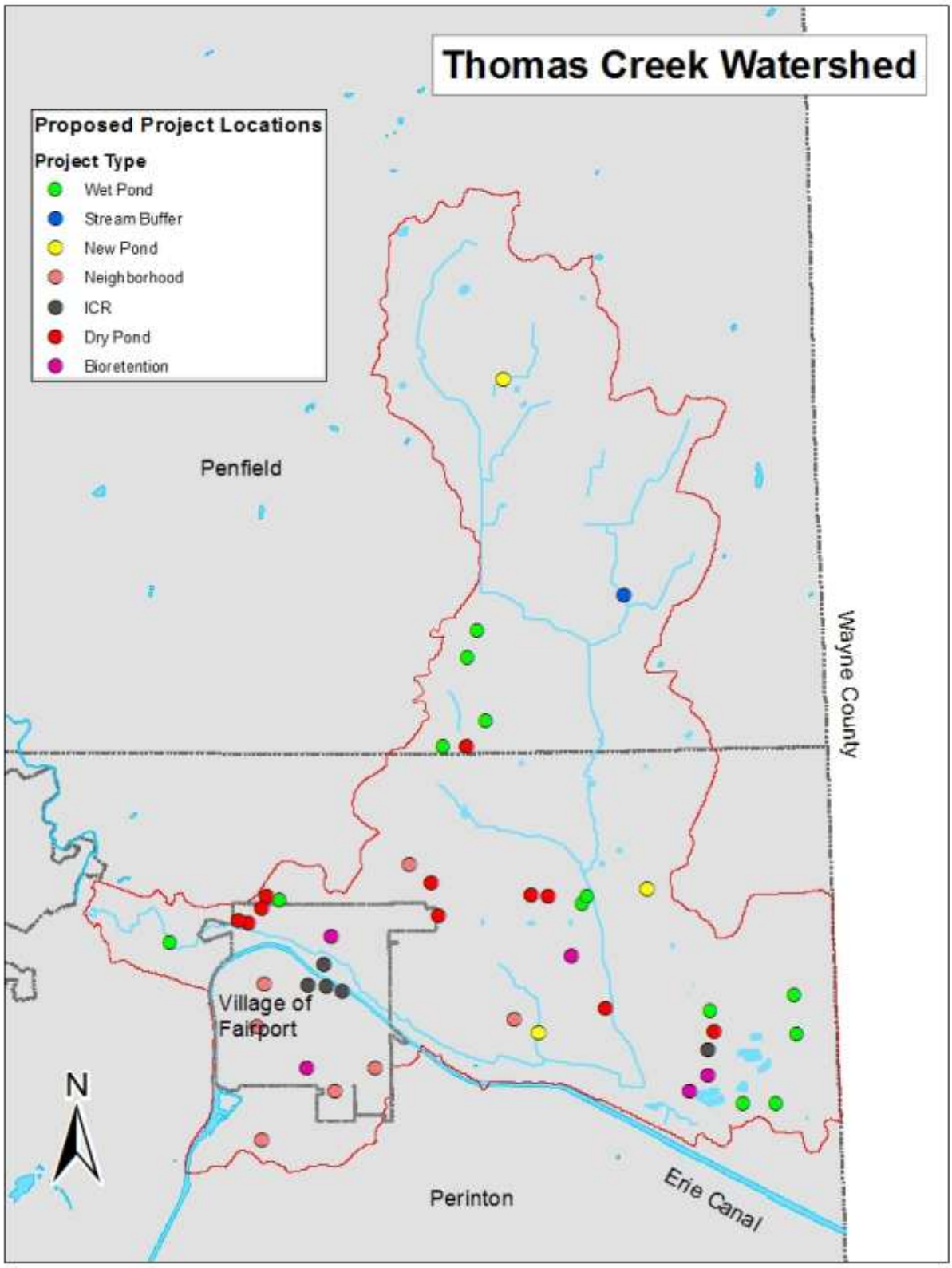

Figure 5: Thomas Creek project sites

Table 2a: Thomas Creek Retrofit Ranking List							
Map I.D	**Project Type**	**Overall Rank**	**Project Location**	**Feasability**	**Watershed Benefits**	**Cost Effectiveness**	**Score**
D4	Dry Pond	1	Behind 34 Rescommon Cresant	4	I, FS, WQ, CP	3	12
D7	Dry Pond	2	499 Fellows Rd	4	I, FS, WQ, E	3	12
P2	New Pond	3	Behind 7 Squirrels Heath Rd	4	I, FS, WQ, CP	3	12
P3	New Pond	4	Behind 21 Hyacinth Lane	4	I, FS, WQ, CP	3	12
O5	ICR	5	50 South Main St	4	I, CR, WQ, E, SC	2	12
W4	Wet Pond	6	20, 22, 24 Glen Eagle Way	3	I, FS, WQ, CP	3	11
W7	Wet Pond	7	Perinton Parkway (across from WM)	3	I, FS, WQ, CP	3	11
W9	Wet Pond	8	Macedon Center Road - Magnolia Manor (S)	4	I, FS, WQ	3	11
W10	Wet Pond	9	Macedon Center Road - Magnolia Manor (N)	4	I, FS, WQ	3	11
W11	Wet Pond	10	Behind 295 Wakeman Rd	4	I, FS, WQ	3	11
D7	Dry Pond	11	Corner of Macedon Center and Wakeman Rd	4	I, FS, WQ	3	11
D1	Dry Pond	12	Across from 3 Windchase Rise	4	I,FS, WQ	3	11
D2	Dry Pond	13	Next to 16 Dona Lea	4	I, FS, WQ	3	11
D3	Dry Pond	14	Across from 2 Edendery Circle	4	I, FS, WQ	3	11
D5	Dry Pond	15	Portage Circle	4	I, FS, WQ	3	11
W13	Wet Pond	16	Next to 4 Lanaray Park	4	I, FS, WQ	3	11
O6	Bioretention	17	181 Hamilton Rd	3	I, CR, WQ, E, SC	2	11
O7	ICR	18	Pleasant St	4	I, CR, WQ, SC	2	11
D7	Dry Pond	19	815 Whitney Rd	4	I, FS, WQ	3	11
W6	Wet Pond	20	45 Oconnor Rd	2	I, FS, WQ, CP	3	10
W8	Wet Pond	21	45 Perinton Parkway	3	I, FS, WQ	3	10
O4	Bioretention	22	85 Potter Place	3	I, WQ, SC, E	2	10
P1	New Pond	23	1727 Harris Rd	2	I, FS, WQ, CP	3	10

Table 2b: Thomas Creek Retrofit Ranking List Continued

Map I.D	Project Type	Overall Rank	Project Location	Feasability	Watershed Benefits	Cost Effectiveness	Score
D5	Dry Pond	24	815 Whitney Rd West	3	I, FS, WQ	3	10
D6	Dry Pond	25	815 Whitney Rd West	3	I, FS, WQ	3	10
O10	ICR	26	9 Liftbridge Lane	4	I, WQ, SC	2	10
W1	Wet Pond	27	34 Helmsford Way	2	I, FS, WQ	3	9
W2	Wet Pond	28	50 Helmsford Way	2	I, FS, WQ	3	9
W5	Wet Pond	29	Nine Mile Point Rd, Office Complex	2	I, FS, WQ	3	9
W12	Wet Pond	30	2 Hamilton Rd	2	I, FS, WQ	3	9
O2	ICR	31	15 Parker St	3	I, WQ, SC	2	9
D8	Dry Pond	32	65-75 Sonoma Drive	2	I, FS, WQ	3	9
O3	ICR	33	72 Perinton Parkway	3	I, WQ, SC	2	9
W12	Wet Pond	34	60 Fellows Rd	2	I, FS, WQ	3	9
O8	Bioretention	35	130 Perison Prwy	3	I, WQ, SC	2	9
O1	Bioretention	36	130 Perinton Parkway	2	FS, WQ, SC	3	8
N1	Neighborhood	37	Brambleridge	2	WQ, CR, E, SC	2	8
N4	Neighborhood	38	Fairport Manor	2	WQ, CR, E, SC	2	8
N2	Neighborhood	39	Summit Heights	2	WQ, CR, E, SC	2	8
N3	Neighborhood	40	Whitney Courtry	2	WQ, CR, E, SC	2	8
N5	Neighborhood	41	Whitney Farms	2	WQ, CR, E, SC	2	8
N6	Neighborhood	42	Fairport Terrace/Meadows	2	WQ, CR, E, SC	2	8
N7	Neighborhood	43	Residential Area N of Church St & W of Perrin	2	WQ, CR, E, SC	2	8
O9	Bioretention	44	20 East Ave	2	I, WQ, SC	2	8

References:

Center for Watershed Protection. 2004a. *Unified Stream Assessment: A User's Manual*. Manual 10 in the Urban Subwatershed Restoration Manual Series. Center for Watershed Protection, Inc. Ellicott City, MD.

2004b. *Unified Subwatershed and Site Reconnaissance: A User's Manua*l. Manual 11 in the Ur ban Subwatershed Restoration Manual Series.

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2007. *Stormwater Retrofit Practices*. Manual 3 in the Urban Subwatershed Restoration Manual Series.

New York State Department of Environmental Conservation. 2004. *Ontario Basin Waterbody Inventory and Priority Waterbodies List, Revised 2007*

USGS. Coon, W.F., 2003, Simulating Land-Use Changes and Stormwater-Detention Basins and Evaluating their Effect on Peak Streamflows and Stream-Water Quality in Irondequoit Creek Basin, New York

Sherwood, D.A., 2003, Water Resources of Monroe County, New York, Water Years 1997-99, with Emphasis on Water Quality in the Irondequoit Creek Basin--Atmospheric Deposition, Ground Water, Streamflow, Trends in Water Quality, and Chemical Loads to Irondequoit Bay

Sherwood, D.A., 2006, Water resources of Monroe County, New York, water years 2000-02: Atmospheric deposition, ground water, streamflow, trends in water quality, and chemical loads in streams

APPENDIX A

NYSDEC PWL Datasheet

Thomas Creek/White Brook (0302-0023) — Impaired Seg

Waterbody Location Information

Revised: 05/08/2007

Water Index No:	Ont 108/P113- 3-12	**Drain Basin:**	Lake Ontario
Hydro Unit Code:	04140101/020 **Str Class:** B		Irondequoit/Ninemile
Waterbody Type:	River	**Reg/County:**	8/Monroe Co. (28)
Waterbody Size:	28.7 Miles	**Quad Map:**	FAIRPORT (I-11-4)
Seg Description:	stream and tribs, from mouth to NYS Barge Canal		

Water Quality Problem/Issue Information

(CAPS indicate MAJOR Use Impacts/Pollutants/Sources)

Use(s) Impacted	Severity	Problem Documentation
PUBLIC BATHING	Impaired	Known
AQUATIC LIFE	Impaired	Known
RECREATION	Impaired	Known

Type of Pollutant(s)

Known:	Silt/Sediment
Suspected:	NUTRIENTS, UNKNOWN TOXICITY
Possible:	Pathogens

Source(s) of Pollutant(s)

Known:	OTHER SANITARY DISCH, URBAN/STORM RUNOFF, Construction
Suspected:	Agriculture, Streambank Erosion
Possible:	- - -

Resolution/Management Information

Issue Resolvability: 1 (Needs Verification/Study (see STATUS))
Verification Status: 2 (Problem Verified, Cause Unknown)
Lead Agency/Office: DOW/Reg8 **Resolution Potential:** Medium
TMDL/303d Status: 3b*

Further Details

Aquatic life support, public bathing and recreational uses in Thomas/White Creek are impaired by unspecified toxicity, nutrients and various other pollutants likely from urban/stormwater runoff and other nonpoint sources in the watershed.

NYSDEC Rotating Intensive Basin Studies (RIBS) Intensive Network monitoring of Thomas Creek in East Rochester, Monroe County, (at Baird Road) was conducted in 2000. Intensive Network sampling typically includes macroinvertebrate community analysis, water column chemistry, sediment and invertebrate tissues analysis and toxicity evaluation. During this sampling the biological (macroinvertebrate) sampling results indicated moderately impacted water quality conditions. Impact Source Determination indicated toxicity to be the primary factor affecting the fauna. Nutrient Biotic Indices also indicated nutrient levels corresponding to eutrophic conditions in the stream. Water column sampling revealed dissolved solids to be a parameter of concern, with values often slightly above the assessment criterion. Bottom sediment sampling results revealed no substances to be exceeding the Probable Effects Level - a level at which adverse impacts are expected. However several PAHs were found at levels exceeding the Threshold Effects Level - levels at which adverse impacts occasionally occur. Toxicity testing of the water column found one of three

samples showed severe reproductive impacts and indications of significant mortality as well. (DEC/DOW, BWAM/RIBS, September 2005)

A biological (macroinvertebrate) assessment of Thomas Creek in East Rochester was also conducted in 1999 during the Biological Screening effort in the basin. Sampling results also indicated moderately impacted water quality conditions and strongly suggested the presence of toxicity, the source of which was undetermined. A 1998 assessment conducted by Dr. William Sutton in cooperation with NYSDEC found slight to moderate impacts. Both assessments indicate the presence of nutrient enrichment in the stream. (DEC/DOW, BWAM/SBU, January 2001)

Urban and stormwater runoff related to the high degree of impervious surface area (shopping plazas, parking lots, roadways, etc) has been identified as the primary source of nutrients and other pollutants (pathogens, oil and grease, floatables) to the creek. Agricultural activities in the upper watershed, impacts from failing and/or inadequate on-site septic systems, tributary stream erosion and residential and commercial development throughout the watershed are also thought to contribute to nutrient and silt/sediment loadings. (Monroe County WQCC, May 2001)

Considerable bay and watershed water quality management and monitoring efforts are continuing. Municipalities within the watershed have formed the Irondequoit Watershed Collaborative. IWC activities have focused on comprehensive stormwater management efforts and (with USGS) hydrologic modeling to predict the impact of land use changes. Efforts within Monroe County include the establishment of a collaborative to assist with the implementation of phase II stormwater regulations. The Monroe County WQCC has evaluated road salt use and conducted a residential lawn care education project. A town highway facility is the focus of a pollutant removal demonstration project being conducted with NYS DEC funding. (Monroe County WQCC, May 2001)

The Monroe County Environmental Health Laboratory has maintained a cooperative monitoring program with USGS which grew out of a Nationwide Urban Runoff Program effort on Irondequoit Basin in 1980s. Subsequent USGS reports on water quality in the basin have been published in 1996, 1997 and 1999. (Monroe County Environmental Health Laboratory, May 2001)

This segment includes the portion of the stream and all tribs from the mouth to the NYS Barge Canal. The waters of the stream are Class B. Tribs to this reach/segment, including Commission Ditch (-3), are Class B and C. (May 2001)