Save the Rain Program Green Infrastructure Maintenance Manual

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Prepared for Onondaga County, New York



April 2013





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Prepared by CH2MHILL.

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Save the Rain: Green Infrastructure Program Green Infrastructure Maintenance Manual

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DATE:	April 4, 2013

Background

Onondaga County, New York, has been implementing an amended consent judgment (ACJ) for control of combined sewer overflows (CSOs) to Onondaga Lake. The ACJ was amended in 2009 to incorporate green infrastructure as an approach to CSO reduction and to balance grey and green infrastructure (GI) implementation to achieve 95% CSO reduction by December 31, 2018. Under CH2M HILL, the GI Program Manager, 97 GI projects have been designed and constructed since inception of the County's Save the Rain Program (STR) in 2010. Specific maintenance agreements with private property owners are still under development, however, it is understood that all GI projects will require regular maintenance to ensure performance.

In 2012, Standard Maintenance Procedures (SMPs) were prepared for 13 GI maintenance activities and several GI maintenance training sessions were held. In addition, pilot asset lists and maintenance schedules were prepared for several of the 2010 GI projects to test uploading of information into the County's computerized maintenance management system, Maximo. Modifications, updates, and additions to the 2012 information, are included in this 2013 GI Maintenance Manual.

Table of Contents

The following items are included:

- Table 1 summarizes: the SMPs, the maintenance task, and the GI asset requiring the associated SMP. Table 1 also applies a craft to each SMP, which is a category created for Maximo hierarchy and organization.
- Table 2 defines the full suite of green assets that are part of each craft and includes the unit of measurement. This table forms the basis of a look-up table for each project asset list provided in Appendix C. This is a new table in this 2013 version of the Manual.

- Table 3 provides a matrix relating each SMP to the 13 various types of GI technologies. Each project asset list in Appendix C references one or more of these technologies. This is a new table in this 2013 version of the Manual.
- Table 4 depicts the seasonal activity of each SMP. Many activities occur at varying intervals, year after year, and the Notes section includes the specific time range of activities. This is a new table in this 2013 version of the Manual.
- Table 5 provides a summary of the required equipment and supplies needed for GI maintenance activities, and groups those items that unique to the GI Program separately from those items would be shared with other departments.
- Table 6 shows an estimate of labor needs for maintenance of the Connective Corridor Phase 1 projects C-29A, C-29B, and C-29C. This was developed upon request specifically for the Connective Corridor project for informational/discussion purposes. This is a new table in this 2013 version of the Manual.
- Table 7 provides an overview of the frequencies and responsible party associated with each SMP. It is understood that Green Improvement Fund (GIF) and other privately-owned properties are excluded. This is a new table in this 2013 version of the Manual.
- Table 8 provides the estimated life expectancy of each asset identified in the GI Projects. This is a new table in this 2013 version of the Manual.
- Appendix A includes the draft SMPs completed to date. The format of the SMPs has been developed to match required inputs to Maximo.
- Appendix B includes the Maintenance Report Logs to be used when performing maintenance activities.
- Appendix C includes detailed assets lists for constructed projects.
- Appendix D includes the PowerPoint presentation given at the Maintenance Training Workshop held in March 2011.
- Appendix E includes the Green Infrastructure Fact Sheets
- Appendix F includes the Landscape Identification Manual

SMP ID #	Maintenance Task	GI Asset Included	Craft
SMP-01	Porous Pavement Vacuuming	Porous Asphalt, Porous Concrete, Porous Pavers, Flexible Pavement	Paving
SMP-02	Porous Pavement Power Washing	Porous Asphalt, Porous Concrete, Flexible Pavement	Paving
SMP-03	Porous Paver Maintenance (Restoring Aggregate)	Porous Pavers	Paving
SMP-04	Stormwater Structure Cleaning	Catch basins, Inlets, Manholes, Observation Wells, Cleanouts, Domed PVC Risers	Drainage
SMP-05	Inlet Filter Insert Cleaning or Filter Insert Pouch Replacement	Inlet Filter Bags, Filter Inserts	Drainage
SMP-06	Green Roof Maintenance	Green Roof	Roof
SMP-07	Riverstone Edge Maintenance	Riverstone Edge/Stone Gutter	Drainage
SMP-08	Winter Maintenance for Porous Pavements	Porous Asphalt, Porous Concrete, Porous Pavers, Flexible Pavement	Paving
SMP-09 (a)	Tree General Maintenance, Weeding, Mulching, Soil Amendment	Trees	Trees
SMP-09 (b)	Landscaping Areas General Maintenance, Weeding, Mulching	Planters, Plant Beds, Rain Gardens, Bioswales,	Landscaping
SMP-09 (c)	Meadow Inspection, Control of Invasive Species	Meadows	Landscaping
SMP-10 (a)	Tree Watering	Trees	Trees
SMP-10 (b)	Landscape Watering	Planters, Plant Beds, Rain Gardens, Bioswales, Meadows	Landscaping
SMP-11 (a)	Tree Pruning	Trees	Trees
SMP-11 (b)	Landscape Pruning	Planters, Plant Beds, Rain Gardens, Bioswales	Landscaping
SMP-12	Meadow Mowing	Meadows	Meadow
SMP-13	Landscape Replacement (excludes Trees)	Planters, Plant Beds, Rain Gardens, Bioswales, Meadows	Landscaping

Table 1. Standard Maintenance Procedures (SMPs) ID, Task, Assets and Craft

Craft	Asset ID	Asset Item	Asset Unit
	D-1	Perforated Pipe	Linear Feet (LF)
	D-2	Solid Pipe	Linear Feet (LF)
	D-3	Channel with Grate (Trench Drain)	Linear Feet (LF)
	D-4	Manhole	Each (ea)
	D-5	Catch Basin	Each (ea)
	D-6	Outlet Riser	Each (ea)
lge	D-7	Overflow Control Structure	Each (ea)
aine	D-8	Inlet	Each (ea)
Dra	D-9	Inlet Filter Insert / Filter Basket	Each (ea)
	D-10	Curb Stormwater Inlet	Each (ea)
	D-11	Downspout Outfall	Each (ea)
	D-12	Cleanout	Each (ea)
	D-13	Observation Well/Port	Each (ea)
	D-14	Anti-seep Collar	Each (ea)
	D-15	Modular Storage System	Square Feet (SF)
ß	L-1	Planting Area / Landscape Bed / Shrubs	Square Feet (SF)
pin	L-2	Meadow	Square Feet (SF)
lsca	L-3	Mulch	Square Feet (SF)
anc	L-4	Riverstone Edging	Square Feet (SF)
	L-5	Rip-Rap Apron	Square Feet (SF)
ses	T-1	Tree: Existing	Each (ea)
Tre	T-2	Tree: New	Each (ea)
	P-1	Porous Asphalt	Square Feet (SF)
ස	P-2	Porous Concrete	Square Feet (SF)
avir	P-3	Precast Porous Concrete Splash Pad	Square Feet (SF)
à	P-4	Porous Pavers	Square Feet (SF)
	P-5	Flexible Pavement	Square Feet (SF)
Roof	R-1	Green Roof	Square Feet (SF)

Table 2. List of Assets and Asset Units by Craft

Table 3. GI Assets and SMPs Associated with Green Infrastructure Technologies/Project Types

SMP ID #	Maintenance Task ¹	GI Asset Included	Bioswale	Rain Garden	Plant Bed	Planter	Green Roof	Meadow	Tree Trench	Tree Planting	Infiltration Trench	Flexible Pavement	Porous Asphalt	Porous Concrete	Porous Pavers
SMP-01	Vacuuming	Porous Asphalt, Porous Concrete, Porous Pavers, Flexible Pavement										\checkmark	\checkmark	\checkmark	\checkmark
SMP-02	Power Washing	Porous Asphalt, Porous Concrete, Flexible Pavement										\checkmark	\checkmark	\checkmark	
SMP-03	Restoring Aggregate	Porous Pavers													\checkmark
SMP-04	Structure Cleaning	Catch basins, Inlets, Manholes, Observation Wells, Cleanouts, Domed PVC Risers	\checkmark	✓	~	\checkmark			\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
SMP-05	Filter Insert Cleaning/Replacement	Inlet Filter Bags, Filter Inserts	\checkmark	\checkmark	\checkmark	\checkmark			\checkmark		\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
SMP-06	General Maintenance	Green Roof					~								
SMP-07	General Maintenance	Riverstone Edge/Stone Gutter		\checkmark									\checkmark	\checkmark	
SMP-08	Winter Maintenance	Porous Asphalt, Porous Concrete, Porous Pavers, Flexible Pavement										\checkmark	\checkmark	✓	~
SMP-09 (a)	Weeding, Mulching, Soil Amendment	Trees	\checkmark	✓	~				\checkmark	\checkmark					
SMP-09 (b)	General Maintenance, Weeding, Mulching	Planters, Plant Beds, Rain Gardens, Bioswales,	\checkmark	✓	~	\checkmark									
SMP-09 (c)	Inspection, Control of Invasive Species	Meadows						\checkmark							
SMP-10 (a)	Watering	Trees	\checkmark	~	~				~	\checkmark					
SMP-10 (b)	Watering	Planters, Plant Beds, Rain Gardens, Bioswales, Meadows	\checkmark	\checkmark	\checkmark	\checkmark									
SMP-11 (a)	Pruning	Trees	\checkmark	~	~				~	\checkmark					
SMP-11 (b)	Pruning	Planters, Plant Beds, Rain Gardens, Bioswales	\checkmark	✓	~	\checkmark									
SMP-12	Mowing	Meadows						\checkmark							
SMP-13	Landscape Replacement ²	Planters, Plant Beds, Rain Gardens, Bioswales, Meadows	\checkmark	\checkmark	\checkmark	\checkmark		\checkmark							

NOTES:

1. See Table 4 and Table 7 for maintenance frequencies and responsibilities

2. Replacement of landscape features is a corrective maintenance task that should only be performed on an as needed basis.

Table 4. Maintenance Required by Season for each SMP

			MAINTENANCE REQUIRED BY SEASON													
				SPRING			SUMMER			FALL			WINTER			
SMP ID #	Maintenance Task	GI Asset Included	MAR	APR	ΜΑΥ	JUN	JUL	AUG	SEP	ост	NOV	DEC	JAN	FEB		
SMP-01	Vacuuming	Porous Asphalt, Porous Concrete, Porous Pavers, Flexible Pavement	✓ See Note 1							✓ See Note 1						
SMP-02	Power Washing	Porous Asphalt, Porous Concrete, Flexible Pavement	Once eve va	✓ /ery 3 years following /acuuming SMP		✓ Once every 3 years following vacuuming SMP										
SMP-03	Restoring Aggregate	Porous Pavers		✓ As needed												
SMP-04	Structure Cleaning	Catch basins, Inlets, Manholes, Observation Wells, Cleanouts, Domed PVC Risers		✓					✓							
SMP-05	Filter Insert Cleaning/Replacement	Inlet Filter Bags, Filter Inserts		✓ See Note 2			✓ See Note 2			✓ See Note 2			✓ See Note 2			
SMP-06	General Maintenance	Green Roof		See Note 3						✓ See Note 3						
SMP-07	General Maintenance	Riverstone Edge/Stone Gutter		✓												
SMP-08	Winter Maintenance	Porous Asphalt, Porous Concrete, Porous Pavers, Flexible Pavement											\checkmark			
SMP-09 (a)	General Maintenance, Weeding, Mulching, Soil Amendment	Trees			۲ See N	lote 4				✓ See Note 4						
SMP-09 (b)	General Maintenance, Weeding, Mulching	Planters, Plant Beds, Rain Gardens, Bioswales,		✓ See Note 5		✓ See Note		✓ ee Note 5		✓ See Note 5						
SMP-09 (c)	Inspection, Control of Invasive Species	Meadows		✓ See Note 6			✓ See Note 6			✓ See Note 6						
SMP-10 (a)	Tree Watering	Trees (See Note 7)														
SMP-10 (b)	Landscape Watering	Planters, Plant Beds, Rain Gardens, Bioswales, Meadows (See Note 7)														
SMP-11 (a)	Tree Pruning	Trees		✓ See Note 8						✓ See Note 8						
SMP-11 (b)	Pruning	Planters, Plant Beds, Rain Gardens, Bioswales	✓ See N	ote 9					See N	lote 9						
SMP-12	Mowing	Meadows (See Note 10)		√ Once ever	ry 2 years					✓ Year 2 Only						
SMP-13	Landscape Replacement	Planters, Plant Beds, Rain Gardens, Bioswales, Meadows (See Note 11)														

NOTES:

1. Vacuuming to occur two times per year for concrete, asphalt and flexible pavement; once annually in spring for pavers

2. Cleaning to occur quarterly until it is established that a particular inlet requires less frequent cleaning

3. Green roof maintenance begins after 2-3 year establishment period; Maintenance must adhere to the project specifications/warranty provisions so that long-term waterproofing warranty is not voided

4. Weeding of tree pit area occurs once in late spring or early summer; and once in fall; mulching only once in spring

5. Weeding of landscape areas occurs 3 times per year (spring clean-up; summer maintenance; fall clean up); Mulching to occur 1x/year in spring; Amend soil with organic compost occurs once per year (in spring) only in Year 2 and Year 4

6. Monitor meadow monthly during growing season (Apr - Oct) for invasive species during the first 2 to 3 years; Monitor a minimum of 3x/year thereafter

7. Tree watering is only done in Year 1 and Year 2. Year 1 watering should be covered by the one-year maintenance agreement as outlined in the project specifications and contract/warranty provisions.

Year 1 of landscape watering is covered by the contractor's maintenance agreement; watering during Years 2 and 3 should occur during the first 4-6 weeks of the growing season, and then only during extended periods of drought

8. Year 1 is covered by Contractor's maintenance agreement/warranty; One-time per year in Year 3 (Fall or Spring depending on species); One time per year in years 5, 8, 12, 18, 24, 30, 36, 44, 52, 60

9. Year 1 is covered by Contractor's maintenance agreement/warranty; 1x/year beginning in Year 2 depending on plant type below

Shrubs: 1x/year in March/April or September/October depending on species; Perennials: 1x/year cutback in March/April or September/October (March/April recommended); Grasses: 1x/year cut back as needed, March/April 10. Meadow mowing to occur at Year 1: once a month from Apr-Nov; Year 2: Once in Fall; Year 3 and beyond: once every 2 years in Spring

11. Replacement of landscape features is a corrective maintenance task that should only be performed on an as needed basis

Table 5. Summary of Required Tools, Equipment and Supplies for Green Infrastructure Maintenance (DRAFT)

	Green Program Specific			
Equipment	or Shared with Other Maintenance Activities	Type of Equipment	Approximate Cost per Unit	Replacement/Life Expectancy (Years)
Clean washed paver aggregate	Green Program	Consumable	су	-
Gator bag	Green Program	Tool	ea	5
Industrial Vacuum	Green Program	Tool	ea	20
Mulch	Green Program	Consumable	су	-
Pavement Vacuum Truck	Green Program	Tool	ea	20
Plant material/Replacement	Ŭ			
Vegetation	Green Program	Landscape Feature	sf	-
Replacement filter insert pouch	Green Program	Consumable	ea	-
Riverstone rock	Green Program	Consumable	су	-
Trees/Replacement Trees	Green Program	Landscape Feature	ea	40
Water source (truck or hydrant)	Green Program	Tool	ea	20
Batteries for Camera	Shared	Consumable	ea	-
Bucket truck (Trees > 20-ft)	Shared	Tool	ea	20
Camera	Shared	Tool	ea	4
Crowbar	Shared	Tool	ea	20
Flail-type Mower	Shared	Tool	ea	20
Gloves	Shared	Tool	pair	3
Hand pruners	Shared	Tool	ea	20
Hand saw	Shared	Tool	ea	20
Hand scythes	Shared	Tool	ea	20
Hand trowel	Shared	Tool	ea	20
Hose or hydrant connection	Shared	Tool	ea	20
Landscaping Edger	Shared	Tool	ea	20
Landscaping Mower	Shared	Tool	ea	20
Landscaping weed wacker	Shared	Tool	ea	20
Leaf blower	Shared	Tool	ea	20
Personal Safety equipment	Shared	Tool	ea	10
Pole attachment	Shared	Tool	ea	20
Power Scythe	Shared	Tool	ea	20
Power Strimmer	Shared	Tool	ea	20
Powerwasher	Shared	Tool	ea	20
Protective clothing	Shared	Tool	ea	
Rake	Shared	Tool	ea	20
Riding or Push Mower	Shared	Tool	ea	20
Rigid street broom	Shared	Tool	ea	3
Safety cone	Shared	Tool	ea	20
Salt/deicers	Shared	Consumable	су	-
Screwdriver	Shared	Tool	ea	20
Shovel	Shared	Tool	ea	10
Spade	Shared	Tool	ea	10
Trash bags	Shared	Tool	box	0.05
Truck with snow plow	Shared	Tool	ea	20
Wheelbarrow	Shared	Tool	ea	10

Note: Many of these elements are required for ongoing maintenance activities outside of the STR green program.

Table 6. Example Maintenance Labor Estimate created for Connective Corridor Phase 1

C-29A, C-29B, C-29C	C : Connective Corridor Maintenance Labor and Cost Estimate	Labor Rate Assumptions:		
Prepared on: 30	0-Jan-13	Civil Supervisor	30.00) (Placeholder)
Prepared By: C	H2M HILL	Civil Laborer	5 15.00) (Placeholder)
Project ID: C-	-29A/C-29B/C-29C	Landscape Supervisor	30.00) (Placeholder)
Project Name: Co	onnective Corridor Phase 1 @ University Ave;	Landscape Laborer	\$ 13.05	5 'Updated Value)
G	enesee St and Forman Park			

Asset Category	Asset (Refer to Detailed Plant Lists	Maintenance Activity*	Quantity	Units	Applicable	Recomment Needs (2	led Personnel Minimum) ¹	Assumptions ²	Estimated Personnel	Estimated Personnel Hours (Per Person) For	Estimated Personnel	
, loce category	Attached)		Quantity	onito	SMP(s)	Staff	Supervisor	Assumptions	Hours: Set Up ³	Maintenance Activity	Hours: Clean Up ⁴	٣
C-29A - Universit	y Avenue											
	Civil Assets	Inspection	4	blocks	00	1	1	Site walk, includes time to fill out log and inspect catch basins and porous pavement, 0.5 hr per block (2 sides)	0	2.0	0	
	Porous Concrete	Vacuuming	6,340	sf	01	1	1	Assumed minimum rate of 1 hr for sites up to 20,000 sf, 1 hr per additional 20,000 sf.	0.5	1.0	0.5	
Civil Tasks	Porous Concrete	Power Washing	6,340	sf	02	1	1	Depends if done by truck or hand. Truck - Assumed minimum rate of 1 hr for sites up to 10,000 sf plus 1 hr per additional 10,000 sf. Hand - Assumed minimum rate of 2 hrs for sites up to 5,000 sf plus 1 hr per additional 2,500 sf. (Note - only needs to be performed once every 3 years.)	0.5	2.0	0.5	
	Porous Pavers	Vacuuming/Stone Restoration	12,447	sf	01,03	1	1	Assumed minimum rate of 2 hrs for sites up to 5,000 sf, 1 hr per additional 2,500 sf.	0.5	5.0	0.5	
	Catch Basins	Insert/Sump Cleaning	30	each	04, 05	1	1	20 min per structure (average)	0.25	10.0	0.25	
											SUBTOTALS	

Accest Coloneau	Asset (Refer to Detailed Plant Lists	Maintenana Astivitus	Quantitu	United	Applicable	Recommen	ded Personnel		Estimated Personnel	Estimated Personnel	Estimated Personnel	Тс
Asset Category	Attached)	Maintenance Activity*	Quantity	Units	SMP(s)	Staff	Supervisor	Assumptions	Hours: Set Up ³	Hours (Per Person) For	Hours: Clean Up ⁴	pe
	Landscape Assets	Inspection	4	blocks	00	1	1	Site walk, includes time to fill out log and inspect all vegetation and plant material, 0.5 hr per block (2 sides)	0	2.0	0	
	Trees	Tree General Maintenance (Weeding, Mulching)	105	each	09	2	1	7 min per tree, includes travel between trees	0.5	12.3	0.5	
	Trees	Tree Watering	105	each	10	1	1	12 min per tree, assumes using hose/water truck to fill Gator Bags, includes travel between trees	0.5	21.0	0.5	
Landscape Tasks	Trees	Tree Pruning	105	each	11	2	1	Years 1-3: 15 min per tree, assume only half of trees need some form of pruning per year, includes travel between trees (Years 3-5, 20 min per tree, assume 3/4 of trees need structural pruning	0.25	13.1	0.25	
	Shrubs and Groundcover	Shrub Pruning	2521	each	11	2	1	15 min per 20 shrubs, assume only half of shrubs need some form of pruning per year (depends on type of shrubs and goals for pruning)	0.25	15.8	0.25	
	Shrubs and Groundcover, Perennials/Bulbs	Shrub and Herbaceous Plant Material General Maintenance (Weeding, Mulching)	3640	each	09	2	1	15 min per 20 plants, assumes only one-half of total shrub/plant bed area needs weeding	0.25	22.8	0.25	
	Shrubs and Groundcover, Perennials/Bulbs	Plant Bed Watering	3640	each	10	2	1	15 min per 100 plants (approx. 100 sf), depending on how much watering is required	0.5	9.1	0.5	
	Perennials/Bulbs	Herbaceous Plant Material Pruning/Cutback	1119	each	11	2	1	1.5 min per 10 plants	0.25	2.8	0.25	
											SUBTOTALS	

C-29B - East Gene	esee Street											
Accet Category	Asset (Refer to Detailed Plant Lists	Maintonanco Activity*	Quantity	Unite	Applicable	Recomment	ded Personnel	Assumptions ²	Estimated Personnel	Estimated Personnel	Estimated Personnel	Т
Asset Category	Attached)	Wantenance Activity	Quantity	Units	SMP(s)	Staff	Supervisor	Assumptions	Hours: Set Up ³	Hours (Per Person) For	Bestimated Personnel (s (Per Person) For Estimated Personnel Hours: Clean Up ⁴ 1.5 0 1.0 0.5 2.0 0.5 3.7 0.5 4.3 0.25 SUBTOTALS	pr
	Civil Assets	Inspection	3	blocks	00	1	1	Site walk, includes time to fill out log and inspect catch basins and porous pavement, 0.5 hr per block (2 sides)	0	1.5	0	
	Porous Concrete	Vacuuming	10,227	sf	01	1	1	Assumed minimum rate of 1 hr for sites up to 20,000 sf, 1 hr per additional 20,000 sf.	0.5	1.0	0.5	
Civil Tasks	Porous Concrete	Power Washing	10,227	sf	02	1	1	Depends if done by truck or hand. Truck - Assumed minimum rate of 1 hr for sites up to 10,000 sf plus 1 hr per additional 10,000 sf. Hand - Assumed minimum rate of 2 hrs for sites up to 5,000 sf plus 1 hr per additional 2,500 sf. (Note - only needs to be performed once every 3 years.)	0.5	2.0	0.5	
	Porous Pavers	Vacuuming/Stone Restoration	9,243	sf	01,03	1	1	Assumed minimum rate of 2 hrs for sites up to 5,000 sf, 1 hr per additional 2,500 sf.	0.5	3.7	0.5	
Catch Basins		Insert/Sump Cleaning	13	each	04, 05	1	1	20 min per structure (average)	0.25	4.3	0.25	
											SUBTOTALS	

otal Hours, Per Person er Task (Includes Set Up and Clean Up)	Total Estimated Labor Costs Per Task ⁵	Recommended Annual Frequency (# of Times Task is Performed Per Year) ⁶	Total Annual Estimated Labor Costs
	-		
2	\$90.00	2	\$180.00
2	\$90.00	2	\$180.00
3	\$135.00	0.33	\$44.55
6	\$269.05	1	\$269.05
11	\$472.50	2	\$945.00
23	\$1,056.55		\$1,618.60
otal Hours, Per Person or Task (Includes Set Un	Total Estimated	Recommended Annual	Total Annual Estimated
in rusk (includes set op		Trequency (# of Times Task is	20001 20313
2	\$86.10	2	\$172.20
13	\$743.33	2	\$1,486.65
22	\$947.10	15	\$14,206.50
14	\$764.36	1	\$764.36
16	\$911.98	1	\$911.98
23	\$1,304.33	3	\$3,912.98
10	\$566.61	10	\$5,666.10
3	\$184.99	1	\$184.99
104	\$5,508.79		\$27,305.75
otal Hours Per Person	Total Estimated	Recommended Annual	Total Annual Estimated
er Task (Includes Set Up	Labor Costs Per	Frequency (# of Times Task is	Labor Costs
2	\$67.50	2	\$135.00
2	\$90.00	2	\$180.00
3	\$135.00	0.33	\$44.55
5	\$211.37	1	\$211.37
5	\$217.50	2	\$435.00
16	\$721.37		\$1,005.92

C-29B - East Gen	esee Street														
Asset Category	Asset (Refer to Detailed Plant Lists	Maintenance Activity*	Quantity	Unite	Applicable	Recommen	nded Personnel	A	Estimated Personnel	Estimated Personnel	Estimated Personnel	Total Hours, Per Person	Total Estimated	Recommended Annual	Total Annual Estimated
Asset Category	Attached)	Maintenance Activity	Quantity	Units	SMP(s)	Staff	Supervisor	Assumptions	Hours: Set Up ³	Hours (Per Person) For	Hours: Clean Up ⁴	per Task (Includes Set Up	Labor Costs Per	Frequency (# of Times Task is	Labor Costs
	Landscape Assets	Inspection	3	blocks	00	1	1	Site walk, includes time to fill out log and inspect all vegetation and plant material, 0.5 hr per block (2 sides)	0	1.5	0	1.5	\$64.58	2	\$129.15
	Trees	Tree General Maintenance (Weeding, Mulching)	52	each	09	2	1	7 min per tree, includes travel between trees	0.5	6.1	0.5	7	\$396.44	2	\$792.88
	Trees	Tree Watering	52	each	10	1	1	12 min per tree, assumes using hose/water truck to fill Gator Bags, includes travel between trees	0.5	10.4	0.5	11	\$490.77	15	\$7,361.55
Landscape Tasks	Trees	Tree Pruning	52	each	11	2	1	Years 1-3: 15 min per tree, assume only half of trees need some form of pruning per year, includes travel between trees (Years 3-5, 20 min per tree, assume 3/4 of trees need structural pruning	0.25	6.5	0.25	7	\$392.70	1	\$392.70
	Shrubs and Groundcover	Shrub Pruning	1761	each	11	2	1	15 min per 20 shrubs, assume only half of shrubs need some form of pruning per year (depends on type of shrubs and goals for pruning)	0.25	11.0	0.25	12	\$645.50	1	\$645.50
	Shrubs and Groundcover, Perennials/Bulbs	Shrub and Herbaceous Plant Material General Maintenance (Weeding, Mulching)	5379	each	09	2	1	15 min per 20 plants, assumes only one-half of total shrub/plant bed area needs weeding	g 0.25	22.2	0.25	23	\$1,272.82	3	\$3,818.45
	Shrubs and Groundcover, Perennials/Bulbs	Plant Bed Watering	5379	each	10	2	1	15 min per 100 plants (approx. 100 sf), depending on how much watering is required	0.5	13.4	0.5	14	\$810.50	10	\$8,105.05
	Perennials/Bulbs	Herbaceous Plant Material Pruning/Cutback	3618	each	11	2	1	1.5 min per 10 plants	0.25	9.0	0.25	10	\$535.47	1	\$535.47
	-					-		•	-		SUBTOTALS	85	\$4,608.78		\$21,780.76
C-29C - Forman P	ark														
Asset Category	Asset (Refer to Detailed Plant Lists Attached)	Maintenance Activity*	Quantity	Units	Applicable SMP(s)	Recommer Staff	nded Personnel Supervisor	Assumptions ²	Estimated Personnel Hours: Set Up ³	Estimated Personnel Hours (Per Person) For	Estimated Personnel Hours: Clean Up ⁴	Total Hours, Per Person per Task (Includes Set Up	Total Estimated Labor Costs Per	Recommended Annual Frequency (# of Times Task is	Total Annual Estimated Labor Costs
	Landscape Assets	Inspection	1	blocks	00	1	1	Site walk, includes time to fill out log and inspect all vegetation and plant material, 0.5 hr per block (2 sides)	0	0.5	0	0.5	\$21.53	2	\$43.05
	Shrubs and Groundcover	Shrub Pruning	1280	each	11	2	1	15 min per 20 shrubs, assume only half of shrubs need some form of pruning per year (depends on type of shrubs and goals for pruning)	0.25	8.0	0.25	9	\$476.85	1	\$476.85
Landscape Tasks	Shrubs and Groundcover, Perennials/Bulbs	Shrub General Maintenance (Weeding, Mulching)	5222	each	09	2	1	15 min per 20 plants, assumes only one-half of total shrub/plant bed area needs weeding	g 0.25	21.5	0.25	22	\$1,236.49	3	\$3,709.46
	Shrubs and Groundcover, Perennials/Bulbs	Plant Bed Watering	5222	each	10	2	1	15 min per 100 plants (approx. 100 sf), depending on how much watering is required	0.5	13.1	0.5	14	\$788.49	10	\$7,884.86
	Perennials	Herbaceous Plant Material Pruning/Cutback	3944	each	11	2	1	1.5 min per 10 plants	0.25	9.9	0.25	10	\$581.20	1	\$581.20
											SUBTOTALS	55	\$3,104.54		\$12,695.41

C-29C - Forman Pa	J-29C - Forman Park										
Asset Category	Asset (Refer to Detailed Plant Lists	Maintenance Activity*	Quantity	Unite	Applicable	Recomment	led Personnel	Accumptions ²	Estimated Personnel	Estimated Personnel	Estimated Personnel
Asset category	Attached)	Maintenance Activity	Quantity	Onits	SMP(s)	Staff	Supervisor	Assumptions	Hours: Set Up ³	Hours (Per Person) For	Hours: Clean Up ⁴
	Landscape Assets	Inspection	1	blocks	00	1	1	Site walk, includes time to fill out log and inspect all vegetation and plant material, 0.5 hr per block (2 sides)	0	0.5	0
	Shrubs and Groundcover	Shrub Pruning	1280	each	11	2	1	15 min per 20 shrubs, assume only half of shrubs need some form of pruning per year (depends on type of shrubs and goals for pruning)	0.25	8.0	0.25
Landscape Tasks	Shrubs and Groundcover, Perennials/Bulbs	Shrub General Maintenance (Weeding, Mulching)	5222	each	09	2	1	15 min per 20 plants, assumes only one-half of total shrub/plant bed area needs weeding	0.25	21.5	0.25
	Shrubs and Groundcover, Perennials/Bulbs	Plant Bed Watering	5222	each	10	2	1	15 min per 100 plants (approx. 100 sf), depending on how much watering is required	0.5	13.1	0.5
	Perennials	Herbaceous Plant Material Pruning/Cutback	3944	each	11	2	1	1.5 min per 10 plants	0.25	9.9	0.25

General Notes This table is based off of one season of maintenance experience and it is anticipated that future maintenance costs and efforts may vary. *Note: This table provides estimates of time and costs per maintenance task for the Connective Corridor Project on a task basis and also an annual basis. It does not provided specific maintenance frequencies and seasonal requirements.

Specific Notes

Some landscape tasks will likely require more than 1 staff (i.e. a crew of 2-3 staff weeding makes more sense than 1 person weeding). Formula will need to be modified.
Assumptions are converted to a factor by which the total time is calculated

Assumptions are converted to a factor by which the total time is calculated
Assumptions are converted to a factor by which the total time is calculated
Set up activities include placing safety cones, removing large debris from site, accessing hydrant, setting vacuum controls, etc. See Maintenance SOP for more information; Travel time to site is not included.
Clean up Activities include sweeping, removing debris, gathering equipment, picking up safety cones, and disconnecting, powering down, and cleaning equipment. See Maintenance SOP for more information; Travel time to site is not included.
Labor Costs are calculated by multiplying the staff and supervisor needs, by the total hours per person, per task, and the labor rate for each worker category; It is assumed that the supervisor will work equally along with the staff.
Tree watering and plant bed watering are only required for Years 1-2 to assist with vegetation establishment. After Years 1-2, annual frequency is reduced to "as needed" during times of extreme drought.
See Maintenance SOP for full list of equipment required

Table 7. Overview of Maintenance Frequencies and Responsibilities

SMP ID #	Maintenance Task Recommended Frequency		Description	Responsible Party (Excludes GIF and Privately- Owned Properties)
SMP-01	Porous Pavement Vacuuming	Semi-annually (2x/year) for concrete, asphalt and flexible pavement; annually in spring for pavers	Porous pavement surfaces require vacuuming to remove debris that may clog the permeable layers/voids and prevent infiltration.	OCDWEP
SMP-02	Porous Pavement Power Washing	Once every three years (or as necessary)	Power washing restores permeability and should follow porous pavement vacuuming. Porous pavers should not be power washed.	OCDWEP
SMP-03	Porous Paver Maintenance (Restoring Aggregate)	As needed when gravel infill is not within 1/2 inch of the paver surface, immediately following vacuuming	This task refers to the refilling of voids between pavers with additional aggregate material to replace any material that has been lost by vacuuming and/or due to natural migration, settlement, and erosion.	OCDWEP
SMP-04	Stormwater Structure Cleaning	Semi-annually (2x/year)	Stormwater Structure Cleaning refers to removing debris or clogged materials and vacuuming the interior of the structure.	OCDWEP
SMP-05	Inlet Filter Insert Cleaning or Filter Insert Pouch Replacement	Clean Quarterly (4x/year) until it is determined a particular inlet requires less frequent cleaning; Replace annually	Filter inserts need to be cleaned with an industrial vacuum to remove debris and prevent clogging	OCDWEP
SMP-06	Green Roof Maintenance	Spring and Fall, after initial 2-3 year establishment period; must adhere to the project specifications/warranty provisions	Remove debris, weed, prune plants, replenish, fertilize if needed. Follow project- specific maintenance plan, if prepared and approved	OCDWEP
SMP-07	Riverstone Edge Maintenance	Annually in Spring	Remove debris, weed, rake, replenish as needed.	OCDWEP
SMP-08	Winter Maintenance for Porous Pavements	As necessary during Winter	Porous pavement surfaces require modified plowing and salting practices during the winter months when snow is present.	OCDWEP
SMP-09 (a)	Tree General Maintenance, Weeding, Mulching, Soil Amendment	Year 1 is covered by Contractor's maintenance agreement/warranty; Year 2: weeding occurs 3 times/year; mulching occurs annually in Spring	Tree inspection covers an initial tree health assessment, followed by tree pit weeding and tree pit mulching.	Year 1: Contractor; Year 2: OCDWEP; Year 3 and beyond: OCDWEP and City (for City owned projects)
SMP-09 (b)	Landscaping Areas General Maintenance, Weeding, Mulching	Inspection: 1x/year; Weeding to occur 3x/year (spring clean-up; Summer maintenance; fall put to bed); Mulching to occur 1x/year in Spring	Landscape inspection covers an initial health assessment of the plantings, followed by trash removal, weeding, and mulching	OCDWEP
SMP-09 (c)	Meadow Inspection, Control of Invasive Species	Monitor meadow monthly during growing season for invasive species during the first 2 to 3 years	Inspect and monitor the meadow for invasive species	OCDWEP
SMP-10 (a)	Tree Watering	Year 1 is covered by Contractor's maintenance agreement/warranty; Year 2: water weekly in the absence of rain; Years 3+: only as necessary in during extended periods of drought	Tree and landscape watering refers to watering during establishment in Years 1 and 2	Year 1: Contractor; Year 2: OCDWEP; Year 3 and beyond: OCDWEP and City (for City owned projects)
SMP-10 (b)	Landscape Watering	Year 1 is covered by Contractor's maintenance agreement/warranty; Year 2 and 3: water during the first 4-6 weeks of the growing season, and then only during extended periods of drought	and as necessary during extended periods of drought.	OCDWEP
SMP-11 (a)	Tree Pruning	Year 1 is covered by Contractor's maintenance agreement/warranty; One-time per year in Year 3 (Fall or Spring depending on species); One time per year in years 5, 8, 12, 18, 24, 30, 36, 44, 52, 60	Tree and landscape pruning refers to annual pruning to maintain aesthetics and	OCDWEP during years 3 and 5 only for trees planted in GI Asset
SMP-11 (b)	Landscape Pruning	Year 1 is covered by Contractor's maintenance agreement/warranty; 1x/year beginning in Year 2 depending on plant type		Year 1: Contractor; Year 2 and beyond: OCDWEP
SMP-12	Meadow Mowing	Year 1: once a month from Apr-Nov; Year 2: Once in Fall; Year 3 and beyond: once every 2 years in Spring	Mowing helps prevent/control woody plant and weed establishment, and helps to disperse seeds of desirable species.	OCDWEP
SMP-13	Landscape Replacement (excludes Trees)	Spring and Fall, as a corrective maintenance task that should only be performed on an as needed basis.	Replace missing, dead, or diseased shrubs and herbaceous plant material	OCDWEP

			Life Expectancy
Class	Asset ID	Asset Item	(years)
	D-1	Perforated Pipe	50
	D-2	Solid Pipe	50
	D-3	Channel with Grate (Trench Drain)	50
	D-4	Manhole	50
	D-5	Catch Basin	50
	D-6	Outlet Riser	50
age	D-7	Overflow Control Structure	50
aina	D-8	Inlet	50
Dra	D-9	Inlet Filter Insert / Filter Basket	1
	D-10	Curb Stormwater Inlet	50
	D-11	Downspout Outfall	25
	D-12	Cleanout	25
	D-13	Observation Well/Port	25
	D-14	Anti-seep Collar	50
	D-15	Modular Storage System	50
<u>8</u>	L-1 Planting Area / Landscape Bed / Shrubs		30
pin	L-2	Meadow	30
sca	L-3	Mulch	30
and	L-4	Riverstone Edging	30
Ľ	L-5	Rip-Rap Apron	30
ses	T-1	Tree: Existing	n/a
Tre	T-2	Tree: New	40
	P-1	Porous Asphalt	30
മ	P-2	Porous Concrete	30
avin	P-3	Precast Porous Concrete Splash Pad	30
Å	P-4	Porous Pavers	30
	P-5	Flexible Pavement	30
Roof	R-1	Green Roof	30

Table 8. Anticipated Life Expectancy of Assets (DRAFT)

Appendix A

Detailed Green Infrastructure Standard Maintenance Procedures

SMP-01: Porous Pavement Vacuuming

Porous Pavement Vacuuming is done in order to remove sediment that may lead to a clogging of the porous surface, preventing water from infiltrating through the pavement into the stone reservoir.

Porous Pavement Vacuuming applies to several types of porous pavements described below:

- <u>Porous Pavers</u>: an alternative to traditional hardscape paving which allows water to infiltrate between the pavers and through permeable layers below ground. When vacuuming porous pavers, the setting should be adjusted to a lower power in order to prevent complete removal of aggregate between voids (unless more intensive vacuuming is required to alleviate clogged areas).
- <u>Porous Concrete</u>: a type of concrete that has a high porosity due to an increased void space to facilitate water infiltration through the porous concrete into a stone reservoir and then into the ground.
- <u>Porous Asphalt</u>: a type of asphalt that has a high porosity due to an increased void space to facilitate water infiltration through the porous asphalt into a stone reservoir and then into the ground.
- <u>Flexible Porous Pavement (e.g., Flexipave)</u>: a type of porous pavement that has a high porosity due to an increased void space to facilitate water infiltration through the porous pavement into a stone reservoir and then into the ground. This porous pavement is made from recycled rubber (tires) that is mixed with a bonding agent and aggregate and is somewhat flexible when weighted movement is applied on its surface.

Type of Maintenance: Preventative

Tools and Supplies:

- Porous pavement vacuum
- Water source
- Safety cones, trash bags, gloves, street broom

Frequency: Semi-Annually for Porous Concrete, Porous Asphalt, Flexible Porous Pavement

Annually for Porous Pavers (Spring)

Labor Requirements: 2 people for approximately 2 hours per acre

- 10 *Safety set-up:* Set up safety perimeter. Ensure that no vehicles are parked in the vicinity of the location and that area is closed to the public. Public notice announcing area closing needs to be posted per City/County standards of notification.
- 20 *Inspect:* Visually inspect porous pavement for damage, including holes, cracks, excessive scuffing, settlement, and areas of standing water. Inspect status of aggregate between voids in porous pavers before and after vacuuming to see if additional replacement aggregate is needed. Record observations/damage in the <u>Maintenance Report Log</u>, include photos if possible, and report as necessary.
- 30 *Prepare site for vacuuming:* Remove (by hand) bulky debris and waste materials from surface of porous pavement that may be too large to be picked up and/or block/clog the vacuum hose (i.e. litter, tree

branches, wire, car parts) prior to using vacuum. Use a rigid street broom to loosen debris as needed. Pay particular attention to pavement edges and heavily loaded areas.

40 *Vacuum:* Vacuum porous pavement per the vacuum manufacturer recommendations.

Note: If vacuuming porous pavers, set vacuum at a lower power in order to prevent complete removal of aggregate between voids (unless more intensive vacuuming is required to alleviate clogged areas).. Vacuum machine speed should be adjusted so that the vacuum draws out the first inch or so of stone and dirt in the openings between porous pavers, as this is where most unwanted sediment/debris typically collects.

Follow all steps in the Manufacturer's Operation Checklist for the specified vacuum.

- 41 Engage the Water Feature/ Water Dust Control Option of the vacuum (or equivalent on specific vacuum model).
- 42 Drive the vacuum over the porous pavement, operating at a slow speed setting not greater than 5 miles per hour. Overlap the edges of the vacuum runs and make two passes over the entire porous pavement area.
- 43 Frequently check and empty the filter bag (located above the debris bag) when vacuuming areas with excessive sediment.
- 50 *Post-vacuuming inspection:* After two passes, visually inspect porous pavement to ensure adequate debris removal. Any areas with visible debris/sediment still present should be vacuumed again until debris is removed. In the event that the surface of the porous pavement becomes clogged with fine dirt or sand, follow maintenance tasks outlined in <u>SMP-02 Porous Pavement Power Washing</u>. Record observations in the <u>Maintenance Report Log</u>.
- 60 *Review checklist:* Follow all steps in the post-operation checklist for the specified vacuum.
- 70 *Measure debris removal prior to disposal:* Remove material/debris from vacuum bag and hopper and put into a labeled trash bag. Label bag with date and project location, and note the weight on the <u>Maintenance</u> <u>Report Log.</u>
- 80 *Clean up:* Clean up work area and vacuum equipment (per Manufacturer's Operation Manual).
- 90 *Safety completion:* Remove safety perimeter and re-open lot for parking/public access.

SMP-02: Porous Pavement Power Washing

Porous Pavement Power Washing applies to several types of porous pavements described below. Power washing should be done if porous pavement surfaces become clogged with fine dirt or sand. Power washing of the pavement surface allows partial restoration of the original void space and therefore permeability and should immediately follow the porous pavement vacuum task (once every three years or more often as necessary). Power washing of porous pavers should never occur as it may damage pavers and/or remove aggregate between pavers.

- <u>Porous Concrete</u>: a type of concrete that has a high porosity due to an increased void space to facilitate water infiltration through the porous concrete into a stone reservoir and then into the ground.
- <u>Porous Asphalt</u>: a type of asphalt that has a high porosity due to an increased void space to facilitate water infiltration through the porous asphalt into a stone reservoir and then into the ground.
- <u>Flexible Porous Pavement (e.g., Flexipave)</u>: a type of porous pavement that has a high porosity due to an increased void space to facilitate water infiltration through the porous pavement into a stone reservoir and then into the ground. This porous pavement is made from recycled rubber (tires) that is mixed with a bonding agent and aggregate and is somewhat flexible when weighted movement is applied on its surface.

Type of Maintenance: Preventative

Tools and Supplies

- Power washer
- Water source
- Safety cones, trash bags, gloves, street broom

Frequency: Once every three years (perform immediately after thorough vacuuming) or more frequently if necessary, recommended time is Spring.

Labor Requirements: 2 people for approximately 2 hours per acre

- 10 *Safety set-up:* Set up safety perimeter. Ensure that no vehicles are parked in the vicinity of the location and that area is closed to the public. Public notice announcing area closing needs to be posted per City/County standards of notification.
- 20 *Inspect:* Visually inspect porous pavement for damage, including holes, cracks, settlement, excessive scuffing/raveling and areas of standing water. Record observations/damage in the <u>Maintenance Report</u> <u>Log</u>, include photos if possible, and report as necessary.
- 30 *Prepare site for power washing:* Remove (by hand) bulky debris and waste materials from surface of porous pavement that may block or impede power washer access to the surface (i.e. litter, tree branches, wire, car parts). Use a rigid street broom to loosen debris as needed. Pay particular attention to pavement edges and heavily loaded areas.
- 40 *Power wash:* Follow manufacturer's recommendations for use of the power washer unit with the clarifications noted below. Ensure that the water inlet valve and pump are both on.

- 41 Set the pressure levels to be no greater than 500 PSI.
- 42 Perform two passes over surface of pavement, with wand spraying at a 45 degree angle. Do not keep water flow on one location for longer than 5 seconds.
- 50 *Vacuuming:* Power washing may need to be followed immediately by vacuuming. Refer to SMP-01 Porous Pavement Vacuuming for detailed instructions. If sediment is exposed (brought to the surface) during power washing, this sediment must be immediately removed through vacuuming instead of allowing the sediment to migrate and re-enter the porous pavement.
- 50 *Post-power washing inspection: Visually inspect porous pavement to ensure adequate sediment/debris removal. Any areas with visible debris/sediment still present should be washed again until debris is removed. Note if water remains ponded in any areas of the porous pavement. Record observations in the <u>Maintenance Report Log</u>.*
- 60 Store equipment: Shut off pump and return hose and wand to proper storage place.
- 70 *Safety completion:* Remove safety perimeter and re-open lot for parking/public access.

SMP-03: Porous Paver Maintenance (Restoring Aggregate)

Porous pavers are an alternative to traditional hardscape paving which allows water to infiltrate between the pavers and through the permeable layers below them. Pavers are laid out on the surface and clean-washed aggregate material (also called screening or gravel) are placed in the spaces (voids) between paver units to provide stability and surface drainage while keeping unwanted debris out of the system. This SMP refers specifically to the task of refilling the voids between pavers with additional aggregate material to replace any material that has been lost by vacuuming and/or due to natural migration, settlement, and erosion.

Type of Maintenance: Preventative

Tools and Supplies

- Safety cones
- Rigid Street Broom
- Shovel
- Manhole Pick
- Wheelbarrow
- Clean-washed small aggregate (gravel) per project specifications

Frequency: As needed when gravel infill is not within ½ inch of the paver surface, immediately following vacuuming

Labor Requirements: 2 people for approximately 3 hours per acre

Maintenance Procedure (numbers correspond with Maximo sequencing):

- 10 *Safety set-up:* Set up safety perimeter. Ensure that no vehicles are parked in the vicinity of the location and that area is closed to the public. Public notice announcing area closing needs to be posted per City/County standards of notification.
- 20 *Inspect:* Visually inspect porous pavers for damage, including broken pavers, cracks, settlement, and any areas of standing water or evidence of standing water. Inspect status of aggregate infill material in the voids between porous pavers to see if additional replacement aggregate is needed. Evaluate if voids (joints) between porous pavers are clogged or not

Inspect to see if pavers themselves are missing from any areas and note need for replacement pavers. Record observations/ damage in the <u>Maintenance Report Log</u>, include photos if possible, and report as necessary.

- 30 *Prepare site:* Remove (by hand) bulky debris and waste materials from surface of pavers.
- 40 *Cleaning Clogged Voids*: If voids (joints) between porous pavers are still clogged even after area has been vacuumed (SMP-01 Porous Pavement Vacuuming), use a manhole pick to tool out joint until clean aggregate is found. Follow aggregate replacement instructions below.
- 40 *Add aggregate*: Using a shovel, spread aggregate over the surface of the pavers. Using a broom, sweep aggregate into the voids between porous paves, taking care to fill in any obvious holes. Once the aggregate

has been added to the pavers, and the voids have been filled, perform a final sweeping pass with the hand broom to remove any excess gravel from the paver surface.

- 50 *Clean up:* Clean-up work area.
- 60 *Safety completion:* Remove safety perimeter and re-open area for parking/public access.

SMP-04: Stormwater Structure Cleaning

Stormwater Structures are structures used to capture runoff, connect pipes, provide access, control the water level in stormwater management systems, and/or allow excess runoff to discharge or overflow in a controlled manner. Stormwater structures may include the following:

- Catch basin
- Inlet
- Sediment trap
- Manhole
- Overflow structure with or without removable weir
- Observation well
- Clean-out
- Domed riser

Type of Maintenance: Preventative

Tools and Supplies

- Manhole Pick
- Vacuum/Vactor truck
- Safety cones, trash bags, gloves
- Screwdriver or similar tool for cleaning clogged orifices in sediment trap/sump
- Wrench, if necessary, for removing weir

Frequency: Semi-Annually

Labor Requirements: 2 people for approximately 30 minutes per structure, varies by structure type and configuration.

- 10 *Safety set-up:* Set up safety perimeter.
- 20 *Inspect*: Visually inspect stormwater structure and adjacent area for any immediate damage or potential problems, including any upstream pollution sources or locations of existing or potential vegetation debris. Inspect stormwater structure for signs of accumulated sediment, leaf litter, and/or debris. Look for signs of settlement and/or washout around structures and attached pipes. Record all observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.
- 30 Prepare site for servicing: Remove any debris that has accumulated on top of the structure. Remove structure lid (e.g., inlet grate, manhole cover, or observation well cover) and set aside. Visually inspect interior of the structure for defects and evidence of illegal dumping. If illegal dumping has occurred, notify the proper authorities as necessary. Record observations/ damage in the <u>Maintenance Report Log</u>, include photos if possible, and report as necessary.

- 31 Examine structure for any unintended or excessive standing water. Inspect for signs of mosquito larvae. If sediment trap is in place and contains standing water, inspect the drainage orifices for signs of clogging. These orifices are usually 1-inch diameter and located at the base of the structure. Remove any and all material clogging these orifices.
- 32 Observe if the structure has a filter insert and follow separate guidelines in **SMP-05 Inlet Filters** for maintenance and replacement of filter insert.
- 40 *Cleaning*: If using a vacuum truck, clean the interior of the structure and remove all debris or sediment contained in sump. Leave weir in place. Employees should be properly trained in use of the vactor truck and should follow all recommended guidelines for use by the vacuum truck manufacturer. If removable weir is present and not sufficiently cleaned, use wrench/screwdriver or other tool to remove the bolts, lift it up and out of the structure, and set it to the side and repeat cleaning.
- 50 *Disposal*: Ensure that the removed waste/sediment is properly disposed of and securely contained as to not run back into the stormwater system. Follow guidelines for disposal of waste/sediment on the local, state, and federal levels.
- 60 *Record:* Make a note of any recorded observations in the <u>Maintenance Report Log</u>.
- 70 *Replace:* Replace the stormwater structure cover and confirm it is tightly secured.
- 80 *Safety completion:* Remove safety perimeter.

SMP-05: Inlet Filter Insert Cleaning

Manufactured filter inserts are designed to trap sediment, debris, trash, oil and grease. Filter inserts are located inside a catch basin or stormwater inlet. Filter inserts should be cleaned quarterly. Replacement of the filter insert pouch should occur at least annually, or as necessary, during a cleaning task.

Type of Maintenance: Preventative

Tools and Supplies

- Manhole Pick
- Replacement filter insert pouch (one pouch per inlet)
- Industrial vacuum and/or vacuum truck with hose
- Safety cones, trash bags, gloves

Frequency: Quarterly, unless established that a particular inlet requires less frequent cleaning.

Labor Requirements: 2 people for approximately 30 minutes per inlet

- 10 *Safety set-up:* Set up a safety perimeter.
- 20 *Inspect:* Remove catch basin lid/grate with manhole pick and set safely aside. Visually inspect filter insert for evidence of defects and deterioration. Extensive damage to the filter (torn liner/mesh, etc.) will require immediate replacement. Record all observations in the <u>Maintenance Report Log</u> and report as necessary.
- 30 *Clean filter liner/mesh:* Use an industrial vacuum or vacuum truck hose to remove any collected materials from the liner. Follow vacuum manufacturer's directions for operation of the vacuum.
- 40 Inspect filter hardware: After removal of collected materials from the filter, remove the filter insert as per manufacturer's instructions. In many filters, this is done by unsnapping the tether from the D-ring. Set inlet filter insert to one side. Inspect the filter liner, gaskets, stainless steel frame, and mounting brackets, etc. for continued serviceability. Refer to the manufacturer's manual to assist in locating these items. Correct minor damage and/or defects found during inspection. Record all damage and corrective actions undertaken in the <u>Maintenance Report Log</u>. Follow replacement guidelines attached to this SMP if filter is torn or in need of replacement.
- 50 *Insert filter:* After thoroughly inspecting the filter insert pouch for damage and continued serviceability, reattach the pouch tethers to the liner's D-ring (or equivalent part).
- 60 *Replace grate/lid:* Replace the catch basin grate/lid and make sure it is secure.
- 70 *Safety completion:* Remove safety perimeter.

Task Name: Inlet Filter Insert Pouch Replacement

Manufactured filter inserts are designed to trap sediment, debris, trash, oil and grease. Filter inserts are located in the interior of a catch basin or inlet. Replacement of the filter insert pouch should occur at least annually, or as necessary, in conjunction with cleaning task.

Type of Maintenance: Predictive

Tools and Supplies

- Manhole Pick
- Replacement filter insert pouch (one pouch per inlet)
- Industrial vacuum and/or truck
- Safety cones, trash bags, gloves

Frequency: as needed

Labor Requirements: Included in the time required to complete the filter insert cleaning task

Annually:

- 10 *Safety set-up:* Set up a safety perimeter.
- 20 *Remove lid/grate:* Remove catch basin lid/grate with manhole pick, and set safely aside.
- 30 *Remove and replace pouch:* Remove and replace filter insert pouch. Properly dispose of removed pouches and debris according to local, state and federal regulations. Record observations in the <u>Maintenance</u> <u>Report Loq</u>, include photos if possible, and report as necessary.
- 40 *Replace lid/grate:* Replace the catch basin grate/lid and make sure it is secure.
- 50 Safety completion: Remove safety perimeter

SMP-06: Green Roof Maintenance (after initial 2-3 year establishment period)

NOTE: <u>Green roof maintenance must adhere to the project specifications/warranty provisions so that the long-term waterproofing warranty is not voided.</u> Typically this involves a maintenance agreement and contractor approved by the waterproofing manufacturer. See the individual project warranty provisions for details. In the case of a conflict between this SMP and the approved project-specific maintenance plan, the project-specific plan shall govern.

A green (vegetated) roof is a layer of vegetation that is grown on and covers a roof. A green roof typically consists of multiple layers, including waterproofing, synthetic insulation, non-soil engineered growth media, geotextile fabric, drainage components, and plants. Routine maintenance is intended to increase survival of the vegetated cover, promote the development of robust and durable green roof plants, and prevent drainage problems and erosion. Plants used in green roofs should be drought tolerant and winter hardy. No watering is typically required after the initial 2-3 year establishment period unless there are periods of extreme drought. Supplemental maintenance may be provided to satisfy additional aesthetic requirements.

When maintaining a green roof, avoid using sharp tools of any kind to prevent damage to the underlying waterproofing system beneath the plant material. Avoid using lawn staples or stakes for any purpose. Also, minimize foot traffic on top of the green roof vegetation during maintenance activities, as green roof plants are not generally intended for pedestrian access.

Type of Maintenance - Preventative

Tools and Supplies

- Hand Pruners
- Safety equipment including fall protection as applicable
- Trash bag, gloves

Frequency: Spring and Fall (two times/year)

Labor Hours: 2 people for approximately 0.5 to 1 hour per 1000 square feet

Maintenance Procedure (numbers correspond with Maximo sequencing):

- 10 *Safety set-up:* Set up a safety perimeter.
- 20 *Inspect*: Visually inspect the green roof system for the following:

Plant Material: Inspect for large bare spots; colonization of the green roof by annual grass, moss, weeds, woody material, etc.; high mortality rates for one or more plant species; loss of plant material/growing media to wind scour or erosion; or consistently moist or spongy areas of the roof.

Waterproofing System: Inspect exposed components of the waterproofing system, including flashings and counter-flashings.

Drainage System: Inspect drain outlets (scuppers) to make certain that they are free from clogging or obstructions. Look for evidence of prolonged ponding of water following rainfall events.

Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions. <u>Follow approved maintenance agreement provisions closely</u> to ensure warranty is not voided.

- 30 *Remove trash/debris:* Remove any large debris or trash that has accumulated on the green roof.
- 40 *Weed*: Weed the green roof plantings as necessary by hand pruning/pulling. Immature extensive green roofs are vulnerable to colonization by annual grass, especially crabgrass. A pre-emergent crabgrass treatment may be advisable in early spring.

Do not use pointed or sharpened tools when weeding (such as trowels, shovels, spades, weeders, hand cultivators) to avoid damage to the underlying waterproofing system.

Do not mow or scythe on a green roof.

- 50 *Plant Pruning*: Trim any plant material that may be growing within the drainage medium or interfering with the drainage system or waterproofing system.
- 60 *Replenish:* Patches of bare growing media (bare green roof) may be re-planted by taking cuttings from adjacent green roof plants or by separating and transplanting healthy plants. Plant cuttings should be at least one-inch long and should preferably include some 'air roots'. Cuttings set best in early spring or late fall, but can be planted at any time except when temperature is below freezing. Water and a light dusting of compost may accelerate plant growth.
- 70 *Fertilize:* Only fertilize if ideal total soluble nitrogen (nitrate plus ammonium) levels for the plantings fall below 5 ppm. Do not fertilize if soil test shows total soluble nitrogen levels exceeding 5 ppm. These measurements should be determined from annual (fall) soil tests. Apply fertilizers (nutrients) in early spring or fall. Over-fertilization can seriously disturb the green roof; use caution when applying and only apply approved/recommended fertilizers for green roofs.
- 80 *Record:* Make note of any additional observations in the <u>Maintenance Report Log.</u>
- 90 Safety completion: Remove safety perimeter.

SMP-07: Riverstone Edge/Stone Gutter Maintenance

The riverstone edge/stone gutter is a 1 to 3-foot wide (width varies) gravel edge around some porous pavement areas that serves as a backup mechanism for runoff to enter the subsurface infiltration bed should the porous pavement ever be adversely modified such that is permeability is reduced.

Type of Maintenance - Preventative

Tools and Supplies

- Rake
- Clean-washed riverstone per project specifications
- Trash bag, gloves

Frequency: Annually in spring

Labor Hours: 2 people for approximately 1-2 hours per site

- 10 Safety set-up: Set up a safety perimeter
- 20 Inspect: Visually inspect the riverstone edge/stone gutter for any areas of riverstone that are bare and/or need to be replenished or replaced. Inspect for signs of weed growth, dumping of debris, or plow damage. Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.
- 30 *Remove trash/debris:* Remove any large debris and trash that has accumulated in the riverstone edge/stone gutter area.
- 40 *Weed*: Remove any obvious weed growth that has established itself within the limits of the riverstone edge/stone gutter. The riverstone edge should be free of vegetative growth.
- 60 *Rake:* Gently rake riverstone edge/stone gutter to re-establish an even surface and even out any irregular depressions or high points (stones may have moved or shifted during the year).
- 70 *Replenish:* Add new riverstone only if shallow and/or bare areas exist after raking has been completed. Add only enough riverstone to bring entire riverstone edge/stone gutter to a consistent and level grade, approximately even with the elevation of the adjacent edge of pavement.
- 80 *Record:* Make note of any unrecorded observations in the <u>Maintenance Report Log.</u>
- 90 Safety completion: Remove safety perimeter.

SMP-08: Winter Maintenance for Porous Pavements

During the winter, porous pavement surfaces require different maintenance practices from standard pavement surfaces in order to maintain performance and promote infiltration. Specifically, sanding of porous pavement surfaces is prohibited, salting must be minimal, and plow blade heights may need to be set higher in some instances. In addition, plowed snow should not be stockpiled directly on top of porous pavement if possible.

Type of Maintenance - Preventative

Tools and Supplies

- Truck with snow plow
- Salt/Deicers and appropriate machinery as needed
- Hand shovel

Frequency: As necessary following snowfall or icy conditions

Labor Hours: 2 people for approximately 1-2 hours per acre (varies with snow conditions)

- 10 Safety set-up: Set up a safety perimeter
- 20 Inspect: Visually inspect entire area to be plowed prior to plowing snow and/or salting the porous pavement surface. Refer to project site plan if necessary to identify location of landscape elements and porous pavement surfaces. Note presence of trees, shrubs, landscape features, and wheel stops or bollards so that plow does not hit them during plowing and cause physical damage. Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.
- 30 *Remove trash/debris*: Remove any large debris and trash from porous pavement surface prior to plowing.
- 40 *Plow:* If plowing on top of porous pavers, raise plow blade to a slightly higher level (1" higher) than for other types of porous pavement (asphalt, concrete, or flexipave) to prevent the plow from catching paver edges and dislodging paver units. If possible, it is recommended that a rubber plow blade be used for plowing porous pavement surfaces.
- 50 *Storage of snow piles*: If possible, do not leave plowed snow piles on top of porous pavement surfaces to melt. This may result in sediment from the plow operations entering the porous pavement which can lead to clogging. Move snow piles to standard/conventional pavement area or to grassy/lawn area nearby. Refer to project site plan if necessary to identify location of landscape elements, porous and non-porous pavement surfaces, and snow stockpiling areas.

60 *Salting:* Use road salt in moderation on porous pavement surfaces. If possible, use an environmentallysafe road salt/deicer. <u>Use approximately only 25% of the amount of deicing salt that is routinely applied</u> to standard pavement parking lots or as needed to maintain acceptable driving conditions. (*This is approximately a 75% reduction in salt use that is recommended*).

Recommended Environmentally Safe Road Salts: Calcium magnesium acetate (CMA) and potassium acetate (KA) are highly recommended. A second suggestion is calcium chloride (CaCl), which is similar to sodium chloride but can be used in smaller amounts. A mix of sodium chloride or calcium chloride and CMA or KA is better than one of the salts alone. <u>Recommended products include GEOMELT, ECO Salt, and GEOSALT.</u>

- 70 *Record:* Make note of any unrecorded observations in the <u>Maintenance Report Log.</u>
- 80 Safety completion: Remove safety perimeter.

SMP-09a: Tree General Maintenance - Tree Pit Weeding, Tree Pit Mulching, Soil Amendment with Organic Compost

Actions include visual inspection, weeding tree pits, straightening/resetting small caliper existing trees, mulching tree pits, and amending tree pits with organic compost.

Healthy trees should be able to withstand minor disease and insect damage without controls. Routine application of pesticides shall not be practiced, as this destroys natural predator-prey relationships in the environment. Where unusually high infestations or infections occur, an accurate identification of the disease or insect shall be made and the control selected with care, prior to application. All chemical controls must be applied under the supervision of a licensed and qualified pest control applicator, following the procedures set forth in the labeling of the product, as required by law.

Type of Maintenance - Preventative

Tools and Supplies

- Safety cones
- Safety gear (clothing, gloves, etc.)
- Mulch (as specified)
- Mulch fork
- Rake
- Trash bags for debris, weeds, etc.
- Hand Pruners, Weeding Tools
- Mowers
- Edgers

Frequency:

Inspection: Minimum 1x/year (Late May to early June and/or early September)

Weeding of Tree Pit Areas: Weed tree pits a minimum of 2 times per year, at least once in late spring/early summer and once in fall.

Mulching: Minimum 1x/year (Spring)

Amending Soil with Organic Compost: 1x/year (Spring) in Year 2 and Year 4

Labor Hours: 2 people for approximately 4-8 hours per site depending on size of site

Maintenance Procedure (numbers correspond with Maximo sequencing):

10 *Safety set-up:* Set up a safety perimeter. Protect existing trees from damage due to landscape operations and maintenance and operations of other contractors and trades.

20 *Inspect*: Note the species and location of dead trees. Visually inspect trees for dead, diseased or damaged branches. Inspect for signs of frost heave and note the location and species of those trees that need to be repositioned. Inspect trees for signs of excessive drought, disease, nutrient deficiency, and/or pest problems. Inspect tree pits for signs of soil compaction, soil subsidence, excessive salt deposits, or ponding of water. Inspect any areas of standing water in and around tree pits for mosquito larvae.

Note species and location of all trees experiencing any problems listed above. Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.

NOTE: Based on the above observations, determine if it is necessary for a skilled tree care professional/arborist to conduct a follow up visit to assess any potential tree health issues. Note this in the Maintenance Report Log.

30 *Remove trash/debris:* Remove any leaves, debris, and trash that have accumulated in or around the trees/treepits and legally dispose of them off Owner's property.

Disposal of refuse resulting from the maintenance operation is the responsibility of the party conducting the work.

40 *Weed*: Weeding of tree pits should occur 2 times a year, with a minimum of one spring and and one fall visit.

Restrictions: Do not mow or use weed whackers (strimmers) within 2 feet of tree trunks. Hand weed instead.

Refer to project's **Plant ID Sheet** for photographs of plants in order to be able to identify what plants should remain and what plants are weeds and should be removed.

All tree pit areas shall be kept free of weeds, using mechanical methods defined below;

- a) Carefully hand pull or dig out weeds and invasive plants taking care not to damage surrounding plants.
- b) For control of invasive species, spot spraying with herbicide may be employed only by a Certified Pesticide Applicator after notifying the proper authorities and getting approval to apply herbicides. Spraying is allowed only after receiving approval. Before applying herbicides, the type of weed shall be identified and the control selected accordingly, using the most effective control for the species, the location and the season.

(See recommended herbicidal list in Appendix A: Herbicides for Control of Invasive Plants).

Weeds shall not be allowed to grow in paved areas such as driveways, walks, curbs, gutters, etc. If herbicide is applied, dead weeds shall be removed from the paved areas.

50 Straightening and Raising Existing Small Caliper Trees:

NOTE: The one-year warranty period after tree installation should cover the straightening and raising of small caliper trees.

If necessary, reset existing small caliper trees that are leaning and need to be straightened. Also reset (raise) trees where the top of root balls have sunken below "finish grade". If roots need to be cut they shall be done so with a sharp cutting tool. DO NOT CUT ROOTS THAT ARE MORE THAN 1-INCH (1") IN DIAMETER. Trees shall be set straight, back filled, and mulched. Ensure that trees are not planted too deep – the root flare must remain visible at finish grade.

Fill in soil subsidence that may occur because of settling or other processes as necessary.

60 Amending Soil with Organic Compost (Only Years 2 and 4):

Apply 2 (two) inches of compost and incorporate into the top 2 (two) inches of soil using a hand tool such as a trowel or a steel rake, keeping tools away from the trunk and being careful to leave tree roots intact as you encounter them.

Do not place compost directly against the trunk or a tree or shrub or exposed woody roots (as this could cause rot and invite pest or disease). Top surface of soil with mulch as described below.

- 70 *Mulch:* <u>After</u> weeding the existing mulched area, apply additional mulch across surface of tree pit and/or planting bed in uniform manner; do not apply more than 3-4 inches thick. Mulch should be re-applied one time per year (in the spring), unless additional applications are needed after heavy rain events.
 - a) Type of Mulch: shredded bark mulch:
 - Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - Type: Shredded hardwood or ground or shredded bark.
 - Size Range: 3 inches maximum, 1/2 inch (13 mm) minimum.
 - Color: Natural.
 - b) Application rate:
 - Apply organic mulch throughout plant bed to an average thickness, of 3 to 4 inches (75-mm) in a uniform manner.
 - Do not place mulch within 3 inches (150 mm) of the base of the root flare.
 - Mulch should be applied in a 4 to 6 foot diameter with the highest point at the outer edge of the ring and graded gently to the center of the ring. Do not shape mulch like a "volcano" at tree trunk.
- 80 *Clean up:* Remove surplus mulch and waste material including trash and debris, and legally dispose of them off Owner's property
- 90 *Record:* Make note of any additional observations in the <u>Maintenance Report Log.</u>
- 100 *Safety completion:* Remove safety perimeter.

SMP-09b: Planter/Plant Bed, Rain Garden, and Bioswale (Shrub and Herbaceous Plant Material) General Maintenance, Weeding, Mulching

Actions include visual inspection, weeding, and mulching

Plant beds, or planters, are typically a combination of trees, shrubs, and herbaceous perennials (flowering plants) in a contained planting bed, with a covering of mulch. Planters can be contained within concrete curbs or seatwalls, or are often at ground level.

Rain gardens and bioswales are shallow surface depressions planted with specially selected native vegetation (trees, shrubs, grasses, and perennials) to treat and capture stormwater runoff. They are often designed to be planted on top of a layer of sand or gravel storage.

Healthy plants and lawns should be able to withstand minor disease and insect damage without controls. Routine application of pesticides shall not be practiced, as this destroys natural predator-prey relationships in the environment. Where unusually high infestations or infections occur, an accurate identification of the disease or insect shall be made and the control selected with care, prior to application. All chemical controls must be applied under the supervision of a licensed and qualified pest control applicator, following the procedures set forth in the labeling of the product, as required by law.

Type of Maintenance - Preventative

Tools and Supplies

- Hand Pruners
- Mulch (as specified)
- Mulch fork
- Rake
- Spade shovel
- Pitchfork or spade
- Weeding fork
- Plant and Weed Photo ID Sheet
- Trash bag, gloves

Frequency:

Inspection: 1x/year minimum (Late May to early July, and/or late August/early September)

Weeding: 3x/year minimum (Spring clean up, summer maintenance, fall put to bed)

Mulching: Minimum 1x/year (Spring)

Labor Hours: 2 people for approximately 4-6 hours per site

- 10 *Safety set-up:* Set up a safety perimeter. Protect existing plants from damage due to landscape operations and maintenance and operations of other contractors and trades.
- 20 *Inspect*: Visually inspect for any bare areas of vegetation or for specimen vegetation that has died and needs to be removed and/or replaced. Inspect for signs of frost heave and note any plants that may need to be replaced. Inspect plants for signs of excessive drought, disease, nutrient deficiency, and/or pest problems. Inspect planting areas for signs of soil compaction, soil subsidence, excessive salt

deposits, or ponding of water. Inspect any areas of standing water for mosquito larvae. Also inspect areas (e.g. stabilized outfalls) that may experience erosion or increased sediment deposits which would inhibit infiltration.

Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.

NOTE: Based on the above observations, determine if it is necessary for a skilled horticulture professional to conduct a follow up visit to assess any potential plant health issues. Note this in the **Maintenance Report Log**.

30 *Remove trash/debris:* Remove any leaves, debris, and trash that have accumulated in or around the plant beds/planters and legally dispose of them off Owner's property.

All refuse resulting from the maintenance operation of properties shall be disposed of at locations designated by the Manager/Owner.

40 *Weed*: Weeding shall occur 3x/year at minimum (spring, summer, and fall).

Weeding is easiest if done when soil is moist. It is also recommended to pay attention to specific sites and keep track of weed presence on the **Maintenance Report Log** for each site. Weeding is easier and more effective if done consistently throughout the growing season and done BEFORE weeds go to seed.

Refer to project's **Plant ID Sheet** for photographs of plants in order to be able to identify what plants should remain and what plants are weeds and should be removed.

All planting areas shall be kept free of weeds, using either mechanical or chemical methods defined below;

- a) Carefully hand pull or dig out weeds and invasive plants taking care not to damage surrounding plants.
- b) For control of invasive species, spot spraying with herbicide may be employed by a Certified Pesticide Applicator only after notifying the proper authorities and getting approval to apply herbicides. Spraying is allowed only after receiving approval. Before applying herbicides, the type of weed shall be identified and the control selected accordingly, using the most effective control for the species, the location and the season.

(See recommended herbicidal list in Appendix A: Herbicides for Control of Invasive Plants).

Weeds shall not be allowed to grow in paved areas such as driveways, walks, curbs, gutters, etc. Dead weeds shall be removed from the paved areas.

- 60 *Mulch:* After weeding, apply specified mulch across surface of planter and/or planting bed in uniform manner; do not apply more than 3-4 inches thick. Mulching is only once/year in the spring, unless additional applications are needed after heavy rain events.
 - a) Type: organic shredded hardwood mulch (or mulch specified for specific site)

- Shall be free of ceramic, man-made trash or debris of any kind, wood or other objectionable materials.
- b) Application rate: 3 inches applied to a settled thickness of 2 inches.
 - Do not place mulch within 2 inches (150 mm) of shrub trunks or perennial/plant stems in order to prevent rot from occurring
 - Do not shape mulch like a "volcano". Spread mulch evenly to a uniform, level height.
- 70 *Clean up:* Remove surplus mulch and waste material including trash and debris, and legally dispose of them off Owner's property
- 80 *Record:* Make note of any additional observations in the Maintenance Report Log.
- 90 *Safety completion:* Remove safety perimeter.

SMP-09c: Meadow Inspection, Control of Invasive Species

A meadow is a field consisting primarily of herbaceous grasses, forbs, wildflowers, and other non-woody plants. Meadow inspection consists of a visual inspection, trash/debris removal, and invasive species management.

Refer to SMP-12 Meadow Mowing for meadow maintenance and management of most meadow weeds.

Healthy plants and lawns should be able to withstand minor disease and insect damage without controls. Routine application of pesticides shall not be practiced, as this destroys natural predator-prey relationships in the environment. Where usually high infestations or infections occur, an accurate identification of the disease or insect shall be made and the control selected with care, prior to application. All chemical controls must be applied under the supervision of a licensed and qualified pest control applicator, following the procedures set forth in the labeling of the product, as required by law.

Type of Maintenance - Preventative

Tools and Supplies

- Hand Pruners
- Trowel
- Spade
- Pitchfork and Weed fork
- Plant and Weed Photo ID Sheet
- Trash bag, gloves

Frequency:

Inspection: Minimum 3x/year (Spring, Summer, Fall)

• Monitor meadow **monthly** during growing season for invasive species during the first 2 to 3 years

Labor Hours: 2 people for approximately 4-8 hours per site

- 10 *Safety set-up:* Set up a safety perimeter. Protect existing plants from damage due to landscape operations and maintenance.
- 20 *Inspect*: Visually inspect for any bare areas of vegetation or specimen vegetation that has died and needs to be removed and/or replaced. Inspect plants for signs of excessive drought, disease, nutrient deficiency, and/or pest problems. Inspect any areas of standing water for mosquito larvae.

Inspect meadow area for evidence of invasive species and woody plant establishment. Monitor meadow monthly during growing season for invasive species during the first 2 to 3 years. Examples of invasive species include thistle, knapweed, phragmites, and general weeds such as dandelions.

Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.

NOTE: Based on the above observations, determine if it is necessary for a skilled horticulture professional to conduct a follow up visit to assess any potential plant health issues. Note this in the **Maintenance Report Log**.

30 Control of Invasive Species:

Refer to **SMP-12 Meadow Mowing** for information on managing invasive species in meadows, which is primarily done through mowing.

Refer to project's **Plant ID Sheet** for photographs of plants in order to be able to identify what plants should remain and what plants are weeds and should be removed.

For the control of certain types of invasive species not able to be managed by mowing, such as Crown Vetch, spot spraying and hand pulling should be conducted as directed below:

- a) Carefully hand pull or dig out invasive plant species taking care not to damage surrounding plants in meadow.
- b) For control of invasive species, spot spraying with herbicide may be employed only by a Certified Pesticide Applicator after notifying the proper authorities and getting approval to apply herbicides. Spraying is allowed only after receiving approval. Before applying herbicides, the type of weed shall be identified and the control selected accordingly, using the most effective control for the species, the location and the season.

(See recommended herbicidal list in Appendix A: Herbicides for Control of Invasive Plants).

- 40 *Remove trash/debris:* Remove any leaves, debris, and trash that have accumulated in or around the meadow. All refuse resulting from the maintenance operation of properties shall be disposed of at locations designated by the Manager/Owner.
- 50 *Record:* Make note of any additional observations in the Maintenance Report Log.
- 60 Safety completion: Remove safety perimeter.
Appendix A: Herbicides for Control of Invasive Plants

HERBICIDES FOR CONTROL OF INVASIVE PLANTS

These sprays were reviewed with NPS and approved by the New River Gorge National River Natural Resources Branch (Ken Stevens, Chief) for use at the Sandstone Visitor/Orientation Center.

Glyphosphate

Glyphosphate herbicide may be used for total vegetation control and is safe to use immediately prior to planting and up to four days after seeding. Glyphosphate may also be used to target individual weeds as a careful spot spraying after planting, but some non-target plants are likely to be damaged and killed as well. A formulation such as Roundup can be used for total vegetation control prior to planting in the grassland and mow strip areas. A formulation approved for wetland use, such as Rodeo, can be used in storm water infiltration basins and swales.

Plateau (Best application for areas near Rain gardens)

Plateau herbicide is a very good herbicide for pre and post-emergent weed control for establishing warm-season grasses. Pre-emergent application prior to planting is best. Plateau's utility is limited when wildflowers or coolseason grasses are incorporated into the seeding mix. Native forbs, depending on the species, may or may not be tolerant of Plateau. Cool season grasses are not very tolerant of Plateau. Switch grass is not as tolerant to Plateau as other warm season grasses.

Transline

Transline is a selective herbicide for the control of composites, polygonums, and legumes such as Crown Vetch. If carefully used as directed, it is an effective post-planting spot spray, because it will not kill all of the desired vegetation that is touched by over-spray. Transline can be sprayed over the top of grass plantings where Crown Vetch is abundant and where there are no desired composite wildflowers or legumes. Control of Crown Vetch will likely require at least 2 to 3 years of scouting and retreating with spot spray applications. Legumes and composites should be planted sparingly in the successional grassland in treated Crown Vetch areas.

Note: All products mentioned here are for information only and are not an endorsement of a particular brand.

DEER REPELLENT

No one deer repellent appears to stand out as more effective than any other in our experience, but newer repellents are easier to apply and last longer than previous formulations.

Save the Rain: Green Infrastructure Program Standard Maintenance Procedure (SMP)

SMP-10a: Tree Watering

*NOTE: Tree watering for the first year after installation should be covered by the one-year maintenance agreement as outlined in the project specifications and contract/warranty provisions.

This Tree Watering SMP takes effect one year after tree installation (beginning of Year 2).

Type of Maintenance - Preventative

Tools and Supplies

- Gator bags
- Sprinkler & Hose
- Hydrant
- Water truck (if no access to water hydrant)

Frequency:

Initial Tree Establishment (First Year After Tree Installation)*: Water twice a week in the absence of rain during first year after tree installation. (15-25 gallons of water twice per week).

<u>Year 2</u>: Water weekly (once a week) in the absence of rain during second year after tree installation. Water to supplement rainfall in order to maintain a rate of 1" of water per week. (15-25 gallons of water once per week)

Year 3 and beyond: Water as needed during extended periods of drought, only when ground is not frozen.

Labor Hours: 2 people for approximately 1-5 hours per site depending on site size

Maintenance Procedure (numbers correspond with Maximo sequencing):

- 10 *Safety set-up:* Set up a safety perimeter.
- 20 Inspect: Visually inspect for any trees or tree branches that have died and need to be removed and/or replaced (in the case of an entire tree being dead). Inspect for signs of frost heave and note any plants that may need to be replaced. Inspect trees for signs of vandalism, plow damage, excessive drought, disease, and/or pest problems. Inspect soil surface in treepits for signs of overly compacted soils or evidence that trees were planted too deeply. Ensure that root flare is still visible at finish grade.

Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.

- 30 *Remove trash/debris:* Remove any litter, debris, and trash that have accumulated in the landscaped area around trees and/or in the tree pits.
- 40 Water:

During the first year after tree installation, regular watering to supplement rainfall shall occur between the months of April/May through November. Apply 15-25 gallons of water twice a week in the absence of rain in Year One.

During the second year after tree installation, apply 15-25 gallons of water once a week in the absence of rainfall, between the months of April/May through November.

In general, water to supplement rainfall in order to maintain a rate of 1" of water per week during the growing season, especially during late summer months experiencing higher temperatures and when available water in soil from spring snow melt has depleted.

There is no need to water trees if rainfall has fulfilled the 1" of water per week requirement.

Discontinue watering activities once temperatures create frozen soil conditions. Start again in spring when tree buds swell and sprout new leaves.

After the first two years, only water in the manner above between April/May and November during extended periods of drought.

Watering Technique:

Using a hose, water at the base of the tree but avoid watering directly on the tree trunk. Water deeply, allowing 15-25 gallons to seep slowly down to the roots.

If watering from a piped water source, water for approximately 10 minutes for each tree, with water at half pressure, or when water starts ponding and running off.

If watering in clay soils, water at a rate of ¼ inch per hour because infiltration will be slower. Crews may need to repeat an "on/off watering cycle" to get water throughout the top 18-24 inches. This may take a couple of days, especially during long periods of drought.

Water as necessary so planting soil remains moist 2-3 inches below the finished grade. Use a trickling hose or a Tree Gator to ensure steady, slow water flow.

- 50 *Record:* Make note of any additional observations in the <u>Maintenance Report Log.</u>
- 60 Safety completion: Remove safety perimeter.

SMP-10b: Plant Bed (Planter) Watering, Rain Garden/Bioswale Watering, Meadow Watering

NOTE: Landscape watering for the first year after installation should be covered by the one-year maintenance agreement as outlined in the project specifications and contract/warranty provisions.

This Landscape Watering SMP takes effect one year after tree installation (beginning of Year 2).

Plant beds, or planters, are typically a combination of trees, shrubs, and perennials (flowering plants) in a contained planting bed, with a covering of mulch. Planters can be contained within concrete curbs or seatwalls, or are often at ground level.

Rain gardens and bioswales are shallow surface depressions planted with specially selected native vegetation (trees, shrubs, grasses, and perennials) to treat and capture stormwater runoff. They are often designed to be planted on top of a layer of sand or gravel storage.

A meadow is a field consisting primarily of herbaceous grasses, forbs, wildflowers, and other non-woody plants.

If Trees are present, refer to SMP-10a Tree Watering.

Type of Maintenance - Preventative

Tools and Supplies

- Hose
- Sprinkler
- Hydrant
- Water backpack (for small areas)
- Water truck (if no access to water hydrant)

Frequency:

Initial Establishment (First Year after Plant Installation): Water in absence of rainfall in order to maintain a rate of 1" of water per week.

Year 2, Year 3: Water as needed (generally up to ½" of water per week) during the first 4-6 weeks of the growing season, and then only during extended periods of drought and only when ground is not frozen.

Year 4 and Beyond: Water to supplement rainfall only during extended periods of drought and only when ground is not frozen.

Labor Hours: 2 people for approximately 1-5 hours per site depending on site size

Maintenance Procedure (numbers correspond with Maximo sequencing):

- 10 *Safety set-up:* Set up a safety perimeter.
- 20 *Inspect*: Visually inspect for any bare areas within planters/plant beds/rain gardens/bioswales and also for specimen vegetation that has died and needs to be removed and/or replaced. Inspect plants for signs of excessive drought, disease, and/or pest problems. Inspect any areas of standing water for mosquito larvae.

Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.

- 30 *Remove trash/debris:* Remove any large debris and trash that has accumulated in the plant beds/planters.
- 40 Water:

During the first year after plant installation, water to supplement rainfall throughout the growing season (April through November) if soil conditions are dry. Do not water if ground is frozen. The amount of water recommended (combination of rainfall and/or supplemental watering) is 1" of water per week. If resources permit, 2" of water per week is recommended during extreme drought conditions for ideal plant growth and peak performance.

During the second and third year after plant installation, water to supplement rainfall in the first 4-6 weeks of each growing season (April through May) if soil conditions are dry and there is not adequate spring snow melt to provide soil moisture. Do not water if ground is frozen. Also water throughout the growing season if there is extreme drought. The amount of water recommended (combination of rainfall and/or supplemental watering is 1" of water per week). *If resources permit, 2" of water per week is recommended during extreme drought conditions for ideal plant growth and peak performance.*

There is no need to water plants if rainfall has fulfilled the 1" of water per week requirement.

Discontinue watering activities once temperatures create frozen soil conditions. Start again in spring when tree buds swell and sprout new leaves.

Watering Technique:

For tree watering, refer to SMP-10a Tree Watering.

Water as necessary so planting soil remains moist 2-3 inches below the finished grade. Use a trickling hose if possible to ensure steady, slow water flow. Water plant roots and avoid watering plant leaves (foliage). Water deeply to promote deeper root growth, which will ultimately enable plants to be more tolerant of drought in the long term.

- 50 *Record:* Make note of any additional observations in the <u>Maintenance Report Log.</u>
- 60 Safety completion: Remove safety perimeter.

Save the Rain: Green Infrastructure Program Standard Maintenance Procedure (SMP)

SMP-11a: Tree Pruning

NOTE: This SMP includes activities that should be supervised by a certified arborist.

Tree pruning standards shall comply with the following benchmark standards:

ANSI A300 Standard

ANSI Z133.1 Safety Standards

ISA Best Management Practices: Tree Pruning

To ensure that pruning is appropriate for the species and tree/site conditions, it is important to have a clear understanding of the specific needs of the tree and the objectives for pruning. Pruning objectives for shade trees include the following:

- Improve structural strength and reduce failure potential (including dead branch removal)
- Prevent or mitigate a pest problem
- Improve aesthetic characteristics
- Provide clearance for pedestrians, vehicles, and structures
- Improve safety and security for residents and visitors
- Repair structural damage from wind loading
- Reduce maintenance costs (i.e., when applied to young trees)
- Influence flowering and fruiting of some species

Type of Maintenance - Preventative

Tools and Supplies

- Hand Pruners (including hand pruners on pole attachment)
- Pruning Equipment (poles with pruning and saw attachment)
- Bucket Truck (required for pruning once tree is over 20' tall)
- Trash bag, gloves

Frequency:

Pruning: Year 1 (Pruning of deadwood only) 1x per tree in Year 1, either January to March or June to September

Year 3 (Correction of Structural Issues) 1x per tree in Year 3, either January to March or June to September:

- a. Reduce or Remove codominant stems
- b. Eliminate included bark and crossing branches
- c. Create balanced canopy
- d. Prevent lion's tailing and over-lifting

e. Remove large lower limbs

Year 5, 8, 12, 18, 24, 30, 36, 44, 52, 60 (Initiation of Structural pruning) 1x per tree in these years, either January to March or June to September:

a. Develop or maintain central leader

b. Identify lowest branches in the permanent canopy. Prevent branches below the permanent canopy from growing too large

- d. Keep all branches less than one half the trunk diameter
- e. Space main branches along one dominant trunk
- f. Suppress growth on branches with included bark

Labor Hours: 1 person per tree Years 1-12; 10 minutes per tree Years 1 through 6; 20 minutes per tree Years 6 to 12;

> Bucket truck required after year 12 (typically when tree has reached 20' in height); 20 minutes per crew Years 12 to 24; 30 minutes per crew Years 25 to 36.

Approximate labor hours may vary depending on tree size.

Maintenance Procedure (numbers correspond with Maximo sequencing):

- 10 *Safety set-up:* Set up a safety perimeter. During pruning, keep adjacent paving and construction clean and work area in an orderly condition. Protect existing plants from damage due to landscape maintenance operations and operations of other contractors and trades.
- 20 Inspect: Visually inspect for any trees or tree branches that are dead or broken and need to be removed and/or replaced (in the case of an entire tree being dead). Inspect for signs of frost heave and note any plants that may need to be replaced. Inspect trees for signs of vandalism, trunk damage, excessive drought, disease, and/or pest problems. Inspect soil surface in tree pits for signs of overly compacted soils or evidence that trees were planted too deeply (ensure that root flare is still visible).

Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.

- 30 *Remove trash/debris:* Remove any large debris and trash that has accumulated around trees and tree pits and legally dispose of them off Owner's property.
- 40 Tree Canopy Structural Pruning:
 - a. Develop or maintain central leader
 - b. Identify lowest branches in the permanent canopy.

- c. Prevent branches below the permanent canopy from growing too large
- d. Keep all branches less than one half the trunk diameter
- e. Space main branches along one dominant trunk
- f. Suppress growth on branches with included bark

Pruning may be done before or after planting at the direction of the City-County Arborist or authorized representative. Pruning shall be done with clean, sharp tools, and not by snapping or chopping portions of the tree

Prune, thin, and shape trees according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by City Arborist, do not cut or remove the central tree leader; remove only injured, dying, or dead branches. Remove all sucker growth from trees and remove overlapping branches to prevent rubbing.

Prune to retain natural character/form. All trees shall be allowed to grow to their natural genetic form and size, unless specifically accepted. Any pruning shall be done to promote structural strength and to accentuate the natural form and features of the tree.

Pruning of street trees shall be carried out to permit unobstructed passage to pedestrians and motor vehicles. Branches shall be maintained to a minimum of 7-1/2 feet above sidewalks and a minimum of 12 feet immediately above vehicular use areas. Within sight clearance restricted areas at traffic intersections, tree canopies shall be maintained at a minimum of 8-1/2 feet above finished grade. Trees in planters or plant beds which do not obstruct passage shall not be limbed up unless otherwise instructed.

Stripping of lower branches of young trees shall not be permitted. Lower branches shall be retained in a pinched condition with as much foliage as possible to promote trunk caliper. Lower branches should be cut off only after the tree is able to stand erect without staking or other support.

Thinning of certain species and individual specimens may be required to prevent wind damage. Suckers, water sprouts, rubbing and heavily laden branches shall be removed to provide less wind resistance.

- 50 *Disposal*: Gather and dispose of vegetation debris as appropriate.
- 60 *Record:* Make note of any additional observations in the Maintenance Report Log.
- 70 *Safety completion:* Remove safety perimeter.

SMP-11b: Plant Bed/Planter/Rain Garden/Bioswale

(Shrub and Herbaceous Groundcover) Pruning, Division, and Cutback (Removal of Dead Vegetation)

Plant beds, or planters, are typically a combination of trees, shrubs, and perennials (flowering plants) in a contained planting bed, with a covering of mulch. Planters can be contained within concrete curbs or seatwalls, or are often at ground level.

Rain gardens and bioswales are shallow surface depressions planted with specially selected native vegetation (trees, shrubs, grasses, and perennials) to treat and capture stormwater runoff. They are often designed to be planted on top of a layer of sand or gravel storage.

Plants are chosen for their natural shape and growth habit and maintenance should encourage vegetation health and enhance the natural form of plant material. Activities such as trimming and pruning should not alter plant form considerably.

Type of Maintenance - Preventative

Tools and Supplies

- Hand Pruners
- Trowel
- Spade shovel
- Pitchfork
- Bow saw (if necessary)
- Trash bag, gloves

Frequency: 1x/year, see below:

Shrubs: 1x/year in March/April or September/October depending on species

Perennials: 1x/year cutback in March/April or September/October (March/April recommended)

Grasses: 1x/year cut back as needed, March/April

Labor Hours: 2 people for approximately 1-8 hours per site, depending on site size

Maintenance Procedure (numbers correspond with Maximo sequencing):

- 10 *Safety set-up:* Set up a safety perimeter. During pruning, keep adjacent paving and construction clean and work area in an orderly condition. Protect plants from damage due to landscape maintenance operations and operations of other contractors and trades.
- 20 *Inspect*: Visually inspect for any bare areas of vegetation, or for specimen vegetation that has died and needs to be removed and/or replaced. Inspect plants for signs of excessive drought, disease, and/or pest problems. Inspect any areas of standing water for mosquito larvae.

Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.

30 *Remove trash/debris:* Remove any large debris and trash that has accumulated in and around planters/plant beds and legally dispose of them off Owner's property.

40 Prune:

Shrubs:

Prune, thin, and shape shrubs according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by City Arborist, remove only injured, dying, or dead branches from shrubs; and prune to retain natural character/form. Do not prune for shape.

Shrubs shall be pruned to maintain growth within space limitations, to maintain or enhance the natural growth habit, or to eliminate diseased or damaged growth. Some species shall be trimmed appropriately to influence flowering and fruiting, or to improve vigor.

Shrubs must be trimmed as needed to permit unobstructed passage to residents or vehicles. Trimming shrubs within site clearance restricted areas at intersections is appropriate and shall have a maximum height of 2-1/2 feet from vehicular surface. Any curbs or raised planting areas shall be factored into the maximum 2-1/2 feet height. Shrubs must be trimmed 4 inches from the edges of sidewalks and curbs.

Shrubs shall be pruned to conform to the design concept of the landscape. Individual shrubs shall not be clipped into balled or boxed forms, except where specifically instructed.

Perennials and Herbacious Plants:

Established plants bordering sidewalks or curbs shall be edged as often as necessary to prevent encroachment. Plants shall not be allowed to cover the crowns of shrubs or trees.

Refer to Plant ID Sheet to identify weeds from intended plants.

<u>Perennial cutback/clean-up/removal of dead vegetation</u>: Removing dead vegetation (on perennials) shall occur a minimum of 1x/year during the spring or fall, with a recommendation towards mid-spring before new vegetated growth has emerged or when plant is dormant. Use hand shears to remove dead vegetation and cut back perennials to 6-8" above root crown.

If dried seed pods or dried flowers are considered desirable by the property owner, then the dead vegetation may be allowed to remain through the winter and should be cut back in the spring. Some species have seed pods that act as food for birds/wildlife and/or decorative dried features, however other species may spread seed or look unkempt when dried and this may not be desired.

<u>Perennial Division and Thinning</u>: Depending on the species, perennials may need dividing every 3 – 5 years. This is because as certain plants get older, they die back starting from the center. Division is also done in order to prevent crowding as a plant grows and becomes larger in size. To divide perennials, dig up the old plant, remove the dead vegetation entirely, and replant the healthier sections. To thin perennials, selectively remove individual plant stems (either healthy or dead) if overcrowding is occurring. Thinning of perennials is done to prevent overcrowding and mildew by encouraging air circulation between individual plants.

Grasses:

Refer to Plant ID Sheet to identify weeds from intended plants.

<u>Grass cutback:</u> Cut back foliage to 6 – 10" above root crown in mid-spring before warm season grasses emerge, but when cool season weeds are actively growing. Leave a minimum 4-6" of previous growing

season's growth depending on the ornamental grass species. Shorter species such as Blue Fescue will be 4" while taller species such as Switchgrass will be 6".

<u>Grass division</u>: Ornamental and/or clumping grasses shall also be divided every 3 to 5 years to increase vigor. Groundcover grasses and meadow grasses do not need dividing.

List of example grasses that require division:

Sedges (Carex spp.) Miscanthus (Maiden Grass) Pennisetum (Fountain Grass) Andropogon gerardii (Big Bluestem) Schizachyrium scoparium (Little Bluestem) Panicum virgatum (Switchgrass) Calamagrostis x acutiflora (Feather Reed Grass) Chasmanthium latifolium (Northern Sea Oats) Festuca ovina var. glauca (Blue Fescue)

- 50 *Record:* Make note of any additional observations in the <u>Maintenance Report Log.</u>
- 60 Safety completion: Remove safety perimeter

Save the Rain: Green Infrastructure Program Standard Maintenance Procedure (SMP)

SMP-12: Meadow Mowing and Invasive Species Management

A meadow is a field consisting primarily of herbaceous grasses, forbs, wildflowers, and other non-woody plants. Mowing a meadow helps to prevent and control woody plant and weed establishment, while also helping to disperse seeds of desirable species. Mowing manages for cool season weeds, which helps promote warm season grass establishment. Using a flail-type mower for large grassland areas results in finely chopped plant material, encourages more rapid breakdown of leaf litter and eliminates the need to bale and remove any cut grasses and/or weeds.

Type of Maintenance - Preventative

Tools and Supplies (see Appendix B: Meadow Maintenance Equipment List)

- Hand Scythes (small meadows)
- Power Strimmer (String Trimmer/Weed Whacker) (small meadows)
- Power Scythe (large meadows)
- Flail-type Mower suggested mower for large meadows
- Riding or Push Mower suggested mower for small to medium meadows
- Trash bag, gloves

Frequency:

Initial establishment: 1st Growing Season (Year 1)

• Mow meadow once a month during growing season (April through November)

Initial establishment: Year 2

• Mow once in fall

Long Term Maintenance regime: Year 3 and after:

 Mow once every 2 years in early to mid-spring prior to significant warm season grass regrowth, but when cool season weeds are actively growing. If basin bottom is too wet for spring mowing, mow in late fall (after plants have set seed).

Labor Hours: 2 people for approximately 2-6 hours per site, depending on site size

Maintenance Procedure (numbers correspond with Maximo sequencing):

- 10 *Safety set-up:* Set up a safety perimeter.
- 20 *Inspect*: Visually inspect the meadow for any bare areas of vegetation or for specimen vegetation that has died and needs to be removed and/or replaced. Inspect plants for signs of excessive drought, disease, and/or pest problems. Inspect any areas of standing water for mosquito larvae.

Inspect meadow area for evidence of invasive species establishment. Examples of invasive species include thistle, crown vetch, knapweed, phragmites, and general weeds such as dandelions.

Note areas that will require hand pulling and spot spraying of invasive species (only if the invasive species will not be managed through mowing). Refer to SMP-11c for the instructions on hand pulling and spot spraying of invasives.

Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.

- 30 *Remove trash/debris:* Remove any large debris and trash that has accumulated in the meadow area and legally dispose of them off Owner's property.
- 40 Mowing:

Never mow when soil is saturated with water.

During mowing, keep adjacent paving and construction clean and work area in an orderly condition. Protect plants from damage due to landscape maintenance operations and operations of other contractors and trades.

Small meadows can be cut/mown with hand scythes or a power strimmer. Larger meadows can be cut/mown with a power scythe or a tractor mower (flail-type mower is recommended).

Refer to Appendix B: Meadow Maintenance Equipment List

- Initial establishment: 1st Growing Season (Year 1)
 - Mow meadow when plants/grasses reach a height of approximately 10-inches (10"), which is about
 once a month during the growing season. Mow down to to height of 6" (or just above the height of
 emerging native grass seedlings).
 - Remove, finely chop, and redistribute mowings to prevent cut weeds from smothering native grass seedlings.
- Initial establishment: Year 2
 - Fall: Mow once during fall to a height of 8".
- Long Term Maintenance regime: Year 3 and after:
 - Mow to a height of 6-8" once every 2 years in early to mid-spring prior to significant warm season grass regrowth, but when cool season weeds are actively growing. If basin bottom is too wet for spring mowing, mow in late fall (after plants have set seed).
 - Remove cut material, or mow with a flail mower to finely chop residue.
 - If dry leaf litter builds up:
 - Mow every year or
 - Pull out lower litter that a mower can't reach with a harrow or rake.
- 50 *Record:* Make note of any additional observations in the <u>Maintenance Report Log.</u>
- 60 Safety completion: Remove safety perimeter.

Appendix B: Meadow Maintenance Equipment List

Riding or Push Mower with 30" Max. Cutting Deck

Use this mower to maintain the fescue mow strips, Landscape Management Zone 4.0 "Mow strips/ Grassed Edges." Use a 3" minimum mow height.

Flail-type mower

Flail mowers are suggested for maintenance of large grassland/meadow areas. The advantage to using flail mowers is that they chop material into fine pieces, encouraging more rapid breakdown of leaf litter and eliminating the need to bale and remove cut grasses or weeds. A flail mower with an arm will be useful in mowing islands and slopes.

Harrow

Harrows may be necessary to rejuvenate meadow stands periodically if flail mowers do not remove enough old plant litter, but they are not needed for annual use.

Save the Rain: Green Infrastructure Program Standard Maintenance Procedure (SMP)

SMP-13a: Plant (Shrub and Herbaceous Plant Material) Replacement

Plant (shrub and herbaceous plant material) replacement involves replacing missing, dead, or diseased shrubs and herbaceous plant material (perennials, forbs, grasses) in planter beds, planters, rain gardens, and/or bioswales if replacement has been deemed necessary.

NOTE: Tree replacement is not part of this SMP and will occur separately.

Type of Maintenance - Replacement

Tools and Supplies

- Safety cones
- Safety gear (clothing, gloves, etc.)
- Planting and Mulching Equipment shovels, pitchfork, rake, etc.
- Shrubs, plants, and seeds (to be planted)
- Mulch (as specified)
- Trash bags for debris, weeds, etc.

Frequency: Spring and Fall, Replacement as necessary

Labor Hours: 2 people for approximately 2-6 hours per site depending on scope of replacement

Maintenance Procedure (numbers correspond with Maximo sequencing):

- 10 *Safety set-up:* Set up a safety perimeter. Protect existing plants from damage due to landscape operations and maintenance.
- 20 *Inspect*: Visually inspect for any bare areas of vegetation or specimen vegetation that has died and needs to be removed and/or replaced. Inspect areas where plants will be planted (replaced) and note signs of soil subsidence, soil compaction, standing water, evidence of disease/fungus, and animal burrowing.

Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.

30 *Remove trash/debris:* Remove any leaves, debris, and trash that have accumulated in or around the plant beds/planters.

All refuse resulting from the maintenance operation of properties shall be disposed of at locations designated by the Manager/Owner.

- 40 *Replacement:* Follow the below instructions if shrub and herbaceous groundcover replacement has been deemed necessary. **Tree replacement will occur separately.**
 - a) Replacement requirements for shrubs and groundcover:

- Shrubs: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and with healthy root systems developed by transplanting or root pruning.
 Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required.
 - Set balled and potted and container-grown stock plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.
 - Pit should be twice as wide as it is deep
 - Use planting soil for backfill, of types specified and scheduled.
 - Carefully remove root ball from container without damaging root ball or plant.
 - Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - If amending soil, place amendment tablets or incorporate amendments in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. If using amendment tablets, place tablets beside the root ball about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole.
 - Continue backfilling process. Water again after placing and tamping final layer of soil.
- Groundcover and Perennial Plugs: For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
 - Set out and space ground cover and plants in swaths to fill in vegetated gaps in plant bed.
 - Dig holes large enough to allow spreading of roots.
 - Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
 - Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
 - Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.
- Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - Shrubs:
 - Spring Planting: March 1 to May 1.
 - Fall Planting: September 1 to November 1.
 - Grass & Perennial Plugs:
 - Spring Planting: April 1 to June 15.
 - Fall Planting: August 1 to September 15.

- Bulbs:
 - Fall Planting: September 15 to October 30.
- 50 *Cleanup*: Stones, debris, tools, equipment, rope, pruned branches, tree debris, etc., shall be removed from the site upon completion of work. Excess soil outside of the saucer areas shall be removed and the area raked smooth. Paved areas shall be broom cleaned.
- 60 *Record:* Make note of any additional observations in the <u>Maintenance Report Log.</u>
- 70 *Safety completion:* Remove safety perimeter.

SMP-13b: Meadow Replacement

Meadow replacement involves reseeding or replugging meadow grasses or herbaceous groundcover plants if replacement has been deemed necessary.

Type of Maintenance - Replacement

Tools and Supplies

- Safety cones
- Safety gear (clothing, gloves, etc.)
- Planting Equipment shovels, etc.
- Plant plugs and seed (to be planted)
- Mulch (as specified)
- Trash bags for debris, weeds, etc.

Frequency: Spring and Fall, Replacement/Reseeding as Necessary

Labor Hours: 2 people for approximately 4-6 hours per site depending on scope of replacement

Maintenance Procedure (numbers correspond with Maximo sequencing):

- 10 *Safety set-up:* Set up a safety perimeter. Protect plants from damage due to landscape operations and maintenance.
- 20 *Inspect*: Visually inspect for any bare areas of vegetation or specimen vegetation that has died and needs to be removed and/or replaced. Inspect areas where plants will be planted (replaced) and note signs of soil subsidence, soil compaction, standing water, evidence of disease/fungus, and animal burrowing.

Record observations in the <u>Maintenance Report Log</u> and report as necessary. If possible, take photographs to document site conditions.

30 *Remove trash/debris:* Remove any leaves, debris, and trash that have accumulated in or around the meadow.

All refuse resulting from the maintenance operation of properties shall be disposed of at locations designated by the Manager/Owner.

- 50 *Replace Plants (Plugging/Reseeding):* Follow the below instructions if meadow reseeding has been deemed necessary. For Shrubs and Herbaceous Groundcover, see SMP-15 Plant (Shrub and Herbaceous Groundcover) Replacement.
 - a) Replacement Requirements:
 - Re-plugging: see SMP-13a Plant (Shrub and Herbaceous Groundcover) Replacement for instructions.
 - b) Reseeding Requirements:
 - Reseed bare areas with same materials specified for respective grasses & forbs.
 - Seed mixture shall be fresh, clean, new crop seed. Seed shall be of the previous year's crop and in no case shall the weed seed content exceed 0.25% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and

properly labeled containers. All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed that has become wet, moldy or otherwise damaged shall not be acceptable.

- Percent Pure Live Seed (PLS) shall be calculated for all seed lots using each seed lot's own unique purity and germination test results. Percent Pure Live Seed is defined by the following formula: Percent (%) Purity x Percent (%) Germination/100 = Percent (%) Pure Live Seed (PLS). The minimum % PLS shall be 75% for each seed lot. A "PLS Pound" is defined as the bulk weight of seed required to equal one pound of 100% pure, germinable seed.
- b) Reseeding Instructions:
 - Weather Limitations: Proceed with seeding only when existing and forecasted weather conditions permit.
 - Seeded areas to be lightly scarified with springy rake to loosen soil before reseeding.
 - For small areas, hand broadcast seed to match initial seeding rate specified for site.
 - Mix seed with two-thirds of a bushel of moist vermiculite before sowing. Divide seed and vermiculite mix into quantities for each area to be reseeded.
 - Broadcast seed evenly across meadow area.
 - After broadcast seeding by hand, firm the seeded area with a land roller, such as a cultipacker or equivalent machinery. Cultipacking is not required if using a Truax no-till drill or a Brillion seeder.
 - For larger areas, use no-till seed drill or broadcast seeder, without inert matter added.
 - Seeders such as a "Truax" no-till drill or a double box "Brillion" grass and legume broadcast seeder are recommended. The use of other drill or seeder will require approval of seed supplier prior to use for meadow seeding. The Brillion seeder requires that a fine-graded seedbed be worked up prior to seeding.
 - Maintain and establish vegetation by watering, reseeding, weeding, controlling pests and diseases, and other operations. Roll, regrade, and reseed bare or eroded areas and remulch to produce a uniformly smooth vegetative cover.
 - Add new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.
 - Meadow Mowing: Refer to SMP-12 Meadow Mowing.
- c) Reseeding Restrictions:
 - Seed during one of the following periods.
 - Meadow Seeding: March 15th to June 15th
 - Warm-Season Meadow Seeding: April 15th to June 15th and August 15th to September 15th

- *Cleanup*: Stones, debris, tools, equipment, rope, pruned branches, plant debris, etc., shall be removed from the site upon completion of work. Excess soil outside of the saucer areas shall be removed and the area raked smooth. Paved areas shall be broom cleaned.
- *Record:* Make note of any additional observations in the <u>Maintenance Report Log.</u>
- *Safety completion:* Remove safety perimeter.

Appendix B

Green Infrastructure Maintenance Report Log

Save the Rain: Green Infrastructure Program Maintenance Report Log

PM Task Name: Porous Pavement Maintenance – Porous Asphalt/Concrete & Flexipave

Truck Number:		Weather Conditions:
Location Name:		Location Address:
Task Code:		Task Description:
Task Start Date:		Personnel/Task Start Time:
Task End Date:		Personnel/Task End Time:
Labor Personne	l Name: Phil Centore 🗌	Paul Legnetto Other:
Tools Used:	Broom	Maximo Item No. 2376
	Flat Shovel	Maximo Item No. 8491
	Rake	Maximo Item No. 18209
	Dust Pan	Maximo Item No. 8386
	Other:	Maximo Item No
	Other:	Maximo Item No
Materials Used:	Plastic Bag	Maximo Item No. 4478 Qty:
	Other:	Maximo Item NoQty:
	Other:	Maximo Item NoQty:

VACUUMING (Please submit photos if necessary) Maximo Task Code: _____

Vacuum Type/Manufacturer: _			
Hour Meter Start:	Hour Meter End:	Number of Passes:	
Weight/Amount of Material Co	llected (# bags x pounds or	gallons/bag):	
Description of Collected Mate	rials:		
Description of Vacuumed Mate	erials:		
Notes:			

POWER WASHING (Please submit photos if necessary) Maximo Task Code: ______

Power Washer Type/Manufacturer: _____

	Hour Meter Start:	Hour Meter End:	Number of Passes:
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WINTER MAINTENANCE (Please submit photos if necessary) Maximo Task Code: _____

Plow Type/Manufacturer:
Hour Meter Start: Hour Meter End: Number of Passes:
Plowing Notes:
Deicing Salt Type/Product Used, if Applicable:
Amount Used:
Notes:
RIVERSTONE EDGE MAINTENANCE (Please submit photos if necessary) Maximo Task Code:

Existing Condition of Riverstone and Amount of Weed Growth:

Weeds Removed from Riverstone? (YES/NO): _____

Type/Specification of Riverstone Used to Replenish Riverstone: ______

Amount of Riverstone Used:_____

Save the Rain: Green Infrastructure Program Maintenance Report Log

PM Task Name: Porous Paver Maintenance

Truck Number:		Weather Conditions:
Location Name:		Location Address:
Task Code:		Task Description:
Task Start Date:		Personnel/Task Start Time:
Task End Date:		Personnel/Task End Time:
Labor Personne	l Name: Phil Centore 🗌	Paul Legnetto Other:
Tools Used:	Broom	Maximo Item No. 2376
	Flat Shovel	Maximo Item No. 8491
	Rake	Maximo Item No. 18209
	Dust Pan	Maximo Item No. 8386
	Other:	Maximo Item No
	Other:	Maximo Item No
Materials Used: Plastic Bag		Maximo Item No. 4478 Qty:
	Other:	Maximo Item NoQty:
	Other:	Maximo Item NoQty:

VACUUMING (Please submit photos if necessary) Maximo Task Code: _____

Vacuum Type/Manufacture	r:		
Hour Meter Start:	Hour Meter End:	Number of Passes:	
Weight/Amount of Material	Collected (# bags x pound	s or gallons/bag):	
Description of Collected Ma	aterials:		
Description of Vacuumed N	Naterials:		
Notes:			

REFILLING VOIDS WITH AGGREGATE (Please submit photos if necessary) Maximo Task Code: _____

Type/Specification of Aggregate Used: _____

Amount of Aggregate Used to Refill Voids:_____

WINTER MAINTENANCE (Please submit photos if necessary) Maximo Task Code: _____

Plow Type/Manufacturer:			
Hour Meter Start:	_ Hour Meter End:	Number of Passes:	
Plowing Notes:			
Deicing Salt Type/Product	Used, if Applicable:		
Amount Used:			
Notes:			

RIVERSTONE EDGE MAINTENANCE (Please submit photos if necessary) Maximo Task Code: _____

Existing Condition of Riverstone and Amount of Weed Growth: _____

Weeds Removed from Riverstone? (YES/NO): ______

Type/Specification of Riverstone Used to Replenish Riverstone:

Amount of Riverstone Used:_____

Save the Rain: Green Infrastructure Program Maintenance Report Log

PM Task Name: Stormwater Structure Cleaning

Truck Number:		Weather Conditions:
Location Name:		Location Address:
Task Code:		Task Description:
Task Start Date:		Personnel/Task Start Time:
Task End Date:		Personnel/Task End Time:
Labor Personne	l Name: Phil Centore 🗌	Paul Legnetto Other:
Tools Used:	Broom	Maximo Item No. 2376
	Flat Shovel	Maximo Item No. 8491
	Rake	Maximo Item No. 18209
	Dust Pan	Maximo Item No. 8386
	Other:	Maximo Item No
	Other:	Maximo Item No
Materials Used: Plastic Bag		Maximo Item No. 4478 Qty:
	Other:	Maximo Item NoQty:
	Other:	Maximo Item NoQty:

STORMWATER STRUCTURE MAINTENANCE (Please submit photos if necessary) Maximo Task Code: _____

Type of Stormwater Structure:	
Condition of Interior of Stormwater Structure:	
Types of Debris/Leaf Litter/Sediment Found inside Structure:	
Vacuum Type/Manufacturer:	
Hour Meter Start: Hour Meter End:	
Weight/Amount of Vacuumed Material:	
Description of Vacuumed Materials:	
Notes:	

|--|

Condition of Existing I	nlet Filter Insert:		
Vacuum Type/Manufac	turer:		
Hour Meter Start:	Hour Meter End:		
Description of Vacuum	ed Materials:		
Notes about Vacuumed	Materials:	,,	
Filter Insert Successfu	Ily Reattached? (YES/NO):		
Replacement of Filter I	nsert? (YES/NO):		
Type of Filter Insert Re	placed:		
Notes:			

RIVERSTONE EDGE MAINTENANCE (Please submit photos if necessary) Maximo Task Code: _____

Existing Condition of Riverstone and Amount of Weed Growth: _____

Weeds Removed from Riverstone? (YES/NO): _____

Type/Specification of Riverstone Used to Replenish Riverstone:

Amount of Riverstone Used:_____

Save the Rain: Green Infrastructure Program Maintenance Report Log

PM Task Name: Green Roof

Truck Number:	Weather Conditions:	
Location Name:	Location Address:	
Task Code:	Task Description:	
Task Start Date:	_ Personnel/Task Start Time:	
Task End Date:	_ Personnel/Task End Time:	
Labor Personnel Name: Phil Cer	ore Paul Legnetto Other:	
Tools Used: Broom	Maximo Item No. 2376	
Flat Shovel	Maximo Item No. 8491	
Rake	Maximo Item No. 18209	
Dust Pan	Maximo Item No. 8386	
Other:	Maximo Item No	
Other:	Maximo Item No	
Materials Used: Plastic Bag	Maximo Item No. 4478 Qty:	
Other:	Maximo Item NoQty:	
Other:	Maximo Item NoQty:	
<u>GREEN ROOF MAINTENANCE (Please submit photos if necessary)</u> Maximo Task Code:		
Condition of Green Roof Plants:		
Condition of Waterproofing Syste	n (Flashings/Counter-Flashings):	
Condition of Drainage System (So	.uppers/Outlets):	
Amount of Weeds Present:		
Plant Replacement/Replenishment Necessary? (YES/NO):		
Number/Amount of Plants Planted:		
Types of Species (If Known):		
Notes:		

Save the Rain: Green Infrastructure Program Maintenance Report Log

PM Task Name: Landscaping - Trees/Shrubs/Vegetation

Truck Number:		Weather Conditions:
Location Name:		Location Address:
Task Code:		Task Description:
Task Start Date:		Personnel/Task Start Time:
Task End Date:		Personnel/Task End Time:
Labor Personnel	Name: Phil Centore	Paul Legnetto Other:
Tools Used:	Broom	Maximo Item No. 2376
I	Flat Shovel	Maximo Item No. 8491
I	Rake	Maximo Item No. 18209
I	Dust Pan	Maximo Item No. 8386
(Other:	Maximo Item No
(Other:	Maximo Item No
Materials Used: F	Plastic Bag	Maximo Item No. 4478 Qty:
(Other:	Maximo Item NoQty:
(Other:	Maximo Item NoQty:
LANDSCAPE GEI	NERAL MAINTENANCE (Please s	ubmit photos if necessary) Maximo Task Code:
Condition of Tree	es:	

Are Root Flares Present? Are trees planted too deep or too shallow? _______Arborist Follow-Up Visit Necessary? If yes, note which trees: _______Condition of Shrubs: ______

Condition of Perennials/Grasses/Herbaceous Plants:_____

Amount of Weeds Present:____

Plant Replacement/Replenishment Necessary? (YES/NO): ______

Amount of Weeds Removed/Types of Weeds (If Known):	LANDSCAPE WEEDING (Please submit photos if necessary) Maximo Task Code:
Are invasive species present? (YES/NO if known): Herbicide Used? (Control of Invasive Species Only and Permission Obtained): Type of Herbicide Used: Amount Used: Notes: LANDSCAPE MULCHING (Please submit photos if necessary) Maximo Task Code: What was mulched? Tree Pits Trees Plant Beds Rain Gardens Other: Type of Mulch Used: Amount of Mulch Used: Amount of Mulch Used: Amount of Mulch Used: Motes: LANDSCAPE WATERING (Please submit photos if necessary) Maximo Task Code: Motes: LANDSCAPE WATERING (Please submit photos if necessary) Maximo Task Code: Type of Mulch Used: Notes: LANDSCAPE WATERING (Please submit photos if necessary) Maximo Task Code: Type of Organic Matter/Mycorrhizae Used: Amount Organic Matter/Mycorrhizae Applied: Type of Organic Matter/Mycorrhizae Applied: Type of Organic Matter/Mycorrhizae Applied: Type of Pruning Done? Deadwood Structural Other: Type of Pruning Done? Deadwood Structural Other: Arborist Follow-Up Visit Necessary? If yes, note which trees: Notes: Notes:	Amount of Weeds Removed/Types of Weeds (If Known):
Herbicide Used? (Control of Invasive Species Only and Permission Obtained): Type of Herbicide Used: Amount Used: Notes: LANDSCAPE MULCHING (Please submit photos if necessary) Maximo Task Code: What was mulched? Tree Pits Trees Plant Beds Rain Gardens Other: Type of Mulch Used: Amount Volume of Water Applied: Rate of Watering: Notes: TREE FERTILIZATION (Please submit photos if necessary) Maximo Task Code: Type of Organic Matter/Mycorrhizae Used: Amount Organic Matter/Mycorrhizae Applied: Notes: PRUNING OF TREES AND SHRUBS (Please submit photos if necessary) Maximo Task Code: Type of Pruning Done? Deadwood Structural Other: What was pruned? Trees Shrubs Other: Maximo Task Code: Type of Pruning Done? Deadwood Structural Other: Notes: Type of Pruning Done? Deadwood <	Are invasive species present? (YES/NO if known):
Type of Herbicide Used:	Herbicide Used? (Control of Invasive Species Only and Permission Obtained):
Amount Used:	Type of Herbicide Used:
Notes:	Amount Used:
LANDSCAPE MULCHING (Please submit photos if necessary) Maximo Task Code: What was mulched? Tree Pits Trees Plant Beds Rain Gardens Other: Type of Mulch Used:	Notes:
LANDSCAPE MULCHING (Please submit photos if necessary) What was mulched? Tree Pits Trees Plant Beds Rain Gardens Other: Type of Mulch Used: Amount of Mulch Used: Amount of Mulch Used: Notes:	
What was mulched? Tree Pits Trees Plant Beds Rain Gardens Other:	LANDSCAPE MULCHING (Please submit photos if necessary) Maximo Task Code:
Type of Mulch Used: Amount of Mulch Used: Notes: LANDSCAPE WATERING (Please submit photos if necessary) Maximo Task Code: Amount/Volume of Water Applied: Rate of Watering: Notes: TREE FERTILIZATION (Please submit photos if necessary) Maximo Task Code: Type of Organic Matter/Mycorrhizae Used: Amount Organic Matter/Mycorrhizae Applied: Notes: PRUNING OF TREES AND SHRUBS (Please submit photos if necessary) Maximo Task Code: Type of Pruning Done? Deadwood Structural Other: Mat was pruned? Trees Shrubs Other: Arborist Follow-Up Visit Necessary? If yes, note which trees:	What was mulched? Tree Pits Trees Plant Beds Rain Gardens Other:
Amount of Mulch Used:	Type of Mulch Used:
Notes:	Amount of Mulch Used:
LANDSCAPE WATERING (Please submit photos if necessary) Maximo Task Code:	Notes:
LANDSCAPE WATERING (Please submit photos if necessary) Maximo Task Code:	
Amount/Volume of Water Applied:	LANDSCAPE WATERING (Please submit photos if necessary) Maximo Task Code:
Rate of Watering:	Amount/Volume of Water Applied:
Notes:	Rate of Watering:
TREE FERTILIZATION (Please submit photos if necessary) Maximo Task Code:	Notes:
TREE FERTILIZATION (Please submit photos if necessary) Maximo Task Code: Type of Organic Matter/Mycorrhizae Used: Amount Organic Matter/Mycorrhizae Applied: Notes: PRUNING OF TREES AND SHRUBS (Please submit photos if necessary) Maximo Task Code: Type of Pruning Done? Deadwood Structural Other: What was pruned? Trees Shrubs Other: Arborist Follow-Up Visit Necessary? If yes, note which trees:	
TREE FERTILIZATION (Please submit photos if necessary) Maximo Task Code:	
Type of Organic Matter/Mycorrhizae Used:	TREE FERTILIZATION (Please submit photos if necessary) Maximo Task Code:
Amount Organic Matter/Mycorrhizae Applied:	Type of Organic Matter/Mycorrhizae Used:
Notes:	Amount Organic Matter/Mycorrhizae Applied:
PRUNING OF TREES AND SHRUBS (Please submit photos if necessary) Maximo Task Code:	Notes:
PRUNING OF TREES AND SHRUBS (Please submit photos if necessary) Maximo Task Code:	
PRUNING OF TREES AND SHRUBS (Please submit photos if necessary) Maximo Task Code: Type of Pruning Done? Deadwood Structural Other: What was pruned? Trees Shrubs Other: Arborist Follow-Up Visit Necessary? If yes, note which trees: Notes:	
Type of Pruning Done? Deadwood Structural Other:	PRUNING OF TREES AND SHRUBS (Please submit photos if necessary) Maximo Task Code:
What was pruned? Trees Shrubs Other: Arborist Follow-Up Visit Necessary? If yes, note which trees:	Type of Pruning Done? Deadwood 🗌 Structural 🗌 Other:
Arborist Follow-Up Visit Necessary? If yes, note which trees:	What was pruned? Trees Shrubs Other:
Notes:	Arborist Follow-Up Visit Necessary? If yes, note which trees:
	Notes:

PLANT DIVISION/CUTBACK: (Please submi	t photos	if necessary) N	laximo Task Cod	e:	
Approximate number/square footage of pla	ants cut	back/dead ve	getation removed	:	
Perennials divided? YES/NO					
Grasses divided? YES/NO					
Species divided (If known):					
Notes:					
LANDSCAPE REPLACEMENT (Please subl	mit photo	s if necessary)	Maximo Task Co	de:	
Plant Replacement/Replenishment Necess	ary? (YE	:S/NO):			
What was replaced? (Circle answer)	Trees	Shrubs	Perennials	Grasses	Other
Number/Amount of Plants Planted:					
Types of Species (If Known):					
Notes:					
MEADOW MOWING (Please submit photos in	^r necessa	<u>ary)</u> Maximo Ta	ask Code:		
Mower Type/Manufacturer:					
Hour Meter Start: Hour Meter En	d:	Number	of Passes:		
Height of Mow Blade:					
Notes:					

Additional Notes (Please submit photos if necessary):

Appendix C

Appendix C: STR Projects with Green Assets Identified

		Year		Plan Type Available
P-ID	Project Name	Procured	Parcel Owner	03-15-13
C-01	City Parking Lot #21	2010	Syracuse Urban Renewal Agency	Final Design
C-07	Municipal Parking Garage: OnCenter	2011	County of Onondaga	As-Built
C-09	County Parking Lot B at S. Townsend Street	2010	County of Onondaga	As-Built
C-101	Green Park: Skiddy Park (Site)	2011	City of Syracuse	As-Built
C-11	Commercial Green Streets: Harrison Street	2011	City of Syracuse	As-Built
C-110	Sevmour Academy Parking Lot	2012	Svracuse City School District	As-Built
C-117	Tree Plantings in Court Woodlawn	2011	Private	No Plans
C-12a	Townsend St Median Revegetation Phase 1	2012	City of Syracuse	As-Built
C-12b	Townsend St Median Revegetation Phase 2	2011	City of Syracuse	Construction Plans
C-134b	Tree Planting at Union & Demong Parks	2011	City of Syracuse	No Plans
C-137b	Tree Planting at Schiller Park	2011	City of Syracuse	No Plans
C-29a	Connective Corridor Phase 1 - Contract 1 (University Ave)	2011	City of Syracuse	Contract Drawings
C-29b	Connective Corr Phase 1 - Contract 2 (E. Genesee St)	2011	City of Syracuse	Contract Drawings
C-33	War Memorial Cistern System			
C-34	Green Roof at OnCenter	2011	County of Onondaga	As-Built
C-38	County Parking Lot: OnCenter	2011	County of Onondaga	As-Built
C-42	Atrium Garage Stormwater Cistern		THIS IS A PILOT PROJECT AND UNIQUE	
C-48	Green Roof at Erie Canal Museum and Visitor Center	2011	County of Onondaga	As-Built
C-54c	Downtown Streetscape @ Water St	2011	City of Syracuse	As-Built
C-54d	Downtown Streetscape @ Montgomery St	2011	City of Syracuse	As-Built
C-54e	Downtown Streetscape @ Montgomery St (East Side)	2012	City of Syracuse	As-Built
C-54f	Downtown Streetscape @ West Side 100 S. State St.	2012	City of Syracuse	As-Built
C-60	Green School: Seymour Academy Playground	2012	Syracuse City School District	As-Built
C-61	Gateway Project at Water Street	2011	City of Syracuse	As-Built
C-68	Street Trees along Marcellus Ave	2012	City of Syracuse	No Plans
C-74a	Otisco Street Green Corridor - Phase 1	2011	City of Syracuse	Final Design
C-85	SCSD Central Offices	2011	Syracuse City School District	Final Design
C-99	Vacant Lot: 701 Oswego St.	2011	City of Syracuse	Final Design
E-06	City Parking Lot #3	2010	Syracuse Urban Renewal Agency	As-Built
E-08	Green Library: Petit Branch	2012	City of Syracuse	As-Built
E-36	Upper Sunnycrest Park	2011	City of Syracuse Parks Department	As-Built
E-39	East Water Street Pavement Removal	2011	City of Syracuse	As-Built
E-42	County Board of Election Building	2011	County of Onondaga	Site-Plan only, Need to
E-43	Westcott Community Center	2012	City of Syracuse	As-Built
F-01	City Parking Lot at Pearl Street	2010	New York State DOT	As-Built
F-02	Green Library: White Branch	2012	City of Syracuse	As-Built
F-04a	City Parking Lot #4	2012	New York State DOT	Final Design
F-04b	Green Street: N State St at City Lot 4	2012	City of Syracuse	Final Design
H-05	Green Roof at Hazard Branch Library	2011	City of Syracuse	As-Built
H-05b	Green Library: Hazard Branch Site Improvements	2012	City of Syracuse	As-Built
H-06	Green Library: Mundy Branch	2012	City of Syracuse	As-Built
H-11	Avery Ave Greening at Pass Arboretum	2011	City of Syracuse Parks Department	As-Built
H-13	Wilbur Avenue Zoo Entrance Enhancement	2011	City of Syracuse	As-Built
H-17	Rain Garden at Grand & Delaware	2011	City of Syracuse	60pct Submittal
H-30	Vacant Lot: 1344-50 W. Onondaga St	2012	City of Syracuse	As-Built
H-38	Vacant Lot: 224-226 Putnam Street	2012	City of Syracuse	As-Built
H-44	Vacant Lot: 109 Hartson Street	2012	City of Syracuse	As-Built
H-47	Road Recon #12: 600 Block Gifford St	2012	City of Syracuse	No Plans
M-10b	Green Library: Beauchamp Site Improvements	2012	City of Syracuse	No Plans
M-23	Greening the Grey in Basin 044	2011	TBD	Bid Drawings
M-29	GIF#017 Create Public Art	2012	Private	As-Built
M-29	Hugnes Magnet School Parking Lot	2011	Syracuse City School District	AS-Built
IVI-29d	Arbor Day Tree Plantings: Hugnes Magnet School	2012	Syracuse City School District	
IVI-39	Bellevue Academy Tree Plantings	2011	Syracuse City School District	NO Plans
IVI-52	Koad Kecon #4: S State Street	2012	City of Syracuse	As-Built
IVI-53	Koad Kecon #5: Sumner Ave	2012	City of Syracuse	AS-BUIIT
22-02a	Street Tree Planting Spring 2011	2011	City of Syracuse	Final Contract
22-02b	Street Tree Planting Fall 2011	2011	City of Syracuse	Final Contract
ZZ-UZC	Street Tree Contract Foll 2012	2012	City of Syracuse	
22-02d	Street free Contract - Fail 2012 Planting	2012	City of Syracuse	INO PIARIS

P-ID	C-01				
P-NAME	City Parking Lot # 21				
P-ADDRESS	SW Corner of West Washington St and Clinton	on St			
GI TECHNOLOGIES	Infiltration Trench	Porous Pavers	Tree Trench		
INSTALL DATE	2010 October				
LONGITUDE (X)	935226.8285				
LATITUDE (Y)	1111349.128				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		378	Lin. Feet	HDPE
Drainage	Solid Pipe		13	Lin. Feet	HDPE
Drainage	Catch Basin	Syracuse Castings	4	Ea.	
Drainage	Inlet Filter Insert / Filter Basket	Flogard Plus (Kristar)	2	Ea.	
Drainage	Cleanout	East Jordan Iron Works	3	Ea.	
Drainage	Observation Well/Port		1	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	2	Ea.	
Paving	Porous Pavers		760	Sq. Feet	
Landscaping	Mulch		100	Sq. Feet	
Trees	Tree: New		6	Ea.	Part of GI System

P-ID	C-07				
P-NAME	Municipal Parking Garage: OnCenter				
P-ADDRESS	817 - 835 S. State Street and E. Adams Street				
GI TECHNOLOGIES	Rain Garden				
INSTALL DATE	2011 October				
LONGITUDE (X)	936942.0662				
LATITUDE (Y)	1109122.636				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
			no built quality	••••••	
Drainage	Solid Pipe		173	Lin. Feet	HDPE
Drainage Drainage	Solid Pipe Outlet Riser	(1) <i>SS Weir</i> : Nyloplast; (5) Nyloplast	173 6	Lin. Feet Ea.	HDPE
Drainage Drainage Drainage	Solid Pipe Outlet Riser Inlet Filter Insert / Filter Basket	(1) <i>SS Weir</i> : Nyloplast; (5) Nyloplast Nyloplast	173 6 6	Lin. Feet Ea. Ea.	HDPE
Drainage Drainage Drainage Drainage	Solid Pipe Outlet Riser Inlet Filter Insert / Filter Basket Manhole	(1) <i>SS Weir</i> : Nyloplast; (5) Nyloplast Nyloplast	173 6 6 1	Lin. Feet Ea. Ea. Ea.	HDPE (1) Existing
Drainage Drainage Drainage Drainage Drainage	Solid Pipe Outlet Riser Inlet Filter Insert / Filter Basket Manhole Downspout Outfall	(1) <i>SS Weir</i> : Nyloplast; (5) Nyloplast Nyloplast	173 6 6 1 4	Lin. Feet Ea. Ea. Ea. Ea. Ea.	HDPE (1) Existing
Drainage Drainage Drainage Drainage Drainage Drainage	Solid Pipe Outlet Riser Inlet Filter Insert / Filter Basket Manhole Downspout Outfall Modular Storage System	(1) <i>SS Weir</i> : Nyloplast; (5) Nyloplast Nyloplast Stormtech SC 740 Chamber System	173 6 6 1 4 1,234	Lin. Feet Ea. Ea. Ea. Ea. Sq. Feet	HDPE (1) Existing
Drainage Drainage Drainage Drainage Drainage Drainage Landscaping	Solid Pipe Outlet Riser Inlet Filter Insert / Filter Basket Manhole Downspout Outfall Modular Storage System Riverstone Edging	(1) <i>SS Weir</i> : Nyloplast; (5) Nyloplast Nyloplast Stormtech SC 740 Chamber System	173 6 6 1 4 1,234 30	Lin. Feet Ea. Ea. Ea. Ea. Sq. Feet Sq. Feet	HDPE (1) Existing
Drainage Drainage Drainage Drainage Drainage Drainage Landscaping Landscaping	Solid Pipe Outlet Riser Inlet Filter Insert / Filter Basket Manhole Downspout Outfall Modular Storage System Riverstone Edging Rip-Rap Apron	(1) <i>SS Weir</i> : Nyloplast; (5) Nyloplast Nyloplast Stormtech SC 740 Chamber System	173 6 6 1 4 1,234 30 170	Lin. Feet Ea. Ea. Ea. Ea. Sq. Feet Sq. Feet Sq. Feet	HDPE (1) Existing

2,630

8

Sq. Feet

Ea.

Not part of GI.

Landscaping

Trees

Mulch

Tree: Existing
P-ID	C-09	
P-NAME	County Parking Lot B at S. Townsend Street	
P-ADDRESS	431 Harrison St and Townsend St	
GI TECHNOLOGIES	Tree Trench	Plant Bed
INSTALL DATE	2010	
	007404 0570	

LONGITUDE (X) 937181.9573

LATITUDE (Y) 1109800.238

NOTES Updated based on As-Built Drawings

Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		422	Lin. Feet	HDPE
Drainage	Solid Pipe		207	Lin. Feet	HDPE
Drainage	Catch Basin		2	Ea.	(1) New; (1) Existing
Drainage	Outlet Riser	Nyloplast	8	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	2	Ea.	
Landscaping	Planting Area / Landscape Bed / Shrubs		3,800	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		2,700	Sq. Feet	Non-GI Planting Area
Landscaping	Mulch		6,500	Sq. Feet	
Trees	Tree: New		79	Ea.	46 are in GI System.

P-ID	C-11				
P-NAME	Harrison St				
P-ADDRESS	Harrison St between S State St and Montgom	nery St			
GI TECHNOLOGIES	Tree Trench				
INSTALL DATE	Jun-12				
LONGITUDE (X)	936530.0267				
LATITUDE (Y)	1109494.264				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Builts Quantity	Units	Notes
Craft Drainage	Asset Perforated Pipe	Manufacturer (if known)	As-Builts Quantity 180	Units Lin. Feet	Notes HDPE
Craft Drainage Drainage	Asset Perforated Pipe Outlet Riser	Manufacturer (if known) Nyloplast	As-Builts Quantity 180 2	Units Lin. Feet Ea.	Notes HDPE
Craft Drainage Drainage Drainage	Asset Perforated Pipe Outlet Riser Curb Stormwater Inlet	Manufacturer (if known) Nyloplast	As-Builts Quantity 180 2 4	Units Lin. Feet Ea. Ea.	Notes HDPE
Craft Drainage Drainage Drainage Landscaping	Asset Perforated Pipe Outlet Riser Curb Stormwater Inlet Planting Area / Landscape Bed / Shrubs	Manufacturer (if known) Nyloplast	As-Builts Quantity 180 2 4 1,160	Units Lin. Feet Ea. Ea. Sq. Feet	Notes HDPE
Craft Drainage Drainage Drainage Landscaping Landscaping	Asset Perforated Pipe Outlet Riser Curb Stormwater Inlet Planting Area / Landscape Bed / Shrubs Mulch	Manufacturer (if known) Nyloplast	As-Builts Quantity 180 2 4 1,160 1,160	Units Lin. Feet Ea. Ea. Sq. Feet Sq. Feet	Notes HDPE
Craft Drainage Drainage Drainage Landscaping Landscaping Trees	Asset Perforated Pipe Outlet Riser Curb Stormwater Inlet Planting Area / Landscape Bed / Shrubs Mulch Tree: New	Manufacturer (if known) Nyloplast	As-Builts Quantity 180 2 4 1,160 1,160 6	Units Lin. Feet Ea. Ea. Sq. Feet Sq. Feet Ea.	Notes HDPE

P-ID	C-12a and C-12b				
P-NAME	Townsend Median Phase 1 and Phase 2				
P-ADDRESS	S Townsend St between E. Genesee St and E Adams St, S Tow	nsend St between E Adams S	t and E Taylor St		
GI TECHNOLOGIES	Tree Planting	Plant Bed			
INSTALL DATE	2011				
LONGITUDE (X)	937338.8542				
LATITUDE (Y)	1109788.284				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Curb Stormwater Inlet		2	Ea.	
Landscaping					
	Planting Area / Landscape Bed / Shrubs		7,200	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs Mulch		7,200 7,280	Sq. Feet Sq. Feet	
Landscaping Trees	Planting Area / Landscape Bed / Shrubs Mulch Tree: Existing		7,200 7,280 64	Sq. Feet Sq. Feet Ea.	

P-ID	C-29a				
P-NAME	Connective Corridor Phase 1 Contract 1				
P-ADDRESS	University Ave from Waverly Ave to East Genesee St				
GI TECHNOLOGIES	Porous Concrete	Porous Pavers	Infiltration Trench	Tree Trench	Rain Garden
INSTALL DATE	2011-2012				
LONGITUDE (X)	940212.2916				
LATITUDE (Y)	1109506.868				
NOTES	Updated based on Contract Drawings				
Craft	Asset	Manufacturer (if known)	Contract Drawings Quantity	Units	Notes
Drainage	Perforated Pipe		241	Lin. Feet	Underdrain
Drainage	Solid Pipe		3,838	Lin. Feet	(999) PVC; (2,839) SICPP
Drainage	Catch Basin	Trap: Syracuse Casting Corp.	30	Ea.	
Drainage	Inlet Filter Insert / Filter Basket	Suntree Technologies	30	Ea.	
Drainage	Modular Storage System	Silva Cells, DeepRoot	3,010	Sq. Feet	
Paving	Porous Concrete		6,340	Sq. Feet	
Paving	Porous Pavers	Whiteacre Greer	12,450	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		1,300	Sq. Feet	
Landscaping	Mulch		2,050	Sq. Feet	
Trees	Tree: New		105	Ea.	In GI System.

P-ID	C-29b						
P-NAME	Connective Corridor Phase 1 - Contract 2 (E. Genesee St)						
P-ADDRESS	East Genesee St from Forman St to University	East Genesee St from Forman St to University Ave					
GI TECHNOLOGIES	Porous Concrete	Porous Pavers	Infiltration Trench	Tree Trench	Rain Garden		
INSTALL DATE	2011-2012						
LONGITUDE (X)	939631.9402						
LATITUDE (Y)	1110474.12						
NOTES	Updated based on Contract Drawings						
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes		
Drainage	Perforated Pipe		975	Lin. Feet	Perforated Corrugated Polyethelene Underdrain		
Drainage	Solid Pipe		1,760	Lin. Feet	(540) PVC; (1,220) SICPP		
Drainage	Catch Basin	Trap: Syracuse Casting Corp.	13	Ea.			
Drainage	Inlet Filter Insert / Filter Basket	Suntree Technologies	13	Ea.	Water Quality Inlet Skimmer Box		
Drainage	Modular Storage System	Silva Cells, DeepRoot	6,105	Sq. Feet			
Paving	Porous Concrete		10,230	Sq. Feet			
Paving	Porous Pavers		9,250	Sq. Feet			
Landscaping	Planting Area / Landscape Bed / Shrubs		1,020	Sq. Feet			
Landscaping	Mulch		1,390	Sq. Feet			
Trees	Tree: New		52	Ea.	In GI System		

P-ID	C-33				
P-NAME	Cistern System at the War Memorial				
P-ADDRESS	515 Montgomery St				
GI TECHNOLOGIES	Rain Cistern				
INSTALL DATE	2011-2012				
LONGITUDE (X)	936643.3214				
LATITUDE (Y)	1109881.198				
NOTES	Updated based on Bid Drawings and Technical Specifications				
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes

Poly Processing Company SAFE Tank

15,000

Gal.

Drainage

Rain Cistern

P-ID	C-34				
P-NAME	Green Roof at OnCenter				
P-ADDRESS	800 S. State Street				
GI TECHNOLOGIES	Green Roof				
INSTALL DATE	November 2011				
LONGITUDE (X)	936519.8343				
LATITUDE (Y)	1109224.298				
NOTES					
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Roof	Green Roof	-	65,000	Sq. Feet	

P-ID	C-38				
P-NAME	County Parking Lot: OnCenter				
P-ADDRESS	801 - 813 S. State Street; 422 - 434 Harrison S	St			
GI TECHNOLOGIES	Porous Asphalt	Infiltration Trench	Tree Planting		
INSTALL DATE	2011				
LONGITUDE (X)	936995.3084				
LATITUDE (Y)	1109363.986				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		1,315	Lin. Feet	HDPE
Drainage	Solid Pipe		273	Lin. Feet	HDPE
Drainage	Inlet	(2) Nyloplast	9	Ea.	
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban Filter by Abtech Industries	9	Ea.	
		(11) Frame and Cover : Syracuse Casting Corp.; (6)			
Drainage	Manhole	Nyloplast	17	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	7	Ea.	
Paving	Porous Asphalt		27,690	Sq. Feet	
Landscaping	Riverstone Edging		1,300	Sq. Feet	
Landscaping	Mulch		64	Sq. Feet	Placed around new trees
Trees	Tree: New		9	Ea.	Part of GI system
Trees	Tree: Existing		16	Ea.	

P-ID	C-42				
P-NAME	Atrium Garage Stormwater Cistern				
P-ADDRESS	201 S Franklin St				
GI TECHNOLOGIES	Rain Cistern				
INSTALL DATE	2011-2012				
LONGITUDE (X)	934715.0299				
LATITUDE (Y)	1111284.995				
NOTES	Updated based on Final Design Drawings				
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
		Chem-Tainer 500 Gallon Cone Bottom			
Drainage	Rain Cistern	Polyethelene Tank with Stand	500	Gal.	

P-ID	C-48				
P-NAME	Erie Canal Museum				
P-ADDRESS	318 Erie Blvd				
GI TECHNOLOGIES	Green Roof				
INSTALL DATE	May 2012				
LONGITUDE (X)	936412.1497				
LATITUDE (Y)	1111826.772				
NOTES	Updated based on Bid Drawings				
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Roof	Green Roof		2,200	Sq. Feet	

P-ID	C-54c
P-NAME	Downtown Streetscape at block Water St

P-ADDRESS 200 Block of E Water St between S Warren St and Montgomery St

GI TECHNOLOGIES	Porous Pavers	Tree Trench	Tree Planting		
INSTALL DATE	June 2012				
LONGITUDE (X)	935796.9495				
LATITUDE (Y)	1111644.296				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes

Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		126	Lin. Feet	HDPE
Drainage	Solid Pipe		28	Lin. Feet	HDPE
Drainage	Catch Basin		2	Ea.	
		Frame and Lid : East Jordan Iron Works;			
Drainage	Overflow Control Structure	Trap : Syracuse Casting Corp.	1	Ea.	
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban Filter by Abtech Industries	1	Ea.	
Drainage	Cleanout		4	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	1	Ea.	
Drainage	Modular Storage System	Silva Cells, DeepRoot	570	Sq. Feet	
Paving	Porous Pavers	Pine Hall Brick	390	Sq. Feet	
Landscaping	Mulch	120		Sq. Feet	
Trees	Tree: New		7	Ea.	Part of GI system.

P-ID	C-54d								
P-NAME	Downtown Streetscape at Montgomery								
P-ADDRESS	200 Block of Montgomery St between E. Wa	shington St and E Fayette St							
GI TECHNOLOGIES	Tree Trench								
INSTALL DATE	June 2012								
LONGITUDE (X)	936220.4565								
LATITUDE (Y)	1111173.144								
NOTES	Updated based on As-Built Drawings								
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes				
Drainage	Perforated Pipe		110	Lin. Feet	HDPE				
Drainage Drainage	Perforated Pipe Solid Pipe		110 31	Lin. Feet Lin. Feet	HDPE HDPE				
Drainage Drainage Drainage	Perforated Pipe Solid Pipe Catch Basin		110 31 1	Lin. Feet Lin. Feet Ea.	HDPE HDPE				
Drainage Drainage Drainage Drainage	Perforated Pipe Solid Pipe Catch Basin Inlet		110 31 1 1	Lin. Feet Lin. Feet Ea. Ea.	HDPE HDPE (1) Existing				
Drainage Drainage Drainage Drainage Drainage	Perforated Pipe Solid Pipe Catch Basin Inlet Inlet Filter Insert / Filter Basket	Nyloplast	110 31 1 1 1	Lin. Feet Lin. Feet Ea. Ea. Ea.	HDPE HDPE (1) Existing				
Drainage Drainage Drainage Drainage Drainage Drainage	Perforated Pipe Solid Pipe Catch Basin Inlet Inlet Filter Insert / Filter Basket Cleanout	Nyloplast	110 31 1 1 1 3	Lin. Feet Lin. Feet Ea. Ea. Ea. Ea.	HDPE HDPE (1) Existing				
Drainage Drainage Drainage Drainage Drainage Drainage Drainage	Perforated Pipe Solid Pipe Catch Basin Inlet Inlet Filter Insert / Filter Basket Cleanout Anti-seep Collar	Nyloplast Lane Enterprises	110 31 1 1 1 1 3 1	Lin. Feet Lin. Feet Ea. Ea. Ea. Ea. Ea.	HDPE HDPE (1) Existing				
Drainage Drainage Drainage Drainage Drainage Drainage Drainage Drainage	Perforated Pipe Solid Pipe Catch Basin Inlet Inlet Filter Insert / Filter Basket Cleanout Anti-seep Collar Modular Storage System	Nyloplast Lane Enterprises Silva Cells, DeepRoot	110 31 1 1 1 3 1 490	Lin. Feet Lin. Feet Ea. Ea. Ea. Ea. Sq. Feet	HDPE HDPE (1) Existing				

Tree: New

Trees

5

Ea.

Part of GI System.

P-ID	C-54e						
P-NAME	Downtown Streetscape: Eas	Downtown Streetscape: East Side of 200 Montgomery Street					
P-ADDRESS	200 Block of Montgomery St	reet					
GI TECHNOLOGIES	Tree Trench	Porous Pavers					
INSTALL DATE	2012						
LONGITUDE (X)	936249.5573						
LATITUDE (Y)	1111281.848						
NOTES							

Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Landscaping	Planting Area / Landscape Bed / Shrubs	-	665	Sq. Feet	Tree Trench
Landscaping	Mulch	-	112	Sq. Feet	
Paving	Porous Pavers	-	1190	Sq. Feet	Porous Pavers
Drainage	Perforated HDPE Pipe	-	215	Lin. Feet	8" Perf. HDPE
Drainage	Solid HDPE Pipe	-	14	Lin. Feet	8" Solid HDPE
Drainage	Catch Basin	-	2	Ea.	City Type A Inlet/Catch Basin
Drainage	Inlet Filter Insert / Filter Basket	-	2	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	1	Ea.	
Drainage	Cleanout	-	3	Ea.	
Trees	Tree: New	-	7	Ea.	Part of GI System

P-IDC-54fP-NAMEDowntown Streetscape: West Side of 100 State StP-ADDRESS100 State StreetGI TECHNOLOGIESInfiltration TrenchINSTALL DATE2012LONGITUDE (X)936695.2001LATITUDE (Y)111596.626

NOTES

Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Drainage	Perforated HDPE Pipe	-	246	Lin. Feet	(246) 8" Perf. HDPE
Drainage	Solid HDPE Pipe	-	32	Lin. Feet	(32) 8" Solid HDPE
Drainage	Catch Basin	-	3	Ea.	New City of Syracuse Precast Type A
Drainage	Catch Basin	-	1	Ea.	Existing Street Catch Basin
Drainage	Inlet Filter Insert / Filter Basket	-	4	Ea.	
Drainage	Cleanout	-	2	Ea.	8" PVC
Drainage	Outlet Riser	Nyloplast	3	Ea.	12" Domed PVC Riser
Drainage	Outlet Riser	Nyloplast	1	Ea.	24" Domed PVC Outlet Riser w/Weir
Drainage	Anti-seep Collar	Lane Enterprises	1	Ea.	
Landscaping	Planting Area / Landscape Bed / Shrubs	-	1500	Sq. Feet	GI Planting Bed over infiltration Trench
Landscaping	Mulch	-	1500	Sq. Feet	
Trees	Tree: New	-	16	Ea.	Part of GI System

P-ID	C-60				
P-NAME	Green School: Seymour Academy Playground				
P-ADDRESS	108 Shonnard Street				
GI TECHNOLOGIES	Rain Garden	Tree Trench	Tree Planting		
INSTALL DATE	August 2012				
LONGITUDE (X)	933538.0599				
LATITUDE (Y)	1108676.649				
NOTES					
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Landscaping	Planting Area / Landscape Bed / Shrubs	-	3500	Sq. Feet	Rain Garden
Landscaping	Planting Area / Landscape Bed / Shrubs	-	1100	Sq. Feet	Tree Trench
Drainage	Catch Basin	Nyloplast	1	Ea.	10" PVC CB, with Solid Cover
Drainage	Outlet Riser	Nyloplast	1	Ea.	12" PVC Riser, with Lockable Domed Grate
Drainage	Catch Basin	Nyloplast	1	Ea.	24" PVC CB, with Weir and Solid Cover
Drainage	Curb Stormwater Inlet	-	2	Ea.	Curb Stormwater Inlet Retrofit with Granite Splash Pad
Drainage	Perforated HDPE Pipe	-	130	Lin. Feet	(100) 8" HDPE, (30) 6" HDPE
Drainage	Solid HDPE Pipe	-	5	Lin. Feet	(5) 8" HDPE
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban by Abtech	1	Ea.	Filter inserts in Type T CB
Drainage	Catch Basin	-	1	Ea.	Precast NYSDOT Catch Basin, Type T
Landscaping	Planting Area / Landscape Bed / Shrubs	-	3150	Sq. Feet	Non-GI Planting Area
Landscaping	Mulch	-	6650	Sq. Feet	
Trees	Tree: New	-	4	Ea.	(4)Homestead Elm - Trees are in GI system.
Trees	Tree: Existing	-	12	Ea.	

P-ID	C-61				
P-NAME	Water Street Gateway				
P-ADDRESS	300 Block of E Water St				
GI TECHNOLOGIES	Tree Trench	Porous Pavers	Infiltration Trench		
INSTALL DATE	June 2012				
LONGITUDE (X)	936499.7485				
LATITUDE (Y)	1111758.359				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		901	Lin. Feet	HDPE
Drainage	Solid Pipe		181	Lin. Feet	HDPE
Drainage	Catch Basin		12	Ea.	
Drainage	Outlet Riser	Nyloplast	7	Ea.	
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban Filter by Abtech Industries	14	Ea.	
Drainage	Manhole		1	Ea.	(1) Existing
Drainage	Cleanout	Lid : East Jordan Iron Works	4	Ea.	
Drainage	Anti-seep Collar	Agri Drain	1	Ea.	
Paving	Porous Pavers		4,780	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		6,920	Sq. Feet	
Landscaping	Mulch		6,920	Sq. Feet	
Trees	Tree: New		62	Ea.	
Trees	Tree: Existing		8	Ea.	

P-ID	C-68								
P-NAME	Street Trees Along Marcellus Ave								
P-ADDRESS	Marcellus from S Geddes to Seneca								
GI TECHNOLOGIES	Tree Planting								
INSTALL DATE	2012								
LONGITUDE (X)	930920.5576								
LATITUDE (Y)	1109820.538								
NOTES	Quantity taken from database								
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes				
Trees	Tree: New		8	Ea.	Not in GI Systems.				

P-ID	C-74a				
P-NAME	Otisco Street Green Corridor - Phase 1				
P-ADDRESS	Otisco St from Ontario to Seneca St				
GI TECHNOLOGIES	Rain Garden	Bioswale	Plant Bed	Tree Planting	
INSTALL DATE	2012 October				
LONGITUDE (X)	931599.8284				
LATITUDE (Y)	1109665.255				
NOTES	Updated based on Final Design Drawings				
Craft	Asset	Manufacturer (if known)	Final Design Quantity	Units	Notes
Drainage	Perforated Pipe		2,077	Lin. Feet	HDPE
Drainage	Solid Pipe		680	Lin. Feet	HDPE
Drainage	Catch Basin		26	Ea.	(18) New; (8) Existing
Drainage	Outlet Riser	Nyloplast	38	Ea.	
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban Filter by Abtech Industries	64	Ea.	
Drainage	Curb Stormwater Inlet		50	Ea.	
Drainage	Manhole		4	Ea.	(4) Existing
Drainage	Anti-seep Collar	Agri-Drain	29	Ea.	
Landscaping	Planting Area / Landscape Bed / Shrubs		22,990	Sq. Feet	
Landscaping	Mulch		23,120	Sq. Feet	
Trees	Tree: New		18	Ea.	Part of GI System

P-ID	C-85				
P-NAME	SCSD Central Offices Parking Lot				
P-ADDRESS	725 Harrison Street				
GI TECHNOLOGIES	Porous Asphalt	Infiltration Trench			
INSTALL DATE	June 2012				
LONGITUDE (X)	938798.4825				
LATITUDE (Y)	1109651.463				
NOTES	Updated based on Final Design Drawings				
Craft	Asset	Manufacturer (if known)	Final Design Quantity	Units	Notes
Drainage	Perforated Pipe		808	Lin. Feet	HDPE
Drainage	Solid Pipe		111	Lin. Feet	HDPE
Drainage	Catch Basin	Frame and Grate : Syracuse Casting Corp.	6	Ea.	
Drainage	Overflow Control Structure	Frame and Grate: East Jordan Iron Works; Trap : Syracuse Casting Corp.	2	Ea.	
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban Filter by Abtech Industries	8	Ea.	
Drainage	Manhole	(2) Frame and Cover : Syracuse Casting Corp.	4	Ea.	(2) New; (2) Existing
Drainage	Cleanout	Lid: East Jordan Iron Works	6	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	6	Ea.	

P-ID	C-99				
P-NAME	Vacant Lot Project #2				
P-ADDRESS	701 Oswego Street				
GI TECHNOLOGIES	Infiltration Trench	Plant Bed	Tree Planting		
INSTALL DATE	July 2012				
LONGITUDE (X)	932406.9626				
LATITUDE (Y)	1108362.387				
NOTES	Updated based on Final Design Drawings				
Craft	Asset	Manufacturer (if known)	Final Design Quantity	Units	Notes
Drainage	Perforated Pipe		105	Lin. Feet	HDPE
Drainage	Solid Pipe		40	Lin. Feet	HDPE
Drainage	Catch Basin		2	Ea.	(2) Existing
Drainage	Outlet Riser	Nyloplast	3	Ea.	
Drainage	Inlet Filter Insert / Filter Basket	Abtech Industries	5	Ea.	
Drainage	Curb Stormwater Inlet		2	Ea.	
Drainage	Cleanout		2	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	3	Ea.	
Landscaping	Riverstone Edging		8	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		1,270	Sq. Feet	Non-GI Planting Area
Landscaping	Mulch		1,320	Sq. Feet	Placed on planting area and around new trees
Trees	Tree: New		7	Ea.	Trees are in GI System
Trees	Tree: Existing		3	Ea.	

P-ID	C-101				
P-NAME	Skiddy Park				
P-ADDRESS	Tully St between Oswego and Tioga				
GI TECHNOLOGIES	Flexible Pavement	Infiltration Trench	Bioswale	Tree Planting	
INSTALL DATE	2011-2012				
LONGITUDE (X)	932517.9825				
LATITUDE (Y)	1109747.423				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		334	Lin. Feet	HDPE
Drainage	Solid Pipe		77	Lin. Feet	HDPE
Drainage	Catch Basin	Nyloplast	4	Ea.	(2) New; (2) Existing
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban Filter by Abtech Industries	3	Ea.	
Drainage	Cleanout	East Jordan Iron Works	2	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	2	Ea.	
Paving	Flexible Pavement		3,970	Sq. Feet	
Landscaping	Riverstone Edging		3	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		795	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		380	Sq. Feet	Non-GI Planting Area
Landscaping	Mulch		1,190	Sq. Feet	
Trees	Tree: New		1	Ea.	
Trees	Tree: Existing		6	Ea.	Non-GI

P-ID	C-110			
P-NAME	Seymour Academy Parking Lot			
P-ADDRESS	108 Shonnard Street			
GI TECHNOLOGIES	Porous Concrete	Planter	Tree Trench	
INSTALL DATE	August 2012	-		
LONGITUDE (X)	933375.2298			
LATITUDE (Y)	1108602.022			

NOTES

Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Paving	Porous Concrete	-	7350	Sq. Feet	
Drainage	Catch Basin	Nyloplast	2	Ea.	24" PVC CB, with Grate Cover and Filter Insert
Drainage	Catch Basin	Nyloplast	4	Ea.	10" PVC CB, with Solid Cover
Drainage	Outlet Riser	Nyloplast	1	Ea.	24" PVC with Weir and Grate Cover
Drainage	Cleanout	Nyloplast	4	Ea.	8" PVC Cleanout with Solid Lockable Lid
Drainage	Anti-seep Collar	Lane Enterprises	6	Ea.	
Drainage	Perforated HDPE Pipe	-	328	Lin. Feet	(328) 8" HDPE
Drainage	Solid HDPE Pipe	-	256	Lin. Feet	(256) 8"HDPE
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban by Abtech	3	Ea.	Filter inserts in existing Street Structures
Drainage	Catch Basin	-	4	Ea.	Existing Street Structures directed to storage beneath Porous Concrete
Drainage	Manhole	-	1	Ea.	Existing Manhole on Niagara St. directed to storage beneath Porous Concrete
Landscaping	Planting Area / Landscape Bed / Shrubs	-	2650	Sq. Feet	Non-GI Planting Area
Landscaping	Mulch	-	1665	Sq. Feet	
Trees	Tree: New	-	16	Ea.	(12) Dwarf Red-Osier Dogwood, (4) Homestead Elm (Trees not in GI system)

P-ID	C-117				
P-NAME	Tree Planting in Court Woodland				
P-ADDRESS	Grant Blvd and Woodlawn Terrace				
GI TECHNOLOGIES	Tree Planting				
INSTALL DATE	2011				
LONGITUDE (X)	940983.4059				
LATITUDE (Y)	1119940.351				
NOTES	Quantity taken from database				
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Trees	Tree: New		59	Ea.	Not in GI Systems.

P-ID	C-134b				
P-NAME	Tree Planting at Union and Demong Parks				
P-ADDRESS	Union Pl, Kirkpatrick St, N Salina St				
GI TECHNOLOGIES	Tree Planting				
INSTALL DATE	2011				
LONGITUDE (X)	934197.3726				
LATITUDE (Y)	1116754.765				
NOTES	Quantity taken from database				
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Trees	Tree: New		24	Ea.	Not in GI Systems.

P-ID	C-137b				
P-NAME	Tree Planting at Schiller Park				
P-ADDRESS	112 Whitwell Dr				
GI TECHNOLOGIES	Tree Planting				
INSTALL DATE	2011				
LONGITUDE (X)	939550.757				
LATITUDE (Y)	1117779.879				
NOTES	Quantity taken from database				
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Trees	Tree: New		80	Ea.	Not in GI Systems.

P-ID	E-06				
P-NAME	City Lot # 3				
P-ADDRESS	101 Oswego Boulevard				
GI TECHNOLOGIES	Porous Concrete	Tree Trench			
INSTALL DATE	2010 October				
LONGITUDE (X)	935987.9255				
LATITUDE (Y)	1112032.647				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Solid Pipe		135	Lin. Feet	(109) HDPE; (26) SDR-35
Drainage	Perforated Pipe		519	Lin. Feet	HDPE
Drainage	Overflow Control Structure	Frame and Lid : Syracuse Casting	1	Ea.	
Drainage	Inlet		3	Ea.	(3) Existing
Drainage	Inlet Filter Insert / Filter Basket	Flogard Plus (Kristar)	3	Ea.	
Drainage	Cleanout	East Jordan Iron Works	6	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	4	Ea.	
Paving	Porous Concrete		8,520	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		3,410	Sq. Feet	
Landscaping	Mulch		3,440	Sq. Feet	
Trees	Tree: New		23	Ea.	
Trees	Tree: Existing		4	Ea.	

P-ID	E-08				
P-NAME	Green Library: Petit Branch				
P-ADDRESS	105 Victoria Place				
GI TECHNOLOGIES	Porous Concrete				
INSTALL DATE	2012				
LONGITUDE (X)	944476.1327				
LATITUDE (Y)	1108321.438				
NOTES					
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Craft Paving	Asset Porous Concrete	Manufacturer (if known) -	Quantity 2100	Units Sq. Feet	Notes
Craft Paving Drainage	Asset Porous Concrete Perforated HDPE Pipe	Manufacturer (if known) - -	Quantity 2100 230	Units Sq. Feet Lin. Feet	Notes (100) 6" Perf. HDPE, (130) 8" Perf. HDPE
Craft Paving Drainage Drainage	Asset Porous Concrete Perforated HDPE Pipe Solid HDPE Pipe	Manufacturer (if known) - - -	Quantity 2100 230 185	Units Sq. Feet Lin. Feet Lin. Feet	Notes (100) 6" Perf. HDPE, (130) 8" Perf. HDPE (20) 6" Solid HDPE, (165) 8" Solid HDPE
Craft Paving Drainage Drainage Drainage	Asset Porous Concrete Perforated HDPE Pipe Solid HDPE Pipe Catch Basin	Manufacturer (if known) - - - - -	Quantity 2100 230 185 2	Units Sq. Feet Lin. Feet Lin. Feet Ea.	Notes (100) 6" Perf. HDPE, (130) 8" Perf. HDPE (20) 6" Solid HDPE, (165) 8" Solid HDPE PVC Catch Basin/Drain Inlet
Craft Paving Drainage Drainage Drainage Drainage	Asset Porous Concrete Perforated HDPE Pipe Solid HDPE Pipe Catch Basin Cleanout	Manufacturer (if known)	Quantity 2100 230 185 2 6	Units Sq. Feet Lin. Feet Lin. Feet Ea. Ea.	Notes (100) 6" Perf. HDPE, (130) 8" Perf. HDPE (20) 6" Solid HDPE, (165) 8" Solid HDPE PVC Catch Basin/Drain Inlet

P-ID	E-16				
P-NAME	Sunnycrest Park Lower Parking Lot				
P-ADDRESS	East of the 100 Block of Caleb Ave				
GI TECHNOLOGIES	Rain Garden	Plant Bed	Tree Planting		
INSTALL DATE	June 2012				
LONGITUDE (X)	945545.4611				
LATITUDE (Y)	1114829.973				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		200	Lin. Feet	HDPE
Drainage	Solid Pipe		235	Lin. Feet	HDPE
Drainage	Catch Basin	Nyloplast	1	Ea.	
Drainage	Outlet Riser	Nyloplast	1	Ea.	
Drainage	Inlet		1	Ea.	(1) Existing
Drainage	Inlet Filter Insert / Filter Basket		1	Ea.	
Drainage	Curb Stormwater Inlet		9	Ea.	
Drainage	Manhole	Frame and Lid: Syracuse Casting Corp.	3	Ea.	(1) New; (2) Existing
Drainage	Cleanout	East Jordan Iron Works	2	Ea.	
Drainage	Anti-seep Collar		1	Ea.	
Landscaping	Rip-Rap Apron		50	Sq. Feet	
Landscaping	Riverstone Edging		40	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		5,900	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		1,200	Sq. Feet	Non-GI Planting Area
Landscaping	Mulch		7,210	Sq. Feet	Placed on planting areas and around new trees
Trees	Tree: New		16	Ea.	
Trees	Tree: Existing		45	Ea.	Not part of GI system.

P-ID	E-36				
P-NAME	Upper Sunnycrest Park				
P-ADDRESS	St. Anne Dr and Robinson St				
GI TECHNOLOGIES	Porous Asphalt	Rain Garden	Tree Trench	Tree Planting	
INSTALL DATE	2011 November				
LONGITUDE (X)	944692.7548				
LATITUDE (Y)	1115026.542				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		897	Lin. Feet	HDPE
Drainage	Solid Pipe		111	Lin. Feet	HDPE
Drainage	Catch Basin	Frame and Grate: Syracuse Casting Corp.	5	Ea.	
Drainage	Outlet Riser	Nyloplast	2	Ea.	
		Frame and Lid: East Jordan Iron Works			
Drainage	Overflow Control Structure	Trap: Syracuse Casting Corp.	3	Ea.	
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban Filter by Abtech Industries	7	Ea.	
Drainage	Curb Stormwater Inlet		3	Ea.	
Drainage	Manhole	Frame and Grate: Syracuse Casting Corp.	3	Ea.	
Drainage	Cleanout	East Jordan Iron Works	6	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	4	Ea.	
Paving	Porous Asphalt		11,530	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		1,510	Sq. Feet	
Landscaping	Mulch		2,270	Sq. Feet	
Trees	Tree: New		28	Ea.	10 Trees Not in GI Systems

P-ID	E-39				
P-NAME	E Water St Pavement Removal				
P-ADDRESS	Southeast Corner of Erie Blvd and E Beech S	t			
GI TECHNOLOGIES	Porous Concrete	Porous Asphalt	Tree Trench	Tree Planting	
INSTALL DATE	2012 June				
LONGITUDE (X)	942090.6648				
LATITUDE (Y)	1111689.93				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Solid Pipe		192	Lin. Feet	HDPE
Drainage	Perforated Pipe		306	Lin. Feet	HDPE
		(2) Frame and Grate : Syracuase Casting Corp.;			
Drainage	Catch Basin	Drain Basin : Nyloplast	4	Ea.	(2) New; (2) Existing
Drainage	Outlet Riser	Nyloplast	2	Ea.	
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban Filter by Abtech Industries	2	Ea.	
Drainage	Curb Stormwater Inlet		4	Ea.	
Drainage	Cleanout	Lid: East Jordan IronWorks	1	Ea.	
Drainage	Anti-seep Collar	Lane Enterprises	5	Ea.	
Paving	Porous Concrete		400	Sq. Feet	
Paving	Porous Asphalt		2,220	Sq. Feet	
Landscaping	Mulch		100	Sq. Feet	Placed around new trees
Trees	Tree: New		14	Ea.	
Trees	Tree: Existing		1	Ea.	

P-ID	E-42				
P-NAME	County Board of Election Building				
P-ADDRESS	1000 Erie Blvd West				
GI TECHNOLOGIES	Planter				
INSTALL DATE	November 2011				
LONGITUDE (X)	929355.3011				
LATITUDE (Y)	1111054.753				
NOTES	Pending Final As-Built				
a (1	A				Netze
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Landscaping	Asset Planting Area / Landscape Bed / Shrubs	-	Quantity 115	Sq. Feet	Notes Non-GI Plant Bed Area
Landscaping Landscaping	Asset Planting Area / Landscape Bed / Shrubs Planting Area / Landscape Bed / Shrubs	Manufacturer (if known)	115 590	Sq. Feet Sq. Feet	Notes Non-GI Plant Bed Area GI Planter Area
Landscaping Landscaping Landscaping	Asset Planting Area / Landscape Bed / Shrubs Planting Area / Landscape Bed / Shrubs Mulch	Manufacturer (if known)	Quantity 115 590 115	Sq. Feet Sq. Feet Sq. Feet	Notes Non-GI Plant Bed Area GI Planter Area
Landscaping Landscaping Landscaping Landscaping	Asset Planting Area / Landscape Bed / Shrubs Planting Area / Landscape Bed / Shrubs Mulch Riverstone Edging	Manufacturer (if known)	Quantity 115 590 115 590 115 590	Sq. Feet Sq. Feet Sq. Feet Sq. Feet	Notes Non-GI Plant Bed Area GI Planter Area
Landscaping Landscaping Landscaping Landscaping Drainage	Asset Planting Area / Landscape Bed / Shrubs Planting Area / Landscape Bed / Shrubs Mulch Riverstone Edging Outlet Riser	Manufacturer (if known) Nyloplast	Quantity 115 590 115 590 2	Sq. Feet Sq. Feet Sq. Feet Sq. Feet Ea.	Notes Non-GI Plant Bed Area GI Planter Area 4" PVC Domed Grate Top PVC CB/Overflow Structure
Landscaping Landscaping Landscaping Landscaping Drainage Drainage	Asset Planting Area / Landscape Bed / Shrubs Planting Area / Landscape Bed / Shrubs Mulch Riverstone Edging Outlet Riser Perforated HDPE Pipe	Manufacturer (if known) Nyloplast	Quantity 115 590 115 590 2 104	Sq. Feet Sq. Feet Sq. Feet Sq. Feet Ea. Lin. Feet	Notes Non-GI Plant Bed Area GI Planter Area 4" PVC Domed Grate Top PVC CB/Overflow Structure 6" Perf. HDPE
Landscaping Landscaping Landscaping Landscaping Drainage Drainage Drainage	Asset Planting Area / Landscape Bed / Shrubs Planting Area / Landscape Bed / Shrubs Mulch Riverstone Edging Outlet Riser Perforated HDPE Pipe Solid HDPE Pipe	Manufacturer (if known) Nyloplast	Quantity 115 590 115 590 2 104	Sq. Feet Sq. Feet Sq. Feet Sq. Feet Ea. Lin. Feet Lin. Feet	Notes Non-GI Plant Bed Area GI Planter Area 4" PVC Domed Grate Top PVC CB/Overflow Structure 6" Perf. HDPE 6" Solid HDPE

P-ID	E-43							
P-NAME	Westcott Community Center							
P-ADDRESS	822-26 Euclid Ave and Westcott Street							
GI TECHNOLOGIES	Porous Pavers	Rain Barrel/Cistern						
INSTALL DATE	2012							
LONGITUDE (X)	944286.7181							
LATITUDE (Y)	1106719.278							
NOTES								
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes			
Paving	Porous Pavers	-	350	Sq. Feet				
Drainage	Channel with Grate (Trench Drain)	Polydrain by ABT	32	Lin. Feet	Pre-Fabricated Polymer Concrete Trench Drain w/Ductile iron Frame and Grate			
Drainage	Catch Basin	-	1	Ea.	New City Standard Precast Type A			
Drainage	Catch Basin	-	1	Ea.	Existing City Type A Inlet/Catch Basin			
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban by Abtech	2	Ea.				
Drainage	Catch Basin	-	1	Ea.	18" PVC CB w/Solid Top and Hood			
Drainage	Catch Basin	-	1	Ea.	24" PVC CB w/Weir and Solid Top			
Drainage	Cleanout	-	2	Ea.	8" PVC			
Drainage	Rain Barrel/Cistern	-	110	#N/A	(2) 55 Gallon Rain Barrels			
Drainage	Perforated HDPE Pipe	-	59	Lin. Feet	(59) 8" Perf. HDPE			
Drainage	Solid HDPE Pipe	-	66	Lin. Feet	(66) Solid HDPE			
Trees	Tree: Existing	-	2	Ea.				

P-ID	F-01						
P-NAME	Pearl Street Parking Lot						
P-ADDRESS	400 Block of Pearl Street						
GI TECHNOLOGIES	Porous Asphalt	Tree Planting					
INSTALL DATE	2010 October						
LONGITUDE (X)	935645.042						
LATITUDE (Y)	1113238.882						
NOTES	Updated based on As-Built Drawings						
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes		
Drainage	Catch Basin	Frame and Grate: Syracuse Castings	1	Ea.			
Drainage	Inlet	Syracuse Casting	9	Ea.	(2) New; (7) Existing		
Drainage	Inlet Filter Insert / Filter Basket	Flogard Plus (Kristar)	5	Ea.			
Drainage	Manhole	Frame and Cover : Syracuse Castings	6	Ea.	(5) New; (1) Existing		
Drainage	Cleanout	East Jordan IronWorks	7	Ea.			
Drainage	Solid Pipe		503	Lin. Feet	HDPE		
Drainage	Perforated Pipe		380	Lin. Feet	HDPE		
Drainage	Anti-seep Collar	Lane Enterprises	3	Ea.			
Paving	Porous Asphalt		25,150	Sq. Feet			
Landscaping	Riverstone Edging		2,200	Sq. Feet			
Landscaping	Rip-Rap Apron		315	Sq. Feet			
Landscaping	Mulch		30	Sq. Feet	Placed around new trees		
Trees	Tree: New		4	Ea.	Not part of GI system.		
Trees	Tree: Existing		16	Ea.	Not part of GI system.		

P-ID	F-02							
P-NAME	Green Library: White Branch							
P-ADDRESS	763 Butternut St							
GI TECHNOLOGIES	Porous Concrete	Rain Garden	Bioswale	Rain Barrel/Cistern				
INSTALL DATE	2012							
LONGITUDE (X)	937218.9783							
LATITUDE (Y)	1115791.014							
NOTES								
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes			
Paving	Porous Concrete	-	2360	Sq. Feet				
Drainage	Perforated HDPE Pipe	-	300	Lin. Feet	(300) 8" Perf. HDPE			
Drainage	Solid HDPE Pipe	-	250	Lin. Feet	(95) 6" Solid HDPE, (155) 8" Solid HDPE			
Drainage	Catch Basin	-	2	Ea.	PVC Catch Basin/Drain Inlet			
Paving	Precast Porous Concrete Splash Pad	-	2	Sq. Feet	2 Splach Blocks			
Drainage	Catch Basin	-	2	Ea.	Syracuse Standard Catch Basin			
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban by Abtech	2	Ea.				
Drainage	Outlet Riser	Nyloplast	3	Ea.	PVC Riser Structure			
Drainage	Catch Basin	Nyloplast	1	Ea.	PVC Catch Basin			
Landscaping	Planting Area / Landscape Bed / Shrubs	-	1150	Sq. Feet	GI Rain Garden			
Trees	Tree: Existing	-	18	Ea.	Not in GI system.			
Landscaping	Mulch	-	1500	Sq. Feet				
Drainage	Rain Barrel/Cistern		55	#N/A	Assumed Volume of Single Rain Barrel			

P-ID	F-04a							
P-NAME	City Parking Lot #4							
P-ADDRESS	Butternut and N. State Streets							
GI TECHNOLOGIES	Porous Asphalt	Porous Concrete	Rain Garden	Tree Trench				
INSTALL DATE	2012							
LONGITUDE (X)	935212.4939							
LATITUDE (Y)	1114464.617							
NOTES	Pending Final As-Built							
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes			
Paving	Porous Asphalt	-	10567	Sq. Feet				
Paving	Porous Concrete	-	525	Sq. Feet	Precast Porous Concrete Edging			
Landscaping	Planting Area / Landscape Bed / Shrubs	-	917	Sq. Feet	GI Rain Garden			
Landscaping	Planting Area / Landscape Bed / Shrubs	-	400	Sq. Feet	GI Tree Trench			
Landscaping	Mulch	-	1317	Sq. Feet				
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban by Abtech	2	Ea.				
Drainage	Catch Basin	-	1	Ea.	Existing Street Catch Basin			
Drainage	Catch Basin	-	1	Ea.	New NYSDOT Precast CB, Type T			
Drainage	Catch Basin	Nyloplast	3	Ea.	24" PVC Catch Basin w/Grated Top and Weir			
Drainage	Outlet Riser	Nyloplast	1	Ea.	24" PVC Outlet Riser w/Weir			
Drainage	Curb Stormwater Inlet	-	3	Ea.				
Drainage	Perforated HDPE Pipe	-	703	Lin. Feet	(694) 8" Perf. HDPE			
Drainage	Solid HDPE Pipe	-	117	Lin. Feet	(117) 8" Solids HDPE			
Drainage	Cleanout	-	9	Ea.	8" PVC			
Drainage	Anti-seep Collar	Lane Enterprises	3	Ea.				
Trees	Tree: New	-	6	Ea.	Part of GI System.			

P-ID	F-04b							
P-NAME	Green Street: N. State Street at City Lot #4							
P-ADDRESS	N. State Street between Butternut and Ash							
GI TECHNOLOGIES	Porous Asphalt	Rain Garden						
INSTALL DATE	2012							
LONGITUDE (X)	935021.1525							
LATITUDE (Y)	1114927.138							
NOTES	Pending Final As-Built							
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes			
Paving	Porous Asphalt	-	7600	Sq. Feet				
Landscaping	Planting Area / Landscape Bed / Shrubs	-	1406	Sq. Feet	GI Rain Garden			
Landscaping	Mulch	-	1406	Sq. Feet				
Drainage	Perforated HDPE Pipe	-	539	Lin. Feet	(529) 8" Perf. HDPE			
Drainage	Solid HDPE Pipe	-	229	Lin. Feet	(229) 8" Solid HDPE			
Drainage	Catch Basin	-	1	Ea.	New NYSDOT Precast CB, Type T			
Drainage	Catch Basin	-	3	Ea.	Existing Street CB			
Drainage	Catch Basin	Nyloplast	1	Ea.	24" PVC CB w/Weir, H-25 Loading			
Drainage	Outlet Riser	Nyloplast	1	Ea.	24" Domed PVC Outlet Riser w/Weir			
Drainage	Overflow Control Structure	-	1	Ea.	Precast 4'x4' Structure w/Weir			
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban by Abtech	4	Ea.				
Drainage	Cleanout	-	4	Ea.				
Drainage	Anti-seep Collar	Lane Enterprises	4	Ea.				
P-ID	H-05							
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P-NAME	Green Roof at Hazard Branch Library							
P-ADDRESS	1620 West Genesee Street							
GI TECHNOLOGIES	Green Roof							
INSTALL DATE	May 2012							
LONGITUDE (X)	926038.6425							
LATITUDE (Y)	1112637.568							
NOTES								
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes			
Roof	Green Roof	-	4750	Sq. Feet				

P-ID H-05b P-NAME Green Library: Hazard Branch P-ADDRESS 1620 West Genesee Street Porous Pavers Porous Concrete Rain Garden **GI TECHNOLOGIES** INSTALL DATE August 2012 LONGITUDE (X) 926035.4185 LATITUDE (Y) 1112714.943 NOTES

Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Paving	Porous Pavers	-	2150	Sq. Feet	
Paving	Porous Concrete	-	3360	Sq. Feet	
Drainage	Perforated HDPE Pipe	-	297	Lin. Feet	(222) 6" Perf. HDPE, (75) 4" Perf. HDPE
Drainage	Solid HDPE Pipe	-	100	Lin. Feet	(100) 8" Solid HDPE
Drainage	Cleanout	-	5	Ea.	
Drainage	Observation Well/Port	-	3	Ea.	
Drainage	Catch Basin	-	2	Ea.	Syracyuse Standard Precast Type A
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban by Abtech	2	Ea.	
Landscaping	Planting Area / Landscape Bed / Shrubs	-	1079	Sq. Feet	GI Rain Garden
Landscaping	Mulch	-	900	Sq. Feet	
Landscaping	Rip-Rap Apron	-	179	Sq. Feet	
Trees	Tree: Existing	-	8	Ea.	
Trees	Tree: New	-	9	Ea.	

P-ID	H-06								
P-NAME	Green Library: Mundy Branch								
P-ADDRESS	1204 S Geddes Street								
GI TECHNOLOGIES	Porous Pavers	Tree Trench	Infiltration Trench						
INSTALL DATE	2012								
LONGITUDE (X)	929518.865								
LATITUDE (Y)	1106365.526								
NOTES									
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes				
Paving	Porous Pavers	-	945	Sq. Feet					
Drainage	Perforated HDPE Pipe	-	213	Lin. Feet	(103) 6" Perf. HDPE, (110) 8" Perf. HDPE				
Drainage	Solid HDPE Pipe	-	20	Lin. Feet	(13) 6" Solid HDPE, (7) 8" Solid HDPE				
Drainage	Cleanout	-	6	Ea.					
Drainage	Observation Well/Port	-	1	Ea.					
Drainage	Catch Basin	-	1	Ea.	PVC Catch Basin				
Drainage	Outlet Riser	Nyloplast	1	Ea.	PVC Riser Structure				
Drainage	Catch Basin	Nyloplast	1	Ea.	PVC Catch Basin				
Landscaping	Planting Area / Landscape Bed / Shrubs	-	200	Sq. Feet	GI Tree Trench				
Landscaping	Planting Area / Landscape Bed / Shrubs	-	125	Sq. Feet	GI Infiltration Trench				
Landscaping	Mulch	-	200	Sq. Feet					
Trees	Tree: New	-	3	Ea.					
Trees	Tree: Existing	-	9	Ea.	Part of GI system.				

P-ID	H-11				
P-NAME	Avery Avenue at Pass Arboretum				
P-ADDRESS	Avery Ave and Tompkins Street				
GI TECHNOLOGIES	Rain Garden	Tree Planting			
INSTALL DATE	2011-2012				
LONGITUDE (X)	925388.4359				
LATITUDE (Y)	1109566.445				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		213	Lin. Feet	HDPE
Drainage	Solid Pipe		936	Lin. Feet	HDPE
Drainage	Catch Basin	Frame and Grate: Syracuse Casting Corp.	7	Ea.	
Drainage	Overflow Control Structure	Nyloplast	2	Ea.	
Drainage	Inlet		2	Ea.	(2) Existing
Drainage	Manhole	Frame and Cover: Syracuse Casting Corp.	3	Ea.	
Drainage	Cleanout	Lane Enterprises	3	Ea.	
Drainage	Anti-seep Collar		2	Ea.	
Landscaping	Riverstone Edging		40	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		11,900	Sq. Feet	
Landscaping	Mulch		12,030	Sq. Feet	Placed on planting area and around new trees
Trees	Tree: New		77	Ea.	Trees in and around GI systems.
					Only includes existing trees on plans that were south
					of S Avery Avenue near Rain Gardens. (Not part of GI
Trees	Tree: Existing		23	Ea.	system).

P-ID	H-13				
P-NAME	Wilbur Avenue Zoo Entrance Bioretention				
P-ADDRESS	S Wilbur Ave and Coleridge Ave				
GI TECHNOLOGIES	Rain Garden	Plant Bed	Tree Planting		
INSTALL DATE	2011-2012				
LONGITUDE (X)	928785.5128				
LATITUDE (Y)	1109968.671				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		345	Lin. Feet	НДРЕ
Drainage	Solid Pipe		866	Lin. Feet	(802) HDPE; (64) SDR 21
Drainage	Catch Basin	Frame and Grate : Syracuse Castings	5	Ea.	
Drainage	Overflow Control Structure	Nyloplast	3	Ea.	
Drainage	Inlet		3	Ea.	(3) Existing
Drainage	Manhole	Frame and Cover : Syracuse Casting Corp.; Trap : Syracuse Castings Sales Corporation	5	Ea.	
Drainage	Cleanout	Lid : East Jordan Iron Works	3	Ea.	
Landscaping	Riverstone Edging		80	Sq. Feet	
Landscaping	Meadow		36,400	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		13,050	Sq. Feet	
Landscaping	Mulch		13,140	Sq. Feet	Placed on planting areas and around new trees
Trees	Tree: New		17	Ea.	Part of GI System
Trees	Tree: Existing		55	Ea.	

P-ID	H-17								
P-NAME	Rain Garden at Grand and Delaware								
P-ADDRESS	Grand Ave and Delaware St								
GI TECHNOLOGIES	Rain Garden	Porous Concrete							
INSTALL DATE	2012								
LONGITUDE (X)	929704.4405								
LATITUDE (Y)	1107897.496								
NOTES	Pending Final As-Built								
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes				
Landscaping	Planting Area / Landscape Bed / Shrubs	-	9856	Sq. Feet	GI Rain Garden				
Landscaping	Mulch	-	9856	Sq. Feet					
Paving	Porous Concrete	-	4300	Sq. Feet					
Drainage	Curb Stormwater Inlet	-	6	Ea.					
Drainage	Perforated HDPE Pipe	-	625	Lin. Feet	6" Perf. HDPE				
Drainage	Solid HDPE Pipe	-	370	Lin. Feet	(317) 12" SICPP, (53) 6" HDPE				
Drainage	Outlet Riser	-	1	Ea.	PVC Structure w/Domed Grate				
Drainage	Catch Basin	-	3	Ea.	New Precast CB				
Drainage	Cleanout	-	6	Ea.	6" PVC				
Trees	Tree: New	-	22	Ea.					
Trees	Tree: Existing	-	20	Ea.					

P-ID	H-30				
P-NAME	Vacant Lot: 1344-50 W. Onondaga Street				
P-ADDRESS	1344-50 West Onondaga Street				
GI TECHNOLOGIES	Rain Garden				
INSTALL DATE	2012				
LONGITUDE (X)	928879.0927				
LATITUDE (Y)	1105757.399				
NOTES					
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Landscaping	Planting Area / Landscape Bed / Shrubs	-	1075	Sq. Feet	GI Rain Garden
Landscaping	Mulch	-	1215	Sq. Feet	
Drainage	Perforated HDPE Pipe	-	76	Lin. Feet	(76) 8" Perf. HDPE
Drainage	Solid HDPE Pipe	-	108	Lin. Feet	(108) 8" Solid HDPE
Drainage	Catch Basin	-	2	Ea.	New NYSDOT Precast CB, Type T
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban by Abtech	2	Ea.	
Drainage	Outlet Riser	Nyloplast	2	Ea.	18" PVC Riserw/Filter Insert
Drainage	Outlet Riser	Nyloplast	1	Ea.	24" PVC Riser w/Domed Top, Filter Insert, and Weir
Drainage	Anti-seep Collar	Lane Enterprises	1	Ea.	
Trees	Tree: New	-	7	Ea.	Not in GI System
Trees	Tree: Existing	-	3	Ea.	

P-ID	H-38								
P-NAME	Vacant Lot: 224-226 Putnam Street								
P-ADDRESS	224-226 Putnam Street								
GI TECHNOLOGIES	Rain Garden								
INSTALL DATE	2012		-						
LONGITUDE (X)	930405.5165								
LATITUDE (Y)	1106601.174								
LATITUDE (Y) NOTES	1106601.174								
LATITUDE (Y) NOTES Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes				
LATITUDE (Y) NOTES Craft Landscaping	Asset Planting Area / Landscape Bed / Shrubs	Manufacturer (if known) -	Quantity 525	Units Sq. Feet	Notes GI Rain Garden				
LATITUDE (Y) NOTES Craft Landscaping Landscaping	1106601.174 Asset Planting Area / Landscape Bed / Shrubs Mulch	Manufacturer (if known) - -	Quantity 525 625	Units Sq. Feet Sq. Feet	Notes Gl Rain Garden				
LATITUDE (Y) NOTES Craft Landscaping Landscaping Drainage	Asset Planting Area / Landscape Bed / Shrubs Mulch Perforated HDPE Pipe	Manufacturer (if known) - - - -	Quantity 525 625 27	Units Sq. Feet Sq. Feet Lin. Feet	Notes GI Rain Garden (27) 8" Perf. HDPE				

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Ultra Urban by Abtech

Nyloplast

Lane Enterprises

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New NYSDOT Precast CB, Type T

Not in GI System.

12" PVC Riser w/Domed Top and Filter Insert

Drainage

Drainage

Drainage

Drainage Trees Catch Basin

Outlet Riser

Tree: New

Anti-seep Collar

Inlet Filter Insert / Filter Basket

Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
NOTES					
LATITUDE (Y)	1106627.438				
LONGITUDE (X)	929403.0614				
INSTALL DATE	2012				
GI TECHNOLOGIES	Rain Garden				
P-ADDRESS	109 Hartson Street				
P-NAME	Vacant Lot: 109 Hartson Street				
P-ID	H-44				

Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Landscaping	Planting Area / Landscape Bed / Shrubs	-	300	Sq. Feet	GI Rain Garden
Landscaping	Mulch	-	420	Sq. Feet	
Drainage	Perforated HDPE Pipe	-	7	Lin. Feet	(76) 8" Perf. HDPE
Drainage	Solid HDPE Pipe	-	42	Lin. Feet	(108) 8" Solid HDPE
Drainage	Catch Basin	-	1	Ea.	Existing Street CB
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban by Abtech	1	Ea.	
Drainage	Outlet Riser	Nyloplast	2	Ea.	12" PVC Riser w/Domed Top
Drainage	Anti-seep Collar	Lane Enterprises	1	Ea.	
Trees	Tree: New	-	6	Ea.	Not in GI System.
Trees	Tree: Existing	-	3	Ea.	

P-ID	H-47							
P-NAME	Road Recon: 600 Block Gifford Street							
P-ADDRESS	Gifford Street from Geddes to Ontario Street	Gifford Street from Geddes to Ontario Streets						
GI TECHNOLOGIES	Infiltration Trench							
INSTALL DATE	2012							
LONGITUDE (X)	930850.536							
LATITUDE (Y)	1108992.674							
NOTES								
			Ι					

Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Drainage	Perforated HDPE Pipe	-	856	Lin. Feet	(856) 8" Perf. HDPE
Drainage	Solid HDPE Pipe	-	137	Lin. Feet	(137) 8" Solid HDPE
Drainage	Catch Basin	-	10	Ea.	Existing Street Catch Basin
Drainage	Catch Basin	-	1	Ea.	New City of Syracuse Standard Precast CB
Drainage	Inlet Filter Insert / Filter Basket	Flexstorm	11	Ea.	
Drainage	Cleanout	-	5	Ea.	8" PVC

P-ID	M-10b				
P-NAME	Green Library: Beauchamp Branch				
P-ADDRESS	2111 S. Salina Street				
GI TECHNOLOGIES	Rain Garden				
INSTALL DATE	2012				
LONGITUDE (X)	937372.5496				
LATITUDE (Y)	1102778.654				
NOTES					
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Craft Landscaping	Asset Planting Area / Landscape Bed / Shrubs	Manufacturer (if known) -	Quantity 2000	Units Sq. Feet	Notes GI Rain Garden
Craft Landscaping Landscaping	Asset Planting Area / Landscape Bed / Shrubs Mulch	Manufacturer (if known) 	Quantity 2000 1000	Units Sq. Feet Sq. Feet	Notes GI Rain Garden
Craft Landscaping Landscaping Landscaping	Asset Planting Area / Landscape Bed / Shrubs Mulch Rip-Rap Apron	Manufacturer (if known) - -	Quantity 2000 1000 1000	Units Sq. Feet Sq. Feet Sq. Feet	Notes GI Rain Garden
Craft Landscaping Landscaping Landscaping Drainage	Asset Planting Area / Landscape Bed / Shrubs Mulch Rip-Rap Apron Solid HDPE Pipe	Manufacturer (if known) - - - - -	Quantity 2000 1000 1000 90	Units Sq. Feet Sq. Feet Sq. Feet Lin. Feet	Notes GI Rain Garden (90) 8" Solid HDPE
Craft Landscaping Landscaping Landscaping Drainage Drainage	Asset Planting Area / Landscape Bed / Shrubs Mulch Rip-Rap Apron Solid HDPE Pipe Catch Basin	Manufacturer (if known) - - - - - -	Quantity 2000 1000 1000 90 1	Units Sq. Feet Sq. Feet Sq. Feet Lin. Feet Ea.	Notes GI Rain Garden (90) 8" Solid HDPE Syracyuse Standard Precast Type A

-

Trees

Tree: Existing

4

Ea.

P-ID	M-23							
P-NAME	Greening the Grey in Basin 044							
P-ADDRESS	West Castle St From South Ave to Dearborn Pl							
GI TECHNOLOGIES	Rain Garden Bioswale							
INSTALL DATE	2011-2012							
LONGITUDE (X)	934347.2887							
LATITUDE (Y)	1104695.028							
NOTES	Updated based on Bid Drawings							
Craft	Asset	Manufacturer (if known)	Bid Drawing Quantity	Units	Notes			
Craft Drainage	Asset Perforated Pipe	Manufacturer (if known)	Bid Drawing Quantity 669	Units Lin. Feet	Notes Underdrain			
Craft Drainage Drainage	Asset Perforated Pipe Solid Pipe	Manufacturer (if known)	Bid DrawingQuantity66933	Units Lin. Feet Lin. Feet	Notes Underdrain Storm Pipe			
Craft Drainage Drainage Drainage	Asset Perforated Pipe Solid Pipe Channel with Grate (Trench Drain)	Manufacturer (if known)	Bid Drawing Quantity 669 33 15	Units Lin. Feet Lin. Feet Lin. Feet	Notes Underdrain Storm Pipe			
Craft Drainage Drainage Drainage Drainage	Asset Perforated Pipe Solid Pipe Channel with Grate (Trench Drain) Catch Basin	Manufacturer (if known) Trap : Syracuse Castings Sales Corp.	Bid Drawing Quantity 669 33 15 3	Units Lin. Feet Lin. Feet Lin. Feet Ea.	Notes Underdrain Storm Pipe			
Craft Drainage Drainage Drainage Drainage Landscaping	Asset Perforated Pipe Solid Pipe Channel with Grate (Trench Drain) Catch Basin Planting Area / Landscape Bed / Shrubs	Manufacturer (if known) Trap : Syracuse Castings Sales Corp.	Bid Drawing Quantity 669 33 15 3 3,940	Units Lin. Feet Lin. Feet Ea. Sq. Feet	Notes Underdrain Storm Pipe			
Craft Drainage Drainage Drainage Drainage Landscaping Landscaping	Asset Perforated Pipe Solid Pipe Channel with Grate (Trench Drain) Catch Basin Planting Area / Landscape Bed / Shrubs Mulch	Manufacturer (if known) Trap : Syracuse Castings Sales Corp.	Bid Drawing Quantity 669 33 15 3 3,940 300	Units Lin. Feet Lin. Feet Ea. Sq. Feet Sq. Feet	Notes Underdrain Storm Pipe			

P-ID	M-29				
P-NAME	Hughes Magnet School Parking Lot				
P-ADDRESS	370 Jamesville Ave				
GI TECHNOLOGIES	Porous Asphalt	Infiltration Trench	Plant Bed	Tree Planting	
INSTALL DATE	2011-2012				
LONGITUDE (X)	940253.7762				
LATITUDE (Y)	1101600.715				
NOTES	Updated based on As-Built Drawings				
Craft	Asset	Manufacturer (if known)	As-Built Quantity	Units	Notes
Drainage	Perforated Pipe		333	Lin. Feet	HDPE
Drainage	Solid Pipe		231	Lin. Feet	HDPE
		(1) Frame and Grate : East Jordan Iron Works;			
Drainage	Catch Basin	Drain Basin : Nyloplast	2	Ea.	(1) New; (1) Existing
Drainage	Overflow Control Structure	Drain Basin : Nyloplast	1	Ea.	
Drainage	Inlet		3	Ea.	(3) Existing
Drainage	Inlet Filter Insert / Filter Basket	Ultra Urban Filter: Abtech Industries	4	Ea.	
Drainage	Manhole		2	Ea.	(2) Existing
Drainage	Cleanout		4	Ea.	
Drainage	Anti-seep Collar		2	Ea.	
Paving	Porous Asphalt		3,680	Sq. Feet	
Landscaping	Planting Area / Landscape Bed / Shrubs		1,040	Sq. Feet	Non-GI Planting Area
Landscaping	Mulch		1,200	Sq. Feet	Placed on planting area and around new trees
Trees	Tree: New		25	Ea.	3 Trees in Rain Garden, Others Not in GI System
Trees	Tree: Existing		2	Ea.	

P-ID	M-29d				
P-NAME	Arbor Day Tree Plantings: Hughes Magnet Sc	hool			
P-ADDRESS	745-55 Jamesville Ave				
GI TECHNOLOGIES	Tree Planting				
INSTALL DATE	2012				
LONGITUDE (X)	940253.7762				
LATITUDE (Y)	1101600.715				
NOTES	Quantity taken from database				
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Trees	Tree: New		10	Ea.	Not in GI Systems.

P-ID	M-39				
P-NAME	Bellevue Academy Tree Plantings				
P-ADDRESS	S Geddes and Grant Ave				
GI TECHNOLOGIES	Tree Planting				
INSTALL DATE	2011				
LONGITUDE (X)	929882.8077				
LATITUDE (Y)	1104529.433				
NOTES	Quantity taken from database				
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Trees	Tree: New		12	Ea.	Not in GI Systems.

P-ID	M-52								
P-NAME	Road Recon #4: South State Street								
P-ADDRESS	South State Street from Kennedy to East Colvin Streets								
GI TECHNOLOGIES	Infiltration Trench								
INSTALL DATE	2012								
LONGITUDE (X)	937423.666								
LATITUDE (Y)	1104026.902								
NOTES									
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes				
Craft Drainage	Asset Perforated HDPE Pipe	Manufacturer (if known) -	Quantity 1951	Units Lin. Feet	Notes (1951) 8" Perf. HDPE				
Craft Drainage Drainage	Asset Perforated HDPE Pipe Solid HDPE Pipe	Manufacturer (if known) - -	Quantity 1951 230	Units Lin. Feet Lin. Feet	Notes (1951) 8" Perf. HDPE (230) 8" Solid HDPE				
Craft Drainage Drainage Drainage	Asset Perforated HDPE Pipe Solid HDPE Pipe Catch Basin	Manufacturer (if known) - - -	Quantity 1951 230 11	Units Lin. Feet Lin. Feet Ea.	Notes (1951) 8" Perf. HDPE (230) 8" Solid HDPE Existing Street Catch Basin				
Craft Drainage Drainage Drainage Drainage	Asset Perforated HDPE Pipe Solid HDPE Pipe Catch Basin Inlet Filter Insert / Filter Basket	Manufacturer (if known) Flexstorm	Quantity 1951 230 11 11	Units Lin. Feet Lin. Feet Ea. Ea.	Notes (1951) 8" Perf. HDPE (230) 8" Solid HDPE Existing Street Catch Basin				
Craft Drainage Drainage Drainage Drainage Drainage	Asset Perforated HDPE Pipe Solid HDPE Pipe Catch Basin Inlet Filter Insert / Filter Basket Cleanout	Manufacturer (if known) Flexstorm	Quantity 1951 230 11 11 N/A	Units Lin. Feet Lin. Feet Ea. Ea. Ea.	Notes (1951) 8" Perf. HDPE (230) 8" Solid HDPE Existing Street Catch Basin Cleanouts not identified on As-Built Record Drawings				

P-ID	M-53		
P-NAME	Road Recon #5: Sumner Ave		
P-ADDRESS	Sumner Ave from Euclid to Stratford		
GI TECHNOLOGIES	Infiltration Trench		
INSTALL DATE	2012		
LONGITUDE (X)	942608.823		
LATITUDE (Y)	1106265.743		

NOTES

Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Drainage	Perforated HDPE Pipe	-	946	Lin. Feet	(946) 8" Perf. HDPE
Drainage	Solid HDPE Pipe	-	138	Lin. Feet	(138) 8" Solid HDPE
Drainage	Catch Basin	-	5	Ea.	Existing Street Catch Basin
Drainage	Catch Basin	-	1	Ea.	Existing CB w/Weir and Hood
Drainage	Catch Basin	-	3	Ea.	City of Syracuse Standard Precast CB
Drainage	Inlet Filter Insert / Filter Basket	Flexstorm	6	Ea.	
Drainage	Cleanout	-	14	Ea.	8" PVC

Trees	Tree: New		35	Ea.	Not in GI Systems.
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
NOTES	Quantity taken from database				
LATITUDE (Y)	N/A - Various Locations				
LONGITUDE (X)	N/A - Various Locations				
INSTALL DATE	2011				
GI TECHNOLOGIES	Tree Planting				
P-ADDRESS	Various Locations				
P-NAME	Street Tree Planting Spring 2011				
P-ID	ZZ-02a				

Trees	Tree: New		209	Ea.	Not in GI Systems.
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
NOTES	Quantity taken from database				
LATITUDE (Y)	N/A - Various Locations				
LONGITUDE (X)	N/A - Various Locations				
INSTALL DATE	2011				
GI TECHNOLOGIES	Tree Planting				
P-ADDRESS	Various Locations				
P-NAME	Street Tree Planting Fall 2011				
P-ID	ZZ-02b				

P-ID	ZZ-02c				
P-NAME	Street Tree Planting Spring 2012				
P-ADDRESS	Various Locations				
GI TECHNOLOGIES	Tree Planting				
INSTALL DATE	2012				
LONGITUDE (X)	N/A - Various Locations				
LATITUDE (Y)	N/A - Various Locations				
NOTES	Quantity taken from database				
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Trees	Tree: New		425	Ea.	Not in GI Systems.

P-ID	ZZ-02d				
P-NAME	Street Tree Contract - Fall 2012 Planting				
P-ADDRESS	Various Locations				
GI TECHNOLOGIES	Tree Planting				
INSTALL DATE	2012				
LONGITUDE (X)	N/A - Various Locations				
LATITUDE (Y)	N/A - Various Locations				
NOTES	Quantity taken from database				
Craft	Asset	Manufacturer (if known)	Quantity	Units	Notes
Trees	Tree: New		425	Ea.	Not in GI Systems.

Appendix D

Green Infrastructure Maintenance Training

Joanne M. Mahoney, County Executive

Onondaga Lake Amended Consent Judgment (ACJ) Combined Sewer Overflow (CSO) Compliance Program

March 9, 2012

Tom Rhoads, Commissioner, OCDWEP

Matthew Marko, Rita Fordiani, Courtney Finneran, Leah Rominger CH2M HILL

Save the Rain

Save the Rat



Save the Rain

Logistics

- Restrooms
- Exit in case of emergency
- Please turn off your cell phones
- Parking Lot for extraneous issues
- Feel free to ask questions











Outline (Part 2)

- Overview of Maintenance
- Maintenance Efforts To Date
- Specific Green Infrastructure Maintenance Tasks
- Porous Pavements
- Stormwater Structures
- Landscape Features
- Trees
- Vegetation
- Meadows
- Green Roof

Green Infrastructure Technology • Green Infrastructure Technology Overview

- Porous Pavements
- Porous Asphalt; Porous Concrete; Permeable Pavers
 Infiltration Bed
- Dry Well; Infiltration Bed; Infiltration Trench/Tree Trench
- Cistern/Rain Barrel
- Green Roof

Save the Rat

- Rain Garden/Bioretention
- Green Streets
- Vegetated Curb Extensions; Sidewalk Planters

Inlet Filter Insert





Save the Rai

























Save the Rat

Porous Pavements: General Maintenance

- Clean inlets; clean-outs twice per year
- Vacuum annually; Power-wash
- Maintain adjacent landscaping/planting beds
- Winter maintenance considerations
- <u>Detailed maintenance discussion to be held</u> <u>later on in the workshop</u>

Save the Ra

Green Infrastructure Technology

• Porous Pavements

- Porous Asphalt; Porous Concrete; Permeable Pavers
- Infiltration Bed
- · Dry Well; Infiltration Bed; Infiltration Trench/Tree Trench
- Cistern/Rain Barrel
- Green Roof
- Rain Garden/Bioretention
- Green Streets
 Vegetated Curb Extensions; Sidewalk Planters
- Inlet Filter Insert



Infiltration Practice: Dry Well







Save the R



Infiltration Practices: General Maintenance

- Inspect and clean catch basins/inlets at least twice per year
- Maintain overlying vegetation; re-vegetate bare spots ASAP
- Prohibit vehicular access on subsurface infiltration areas unless designed to allow vehicles
- Avoid excessive compaction by mowers
- <u>Detailed maintenance discussion to be held later on in</u> <u>the workshop</u>









Save the Rat



Infiltration Trench/Tree Trench: General Maintenance

- Water, mulch, treat diseased trees, and remove litter as needed
- Annual inspection for erosion, sediment buildup, vegetative conditions
- Inspection and clean inlets, outlets, cleanouts, etc. twice per year
- <u>Detailed maintenance discussion to be held later on in</u> <u>the workshop</u>

Green Infrastructure Technology Overview

- Porous Pavements
- Porous Asphalt; Porous Concrete; Permeable Pavers
 Infiltration Bed
- Dry Well; Infiltration Bed; Infiltration Trench/Tree Trench
- Cistern/Rain Barrel
- Green Roof Rain Garden/Bioretention
- Green Streets
- Vegetated Curb Extensions; Sidewalk Planters
- Inlet Filter Insert





Save the Rain



Cistern/Rain Barrel: General Maintenance

- Discharge water before next storm event
- Cisterns, rain barrels, and downspouts leading to them should be inspected regularly and cleaned
- The seals should be inspected periodically to prevent mosquito infestation
- May require flow bypass valves during the winter
- <u>Detailed maintenance discussion to be held later on in</u> <u>the workshop</u>

Save the R

Green Infrastructure Technology Overview

Porous Pavements

- Porous Asphalt; Porous Concrete; Permeable Pavers
- Infiltration Bed
 Dry Well; Infiltration Bed; Infiltration Trench/Tree Trench
- Dry wen, minimation Bed, minimation Trench/Tree T
 Cistern/Rain Barrel
- Green Roof
- Rain Garden/Bioretention
- Green Streets
- Vegetated Curb Extensions; Sidewalk Planters
- Inlet Filter Insert







Green Roof: General Maintenance • Once vegetation is established, little to no maintenance needed for the extensive system • <u>Detailed maintenance discussion to be held later on in</u> the workshop

Green Infrastructure Technology Overview

- Porous Pavements
- Porous Asphalt; Porous Concrete; Permeable Pavers
- Infiltration Bed • Dry Well; Infiltration Bed; Infiltration Trench/Tree Trench
- Cistern/Rain Barrel
- Green Roof

Rain Garden/Bioretention

- Green Streets
- Vegetated Curb Extensions; Sidewalk Planters
- Inlet Filter Insert





Save the Ra





Rain Garden: General Maintenance

- Water, mulch, trim, prune, weed, and remove litter
- Inspect for erosion, sediment buildup, and vegetation health
- Inspect and clean inlets, outlets, overflow risers, etc.
- <u>Detailed maintenance discussion to be held later on in</u> <u>the workshop</u>

Save the Rat

Green Infrastructure Technology Overview

- Porous Pavements
- Porous Asphalt; Porous Concrete; Permeable Pavers
- Infiltration Bed
- Dry Well; Infiltration Bed; Infiltration Trench/Tree Trench
 Cistern/Rain Barrel
- Green Roof
- Rain Garden/Bioretention
- Green Streets
- Vegetated Curb Extensions; Sidewalk Planters

Save the Ra

Inlet Filter Insert















Green Street: General Maintenance Water, mulch, trim, prune, weed, and remove litter Inspect for erosion, sediment buildup, and vegetation health Porous pavement maintenance as discussed Inspect and clean inlets, outlets, cleanouts, etc. Detailed maintenance discussion to be held later on in the workshop

Green Infrastructure Technology Overview

- Porous Pavements
- Porous Asphalt; Porous Concrete; Permeable Pavers
 Infiltration Bed
- Dry Well; Infiltration Bed; Infiltration Trench/Tree Trench
 Cistern/Rain Barrel
- Green Roof
- Rain Garden/Bioretention
- Green Streets
- Vegetated Curb Extensions; Sidewalk Planters
- Inlet Filter Insert





Save the Rain



Inlet Filter Insert: General Maintenance

- Follow manufacturer's guidelines
- Inspect at least twice per year and after all major storm events (if possible)
- For areas with high leaf volume, inserts should be inspected once every 2 weeks during the fall, as leaf litter can affect the operation of the insert
- <u>Detailed maintenance discussion to be held later on in</u> <u>the workshop</u>

Save the Ri

Green Infrastructure at the Rosamond Gifford Zoo

- · Site intentionally chosen for today's workshop
- Multiple GI technologies constructed and in design



Rosamond Gifford Zoo Elephant Exhibit, 2011

6,000 sq.ft. Green Roof

Porous pavement and rain barrels for stormwater reuse



GI Technology: Green roof Project Owner: County Capture Area: 6,000 square feet Runoff Reduction: 114,000 gallons/year Construction Cost: \$183,900 \$/gallon: \$2.27

Save the R









Activity - How to Read a Site Plan

- In your packet are 3 Site Plans (11 x 17)
 - City Lot 21
 - City Lot 3
 - Townsend Lot
- Using highlighters, make note of all the green infrastructure elements.

Save the Ra

Circle / outline each element



PID PNAME PADDRESS	y Lot 21: GI Asset CRI LOT 21: GI Asset SW Come of West Washington Street and Clinton Street	: List		
INSTALL DATE LONGITUDE (X) LATITUDE (Y)	2010 October 915226.8285 1111349.128			
NOTES	Anat	Manufacturer if known	Occupito	India
Drainage	If a If concrete catch basis w/ solid lid	East jardan ironWarks	2	
Drainage	If a B' concrete catch basin w/ grate		2	ea.
Drainage	inlet filter inserts	Flogard Plus (Oistar)	2	**
Drainage	Two-Piece HDPE Anti-Seep Collar	Lane Enterprises	2	
Drainage	Solid HDPE pipe with bedding		13	Linear Fee
Drainage	Perforated HDPE pipe without bedding		223.6	Linear Fee
Landscaping	Trees (Species not specified in bid plan)		6	
Landscaping	Hedgerow		1.1.1.2	
	Apot barrier	Deep Root	82.56	Sq. Yard
Landscaping	CU Structural Sell	Cornell University		
Landscaping Landscaping			200	So Feet
Landscaping Landscaping Paving	Porous Pavers			



13



City PND PNAME PADDRESS INSTALL DATE LONGITUDE (V) LATITUDE (V)	Lot 3: GI Asset Li ^{6.60} ⁶⁷ Lid # 3 ¹⁰¹ Onega Bolowed ²⁰¹⁰ Oxford ^{935047 9255} ^{1123012.447}	st		
NOTES	Asset	Manufacturer if known	Quantity	Units
	Existing Ob. On dists		2	and the
Drainage	ILABORE CITY COMPLE			i eacri
Drainage Drainage	Concrete Overflow Control Structure with Removable Weir		1	each
Drainage Drainage Orainage	Concrete Overflow Control Structure with Removable Weir Existing City Manhole		1	each each
Drainage Drainage Drainage Drainage	Existing City Overflow Control Structure with Removable Weir Existing City Manhole Indet filter inserts	Flogard Plus (Kristar)	1 1 3	each each each
Drainage Drainage Drainage Drainage Drainage	Concrete Overflow Control Structure with Removable Weir Existing City Machole Indet filter Inserts Two-Piece HDPE Arth-Seep Collar	Flogard Plus (Kristar) Lane Enterprises	1 1 3 3	each each each each
Drainage Drainage Drainage Drainage Drainage Drainage	Concrete Coefficier Control Structure with Removable Weir Existing City Machole Intel Rifter Inserts Two-Fisce HOPE Anti-Seep Collar Clean Outs	Flogard Plus (Kristar) Lane Enterprises East Jordan IronWorks	1 1 3 3 10	each each each each each
Drainage Drainage Drainage Drainage Drainage Drainage Drainage	Concrete Overflow Control Structure with Removable Weir Existing City Manhole Intel Riter Inserts Two-Piece HDPE Anti-Seep Collar Clean Outs Aeti-Seep Collars	Flogard Pics (Kristar) Lane Enterprises East Jordan Iron/Works	1 1 3 3 10 4	each each each each each each each
Drainage Drainage Orainage Drainage Drainage Drainage Drainage Landicaping	Concrete Overflow Control Structure with Removable Weir Cancerte Overflow Control Structure with Removable Weir Existing Chr. Machole Intel Titler Inserts Two-Piece HDPL Anti-Seep Collar Clean OUS Clean OUS Trees Trees	Flogard Pks (Kristar) Lane Enterprises East Jordan IronWorks	1 3 3 10 4 23	each each each each each each each each
Drainage Drainage Drainage Drainage Drainage Drainage Landscaping Landscaping	Conceile Overflow Control Structure with Removable Weir Exhibits (CD) Marcholt Indef Hitler Inserts Teor-Price OFF Archisep Collar Clean Octs Anti-Seep Collars Trees Trees Hedgerow	Flogard Plus (Kristar) Lane Enterprises East Jordan FronWorks	1 3 3 10 4 23	each each each each each each each
Drainage Drainage Orainage Orainage Drainage Drainage Landscaping Landscaping Landscaping	Concerte Develops: Control Structure with Removable Wein Exiting City Machole Indef Rith Index Control Structure with Removable Wein Exited Rith Index Two-Preze HOTE Arti-Seep Collar Clean Outs Clean Outs Clean Outs Trees Trees Reference Root burrier	Flogard Plus (Kristar) Lane Enterprises East Jordan Iron/Works Deep Root	1 3 3 10 4 23 170	each each each each each each each each
Drainage Drainage Orainage Drainage Drainage Drainage Drainage Drainage Landscaping Landscaping Landscaping	Concesse Overflow Control Structure with Removable Weir Example CDN Mancholt Team-Price OFT Anti-Seep Collar Clean Out: Anti-Seep Collars Trees Trees Trees Trees Tees Root barrier CU Structural Sol	Flogard Plus (Kristar) Lane Enterprises East Jordan IronWorks Deep Root Cornell University	1 3 3 10 4 23 170 310	each each each each each each each each
Orainage Drainage Orainage Orainage Orainage Orainage Drainage Landscaping Landscaping Landscaping Landscaping	Converse Overflow Control Structure with Renovable Weir Existing CfW Methods Intel Riter Inserts Teon-Piece Office Acti-Seep Collar Clean Out: Acti-Seep Collars Trees Acti-Seep Collars Trees Action Seep Collars Trees Action Se	Flogard Plus (Kristar) Lane Enterprises East Jordan IronWorks Deep Root Cornell University	1 1 3 3 10 4 23 170 310 260	each each each each each each each each
Drainage Drainage Drainage Drainage Drainage Drainage Drainage Landscaping Landscaping Landscaping Landscaping Landscaping Paving	Concrease Dourlings Control Structures with Removable Weir Example CDN Mancholt Team-Price PDT Anti-Seep Collar Clean Out: Anti-Seep Collars Trees Hedgerow Root burrier CU Structural Sol Topgoll Aughalt Treated Permeable Rase	Flogard Plus (Kristar) Lane Enterprises East Jordan IronWorks Deep Root Cornell University	1 1 3 3 10 4 23 170 310 260 8730	each each each each each each each each
Drainage Drainage Drainage Drainage Drainage Drainage Drainage Landscaping Landscaping Landscaping Landscaping Landscaping Paving Paving Paving	Converse Countings Control Structure with Removable Weir Existing Cry Marchole Taon-Prese Offic Anti-Seep Collar Clean Outs Acti Seep Collars Trees Hedgerow Rol Structure Rol Structure Rol Structure South Offic Proje with Setding	Flogand Plus (Kristar) Lane Enterprises East Jordan IronWorks Deep Root Cornell University	1 1 3 3 10 4 23 170 310 260 8730 200	each each each each each each each each








Maintenance Requirements for GI

- Overview of Maintenance
- Maintenance Efforts To Date
- Specific Green Infrastructure Maintenance Tasks
 - Porous Pavements
 - Stormwater Structures
- Landscape Features
 - Trees
 - \cdot Vegetation
 - Green Roof
 - Meadows

Overview of Maintenance: Why do we need to maintain GI?

- Required for proper and continued functioning of projects
- Important for aesthetics (landscaping, trees)
- Long-term investment that needs maintenance just like anything else!
- This region is one of the very few that have undertaken implementation of GI at this scale. There are not many examples to learn from
- Portland, Oregon
- Philadelphia, Pennsylvania
- Seattle, Washington

GI as part of the Facilities Network



- Many GI features are buried
- Dig-Safely New York (811) program in place to prevent unexpected exposure of buried utilities
 GI to be part of the system by 2013
- Unplanned repairs / maintenance can be managed
- Utilities (water lines, gas lines) can coexist along with green infrastructure



Maintenance Efforts to Date OCDWEP OCDWEP Onondaga Earth Corps Onondaga Earth Corps OCDWEP OCDWEP Maintenance Activities To Date Nine sites visited Mostly porous pavements & tree infiltration trenches Approx. 70 bags of debris collected x ~4 pounds/bag = ~280-290 pounds of debris that did not go into (did not dor gomerne)

Save the Ra

- 280-290 points of debris that did hot go into/did not clog sewers or waterways
 Debris included
 mostly trash (floatables – fast food containers, cans, etc.), & dirt, dust, stones, leaves
- Pre-cleaning (trash pickup, sweeping) often critical prior to vacuuming

Onondaga Earth Corps Landscape Maintenance Oct-Nov 2011

- · Visited 4 parking lots
- · Evidence of excessive debris in inlets/storm drains
- Excessive amounts of litter; dog-waste
- · Lack of care with mowing (i.e. clear-cutting establishing species)
- · Pedestrian traffic impacts vegetated areas

Save the Ra

Snowplow-operator issues

Plant Identification

- Preparation of a Plant Identification Manual is underway
- Seasonal photographs of perennials that may vary in appearance
- Draft provided in handouts Will be available on the STR
- website this spring! Includes common plant
- species as well as Common Weeds to be removed!

ONONDAGA COUNTY





Overview of Maintenance: Standard Maintenance Procedures

 Table 1 in your packet provides a listing of all the Standard Maintenance Procedures (SMPs) prepared for OCDWEP

Every GI design component (or GI asset) that needs maintenance has an SMP associated with it

We will review all 13 SMPs today!

3559 15-8	Maintenance Tank	Gi Asset Included	
sker os	Person Passenerit Vacuanting	Porous Apphail, Porous Camereta, Forous Epvert, Finable Epvement	
SMP-02	Paraus Paventent Power Washing	ohing Forms Aughait, Porous Careyota, Finable Poromett	
1467-219	Persui Faser Maltimence	Parces Pevers only	
WP-04	Ocementer Structure Dearing	Catch busins, inlets, Manfielder, Observation Wells, Cleansuits, Damed PVC (Dame	
SARP-05	trist Filer must Ceaning in Filer must Prick Replacement	Filter Bags/Filter Inserts	
SMP-06	Genes Roof Maintanance	Greet Roof	
1MP-07	Riverstone Edge Maintename	Riverstone Edge/Mone Gatter (in Parking Linc)	
SMP-DE	White Mantenance for Porces Pasemants	Portus, Righalt, Portus Concrete, Fortus, Pavers, Ficultie Pavement	
MP-09 (A.N. C)	Landscape General Maintenance/Womling/Mulching	Times, Planters, Plant Beds, Rain Kardens, Bissaules, Meadows	
SAMP DE LA. NO	Landscape Matering	Yores, Planters, Plant Beck, Ruin Gardens, Binswales, Meadows	
1449-11 (a, b)	Landscape Pruning	Trens, Planters, Plant Beits, Kain Garders, Bisseadrs	
SMP 12	Muslie Moning	Mistheri	
SAP-13	Landscape Replacement (includes Trans)	Panton, Plant Bods, Rain Gardons, Brownier, Meadowr	



Overview of Maintenance: Recording

participation from others

Overview of Maintenance: Seasonal Activities

- Table 3 in your packet provides a seasonal summary of Maintenance Activities
- Use as a guide to plan maintenance activities for your GI projects
- SMPs do not cover activities during contractor-specified warranties (landscaping and green roof)

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Maintenance Requirements for GI

- Overview of Maintenance
- Maintenance Efforts To Date
- Specific GI Maintenance Tasks
 - Porous Pavements
- Stormwater StructuresLandscaping Features
 - Trees
 - · Irees
 - VegetationMeadow
 - Green Roof



Maintenance of Porous Pavements

- SMP-01:
- Porous Pavement Vacuuming
- SMP-02:
 - Porous Pavement Power Washing
- SMP-03:
- Porous Paver Maintenance (Restoring Aggregate)
- SMP-08:
- Winter Maintenance for Porous Pavements

Save the Rai

Save the Ra

Detailed Visual Inspection

- Confirm "good house keeping" practices are in place.
- Surface should be checked for signs of ponding.
- Inspect for spalling and surface deterioration.
- Voids should be checked for accumulation of fine material.
- Check for accidental or illicit spillage.
- A log should be kept detailing annual inspection and maintenance activities.



SMP-01: Porous Pavement Vacuuming

 Porous Pavement
 Vacuuming is done in order to remove sediment that may lead to a clogging of the porous surface, preventing water from infiltrating through the pavement into the stone reservoir



SMP-01: Porous Pavement Vacuuming

• Frequency:

- Semi-Annually for Porous Concrete, Porous Asphalt, Flexible Porous Pavement
- Annually for Porous Pavers (Spring)
- Tools and Supplies:

Porous pavement vacuum



Save the Rat

- Water source
- · Safety cones, trash bags, gloves, street broom













SMP-01: Porous Pavement Vacuuming Procedures

- 1. Set up safety perimeter
- 2. Inspect
- Visually inspect porous pavement surface for visitally hispect porous pavement surface for damage
 Inspect aggregate in porous pavers to see if additional replacement aggregate is needed
 Record observations in Maintenance Report Log

- 3. Prepare Site

 - Remove debris/trash
 Sweep to loosen debris as needed

SMP-01: Porous Pavement Vacuuming Procedures

- 4. Vacuum per manufacturer's recommendation
 - Engage water function
- Two passes over area
- Empty bag as needed
- 5. Inspect area to ensure adequate debris removal
- 6. Record observations in Maintenance Report Log
- 7. Clean-up; Remove safety perimeter

SMP-02: Porous Pavement Power Washing

- Power washing should be done if porous pavement surfaces become clogged with fine dirt or sand.
- This allows partial restoration of the original void space and permeability of surface
- Should immediately follow the porous pavement vacuum task
- Once every three years or more often as necessary.
- · NEVER power wash porous pavers



SMP-02: Porous Pavement Power Washing

• Frequency:



- Once every three years
- Perform immediately after thorough vacuuming
- Recommended season is Spring
- Tools and Supplies:
 - Power washer
 - Water source
 - Safety cones, trash bags, gloves, street broom

SMP-02: Porous Pavement Power Washing Procedures 1. Set up safety perimeter 2. Inspect • Visually inspect for damage; • Record observations in Maintenance Report Log 3. Prepare Site • Remove debris/trash • Sweep to loosen debris as needed

SMP-02: Porous Pavement Power Washing Procedures

4. Power Wash per manufacturer's recommendation

- Water pressure no greater than 500 dpi
- Two passes over area; no longer than 5 sec
- 5. Inspect area to ensure adequate debris removal
- 6. Record observations in Maintenance Report Log
- 7. Clean-up; Remove safety perimeter















SMP-03: Porous Paver Maintenance

- 1. Set up safety perimeter
- 2. Inspect
 - Visually inspect for damage; missing pavers; clogged voids
- Record observations in Maintenance Report Log 3. Prepare Site
- Remove debris/trash from surface of pavers
 Clean Clogged Voids
 - If voids are clogged, use a manhole pick to tool out joint until clean aggregate is found

Save the Ra





SMP-03: Porous Paver Maintenance (Restoring Aggregate)



Refilling the voids between pavers with additional aggregate material to replace any material that has been lost by vacuuming and/or due to natural migration, settlement, and argoing and erosion.







SMP-03: Porous Paver Maintenance (Restoring Aggregate)

• Frequency:

- $^\circ\,$ As needed when gravel infill is not within 1/2 inch of the paver surface
- Immediately following vacuuming
- Tools and Supplies:
 - Wheelbarrow, Shovel, Manhole Pick
- Clean-washed small aggregate (gravel) per project specifications
- $\, \circ \,$ Safety cones, trash bags, gloves, street broom



SMP-03: Porous Paver Maintenance Restoring Aggregate Procedures

- 5. Add Aggregate
 - Use a shovel to spread aggregate over the surface of the pavers
 - Use a broom to sweep aggregate into the voids between porous paves, taking care to fill in any obvious holes
- Perform a final sweeping pass with the hand broom to remove any excess gravel from the paver surface
- 6. Record observations in Maintenance Report Log
- 7. Clean-up; Remove safety perimeter

Save the Rain

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SMP-08: Winter Maintenance for Porous Pavements Procedures

- Frequency:
 - As necessary following snowfall or icy conditions
- Tools and Supplies:
- Truck with snow plow
- Salt/Deicers and appropriate machinery as needed
- Hand shovel









SMP-08: Winter Maintenance for **Porous Pavements Procedures**

- 3. Plow
 - Raise blade level 1" higher to prevent the plow from catching edges and dislodging paver units Rubber plow blade is recommended
- Rubber plow blade is recommended
 Storage of snow piles
 Do not leave plowed snow piles on top of porous pavement surfaces
 Move snow piles to standard/conventional pavement area or to grassy/lawn area
 Salting
 Use in moderation
 Only us 25% of amount that is routinely applied
 Record observations in Maintenance Report Log
 Clean-uw Remove safety nerimeter

- Clean-up; Remove safety perimeter 7.

Save the Rain

SMP-08: Winter Maintenance for **Porous Pavements**

- Salting must be to a minimal
- Plow blade heights may need to be set higher
- Plowed snow should not be stockpiled directly on top of porous pavement if possible.



Save the Rai









Maintenance of Stormwater Structures

- SMP -04:
 - Stormwater Structure Cleaning
- SMP-05:
 - Inlet Filter Insert Cleaning



SMP -04: Stormwater Structure

Cleaning

 Structures used to capture runoff, connect pipes, provide access, control the water level in stormwater management systems

Catch basin Inlet

- Sediment trap
- Manhole
- Overflow structure with or without removable weir
- Observation well
- Clean-out Domed riser





Save the Ra

SMP -04: Stormwater Structure Cleaning Procedures

4. Prepare Site (Cont'd)

- Examine unintended or excessive standing water
- Inspect the drainage orifices for signs of clogging
 Remove any and all material clogging these orifices
- If structure has filter insert, follow SMP-05
- 5. Clean Structure
 - If using vacuum truck, clean the interior of the structure and remove all debris or sediment contained in sump

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Save the Ra

SMP -04: Stormwater Structure Cleaning Procedures

- 6. Disposal
- Properly dispose of waste/sediment
- 7. Replace structure lid; secure tightly
- 8. Record observations in Maintenance Report Log
- 9. Clean-up; Remove safety perimeter





SMP-05: Inlet Filter Insert Cleaning

- Inlet filter inserts are designed to trap sediment, debris, trash, oil and grease
- Are located inside a catch basin or stormwater inlet
- Replacement of the filter insert pouch should occur at least annually, or as necessary, during a cleaning task



SMP-05: Inlet Filter Insert Cleaning • Frequency: • Quarterly, • Unless stablished that a particular inlat apprive

- Unless established that a particular inlet requires less frequent cleaning
- Tools and Supplies:
 - Manhole Pick
 - Replacement filter insert pouch (one pouch per inlet)
- Industrial vacuum and/or vacuum truck with hose
- $\, \circ \,$ Safety cones, trash bags, gloves

SMP-05: Inlet Filter Insert Cleaning
Procedures
1. Set up safety perimeter
2. Inspect
8. Remove catch basin lid/grate with manhole pick and set safely aside
8. Visually inspect filter insert for evidence of defects and deterioration
8. Record observations in Maintenance Report Log
3. Clean filter liner/mesh
8. Use an industrial vacuum or vacuum truck hose to remove any collected materials from the liner

SMP-05: Inlet Filter Insert Cleaning Procedures

- 4. Inspect filter hardware (follow manuf. Spec)
- Unsnap the tether from the D-ring (or equivalent) Inspect the filter liner, gaskets, stainless steel frame, and mounting brackets, etc. for continued serviceability
- 5. Insert filter
- Reattach the pouch tethers to the liner's D-ring (or equivalent)
- 6. Replace grate/lid; secure tightly
- Record observations in Maintenance Report Log 7.
- 8. Clean-up; Remove safety perimeter



SMP-07: Riverstone Edge Maintenance

• The riverstone edge/stone gutter is a 1 to 3-foot wide (width varies) gravel edge around some porous pavement areas that serves as a backup mechanism for runoff to enter the subsurface infiltration bed should the porous pavement ever be adversely modified such that is permeability is reduced.



Save the Ra

Riverstone edges also provide protection for upslope debris/run-on

SMP-07: Riverstone Edge Maintenance

- Remove trash/debris
- Weed: Remove any obvious weed growth that has established itself within the limits of the riverstone edge/stone gutter.
- Rake to establish even surface: e gutter to
- Rake of establish an even sufface and even out Gently rake riverstone edge/stone gutter re-establish an even surface and even out any irregular depressions or high points *Replenish:* Add new riverstone only if shallow and/or bare a rease sexist after raking has been completed. King has been completed. Add only enough riverstone to bring entire riverstone edge/stone gutter to a consistent and level grade, approximately even with the elevation of the adjacent edge of payment



Save the Rat

SMP-07: Riverstone Edge Maintenance

- Frequency:
 - Annually in spring
- · Tools and Supplies:
 - Rake
 - · Clean-washed riverstone per project specifications

Save the Rain

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Trash bag, gloves

Maintenance Requirements for GI

- Overview of Maintenance
- Specific GI Maintenance Tasks
- Porous Pavements
- Stormwater Structures
- Landscape Features
- Trees
- Vegetation
- Meadow
- Green Roof

Maintenance of Trees

• SMP-09a:

- Tree General Maintenance Tree Pit Weeding, Tree Pit Mulching, Soil Amendment with Organic Matter
- SMP-10a:
- Tree Watering
- SMP-11a:
 - Tree Pruning

SMP-09a: General Maintenance

- Inspection for problems
- Remove trash and debris
- Weeding
- Mulching
- · Soil Amendment with Organic Matter





Save the Ra

SMP-09a: General Maintenance



Save the R





SMP-11a: Pruning

- Improve structural strength and reduce failure potential
- Prevent or mitigate a pest problemImprove aesthetic characteristics
- Provide clearance for pedestrians, vehicles, and structures
- Improve safety and security for
- residents and visitors • Repair structural damage from wind
- loading
- Reduce future maintenance costs



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SMP-11a: Tree Pruning Procedures

• Year 1 - remove damaged and dead branches































Types of Vegetation

- Annual: completes its life cycle in one growing season.
 Perennial: Plants that live for more than 2 years.

 - Grass
 A slender leaved, perennial with a jointed stem that dies back to the ground in the winter
 Forb
 A broad leaved perennial with a smooth stem that dies back to the ground in the winter. Typically when a gardener talks about "perennials", this is what they mean
 Shrub
 A woodu plot of relatively low beight buying sayaral storm.
 - A woody plant of relatively low height, having several stems arising from the base and lacking a single trunk **Tree**
 - A woody plant usually having 1 stem, called the trunk arising from the base, relatively taller than a shrub

Save the R

Gardens are Dynamic They change season to season

Spring

Summer















Cheap tricks for telling the plants and weeds apart

- Forthcoming Manual on STR website!
- Use plant markers
- Use the plant list for each project and the picture page
- The rule of P's, pull prickers, leave pearls and pots
- Use the list of common weeds
- Other resources: "Weeds of the Northeast"
- http://njaes.rutgers.edu/weeds/thumbnail.asp
- http://www.garden.org/weedlibrary/

SMP-09b: Landscaping Maintenance (Weeding)

Weed early and often

- SMP: 3x/year-spring clean-up, summer and fall put to bed
- Weeding more often will save time in the long run
- Pull weeds out by the roots before they set seed • Grasp the plant firmly at base or use a tool
- Weeding is easiest when the soil is moist
- Avoid compacting the soil and trampling the plants!
- Tools and Supplies
- Gloves, trowel, weeding fork, spade or pitch fork, trash bag, weed id guide

SMP-09b: Landscaping Maintenance (Mulching)

- Apply 2-3 inches of double- shredded hardwood mulch in Spring
- Keep mulch away from stems May need to remove
- old mulch to maintain functionality of rain gardens and bioswales







SMP-10b: Landscape Watering Procedures and Techniques

- 1. Water the roots not the leaves
- 2. Water deeply to encourage good root development, soil should remain moist at least 2-3 inches below grade
- 3. Properly used hoses are better then sprinklers

SMP-11b: Landscape Pruning, Thinning, and Removing Dead Plant Material

Thin disease-prone plants such as phlox and beebalm



Plant Division

Why

- Reinvigorate plants
- Provide space for plants to growGet more plants!
- How
- Dig up the whole plant and wash or brush the soil off the roots
- Use a knife, spade or ax to cut the plant. Each piece will need roots and a portion of crown
- Re-plant the newly divided plants into a larger area than the plant once occupied
- When? Spring or Fall: depends on plant



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SMP-11b: Landscape Cutback Procedures-putting the garden to bed

- A fall cleanup can include cutting most perennials back to about 4 inches above the ground
- 2. Some plants such as iris should not be cut back while the foliage is still green



SMP-13a:Landscape Plant Replacement

- Plant (shrub and herbaceous material) replacement involva replacing missing, dead, or diseased species in planter beds, planters, rain gardens, and/or bioswales <u>if</u> <u>replacement has been deemed</u> <u>necessary</u>
- Does not include tree replacement (separate contract)



Save the R

SMP-13a:Landscape Plant Replacement

- Frequency
 - Planting is done in Spring and Fall, replacement as necessary
- Tools and Supplies
 - See SMP for detailed instructions

SMP-13a:Landscape Plant Replacement Procedures (Detailed Instructions in SMP) 1. Provide plants of sizes, grades, and ball or container sizes

- 1. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required
- 2. Set balled and potted and container-grown stock plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
- 3. Carefully remove root ball from container without damaging root ball or plant.
- Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

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Maintenance Requirements for GI

- Overview of Maintenance
- Specific GI Maintenance Tasks
- Porous Pavements
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 - Vegetation
 - Meadow
 - Green Roof

Maintenance of Meadows

- SMP-09c:
- Meadow Inspection, Control of Invasive Species
- SMP-12:
 - Meadow Mowing and Invasive Species Management
- SMP-13b:
- Meadow Replacement

SMP-09c: Meadow Inspection, Control of Invasive Species

 A meadow is a field consisting primarily of herbaceous grasses, forbs, wildflowers, and other non-woody plants. Meadow inspection consists of a visual inspection, trash/debris removal, and invasive species management.



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SMP-09c: Meadow Inspection, Control of Invasive Species

- Frequency
 - Minimum 3x/year (Spring, Summer, Fall)
- Tools and Supplies
 - See SMP for detailed instructions

SMP-09c: Meadow Inspection, Control of Invasive Species Procedures

- Inspect meadow area for evidence of invasive species and woody plant establishment. (Monthly recommended)
- <u>Examples of invasive species:</u> thistle, knapweed, phragmites, and general weeds such as dandelions. (Refer to Weed ID Sheet)
- Managing invasive species in meadows is primarily done through mowing
- For the control of certain types of invasive species not able to be managed by mowing, such as Crown Vetch, <u>spot spraying and hand pulling should be</u> <u>conducted</u>.

Save the Ra

SMP-12: Meadow Mowing and Invasive Species Management

 Mowing a meadow helps to prevent and control woody plant and weed establishment, while also helping to disperse seeds of desirable species. Mowing manages for cool season weeds, which helps promote warm season grass establishment.



Example of a flail-type mower

SMP-12: Meadow Mowing and Invasive Species Management

Frequency

Year 1: Mow meadow **once a month** during growing season

Year 2: Mow once in fall

Long Term Maintenance regime: Year 3 and after: Now once every 2 years in early to mid-spring prior to significant warm season grass regrowth, but when cool season weeds are actively growing. If basin bottom is too wet for spring mowing, mow in late fall (after plants have set seed).

- Tools and Supplies
- Hand Scythes (small meadows) Power Strimmer (String Trimmer/Weed Whacker) (small meadows)
- Power Scythe (large meadows) Flail-type Mower suggested mower for large meadows Riding or Push Mower suggested mower for small to medium meadows



SMP-13b: Meadow Replacement

· Meadow replacement involves reseeding or replugging meadow grasses or herbaceous groundcover plants if replacement has been deemed necessary.



Save the Ra

SMP-13b: Meadow Replacement

Tools and Supplies

- Planting equipment (for larger areas: 'Truax' notill drill or a double box 'Brillion' grass/legume broadcast seeder)
- Plant plugs and seed
- Mulch



SMP-13b: Meadow Replacement Procedures (Detailed Instructions in SMP) 1. Replacement Requirements:

- · Re-plugging: see SMP-13a Plant (Shrub and Herbaceous Groundcover) Replacement for detailed instructions.
- 2. Reseeding Requirements:
 - · Reseed bare areas with same materials specified for respective grasses & forbs. Seed mixture shall be fresh, clean, new crop seed.
 - · Seeded areas to be lightly scarified with springy rake to loosen soil before reseeding. Save the Rat

SMP-13b: Meadow Replacement Procedures (Detailed Instructions in SMP) **Reseeding Instructions:** 1. For small areas, hand broadcast seed to match initial seeding rate specified for site. 2. For larger areas, use no-till seed drill or broadcast seeder, without inert matter added. **Reseeding Restrictions:** • Seed during one of the following periods. Meadow Seeding: March 15th to June 15th • Warm-Season Meadow Seeding: April 15th to June 15th and August 15th to September 15th Save the Rat

Maintenance Requirements for GI

- Overview of Maintenance
- Specific GI Maintenance Tasks
- Porous Pavements
- Stormwater Structures
- Landscape Features
 - Trees
 - Vegetation
 - Meadow
 - Green Roof

SMP-06: Green Roof Maintenance

- Follows initial 2-3 year establishment period/contractor warranty period
- Routine maintenance is intended to increase survival of the vegetated cover, promote the development of robust and durable green roof plants, and prevent drainage problems and erosion.



SMP-06: Green Roof Maintenance

- Frequency
 - Spring and Fall (Semi-annually)
- Tools and Supplies
- Hand Pruners
- · Safety equipment, including fall protection as applicable
- Trash bag, gloves

Save the Rain

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SMP-06: Green Roof Maintenance

Procedures

Inspect: Visually inspect the green roof system for the following:

Plant Material: Inspect for large bare spots; colonization of the green roof by annual grass, moss, weeds, woody material, etc.; high mortality rates for one or more plant species; loss of plant material/growing media to wind scour or erosisn; or consistently moist or spongy areas of the root. Waterproofing System: Inspect exposed components of the waterproofing system, including flashings and counter-flashings. Drainage System: Inspect drain outlets (scuppers) to make certain that they are free from clogging or obstructions. Look for evidence of prolonged ponding of water following rainfall events.





SMP-06: Green Roof Maintenance **Procedures**

- Weed: Weed the green roof plantings as necessary by <u>hand pruning/pulling</u>. Immature extensive green roofs are vulnerable to colonization by annual grass, especially crabgrass.
- Plant Pruning: Trim any plant material that may be growing within the drainage medium or interfering with the drainage system or waterproofing system.
 Replenish: Patches of bare growing media (bare green roof) may be re-planted by taking cuttings from roof may be re-planted by taking cuttings from
- adjacent green roof plants or by separating and transplanting healthy plants. Plant cuttings should be at least one-inch long and should preferably include some 'air roots'.

Save the Rat

What's Next?

• Maintenance Report Logs – Submit to OCDWEP

Save the Rain

- Please fill out an evaluation form before you leave
- Next Training in 2013
- Final Questions?

Appendix E

FACT SHEET: Porous Pavement with Infiltration

Porous pavement is a Green Infrastructure (GI) technique that combines stormwater infiltration, storage, and structural pavement consisting of a permeable surface underlain by a storage/infiltration bed. Porous pavement is well suited for parking lots, walking paths, sidewalks, playgrounds, plazas, tennis courts, and other similar uses.

A porous pavement system consists of a pervious surface course underlain by a storage "bed" (i.e. reservoir) placed on uncompacted subgrade to facilitate stormwater infiltration. This storage reservoir, which is typically designed to store at least 1-inch of runoff, may consist of



a bed of uniformly graded and washed coarse aggregate with a void space of approximately 40% (NYSDOT No. 3A) or other pre-manufactured structural storage units (RainTank, StormTank, etc). The depth of the storage reservoir varies and is based on the management objectives, total drainage area, traffic load, and in-situ soil characteristics. The porous pavement may consist of asphalt, concrete, permeable paver blocks, reinforced turf/gravel, or other emerging types of pavement (e.g. Flexipave, Permapave, etc).

For more detailed design guidance, refer to section 5.3.11 of the New York State Stormwater Management Design Manual, August 2010, as well as the following industry references: Information Series 131 – Porous Asphalt Pavements for Stormwater Management by the National Asphalt Pavement Association; Pervious Concrete Pavements by the Portland Cement Association and the National Ready Mixed Concrete Association (2004); and Permeable Interlocking Concrete Pavements, Third Edition, by the Interlocking Concrete Pavement Institute (2006).

POTENTIAL APPLICATIONS		STORMWATER Q FUNCTION	2UANTITY ADDITIONAL CONSID		DERATIONS
Residential	Yes	Volume High		Capital Cost	Medium
Commercial	Yes	Groundwater Recharge High		Maintenance	Medium
Ultra Urban	Yes	Peak Rate Medium/Hi		Winter Performance	Medium/High
Industrial	Yes	Erosion Reduction	Medium/High	Fast Track Potential	Low/Medium
Retrofit	Yes	Flood Protection	Medium/High	Aesthetics	Low/Medium
Highway	Limited	STO	ORMWATER QUA	ALITY FUNCTIONS	
Recreational	Yes	Total Suspended Solids High		Total Nitrogen	High
Public	Yes	Total Phosphorus Medium		Temperature	High

Key Design Features

- Infiltration testing required
- Do not infiltrate on compacted soil
- Level storage bed bottoms
- Provide positive storm water overflow from bed (overflow weir plates should be removable and not prone to clogging by large debris or trash)
- Stormwater control structures should be large enough for a person to enter; the preferred size is either 4'x4' or 4' diameter
- If possible, outlet pipes should connect to existing pipes immediately downstream of existing inlets
- Surface permeability >20"/hr
- Secondary inflow mechanism recommended (inlet grates should be ADA compliant and bicycle safe)
- Pretreatment for sediment-laden runoff

Site Factors

- Water Table/Bedrock Separation: 3-foot minimum
- Soils: HSG A&B preferred; HSG C&D may require underdrains
- Feasibility on steeper slopes: Low
- Potential "Hotspots": Not without design of pretreatment system/impervious liner

Maintenance

- Clean inlets
- Vacuum annually
- Maintain adjacent landscaping/planting beds

Cost

- Varies by surface type
- Generally more than standard pavement, but saves on cost of other GI techniques and drainage infrastructure

Benefits

- Volume control & groundwater recharge, moderate peak rate control
- Versatile with broad applicability
- Dual use for pavement structure and stormwater management

Limitations

- Careful design & construction required
- Higher maintenance needs than standard pavement
- Steep slopes



Porous asphalt parking spaces at SUNY ESF parking lot in Syracuse, NY



Flexipave installation at SUNY ESF in Syracuse, NY



Porous pavers at City Lot #21 in Syracuse, NY

FACT SHEET: Infiltration Practices

Infiltration practices are natural or constructed areas located in permeable soils that capture, store, and infiltrate stormwater runoff. Infiltration practices come in a variety of shapes and sizes.

Dry wells, also referred to as seepage pits, French drains or Dutch drains, are subsurface storage facilities (structural chambers or excavated pits backfilled with a coarse aggregate or alternative storage media) that temporarily store and infiltrate stormwater runoff from rooftops. Due to their size, dry wells are typically designed to handle stormwater runoff from smaller drainage areas (i.e. less than one acre in size).



Infiltration basins are shallow surface impoundments that temporarily store, capture, and infiltrate runoff over a period of several days on a level and uncompacted surface. Infiltration basins are typically used for drainage areas of 5 to 50 acres with land slopes that are less than 15 percent.

Infiltration berms use a site's topography to manage stormwater and prevent erosion. Berms may function independently in grassy areas or may be incorporated into the design of other stormwater GI technologies, such as Rain Gardens. Berms may also serve various stormwater drainage functions including: creating a barrier to flow, retaining flow for volume control, and directing flows.

Infiltration trenches are linear subsurface infiltration structures typically composed of a stone trench wrapped with geotextile that is designed for both stormwater infiltration and conveyance in drainage areas less than five acres in size.

Subsurface infiltration beds generally consist of a rock storage (or alternative) bed below surfaces such as parking lots, lawns, and playfields for temporary storage and infiltration of stormwater runoff with a maximum drainage area of 10 acres.

Rain Gardens are often considered to be infiltration practices and are further discussed in the Rain Garden fact sheet.

Porous Pavement is typically considered an infiltration practice and is further discussed in the Porous Pavement fact sheet

For more detailed design guidance, refer to sections 5.3.7 – Rain Gardens, 5.3.11 – Porous Pavement, and 6.3 – Stormwater Infiltration of the New York State Stormwater Management Design Manual, August 2010.

	Residential	Commercial	Ultra Urban	Industrial	Retrofit	Highway/ Road	Recreational	Private
Dry Well	Yes	Yes	Yes	Limited	Yes	N/A	Yes	Yes
Infiltration Basin	Yes	Yes	Limited	Yes	Yes	Limited	Yes	Yes
Infiltration Berm	Yes	Yes	Limited	Yes	Yes	Yes	Yes	Yes
Infiltration Trench	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subsurface Infiltration Bed	Yes	Yes	Yes	Yes	Yes	Limited	Yes	Yes

Stormwater Quantity Functions

	Volume	Groundwater Recharge	Peak Rate	Erosion Reduction	Flood Protection
Dry Well	Medium	High	Medium	Medium	Low
Infiltration Basin	High	High	High	Medium/High	High
Infiltration Berm	Low/Medium	Low/Medium	Medium	Medium/High	Low/Medium
Infiltration Trench	Medium	High	Low/Medium	Medium/High	Low/Medium
Subsurface Infiltration Bed	High	High	High	Medium/High	Medium/High

Stormwater Quality Functions

	Total Suspended Solids	Total Phosphorus	Total Nitrogen	Temperature
Dry Well	Medium (85%)	High/Medium (85%)	Medium/Low (30%)	High
Infiltration Basin	High (85%)	Medium/High (85%)	Medium (30%)	High
Infiltration Berm	Medium/High (60%)	Medium (50%)	Medium (40%)	Medium
Infiltration Trench	Medium (85%)	High/Medium (85%)	Medium/Low (30%)	High
Subsurface Infiltration Bed	High (85%)	Medium/High (85%)	Low (30%)	High

Additional Considerations

Capital Cost	Medium
Life Cycle Costs	Medium
Maintenance	Medium
Winter Performance	High
Resistance to Heat	High
Fast Track Potential	Medium
Aesthetics	Medium

Key Design Features

- Depth to water table or bedrock
- Pretreatment is often needed to prevent clogging
- Level infiltration surface
- Proximity to buildings, drinking water supplies, karst features, and other sensitive areas
- Soil types (permeability, limiting layer, etc.)
- Provide positive overflow in most uses
- Typical loading ratio of 5:1 (impervious to infiltration area); maximum loading ratio of 10:1

Site Factors

- Minimum infiltration rate of 0.5 inches per hour
- Maximum Site Slope: 15 percent
- Minimum depth to bedrock: 3 feet
- Minimum depth to seasonally high water table: 3 feet
- Potential Hotspots: yes with pretreatment and/or impervious liner
- HSG Soil type: A and B preferred, C & D may require an underdrain

Maintenance

- All catch basins and inlets should be inspected and cleaned at least twice per year
- The overlying vegetation of a subsurface infiltration facility should be maintained in good condition and any bare spots re-vegetated as soon as possible
- Vehicular access on subsurface infiltration areas should be prohibited (unless designed to allow vehicles) and care should be taken to avoid excessive compaction by mowers

Cost

- Dry Well: Construction costs \$4-9/ft³, Maintenance Costs – 5-10% of capital costs
- Infiltration basin: Construction costs varies depending on excavation, plantings, and pipe configuration
- Infiltration Trench: Construction costs \$20-30/ft³, Maintenance Costs – 5-10% of capital costs
- Subsurface Infiltration Bed: Construction costs \$13/ft³

Benefits

- Reduces volume of stormwater runoff
- Reduces peak rate runoff
- Increases groundwater recharge
- Provides thermal benefits
- Increased aesthetics
- Multiple use/Dual use

Limitations

- Pretreatment requirement to prevent clogging
- Not recommended for areas with steen clones



Subsurface Infiltration Bed using Rainstore ™ blocks for storage media, Washington National Cathedral, DC



Infiltration Trench in Chester County, PA



The Subsurface Infiltration Bed beneath this playfield manages rooftop runoff from the adjacent school building, Philadelphia, PA

FACT SHEET: Rain Garden

Rain Gardens (or Bioretention Areas) are shallow surface depressions planted with specially selected native vegetation to treat and capture stormwater runoff and are sometimes underlain by sand or a gravel storage/infiltration bed. A Rain Garden is a method of managing stormwater by pooling water within a planting area and then allowing the water to either infiltrate into the surrounding soil or evapotranspire. In addition to managing runoff volume and mitigating peak discharge rates, this process filters suspended solids and related pollutants from stormwater runoff. A Rain Garden can thus be



designed into a landscape as a garden feature that helps to improve water quality while reducing runoff quantity. In addition, Rain Gardens can be integrated into a site with a high degree of flexibility and can balance nicely with other GI technologies including porous pavement parking lots, infiltration trenches, and other non-structural stormwater practices. Rain Gardens typically require little maintenance once established and often replace areas that were intensively landscaped and require high maintenance.

For more detailed design guidance, refer section 5.3.7 – Rain Gardens of the New York State Stormwater Management Design Manual, August 2010.

POTENTIAL APPLICATIONS		STORMWATER Q FUNCTION	UANTITY IS	ADDITIONAL CONSIDERATION	
Residential	Yes	Volume Medium/High		Capital Cost	Medium
Commercial	Yes	Groundwater Recharge	Groundwater Recharge Medium/High		Medium
Ultra Urban	Limited	Peak Rate	Medium	Winter Performance	Medium
Industrial	Yes	Erosion Reduction	Medium	Fast Track Potential	Medium
Retrofit	Yes	Flood Protection	Low/Medium	Aesthetics	High
Recreational	Yes	STO	ORMWATER QUA	ALITY FUNCTIONS	
Public/Private	Yes	Total Suspended Solids (70-90%)		Total Nitrogen	Medium 40-50%)
Residential	Yes	Total Phosphorus Medium (60%)		Temperature	High

Variations

- Subsurface storage/infiltration bed
- Use of underdrain
- Use of impervious liner

Key Design Features

- Flexible in size and configuration
- Typical ponding depth of 6 inches (maximum 18 inches) for drawdown within 48 hours
- Plant selection (native vegetation that is tolerant of hydrologic variability, salts, and environmental stress)
- Amend soil as needed
- Provide positive overflow for extreme storm events
- Provide stable inflow/outflow conditions
- A length to width ratio of 2:1 is recommended
- Design should include 6-12 inch layer of uniformly graded, clean washed gravel (1.5-2.0-inch diameter rock) under 12-18 inches of soil mix; if an underdrain is used (i.e. poor infiltration or hotspot), then use 12 inches of gravel and 18-24 inches of soil

Site Factors

- Water Table/ Bedrock Separation: 3-foot minimum
- Soils: HSG A and B preferred; C & D may require an underdrain
- Feasibility on steeper slopes: medium
- Potential Hotspots: yes with pretreatment and/or impervious liner
- Maximum loading ratio of 5:1 (impervious to garden area); not more than 1 acre to one rain garden

Maintenance

- Water, mulch, trim, prune, weed, and remove litter as needed
- Inspect for erosion, sediment buildup, and vegetation health
- Remove organic material approximately 2x/year
- Biannual inspection of cleanouts, inlets, outlets, etc.

Cost

• \$5-7 per cubic foot of storage to construct

Benefits

- Volume control & groundwater recharge, moderate peak rate control
- Versatile w/ broad applicability
- Enhance site aesthetics and habitat
- Potential air quality & climate benefits

Limitations

- Higher maintenance until vegetation is established
- Limited impervious drainage area to each garden
- Requires careful selection & establishment of plants



Residential rain garden at the Village at Springbrook Farm in Lebanon, PA



Rain garden at Woodlawn Library in Wilmington, DE.



Commercial rain garden in Traverse City, Michigan

Example Design Details:



Figure 1: Typical rain garden section without a subsurface infiltration bed



Figure 2: Typical rain garden section with a subsurface infiltration bed

FACT SHEET: Vegetated Roof

A vegetated roof cover is a veneer of vegetation that is grown on and covers an otherwise conventional flat or pitched roof, endowing the roof (< 30 degree slope) with hydrologic characteristics that more closely match surface vegetation than the roof. The overall thickness of the veneer typically ranges from 2 to 6 inches and may contain multiple layers, consisting of waterproofing, synthetic insulation, nonsoil engineered growth media, fabrics, and synthetic components. Vegetated roofs, also called "green rooftops" can be optimized to achieve water quantity and water quality benefits. Through the appropriate selection of materials, even thin vegetated covers can provide significant rainfall retention and detention functions.

Depending on the plant material and planned usage for the roof area, modern vegetated roofs can be categorized as systems that are intensive, semi-intensive, or extensive. **Intensive** vegetated roofs utilize a wide variety of plant species that may include trees and shrubs, require deeper substrate layers (usually > 4 inches), are generally limited to flat roofs, require 'intense' maintenance,



and are often park-like areas accessible to the general public. **Extensive** vegetated roofs are limited to herbs, grasses, mosses, and drought tolerant succulents such as sedum, can be sustained in a shallow substrate layer (<4 inches), require minimal maintenance once established, and are generally not designed for access by the public.

These vegetated roofs are typically intended to achieve a specific environmental benefit, such as rainfall runoff mitigation. Extensive roofs are well suited to rooftops with little load bearing capacity and sites which are not meant to be used as roof gardens. **Semi-intensive** vegetated roofs fall between intensive and extensive vegetated roof systems. More maintenance, higher costs and more weight are the characteristics for this intermediate system compared to that of the extensive vegetated roof. For more detailed design guidance, refer to section 5.3.8 – Green Roofs of the New York State Stormwater Management Design Manual, August 2010.

POTENTIAL APPLICATIONS		Stormwater QI Function	ANTITY ADDITIONAL CONSIDERAT		DERATIONS
Residential	Limited	Volume	Medium/High	Capital Cost	High
Commercial	Yes	Groundwater Recharge	Groundwater Recharge N/A		Medium
Ultra Urban	Yes	Peak Rate Medium		Winter Performance	Medium
Industrial	Yes	Erosion Reduction	Low/Medium	Fast Track Potential	Low
Retrofit	Yes	Flood Protection	Low/Medium	Aesthetics	High
Highway/Road	No	STO	RMWATER QU	ALITY FUNCTIONS	
Recreational	Yes	Total Suspended Solids	Medium	Total Nitrogen	Medium
Public/Private	Yes/Yes	Total Phosphorus Medium		Temperature	Medium

Variations

• Single media system; Dual media system; Dual media system with synthetic layer; Intensive, Extensive, or Semi-intensive

Key Design Features

- Engineered media should have a high mineral content. Engineered media for extensive vegetated roof covers is typically 85% to 97% nonorganic.
- Vegetated roof covers intended to achieve water quality benefits should not be fertilized.
- Irrigation requirement depends on the green roof system selected.
 Extensive green roofs grown from cuttings need irrigation in the beginning.
- Internal building drainage, including provision to cover and protect deck drains or scuppers, must anticipate the need to manage large rainfall events without inundating the cover.
- Porous media should be included in drainage layer in order to store water for plant uptake and allow storm buffering
- Assemblies planned for roofs with pitches steeper than 2:12 (9.5 degrees) must incorporate supplemental measures to insure stability against siding.
- The roof structure must be evaluated for compatibility with the maximum predicted dead and live loads. Typical dead loads for wet extensive vegetated covers range from 8 to 36 pounds per square foot.
- The waterproofing must be resistant to biological and root attack. In many instances a supplemental roof-fast layer is installed to protect the primary waterproofing.
- Plants best suited to weather conditions that exist on a roof should be selected. Plants typically native to seashore, alpine, and desert regions are equipped to cope with such environments.

Maintenance

• Once vegetation is established, little to no maintenance needed for the extensive system

Cost

- Depends on building height, accessibility, depth/complexity of assembly, remoteness from material sources, and size
- Typical range: \$15-20 per square foot (not including waterproofing)

Benefits

- High runoff volume reduction (annual basis)
- Insulation from heat, cold and outside noise (Energy savings)
- Moderate ecological value and habitat
- High aesthetic value
- Urban heat island reduction
- Improve air quality

Limitations

- Higher maintenance needs until vegetation is established
- Need for adequate roof structure; can be challenging on retrofit application
- Extreme weather conditions may inhibit plant survival



Vegetated Roof at SUNY-ESF in Syracuse, NY



Residential vegetated roof in the City of Lancaster; (Source: LiveGREEN)





a) Sedum spurium; b) Sedum "Green Spruce"; (Source: Apex Green Roofs)

Example Design Details:





Figure 3. Example eave detail for sloped roof (courtesy Roofscapes, Inc.)


Figure 4. Example parapet flashing detail (courtesy Roofscapes, Inc.)

Local Project Examples:

1. Onondaga County Correctional Facility

Project Name: Onondaga County Correctional Facility Date Completed: September 15, 2009 Location: Jamesville, NY, USA Building Type: Municipal/Government Type: Extensive, Test/Research Size: 7500 sq.ft. Slope: 2% Access: Inaccessible, Private **Objective:** mitigating stormwater problems Specifics: The greenroof slope of 1/4":12" has a fully adhered Carlisle TPO system and includes a MiraDRAIN G4 drainage composite, 3" of extensive growth media, and seven varieties of Sedum.



(Source: Greenroofs.com)

2. SUNY ESF Green Roof

Project Name: University of Syracuse, Baker Lab (SUNY ESF) Year: 2005 Location: Syracuse, NY, USA Building Type: Educational Type: Extensive Size: 7000 sq.ft. Slope: 1.5% Access: Accessible, Private (Source: Greenroofs.com)



ESF green roof in early summer (Source: http://www.esf.edu/sustainability/action/greenroof.htm)



ESF green roof planting (Source: http://www.esf.edu/sustainability/action/greenroof.htm)

FACT SHEET: Green Street

Green Streets incorporate a wide variety of Green Infrastructure (GI) elements including street trees, porous pavement, rain gardens, water quality devices/inserts, planter boxes and swales. Although the design and appearance of Green Streets will vary, the functional goals are the same: provide source control of stormwater, limit its transport and pollutant conveyance to the collection system, restore predevelopment hydrology to the extent possible, and provide environmentally enhanced roads. Also, other benefits include aesthetics, safety, walkability, and heat island reduction.



Cross section through a green street showing the various components and benefits (Source: Chicago Department of Transportation)

Green Street technologies can be applied to residential, commercial and arterial streets, as well as to alleys. The range of GI technologies that can be incorporated into a Green Street allow its developer to manipulate the stormwater management strategy of a given project.

For specific details on the individual GI technologies (e.g., porous pavement, rain gardens, planter boxes, etc) that can be incorporated into a Green Street, please consult the specific GI fact sheet. For more detailed design guidance, refer to sections 5.3.3 – Vegetated Swale, 5.3.4 – Tree Planting/Tree Pit, 5.3.7 – Rain Gardens, 5.3.9 – Stormwater Planters, 5.3.11 – Porous Pavement, 6.3 – Stormwater Infiltration, 6.4 – Stormwater Filtering Systems, and 6.5 – Open Channel Systems of the New York State Stormwater Management Design Manual, August 2010, as well as the EPA's "A Conceptual Guide to Effective Green Streets Design Solutions – Residential Streets, Commercial Streets, Arterial Streets, and Alleys".

POTENTIAL APPLICATIONS		STORMWATER QUANTITY FUNCTIONS		ADDITIONAL CONSIDERATIONS	
Residential	Yes	Volume	Medium	Medium Capital Cost	
Commercial	Yes	Groundwater Recharge	Medium	Maintenance	Medium/High
Ultra Urban	Yes	Peak Rate	Medium	Winter Performance	High
Industrial	Yes	Erosion Reduction	Medium	Fast Track Potential	Low/Medium
Retrofit	Yes	Flood Protection	Low/Medium	Aesthetics	High
Highway/Road	Yes	STORMWATER QUALITY FUNCTIONS			
Recreational	Yes	Total Suspended Solids High (70-90%)		Total Nitrogen	Medium (40-50%)
Public/Private	Yes	Total Phosphorus Medium (60%)		Temperature	High

Key Design Features

- Porous pavement (street and/or sidewalk)
- Vegetated curb extensions
- Infiltration planters
- Infiltration trenches
- Enhanced tree plantings; native species that are salt and pH tolerant with a porous pavement-friendly seed/fruit (if necessary); species selection should consider shade and/or stormwater capture requirements
- Water quality inlets or filter inserts
- See individual GI fact sheets: Porous Pavement, Infiltration Practices, Rain Garden, Tree Trench and Enhanced Street Trees, and Inlet Filter Inserts

Site Factors

- Slope
- Soils
- Utilities
- Extent of right-of-way
- See site factors for individual GI practices

Maintenance

• See maintenance requirements for individual GI practices

Cost

• \$120-\$190 per linear foot of block managed (i.e. capture of 1" of runoff)

Benefits

- Balance parking spaces with landscape space
- Utilize surface conveyance of stormwater
- Add significant tree canopy
- Provide alternative transportation options/improve walkability
- Increased pedestrian safety, improved aesthetics
- Reduction of urban heat island
- Reduced runoff volume, increased groundwater recharge and evapotranspiration
- Significant public education potential
- Enhanced tree health/longevity

Limitations

- Maintenance needs
- Utility conflicts
- Conflicts with structures and other infrastructure (building foundations, etc)



Rain garden along New York street (Source: NYC Department of Parks and Recreation)



Route 9A, NYC, Source: New York Sustainable Stormwater Management Plan



Infiltration trench retrofit at Gorland Ave in Syracuse, NY

Example Design Details:



Figure 1: Typical stormwater trench under street



Figure 2: Typical stormwater trench under sidewalk







Figure 4: Inlet/outlet for curb extensions



Figure 5: Domed outlet riser structure

Figure 6: Curb cut



Figure 7: Stormwater planter cross-section



Figure 8: Stormwater planter







Figure 10: Channel and grate

Figure 11: Trench grate and frame



Figure 12: Street infiltration trench (section)



Figure 13: Street infiltration trench (plan)

FACT SHEET: Tree Trench and Enhanced Street Trees

Tree trenches perform the same functions that other infiltration practices perform (infiltration, storage, evapotranspiration etc.) but in addition provide an increased tree canopy.

For more detailed design guidance, refer to sections 5.3.3 – Vegetated Swale, 5.3.4 – Tree Planting/Tree Pit, 5.3.9 – Stormwater Planters, 5.3.11 – Porous Pavement, 6.3 – Stormwater Infiltration, and 6.5 – Open Channel Systems of the New York State Stormwater Management Design Manual, August 2010, as well as the City of Syracuse Forestry Standards and Specifications (May 2003), "Tree Space Design – Growing the Tree Out of the Box", and "Up By Roots" by James Urban.



POTENTIAL APPLICATIONS		STORMWATER QUANTITY FUNCTIONS		ADDITIONAL CONSIDERATIONS	
Residential	Yes	Volume Medium		Capital Cost	Medium
Commercial	Yes	Groundwater Recharge	Medium	Maintenance	Medium
Ultra Urban	Yes	Peak Rate	Medium	Winter Performance	High
Industrial	Yes	Erosion Reduction	Medium	Fast Track Potential	High
Retrofit	Yes	Flood Protection	Low/Medium Aesthetics		High
Highway/Road	Yes	STORMWATER QUALITY FUNCTIONS			
Recreational	Yes	Total Suspended Solids	High (70-90%)	6) Total Nitrogen Medi (40-5)	
Public/Private	Yes	Total Phosphorus	Medium (60%)	Temperature	High

Variations

- Structural soil or alternative (eg. Silva Cell) under pavement
- Porous pavement tree grates
- Open vegetated tree trench strip (planted with ground cover or grass)
- Utilize uniformly graded and washed coarse aggregate (NYSDOT No. 3A) or alternate storage media (modular storage units)

Key Design Features

- Flexible in size and infiltration
- Native species that are salt and pH tolerant with a porous pavementfriendly seed/fruit (if necessary); species selection should consider shade and/or stormwater capture requirements
- Quick drawdown; avoid prolonged periods of inundation (either above or below ground); provide underdrain if necessary
- Linear infiltration/storage trench
- Provide 600-1000cf of soil per tree (minimum 2 in/hr permeability); 3ft minimum soil depth
- Adequate tree species selection and spacing; species selection and spacing shall be coordinated with City Arborist; typical spacing is 10-20ft on center
- New inlets, curb cuts, or other means to introduce runoff into the trench

Site Factors

- Overhead clearance; potential utility conflicts; Sight distances
- Adequate space for root zone
- Water table
- Soil permeability/limiting zones

Maintenance

- Water, mulch, treat diseased trees, and remove litter as needed
- Annual inspection for erosion, sediment buildup, vegetative conditions
- Biannual inspection of cleanouts, inlets, outlets, etc.

Cost

- \$850 per tree
- For tree infiltration trench: \$120-\$190 per linear foot of block managed (i.e. capture of 1" of runoff)

Benefits

- Increased canopy cover
- Enhanced site aesthetics
- Air quality and climate benefits
- Runoff reductions; Water quality benefits
- High fast track potential
- Enhanced tree health/longevity

Limitations

- Requires careful selection of tree species
- Requires appropriate root zone area
- Utility conflicts, including overhead electric wires, posts, signs, etc.
- Conflicts with other structures (basements, foundations, etc.)



Tree trench with porous pavers and subsurface infiltration bed, located in City Lot No. 21, Syracuse, NY



Tree trench located at Upper Darby Park outside of Philadelphia, PA



Tree trench in urban setting (Viridian Landscape Studio)

FACT SHEET: Cistern/Rain Barrel

Cisterns and Rain Barrel are structures designed to intercept and store runoff from rooftops to allow for its reuse, reducing runoff volume and overall water quality impairment. Stormwater is contained in the cistern or rain barrel structure and typically reused for irrigation or other water needs. This GI technology reduces potable water needs while also reducing stormwater discharges.

Rain Barrel – rooftop downspouts are directed to an above-ground (typically) structure that collects rainwater and stores it until needed for a specific use, usually landscape irrigation. **Cistern** – Underground (typically) container or tank with a larger storage capacity than a rain barrel, and typically used to supplement greywater needs (i.e. toilet flushing) in a building, as well as irrigation. **Hybrid planter/rain barrel** - combines elements of both planter boxes and rain barrels.

Cisterns and rain barrels can be used in urbanized areas where the need for supplemental onsite irrigation or other high water uses is especially apparent. For more detailed design guidance, refer to



sections 5.3.9 – Stormwater Planters and 5.3.10 – Rain Barrels and Cisterns of the New York State Stormwater Management Design Manual, August 2010.

POTENTIAL APPLICATIONS		STORMWATER QUANTITY FUNCTIONS		ADDITIONAL CONSIDERATIONS	
Residential	Yes	Volume Low/Medium		Capital Cost	Low/Medium
Commercial	Yes	Groundwater Recharge	Low	Maintenance	Medium
Ultra Urban	Yes	Peak Rate	Low	Winter Performance	Medium
Industrial	Yes	Erosion Reduction Low		Fast Track Potential	Medium/High
Retrofit	Yes	Flood Protection Low/Medium		Aesthetics	Low/Medium
Highway/Road	N/A	STORMWATER QUALITY FUNCTIONS			
Recreational	Yes	Total Suspended Solids Medium		Total Nitrogen	Medium
Public/Private	Yes/Yes	Total Phosphorus	Medium	Temperature	Medium

Variations

- Rain barrels
- Cisterns, both underground and above ground
- Tanks
- Storage beneath a surface using manufactured products
- Hybrid planters/rain barrels
- Various sizes, materials, shapes, etc.



Key Design Features

- Size of roof (catchment area)
- First flush bypass
- Water demand
- Rain barrel/cistern capacity
- Small storm events are captured with most structures
- Provide overflow for large storms events
- Discharge water before next storm event
- Consider site rainfall pattern, topography, placing structure upgradient of planting (if applicable) in order to eliminate pumping needs
- For hybrid planters/rain barrels, incorporate open reservoir for runoff storage below planting soil (separated by "false bottom" with weep holes); provide overflow just below soil; line soil bottom with geocomposite drainage mat

Site Factors

- Water table to bedrock depth (must be considered only for subsurface systems)
- Potential hotspots yes with treatment

Maintenance

- Discharge before next storm event
- Cisterns, rain barrels, and downspouts leading to them should be inspected regularly and cleaned
- The seals should be inspected periodically to prevent mosquito infestation
- May require flow bypass valves during the winter

Cost

- Rain Barrels \$100 to \$300
- Cisterns start at \$500

Benefits

- Provides supplemental water supply for irrigation and other nonpotable water use
- Reduces potable water use and the associated costs
- Reduced stormwater runoff impacts including downstream management and treatment system
- In the case of hybrid planters/rain barrels, can improve site aesthetics

Limitations

- Manages only relatively small storm events
- Typically requires additional management of runoff
- Requires a use for the stored water (irrigation, gray water, etc.)





Custom rain barrels in Wilmington, DE



Rain barrels in the City of Lancaster, PA (Source: LiveGREEN)

FACT SHEET: Downspout Disconnection

In urban areas, roof runoff flows through gutters and downspouts and out to the storm or combined sewer. Disconnecting downspouts is the process of separating roof downspouts from the sewer system and redirecting roof runoff onto pervious surfaces. This reduces the amount of directly connected impervious area in a drainage area and also prevents basement flooding due to sewer backup during a storm.

For disconnection to be safe and effective, each downspout must discharge into a suitable receiving area. Roof runoff can be redirected to a garden, yard, planter, filtration/infiltration area, or a rain barrel or cistern for eventual reuse. Runoff must not flow toward building foundations or onto adjacent property.

A plan for downspout disconnection will work with the existing downspouts on a building assuming there is an



adequate receiving area; however, for buildings with internal drainage, disconnecting internal downspouts may be difficult or impractical. For more detailed design guidance, refer to section 5.3.5 – Disconnection of Rooftop Runoff of the New York State Stormwater Management Design Manual, August 2010.

POTENTIAL APPLICATIONS		STORMWATER QUANTITY FUNCTIONS		ADDITIONAL CONSIDERATIONS	
Residential	Yes	Volume	Medium	Medium Capital Cost	
Commercial	Yes	Groundwater Recharge	Medium/High	Maintenance	Low
Ultra Urban	Yes	Peak Rate	Medium	Winter Performance	High
Industrial	Yes	Erosion Reduction	sion Reduction Medium F		Low/Medium
Retrofit	Yes	Flood Protection	Low	Aesthetics	High
Highway/Road	N/A	STORMWATER QUALITY FUNCTIONS			
Recreational	Yes	Total Suspended Solids Medium		Total Nitrogen	N/A
Public/Private	Yes	Total Phosphorus	N/A	Temperature	Medium/High

Variations

- Scuppers
- Drip chains
- Decorative gargoyles
- Various receiving GI technologies: rain garden, infiltration systems, rain barrel, etc.

Decorative Downspouts



(Source: Groovygreen.com)



(Source: Rutlandguttering.com)

Key Design Features

- Install splashblock at the end of the extension to prevent erosion
- Limit the contributing rooftop area to a maximum of 500 sq ft per downspout; larger roof areas up to 2,000 sq ft may be acceptable with level spreader
- Roof runoff must be discharged at least 5 feet away from the nearest property line and 10 feet from the nearest impervious surface
- Maximum contributing flow path length from impervious area shall be 75 feet
- Disconnected downspouts must be extended 4 to 6 feet from a basement foundation wall and at least 2 feet from an at-grade foundation or crawlspace
- Downspouts should not be disconnected: on slopes over 10% (average should be 5%), within 10 feet of a retaining wall, directly over a septic tank, drain field or underground oil tank unless they are no longer in use
- Rooftop runoff may also be directed to on-site depression storage areas

Maintenance

- Check materials for leaks and defects
- Remove accumulated debris, especially from gutters

Cost

 Inexpensive (excluding receiving GI technology); materials are readily available at hardware store

Benefits

- Provides supplemental water supply when used in conjunction with capture/reuse systems such as rain barrel and cistern
- Prevents sewer backup and subsequent basement flooding during storm events
- Related cost savings and environmental benefits
- Reduced runoff volume, CSOs, peak rate, and hence the demand on the sewer system, protecting the quality of rivers, streams and groundwater

Limitations

- Internal drainage more difficult to disconnect
- Do not disconnect onto adjacent property owner
- Need adequate receiving area



Residential downspout disconnect in Portland Oregon (Source: Portland Stormwater Website)



Residential downspout disconnection in Lancaster, PA

Example Design Details:



Figure 1: Installation of downspout disconnection (typical) (Source:www.syracuse.com)



Figure 2: Recommended downspout extension length (Source: homestars.com)

Disconnecting Downspouts

(Source: Environmental Services, City of Portland, Oregon)

A. Measure the existing downspout from the top of the standpipe and mark it at about 9 inches above the standpipe. You may need to cut the downspout higher depending on the length of your extension.

B. Cut the existing downspout with a hacksaw at the mark. Remove the cut piece.

C. Plug or cap the standpipe using an in-pipe test plug or an over-the-pipe cap secured by a hose clamp. Do NOT use concrete to seal your standpipe.

D. Attach the elbow. Be sure to attach the elbow OVER the downspout. Do NOT insert the elbow up inside the downspout or it will leak. If the elbow does not fit over the downspout, use crimpers or needle-nose pliers to crimp the end of the cut downspout so it slides INSIDE the elbow.

E. Measure and cut the downspout extension to the desired length. Attach the extension to the elbow by slipping the extension OVER the end of the elbow. Do NOT install the elbow over the extension or it will leak. The length of the extension will depend on site conditions and where you want the downspout to drain.

- Downspouts must drain at least 6 feet from basement walls and at least 2 feet from crawl spaces and concrete slabs.
- The end of the downspout must be at least 5 feet from your property line, and possibly more if your yard slopes towards your neighbor's house.

F. Secure the pieces with sheet metal screws at each joint where the downspout, elbow, and extension connect. It helps to pre-drill holes for the screws.

G. Using a splash block at the end of the extension is optional, but it will help prevent soil erosion.



Figure 3: Recommended downspout disconnection guidelines (*Source: Environmental Services, City of Portland, Oregon*)



Figure 5: Example of downspout disconnection to rain garden (Source: The City of Gresham, Oregon Website)



Figure 6: Example of downspout disconnection to rain barrel

(Source: Onondaga County, New York <ongov.net>)

FACT SHEET: Inlet Filter Inserts (Catch Basin Inserts)

An Inlet Filter Insert (or Catch Basin Insert) is a device that reduces stormwater pollution from runoff, without requiring any land use. These devices are typically attached to the entrance of, or mounted inside of, a catch basin in order to filter incoming runoff. Though they vary in configuration and size, these devices all generally consist of a filter for low flows and overflow/bypass outlets for high flows. These devices are generally configured to remove pollutants including coarse sediment, oil and grease, litter, and debris. Some filtration devices employ additional absorbent/adsorbent material for removal of toxic pollutants. Pollutants attached to sediment such as phosphorus, nitrates, and metals may be removed from stormwater by effective filtration or settling of suspended solids. Regular maintenance is critical for the continued proper functioning of Catch Basin Inserts.



Figure 1: Hydro-Kleen Filtration System

For design guidance on proprietary water quality inlets, including hydrodynamic systems (gravity and vortex separators), wet vaults, and media filters, refer to section 9.5 – Alternative Stormwater Management Practices – Proprietary Practices of the New York State Stormwater Management Design Manual, August 2010, as well as the following references: "Assessment of Proprietary and Nonproprietary Products for Pretreatment of Larger Discharges" by the Center for Watershed Protection (April 2001) and "Field Study of Catch Basin Inserts for the Removal of Pollutants from Urban Runoff" by Callipo, Graves, Khan, Kostarelos, and Velasquez (June 2010). In addition, for a list of the New York State verified proprietary stormwater management practices for redevelopment projects, see: http://www.dec.ny.gov/chemical/29089.html

POTENTIAL APPLICATIONS		STORMWATER QUANTITY FUNCTIONS		ADDITIONAL CONSIDERATIONS	
Residential	Yes	Volume None		Capital Cost	Varies
Commercial	Yes	Groundwater Recharge	None	Maintenance	Varies
Ultra Urban	Yes	Peak Rate	None	Winter Performance	High
Industrial	Yes	Erosion Reduction	None	ne Fast Track Potential	
Retrofit	N/A	Flood Protection None		Aesthetics	Low
Highway/Road	N/A	STORMWATER QUALITY FUNCTIONS			
Recreational	N/A	Total Suspended Solids	S Varies Total Nitrogen Var		Varies (20%)
Public/Private	N/A	Total Phosphorus	Varies (50%)	Temperature	None

Variations

- Various types, configurations, and sizes
- Absorbent pouches
- Acceptable products include, but are not limited to: Ultra Urban Filter, FloGard Plus, Hydro-Kleen, and the Siltsack (only where the collection of sediment is required)

Key Design Features

- Insert shall have an "initial" filtering bypass and an "ultimate" high flow bypass feature
- Follow manufacturer's guidelines and sizing considerations (many manufacturers will determine the most appropriate device type and size to meet project needs)
- Located below ground, as part of the stormwater conveyance system or pretreatment for other BMPs
- Storage capacity shall be 80% of maximum solids collection prior to impeding filtering bypass

Site Factors

- High sediment loads
- Trees (high potential for leaf litter)

Maintenance

- Follow the manufacturer's guidelines for maintenance taking into account expected sediment and pollutant load and site conditions
- Inspect each water quality device at least twice per year and after all major storm events if possible
- For areas with high leaf volumes, inserts should be inspected once every 2 weeks during the fall, as leaf litter can affect the operation of the insert

Cost

- Varies widely according to manufacture, type, and size of water quality devices
- Annual maintenance costs range from \$600-650 per insert

Benefits

- Can be used in a variety of applications including retrofitting existing stormwater systems
- Provides important pretreatment for other GI technologies
- Relatively easy to maintain

Limitations

- Virtually no water quantity benefits
- Typically require frequent maintenance
- Snow accumulation complicates inspection and maintenance of the inserts



Filtration insert with debris in St. Clair Shores, MI. Source: Environmental Consulting & Technology, Inc



FloGard Plus by KriStar



Ultra Urban Filter

Appendix F



Common Rain Garden/Bioretention Plant Species: ORNAMENTAL GRASSES

Andropogon species (Bluestem, BroomSedge)





Bouteloua curtipendula (Sideoats Grama)



Calamagrostis species (BlueJoint Grass)



Chasmanthium latifolium (Northern Sea Oats)



Eragrostis spectablis (Purple Love Grass)









Common Rain Garden/Bioretention Plant Species: ORNAMENTAL GRASSES

Festuca species (Fescue)



Juncus effusus (Soft Rush)



Panicum virgatum var. (Switchgrass)





Schizachyrium scoparium (Little Bluestem)



Sporobolus heterolepis (Prairie Dropseed)





Common Rain Garden/Bioretention Plant Species: FERNS

Athryium felix-femina (Lady Fern)



Dryopteris marginalis (Eastern Wood Fern)



Osmunda cinnamomea (Cinnamon Fern)



Osmunda regalis (Royal Fern)



Polystichum acrostichoides (Christmas Fern)





Common Rain Garden/Bioretention Plant Species: GROUNDCOVERS

Carex spp. (Sedges)









Pachysandra procumbens (Allegheny Spurge)



Phlox species (Phlox)





Rhus aromatica (Fragrant Sumac)



Delosperma nubigenum (Yellow Ice Plant) **



Hypericum species (Hypericum/St. John's Wort)



** Please note these species are not native plants and are only used in stormwater designs that are characterized by harsh planting environments. They should be planted in areas that are contained and where they are not likely to spread into the adjacent landscape.





Common Rain Garden/Bioretention Plant Species: PERENNIALS

spring	summer	fall	late fall/winter
Achillea species (Yarrow)			
FOLTAGE		FLOWER	
Asclepias species (Swamp Mill	kweed/Butterfly Weed)		
FOLIAGE		FLOWER	NO PHOTO AVAILABLE
Aster species (Asters)			

IAG





Echinacea purpurea (Purple Coneflower)









Common Rain Garden/Bioretention Plant Species: PERENNIALS

FLOWER



Heuchera species (Coral Bell)





Common Rain Garden/Bioretention Plant Species: PERENNIALS

spring	summer	fall	late fall/winter
Iris versicolor (Blue Flag Iris)	FLOWER	NO PHOTO AVAIL	ABLE
Liatris spicata (Blazing Star)	e jooj taagor huter		
POLIAGE	FLOWER		
Lobelia species (Cardinal Flov	ver/Great Blue Lobelia)		
FOLACE		NO PHO	TO AVAILABLE
Penstemon digitalis (Foxglove	Beardtongue)		
			大学学家问题









Common Rain Garden/Bioretention Plant Species: PERENNIALS

spring	summer	fall	late fall/winter
Physostegia virginiana (Obedie	ent Plant)		

FOLIAGE





Polygonatum biflorum (Solomon's Seal)



Rudbeckia species (Black-Eyed Susan)



Solidago species (Goldenrod)







Common Weed Species to Look For and REMOVE !

Weed species vary from site to site, depending on surrounding conditions, existing weed seeds, and other factors. Below are some of the common weeds that may be encountered. A good rule of thumb is that anything with "prickers" (thorns) is likely a weed!

Bird's Food Trefoil



Crabgrass





Crown Vetch





Dandelion



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Foxtail







Nutsedge



Common Weed Species to Look For and REMOVE !

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Phragmites



Quack Grass



Ragweed



Additional Weed Identification Resources:

Book - "Weeds of the Northeast"

Internet - www.garden.org/weedlibrary

Sweet Clover



Thistle







Wild Parsnip





Common Rain Garden/Bioretention Plant Species: ORNAMENTAL BULBS

spring

summer

Allium cernum (Nodding Onion)



Allium senescens (Ornamental Onion)



Narcissus var. (Daffodills)

