

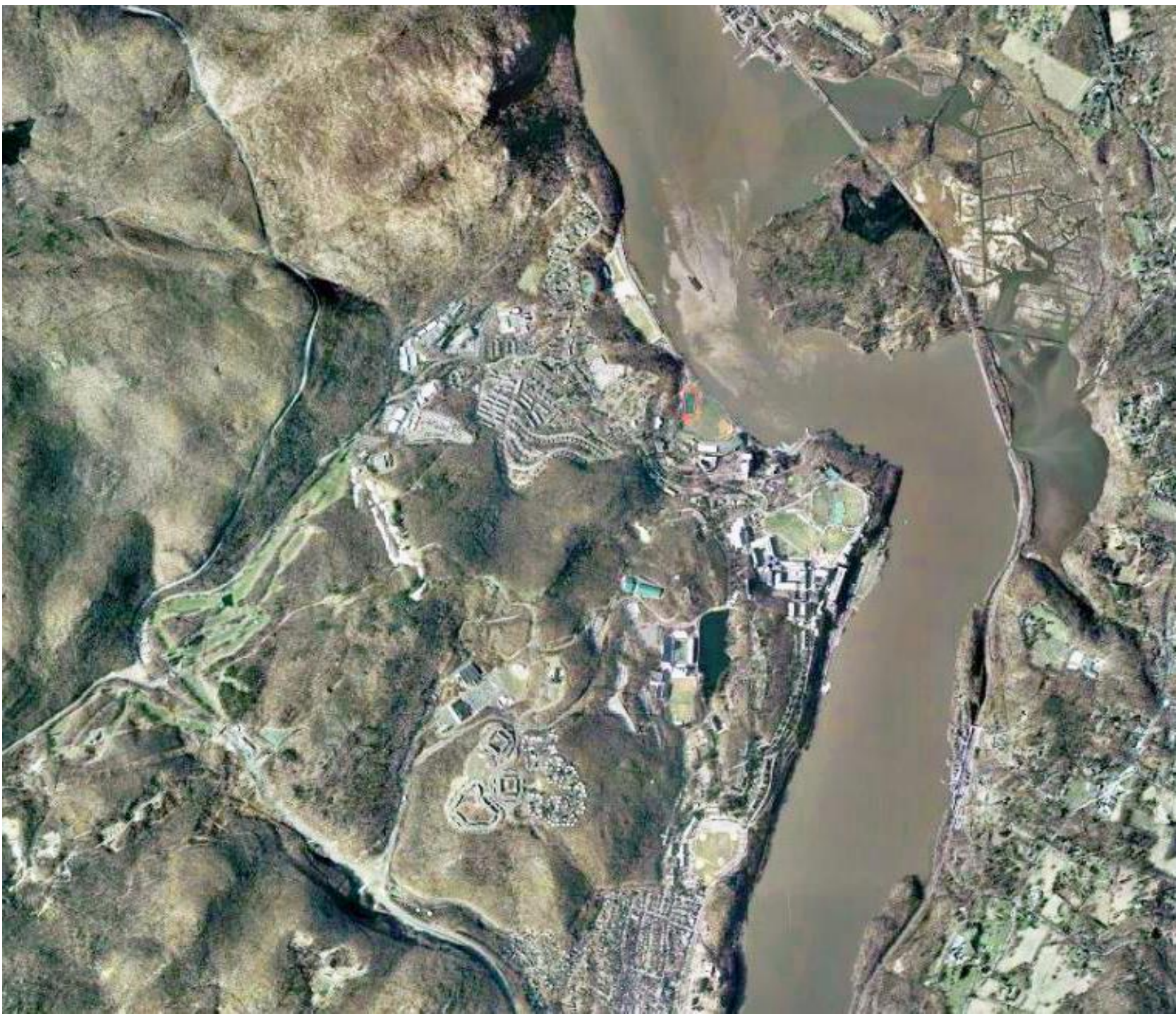


Low Impact Development Stormwater Management Plan

***North Country Tradeshow and Conference
Glens Falls, NY***

Presentation Overview

- I. Project Background
- II. Stormwater Management Plan (SWMP) Objectives
- III. Challenges, Opportunities and Regulatory Context
- IV. SWMP Development Process
- V. Low Impact Development (LID) Concept Plans
- VI. Implementation Schedule































SWMP Objectives

- Incorporate a landscaped approach into campus-wide stormwater management
- Reduce stormwater-related impacts on existing drainage network
- Demonstrate the feasibility and benefits of green stormwater management systems through site-specific investigations
- Engage those who live, study and work on campus in the development of concept designs
- Develop planning process that can be replicated at other federally operated properties and educational campuses

The result, a 20-year stormwater management plan that includes LID concept plans for West Point's Cantonment Area.



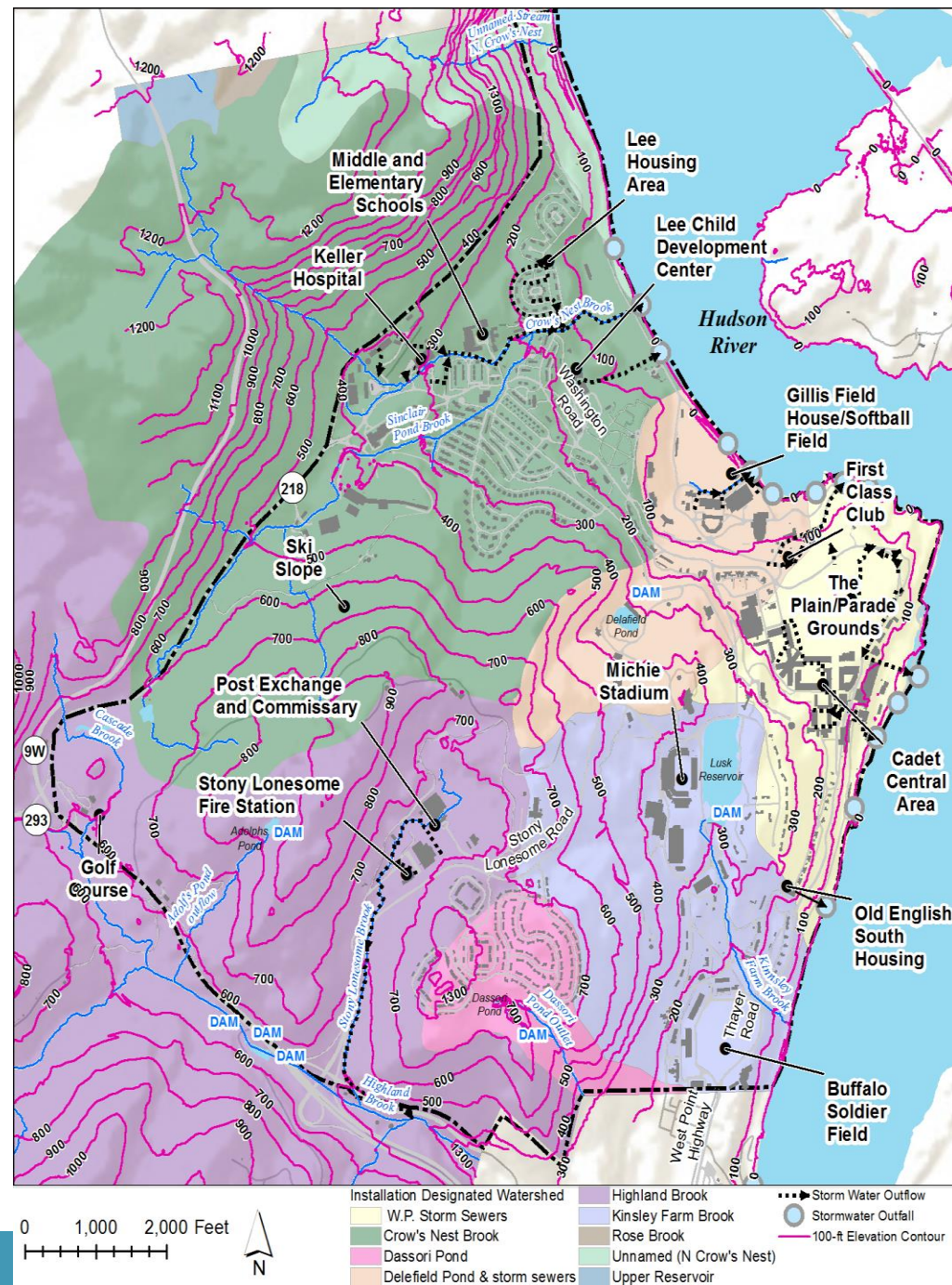
Stormwater-Related Issues at West Point

- Impacts on treatment plant and pumping station during large storm events
- Existing capacity issues within sewer system
- Erosion along surface drainage corridors depositing debris at existing outfalls



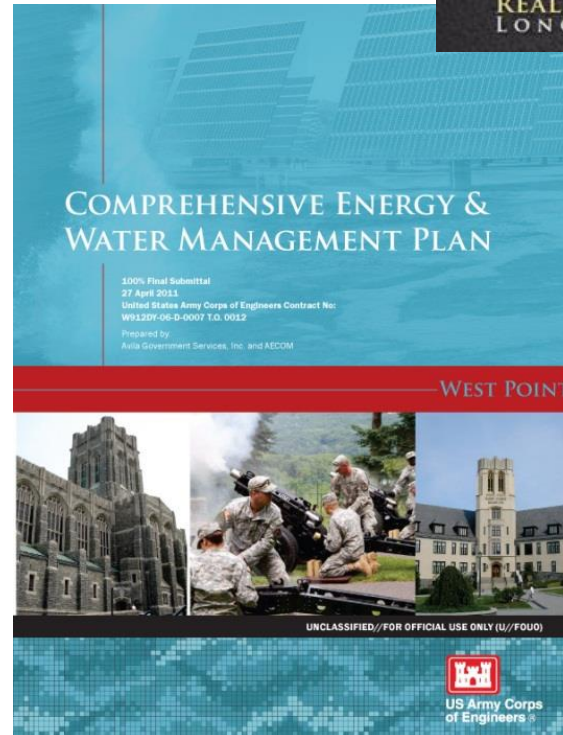
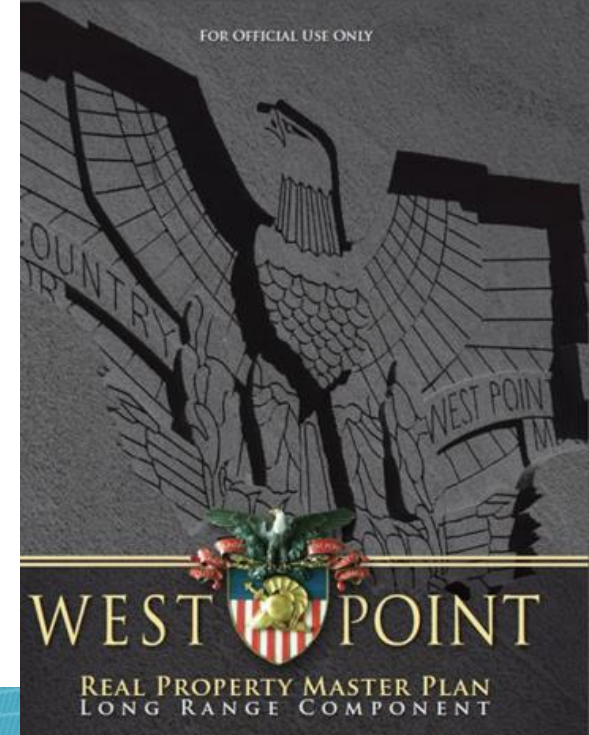
Stormwater Management Challenges

- Mix of dense urban development and natural areas
- Shallow bedrock
- Significant slopes
- Widespread historic resources
- Intense rainfall events and cold weather climate
- Old infrastructure with limited data on existing system



Stormwater Management Opportunities

- Master planning and redevelopment initiatives
- Existing USAG sustainability and “net zero” policies
- Academic partners onsite
- Leveraging of different funding streams



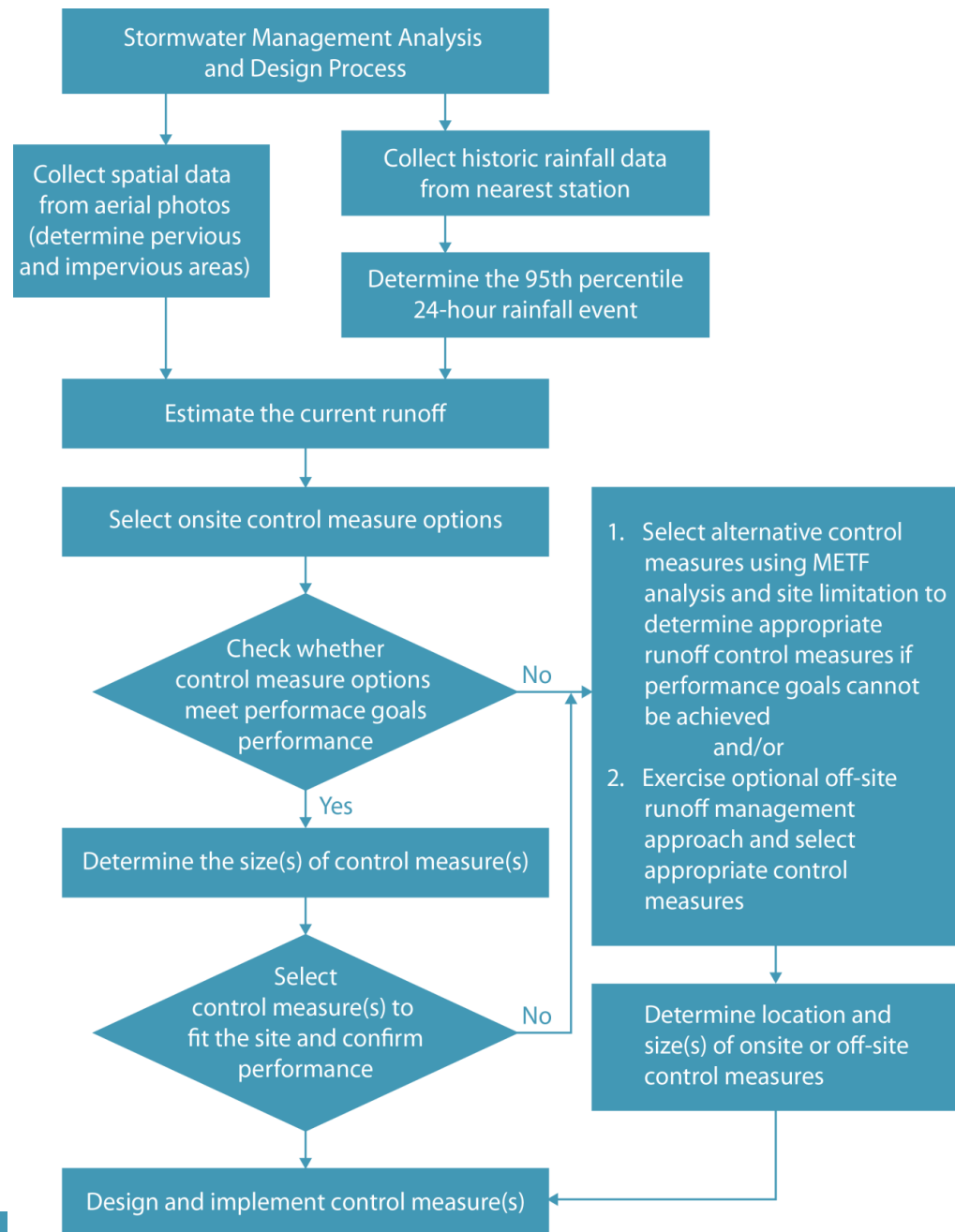
Regulatory Context

Requirements

- AR 200-1 Environmental Protection & Enhancement
- Energy Independence & Security Act (EISA)
 - “...any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall...maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology...”

Policy and Guidance

- Army Sustainable Design Policy Update
- DOD United Facilities Criteria for LID
- Army LID Technical User Guide



SWMP Development Process

Kick-Off Meeting

Data Collection and Review

- Review of Existing Reports
- Identification of SWMP Focus Areas
- Initial Site Visits



Charrette & Design Forum Meeting



Draft SWMP Development

- Additional Site Visits
- Existing/Future Conditions Technical Memo
- LID Opportunities & Technologies Identification

LID Concept Plan Development

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Lee Housing

Observed Features and Conditions:

- Location is generally on top of hill
- Discharges to Crow's Nest Brook with some street drains piped directly
- Roof drains connected on exterior
- Houses that are close together but interspersed with open spaces throughout that appear to be unutilized
- Potential for rooftop disconnection with rain gardens in street or alleyways
- LID opportunities may be limited due to mature trees
- Street seem to have 6-8% slopes throughout
- Potential for "street-edge" approach throughout housing area



Figure 1: Aerial Map of Site



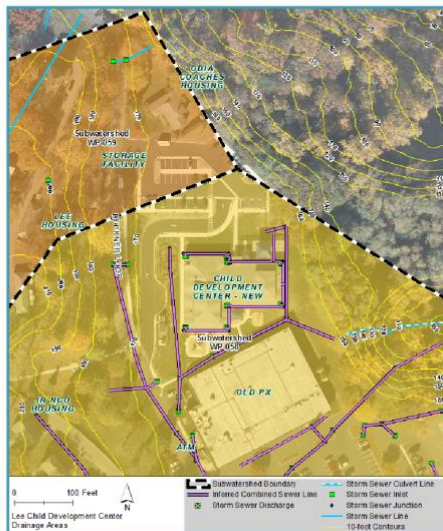
Photograph 1:
View of Crow's
Nest Brook
adjacent to Lee
Housing



Photograph 2:
View of Crow's
Nest Brook
adjacent to Lee
Road



Photograph 3:
View of Crow's
Nest Brook
adjacent to Lee
Housing



Final SWMP Submittal

Sites Visited

1. Outfall No. 1 (Anderson Rugby Field)
2. Outfall No. 2 (Target Hill Athletic Fields)
3. Outfall No. 5 (Gillis Field House)
4. Outfall No. 7 (North Dock)
5. Outfall No. 8
6. Highland Falls Outfall (Route 9, off campus)
7. Lee Housing Area
8. Gray Ghost Housing Area
9. Old/New Brick Housing Area
10. Stony Lonesome Housing
11. Keller Hospital
12. US Military Academy (USMA) Prep school
13. "Firsties" Club
14. Lee Child Development Center Rain Gardens
15. Stony Lonesome Child Development Center
16. PX and Commissary Parking Lot
17. Stony Fire Station or Fire Station #2
18. Cadet Central Area/Thayer Walk
19. Flirtation Walk
20. Trophy Point
21. Central Power Plant
22. The Plains/Parade Grounds
23. Dassori Pond
24. Lusk Reservoir
25. Kinsley Farm Brook
26. Crow's Nest Brook at various locations
27. Delafield Pond
28. Fort Putnam
29. Anderson Rugby Field
30. Target Hill Athletic Fields
31. Gillis Field House
32. Foley Athletic Center
33. Michie Stadium (parking lots)
34. Stony Lonesome Road (between Michie Stadium and Washington Road)



Results from Site Visits

Site Selection Matrix

<div>● : Strongly Agree</div> <div>◐ : Possibly Agree</div> <div>○ : Disagree</div>																																		
Potential Sites	Outfall No. 1 at Anderson Rugby Field	Outfall No. 2 at Target Hill Athletic Center	Outfall No. 5 at Gillis Field House and Softball Fields	Outfall No. 7 at North Dock	Outfall No. 8 at Flirtation Walk	Highland Falls Outfall at McDonald's outside Thayer Gate	Anderson Rugby Field	Target Hill Athletic Center	Gillis Field House	Lee Housing	Grey Ghost Housing	Old/New Brick Housing	Stony Lonesome Housing	Keller Hospital	USMA Preparatory School	First Class Club	Lee Child Development Center Rain Garden	Stony Lonesome Child Development Center	PX and Commissary	Stony Fire Station or Fire Station No. 2	Washington Hall Courtyard	Thayer Walk	Flirtation Walk	Trophy Point	Central Power Plant	The Plains/Parade Grounds	Dassori Pond	Kinsley Farm Brook and Lusk Reservoir	Delafield Pond	Foley Athletic Center	Lee and Sherman Barracks	Michie Stadium Parking Lots	Stony Lonesome Road at Lusk Reservoir	
Reduction of Impacts on Existing Infrastructure and conveyances is possible	○	○	○	○	○	○	○	○	●	●	●	●	◐	◐	◐	●	●	○	◐	◐	●	●	○	◐	◐	●	●	○	◐	◐	●	●	◐	
Campus Enhancement is Possible	○	○	○	◐	◐	○	○	○	●	●	●	●	◐	●	◐	●	●	◐	●	◐	●	●	●	○	○	●	○	○	○	○	○	●	◐	◐
Area is Visibly Predominant within West Point Campus	○	○	◐	◐	◐	○	●	●	●	●	●	●	◐	●	◐	●	◐	○	●	◐	●	●	◐	●	◐	●	◐	●	○	◐	◐	●	●	
Area, Soils, Slope appear to be acceptable for Green Infrastructure Practices	○	○	○	○	○	○	◐	◐	●	●	●	●	●	●	◐	◐	◐	●	●	●	●	◐	●	●	○	●	◐	◐	◐	◐	●	●	◐	◐
Site Issues are within the Scope of the Project	○	○	○	○	○	○	◐	●	●	●	●	●	●	●	◐	●	●	●	●	●	●	●	◐	●	●	◐	●	◐	○	●	●	●	●	●



SWMP Development Process

Kick-Off Meeting

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Charrette & Design Forum Meeting



Draft SWMP Development

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- Street seems to have 6-8% slopes throughout
- Potential for "street-edge" approach throughout housing area



Figure 1: Aerial Map of Site



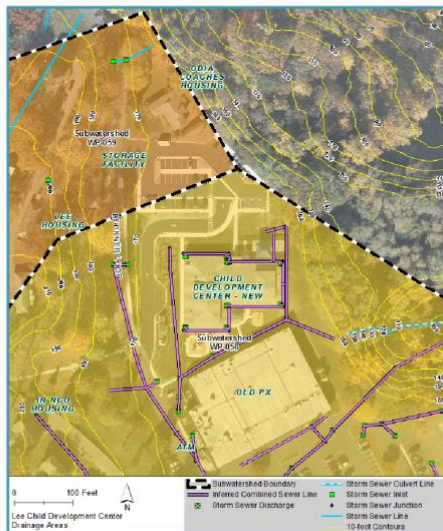
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Road



Photograph 3:
View of Crow's
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Housing



Final SWMP Submittal

Charrette Participants

West Point

- Department of Public Works (DPW)
- Master Planning
- Environmental
- Engineering
- Cultural Affairs
- Operations and Maintenance
- Business Operations and Integration Division (BOID)
- Housing
- US Military Academy (USMA)
- Morale, Welfare and Recreation (MWR)
- Office of the Directorate of Intercollegiate Athletics (ODIA)
- Association of Graduates (AOG)
- US Corps of Cadets (USCC)

U.S. Army Corps of Engineers

Fort Worth District
ERDC-CERL

Consultant Team

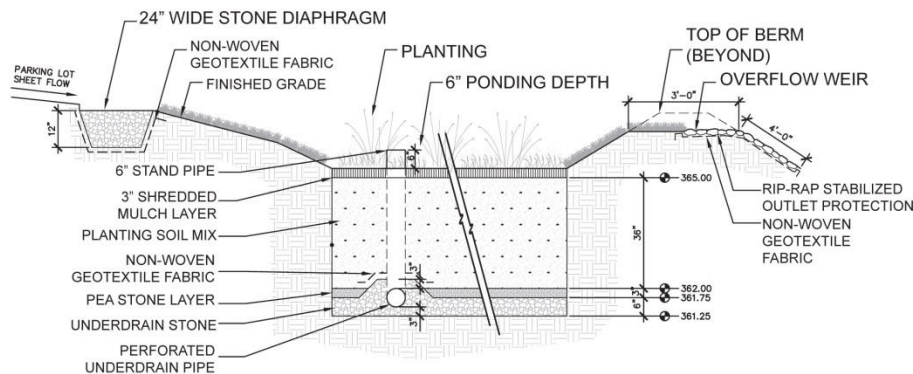
HDR
The LA Group



Bioretention



Photograph - Bioretention cells at Ithaca College capture and treat runoff from parking lots



Typical Cross Section

WHAT IS BIORETENTION?

- Landscaped depressions that are designed to capture and filter stormwater from roofs, pavement and other impervious surfaces
- Stormwater is filtered through layers of mulch, soil and plant roots within the bioretention system
- Filtered, treated stormwater is then infiltrated into the ground recharging groundwater, or, if infiltration is not appropriate, discharged into a traditional stormwater drainage system

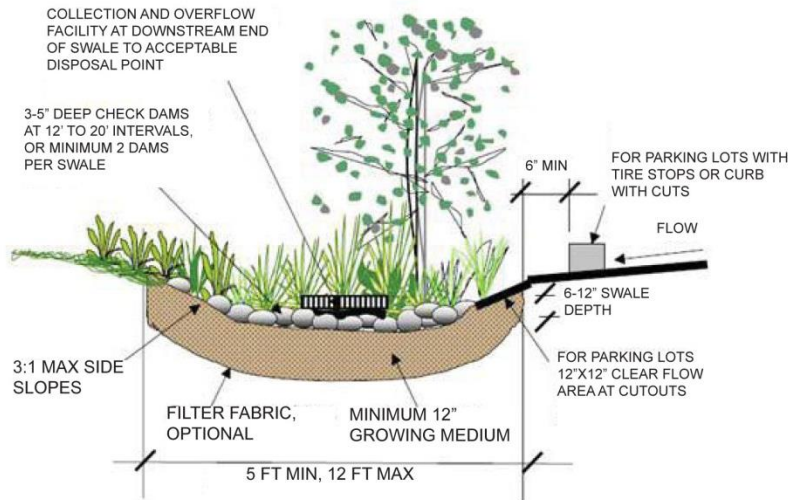
BENEFITS OF USING BIORETENTION:

- Reduces stormwater runoff volume, flow rate and temperature
- Increases groundwater infiltration and groundwater recharge
- Provides a cost-effective way of treating stormwater
- Improves the quality of local surface waterways
- Enhances visual appeal of a site
- Provides wildlife habitat
- Reduces soil erosion

Vegetated Swale



Photographs - Examples of vegetated swales



Typical Cross Section

WHAT IS A VEGETATED SWALE?

- Turf or maintained vegetation in a linear depression designed to convey stormwater from one point to another at a low velocity
- Alternative to underground conveyance systems
- Linear, landscaped depressions are designed to capture and filter stormwater from roofs, pavement and other impervious surfaces
- Filtered, treated stormwater is then infiltrated into the ground recharging groundwater, or, if infiltration is not appropriate, discharged into a traditional stormwater drainage system

BENEFITS OF USING VEGETATED SWALES:

- Increases the "flow time" of runoff when compared to paved channels or pipes
- Reduces the cost of construction when compared to standard practices, such as paved gutters, structures and pipes
- Impacts on existing infrastructure will be reduced
- Provides opportunities for treatment of stormwater through infiltration and groundwater recharge
- Enhances visual appeal of a site

LID Limitations

In General:

- Requires space and flat to moderate slopes
- Deep, well drained soils are preferable to promote infiltration and groundwater recharge
- Green Infrastructure practices are generally not as effective in larger storm events
- Modifications are required in cold climate regions for some systems such as;
 - Disconnection of residential level cisterns in winter months
 - Upsizing of under drains to prevent freezing
 - Sanding of porous pavements will cause clogging



LID Limitations

Additional maintenance is required for some systems such as:



- Periodic debris and sediment removal for infiltration practices such as rain gardens, vegetated swales and bioretention
- Plant replacement if required
- Initial watering and fertilizing to better establish plant material in areas such as green roofs and planters.
- Sweeping and vacuuming of porous pavements to prevent clogging
- Inspection of systems on a regular basis



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- Potential for rooftop disconnection with rain gardens in street or alleyways
- Significant paving throughout due to sidewalks, streets and alleyways
- LID opportunities may be limited due to mature trees
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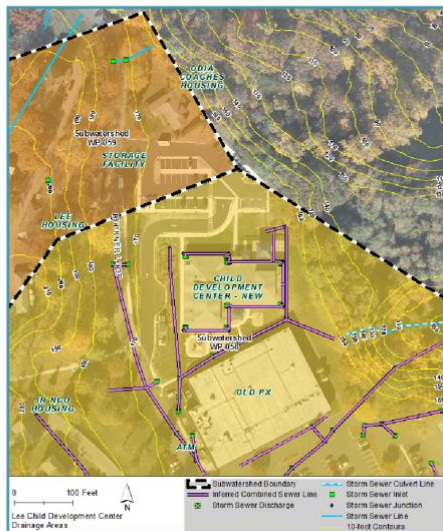
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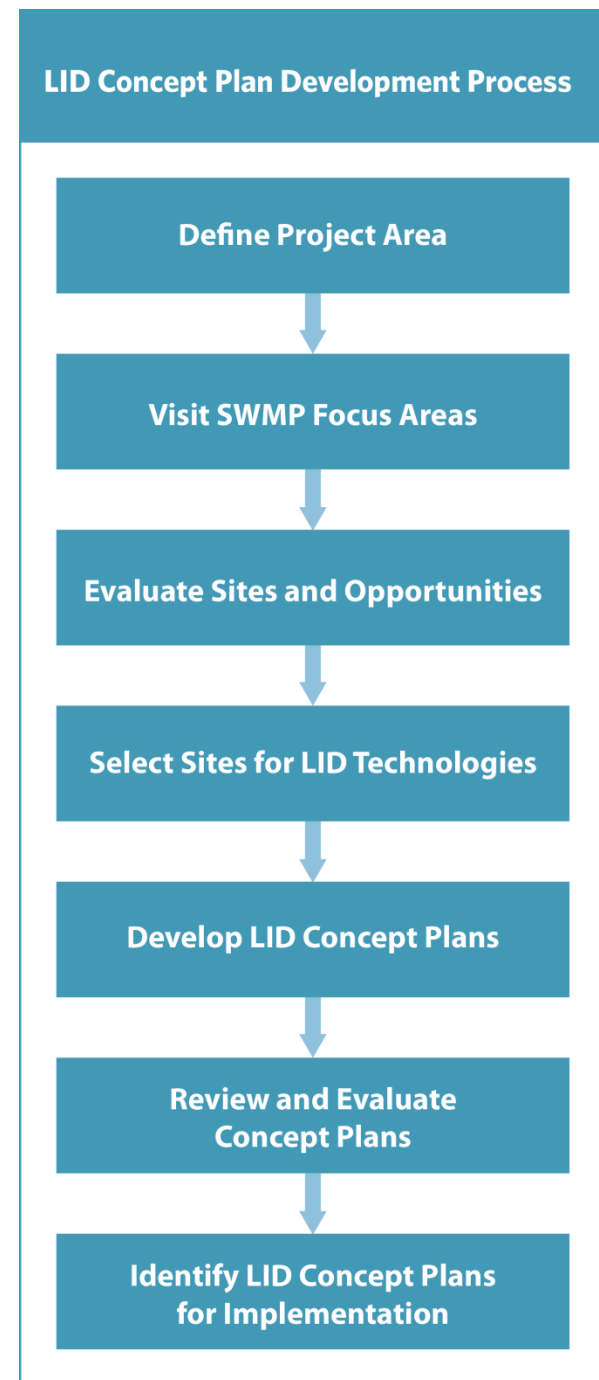
Photograph 3:
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Final SWMP Submittal

LID Concept Plan Development Process

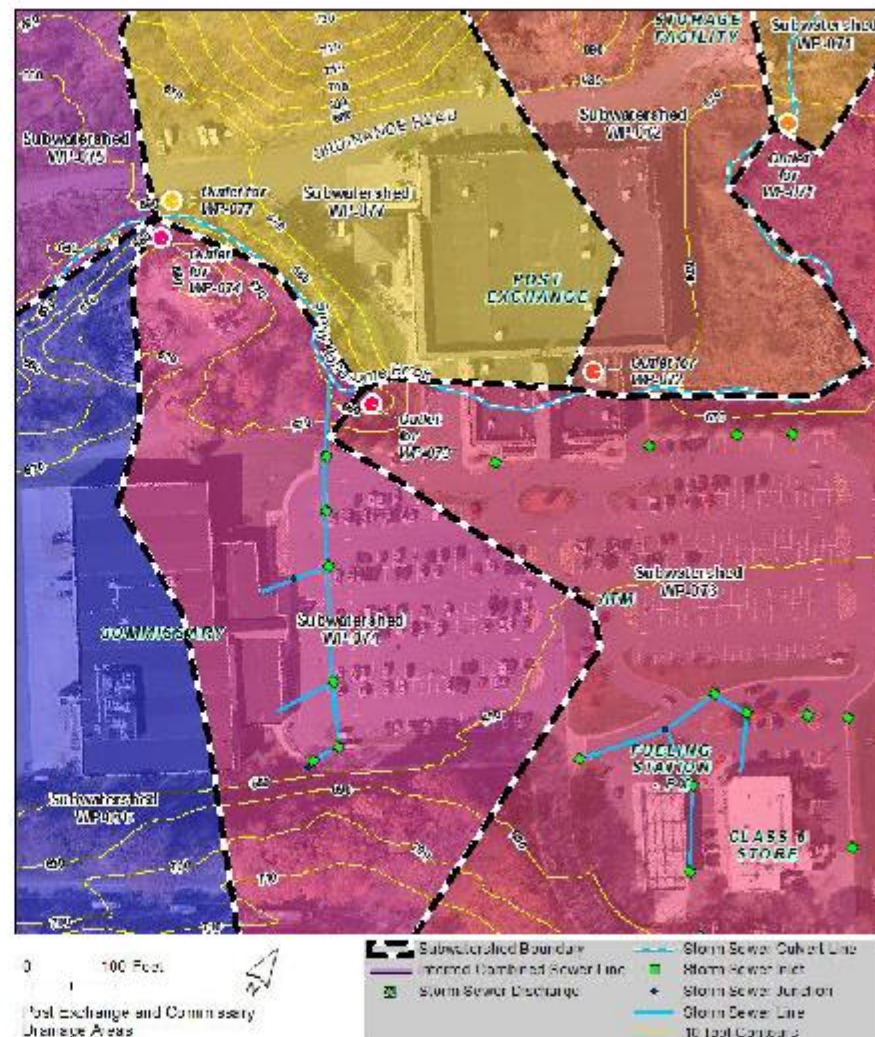
- Multi-step process to complete visual site investigations and engage stakeholders
- Site selection criteria applied including:
 - Reduction of impacts on existing infrastructure and drainage is possible
 - Campus enhancement is possible
 - Area is visibly predominant within the West Point Campus
 - Area, soils, and slope appropriate for green infrastructure
 - Site issues are within the project scope
- Additional considerations for phased implementation applied
 - Schedule for redevelopment
 - Performance based on Army LID Planning Tool
 - Costs



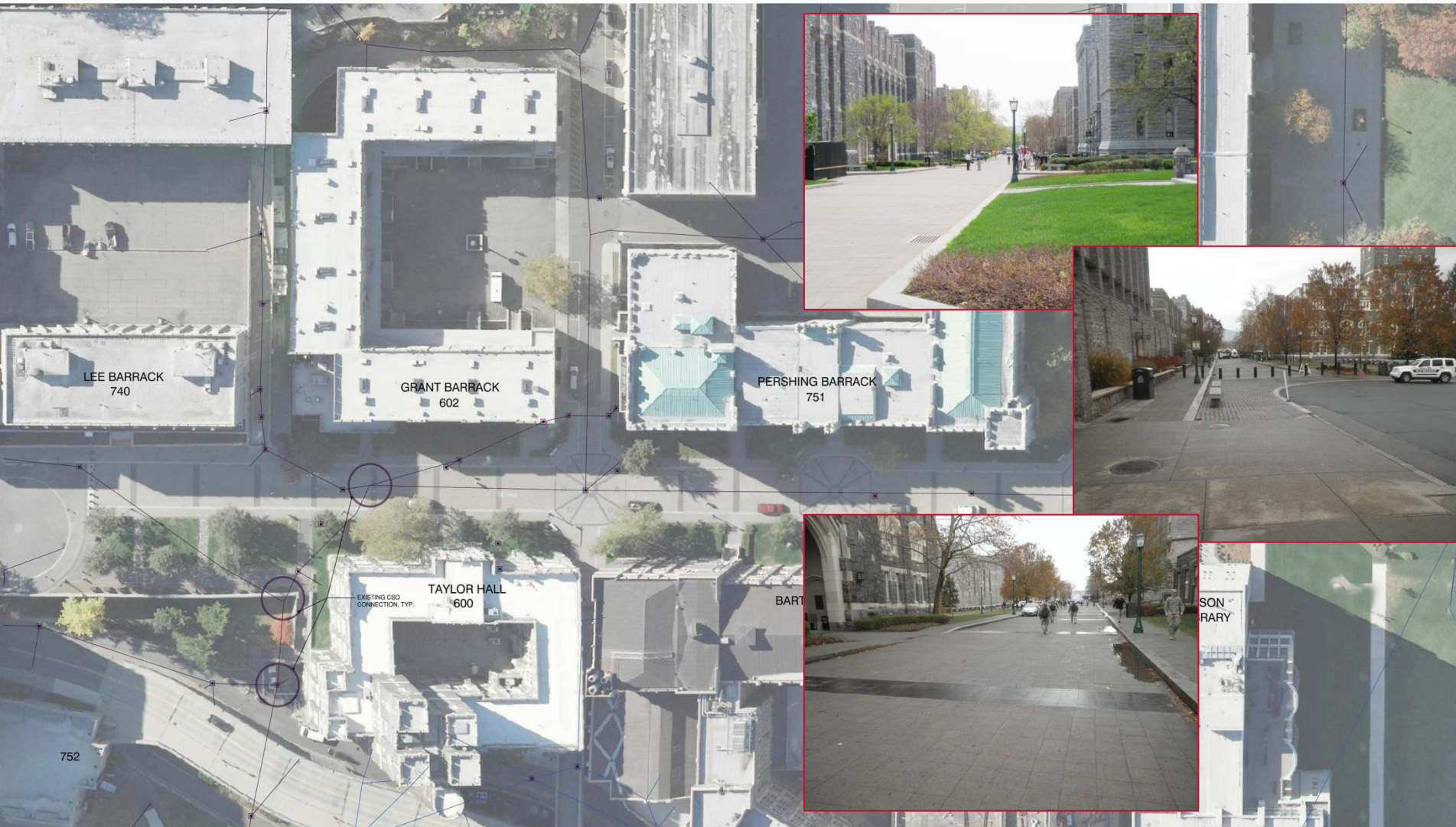
LID Concept Plans

Approach

- ✓ Identified LID opportunities and constraints
- ✓ Held Charrette and Design Forum Meeting
- ✓ Completed conceptual hydrologic analyses for each site
- ✓ Applied LIMITED existing subsurface conditions information
- ✓ Reviewed future development plans
- ✓ Developed 10 LID Concept plans



Existing Site Plan: Thayer Walk



Low Impact Development Storm Water Management Plan

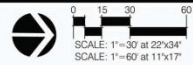
United States Army Garrison at West Point, NY



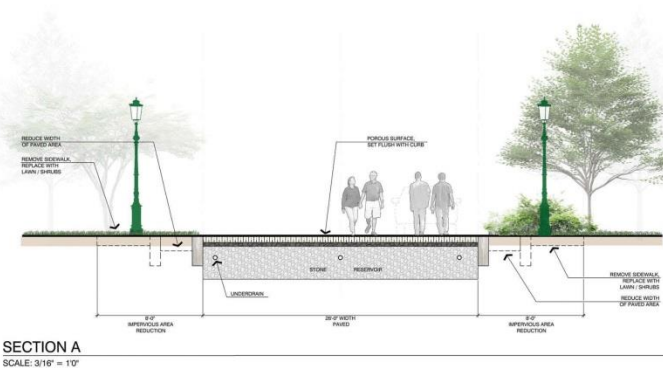
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SITE PLAN: THAYER WALK (A)

April, 2014



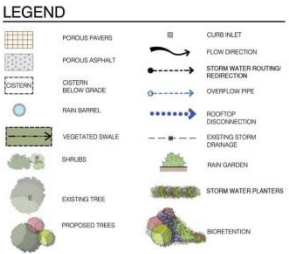
LID Concept Plan: Thayer Walk (Cadet Experience & Campus Visibility)



SECTION A
SCALE: 3/16" = 1'

CONCEPTUAL L.I.D. STORM WATER IMPROVEMENTS

- A** **POROUS PAVERS:** UTILIZE POROUS PAVERS TO ALLOW INFILTRATION AND REDUCE IMPERVIOUS AREA. ANOTHER OPTION IS TO UTILIZE POROUS PAVERS AT THE EDGES ONLY (3' STRIP EACH SIDE) AND USE CONVENTIONAL PAVING IN THE MIDDLE THAT DRAINS TO THE POROUS EDGES.
- B** **STORM WATER PLANTERS:** DISCONNECT EXISTING DOWNSPOUTS FROM SUBSURFACE PIPE AND DISCHARGE TO CURBED PLANTER FOR TREATMENT AND VOLUME REDUCTION.
- C** **CISTERN:** WHERE POSSIBLE, DIVERT STORM WATER PIPE TO UNDERGROUND CISTERN FOR RE-USE AS WATER FOR IRRIGATION ALONG THAYER WALK. REMOVES COMBINED SEWER FLOW.
- D** **CISTERN:** WHERE POSSIBLE, DIVERT STORM WATER PIPE TO UNDERGROUND CISTERN FOR RE-USE AS WATER FOR IRRIGATION ALONG THE PLAIN AND ATHLETIC FIELDS. REMOVES COMBINED SEWER FLOW.
- E** **PAVEMENT REDUCTION:** REDUCE WIDTH OF THAYER WALK AND REPLACE WITH TREES, LAWN AND SHRUBS.
- F** **INTERPRETIVE SIGNAGE:** USE SIGNAGE TO EXPLAIN BENEFITS OF L.I.D. PRACTICES AND HOW THEY FUNCTION. TAKE ADVANTAGE OF HIGH VISIBILITY.
- G** **REMOVE FLOW CONTRIBUTING TO CSO:** REMOVE STORM WATER FLOW DRAINING TO INFERRED COMBINED SEWER BY REDIRECTING DRAINAGE PIPES TO UNDERGROUND CISTERNS.



Existing Site Plan: PX & Commissary



Low Impact Development Storm Water Management Plan

United States Army Garrison at West Point, NY



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SITE PLAN: PX & COMMISSARY

April, 2014



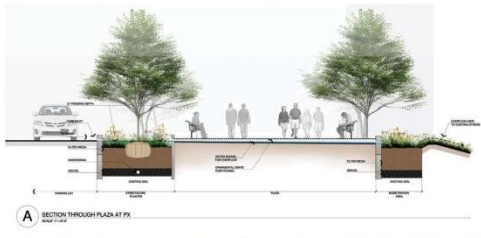
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SCALE: 1"=80' at 11"x17"



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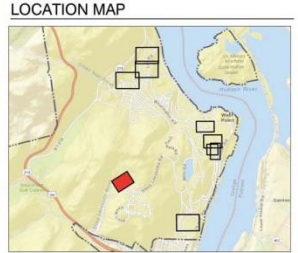
LID Concept Plan: PX & Commissary (High Stormwater Benefit)



LEGEND

	POROUS PAVERS		CURB INLET
	POROUS ASPHALT		FLOW DIRECTION
	CISTERN BELOW GRADE		STORM WATER ROUTING
	RAIN BARREL		OVERFLOW PIPE
	VEGETATED SWALE		ROOFTOP DISCONNECTION
	SHRUBS		EXISTING STORM DRAINAGE
	EXISTING TREE		RAIN GARDEN
	PROPOSED TREES		STORM WATER PLANTERS
			BIORETENTION

- CONCEPTUAL L.I.D. STORM WATER IMPROVEMENTS**
- A** BIORETENTION AREA: CAPTURE FLOW FROM ADJACENT PAVED AREAS FOR TREATMENT AND VOLUME REDUCTION. ADDED AESTHETIC BENEFIT.
 - B** POROUS ASPHALT: ALLOWS RUNOFF THAT WOULD NOT REACH BIORETENTION AREAS TO INFILTRATE.
 - C** CISTERN / WATER RE-USE: WHERE POSSIBLE, DIVERT STORM WATER PIPE TO UNDERGROUND CISTERN. USE AS IRRIGATION FOR GREEN ROOF AND OTHER PLANTED AREAS.
 - D** POROUS PAVEMENT: UTILIZE IN PEDESTRIAN PLAZAS AND WALKS TO ALLOW INFILTRATION AND REDUCE IMPERVIOUS COVER.
 - E** STREETSCAPE PLANTER: BIORETENTION CELLS COLLECT RUNOFF FROM PARKING AREA. CHANNELS THROUGH PEDESTRIAN PLAZA, DIVERT OVERFLOW TO SECONDARY BIORETENTION AREA.
 - F** GREEN ROOF: UTILIZE ON POTENTIAL NEW BUILDING TO REDUCE IMPERVIOUS AREA AND REDUCE FUTURE POTABLE WATER DEMAND.
 - G** PLANT TREES: INCORPORATE PLANTED ISLANDS WITH TREES FOR IMPERVIOUS AREA REDUCTION, AND AESTHETIC BENEFIT.
 - H** FLOW DISSIPATION: INCORPORATE NATURAL PONDING AREAS WITH STONE / BOULDER CHECK DAMS TO REDUCE FLOW RATES.



Existing Site Plan: Buffalo Soldier Field



Low Impact Development Storm Water Management Plan

SITE PLAN: BUFFALO SOLDIER FIELD

LID Concept Plan: Buffalo Soldier Field (High CSO Benefit & Campus Visibility)

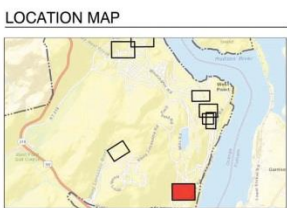


LEGEND

	POROUS PAVEMENT		CURB INLET
	POROUS ASPHALT		FLOW DIRECTION
	CISTERN		STORM WATER ROUTING
	VEGETATED SWALE		RECONNECTION
	SHRUBS		OVERFLOW PIPE
	EXISTING TREE		ROOF TOP DISCONNECTION
	PROPOSED TREES		EXISTING STORM DRAINAGE
			RAIN GARDEN
			STORM WATER PLANTERS
			BIORETENTION

CONCEPTUAL L.I.D. STORM WATER IMPROVEMENTS

- A** BIORETENTION AREA: REDIRECT STORM WATER RUNOFF FROM ROADS AND PARKING AREAS TO BIORETENTION AREAS FOR TREATMENT AND VOLUME REDUCTION.
- B** STORM WATER PLANTERS: COLLECTS RUNOFF FROM ADJACENT ROOFTOPS, PROVIDES FILTRATION AND VOLUME REDUCTION. PLANTERS CAN BE FORMED WITH SHORT WALLS AND CURBS.
- C** POROUS ASPHALT: UTILIZE IN MEDIAN TO ALLOW INFILTRATION AND REDUCE IMPERVIOUS AREA.
- D** CISTERN: WHERE POSSIBLE, DIVERT STORM WATER, PIPE TO UNDERGROUND CISTERN FOR RE-USE AS IRRIGATION FOR BUFFALO SOLDIER FIELD. REMOVES COMBINED SEWER FLOW.
- E** PLANT TREES: RESTRUCTURE PARKING AND VEHICULAR CIRCULATION. PLANT TREES FOR ADDITIONAL STORM WATER BENEFITS.
- F** STREETSCAPE PLANTERS: COLLECT RUNOFF FROM STREETSCAPE IN BIORETENTION CELLS FOR TREATMENT AND VOLUME REDUCTION.
- G** REMOVE FLOW CONTRIBUTING TO CSO: REMOVE STORM WATER FLOW DRAINING TO INFERRED COMBINED SEWER BY REDIRECTING DRAINAGE PIPES TO CISTERN AT BUFFALO SOLDIER FIELD.
- H** REINFORCED TURF: TO SUPPORT EVENT PARKING AND MAINTAIN SOIL INFILTRATION CAPACITY.



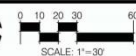
Low Impact Development Storm Water Management Plan

SITE PLAN: BUFFALO SOLDIER FIELD

Existing Site Plan: First Class Club



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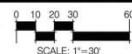
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LID Concept Plan: First Class Club (Cadet Experience & Campus Visibility)



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Planning Level Performance

Assumptions

- For bioretention, an underdrain is assumed unless specified differently.
- Evapotranspiration and depression storage is not accounted for.
- It is assumed that entire media pore space subsurface is available for the design storm.
- Drainage area to LID practice if not specified is assumed to be large enough to produce enough volume in response to design storm that can fill up retention space.
- For green roof and porous pavement, the drainage area to LID footprint is assumed to be 1:1.
- Minimum of: runoff volume generated in the drainage area; volume that can be retained in the LID practice; and stormwater volume that can infiltrate in 24 hours given the native soil hydrological conditions, is claimed as retained volume.
- Volume diverted to cistern from other LID practices is assumed to be 100% retained.
- No retention credit is taken for tree planters.



Planning Level Performance

Approach

- ✓ Used the Army's LID Planning Tool, a simplified tool to calculate the retained volume based on major soil category, and rainfall
- ✓ Managed runoff based on dimensions and high level features of LID technologies
- ✓ 95% percentile rainfall equals 1.76" based on 65-year rainfall record (June 1948 – Aug 2013)

ARMY LID PLANNING TOOL

Page 2 of 2

PLANNING ESTIMATES for LID BEST MANAGEMENT PRACTICES

RID RETENTION

ESTIMATED RUNOFF RETENTION CAPACITY (cubic feet) = 3474

SWALL

ESTIMATED RUNOFF RETENTION CAPACITY (cubic feet) = 0

PERFORATED DRAINAGE

ESTIMATED RUNOFF RETENTION CAPACITY (cubic feet) = 7400

RAINWATER HARVESTING

ESTIMATED RUNOFF RETENTION CAPACITY (cubic feet) = 5007

GRASS ROOT

ESTIMATED RUNOFF RETENTION VOLUME (cubic feet) = 1950

INFILTRATION PRACTICE

ESTIMATED RUNOFF RETENTION VOLUME (cubic feet) = 0



US Army Corps
of Engineers



Low Impact Development Storm Water Management Plan



the LA group
Landscape Architecture
and Engineering, P.C.



April 15, 2014

Page 11

Planning Level Opinion of Probable Construction Costs Estimate

Approach

- ✓ Used RS Means (Q1 2014) productivities, crews, labor resources, and construction equipment resources
- ✓ Direct costs includes labor, labor burden and fringes, materials , and construction equipment
- ✓ Included recommended contingency of 20% reflected in direct cost
- ✓ Indirect cost include Contractor's Field GC, Mob, & Demob (8%); Sales tax on material and construction equipment (8.125%); Home office overhead and profit (15%); and Bond and builder's Risk insurance (1.5%) all compounded
- ✓ Did not include and escalation to mid-point
- ✓ Did not included design or project owner soft costs
- ✓ A detailed Basis of Estimates defining in detail the scope of work for each area is available to support the estimate



Evaluation Criteria for LID Concept Plans

In addition to cost and volume managed,

- CSO Benefit
- Load/Gallons Removed from WWTP
- Storm Water Drainage Benefit
- Campus Visibility
- Impact to Cadet Life
- Linkages with Other Funding Sources
- Future Development Plans Onsite



Evaluation Matrix for LID Concept Plans

See handout.

Evaluation Matrix for LID Concept Plans												
LID Concept Plans		Evaluation Criteria										
LID Concept Plan #	LID Concept Plan Site	CSO Benefit (Yes = 3; Potentially = 2; No = 1) Weighting = TBD	Load/Gallons Removed from WWTP (High = 3; Medium = 2; Low = 1) Weighting = TBD	Storm Water Drainage Benefit (Yes = 3; Potentially = 2; No = 1) Weighting = TBD	Campus Visibility (High = 3; Medium = 2; Low = 1) Weighting = TBD	Impact to Cadet Life (High = 3; Medium = 2; Low = 1) Weighting = TBD	Linkages with Other Funding Sources (Yes = 3; Potentially = 2; No = 1) Weighting = TBD	Future Development Plans Onsite (Large Scale = 3; Small Scale = 2; None = 1) Weighting = TBD	Total Score	Direct Costs (\$) <i>Includes 20% contingency; indirect costs could increase costs by approx. 30%</i>	Estimated Performance (gallons) <i>Conservative estimate based on ARMY LID Planning Tool</i>	Cost per Gallon Managed (\$/gallon) <i>Does not include value of co- benefits e.g., aesthetic improvements</i>
1	First Class Club								0	\$ 764,097	27,655	\$ 27.63
2	Buffalo Soldier Field								0	\$ 1,562,604	100,852	\$ 15.49
3	Thayer Walk A								0	\$ 1,114,173	113,599	\$ 9.81
4	Thayer Walk B								0	\$ 1,148,535	113,811	\$ 10.09
5	Central Area								0	\$ 1,642,672	128,747	\$ 12.76
6	The Plain/Parade Grounds								0	\$ 2,170,655	79,285	\$ 27.38
7	Keller Hospital - School								0	\$ 1,065,265	68,190	\$ 15.62
8	Lee Housing A								0	\$ 1,113,096	58,650	\$ 18.98
9	Lee Housing B								0	\$ 904,242	48,339	\$ 18.71
10	PX/ Commissary								0	\$ 2,779,752	156,243	\$ 17.79



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Low Impact Development Storm Water Management Plan



the LA group
Landscape Architecture
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LID Concept Plan Performance

LID Concept Plan #	LID Concept Plan Site	Average Annual Stormwater Captured (Million Gallons)
1	Buffalo Soldier Field	4.88
2	Thayer Walk A	2.53
3	Thayer Walk B	2.47
4	Central Area	3.00
5	The Plain/Parade Grounds	3.17
6	First Class Club	1.14
7	Keller Hospital and Schools	3.12
8	Lee Housing A	2.60
9	Lee Housing B	2.01
10	PX/ Commissary	4.79

SWMP Implementation Schedule

Short-term (1-5 years)

- Complete and Construct 100% Design for First Class Club LID
- Incorporate Keller Hospital and Elementary School LID Concept Plan into Expansion and Reconstruction Designs
- Advance Buffalo Soldier Field LID Concept Plan to 60 and 100% Design
- Advance Curb Cut Pilot Project to 20, 60 and 100% Design
- Develop LID Technology Application for DPW Staff
- Develop Educational and Stakeholder Involvement Programs
- Complete Traffic Utilization Study

Medium-term (5-10 years)

- Develop Green Street Plan for Implementation throughout Cantonment Area
- Incorporate Central Area LID Concept Plan into New Barracks Construction and Courtyard Reconstruction Designs
- Work with RCI to Implement LID Concept Plans in Housing Areas
- Complete Detailed Analyses for Stormwater Facility Retrofits
- Review and Update Pollution Prevention BMPs Inspection Checklists
- Develop O&M Guidance for LID Technologies
- Implement Data Standards and Repository
- Implement Downspout Disconnection Inventory

Long-term (10-20 years)

- Advance PX and Commissary LID Concept Plan to 60 and 100% Design
- Advance Thayer Walk LID Concept Plan to 60 and 100% Design
- Advance The Plain/Parade Grounds LID Concept Plan to 60 and 100% Design
- Complete Comprehensive Sewer Line Identification Survey and Mapping

Conclusions

- Net zero policies driving sustainability on campus
- Stormwater management issues are extensively studied; however, sewer data needed
- LID practices identified at each site offer varying degrees of flexibility with regards to their implementation.
- Full design of LID Concept Plans requires additional field investigations
- Lower costs per gallon managed anticipated with LID as part of redevelopment projects
- Other LID implementation strategies emphasize academic partnerships and leveraging of various funding streams



Questions?

