Stormwater Design Case Study: Village of Greenwood Lake, NY

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Principles of Low Impact Development:

- Preserve the environmentally sensitive areas
- Create buffers to these sensitive areas
- Limit the amount of clearing & grading
- Reduce the amount of impervious surface
- Integrate stormwater treatment into the design, using green infrastructure whenever practical

Design requirements* include:

- Drainage area size
- Amount of impervious surface
- Soil permeability
- Proper slope to move the water
- Design areas to accommodate quantity of runoff
- Address water quality
- Make sure design enhances the site as well as addresses stormwater requirements
- A landscaping plan, with an emphasis on native plants

* *Per NYSDEC Stormwater Design Manual*

Water quality benefits of trees:

- Reduce the volume & velocity of stormwater runoff
- Take up nutrients
- Filter pollutants
- Promote evapotranspiration
- Stabilize banks
- Provide shade & thermal reduction
- Encourage wildlife habitat
- Discourage geese (!)

Black Tupelo – Nyssa sylvatica

Design Challenges

New Construction:

- Preserve natural site features
- Avoid sensitive areas
- Meet regulatory requirements for size & layout, while meeting clients' needs
- Accommodate stormwater - runoff reduction, & addressing water quantity/quality requirements
- Incorporate *green infrastructure* practices
- Create an attractive and functional landscape

Design Challenges

Green gutter, Village of Greenwood Lake

Retrofits:

- Space is often limited
- Compacted soils
- Site features may restrict options (steep slopes, rock, buildings, water/gas/sewer lines, wells, water bodies – to name a few)

Village of Greenwood Lake

- Small Village – Population about 3,100 (2010 Census)
- Area = 2.5 square miles
- MS4 – Municipal Separate Storm Sewer System
  Priority Watershed

We started small....

Planting a River Birch on Arbor Day with elementary school class.
Funded through a NYSDEC Urban & Community Forestry grant.

Helen Kelly Field – new basketball courts, gravel diaphragm & wet swale

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Overgrown, weed-infested vacant lot owned by the village.

Regrade site, clean swale, plant grass & tree

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Village parking lot before retrofit

Village park after restoration – pavement removed, planted with White Spruce, River Birch and Red Maples.

Riparian Buffer Project

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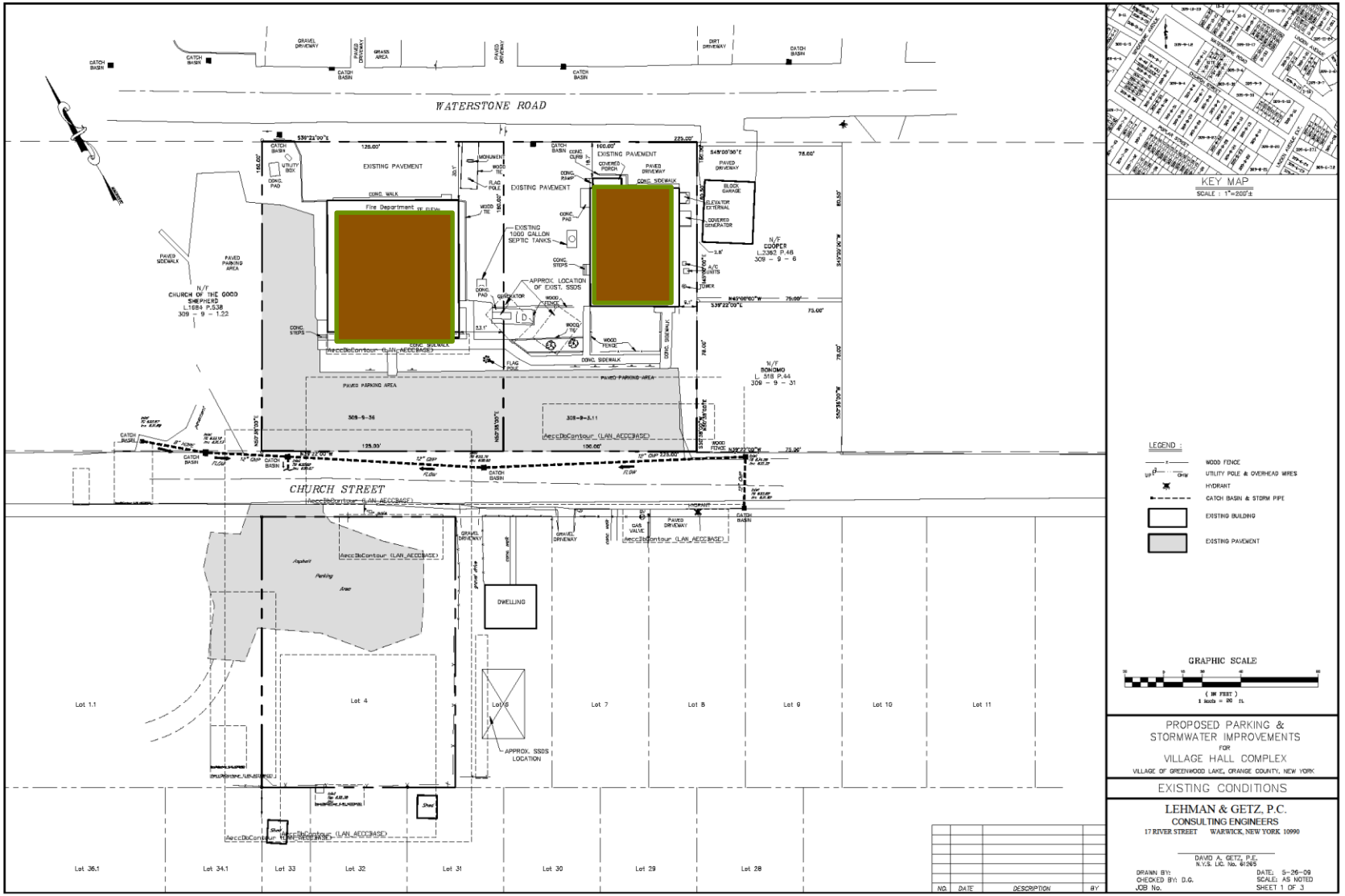
Greenwood Lake Village Hall Complex



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Greenwood Lake Village Hall – March 2009

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Greenwood Lake Police Station/Courthouse - 2009

Parking lot across from Greenwood Lake Village Hall – March 2009

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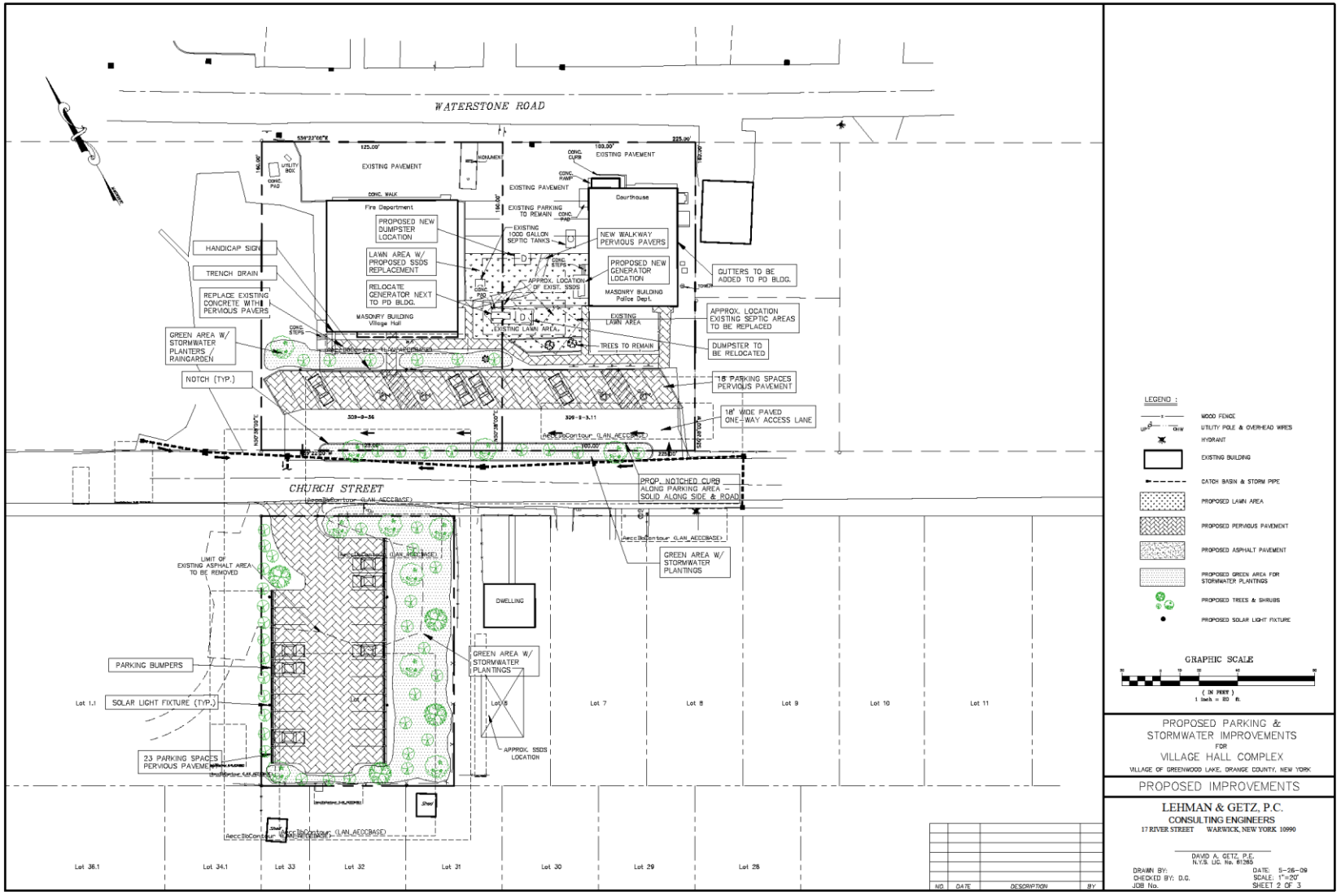
Municipal parking lot

GWL Village Hall Conceptual Design



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Funded through the Federal ARRA Stimulus program & NYS Environmental Facilities Corp. GIGP Program

Rain garden with River Birch, Mardi Gras Daisies & Northern Bayberry.
Joe Pye Weed & Shenandoah Switch Grass along building. Pervious paver walk and parking spaces.

Landscape Design: Karen Arent, LA

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Vegetated swale with Swamp White Oak, GroLo Sumac, Northern Bayberry

Vegetated swale – NY Asters, Gro Lo Sumac, Swamp White Oak

Landscape Design: Karen Arent, LA

Green Screen trellis – native honeysuckle

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New Village Green

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Landscape design: Karen Arent, LA

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View from Village Hall across to the new parking lot

Landscape design: Karen Arent, LA

Village Green at completion

Small Retrofit Project in Wah Tah Wah Park

Private property above Greenwood Lake

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Channel flow into pipe & into Greenwood Lake

Terre Kleen unit – Inclined plate hydrodynamic settler

Funding provided by NYSDEC Water Quality Improvement Grant Program

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Discharge from Terre Kleen unit to the rip rap-lined drainage swale

Rip rap drainage channel to a perforated pipe, to a catch basin with stormwater filters & then discharged to Greenwood Lake.

Greenwood Lake Commuter & Library Parking Lot

Commuter Lot from Jersey Avenue, bus shelter on the left

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Greenwood Lake Library & Commuter Lot Design Goals:

- *Reduce the amount of impervious surface*
- *Capture stormwater runoff and infiltrate it into the ground wherever possible*
- *Provide water quality treatment through a variety of stormwater practices*
- *Provide a safe and handicap-accessible entrance to the library*
- *Create a functional landscape that is also attractive*

Library & Commuter Lot – Red Maples, Bayberry & St. John's Wort

Landscape design: Karen Arent, LA

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Pervious paver parking spaces, bioretention area with Swamp White Oak & Winterberry. Perimeter of parking lot lined with Red Maple, Eastern Redbud & American Hornbeam.

Landscape Design: Karen Arent, LA

Pervious paver parking lot lined with Shenandoah Switchgrass and Winterberry.

Landscape Design: Karen Arent, ASLA

Serviceberries, Red Maples, Northern Bayberry, Switchgrass, St. John's Wort

Landscape design: Karen Arent, LA

Serviceberry & ‘Sunburst’ St. Johnswort in bioretention area.

Landscape Design: Karen Arent, LA

Northern Bayberry shrubs, Serviceberries, Gro Lo Sumac & St. John's Wort

Bioretention area adjacent to pervious paver sidewalk

Landscape Design: Karen Arent, LA

Rain Garden with Serviceberry and ‘Good Vibration’ Junipers

Landscape Design: Karen Arent, LA

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Rain garden with Serviceberry & Northern Bayberry.

Landscape Design: Karen Arent, LA

Before

After

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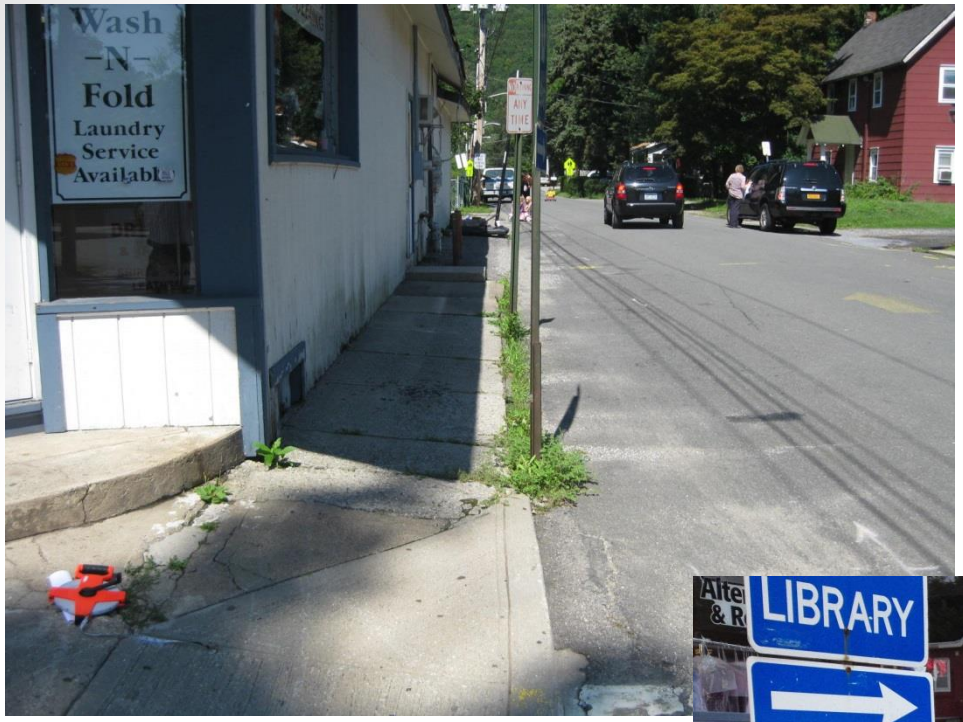

Before

After

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Before

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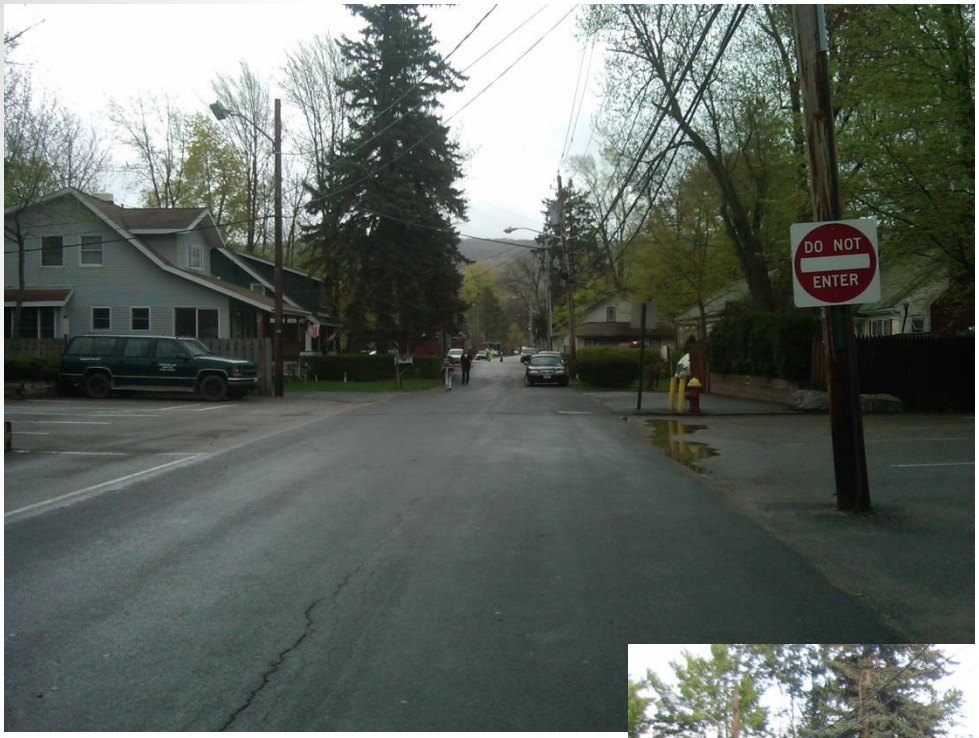

Before

After

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Before

After

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Lessons learned:

- Rain garden conditions are drier than we expected.
- Water plantings well the first year to help establish root systems, even in rain gardens and along riparian buffers.
- Recommend notched curbing for landscape features, when appropriate.
- Aim for continuity in plant material throughout the site.
- Specify trees and plants that can tolerate the conditions they will encounter (wet/dry extremes, road salt, wind, deer browse, sun/shade).
- There is a wide variety of native plants available for stormwater practices – use the landscape design as an opportunity to diversify a municipality's plant species.
- Keep maintenance in mind when planning the landscaping – snow removal & stockpiling, pruning frequency, weeding, etc.
- In summary, invest in the services of a landscape architect – her/his knowledge & experience will pay off in an attractive, cohesive design with plants suited to their environment.

Thank you!

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