Final Grant Report

"Building Municipal Resilience and Climate Adaptation through Low Impact Development"

Respectfully Submitted: December 7, 2017

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Northwest Hills Council of Governments

NHCOG — Northwest Hills — Council of Governments

CIRCA Connecticut Institute for Resilience and Climate Adaptation

Northwest Conservation District

This report is made possible by a grant from the Connecticut Institute for Resilience and Climate Adaptation.

"The mission of the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) is to increase the resilience and sustainability of vulnerable communities along Connecticut's coast and inland waterways to the growing impacts of climate change on the natural, built, and human environment."

More information about CIRCA can be found at circa.uconn.edu

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A. INTRODUCTION

The Northwest Hills Council of Governments respectfully submits this final report for the project titled “Building Municipal Resilience and Climate Adaptation through Low Impact Development”.

As climatic cycles begin to shift, flooding, erosion, and sedimentation are serious and growing concerns for Northwest Connecticut towns. Increased severity of storms, increased rates of precipitation, and warmer temperatures will require new approaches to traditional infrastructure practices. Since rural communities traditionally have less infrastructure, the most efficient approaches will require less ‘pipe-to-pond’ techniques and more nature-based approaches such as Low-Impact Development (LID). In fact, the Connecticut Climate Preparedness Plan features LID as a key adaptive measure for numerous climate impacts.

Since the implementation of LID is a slight departure from traditional precipitation management techniques, this project addresses several components needed to implement such a technique. Development decisions, in Connecticut, occur at the state and the municipal level depending on the size and the location of the project. However, since the local planning and zoning commissions have jurisdiction over the specifications of each new project, the municipal scale offers the most leverage for implementing an infrastructure-focused technique.

To that end, this project included a regulatory review, community education events, a Low Impact Sustainable Design Manual, and assistance to the planning and zoning commission of the town of Morris. We hope that the outreach efforts, the new manual, and the expertise within the Northwest Conservation District will help not only the town of Morris, but the surrounding towns as well, as they face the impacts of climate change.

B. EXECUTIVE SUMMARY

Over the past year, the Northwest Conservation District, supported by the Northwest Hills Council of Governments staff, coordinated the creation of a Low impact Sustainable Development Design (LISD) Manual. The manual, designed for the Planning & Zoning Commission of the town of Morris and drafted by Trinkaus Engineering, LLC, describes the need for the LID approach, engineering specifications for successful systems, and sample enforcement tools.

Low-impact development (LID), alternatively Low-impact Sustainable Development (LISD), is a development mind-set that prioritizes minimally invasive design, construction, and site operation. It especially focuses on on-site precipitation management by reducing runoff quantity, quality, and velocity with a goal of reducing negative impacts to receiving waters. On-site management strategies include reduction in impervious services, installation of infiltration systems, and zone-specific standards. This philosophy departs from long-standing traditions focused on maximum parking, box-building construction, and rapid water removal from a site.

By creating a municipal-scale manual, this project targets the scale at which parcel-by-parcel land use decisions are made. It can be tailored to each municipality's unique water sources and historic development patterns. The municipal focus allows regulatory review to reduce decision-making conflicts and increase the chances of success. This project serves as a manual for municipal-wide implementation of LID.

Trinkaus Engineering, LLC, in cooperation with Morris' town planner, Tom McGowan, reviewed the municipal planning and zoning regulations, town ordinances, and inland wetlands and watercourses regulations for changes needed to implement the manual. While the manual contains the majority of the LID strategy, the municipal regulations and ordinances will require changes to definitions, impervious surface coverage allowances, and approval procedures to implement the manual completely.

Additionally, Northwest Conservation District worked with several regional stakeholders including members of the 'design/build' community, land use commission members, and environmental conservation groups to increase their familiarity with LID techniques and the manual's contents.

C. PROJECT BACKGROUND AND CONTEXT

The Northwest Hills Council of Governments (NHCOG) working in partnership with the Northwest Conservation District (NCD) and the town of Morris utilized grant funding from CIRCA to create and adopt a Low Impact Development (LID) Design Manual. This Design Manual was developed as a model for stormwater management for other small towns in Connecticut. The proposal for this model LID Design Manual received unanimous approval from the 21 towns of the NHCOG at their meeting on October 8, 2015. Both the Morris Planning and Zoning Commission and the Inland Wetlands and Watercourses Commission provided letters of support for NCD to assist them with pursuing regulation changes that require low impact stormwater management strategies for permanent land use change proposals.

While Connecticut does have a DEEP Stormwater Manual with an LID Appendix, this general document does not contain the actual site specific "how to" guidance needed by engineers and designers to apply LID in the field. The completed LID Design Manual provides actual specifications, BMP selection, site specific sizing calculations etc. based on the type of pollutant removal needed and characteristics of each site. Several Connecticut cities and larger towns have used their financial resources to develop their own LID Design Manuals. Typically, this is a very difficult financial burden for a small town. Creating a model manual allows other towns a more complete product that can be modified as needed to accommodate local land use regulations.

Although small towns do not typically experience repeated large-scale development, any development in a small town has a significant impact on the surrounding environment since most small towns in Connecticut are blessed with ample natural resources. Stormwater run-off may not be of the same scale as in urban areas; however, its impacts may be more devastating. LID techniques are simple and affordable, offering significant short and long-term returns for small investment.

Furthermore, local commissions make the majority of land use decisions in Connecticut. This manual, integrated into municipal ordinances and regulations, will directly affect regulated projects in the town of Morris.

NCD has been working with the Town of Morris to build the foundation needed to adopt a LID Design Manual, and successfully incorporate it into their land use regulations. The work accomplished to date includes: land use commission and land use staff LID trainings; installation of demonstration LID projects; LID workshops for the local design and engineering community and researching other communities in Connecticut that have adopted LID Regulations.

NCD initially focused on Morris because of their sensitive water resources including Bantam Lake. Approximately one third of Morris lies within drinking water watersheds. Several waterbodies within Morris cross municipal boundaries into Litchfield, Thomaston, Watertown, Washington and Bethlehem. Not only serving as a model, this project implemented in one town will benefit surrounding towns immediately.

From a technical standpoint, the LID approach offers significant advantages. On an undisturbed vegetated site, 90% of a one inch rainfall will infiltrate into the soils with only 10% becoming runoff. When a site is developed in the traditional manner, this relationship reverses to only 10% infiltrating and 90% becoming runoff. Current land use codes often mandate extensive land clearing that destroys existing on-site vegetation and hydrology. The old style development uses Hard Engineering with expensive "pipe to pond" designs that only move the problems of pollution and flooding from one place to another, but do not solve them.

The LID Design Manual provides the technical framework to implement stormwater management strategies on new development to protect local water resources from adverse impacts. Engineers, property owners, developers, homeowners, and municipal officials will use the manual, hopefully, at the onset of the project to increase compliance. This LID Design Manual will assist homeowners and individuals to understand the adverse impacts of stormwater on their environment and design site and project-appropriate systems. Compared to traditional infrastructure, LID systems are easy to install and easy for the end users to maintain over the long term.

Without the implementation of the requirements in a LID Design Manual, long-term adverse impacts to both surface and groundwater are likely to occur. According to the 2010 report, "Impacts of Climate on Connecticut Agriculture, Infrastructure, Natural Resources and Public Health", weather events in Connecticut will become more severe with intense but less frequent precipitation. The proper capture, filtration, and management of stormwater will recharge groundwater, reduce erosion, and protect sensitive habitats. LID will increase local resilience to climate change by mitigating the impacts of drought, protecting drinking water reserves, reducing flooding, and reducing stress on infrastructure.

In fact, LID was a best management practice highlighted in the 2011 Connecticut Climate Preparedness Plan. That plan referred to LID as an adaption tool several times, including:

- "Municipalities should adopt Low Impact Development (LID) best management practices (BMPs) into their planning and zoning regulations, and developers and

homeowners should be educated as to the benefits and cost savings of LID and buffers to reduce nonpoint and stormwater pollution and improve groundwater recharge."

- "Guidance should also be developed for conservation practices for homeowners, commercial and industrial users and application of LID practices, especially for private well users, that improve climate change resilience."
- "An incentive program to offset the cost of rain barrels for the average homeowner could help to encourage this water conservation strategy. Other activities that soften the landscape using LID practices can contribute to storage in groundwater for later extraction."
- "LID BMPs could help minimize increased water runoff by encouraging more pervious development surfaces and green infrastructure measures that incorporate existing hydrology and mimic water retention of natural systems (e.g., rain gardens, green roofs, retention ponds)."
- "…Using alternative LID construction and landscaping practices can help support ecosystems by build [stet] resiliency. These LID practices start with minimizing the footprint of any construction project, especially minimizing the disturbance of native vegetation and soils."

This is exactly why LID regulations are such a vital and timely tool for land use. LID offers solutions that make projects less costly to install, more attractive in the landscape and much more effective at protecting clean water. This manual will streamline the land use process in towns by providing a clear guidebook to reference and follow. This project will also advance CIRCA's mission by creating a model that could be implemented in all the smaller Connecticut towns and bringing adaption tools directly to decision-makers.

In short, use of LID principles and techniques deliver major contributions to climate adaptation and resiliency. This project increases local adaptive capacity by directly educating the decision-makers and immediately reducing the impacts of development on the landscape.

D. PROJECT DESCRIPTION, INCLUDING GOALS AND METHODS

This project consisted of three primary goals focused on producing technical information, educating stakeholders, and incorporating the technical information into municipal practices.

Below are the goals of the project and the methods used to achieve them:

1) Draft a Low Impact Sustainable Development (LISD) Design Manual for the town of Morris.

   Steven Trinkaus, PE, of Trinkaus Enginerring LLC, prepared the draft "Morris Low Impact Sustainable Development and Stormwater Management Design Manual". He reviewed the local land use patterns and hydrologic points of interest to create a tailored LID manual. The manual includes initiating circumstances, implementation standards, and

enforcement procedures to assist applicants and members of the planning and zoning commission to bring LID technologies to all new projects in the town of Morris.

Available on the CIRCA website, the manual discusses the water resources in the town of Morris, how to apply the manual, descriptions of water quality issues, the goals and benefits of LISD, specific design strategies for LISD, and specific performance criteria and design standards for LISD strategies. The Manual also includes information to assist regulatory bodies in managing LISD systems such as a draft maintenance agreement, a plant list for LISD treatment, and a step by step process to develop on-site hydrologic modeling.

2) Educate residents, design build community, local officials, and other interested parties in the goal and specifics of Low Impact Development.

Northwest Conservation District presented the goals and specifics of LID to a variety of audiences and in many formats, including a Rain Garden Design at the town of Morris Public Works Garage. Specific events are listed in Appendix B.

Joanna Wozniak-Brown presented the project at the Climate Change Resiliency Workshop on September 23, 2016; the 2017 Winter Conference of the Southern New England Chapter of the Soil & Water Conservation Society on February 24, 2017 and attended the CIRCA poster session on May 4, 2017.

3) Assist the town of Morris to integrate the Low Impact Design Manual into the existing municipal regulatory framework.

Steve Trinkaus presented the draft LISD manual on March 13, 2017 to the Planning & Zoning Commission. Commission members and attendees were able to discuss the manual, the need for LISD practices, and the path to implement, enforce, and support the plan components.

To reduce conflicting regulatory requirements, Tom McGowan, planner for the town of Morris, reviewed the manual and suggested changes. On April 20, Sean Hayden of the Northwest Conservation District met with Tom McGowan, Steve Trinkaus, and Joanna Wozniak-Brown of the Northwest Hills Council of Governments to review the potential conflicts, discuss mitigation strategies, and review the implementation process. It was agreed that the manual should clarify the reasoning behind the buffer area from the Bantam Lake shoreline and the size of a project that would require use of the LISD standards. Tom McGowan also suggested ways to incentivize the use of LISD. The town planner and the engineer also reviewed the local regulations and ordinances for consistency with the new manual. Changes suggested by Steve Trinkaus are provided in Appendix C.

The commission held a public hearing on September 25 where the manual was officially adopted.

E. EXPLANATION OF HOW PROJECT ADVANCED CIRCA MISSION AND PRIORITY AREAS

The mission of the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) is to increase the resilience and sustainability of vulnerable communities along Connecticut's coast and inland waterways to the growing impacts of climate change on the natural, built, and human environment.

This project can increase the resilience of Connecticut's small inland towns to the growing impacts of climate change on the natural, built and human environment. The installation of LID stormwater infrastructure measures increases small town resiliency in many ways, including:

- Protect drinking water supplies, streams, rivers and other water resources
- Protect natural vegetation, hydrology and other resources on development sites
- Improve and protect water quality throughout the watershed
- Produce healthy, attractive human landscapes
- Reduce damage to local roads, bridges, and built environment
- Reduce damage to agricultural resources
- Reduce damage to human environment

The development of a Low Impact Design Manual deployed natural science, engineering, legal and best policy practices for climate resilience. It focuses on deliverables achievable by municipalities with maximum effect.

Further, the development of a small town LID Design Manual offers maximum return for dollars invested by producing a product easily transferrable to many towns.

F. PROJECT OUTCOMES & LESSONS LEARNED

Although other manuals on this topic exist, hiring a professional engineer experienced in this topic was critical to the project partners. The design of an effective and defensible LISD system requires careful calculations and design standards. The use of a professional engineer increases the reliability and accuracy of the information. Coupled with a review of town-specific land use patterns, it aptly connects the planning and zoning regulations with defensible and effective design. The manual, with discrete sections, can be modified to address the specific geography and zoning regulations in another municipality while maintain its technical integrity.

As described above, the integration of LID into regular construction practices will require a paradigm shift. Continued support of local land use commissions post-implementation will also be integral to reduce confusion, avoid frustrations, and successfully implement LID.

Northwest Conservation District has been pursuing additional funding to provide further support and to implement the manual in other municipalities. Furthermore, this topic will be discussed at our upcoming "5th Thursday" meeting as an educational opportunity for the regional land use commissions.

While COGs cannot enforce regulation, they serve an important role for education, skills-sharing, and development of example projects. Regular meetings with land use commissions and institutional knowledge at NHCOG will reinforce the need for innovative and cost-effective infrastructure management that accounts for our changing climate.

G. FINAL PROJECT SCHEDULE & BUDGET SUMMARY

Table 1: Final Project Schedule		
1	Project Team will work with Morris Land Use Commission throughout the process of developing and adopting the Low Impact Development Design Manual including public hearings/comment periods.	Spring 2016 to Fall 2017
2	LISD Development, NHCOG and NCD will deliver public education workshops for Morris residents, Land Use Staff, Engineer and Design Community on the principles and benefits of Low Impact Development.	Spring 2016 to Summer 2017
3	LISD Development will provide draft Morris LID Design Manual for Commission Review.	Spring 2017
4	Tom McGowan will work with Land Use Commissions to ensure that the LID Design Manual is tailored to existing regulations and resolve any conflicting regulatory requirements.	Summer 2017
5	NCD and NHCOG will conduct demonstration tours of successful local LID projects for the design community, land use staff and commissioners.	Throughout project
6	Town of Morris adopts LID Design Manual and incorporates the Manual into town regulations.	Fall 2017

Table 2: Final Budget Summary	
NHCOG	$4,000
Northwest Conservation District	$5,000
Trinkaus Engineering LLC	$9,000
Total Project Budget	$18,000

H. PROJECT PRODUCTS

Appendix A: Morris Low Impact Sustainable Development and Stormwater Management Design Manual (available online)

Appendix B: Northwest Conservation District Interim Report (dated September 25, 2017)

Appendix C: Results of Regulatory Audit Performed by Trinkaus Engineering LLC Collated by Joanna Wozniak-Brown

APPENDIX A

MORRIS LOW IMPACT SUSTAINABLE DEVELOPMENT AND STORMWATER MANAGEMENT DESIGN MANUAL

Available at http://northwesthillscog.org/environmental-planning

APPENDIX B

NORTHWEST CONSERVATION DISTRICT INTERIM REPORT

Northwest Conservation District
1185 New Litchfield Street, Torrington CT 06790
Telephone (860)-626-7222

Joanna Wozniak-Brown, PhD, Regional Planner
Northwest Hills Council of Governments
59 Torrington Road, Suite A-1
Goshen, CT 06756

September 25, 2017

Re: Final Report: Northwest Hills Council of Governments and Northwest Conservation District Agreement for Small Town Low Impact Design Manual Creation

Completed Tasks

Task – Develop and Deliver Educational Workshops – NCD and Trinkaus Engineering have designed and delivered workshops that include educating a broad based audience on the process of developing and adopting Low Impact Design Regulations and Design Manual principles and benefits of Low Impact Developments at the following public education events.

1) Bantam Lake Day at the Morris Town Beach – Sponsored by the Bantam Lake Protective Association. August 20, 2016. Targeted audience/lake front property owners. NCD staff (Sean Hayden and Karen Griswold Nelson) in attendance.
2) How Can We Grow and Still Protect Lakes, Rivers and Wetlands – Sponsored by the Woodbury and Roxbury Land Use Departments. Town of Woodbury Senior Center, August 24, 2016. Presentation by Sean Hayden) Approximately 30 attendees including all Woodbury Land use boards & Pomperaug Watershed.
3) Northwest Connecticut Community College Ecology Class Lab site tour and demonstration – LID Permeable Paver Parking Lot, Torrington. August 26,

2016. Tour and presentation by Sean Hayden to 21 students, City of Torrington officials and the general public. LID is being used in a comparative study of the rivers of the northwest corner of CT to look at the impact of paved surfaces and other development on river health. Class being taught by Tara Jo Holmberg, Biology Department and Professor of Environmental Science and Biology, recently named Connecticut Community Engaged Educator of 2016 by Connecticut Campus Compact, and longtime NCD Board of Director.

4) Maintaining a Healthy Waterfront – Morris Inland Wetlands Commission and Morris residents. September 8, 2016. Presentation by Sean Hayden- 20 attendees. Start of ongoing and continuing outreach by NCD (Hayden and Griswold Nelson) to the Morris Inland Wetlands Commission and enforcement staff regarding partnering with the Morris Planning and Zoning Commission to remove impediments to LID in the Morris Inland Wetlands Regulations to further support and strengthen the standards set forth in the LISD manual. Ongoing staff review of inland wetlands applications town wide to educate Morris property owners on implementing LID into site designs for wetlands consideration.
5) Climate Change Resiliency Workshop at the Litchfield Community Center – Sponsored by River Alliance of Connecticut. September 23, 2016. Presentation by Sean Hayden. Approximately 50 attendees from surrounding towns including Morris, Litchfield, Warren and Washington.
6) Minimizing the Impacts of Stormwater on our Communities – Sponsored by White Memorial Foundation and Connecticut Community at White Memorial Foundation September, 2016. Presentation by Sean Hayden - 50 attendees.
7) Primary Stormwater Treatment for Difficult Sites – Annual Meeting of the Connecticut Association of Conservation and Inland Wetlands Commissions. November 12, 2016. Seminar by Sean Hayden – 60 plus conservation, inland wetlands and land use members and staff attendees/statewide.
8) CT Envirothon Steering Committee Meeting, November 17, 2016, Arethusa Farm, Litchfield followed by tour of subsurface gravel wetlands in Morris and Litchfield. Attendees included CT Conservation District executive directors and staff, DEEP representatives, and interested parties.
9) How Can We Grow and Still Protect Lakes, Rivers and Wetlands - Sponsored by Steep Rock Association and Lake Waramaug Task Force, November 6, 2016, Washington. Presentation by Sean Hayden. Approximately 50 attendees including Washington land use boards, Lake Waramaug Task force, developers and lakefront (Waramaug) and town residents.
10) Morris Planning and Zoning Regular Meetings – formal meetings, March 13, May 8, 2017, September 6 and September 25, 2017 (and additional staff

meetings (NCD staff Hayden and Griswold Nelson, Planning Consultant Tom McGowan, and Design engineer Steve Trinkaus, P&Z chairman Robert McIntosh). Overview of current development practices and impacts on the natural environment, current stormwater management practices and impacts on the natural environment and Description of Low Impact Development and discussion of how the implementation of LID can address environmental impacts as a result of development and the discharge of stormwater

11) 2017 Connecticut Lakes Conference and Annual Meeting, April 29, New Haven. Presentation by Sean Hayden to all attendees on "Low Impact Development" with cover of Morris LISD draft manual as part of presentation.
12) NCD Earth Day Plant Sale, April 20-23. Educational outreach through the UConn Master Gardener program regarding the implementation of LID practices in landscape designs. Volunteer Master gardeners and NCD staff distributed LID literature, directed the public to specific "rain garden" plants and planting plans for implementation of residential LID structures, with emphasis on "rain gardens". Literature created by and distributed by NCD staff attached. Estimated attendees at Earth Day Plant sale – 1500 to 1700 people from all socio-economic strata. On-site LID and soils presentation to South Kent School volunteers (15 students and 5 staff) by Sean Hayden as part of curriculum for classes taught by Professor MaryAnn Haverstock, Director of Sustainability. Ms. Haverstock is former DEEP Long Island Sound project employee, including creating grant opportunities for the removal of barriers to LID in land use and municipal regulations and ordinances (2008).
13) Follow up LID rain garden presentations by NCD staff (Griswold Nelson) to garden clubs in collaboration with the UConn Master Gardener program (as a result of Earth Day Plant Sale volunteers) Harwinton Senior Center May 11, Kent Memorial Library July 25, and Sullivan Senior Center, Torrington, June 21
14) Bantam Lake Task Force Annual meeting, September 16, 2017, Bantam Lake, Morris. Presentation of draft LID Design Manual by NCD staff and request for support for regulatory changes being brought forward by the Morris Planning & Zoning Commission.

Additional educational outreach:

- NCD Winter 2016, Spring 2016, and Fall 2016 newsletters with distribution to NCD mailing list containing first 3 of 5 technical articles written by Steven Trinkaus, "Why the Change to Low Impact Development" – mailed to NCD data base (5,000 plus) with distribution of Spring 201

newsletters to libraries and municipal offices in NWHCOG towns. (Copies attached)

- ❖ Spring 2017 newsletter with distribution to NCD mailing list and targeted additional mailing to lake communities in Morris, Washington, Warren, and Kent (total newsletter mailed 7400 in addition of 1,000 distributed to libraries, municipal offices, etc.) containing part 4 of 5 technical articles written by Steven Trinkaus, "Why the Change to Low Impact Development". Newsletter cover "Rain Garden Design" by Richard Rosiello, Meadowbrook Landscaping and president of "Mad Gardeners" in support of LID practices on residential site. (Copies attached)

Task – Educate the Design / Build Community on the Benefits of Low Impact Development - NCD has discussed (in-house NCD office/Torrington), on-site and third party review and consultation) the approach of creating a LID Design Manual and incorporating it into town regulation and received positive responses from the following professionals in the Northwester Connecticut Design/Build community including;

- Dennis McMorrow PE – Berkshire Engineering. In-house and on-site meetings for design and construction of LID structures in residential and commercial settings including subsurface graveled wetlands in Morris, Litchfield. Now third party review engineer for NCD projects.
- Tom Grimaldi PE - RR Hiltbrand Engineers & Surveyors LLC. In-house and on-site meetings for design and construction of LID structures including subsurface graveled wetlands in Morris, Litchfield. Now third party review engineer for NCD projects.
- Ken Hrica PE– Hrica and Associates. In-house and on-site meetings for design and construction of LID structures including residential and commercial site (Dunkin Donuts, New Hartford)
- Ron Wolff PE– Wolf Engineering. In-house and on-site meetings for design and implementation of LID in cluster/affordable income housing subdivision in Woodbury.
- Dainius Virbickas PE – Artel Engineering. On-site meetings for implementation of LID measures in single family residential development in Brookfield.
- Earthtones Native Plant Nursery and Landscaping. On-site meetings and shared workshop meetings with Earthtones principals Liza and Kyle Turoczi and their clients to implement LID practices in lakefront (Bantam Lake, West Hill Lake, and First Light lakes, Candlewood, Zoar and Lillinonah and Lake Wononscopomuc) residential development and re-development site. Partners with NCD to conduct their own educational seminars showing LID structures as

part of their designs (including West Hill Lake property owners annual meeting, June 2017)

- Richard Rosiello – Meadowbrook Landscaping. On-site meetings (Warren, Washington and First Light lakes) to implement LID practices in lakefront (Lake Waramaug and First light lakes) property residential development and re-development, residential sites and commercial development. Mr. Rosiello is the current president of the Mad Gardeners, (a group of passionate, amateur–professional gardeners in Southern New England. Southern Litchfield County in west central Connecticut), that supports NCD with members on numerous western Connecticut land use boards.
- Paul Szymanski PE– Howland Engineering. On-site meetings (Warren, Washington and Cornwall) to implement LID practices in lakefront (Lake Waramaug) property residential development and re-development and commercial development.
- Pat Hackett PE– Hackett Engineering. In-house meetings to implement LID practices in lakefront (Lake Wononscopomuc) property residential development and re-development and residential sites (Cornwall, Salisbury).
- Dave Wilson PE- Village Associates. In-house meetings to implement LID practices in residential development in area towns. (Litchfield, Warren and Cornwall
- Todd Parsons PE, Roger Hulbert PE and David Batista PE – Lenard Engineering. Consultation on town projects with town and shared town/NCD staff to implement LID practices (New Hartford and Cornwall)
- Bart Clark PE– Oakwood Engineering. Consultation on town projects to implement LID practices (Warren and Cornwall)
- Kleinschmidt Associates. NCD Third party review. Implementation of LID design in the final site design of the "Bend Project" in West Cornwall, CT through the collaborative efforts of the NCD/Housatonic Valley Association staff. Review of site design features at a September 13, 2016 P&Z meeting with members of the Housatonic River Commission, town officials, and interested parties.
- Laurel Engineering, Winsted. On-site meetings to design and construct a subsurface graveled wetlands structure on a new commercial development site in Winsted.
- Brian Neff PE, Roxbury, CT. On-site meetings for implementation of LID measures in single family residential development, Cornwall.
- Michael Mazzuco PE – Mazucco Engineering. Consultation on and review of Brookfield residential and commercial subdivision projects.
- Douglas Divesta PE - Divesta Engineering. Consultation and design of rain gardens in Fairfield.

- Steve Sullivan PE – CCA Engineering and Surveyors. Consultation and third party review of residential and commercial subdivisions in Brookfield.
- Ralph Stanton PE – Certified Soil Scientist. On-site meetings and consultation of LID practices in design of Stormwater Park, Town of Norfolk village center.
- Robert Green PE – Robert Green Associates. Third party review and consultation (Trinkaus) of redevelopment of lakefront properties incorporating LID features, New Hartford.
- Curtis and Emily Jones PEs – Civil 1. Consultation and review for the implementation of LID practices in an affordable housing project, Watertown.
- Curtis Smith and Mark Riefenhauser, PE, Smith and Company. Consultation and review of single family subdivisions lots in Woodbury, CT
- Jason Dismukes PE, Goshen. In-house and collaborative work to implement LID practices in residential and recreational projects in Goshen and Cornwall
- Jones Engineering, Southbury, CT. Collaborative (Lenard third party review for town staff) for implementation of LID practices on a residential site in Cornwall.

Task – Educate Local Environmental Conservation Organizations
NCD has discussed the approach of creating a, LID Design Manual and incorporating it into town regulations and received positive response and support from the following organizations as part of educational workshops, tours and outreach:

- Steep Rock Association – Washington
- White Memorial – Morris and Litchfield
- Housatonic Valley Association - Housatonic River Watershed
- Farmington River Watershed Association, Farmington River Watershed
- Rivers Alliance of Connecticut (state wide lake protection non-profit)
- First Light Power Resources – Housatonic River Watershed.
- Lake Waramaug Task Force -Washington and Warren
- Lake Wononscopomuc Association - Salisbury
- West Hill Lake Association – New Hartford
- Bantam Lake Protective Association - Morris
- Candlewood Lake Authority, Lake's Zoar, Lillinonah and Candlewood.
- Various town Conservation Commission including Cornwall, Bethlehem and Woodbury.

Task – Demonstration Low Impact Development Project – NCD assisted the Town of Morris Highway Department with a LID design to keep stormwater runoff from running through a road salt storage area and contaminating a nearby wetland. NCD worked with the Public Works foreman to create a conceptual design to capture and divert salt shed roof and parking area runoff to a bioswale/infiltration trench. NCD worked directly with the Town of Morris Inland Wetland Commission to permit the

project and assisted the Public Works foreman to install the structure in early May. All materials needed for construction have been supplied and the project completed. (Photos attached)

Ongoing Tasks

Task – **Adopt Low Impact Design Manual into Planning Regulations –** Fall 2017

Respectfully submitted,

Northwest Conservation District

APPENDIX C

RESULTS OF REGULATORY AUDIT PERFORMED BY TRINKAUS ENGINEERING LLC COLLATED BY JOANNA WOZNIAK-BROWN

PLANNING AND ZONING REGULATIONS, Town of Morris

Section 1 – Purpose

ADD: “Protect the natural aquatic resources in the Town of Morris from the adverse impacts of stormwater runoff and non-point source pollutants”

Section 2 – Jurisdiction

ADD: “All new development and redevelopment projects in all zones proposed in the Town of Morris are required to comply with the requirements found in the Town of Morris Low Impact Sustainable Development Design Manual.”

Section 8 – Additional Standards

1. Site Plan
   Change to:

   A site plan shall be drawn to a scale of not less than 40 feet to the inch and shall show all of the following information, both existing and proposed, as applicable to the particular Zoning Permit: property lines and lines delineating the land to be used under the Zoning Permit; contours at an interval not exceeding two (2) feet or equivalent ground elevations; buildings, structures, retaining walls, signs and outdoor illumination facilities; streets, driveways, off-street parking and loading spaces, outside storage areas and all paved areas; water courses, ponds, and wetlands, stormwater management system designed in accordance with the Town of Morris Low Impact Sustainable Development Design Manual and sewage disposal, and water supply facilities; docks, wharfs, and bulkheads; landscaping (including trees and/or shrubs, lawns and other landscape features and natural terrain not disturbed). The site plan shall be prepared by a professional engineer, licensed to practice in the State of Connecticut.

3. Erosion and Sediment Control Plan CHANGE TO: Stormwater Pollution Prevention Plan (SWPPP)

   CHANGE text to:

   A SWPPP subject to the requirements of Section 51.2 shall be submitted with any application for development in any district when the disturbed area of such development is cumulatively more than one-half acre.

<u>Farms</u>

ADD “#3 It is highly recommended that farms implement Low Impact Sustainable Development practices specified in Section 4.6 of the Town of Morris Low Impact Sustainable Development Manual to improve the water quality of the runoff from farm and agricultural operations.”

<u>Minimum Access and Interior Lots</u>

Change #5 to: "The Commission shall require a driveway construction and stormwater management plan for any new residential or commercial driveway."

Section 9 – Definitions

9. Change to: "BUILDING IMPERVIOUS COVERAGE" The percentage of a parcel which is covered by all buildings and structure, not including:

INSERT "PERMEABLE GRAVEL DRIVEWAY" A driveway constructed with washed crushed aggregate which contains no fines or stone dust that is constructed in accordance with the specifications found in the Town of Morris Low Impact Sustainable Development Design Manual."

24. Change to #24 and text: ""IMPERVIOUS SURFACE" An impervious surface is any of the following surfaces which minimize or prevent the infiltration of rainfall into the soil: Any Building Roofs, Pools, Tennis Courts, Other athletic courts, Concrete or stone patios, and walkways, road and driveways consisting of bituminous concrete, concrete, compacted soils, compacted bank run sand and gravel and compacted processed stone material, permeable pavement, porous concrete or permeable interlocking concrete pavers . "

INSERT "NON-POINT SOURCE RUNOFF: *Non-point source* (*NPS*) *pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. These pollutants include: Total Suspended Solids, Phosphorous, Nitrogen, Metals and Hydrocarbons."*

INSERT ""LOW IMPACT SUSTAINABLE DEVELOPMENT" An ecologically friendly approach to site development and stormwater management that aims to mitigate development impacts to land, water, and air. The approach emphasizes the integration of site design and planning techniques that converse sensitive natural systems and hydrologic functions on a site."

INSERT "TOTAL IMPERVIOUS COVERAGE" The total percentage of a lot or parcel covered by buildings, accessory structures, pools, patios, driveways, tennis courts or any other hard surface which does not infiltrate rainfall.

Section 21- Residence R-40 District

Lot Coverage

ADD: Total Impervious Coverage 35%

Section 22- Residence R-60 District

Lot Coverage

ADD: Total Impervious Coverage 30%

Section 23- Residence R-80 District

Lot Coverage

ADD: Total Impervious Coverage 25%

Section 24- Residence R-160 District

Lot Coverage

ADD: Total Impervious Coverage 25%

Section 25- Lake Residential District L.R.

Lot Coverage

CHANGE: Maximum Coverage by Buildings and Structures to 15%

ADD: Total Impervious Coverage 30%

Section 26- Deer Island District D.I.D.

Lot Coverage

CHANGE: Maximum Coverage by Buildings and Structures to 15%

ADD: Total Impervious Coverage 25%

Section 31 – Commercial District CA

Building bulk and coverage

ADD: Total Impervious Coverage 50%

Section 32– Commercial District CB

Building bulk and coverage

ADD: Total Impervious Coverage 50%

Section 33 – Lake Commercial District L.C.D.

Building bulk and coverage

CHANGE: Maximum Coverage by Buildings and Structures to 15%

ADD: Total Impervious Coverage 25%

Section 34 – Lake Recreational District L.R.D.

Building bulk and coverage

ADD: Total Impervious Coverage 25%

Section 41– Light Industrial – 80 District

Building bulk and coverage

CHANGE: Maximum Ground Coverage to Maximum Coverage by Buildings & Structures

ADD: Total Impervious Coverage 65%

Site plan

ADD: "The buffer area may be used for the installation of Low Impact Sustainable Development vegetative treatment practices utilizing native species where permitted by the Commission as specified in the Town of Morris Low Impact Sustainable Development Design Manual."

Section 51 - Standards and Requirements For Site Plans & Erosion And Sediment Control Plans

CHANGE: Section 51 - Standards and Requirements For Site Plans & Stormwater Pollution Prevention Plans (SWPPS)

Change all references in Section from Erosion & Sediment Control to Stormwater Pollution Prevent

Section 51.1 Site Plans

Application

Add #6 "A stormwater management plan designed in accordance with the requirements of the Town of Morris Low Impact Sustainable Development Design Manual."

Duties of the Commission

Change #3 to: Adequate provisions for obtaining potable water and discharge of wastewater to a sanitary sewer system or on-site subsurface sewage disposal system.

INSERT: Compliance with the requirements of the Town of Morris Low Impact Sustainable Development Design Manual.

Section 51.2 CHANGE to Stormwater Pollution Prevent Plan (SWPPP)

General

Remove: "A single family dwelling that is not a part of a subdivision of land shall be exempt from these erosion and sediment control regulations."

Amend to : 2002 Connecticut DEP Guidelines for Erosion and Sediment Control (as amended)

Definitions

"Disturbed Area" Change "destroyed" to "disturbed"

"Eroison & Sediment…" Change to Stormwater PPP; an approach that prevents and/or minimizes soil erosion and sedimentation resulting from development and includes, but is not limited to a map, narrative, calculations, phasing plan and installation details.

Information and Requirements

Change to: Mapped information as required below shall be shown separately or as part of the Site Plan. Said plan shall contain, at a minimum the following information and comply with the requirements found in the CT DEP 2004 Guidelines for Soil Erosion and Sediment Control as may be amended:

Change A) 2. To Phasing Plan and schedule

Change B) add #5. Provisions to handle runoff from active construction areas and prevent the discharge of runoff to the maximum extent practical to off site areas.

Issuance or Denial of Certification

Change reference to Northwest Conservation District

Inspection

Change to: Inspection by the Commission, its authorized agent, or a qualified design professional retained by the applicant and shall be done in compliance with the requirements found in the CT DEP 2002 Guidelines as may be amended and/or should be removed.

Section 52 – Standards and Requirement for Special Exceptions

General Standards

ADD #8: A stormwater management plan designed in accordance with the requirements of the Town of Morris Low Impact Sustainable Development Design Manual.

Section 55 – Planned Development District

Application

ADD: A stormwater management plan designed in accordance with the requirements of the Town of Morris Low Impact Sustainable Development Design Manual.

Section 61 – Parking and Loading

Dimensions

CHANGE text to: For the purpose of this Section, one (1) parking space shall constitute an area with such shape, vertical clearance, access and slope as to accommodate one (1) automobile having an usable length of eighteen (18 feet and an usable width of nine (9) feet containing a minimum area of 180 square feet; one (1) loading space shall constitute an area twelve (12) feet in width and fifty (50) feet in length with a vertical clearance of fifteen (15) feet with such shape, access, and slope as to accommodate one (1) truck having an overall length of thirty (30) feet.

INSERT DIMENSIONS:

Parking Angle (degrees)	30	45	60	90
Curb Length	18.0’	12.7’	10.4’	9.0’
Stall Depth	16.8’	19.1’	20.1’	18.0’

Vehicle aisle width –				
Two-way circulation	24.0’	24.0’	24.0’	24.0’
Vehicle aisle width –				
One-way circulation	12.0’	13.0’	16.0’	22.0’

Section 63 – Excavation and Grading

Application, Maps and Plans

CHANGE list to:

1) existing and proposed land contours at a vertical contour interval of not greater than two feet (2) based upon aerial or field topographic survey
2) existing and proposed drainage systems, wetlands, water courses and waterbodies as delineated by a Certified Soil Scientist;
3) existing ground cover and proposed landscaping;
4) An accurate location of that portion of the tract to be excavated as well as the relationship of the excavated area to the boundaries of the entire parcel

DELETE 5

6) abutting property owners’ names;
7) streets, highways, accessways, or rights-of-way giving access to or through the property;
8) the location of all buildings on the property within 200 feet of its boundaries;
9) proposed access to the excavation and proposed location of all structures (including machinery) to be erected on the premises.
10) Stormwater Pollution Prevention Plan for the controlling of runoff during active excavation phase, including dewatering operations.
11) A stormwater management plan for post-excavation conditions designed in accordance with the requirements of the Town of Morris Low Impact Sustainable Development Design Manual.

Approval

CHANGE i.2 to: Runoff shall be handled in accord with the Stormwater management plan developed under Section 3.a.11 above.

Appendix I – Morris Zoning Regulations, Antennas, Towers, and Wireless Communication Facilities

7. Special Exceptions, b. Tower Plan Proposal Report

ADD #10: A stormwater management plan designed in accordance with the requirements of the Town of Morris Low Impact Sustainable Development Design Manual for the access road to the tower location as well as any impervious area located at the base of the tower.

Appendix II – Winivan Farm PDD

Drainage

CHANGE to: A stormwater management plan designed in accordance with the requirements of the Town of Morris Low Impact Sustainable Development Design Manual.

Appendix III – American Country Barns

Drainage

CHANGE to: A stormwater management plan designed in accordance with the requirements of the Town of Morris Low Impact Sustainable Development Design Manual.

SUGGESTED CHANGES, Regulations for Inland Waterways and Watercourses (October 2013)

Section 2: Definitions

ADD definition of LISD as noted in suggested changes to Planning & Zoning Regulations

Section 7.5:

ADD requirement to require stormwater management as noted in suggested changes to Planning & Zoning Regulations