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December 12, 2023

Mr. Rick Stow, Chairman
Inland Wetlands Commission
238 Danbury Road
Wilton, Connecticut 06897

RE: Old Driftway, LLC
0 Mountain Road
Wilton, Connecticut

Dear Mr. Stow and Members of the Inland Wetlands Commission,

At the request of James Lucas of 2 Indian Hill Road, I have reviewed plans and documents submitted by the applicant for this project. I have reviewed the following plans and documents:

Executive Summary:

A. The stormwater management will not function as intended. It will not result in the reduction of both the peak rate of runoff and increases of runoff volume.
B. The stormwater management plan will not reduce non-point source pollutants generated by the impervious driveway along the Old Driftway. These pollutants will be discharged to wetlands and watercourses.
C. The use of a Bioswale and porous asphalt are not appropriate to this site and will not function as intended. The application of these strategies is considered "Green Washing" which is the addition of LID concepts to a plan to look like an environmentally friendly plan but is not.
D. The stormwater management plan does not comply with the CT DEP 2004 Storm Water Quality Manual and the Town of Wilton regulations.
E. The erosion control plan does not comply with the CT DEP 2002 Guidelines for Soil Erosion and Sediment Control.
F. The submitted plans are missing a lot of information which prevents a land use commission from fully evaluating the design of the project.
G. The plan will have adverse physical impacts to the vernal pool on the site.

I have the following comments on the plans.

Proposed Lot Development:

1. A lot of the proposed text on the plan is too small to read. The code practice by the Connecticut Association of Land Surveyors (CALS) requires minimum text sizes based upon the scale of the plan.
2. At the end of the Old Driftway, it is proposed to construct a six-bedroom single family residence, with a two-bedroom accessory dwelling (8 bedrooms in total), pool/patio, on-site sewage disposal system and stormwater detention systems within the 100' upland review area from the delineated inland wetland boundary. The proposed sewage disposal system is located approximately 40' from the wetland boundary. Due to the proximity of the sewage disposal system to the wetland boundary, a CT DEEP hydraulic analysis needs to be performed to evaluate that the 21-day travel time for bacteria and viruses will be provided in the fill to and native soil at the wetland boundary. Additionally, a nitrogen dilution analysis per the CT DEEP must be performed to show that a nitrogen concentration of 10 mg/l or less will be provided at the wetland boundary. These analyses are necessary to ensure there is no adverse environmental impact to the downgradient inland wetlands.
3. There is only one test pit which is in the approximate center of the primary system and based upon the shallow depth of ledge is not adequate for the design of the sewage disposal system. Additional test holes are necessary to confirm that the native soils meet the minimum suitability requirements under the Current Technical Standards for the design of on-site sewage disposal systems.
4. No test hole was done approximately twenty-five (25') feet downgradient of the system which is required by the Technical Standards.
5. The proposed cross section of the sewage disposal system does not provide extents of select fill and other information required by the Technical Standards.
6. No elevations are provided for the on-site sewage disposal system and all the relevant components.
7. No Minimum Leaching System Spread (MLSS) calculation has been provided for the primary sewage disposal system.
8. No information is provided as to the type of system and length of the system to be used for the primary system.
9. There are no deep test pits for either of the proposed stormwater management systems which are required by the CT DEP 2004 Storm Water Quality Manual "the 2004 Manual". The required vertical separation of 36" to seasonal high groundwater and/or bedrock per the 2004 Manual cannot be confirmed it will be met.
10. The bottom of the larger Cultec System is proposed at 539.7' which is approximate ground surface on the lower side of the system. However, the upper side of the system is located at 542.0' which means that the bottom of the system will be 2.3' into the ground with no confirmation that the required vertical separations to groundwater or bedrock will be met.
11. The bottom of the smaller Cultec System is proposed at 535.7' which is approximately 3.3' below the ground surface on the lower side of the system. The bottom of the upper side of the system will be 4.3' below existing grade with no confirmation that the required vertical separations to groundwater or bedrock will be met.

12. The note for the smaller Cultec System states that it will be used for pool drain and water softener discharge. Based upon my experience, the discharge from a water softener must be directed to its own infiltration system and not combined with another stormwater.
13. No outlet control structure is provided for either underground detention system so it is not clear how zero increase in the peak rate of runoff will be achieved.
14. The construction entrance is shown at thirty (30') feet, which is less than the minimum fifty (50') length required by the CT DEP 2002 Guidelines for Soil Erosion and Sediment Control.
15. The applicant is proposing a coarse particle separator as part of the stormwater management system on the lot. Based upon the detail provided, this is a standard catch basin with a hooded outlet.
16. No elevations have been provided for the proposed house, pool, and patio.

Right of Way Plans (6 sheets):

17. The profiles of the proposed improvements to the Old Driftway do not meet the standard civil engineering scales. The standard scale for a profile is 1" = 40' (horizontal) and 1" = 4' (vertical). The profiles submitted by the applicant cannot be read at the scales provided.
18. No stationing is provided on the plan view of the proposed driveway so it cannot be related to the profile of the proposed driveway.
19. There are nine (9) underground gallery systems shown under the proposed driveway. Starting at the southern end of the Old Driftway, I will number these system one through nine.
    a. The bottom of system #1 is shown to be at 573.5' which is 5.5' below existing grade. Based upon test holes #3 (43" to ledge) and #4 (20" to ledge), this system is not in compliance with the 2004 Manual requirement of providing a three (3') foot vertical separation to bedrock.
    b. The bottom of system #2 is shown to be at 578.5' which is 3.5' below existing grade. Based upon test hole #2 (24" to ledge), this is not in compliance with the 2004 Manual requirement of providing a three (3') foot vertical separation to bedrock.
    c. The bottom of system #3 is shown to be at 580.5' which is 3.6' below existing grade. Based upon test hole #2 (24" to ledge), this is not in compliance with the 2004 Manual requirement of providing a three (3') foot vertical separation to bedrock.
    d. The bottom of system #4 is shown to be at 580.5' which is 5.5' below existing grade. Based upon test hole #2 (24" to ledge), this is not in compliance with the 2004 Manual requirement of providing a three (3') foot vertical separation to bedrock.
    e. The bottom of systems #5 and #6 are shown to be at 576.5' which appear to be at or just below the existing ground surface (cannot be determined from reading the plan). There is no deep test hole in the vicinity of these two systems so it cannot be determined if the required three (3') foot vertical separation to bedrock per the 2004 Manual is being provided.
    f. The bottom of system #7 is shown to be at 572.5' which is 6.5' below existing grade. There is no deep test hole in the vicinity of these two systems so it cannot

be determined if the required three (3') foot vertical separation to bedrock per the 2004 Manual is being provided.

g. The bottom of system #8 is shown to be at 567.5' which is between 1.5' and 4.5' above the existing grade. There is no deep test hole in the vicinity of these two systems so it cannot be determined if the required three (3') foot vertical separation to bedrock per the 2004 Manual is being provided. Additionally, there is no information as to the type and amount of fill which will be placed for this system.
h. The bottom of system #9 is shown to be at 555.5' which is 4.5' below existing grade. There is no deep test hole in the vicinity of these two systems so it cannot be determined if the required three (3') foot vertical separation to bedrock per the 2004 Manual is being provided.

20. No outlet control structures are provided for any of the underground gallery systems. As noted above many of the gallery systems are in bedrock so no infiltration will occur.
21. The applicant proposes the use of porous asphalt before, over and after the proposed series of box culverts across the vernal pool. The 2004 Manual requires that porous asphalt be in Class A or Class B soils. No soil data has been provided in these areas. Wetland soils are Class D, so on that basis alone it is wrong to use porous asphalt in this area. Based upon the limited soil data provided, the porous asphalt will fail as proposed.
22. It is stated on Sheet 1 of 6 that all ledge and rock within two (2') feet of the bottom of the elevation of any concrete gallery or aggregate base under the porous asphalt will be removed as necessary. Per the 2004 Manual, a three (3') foot vertical separation is required so there will be substantial blasting of the ledge along the alignment of the driveway to meet this requirement.
23. No information has been provided about the type of material which will be used to replace the removed ledge rock.
24. In many locations, the width of the right of way of the Old Driftway measure just over 10'. It is simply not possible to construct a ten (10') foot wide driveway without impacting the properties adjacent to the right of way.
25. A series of 7' x 1.5' concrete box culverts are proposed to cross the vernal pool. It is not clear from the plans how many of these box culverts are being proposed for this crossing.
26. There is no information as to how the angle points between sections of box culvert will be addressed.
27. Box culvert must have a cut off wall on the inlet side of them which is not shown on the applicant's plan. A cut off wall is a vertical concrete wall below the invert of the box culvert which extends down to an impermeable soil layer to prevent water from going under the box culvert.
28. Concrete headwalls are required on both sides of the box culvert. None are shown on the applicant's plan.
29. The bottom of the box culvert must be set on a stone base which is a minimum of 12" thick and must be located on top of a soil layer which can support the weight of the culverts as well as the driveway material. This will require an unknown, but likely substantial amount of excavation of the wetland soils in the vernal pool.

30. No plans have been provided to show how excavation and/or filling within the vernal pool will be done without causing siltation of the adjacent wetland areas and potential dewatering of the wetland.
31. The detail for the porous pavement only consists of crushed stone and will not provide any water quality treatment of non-point source pollutant from the driveway. The non-point source pollutants of concern are metals and hydrocarbons from the movement of vehicles on the driveway.
32. The proposed standard catch basins with a 24" deep sump and hooded outlet will provide little to no removal of TSS (total suspended solids)
33. No information has been provided regarding the direct impacts to wetland and watercourses within the Old Driftway as well as on the proposed lot area. Additionally, no information has been provided for how much area within the 100' upland review area will be impacted by this proposal.
34. Over forty trees will be removed within the limits of the Old Driftway. Many of them are located very close to the limit of the right of way and thus the excavation to remove the stumps will cause disturbance to the adjacent properties, where no easements exist to allow this work to be done.
35. No plan has been provided which shows how many trees will be removed within the lot area proposed for development.
36. The applicant is proposed a short bioswale along a portion of the western side of the proposed driveway. The detail for the Bioswale shows an underdrain which will be located at some unknow depth below the top of the soil media. Where will the underdrain discharge to?
37. The detail for the Bioswale calls out "permeable soil". No specifications have been provided for this soil mixture.
38. A note on sheet 1 of 6 states that the porous asphalt will be placed immediately after the installation of the box culverts. This means that the porous asphalt will be subject to the movement and weight of construction equipment such as loaded dump trucks, excavators, concrete trucks, lumber trucks, and other vehicles. The movement of such vehicles over the porous asphalt will cause a total failure of the porous asphalt system as porous asphalt does not have the structural integrity to support heavy weights.
39. How will the siltation fence barriers be installed across the vernal pool which is a ponded condition?
40. The construction narrative is overly simplistic for a project which has a high probability of adverse environmental impacts. The narrative does not conform to the form and content for narratives found in the CT DEP 2002 Guidelines for Soil Erosion and Sediment Control.

Drainage Report:

41. No sizing computations have been provided for the sizing of the Bioswale which must be adequate to convey the runoff from a ten-year rainfall event.
42. The watershed mapping does not include off-site areas which currently drain onto the Old Driftway. How will the off-site runoff be handled?
43. No assessment of non-point source pollutant loads from the paved surface of the proposed driveway has been prepared as well as an assessment of how the proposed stormwater management system will reduce the non-point source pollutant loads.

44. Simply providing the Water Quality Volume (WQV) within the stone layer of the porous asphalt and the underground galleries does not meet the requirements of the 2004 Manual which requires that the WQV is "captured and treated". This standard has not been met.
45. Similarly, the Groundwater Recharge Volume (GRV) must be infiltrated to meet this requirement. It has not been demonstrated that the GRV will be infiltrated on the site and thus the GRV is being met.
46. For the Road Basin watershed, the routing analysis for the 24" gallery system calls out a 6" outlet pipe at the top of the gallery system. Where will this outlet pipe discharge to?
47. As it has not been demonstrated that any infiltration will occur under the gallery system, you cannot consider the storage volume below the invert of the 6" outlet pipe as available storage because it will always be full of water, thus the routing analysis is not valid rendering the reductions of the peak rate of runoff invalid.
48. For the Road Basin watershed, the routing analysis for the first 12" gallery system calls out a 6" outlet pipe at the top of the gallery system. Where will this outlet pipe discharge to?
49. As it has not been demonstrated that any infiltration will occur under the gallery system, you cannot consider the storage volume below the invert of the 6" outlet pipe as available storage because it will always be full of water, thus the routing analysis is not valid rendering the reductions of the peak rate of runoff invalid.
50. For the Road Basin watershed, the routing analysis for the second 12" gallery system calls out a 6" outlet pipe at the top of the gallery system. Where will this outlet pipe discharge to?
51. As it has not been demonstrated that any infiltration will occur under the gallery system, you cannot consider the storage volume below the invert of the 6" outlet pipe as available storage because it will always be full of water, thus the routing analysis is not valid rendering the reductions of the peak rate of runoff invalid.
52. For the Wetland Basin watershed, the routing analysis for the first 12" gallery system calls out a 6" outlet pipe at the top of the gallery system. Where will this outlet pipe discharge to?
53. As it has not been demonstrated that any infiltration will occur under the gallery system, you cannot consider the storage volume below the invert of the 6" outlet pipe as available storage because it will always be full of water, thus the routing analysis is not valid rendering the reductions of the peak rate of runoff invalid.
54. For the Wetland Basin watershed, the routing analysis for the second 12" gallery system calls out a 6" outlet pipe at the top of the gallery system. Where will this outlet pipe discharge to?
55. As it has not been demonstrated that any infiltration will occur under the gallery system, you cannot consider the storage volume below the invert of the 6" outlet pipe as available storage because it will always be full of water, thus the routing analysis is not valid rendering the reductions of the peak rate of runoff invalid.
56. For the Wetland Basin watershed, the routing analysis for the aggregate layer under the porous asphalt calls out a broad crested weir 15" above the bottom of the aggregate. Where will this outlet system discharge to?
57. As it has not been demonstrated that any infiltration will occur under the gallery system, you cannot consider the storage volume below the invert of the 6" outlet pipe as available

storage because it will always be full of water, thus the routing analysis is not valid rendering the reductions of the peak rate of runoff invalid.

58. For the North Basin watershed, the routing analysis for the first 12" gallery system calls out a 6" outlet pipe at the top of the gallery system. Where will this outlet pipe discharge to?
59. As it has not been demonstrated that any infiltration will occur under the gallery system, you cannot consider the storage volume below the invert of the 6" outlet pipe as available storage because it will always be full of water, thus the routing analysis is not valid rendering the reductions of the peak rate of runoff invalid.
60. For the North Basin watershed, the routing analysis for the first 24" gallery system calls out a 6" outlet pipe at the top of the gallery system. Where will this outlet pipe discharge to?
61. As it has not been demonstrated that any infiltration will occur under the gallery system, you cannot consider the storage volume below the invert of the 6" outlet pipe as available storage because it will always be full of water, thus the routing analysis is not valid rendering the reductions of the peak rate of runoff invalid.
62. For the North Basin watershed, the routing analysis for the second 24" gallery system calls out a 6" outlet pipe at the top of the gallery system. Where will this outlet pipe discharge to?
63. As it has not been demonstrated that any infiltration will occur under the gallery system, you cannot consider the storage volume below the invert of the 6" outlet pipe as available storage because it will always be full of water, thus the routing analysis is not valid rendering the reductions of the peak rate of runoff invalid.
64. No stormwater analysis was prepared for the potential development of the lot at the end of the Old Driftway.
65. The applicant submitted an alternative of a 100' long bridge in lieu of the currently proposed box culverts. As the entire length of the vernal pool crossing is approximately 140', how will a 100' long bridge eliminates the adverse impact to the vernal pool?
66. How would the eastern abutment for the alternative bridge be installed, if you cannot physically cross the vernal pool?

Please contact my office if you have any questions concerning this information. A copy of my professional CV is attached for submission to the Inland Wetlands Commission.

Respectfully submitted,
Trinkaus Engineering, LLC

Steven D. Trinkaus, PE

Steven D. Trinkaus, PE
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Qualifications	B.S. / Forest Management/1980 University of New Hampshire
Licenses/Certifications	Licensed Professional Engineer- Connecticut (1988)
Professional Societies	American Society of Civil Engineers Connecticut Society of Professional Engineers International Erosion Control Association
Professional Awards	Steve was named an Industry Icon by Storm Water Solutions in July 2015 http://editiondigital.net/publication/?i=263831&p=16 for his work in the Low Impact Development field.

International Experience

South Korea – July 2017, June 2016, April 2015, October 2014, April 2014, October 2013 and June 2013

- Steve was invited by Dr. Leeyoung Kim of Kongju University to make a presentation at the Seoul International Symposium for water cycle held on July 27, 2017 at Seoul City Hall. Steve's presentation was entitled "Sustainable Urban Water Cycle Management, Low Impact Development Strategies for Urban Retrofits". Steve also made a presentation to Master and PhD Engineering students at Kongju University on designing LID treatment systems. He also visited the research office of Land & Housing Institute in Daejeon to inspect recent LID retrofits consisting of Bioretention systems, Bioswales and Permeable Paver systems.
- Steve was invited by Dr. Shin to visit the Korean GI/LID research center in July of 2017. The purpose of the visit was to inspect the LID research systems which had been in place for a year to observe how well they were functioning and also to observe the current research on infiltration of LID systems and evaportranspiration of green roof systems.
- Steve was an invited attendee to the official opening of the Korean GI & LID Research Center recently constructed at the Yangsam Campus of Pusan National University. Steve was a consultant on the design of the research center for Dr. Hyunsuk Shin of Pusan National University.
- Steve was an invited presenter at the World Water Forum by Dr. Hyunsuk Shin of Pusan National University. He presented case studies of GI/LID applications in the United States.
- Steve was invited by Dr. Yong Deok Cho of Kwater to participate in the Water Business Forum at the World Water Forum. Steve presented an overview of his business and expertise in Low Impact Development.

- Steve was invited by Dr. Hong-Ro Lee of Kunsan National University and made a presentation entitled "Understanding Low Impact Development in the Urban-Rural Interface" for the **Ariul Brainstorming Working Group** on April 16, 2015 in Gunsan, South Korea. He also toured portions of the proposed land reclamation area to assess how Low Impact Development strategies could be incorporated to address water quality issues from the proposed agricultural, residential, commercial and industrial land uses for this area.
- Steve was a Contributing Author as well as an Advisory Reviewer for a report prepared by Land & Housing Institute (LHI) entitled " Pyeongtaek Godeok New City Low Impact Development techniques (LID), A study on the introduction of measures (I) " dated: January 2015. This report by LHI also cited the Town of Tolland LID Design Manual as a foreign LID Manual to be used as a reference document.
- Steve was an invited presenter at the International Water Forum 2014 held in conjunction with the Nakong River International Water Week in Gyeongju, South Korea sponsored by DaeGyeong Water Foundation & the International Hydrologic Environmental Society. His presentation focused on urban stormwater and the benefits of LID in these areas.
- Steve was an invited presenter at the IWA Water Reuse & Energy Conference 2014 held in Daegu, South Korea. His presentation was on the regulatory barriers to implementation of LID and how to overcome these barriers. He also participated in a panel discussion with other presenters.
- He also made a presentation at The 1st GI & LID Technical Education Workshop held at Pusan National University on October 22nd on an overview of LID and the application of LID concepts. He was invited by Dr. Kyung Hak Hyun of Land & Housing Institute (LHI) to make two presentations of LID case studies at Sangyung University and at a seminar hosted at LHI along with Kwater.
- Steve met with Jong-Pyo Park, Director and Kyoung-Do Lee, CEO of HECOREA, a water resource consulting firm to discuss LID in dense urban areas. Steve signed a MOU with HECOREA to provide consulting services on LID monitoring approaches and maintenance protocols for the Go-Deok International Planning District near Pyeongtaek, South Korea.
- Steve was invited by Dr. Kyung Hak Hyun of Land & Housing Institute to present at the 2nd Low Impact Development Forum in Daejeon, South Korea on October 31, 2013. He also inspected the site of Asan-tangjeong which is an expansion of residential housing for the city of Asan. This expansion will incorporate LID stormwater strategies.
- Steve was invited to make a presentation of the implementation of LID on commercial sites by Dr. Reeho Kim of the Korea Institute of Construction Technology in Seoul.
- Steve met with Dr. Sangjin Lee of Korean Water and Dr. Woo Young Heo, CEO of LID Solution Co, Ltd to review the initial concept plans for the Eco-Delta City project. Eco-Delta City is a new city located near the Gimhae International Airport of 13 square kilometers and will incorporate LID concepts throughout the new city.
- Steve signed a MOU with Dr. Shin of Pusan National University to provide consulting services for the Smart GI/LID Research Facility at Pusan National University. Steve was asked by Dr. Shin to review the design plans for the GI/LID research facility to be constructed at Pusan National University with a focus on the exterior LID research facilities. He provided a written comprehensive review for consideration by PNU.
- Steve was invited by Dr. Hyunsuk Shin of Pusan National University in South Korea to present a workshop on Low Impact Development on June 24, 2013. The presentation was made to research professors, graduate engineering students and practicing engineers at K-water headquarters in Daejeon, South Korea. He also met with representatives of other agencies tasked with the development of a new city, called Eco-Delta City which will implement LID practices from the ground up and comprises approximately 3,500 acres.

Nanjing, China, September 2018
Steve was invited by the organizing committee for the third China Sponge City International Exchange Conference to make three presentations on LID. The presentations were entitled: "LID: The Good, the Bad and the Ugly", "Permeable Pavement Case Studies" and "The regulatory framework to adopt LID". The conference was held September 27th and 28th in Nanjing, China.

Beijing/Zhenjiang, China – August 2017
Steve was invited to make a presentation entitled "Urban LID in China and South Korea" at the 2017 Second China Sponge City International Exchange Conference held in Beijing on August 16-1, 2017.
He also made a presentation for Dr. Nian She, Director of Smart Sponge City Planning and Construction Research Institute in Zhenjiang, China on modeling approaches for LID treatment systems as well as inspecting some recent LID retrofits currently under construction in Zhenjiang.
Steve also made a presentation at Reschand entitled "LID Case Studies from US" at the request of Yuming Su of Reschand.

Nanjing, China – September 2016
Steve was invited to present at the 2016 First China Sponge City International Exchange Conference held in Nanjing, China. The presentation focused on several case studies of LID systems in the US.

Zhenjiang, China – June 2015
Was retained by Dr. Nian She to design Urban LID retrofits for a 2.5 hectare (6.5 acres) dense residential area in the city of Zhenjiang. The LID retrofits had to fully treat runoff from the existing impervious areas (building roofs, driveways and parking areas) for 65 mm (2.6") of rainfall in 24 hours. The LID systems also had to attenuate the peak rate of runoff for a rainfall event of 150 mm (5.9") rainfall event. A combination of Bioretention systems, and permeable pavers with a filter course and reservoir layer were used to meet these stormwater requirements.

Zhenjiang, China – May 2015
Steve was invited by Professor Nian She of Shenzhen University to make a presentation entitled "Using LID to Attenuate Large Rainfall Events and Reduce Flood Potential" at the 2015 First Sino US Sponge City LID Technology Practice Conference held on May 4-5, 2015 in Zhenjiang, China organized by Zhenjiang Water Supply and Drainage Management Office. (http://www.c-water.com.cn/2015lid/en/index_e.html). In addition to the presentation, field inspections were made of several new LID installations in the city consisting of Bioswales, permeable pavement systems and rainwater harvesting.

Guangzhou, China – December 2012
- Steve was an invited attendee at the 15th Annual Guangzhou Convention of Chinese Scholars in Science and Technology in Guangzhou, China on December 17 – 21, 2012 to present a project narrative on how Low Impact Development and sustainable development can be applied to address water quality issues in urban and rural areas of China to implement sustainability concepts and conservation of resources. He attended with Dr. Jim Su, PE of Golder Associates of Mt. Laurel, New Jersey. While at the convention he met with representatives from Sichuan University, Chang'an University, Guangdong University of Technology, Shenzhen University and the South China Institute of Environmental Sciences, MEP to discuss LID being incorporated into their engineering programs.
- Steve also met Dr. Hongbin Cheng of New China Times Technology which is located in Stellenbosch, South Africa. Steve has signed a three year partnership agreement with New China Times Technology to introduce LID concepts to the west cape area of South Africa.

Taiwan – December 2011

- Steve was invited by Hung Kwai Chen, Director of the Water Resources Planning Institute, Water Resource Agency, Ministry of Economic Affairs of Taiwan and Dr. Yong Lai of the US Bureau of Reclamation to present a 12-hour presentation on Low Impact Development on December 8th and 9th, 2011 in Taichung, Taiwan. The presentation focused on applying LID strategies in both urban and rural environments to address runoff volumes and water quality issues.
- Steve is an invited consultant to a project team headed up by Xiaoyan Zhou, PhD of the Institute for Taiwan Water Environment Research (TIIWE) along with The National Taiwan Ocean University, Hohai Engineering Professor Liao Chaoxuan, Ting Engineering Consultants Co., Ltd and University of Colorado professor Guo Chunyuan to develop a LID demonstration project in New Taipei City along with LID policy strategies to further the use of LID in New Taipei City, Taiwan.

Low Impact Development

- Review of existing municipal land use regulations to identify barriers to the implementation of Low Impact Development.
- Preparation of regulatory language changes to facilitate the adoption of Low Impact Development
- Preparation of design manuals for the implementation of Low Impact Development strategies and processes with an approach that simplifies the design process.
- Application of environmental site design strategies to focus development concepts on land most suitable for development while enhancing the protection of environmentally sensitive areas.
- Design of Low Impact Development treatment systems, such as Bioretention areas, wet/dry swales, vegetated level spreaders, vegetated filter strips, subsurface gravel wetlands, constructed wetlands and/or pond systems, infiltration basins & trenches.
- Hydrologic analyses of current and post-development conditions to assess impacts of proposed development on storm water flows.
- Design of storm water control systems including detention and water quality basins and appropriate planting plans.
- Perform hydrologic modeling of stormwater management systems to demonstrate compliance with regulatory benchmarks.
- Prepare Pollutant loadings analyses to evaluate the effectiveness of stormwater treatment designs in reducing pollutant loads.

Wastewater Management:

- Soil testing to determine suitability of land to support on-site sewage disposal systems for residential and commercial projects and assistance with identifying optimal location for both small and large scale systems.
- Perform necessary calculations to model and design large scale subsurface sewage disposal systems under CT DEEP criteria and State Department of Public Health
- Design of on-site sewage disposal systems in accordance with state and local health codes
- Perform construction oversight of both small and large scale subsurface sewage disposal systems and provide certifications of compliance.

Site Engineering:

- Development feasibility studies.

- Layout concepts to maximize development, while preserving environmentally sensitive areas.
- Design of horizontal and vertical road geometry.
- Preparation of grading, drainage and erosion and sedimentation control plan.
- Use AutoCAD Land Development, Civil3D, HydroCAD and Pondpack software packages.
- Layout and design of sanitary sewers.
- Bid estimates.
- Construction oversight.
- Third party technical reviews.
- Expert testimony.

Professional Committees

- Chairman and primary author of EWRI/ASCE LID Model Ordinance Task Committee (goal is to create a National LID Guidance document to further the adoption of LID)
- Chairman of EWRI/ASCE LID Task Committee on Filter Strips and Bioswales (goal is to review & evaluate literature and design specifications for filter strips and Bioswales and create uniform design standards for different geographical regions)
- Member of EWRI/ASCE LID National Guidelines Task Committee

Published Articles

- **"Easier Said Than Done – Overcoming common errors when installing bioretention systems"** – October 2018 edition of Storm Water Solutions by Scranton Gillette Communications.
- **"Large-scale LID Design for urban expansion in South Korea**" with co-author, Dr. Kyung Hak Hyun of South Korean Land and Housing Institute – Volume 3/Issue 4, August/September 2015 – Worldwater Stormwater Management by the Water Environmental Federation.
- "**Research team leads LID deployment in South Korea**" – Volume 2/Issue 1, Spring 2014 – Worldwater Stormwater Management by the Water Environmental Federation.
- "**Low Impact Development, Sustainable Stormwater Management**" – English article converted to Chinese and published in the Chinese Edition of Global Water Magazine, July 2013.
- "**A Case Study: Southbury Medical Facility and Low Impact Development**" - January/February 2014 issue of Land and Water.
- "**A True Pioneer of Low Impact Development – Member Spotlight**" – January/February 2014 Issue of Erosion Control – Official Journal of the International Erosion Control Association.
- "**Low Impact Development: Changing the Paradigm**" published in the March 2012 edition of PE, The Magazine for Professional Engineers by the National Society of Professional Engineers. Article was also republished in the Spring 2012 addition of EWRI Currents (with permission of NSPE).
- "**Stormwater Retrofit of Existing Detention Basins**" published in the March/April 2012 Land and Water, The Magazine of Natural Resource Management and Restoration with co-author Sean Hayden of the Northwest Conservation District.
- "**Out in the Open; Creating a Stormwater Park in the Heart of a Community**" published in the April 2013 issue of WaterWorld by Pennwell Corporation.
- "**Creating a Stormwater Park in the City Meadow of Norfolk, Connecticut**" published in the July/August 2013 edition of Land and Water

Volunteer Organizations

- President (elected 11/2013) and Connecticut Representative to the Board of Directors for the Northeast Chapter of IECA,

- Alternate member of Inland Wetlands Commission Town of Southbury (served three years),
- Northwest Conservation District Board of Directors (served 18 months)

Software Development

Developed a proprietary software application called **A**ssessment of **P**ollutant **L**oads and **E**valuation of **T**reatment **S**ystems (**A.P.L.E.T.S.**). This application calculates the pollutant loads for current and future land use conditions for the seven most common pollutants in non-point source runoff (TSS, TP, TN, Zn, Cu, TPH, & DIN) for a total of twenty-two different types of land uses. The application then allows the evaluation of the effectiveness of thirty-four Conventional and Low Impact Development treatment systems in removing these pollutants. Up to four treatment systems can be used in a row as a treatment train to achieve water quality goals.

Future Presentations

- Steve will be making a presentation entitled "Preparing a Pollutant Loading Analysis for Land Development Projects at the IECA 2023 Northeast Conference & Expo in Freeport, ME on November 6 & 7, 2023. https://whova.com/web/CY7juKXuhiRddisb8-ubYvO0q6eYEYD-BSGtie9Tr8s%3D/Agenda/

- Steve will be a member of a panel discussion entitled "Bioretention Practices from the Ground Up" at the 2024 IECA Annual Conference in Spokane, WA in February 2024. Steve will also be making a presentations entitled "Preparing a Pollutant Loading Analysis for Land Development Projects" and "The Many Names of Low Impact Development. Why do we need so many?" https://ieca2024.eventscribe.net/agenda.asp?BCFO=FT|P&pfp=Full_Program&fa=&fb=&fc=&fd=&all=1&mode=

Invited Speaker Presentations:

- Steve made a presentation entitled "Making Rainfall Disappear using Bioretention and Permeable Pavement" for a webinar entitled " Groundwater: Making the Invisible Visible" sponsored by the **Philippine-American Academy of Science and Engineering** (PAASE) on March 11, 2002
- Steve made a two-hour presentation via zoom on November 22, 2021, for the Green Infrastructure & Low Impact Development Specialized Graduate School at **Pusan National University** at the request of Dr. Hyun Suk Shin. The topics presented were "Why we need LID" and "Bioretention systems and the design".
- Steve made two presentations at the **IWA Dipcon 2019**; The 19th IWA International Conference on Diffuse Pollution and Eutrophication being held in Jeju, South Korea in October 2019. The presentations were entitled "How Low Impact Development strategies can mitigate high intensity rainfall events" and "If LID is so easy to implement, how come we keep getting it wrong".
- Steve made the following presentations at **St. Andrews University in Scotland** on October 19th , 2017 for the Sustainable Development program. The first presentation is entitled "Improving the environment with Low Impact Sustainable Development Strategies". The second presentation is entitled "Addressing Water Quality and Runoff Issues in a changing weather world".
- Steve was invited by Dr. Jae Ryu of the University of Idaho Water Center to make a presentation entitled "Designing Low Impact Development treatment systems for **Urban & Agricultural**

Environments" at the Annual US-Korea Conference on Science, Technology, and Entrepreneurship being held in Atlanta, Georgia on July 29 to August 1, 2015.

- Steve was invited by the Lake George Waterkeeper to make a presentation entitled "Applying LID Concepts in the Real World" at the 5th Annual Low Impact Development Conference being held in Lake George, NY on May 7, 2015.
- Steve was invited by Dr. Hyunsuk Shin and made a presentation entitled "Real Adaptation and Implementation of GI and LID Technology in USA" at the **World Water Forum** held in Daegu, South Korea on April 14, 2015.
- Steve prepared a presentation for a workshop to civil and environmental engineering students at **Pusan National University** in Busan, South Korea on April 17, 2015, entitled "Designing LID System - What do you need to know and why".
- Steve was invited by Dr. Hong-Ro Lee of Kunsan National University and made a presentation entitled "Understanding Low Impact Development in the Urban-Rural Interface" for the **Ariul Brainstorming Working Group** on April 16, 2015, in Gunsan, South Korea.
- Steve was an invited speaker at the **2014 Low Impact Development Conference** sponsored by the Lake George Waterkeeper and the Fund for Lake George in Lake George, NY on May 1, 2014, for land use professionals and regulatory agencies. He will be presenting case studies focusing on the application of LID concepts for commercial and residential projects.
- Steve was invited by Justin Kenney, Green Infrastructure Coordinator of the Vermont Department of Environmental Conservation Watershed Management Division to present an eight-hour workshop entitled "From Bioretention to Permeable Pavement: An In-depth Introduction to Low Impact Development and Green Stormwater Infrastructure" in Montpelier, Vermont on December 5, 2013.
- Steve was invited to attend and present on the Application of LID Concepts for the Urban Environment and LID Case Studies at the 2nd Low Impact Development, Stormwater Management Forum hosted by the **Land & Housing Institute, Korean Land & Housing Corporation** held in South Korea in on October 31, 2013. He also made presentations at the **Korean Institute of Construction Technology** and **Pusan National University** on various aspects of LID during this time.
- Steve was an invited speaker at the **2013 Low Impact Development Conference** sponsored by the Lake George Waterkeeper and the The Fund for Lake George in Lake George, NY on May 2, 2013 He made a presentation entitled "Barriers to the implementation of LID".
- Steve was an invited presenter at a closed-meeting of the **National Association of Home Builders (NAHB) and the Water Environment Federation (WEF)** on October 10, 2012 focusing on progressive stormwater management. The presentation focused on the application of LID strategies on actual development projects and discussed the hydrologic performance and cost effectiveness of LID design.
- Steve was the invited presenter for a 1-hour long webinar presented by **Stormwater Solutions and Stormwater USA** on Low Impact Development and the Basics of Bioretention held on September 18, 2012. Over 760 individuals watched the webinar.
- Steve was an invited speaker at and **EPA/WEF Stormwater Technical Meeting** on July 18, 2012 in Baltimore, MD to discuss the application of Low Impact Development strategies for actual projects with a focus on cost effectiveness when compared to conventional stormwater management as well as field performance of the LID designs. The purpose of this meeting was to assist EPA in the development of a National Stormwater Rule.
- Site Design using Low Impact Development Strategies and What are the impacts of Impervious Cover on Water Quality and Quantity were presented at a workshop entitled "Challenges and Solutions using Low Impact Development", sponsored by the **Lake George Waterkeeper** in Lake George, NY on May 5, 2011.

- Steve was an invited speaker at the **2012 Low Impact Development Seminar** sponsored by the Lake George Waterkeeper in Lake George, NY on April 25, 2012, for land use professionals and regulatory agencies. He made a presentation entitled "The Hydrologic Benefits of Vegetation in Site Design".

Conference Presentations:

EWRI World Environmental & Water Resources Congress
May 2023:
Stormwater Management for Ground Mounted Solar Arrays in New England
LID in Connecticut – Are Designs Improving?

May 2013:
Municipal LID Regulations - What is important to include to be successful?
Creating a Stormwater Park in the City Meadow of Norfolk, Connecticut

May 2012:
LID Demonstration Project for Seaside Village in Bridgeport, Connecticut
presented one poster entitled "The Incorporation of LID on Affordable Housing Projects

May 2011:
Stormwater Retrofit of Highwood Estates Detention Basins to enhance Water Quality Benefits;
The Farmington River Enhancement Grants: A tale of two towns and the path to Low Impact Development
A Low Impact Development (LID) Model Ordinance and Guidance Document

May 2010:
The Tolland Low Impact Development Design Manual: The Changing Paradigm for Land Development,
The application of Environmental Site Design Processes to design a residential subdivision
A Low Impact Development (LID) Model Ordinance and Guidance Document

May 2009:
The application of Environmental Site Design Processes to design a residential subdivision
and Assessing Pollutant Loads and Evaluation of Treatment Systems to achieve Water Quality Goals for Land Development Projects

ASCE International Low Impact Development Conference
August 2023:
Designing LID Systems: What do you need to know and why?
LID in Connecticut – Are Designing Improving?

August 2018:
If LID is so easy to implement, how come we keep getting in wrong?

August 2016:
Designing LID practices to achieve a zero discharge site.

March 2015:
Korean GI/LID Research Facility
LID Demonstration Projects in Connecticut: The Good and the Bad

August 2013:
A Case Study – Southbury Medical Facility and LID
LID regulations in Connecticut: The Long and Tortured Road
Creating a Stormwater Park in the City Meadow of Norfolk, Connecticut

September 2011:
Stormwater Retrofit of Highwood Estates Detention Basins to enhance Water Quality Benefits;
A Low Impact Development (LID) Model Ordinance and Guidance Document
The Farmington River Enhancement Grants: A tale of three towns and the path to Low Impact Development

April 2010:
The application of Form-Based Zoning and Low Impact Development for the Revitalization of the Town Center of Simsbury, Connecticut
The Integration of Low Impact Development to enhance the application of Smart Code Zoning to create a Gateway District to the Historic Town Center of Tolland, Connecticut

November 2008:
Ahead of the Curve – Tolland, Connecticut adopts Low Impact Development Regulations
Trade Winds Farm – Winchester, Connecticut – How to create a LID subdivision along with the
A poster on Preparing a Pollutant Loading Analysis for Land Development Projects

EWRI/ASCE Watershed Management Conference:
August 2010:
How the application of Environmental Site Design Strategies and Low Impact Development Storm Water Treatment Systems can mimic the Natural Hydrologic Conditions in a watershed and provide a resource for carbon sequestering
The Importance of Assessing Pollutant Loads from Land Development Project and the Design of Effective Storm Water Treatment Systems

ICEA Annual Conference:
February 2023:
Stormwater Management for Ground Mounted Solar Arrays in the Real World

February 2022:
Low Impact Sustainable Development Design Manual for Morris, Connecticut
LID in Connecticut – Are Designs Improving?

February 2021:
Implementing LID Retrofits to Address Nutrient Loads in Lake Pocotopaug in East Hampton, Connecticut
How to Design Stormwater Management for Ground Mounted Solar Array

February 2019:
A Study on Introduction Plan of Low Impact Development Techniques for Widespread Application in South Korea
If LID is so easy to implement, how come we keep getting it wrong?

February 2018:
How Low Impact Development strategies can mitigate high intensity rainfall event
Designing Low Impact Sustainable Development treatment systems for Agricultural Environments

February 2016:
Designing LID Systems:
What do you need to know and why
Construction Site Stormwater: The Ignored Problem
Solving Construction Stormwater Problems in the Field
Developing Effective LID Municipal Regulations
LID Demonstration Projects in Connecticut, a study of Contrasts

February 2015:
Korean GI/LID Research Facility
Applying LID concepts to High Density Residential Developments,
Municipal LID Regulations
Half day workshop entitled: Designing LID Projects
Moderated an Expert Panel on Low Impact Development with Seth Brown, (Water Environment Federation), Bob Adair (Construction Ecoservices, Inc.) and Roger Sutherland (AMEC)

February 2014:
A Case Study – Southbury Medical Facility and LID
The Implementation of the Highland Estates Detention Basin Retrofit water quality impairment in Northfield Lake
Creating Effective Municipal LID Regulations

February 2013:
LID Demonstration Project for Seaside Village in Bridgeport, Connecticut
Creating a Stormwater Park in the City Meadow of Norfolk, Connecticut
Presented a full day LID workshop entitled "Next Generation Low Impact Development and Meet Today's Needs
Presented a half day workshop on Low Impact Development covering Environmental Site Design, Water Quality Issues, Pollutant Loading Analyses, Designing different types of LID treatment systems and actual case studies.

Northeast Chapter IECA Regional Conference
October 2018:
LID in China and South Korea

November 2014:
Construction Site Stormwater: The Ignored Problem
Applying LID Concepts to High Density Residential Development

November 2013:
Steve co-presented an all day workshop on Low Impact Development with Jamie Houle of the University of New Hampshire Stormwater Center

November 2012:
LID Demonstration Projects in Connecticut, A Study of Contrasts,
Environmental Site Design and LID Hydrologic Issues
Siting and Designing LID Treatment Systems with Case Studies

December 2011:
Stormwater Retrofit of Highwood Estates Detention basins to address Water Quality Issues

How the application of Environmental Site Design Strategies can provide a resource for carbon sequestering

December 2010:
Stormwater Pollutant Load Modeling

October 2008:
Trade Winds Farm – Winchester, Connecticut – How to create a LID subdivision
and Preparing a Pollutant Loading Analysis for Land Development Projects

TRIECA Conference:
March 2018:
Addressing Stormwater in China with Low Impact Development
Implement Low Impact Development in South Korea

Mid-Atlantic Chapter of IECA:
July 2017:
Keynote: A Worldwide Perspective on Municipal Stormwater Issues

Southeast Chapter of IECA:
August 2014:
A Case Study – Southbury Medical Facility
Applying LID concepts on undeveloped land and in the urban environment

Korean-American Scientists and Engineers Association:
December 2021:
Implementing LID Retrofits to address Nutrient Loads in Lake Pocotopaug in East Hampton, CT
How to Design Stormwater Management for Ground Mounted Solar Arrays

August 2019:
Designing Low Impact Development Treatment Systems for Agricultural Environments

August 2016:
Designing LID Systems: What do you need to know and why

Regional KSEA Conference
October 2015:
Applying LID strategies to residential and commercial developments to address water quality and runoff volumes

EPA Region 6 Stormwater Conference:
October 2015:
Designing LID systems: What do you need to know and why
Designing LID treatment systems for Urban and Agricultural Environments

July 2014:
The Incorporation of LID on Affordable Housing Projects, A Case Study – Southbury Medical Facility and LID
Municipal LID Regulations

National StormCon Conference:

August 2008:
The Preparation of a Valid Pollutant Loading Analysis

New England Interstate Water Pollution Control Commission:
April 2016:
Designing LID Systems: What do you need to know and why

May 2011:
Stormwater Retrofit of Highwood Estates Detention Basins to enhance Water Quality Benefits

WEFTEC:
September 2015:
Solving Construction Stormwater Problems in the Field

American Water Works Association:
November 2014:
Overview of Low Impact Development
The Application of Low Impact Development Strategies for Land Development Projects

Soil and Water Conservation Society Winter Conference:
February 2013:
The presentation focused on erosion and sedimentation control issues with Low Impact Development treatment systems.

ASABE Watershed Technology Conference:
May 2012 (Bari, Italy):
LID Demonstration Project for Seaside Village in Bridgeport, Connecticut
The creation of a Stormwater Park in the City Meadow of Norfolk, Connecticut

Ohio Stormwater Conference:
June 2012:
Applying Environmental Site Design Strategies to Design a Residential Subdivision
The incorporation of LID on Affordable Housing Projects

Urban Water Management Conference:
May 2009:
Ahead of the Curve – Tolland, CT adopts Low Impact Development Regulations
Preparing a Pollutant Loading Analysis for Land Development Projects

Workshop Presentations:
Halfmoon Seminars:
6.0 hour in-person seminar webinar entitled "Maryland Stormwater Management 2023"

August 2023:
6.0 hour in-person seminar entitled Designing Low Impact Development Practices for Water Quality

June 2023, April 2022, July 2020, February 2020, December 2019, July 2010 to December 2016 :
6.5-hour webinar over two days entitled Low Impact Development

March 2022, November 2022:

Two-hour webinar entitled Bioretention System Design

December 2021, July 2020:
Two-hour webinar entitled How to Design for Stormwater Management for Ground Mounted Solar Arrays

January 2022:
6.5-hour presentation on CT Erosion and Sediment Control

February 2022:
6.5 hour presentation on New York Erosion and Sediment Control

May 2016: Four one hour long webinars
Introduction to Low Impact Development
Bioretention System Design
Applying LID Concepts to Residential Development
LID Case Studies

November 2015:
6.5 hour presentation on Stormwater Management 2015

June 2014:
6.5 hour presentation on Stormwater Regulations in Connecticut

Connecticut Chapter of the American Institute of Architects:
April 2014, September 2010, December 2010:
What is Low Impact Development and how do you apply it to residential projects
Low Impact Development and the Environmental Site Design
LID Stormwater Treatment Systems: Siting, Design and Installation for Maximum Environmental Benefit. What are the aesthetic, financial and maintenance implications?

Connecticut Association of Wetland Scientists:
March 2014
Wastewater to Stormwater; Designing a subsurface flow gravel wetlands

Soil and Water Conservation Society:
March 2014:
Low Impact Development and the Connecticut General Stormwater Permit

ASCE/EWRI:
March 2013:
Changing the Regulatory Framework to Adopt LID Strategies

August 2013:
He co-taught an ASCE Short Course entitled, Introduction to Low Impact Development with Mike Clar at the 2013 Low Impact Development Symposium

May 2011:
eight-hour short courses on Low Impact Development at the EWRI/ASCE 2011 World Environmental & Water Resources Congress in Palm Springs, CA (May 2011). The following topics will be covered: Understanding and Implementing Principles of Low Impact Development, Applying LID Strategies to a

Site, Low Impact Development Hydrologic Considerations, The Regulatory Framework and LID, LID Integrated Management Practices, Erosion and Sedimentation Controls for the Implementation of LID Practices and Case Studies (Applying LID and Regulations).

Oxford, CT Inland Wetlands and Watercourses Commission:
June 2012:
three-hour workshop on Low Impact Development

Connecticut Conference on Natural Resources:
March 2010:
Workshop entitled Using Environmental Site Design Strategies and LID stormwater systems for commercial development

March 2009:
Workshop entitled Using Environmental Site Design Strategies to create a residential subdivision

PennWell Publishing:
February 2011:
Pollutant Loads and the Design of Effective Stormwater Treatment Systems

Connecticut Technology Transfer Center:
Implementing Low Impact Development in Your Community

Housatonic Valley Association:
October 2009:
What towns can do to encourage LID

Community Builders Institute:
May 2009:
Town of Tolland, CT; Low Impact Development Regulations and Design Manual

Town of Greenwich, Old Lyme, Bolton, Farmington, Guilford and Woodbury, CT:
January to December 2009:
Low Impact Development, Environmental Site Design and Water Quality issues and strategies

Connecticut DEEP:
March 2009:
The Need for Pollutant Loading Analyses for Land Development Projects

Northwest Conservation District:
March 2006:
Stormwater management and Low Impact Development

Land Use Leadership Alliance (LULA):
2007, 2010, & 2011:
Low Impact Development and adoption of LID regulations by municipalities

CT Association of Zoning Enforcement Officers:
March 2006:
Low Impact Development

Conferences Attended

- Bioretention Summit: Ask the Researcher – Annapolis, MD (July 2010).
- Workshop at the University of New Hampshire Stormwater Center on permeable pavements. (December 2009).
- Two workshops at the University of New Hampshire Stormwater Center in Durham, NH to observe conventional and Low Impact Development storm water treatment systems in operation. (March 2006 and May 2007).

- 2ND National Low Impact Development Conference – (March 2007).
- Designing Bio/Infiltration Best Management Practices for Stormwater Quality Improvement – University of Wisconsin (November 2005).
- Stormwater Design Institute – Center for Watershed Protection (December 2004).
- Engineering and Planning Approaches/Tools for Conservation Design – University of Wisconsin (December 2003).
- Law for Design Professionals in Connecticut (September 2002).
- On-site Wastewater Facility Design – University of Massachusetts (May 2002).
- The Northeast Onsite Wastewater Short Course & Equipment Exhibition (March 2002).
- Designing On-site Wetland Treatment Systems, University of Wisconsin (October 1999).
- Cost Effective Drainage System Design – University of Wisconsin (November 1997).
- Treatment Wetlands, University of Wisconsin, (Madison, WI) (April 1996).
- Alternative On-site Wastewater Treatment Systems (November 1994).
- Stormwater Quality, University of Wisconsin (June 1994).

LOW IMPACT SUSTAINABLE
LISD
DEVELOPMENT
TRINKAUS ENGINEERING

LOW IMPACT SUSTAINABLE DEVELOPMENT PROJECTS

LID and LISD Regulations and Design Manuals

- **Town of Tolland. CT –** Prepared amendments to Town of Tolland Zoning, Subdivision, Inland Wetland regulations and Road Design Manual to incorporate Low Impact Development standards. Wrote "Design Manual – Low Impact Development – Storm Water Treatment Systems – Performance Requirements – Road Design & Storm Water Management" prepared for the Town of Tolland; October 2007. The Town of Tolland was awarded the Implementation Award by the CT-APA for the LID regulations and design manual in December 2008.

- **Town of Plainville, CT –** Planimetrics was the lead consultant on this project. This office performed the technical regulatory audit to identify barriers to the implementation of LID. These barriers were removed from the regulations to provide for the implementation of LID. A LID design manual was written by Steve Trinkaus to address specific development/stormwater issues for the Town of

Plainville. The regulatory changes and LID manual were adopted by the Planning and Zoning Commission in September 2010. This work was funded by the Farmington River Enhancement Grants from CT DEP.

- **Town of Harwinton, CT –** In conjunction with Planimetrics of Avon, CT, the existing land use regulations were evaluated for barriers to the implementation of Low Impact Development (LID). The project team suggested changes to the land use regulations to encourage the application of LID in the community. Steve Trinkaus defined design processes and strategies to encourage the implementation of LID in the town. This work was funded by the Farmington River Enhancement Grants from CT DEP.

- **Town of East Granby, CT –** Planimetrics was the lead consultant on this project. This office performed the technical regulatory audit to identify barriers to the implementation of LID. These barriers were removed from the regulations to provide for the implementation of LID. Steve Trinkaus prepared a LID Design Manual and LID Educational document for the town working with Gary Haynes, the town planner. This work was funded by the Farmington River Enhancement Grants from CT DEP.

- **Town of Morris, CT** - This office performed the technical regulatory audit to identify barriers to the implementation of LISD. These barriers were removed from the regulations to provide for the implementation of LISD. A LISD design manual was written by Steve Trinkaus to address specific development/stormwater issues for the Town of Morris. The regulatory changes and LISD manual were adopted by the Planning and Zoning Commission in January 2020.

LID Projects

- **Town of Stonington** – Stonington, Connecticut – Perform site investigation consisting of deep test holes and then double ring infiltration tests to determine feasibility of LISD stormwater retrofits to reduce directly connected impervious cover under Town MS4 permit. Design LISD retrofits consisting of Bioretention systems at four locations. Retrofits will result in the disconnection of approximately five acres of impervious area.

- **Victorian Heron, LLC –** Bethel, Connecticut (Affordable Housing) – An existing Victorian house with 6 apartments will be expanded by the addition of a new building containing five more apartment developed under 8-30g. Access and parking areas improved for fire access to site. Stormwater will be handled by the creation of a Bioretention system to address water quality, groundwater recharge volume and peak rate attenuation.

- **Garden Homes Management –** Westport, Connecticut (Affordable Housing) – 19-unit residential apartment building being developed under 8-30g (affordable housing) on 1 acre site directly tributary to West Branch of the Saugatuck River. All construction activities are located outside regulatory setbacks to tidal wetland and 100-year flood boundary. Stormwater management system was designed to fully infiltrate the runoff for all storm events up to and including the 100-year event and reduce pollutant loads to existing levels as wooded parcel.

- **Jelliff Mill, LLC** – New Canaan, Connecticut: Redesigned the site layout to create ten single family residential units on a site overlooking the restored historic Jelliff Mill dam on the Noroton River. The site design uses two sections of permeable pavement and a Bioretention system to infiltrate the runoff from the proposed impervious areas on the site. Due to the presence of sand and gravel soils, all

runoff from the impervious areas will be infiltrated up to and including the 25-yr storm event (5.7" of rain/24 hrs). Fully constructed and occupied.

- **SRG Family, LLC** – Southbury, Connecticut: Design final site grading for 38,000+ sq.ft. Medical services building and approximately 225 parking spaces in order to maintain overland flow patterns. Designed multiple LID treatment systems consisting of bioswales with weirs, Bioretention systems and Permeable Pavement (asphalt) to handle runoff from all impervious area on the project site. The LID treatment systems are capable of fully infiltrating the runoff from a 50-yr storm event will virtually eliminating the discharge of any pollutants to the adjacent wetland area. Currently pending before Inland Wetlands Commission for modification of original approval.

- **Farmington River Watershed Association** – Winchester, Connecticut: Designed stormwater retrofit for existing 1-acre paved parking area at the science building of the Northwest Community College to treat runoff prior to discharge into the Still River. Retrofit consists of forebay and Bioswale to treat runoff from parking area and building roof. Currently at Bid stage.

- **Garden Homes Management –** Southport, Connecticut (Affordable Housing) - Designed site to support 96-unit apartment building and 115 parking spaces. Site contains both freshwater and tidal wetlands. Stormwater management design required to provide Groundwater Recharge Volume & Water Quality Volume in addition to reducing the post-development peak rate of runoff from the 10-yr rainfall event to the pre-development peak rate of runoff from the 2-yr rainfall event. The stormwater management design includes grassed swales, Bioretention systems and underground concrete galleries to meet all of these stormwater requirements. Due to favorable soils on the site, the site will likely be a zero discharge site. Court Approved.

- **Garden Homes Management** – Milford, Connecticut (Affordable Housing) - Designed site to support 257-unit apartment building with 295 parking spaces. Stormwater management design required to provide Groundwater Recharge Volume & Water Quality Volume in addition to reducing the post-development peak rate of runoff from the 25-yr rainfall event to the pre-development peak rate of runoff from the 25-yr rainfall event. The design utilizes a Bioretention system, two underground galleries systems as well as a small detention basin to meet all of the stormwater requirements. Court Approved.

- **Garden Homes Management** – Milford, Connecticut (Affordable Housing) - Designed site to support 21,888 sq.ft. building (three stories) containing 36 studio apartments and 45 parking spaces. Permeable pavement and Bioretention will be used on the site to treat runoff for water quality improvements along with reducing runoff volume from the 1-yr to 100-yr storm event. Construction complete and project occupied.

- **Quickcomm, Inc. –** Newtown, CT**:** Design a parking facility for approximately 140 vehicles to serve an existing corporate use. Runoff from the entire parking facility will be directed to one of seven Bioretention systems. Water quality of the runoff will be improved by the filtration through a specialized soil media and will then infiltrate into the underlying soils. Due the presence of sand and gravel soils, the Bioretention systems will fully infiltrate all runoff up to and including a fifty-year design storm (6.5" of rain/24 hours). Land use approvals obtained in the fall of 2012 and work completed in the fall of 2013.

- **Garden Homes Management** – Fairfield, Connecticut (Affordable Housing) - Designed site to support 32,592 sq.ft. building (three stories) containing 54 studio apartments and 68 parking spaces. Permeable pavement will be used for majority of parking facility. Roof drains will also be directed

to permeable pavement system for water quality improvement. Reservoir layer was sized to fully contain 1.7" of runoff from contributing impervious area. By using a raised underdrain an anaerobic condition will be maintained in the bottom of the reservoir, thus providing denitrification of Total Nitrogen prior to discharge to tidal section of Rooster River. Construction complete and occupied.

- **Garden Homes Management** – Oxford, Connecticut (Affordable Housing) - Design site plan for 126 units of manufactured housing on 41+ acres. Stormwater management is achieved by the use of linear Bioretention systems (Bioswales) along both sides of all interior roads. After treatment in Bioswales, all runoff is directed to standard detention basins to provide peak rate attenuation from the 2-year to 100-year rainfall event. Approved by Inland Wetlands Agency, Denied by Planning and Zoning Commission. Court Approved and under construction.

- **Compton Family Trust** – New Hartford, Connecticut: Design two wet swales systems to convey and filter runoff from road which is currently discharged into West Hill Lake via a paved swale. West Hill Lake has very good water quality and the owner desires this work on this property to become a template for other homeowners on West Hill Lake to prevent adverse impacts of stormwater on the water quality of the lake. Received all necessary land use approvals. Construction to commence in the summer of 2012.

- **Highwood Estates** – Thomaston, Connecticut: Design retrofits for two existing failing detention basins serving existing 50 lot residential subdivision. Retrofits were designed using LID techniques to improve water quality reaching Northfield Brook, an impaired waterway. The larger basin was converted to an Extended Detention Shallow Wetlands to significantly reduce pollutant loads. Due to a limited area, only a forebay and deep pool could be designed for the smaller basin, thus providing measurable improvements in water quality.

- **Farmington River Watershed Association** – Winchester, Connecticut: Design stormwater retrofits consisting of a Bioretention system at the Town of Winchester Wastewater Treatment Plant and a Bioswale at the Town of Winchester Public Drinking Supply facility. These projects are being funded as LID demonstration projects to increase public awareness of LID. The systems were installed in June 2012 and were featured in articles in the Republican American and Register Citizen newspapers.

- **Harwinton Sports Complex** – Harwinton, Connecticut: Redesign stormwater management system for indoor sports facility to use vegetated swales and Bioretention systems. Redesign site grading to eliminate all structural drainage in parking facility. Client saved over $ 40,000 on infrastructure costs by the use of LID treatment systems.

- **Holland Joint Venture, LLC –** Bridgewater, Connecticut: Prepared site plan for 28,000 sq.ft. industrial/light assembly use and 140 parking spaces on 10.94 acres. Utilize Environmental Site Design strategies to preserve large portions of site in natural condition, minimize impacts due to site disturbance, and minimize impacts to wetland/watercourse system by access driveway. Designed five Bioretention systems for storm water management and pollutant removal from all impervious areas.

- **Goodhouse Flooring, LLC** – Newtown, Connecticut: Design site to accommodate 8,800 commercial building and associated driveway and parking areas on 1-acre site. Designed eight Bioretention systems to handle runoff from all impervious surfaces. Analyze and demonstrate that State of Connecticut water quality goals will be achieved for the site design.

- **Trade Winds Farm** – Winchester, Connecticut: 24 lot Open space subdivision on 104+ acres of land. Performed all civil engineering design work for project. Notable feature of project is the preservation of 64+ acres of the site as dedicated Open Space. Many LID strategies such as Environmental Site Design, site fingerprinting, volumetric reduction and water quality improvements were incorporated into site design. Storm water treatment systems utilized vegetated basins, vegetated swales with gravel filter berms, emergent marsh, Bioretention systems, linear vegetated level spreader, and meadow filter strips.

- **Northern View Estates** – Sherman, Connecticut: Five lot subdivision with private road. Design has no direct wetland impacts and only minor intrusions into defined 100' upland review area. Low Impact Development systems, such as vegetated swales and Bioretention were used to treat post-development runoff while maintaining existing drainage patterns to the maximum extent possible.

- **Mill River** – New Milford, Connecticut: Designed 14 lot open space subdivision on 68-acre site. Performed all civil engineering services for project. .LID treatment systems such as a permanent pond/emergent marsh system, linear biofiltration swale, and rain gardens were designed for the site.

- **Byron Avenue Cluster Development** – Ridgefield, Connecticut: Seven lot cluster subdivision on 4 acres. The Stormwater management system consisted of a road with no curbs, grassed swales, and constructed wetland with detention to reduce pollutant loads and increases in the peak rate of runoff.

- **The Estates on the Ridge** – Ridgefield, Connecticut: 32 lot open space subdivision on 152+ acres. Over 80 acres of the site will be preserved as Open Space as part of this project. Stormwater will be treated by the use of rain gardens for roof drains, infiltration trenches for footing drains, emergent marsh systems and vegetated swales for conveyance and treatment of road runoff. Designed over 1 mile of proposed road for project. Designed bottomless culverts over several wetlands crossing to minimize direct impact on wetland areas.

- **G & F Rentals, LLC** – Oxford, Connecticut: By utilizing LID stormwater concepts such as grass filter strips, Bioretention in parking islands, Bioretention for roof drains, and infiltration trenches, a total of 54,000 sq.ft. of commercial office space along with 140+ parking spaces was placed on 10-acre site. The project also restored previously degraded inland wetlands on the site.

- **Dauti Construction – Edona Commons** – Newtown, Connecticut: Designed 23-unit affordable housing plan to minimize impacts on delineated wetland areas. Designed three construction wetland systems for the treatment of storm water runoff for water quality renovation.

- **American Dimensions, LLC** – New Milford, Connecticut: Redesigned the storm water treatment systems for a 7-lot residential subdivision. Rain gardens were designed to handle the runoff from all roof areas and proposed driveways. Each rain garden provided the required Water Quality Volume and Groundwater Recharge Volume as specified in the 2004 Storm Water Quality Manual. A Subsurface Gravel Wetland was designed to treat the full Water Quality Volume for runoff from adjacent roads network which drained through the subject property.

- **Molitero Residence** – New Fairfield, CT: Designed five Bioretention systems to mitigate both volumetric increases of runoff and address water quality issues for large building addition to single family residence on Candlewood Lake. Also designed landscape filter strip above lake edge to filter runoff from up gradient lawn area. Bioretention systems fully infiltrated 5" of rain in 24 hours from Hurricane Irene in August of 2011. Project was featured in newsletter of Candlewood Lake Authority to demonstrate the effectiveness of LID treatment systems in a lake environment.

- **Multiple single-family residences** – Design Bioretention systems to mitigate volumetric increases of runoff due to increases of impervious cover on the lot for large building additions and new construction including the reduction of volumetric increases up to the 25-yr event (5.7" of rain in 24 hours).

- Brookfield DPW Garage/Bethel DPW Garage and Prince of Peace Church (Brookfield) – Working through a grant obtained by the Housatonic Valley Association design stormwater retrofits using both LID and Conventional approaches to reduced non-point source pollutant loads from each site. Brookfield DPW used Bioretention for roof drains, converted online hydrodynamic separators to off-line configuration, off-line ADS water quality unit and vegetated filter strip. Bethel DPW used Bioretention, Bioswale and two off-line ADS water quality units. Prince of Peace Church used four Bioretention system to treat runoff.

Residential Subdivisions

- **Stone Ridge Estates**, 59 lot residential open space subdivision, Ridgefield, Connecticut (Town of Ridgefield)
- **Oak Knoll**, 14 lot open space subdivision, Ridgefield, Connecticut (Mike Forbes)
- **Ward Acres Farm**, 12 lot open space subdivision, Ridgefield, Connecticut (Sturges Brothers, Inc.)
- **Horblitz Subdivision**, 13 lot open space subdivision, Ridgefield, Connecticut (John Sturges)
- **McKeon Subdivision**, 14 lot conventional subdivision, Ridgefield, Connecticut (McKeon Family Trust)
- **High Ridge Estates**, 5 lot subdivision in historic district, Ridgefield, Connecticut (Scandia Construction)
- **Millstone Court**, 7 lot conventional subdivision, Ridgefield, Connecticut (Sturges Brothers, Inc.)
- **Cricklewood Subdivision** – 12 lot conventional subdivision, Redding, Connecticut (Jay Aaron)
- **Spruce Meadows Subdivision** – 12 lot conventional subdivision, Wilton, Connecticut (Piburo Builders)
- **Noroneke Estates** – 12 lot open space subdivision, Ridgefield, Connecticut (John Sturges)
- **Lynch Brook Lane** – 7 lot open space subdivision, Ridgefield, Connecticut (Sturges Brothers, Inc.)
- **Ledgebrook Subdivision** – 27 lot conventional subdivision, Southbury, Connecticut (Conte Family Trust, LLC)
- **Seven Oaks** – 19 lot open space subdivision, Ridgefield, Connecticut (Basha Szymanska)
- **Applewoods** – 29 lot conventional subdivision, Bethel, Connecticut (Gene & Joe Nazzaro)

Third Party Engineering Reviews

- **Groton Open Space Association** – Wal-Mart Super center, Mystic Woods Age Restricted Development, and changes to stormwater standards in the Town of Groton regulations – Groton, Connecticut. Focus of review was on stormwater management plans to address water quality and runoff volumes per the CT DEP 2004 Storm Water Quality Manual as well as the adequacy of the erosion and sedimentation control plan for the proposed development. Project approved with modifications to stormwater management system to address water quality.
- **Town of Tolland Planning & Zoning Commission** – Star Hill Athletic Complex with focus on water quality impacts on existing impaired waterway. Focus was on suggesting changes to stormwater management system to comply with recently adopted Low Impact Development requirements in the Town of Tolland. Project approved and built with modifications to stormwater management system to address water quality of post-development runoff.

- **Town of Newtown Inland Wetlands Commission** – Sherman Woods – 38 lot residential Subdivision with focus on stormwater management and water quality. Review stormwater management plan for compliance with CT DEP 2004 Storm Water Quality Manual to address water quality issues being directed to high quality wetland systems. Also review erosion & sedimentation control plan for adequacy and compliance with CT DEP 2002 Guidelines for Soil Erosion & Sediment Control. Project withdrawn and not resubmitted.
- **Town of Winchester Inland Wetlands Commission** – 30,000 sq.ft. Commercial building with grading and stormwater management within 100-yr flood plain. Plan reviewed focused on impacts to floodway and 100-year flood plain as a result of the placement of significant fill within the flood plain. Project approved with modifications to stormwater management system.
- **Town of Southbury Inland Wetlands Commission** – 35,000 sq.ft. Medical office building proposed in close proximity to inland wetlands & watercourses. Review focus on the adequacy of the stormwater management plan to address water quality and runoff volumes prior to discharge into on-site wetland areas.
- **Friends of Litchfield** – Stop & Shop proposal on existing retail site proposing an increase of impervious area of 1 acre directly draining into an aquifer protection area. Focus of review was on adequacy of stormwater management system to address water quality of runoff and prevent further off-site adverse impacts. Project approved with minor modifications to stormwater management system.
- **The Regency at Ridgefield** – Proposal for contractor's yard on steep slope immediately uphill of existing pond and wetlands. Project proposed removal of over 45,000 cubic yards of earth and rock to facilitate construction of building. Focus of review was on adequacy of erosion control and stormwater management plan to prevent discharges of pollutants to receiving pond. Project denied citing impacts of stormwater on existing pond.
- **Friends of Oswegatchie Hills Nature Preserve, Inc. and Save the River, Save the Hills, Inc**. – Review of preliminary site plan for 840 unit of affordable housing on a 230+ acre site directly adjacent to the Niantic River submitted for a zone change to the Planning and Zoning Commission. Focus of review was on stormwater management and impacts to down gradient wetlands, including the Niantic River. Preliminary site plan approval granted with conditions of approval requiring final plans to address stormwater issues raised by Trinkaus Engineering, LLC.
- **Save the River, Save the Hills, Inc**. – Review of the erosion control plans and stormwater management plans for 90-acre solar array proposed on core forest in Waterford, Connecticut which drained directly to first order cold water fishery streams. Provide written comments to Connecticut Siting Council on behalf of Save the River, Save the Hills (Intervenor). Siting Council denied project citing erosion and stormwater management issues with the plan.
- **Town of Brookfield Inland Wetlands Commission** – The Enclave at Brookfield, an affordable housing project with 187 units on 9.8 acres proposing filling of wetland, locating stormwater basin within inland wetland area and a significant increase of impervious. Review focused on adequacy of stormwater management system to address water quality, runoff volume and peak rate changes due to development in accordance with CT DEP 2004 Storm Water Quality Manual and local land use requirements, review of erosion & sedimentation control plan for compliance with CT DEP 2002 Guidelines for Soil Erosion & Sediment Control and local land use requirements. Offer modifications to plans to address water quality and runoff volume which applicant accepted resulting in approval of project.
- **Town of Brookfield Inland Wetlands Commission and Zoning Commission** – The Renaissance, an affordable housing project with 156 units of 5+ acres adjacent to the Still River replacing existing development on the site. Review focused on adequacy of stormwater management system to address water quality, runoff volume and peak rate changes due to development in accordance with CT DEP 2004 Storm Water Quality Manual and local land use requirements, review of erosion & sedimentation control plan for compliance with CT DEP 2002 Guidelines for Soil Erosion &

Sediment Control and local land use requirements. Additionally, reviewed issues of development in the floodway and 100-year flood plain of the Still River. Provided modifications to plans to address water quality and runoff volume which applicant accepted resulting in approval of project.

- **Town of Brookfield Inland Wetlands Commission** – Brookfield Village – Phase II – 12/23 Station Road proposing commercial space and residential apartments in the "Four Corners of Brookfield"; 70 Stony Hill Road proposing 26 units of affordable housing served by private water and on-site sewage disposal systems; 468 Federal Road – 280-unit affordable housing project. In all applications, the review focused on the probable adverse impacts to inland wetlands and watercourse as well as the adequacy of the erosion control plan and stormwater management plan to treat non-point source pollutants and runoff volumes to minimize adverse impacts to the receiving inland wetlands and watercourses. Original application withdrawn after initial review. Provide sketch of modifications to improve water quality of post-development runoff and minimize direct impacts on inland wetlands. Application not resubmitted at this time.
- **Town of Salisbury Inland Wetlands Commission** – Review of multiple applications for residential development and/or improvements on existing lakes. Issues reviewed were stormwater management to ensure that water quality of post-development runoff was improved prior to entering lake and that erosion control plans were appropriate and adequate to prevent eroded material from reaching the lake or shoreline wetlands.
- **Branford Citizens for Responsible Development** – Review of development plans for Costco Store and other commercial development on 45 acres in Branford, CT. Review focuses on stormwater management issues particularly increased runoff volumes and pollutant loads to be generated by development and whether the proposed stormwater management proposal would adequately address the impacts of these two issues. Both the 2004 CT DEP Storm Water Quality Manual and the Branford Inland Wetland Regulations were used to determine if the plans were compliant with the applicable standards. The erosion control plan was evaluated for compliance with the CT DEP 2002 Guidelines for Soil Erosion & Sediment Control. Project withdrawn and not resubmitted.
- **Save our Shelton** – Review of development plans for large-scale mixed-use development on 120+ acre site on Bridgeport Avenue. Site contained core forest and high-quality wetland/watercourse systems. Review focused on stormwater management issues, particularly increased runoff volumes and pollutant loads to be generated by development and whether the proposed stormwater management proposal would adequately address the impacts of these two issues. Both the 2004 CT DEP Storm Water Quality Manual and the Shelton Inland Wetland and Stormwater Regulations were used to determine if the plans were compliant with the applicable standards. The erosion control plan was evaluated for compliance with the CT DEP 2002 Guidelines for Soil Erosion & Sediment Control. Project still in land use process.
- **Concerned Citizen Group - Roxbury, CT** – Review of proposed residential 12-lot subdivision on steeply sloping site with high quality wetlands and watercourses. Review of all aspects of civil engineering (site layout, grading, erosion/sediment control, stormwater management, stream crossing methodology) using the CT DEP 2004 Storm Water Quality Manual and CT DEP 2002 Guidelines for Soil Erosion and Sediment Control as well as the Town of Roxbury land use regulations and ordinances and evaluate impacts to wetlands and watercourses. Stormwater management system and erosion control plans were found to be inadequate to protect the high-quality wetlands and watercourses from adverse impacts by the Inland Wetlands Commission. Project denied by Inland Wetlands Commission citing findings from the Trinkaus Engineering, LLC review and other consultants.
- **Par Arbors, LLC – Bloomfield, CT –** Review of truck storage and dispatch center on agricultural land with numerous delineated inland wetland/watercourses on the site. Focus of review was on stormwater management and the adverse effects of increased pollutant loads and runoff volumes on wetland. Also review adequacy of erosion control plans. Provided testimony at two public

hearings in front of Inland Wetlands Commission. Application to conduct regulated activities was denied by the commission in July 2019.

- **Town of Brooklyn –** Perform review of stormwater management design with regard to addressing water quality, runoff volume and downstream impacts of a 51-unit condominium project. Provide suggestions to design engineer to implement comments in review letter.
- **Friends of the Lake – Enfield, CT –** Perform third-party civil engineering review of proposed 819,000 square truck warehouse/distribution center with a focus on impacts of increased runoff volumes and water quality from a high-pollutant load site. Prepare written report and provide testimony in front of Planning and Zoning Commission.
- **Newtown Neighbors – Newtown, CT -** Perform third-party civil engineering review of proposed 340,000 square truck warehouse/distribution center with a focus on impacts of increased runoff volumes and water quality from a high-pollutant load site. Prepare written report and provide testimony in front of Planning and Zoning Commission.
- **Town of Mansfield – Mansfield, CT -** Perform third-party civil engineering review of alterations to existing car dealership to allow for the construction three new restaurants and retail space. Review encompassed all civil engineering aspects of plan. Prepare written report for submission to Inland Wetlands Agency.

Ground Mounted Solar Arrays

- **Lodestar Energy – Winchester, CT:** Performed all civil engineering for an eight-acre solar array on 100-acre parcel. This work included the access driveway, two wetland crossings and the design of a stormwater management system for the project. Notable aspects include: All solar panels are considered impervious area, Soil Class for hydrologic model was dropped down by 1 to account for compaction by the movement of vehicles, grass swales with check dams were proposed on the two sides of the array to collect runoff and convey to a constructed wetland basin which met the requirements of the channel protection volume (DEP Manual). All designed comprehensive erosion and sedimentation control plan with multiple phases. The design of the erosion control plans and stormwater management plans exceed the requirements found in the CT DEP 2004 Storm Water Quality Manual and the CT DEP 2002 Guidelines for Soil Erosion and Sediment Control.

- **GRE – Waterford, CT:** Retained by Save-the-River, Save-the-Hills to review the erosion control plan and stormwater management plan on an environmentally sensitive site with runoff being directed to cold-water fishery streams which support native trout populations and drain to Niantic River. Provide civil engineering technical review in pre-filed testimony to Connecticut Siting Council and testify at Siting Council public hearing on application.

- **GRE – East Lyme, CT**: Retained by adjacent property owner to evaluate stormwater impacts from 30 acres ground mounted solar array in legal case for adverse impacts to wetlands and watercourses. Finding showed that runoff from the site was significantly under-estimated by the design professional as the panels were not considered impervious and the changes to soil conditions due to regrading were not considered in the design which resulted in the failure of the stormwater basins during construction as well as after the construction was complete.

- **Other Ground Mounted Solar Projects:** I have also reviewed the erosion and stormwater management plans for ground mounted arrays in Old Lyme, Brooklyn/Canterbury, New Milford, North Stonington, and East Hampton for compliance with the standards found in the CT DEP 2004 Storm Water Quality Manual. In all cases, the stormwater management designs were not in compliance with the DEP Manual.

Commercial Site Plans

- **Cannondale Corporation Headquarters -** Bethel, Connecticut
- **Village Bank Headquarters** – Danbury, Connecticut
- **Newtown Hardware -** Newtown, Connecticut
- **Amicus Healthcare Living Centers –** Rocky Hill, Connecticut
- **Nathan Hale Office Building** – Fairfield, Connecticut
- **Ridgefield Recreation Center** – Ridgefield, Connecticut
- **Silver Spring Country Clubhouse & Pool house renovations -** Ridgefield, Connecticut

Multi-family Projects

- **64 Wooster Street –** 12-unit affordable housing project - Bethel, Connecticut
- **91 Wooster Street –** 13-unit affordable housing project – Bethel, Connecticut
- **49 Taylor Avenue –** 18-unit affordable housing project – Bethel, Connecticut
- **47 Shelly Road –** 9-unit affordable housing project served by private company and on-site sewage disposal systems – Bethel, Connecticut
- **1315 Washington Boulevard –** 180-unit affordable housing project – Stamford, Connecticut

On-site sewage disposal systems

- **Candle Hill Mobile Home Park** – Design Subsurface Sewage Disposal Systems for individual mobile home units. New Milford, Connecticut.
- **Hemlock Hills Camp Resort** – Expansion of campground, design of gravity sanitary sewer and design of subsurface sewage disposal system to handle 4,800 gpd. Litchfield, Connecticut.
- **Old Field Condominiums** – long term inspection & reporting on the condition of multiple subsurface sewage disposal systems serving 40 unit condominium complex with design flows in excess of 15,000 gpd. Southbury, Connecticut.
- **Thorncrest Farm** – Design of on-site sewage disposal system to handle wastewater from milking operation. Goshen, Connecticut.
- **Silver Spring Country Club** – Design of multiple subsurface sewage disposal systems for private country club with average daily flow of 7,000 gpd during peak usage season.
- **Richter Park Golf Course** – Design subsurface sewage disposal system to replace existing failed system for golf club house and year round restaurant with average daily flow of just under 5,000 gpd.
- **Redding Country Club -** Performed soil testing to design a repair to an existing wastewater management system that was experiencing periodic effluent discharges during high use on very marginal soil conditions. Utilized oversized grease tanks for kitchen waste and septic tanks to increase the clarity of the effluent which was discharged by force main to the subsurface sewage disposal system increase the long term functionality of the system. Discharge rate 4,900 gpd.

General Civil Engineering Projects

- **Montgomery Residence**, 10,000 sq.ft. residence with 2.5 acre pond, Redding, Connecticut.
- **Neils Different,** Design 1 acre pond, Ridgefield, Connecticut.

- **Anthony DeLuca**, Design 2 acre pond**,** Redding, Connecticut.
- **Barrett Cram**, Design 0.5 acre pond, Redding, Connecticut.
- **Jay & Eileen Walker Residence**, 27,000 sq.ft. residence, Ridgefield, Connecticut.

Athletic Facilities

- **Kingdome – East Fishkill, NY,** Prepare comprehensive site plan for the construction of an air-supported structure covering 7.96 acres of land area. Project also includes the design of 303 parking spaces, two full size artificial turf baseball fields and three 54-80 artificial turf baseball fields. Designed all site grading and stormwater management facilities to address water quality volume, channel protection volume as well as peak rate attenuation for the 1-yr, 2-yr, 10-yr, 25-yr, 50-yr and 100-yr rainfall events.
- **Tiger Hollow – Ridgefield High School – Phase I**, Design and site artificial turf competition field and track complex. Design access road to provide access to new building containing locker rooms, concessions, media room, and equipment storage areas. Design all utility connections and obtain local permits.
- **Tiger Hollow – Ridgefield High School – Phase II**, Prepare Conceptual Development plan for reconfiguration of existing athletic fields adjacent to the Tiger Hollow stadium.
- **Joel Barlow High School – Redding, CT**, Provide preliminary Master Plan on pro bono basis for reconfiguration and improvement of existing athletic fields at Joel Barlow in response to Falcon Pride stadium proposal. Plan was provided to Region 9 Board of Education for general discussion purposes.