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VIA EMAIL

September 12, 2024

Chairman Tony Capon
Town of Ledyard Planning & Zoning Commission
741 Colonel Ledyard Highway
Ledyard, CT 06339-1511
E-Mail: planner@ledyardct.org

Re: Application PZ#24-8SUP & PZ#24-9CAM – 1737 & 1761 Connecticut Route 12, Gales Ferry Intermodal, LLC, Applicant

Dear Chairman Capon:

Please be advised that this firm represents Gales Ferry Fire District (also known as Gales Ferry District) and Lee Ann Berry with respect to the above proceedings, both individually and as intervenors pursuant to General Statutes § 22a-19. My clients' Verified Notices of Intervention are in the record in this matter as Exhibits #40 and #41. As a graduate of Juliet W. Long Elementary School, Ledyard Middle School, and Ledyard High School, it is my privilege to represent Gales Ferry Fire District and Lee Ann Berry in opposition to this significant land use application in my hometown.

The public hearing before the Town of Ledyard Planning & Zoning Commission ("Commission") opens on September 12, 2024, and concerns the above-captioned applications (collectively, the "Application"), which propose "industrial site preparation of 26 acres" and "extraction of rock and the excavation of surficial material" within a coastal management area located at 1737 and 1761 Connecticut Route 12, Ledyard, Connecticut (collectively, the "Property"). The public hearing on the Application is expected to be held over multiple nights, and therefore this initial letter is intended to highlight several of the most pressing reasons for which the Application should be denied and to address the Applicant's argument regarding the "character of the neighborhood" evaluation criteria.

1. The Application impermissibly modifies the definition of "Major Excavation" to include "the processing of earth product and rock prior to its removal from the Property."

First, the Application seeks a Special Use Permit supposedly to conduct a "Major

Excavation" use on the Property. Section 2.2 of the Town of Ledyard Zoning Regulations ("Regulations") defines "Major Excavation" as "[t]he excavating or relocating or the movement of 300 cubic yards or more of topsoil, sand, gravel, clay, stone or other materials to, on, or from any lot."

The Application proposes conduct far in excess of that definition. The Applicant's own Application Narrative, Exhibit #1-4, states: "[t]he instant application is an application for modification of Special Permit PZ#23-4SUP … to add the following additional special permit use on the Property (as hereinafter defined) – 'Excavation Major' *including 'the processing of earth product and rock prior to its removal from the Property…'*" (Emphasis added.) EX#1-4, at 1. Further, page 8 of the Application Narrative provides not only that "surficial material" will be removed, but also that "[b]edrock will be severed from the land in well-designed and controlled blasts in order to produce 'shot rock' for processing."

"The processing of earth product and rock prior to its removal from the Property" is an extension and a modification of the definition of "Major Excavation" that the Applicant has invented. The Regulations do not authorize such a use as a principal or accessory use in the Industrial Zone, nor is such a use "customarily incidental and subordinate to the principal use." *See* Regulations § 2.2, definition of Accessory Use. Section 3.6.D of the Regulations is clear that "[a]ny use of land, buildings or structures not expressly permitted by these Regulations as a principal use in a particular Zoning District, or allowable as an accessory use to such a principal use, is prohibited in that District." Further, severing bedrock from the land and processing it into aggregate is a "mining" or "quarrying" use, which is not allowed under the Regulations.

Processing of earth product and rock, including severed bedrock, also cannot be considered "manufacturing" under the Regulations. The "manufacturing" definition in Regulations § 2.2 incorporates the definition of "Industrial, Heavy," which is defined as manufacturing "predominately from previously prepared materials, of finished products or parts…." Severed bedrock is not a "prepared material," but rather is a raw material.

The Application should be denied because it impermissibly modifies the definition of "Major Excavation" under the Regulations.

2. The Applicant has distorted the "character of the neighborhood" decision criteria in an attempt to undermine the significance of public comment and to limit the Commission's discretion to deny the Application.

Second, an entire section of the Application Narrative sets forth a misinterpretation and distortion of Connecticut law designed to discredit public comment and to limit the scope of the Commission's broad discretion to approve or deny a Special Use Permit application. *See* Application Narrative, EX#1-4, at 10–12.

The Applicant notes correctly that General Statutes § 8-2(d) provides: "Zoning regulations adopted pursuant to subsection (a) of this section shall not … (10) [b]e applied to

deny any land use application, including for any … special permit … on the basis of (A) a **district's character**, unless such character is expressly articulated in such regulations by clear and explicit physical standards for site work and structures…." The Applicant also notes that "district" as used in that statute refers to "the particular **zoning district** within which the property lies…." (Emphasis added.) EX#1-4, at 11.

As the Commission knows, Special Use Permits must be evaluated with respect to the Special Permit Criteria set forth in Regulations § 11.3.4. Among those criteria are:

> C. that the proposed uses and structures would be in harmony with the appropriate and orderly development of the **Zoning district** in which they are proposed to be situated, and that the use(s) would not be noxious, offensive, or detrimental **to the area** by reason of odors, fumes, dust, noise, vibrations, appearance or other similar reasons;
>
> D. that no adverse effect would result to the property values or historic features of **the immediate neighborhood**;
>
> E. that the character of **the immediate neighborhood** would be preserved in terms of scale, density, intensity of use, existing historic/natural assets/features and architectural design.

(Emphasis added.) Regulations § 11.3.4.

There is a significant difference between the Property's "zoning district," which is Industrial, as opposed to "the area" and the Property's "immediate neighborhood." That distinction eviscerates the Applicant's argument that "the character of the neighborhood has been specifically eliminated as a legitimate permitting consideration…." EX#1-4 at 10. There is no mention of "neighborhood" in General Statutes § 8-2(d)(10). Any constraint imposed by that statute is applicable only to the character of the *zoning district*, not the character of the *neighborhood*.

What is the Property's "immediate neighborhood"? The Property is bounded on the North, East, and South by residential zones. The Applicant was required to send no fewer than seventy-two (72) abutters letters, the majority of which are to residential properties. *See* EX#1-5. At a minimum, the Property's direct abutters constitute its "immediate neighborhood," and that immediate neighborhood includes primarily residential zones.

Accordingly, the Commission must consider whether "the character of the immediate neighborhood would be preserved in terms of scale, density, intensity of use, existing historical/natural assets/features and architectural design." Regulations § 11.3.4(E). The Commission has discretion to deny the Application on the basis that the "intensity of use" of the proposed blasting, quarrying, and excavation would not preserve the character of the immediate

neighborhood. The Commission's discretion to deny the Application on that basis is unaffected by the 2021 amendment to General Statutes § 8-2(d).

3. The Application, if approved, would have serious environmental impacts.

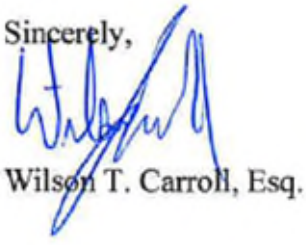
Finally, throughout the course of the public hearing my clients will introduce expert testimony from, and a third-party civil engineering review authored by, professional engineer Steven D. Trinkaus. Mr. Trinkaus has identified critical aspects of the Application that are not in compliance with, among other things, the CT DEEP Storm Water Quality Manual and the CT DEEP Guidelines for Soil Erosion and Sediment Control. Mr. Trinkaus's Third-Party Review of the Application is attached hereto as Exhibit A, and Mr. Trinkaus's CV is attached as Exhibit B.

Mr. Trinkaus's detailed analysis indicates that (1) the Application's deficient stormwater management basins will result in increased pollutant loads being discharged from the Property and ultimately into the Thames River, (2) the Applicant's deficient erosion and sedimentation control plan will result in the discharge of turbid water during the excavation period; (3) the hydrologic data provided in the Applicant's stormwater management report is incorrect, (4) the Applicant's site plans are incomplete, and (5) the design of the Applicant's proposed stormwater management system does not comply with Town of Ledyard Ordinances §§ 300-016 and 300-017.

Section 11.3.4(C) and (G) of the Regulations require the Commission to determine "that the proposed uses … would not be noxious, offensive, or detrimental to the area by reason of odors, fumes, dust, noise, vibrations, appearance, or other similar reasons," and "[i]n accordance with [General Statutes] § 22a-19, that the proposed uses would not cause any unreasonable pollution, impairment or destruction of the air, water and other natural resources of the state." Mr. Trinkaus's testimony and report are directly relevant to that determination.

For the foregoing reasons, we respectfully request that the Commission deny the Application.

Sincerely,



Wilson T. Carroll, Esq.

Enclosures.

EXHIBIT A

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September 10, 2024

Mr. Tony Capon, Chairman
Planning and Zoning Commission
Town of Ledyard
741 Colonel Ledyard Highway
Ledyard, Connecticut 06339

RE: Application PZ11-SUP and PZ#12-CAM Gales Ferry Intermodal, LLC
1737 & 1761 Connecticut Route 12
Gales Ferry, Connecticut

Dear Mr. Capon and Members of the Planning and Zoning Commission,

I have been retained to perform a third-party civil engineering review of the above referenced project. I have reviewed the following plans and documents.

Documents and Plans Reviewed:

a) Zoning Compliance Manual: April 8, 2024,
b) Exhibit #1 – Application & Supporting Documents: 4/9/24,
c) Exhibit #2 – Plan Set, March 28, 2024

Executive Summary:

A. The stormwater management basins and design computations are not in compliance with the CT DEEP 2023 Storm Water Quality Manual and will result in increased pollutant loads being discharged from the site which will reach the Thames River.
B. The erosion and sedimentation control plan are not in compliance with the CT DEEP 2023 Guidelines for Soil Erosion and Sediment Control and will result in the discharge of turbid water during the excavation period.
C. The hydrologic data provided in the Stormwater Management Report has incorrect and missing information.
D. The submitted site plans are missing a lot of information required under the regulations.
E. The design of the Stormwater Management system does not comply with the Town of Ledyard Ordinances Section 300-016 and 300-017.

I have the following comments and concerns for consideration by the Planning and Zoning Commission and your office. Bolded comments are significant issues and concerns.

Exhibit #1 – Application and Supporting Documentation:

1. No comments on this Exhibit

Exhibit #2 – Revised Site Plans:

Sheet C-1:

2. Under Survey Notes, it is stated that wetlands were delineated by JMM Wetland Consulting and other wetlands were taken from mapping by CMA. Which wetlands were delineated by JMM versus those taken from CMA? When were the wetlands by CMA delineated? Were the CMA wetland boundaries inspected in the field? **If not, how do we know the boundaries are valid?**
3. The well depth groundwater data table only shows a singular reading in the three cited wells. To determine the steady state groundwater level, weekly monitoring must be done during the defined wet season of February 1 to May 31. This has not been done which means the groundwater levels could be significantly different than stated on this sheet.

Class A-2 Survey Maps by CME Associates, Inc:

4. No wetland flags as set by a soil scientist are shown on these maps. All wetlands delineated by a soil scientist must be located by a licensed land surveyor and shown on the Class A-2 map of the site.
5. The soil scientists have not signed these map sheets confirming the accuracy of their delineation.

Sheet C-3:

6. A singular 18" mulch sock is shown at the base of the proposed work area. A single erosion control measure is inadequate for a project of this size.
7. No labeling is shown on the plan to define what the heavy dashed lines represent on the plan.

Sheet C-4:

8. Six post-development water quality basins are shown on this plan. None of the contours are labeled for the post-development basins, so it is not possible to determine the storage volumes of the basins.
9. It cannot be determined from the plans what type of stormwater basin is being proposed here and whether the basin design conforms to the CT DEP 2024 Storm Water Quality Manual.
10. **Outlet structures are shown for the six basins, but no elevation information has been provided for them.**
11. **There is no information on the structure and pipe system from the six basins.**
12. Only one of the water quality basins is labeled. **All basins must be labeled.**
13. None of the proposed contours are labeled on this sheet.

Sheet C-5:

14. In Phase I, Water Quality Basin #6 is called out with a bottom of pond at elevation 14.0', however, the existing grade in this basin is 70' to 90'. As Basin #6 is to be used as a temporary sediment basin, how will this be constructed?
15. According to the plan the proposed 20' contour bisects Water Quality Basin #6 which is incorrect with the bottom of the basin at elevation 14'.
16. A similar condition noted in #52 above exists for all other Water Quality Basins. **If this information is in error, it begs the question what else is not correct.**
17. **No emergency spillways are provided for all water quality basins. Emergency spillways are required for all types of stormwater management basins.**
18. No contours are provided for the temporary sediment basins, so the required volumes cannot be verified.
19. Only permanent outlet control structures are called out for the proposed water quality basins and **no information is provided for the outlet structure of the temporary sediment basins, including location of outlet structure and discharge piping.**
20. All the basins will have a ponded depth of 0.1' based upon the invert of the low flow outlet. A depth of 0.1' will not contain the required WQV for the contributing area as discussed above which must be "captured and treated."
21. The low point outlets are either 1.5" or 2" orifices. **Orifices this small are highly prone to clogging by organic debris and even sediments which will severely impact the functionality of the basin.**
22. **Additionally, as proposed the design of basins are not in compliance with the Town of Ledyard Ordinance 300-017, section 2.B.1 which states the following: *"Basins which are designed to drain completely within 12 hours of the end of a rainfall event are preferred. Detention basin designs that result in the presence of permanent standing water, where none existed prior to development, shall not be permitted."***
23. There is no information on the piping system and drainage structures shown on the plan.
24. The stormwater management report discusses hydrodynamic separators, but none are shown on the plan. Are hydrodynamic separators being proposed on the site?
25. Water Bars are shown which appear to direct runoff from active mining areas to the temporary sediment basins. These would be considered temporary diversion swales per the CT DEP 2024 Guidelines for Soil Erosion and Sediment Control. They must be designed as diversion swales. Water bars are commonly used across driveways to break up the flow length on a driveway.
26. **No sizing computations have been provided for the proposed water bars (aka diversion swales).**
27. **None of the proposed contours for the area proposed for mining are labeled. All proposed contours need to be labeled.**

Sheet XS-1:

28. **No volume of the material to be removed is provided on this plan. The volume of the overburden soil as well as the bedrock need to be provided.**
29. Based upon this plan, the maximum cut to the bottom of the proposed quarry is approximately 180'. A cut of this magnitude will cause groundwater within the bedrock which is the source of potable water for nearby homes with individual wells to be pulled toward the quarry as the hydraulic grade line will slope toward the quarry. This condition

can be viewed along any road which has been cut in bedrock. Groundwater which is in the rock is constantly exiting the face of the rock. No information has been provided by the applicant about the potential and significant impact on nearby individual wells.

30. It is noted that the bottom of the quarry will be over excavated so that it can be backfilled with "compacted structural fill material and topsoil overlay." What is the composition of the structural fill material? How thick will the layer of structural fill be? How thick will the topsoil layer be?

Sheet C-6:

31. The 1" = 100' scale of the plan makes it impossible to see many of the erosion control features. It needs to be prepared at a larger scale.
32. A temporary frac. tank is proposed below the temporary sediment basin #1. **It appears that the applicant does not believe the temporary sediment basin will function as intended and thus a backup system is needed**. A frac tank is a large rectangular steel tank with an open top where flocculants are added to runoff to cause fine sediment to clump together and settle out of the water column. Frac tank can range in size from 20,000 gallons to 210,000 gallons. No information has been provided for the size of the proposed frac tank. Flocculants which are used to cause sediment to clump together and settle out are either Aluminum Sulfate, Alum, Ferric Chloride, or Ferric Sulfate.
33. **No elevations are provided for the system to convey water to the frac tank.**
34. According to the detail on sheet C-7 mulch socks are to be installed at the top edge of each bedrock bench. These socks are not shown on the site plan.
35. **There are no provisions to handle runoff from the processing facility on the environmental cap from the crushing, stockpiling and movement of rock material. This operation will create a significant amount of turbid runoff which may overwhelm the perimeter barriers.**
36. **No erosion control measure is called out around the stockpile shown on the plan. This is not in compliance with the 2024 Guidelines from the State of Connecticut DEEP.**

Sheets C-6A:

37. No erosion control measures are shown for the wetland mitigation areas.
38. The excavation for the mitigation area is 1.5' below the existing grade. This would cause groundwater to flow from the existing wetland into the mitigation area and reduce the natural hydroperiod of the natural wetland system by the potential lowering of the groundwater level.
39. A pipe is shown under the railroad tracks, no information is provided for this pipe such as pipe size, slope, and inverts.
40. The monitoring well data shown on this plan has groundwater between 3.01' and 3.55.' The bottom of the wetland mitigation area is shown at elevation 5.0' which means that it is not at or below seasonal high groundwater and will not create adequate hydrologic conditions to support the wetland mitigation area.
41. Based upon a study out of the State of Massachusetts, man-made wetland area were only successful approximately 50% of the time, so it is likely that this system will not turn into a wetland area as proposed.

Sheet C-6B:

42. No erosion control measures are shown for the wetland mitigation areas.
43. The excavation for the mitigation area is 1.5' below the existing grade. This would cause groundwater to flow from the existing wetland into the mitigation area and reduce the natural hydroperiod of the natural wetland system.
44. A pipe is shown under the railroad tracks, no information is provided for this pipe such as pipe size, slope, and inverts.
45. Based upon the "preparation" section of the Implementation Notes, a minimum of 10" of soil is to be placed within the wetland mitigation area which needs to increase the depth of excavation by 10" to approximately 2.5' below the existing grade, thus increasing the potential impacts of lower groundwater tables within the existing wetland system.

Sheet C-7A and C-7B:

46. Plantings are not shown on the plans.

Sheet C-8:

47. How will the mulch sock to be installed at the top of the excavation be anchored into the bedrock as wood/metal stakes cannot be used?
48. The detail for the Typical Sediment Barrier Details calls out either staked hay bales or siltation fence. As hay bales must be set in a trench 4" deep, how will they be installed on bedrock. How will the stakes and the fabric of the siltation fence be installed on bedrock? Where will these two erosion control measures be used on the site?
49. **The detail for the Water Bar is not correct.** The downhill berm of a water bar is not to be permeable. The berm must be designed to prevent runoff from moving down a slope. As noted above, **water bars are not appropriate to direct runoff to temporary sediment basins.** They must be designed as temporary diversion swales per the CT DEP 2002 Guidelines for Soil Erosion and Sediment Control.
50. **The detail of the Basin Outlet Control Structure is generic and does not provide elevations for the various pipes in the structure as well as the overflow system.**
51. **There is no detail for emergency spillways for the water quality basins.**

Sheet C-9:

52. No comment on this plan.

Sheet C-10:

53. No comment on this plan.

Sheet C-11:

54. This plan shows trees to be planted on the finished rock benches. How will trees be planted on bedrock? This plan is unworkable.
55. A note on the plan states that topsoil will be placed on the rock steps. No information is provided about the specifications for the topsoil and how deep the topsoil layer will be.
56. A note states that the sediment basins will be converted to water quality basins. No process has been defined for how this conversion will be done.

57. This plan shows the processing equipment in the lower location. Where and how will it be placed in the actual site for phases beyond the first one.

Sheet C-12:

58. None of the proposed contours are shown on this plan.

Zoning Compliance Manual:

Operational Narrative:

59. No analysis has been provided which shows that the proposed interim cap can support the vehicles expected to track over it. It is stated that actual processing equipment will be placed on crane mats. No information has been provided as to the location and size of the crane mats.
60. It is stated that the erosion control plan is in accordance with the CT DEEP 2023 Guidelines for Soil Erosion and Sediment Control. Based on the comments on Exhibit #2 above, the plans do not comply with the 2023 Guidelines. Additionally, the plans are not in compliance with the CT DEEP 2023 Storm Water Quality Manual. To be eligible for coverage under the CT DEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities, the plans must comply with all applicable aspects of the two DEEP documents.
61. It is stated under Phase 2, Phase 2, Phase 3, and Phase 4 descriptions that any runoff from the overburden removal process will be directed to a temporary sediment basin and allowed to infiltrate in the receiving soils. If the overburden at the bottom of the slope is removed, then the temporary sediment basin will be located on bedrock where no infiltration will occur. Even if the temporary sediment basin is in soil, no infiltration testing has been done to demonstrate that infiltration will occur.
62. Phase 1 is stated to be 9.2 acres, Phase 2 is 9.9 acres. Phase 3 is 9.2 acres. Phase 4 is 9.6 acres which all exceed the limit of 5 acres of disturbance at one time under the CT DEEP General Permit.
63. It is proposed to use water to keep the dust from the mining and excavation operations. However, no estimated volume of water and frequency of application has been provided by the applicant. The proposed temporary sediment basins are not sized to handle the runoff from the dust control applications and thus discharges of this water will occur and run into the downgradient inland wetland areas.

Verdantas Report:

64. It is stated on page 3 of the Verdantas report that “unpaved road were assumed to be maintained with emissions control (i.e. wetting) and/or periodic applications of calcium chloride”, yet there is absolutely no mention as to how much water and how frequently the water must be applicated to areas to control the dust. Excess water from the dust control operations must be treated by one or more of the temporary sediment basins, yet no evidence is provided that this runoff was accounted for in the design of the temporary sediment basins.
65. The use of calcium chloride as a dust control system will have major environmental impacts as stated below.
    a. Drinking water: Large amounts of calcium chloride can contaminate drinking water, making it taste, and unhealthy.

b. Aquatic life: CaCl can be toxic to fish, amphibians, and other aquatic organisms. It can also harm the productivity and diversity of aquatic life, and change the plant community structure in lakes, streams, and wetlands. For example, one study found that low to moderate concentrations of CaCl promoted the growth of invasive and native mollusks, while high concentrations reduced zooplankton and Asian clams.
c. Infrastructure: CaCl can corrode infrastructure, such as aluminum, steel, and concrete. For example, when used as a dust suppressant, CaCl can pit concrete, which can increase maintenance costs.
d. Vegetation: CaCl can harm trees and other vegetation, causing leaf scorch and other injuries. Long-term accumulation of chloride in soil can also reduce soil fertility and permeability, and increase its density and alkalinity. This can negatively impact the soil's chemical properties and its ability to retain water, which are important for plant growth and erosion control.

66. Section 4.0 Soil and Dust Management of the Verdantas report discusses the various wetting measures which can be used to control dust, but again no information is provided as to volumes of water and amounts of calcium chloride which could be used on a daily basis.

Engineered Control Operation and Maintenance Plan:

67. Page 2-1: It is stated that the crane map system will be designed by a professional engineer, however this design information has not been provided as part of this application. This is an omission of data which the commission needs to review as part of the land use process.
68. Page 2-1: It is stated that this site will be under the CT DEEP General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities. As noted above, the General Permit limits site disturbance at one time to five acres and the proposed project will disturb up to 10 acres at a time **so the General Permit is not applicable, and an Individual Permit must be obtained from CT DEEP for the entire site.**
69. Section 3.2: The qualifications of the personnel to perform the inspections are not provided. What qualifications must the inspection personnel have?
70. Section 3-3: It is stated that all documentation will be kept on site for review by DEEP and the Town of Ledyard. **Visits by DEEP to the site are not likely to happen.** All inspection reports must be sent to the DEEP and the Town of Ledyard when they are done.
71. Section 3.4: **The whole idea of using a capped hazardous waste site as a construction staging area is concerning from an environmental perspective.** The best laid plans are often not realistic in the real world. Plans are not always followed by the many contractors on the site, and **this should concern the planning and zoning commission.** What happens if the cap is disturbed, and hazardous material is exposed? If rainfall infiltrates through cracks in the cap, pollutants under the cap can become migratory in the shallow groundwater.
72. Section 4: There very well may be disturbances of the cap based upon the language in this section. It is my professional opinion that **the environmentally capped area**

should not be used for any material processing or storage because of potential disturbances to the cap.

73. It is proposed to use "Dustboss DB-ring" to control dust from the crushing equipment. Based upon the manufacturer's information, there are many different sizes of the DB-rings which can be used and how much water they use in gallons per minute (gpm). Over an eight (8) hour period, here are potential volumes of water which will be used for a 48" ring (7,613 gallons), a 72" ring (9,643 gallons), and a 100" ring (20,808 gallons) from a single crushing machine. If more than one crushing machine is used, the volumes will be larger. There will always be runoff generated by these operations and the plans do not incorporate any provisions for how the runoff will be handled.

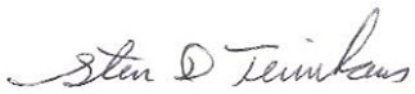
Stormwater Management Report:

74. Section 3.2 states that the finished area will consist of either grass or graded rock areas and according to the applicant will not have any impervious area. **This is not correct**, both surfaces are being placed on top of bedrock. Bedrock does not infiltrate rainfall, so the entire finished area needs to be considered as impervious from a stormwater perspective.
75. Section 3-3 states that the stormwater basins will hold the full water quality volume (WQV). Simply providing a storage volume for the WQV does not comply with the CT DEEP 2023 Storm Water Quality Manual as the full WQV must be "captured and treated". This requirement is not being met by the applicant.
76. Section 4.1.2 provides a list of Runoff Curve Numbers (RCN) for various site conditions.
    a. Dirt and gravel roads which are compacted to permit the movement of construction vehicles will have an RCN of 98 regardless of the soil class.
    b. Newly grassed areas need to be considered as a Fair Condition, not a good condition as it takes three to five years to become a fully established vegetative cover. If the grass is to be placed on a typical 4" layer of topsoil over the bedrock, the soil class must be Class D as there is no infiltration occurring.
    c. For either Brush or Woods to be considered a Good Condition, there must be a dense herbaceous layer and shrub layer under the tree canopy. This will not be found in a well-established forest area as the tree crown is preventing sunlight from reaching the forest floor which is necessary for the herbaceous and shrub layers to be present. Typical mixed hardwood forests in Connecticut are considered as Forest in Fair Condition because of the lack of ground level vegetation.
    d. Based upon my **forty years of experience and my Bachelor of Science in Forest Management** using brush and woods in Fair condition will significantly change the rates of runoff and runoff volumes for both current and future conditions and provide a more accurate determination for the design of the stormwater management systems.
77. Section 4.2 discusses the reductions in the peak rate of runoff for the project. However, this information does not discuss the following important point. At the present time, runoff from the existing conditions is occurring as overland sheet flow through a wooded environment which allows for a significant amount of infiltration to occur into the upper soil layers for all rainfall events. However, future runoff will be occurring as concentrated flow due to the proposed stormwater basins and there will be no infiltration because the solid bedrock is an impermeable surface. Thus, there will be significant increases of runoff volume because of the lack of infiltration.

78. The CT DEEP 2023 Storm Water Quality Manual requires that 1.3" of rainfall be used to determine the Water Quality Volume, not 1". Section 4.3 states that the WQV for the 42.90 acre site is 7,786 cubic feet as there is no impervious coverage. As noted in comment #3 above, because there is no soil underneath the compacted blasted rock or grassed area, there is no infiltration, **thus the entire 42.9 acres of excavated area must be considered impervious for the purpose of determining the WQV.** This would result in a **WQV of 4.415 acre-feet or 192,323 cubic feet** (1.3)(42.90)(0.95)/12) which is more than the value calculated by the applicant. The full WQV must be held below the invert of the lowest outlet pipe in a basin to be considered "captured and treated" per the 2023 Manual. The full WQV must be treated, not simply stored in a basin so the type of basin is critical for treating the WQV.
79. The statement at the end of this section which states "The basins will also allow suspended sediment to be settled and captured before stormwater is discharged" **is not supported by factual analysis demonstrating the removal of sediment.**
80. It is stated that the drainage system leads to two hydrodynamic separators and an infiltration basin, but these systems are not found on the submitted site plans.
81. There is no information for the sizing of the stormwater management conveyance system which demonstrates compliance with the Town of Ledyard requirements.
82. Current Watershed Map: There are no flow paths shown which define the Time of Concentration (Tc) for each watershed under current conditions. **This is a serious omission as the Tc defines the shape of the hydrograph.**
83. Future Watershed Map: There are no flow paths shown which define the Time of Concentration (Tc) for each watershed under future conditions. **This is a serious omission as the Tc defines the shape of the hydrograph.**
84. Appendix D: The Runoff Curve Numbers (RCN) for current and future conditions need to be adjusted as discussed above to accurately reflect the hydrologic conditions on the site. When the RCN values are adjusted to account for the fact that the entire quarried site is impervious, there will be significant increases of runoff volume.
85. It is well documented in professional literature that increased runoff volumes cause adverse impacts to watercourses and flow through wetlands such as erosion of channel banks and deposition of the eroded material in wetlands.
86. Appendix D: **There are no routing analyses for the proposed six "Water Quality Basins" which are required to be part of a stormwater analysis as they define the storage volumes provided in the basin by elevation, the sizes and elevations of the outlet control structures.** Without this information the conclusions in the stormwater management report are not supported by fact.
87. Appendix E: The WQV computations as well as the Water Quality Flow (WQF) computations are invalid as the applicant is claiming the proposed finish site will not have any impervious area which is incorrect as discussed in comment #73 above.
88. Appendix E: Additionally, both WQV and WQF need to be calculated for each separate post-development drainage area which has not been done. Each basin must provide the required treatment for the WQV.
89. Appendix F: The design of Temporary Sediment Basins requires providing a 10-hour residence time for the 10-year rainfall event and it is noted in the calculations that this was taken from a hydrograph. **The applicant has not provided the hydrographs for all storm events so this residence time and volume cannot be verified.**

My current CV is attached for the record. Please contact my office if you have any questions concerning this review.

Respectfully submitted,
Trinkaus Engineering, LLC



Steven D. Trinkaus, PE

EXHIBIT B

Steven D. Trinkaus, PE
Trinkaus Engineering, LLC
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Website: http://www.trinkausengineering.com
Email: strinkaus@earthlink.net
Alternative Email: Trinkaus.korea.lid@gmail.com

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

None at this time.

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 2024:
Steve will be a member of a panel discussions entitled "Bioretention Practices from the Ground Up" and "GSI Around the Country" at the 2024 IECA Annual Conference in Spokane, WA in February 2024. Steve will also be making 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?"

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
November 2023
Preparing a Pollutant Loading Analysis for Land Development Projects

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.

- **Housatonic Valley Association** – Design stormwater retrofits for the Town of Bethel, CT DPW Facility, the Town of Brookfield, CT DPW Facility and the Prince of Peace Church in Brookfield, CT to improve the water quality of the runoff which discharges to the Still River. Bioretention and Bioswales were used along with ADS Water Quality Units, and modifications to existing hydrodynamic separators to improve the pollutant removals.

- **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.