

H.W. Lochner (Lochner) in collaboration with Stahl Sheaffer Engineering (Stahl Sheaffer) has developed this work plan based upon information provided in a request for proposal (RFP) dated July 19, 2018 from Cassadaga Wind. Based upon the proposed site plan included in the RFP, there are approximately 31.7 miles of public roadways planned to be used for the wind farm development.

Task 1 – Road Condition Report Preparation

This task includes the scope of work to prepare a road condition report for the Cassadaga Project in Chautauqua County, NY. The following roads and limits will be included in the study:

| Agency | Road Name | From | To | Length (mi) | Number of Cores | Core Locations |
|----------------------|--------------------------------|---------------------------|-------------------------------|-------------|-----------------|----------------|
| Town of Arkwright | Hall Road | Charlotte Hall Rd | County Route 70 | 1.187 | | |
| Town of Charlotte | Cook Road | County Route 77 | T4 Access/ Lewis Road | 0.683 | | |
| Town of Charlotte | Cassadaga Road | Hall Road | County Route 77 | 2.496 | | |
| Town of Charlotte | North Hill Road | T 20 Access | T3 Access | 0.536 | | |
| Town of Charlotte | Hall Road | T43 Access | Arkwright Hall Road | 3.616 | | |
| Town of Charlotte | East Road | Substation Access | East Creek Road | 1.868 | | |
| Chautauqua County | Farrington Hollow / Erwin Road | T2 Access | Villanova Twp - Plank Road | 3.218 | NA | NA |
| Chautauqua County | Rood Road | T 35 Access | Charlotte - Cassadaga Rd | 0.993 | NA | NA |
| Chautauqua County | Bard/ Cassadaga Road | NY 60 | South Hill Road | 9.927 | NA | NA |
| Town of Cherry Creek | Plank Road | County Route 85 | Villanova Twp - South Hill Rd | 2.173 | | |
| Town of Cherry Creek | Weaver Hill Road | Villanova Plank Road | T23 Access | 0.536 | | |
| Town of Cherry Creek | Boutwell Hill Road | Mill Creek Road | County Rote 85 | 2.858 | | |
| Town of Cherry Creek | Mill Creek Road | Charlotte - East Creek Rd | Boutwell Hill Rd | 0.113 | | |
| Town of Villanova | South Hill Road | Villanova Twp Plank Road | County Route 72 | 1.512 | | |

There will be no geotechnical analysis, upgrade recommendations, or betterment strategy developed for the county roads.

Task 1A – Existing Road Assessment

A roadway surface condition report will be completed for roads that will be utilized for the Cassadaga Wind Project.

- Roadway surface condition survey in accordance with *ASTM Standard Practice for Road and Parking Lots Pavement Condition Index Surveys (D6433-09)* or for gravel roads the *TM 5-626 Unsurfaced Road Maintenance Management from Dept. of the Army (Jan 1995)*.
- Documentation of existing roadway damage by location, type, size, and severity with field data collected with a mobile LiDAR scan with georeferenced imagery.
- Photographs of existing damage or items of concern along the roadway.
- A high-definition video log of the roadway condition at the time of inspection
- Development of an initial Pavement Condition Index (PCI) to rate the overall condition of the roadway surface.

Task 1B – Roadway Geotechnical Investigation

Pavement coring, dynamic cone penetrometer (DCP), and falling weight deflectometer (FWD) for verification of existing strength of roadway. DCP testing in accordance with ASTM D6951 and manufacturers specifications. FWD testing in accordance with ASTM D4694 and ASTM 4695. Locations of cores, DCP's, and FWD's are depicted on the attached map. Traffic control in accordance with state-specific *Manual of Uniform Traffic Control Devices*. Includes:

- place state-specific One-Call Notifications
- Coordinate with road owner to acquire any coring permits, as necessary.
- Prepare pavement core, DCP, and FWD analysis summary reports.

Task 1C – Roadway and Structure Analysis and Report Preparation

- Perform pavement analysis on the selected public access routes.
 - Perform analysis to forecast design life based on excess traffic and operations schedule.
- Perform flexible pavement analysis in accordance with *AASHTO Guide for the Design of Pavement Structures, 1993* and in accordance with *SSE ME-1 Mechanistic-Empirical Pavement Analysis and Design Procedures*.
- Perform gravel road analysis in accordance with *Earth and Aggregate Surfacing Design Guide for Low Volume Roads, USDA EM-7170-16* and in accordance with *SSE ME-1 Mechanistic-Empirical Pavement Analysis and Design Procedures*.
- Prepare recommendations for roadway use.
 - Prepare roadway betterment project scope of work and cost estimate for roadways that are found to be not structurally sufficient.
- Evaluate safety issues and propose mitigations, if necessary

- All existing roadway bridge structures along the route will be documented by location, type, size, and weight restrictions, as applicable. Lochner identified thirteen (13) County/Town owned bridges and culvert structures that will be traversed for erection of the wind turbine generators.

1) Review and assessment of existing bridges to determine disposition during delivery.

Throughout the system there are five bridges of the thirteen structures identified along the project routes as follows:

- County Road 85 (Erwin Rd)
 - 3 sided box founded on pedestals (signs of settlement) #6
- County Road 72 (Bard/Cassadaga Rd)
 - 43'-6" Single Span Adjacent Plank Beam Bridge on Sheet Pile Abutment/Wings (Fabricated Steel Railing – 29'-6" Rail to Rail)
 - 23'-0" Two Span Concrete Slab Bridge founded on Conventional Abutments (Concrete Parapets – 24'-0" Curb to Curb)
 - 42'-0" Single Span Adjacent Plank Beam Bridge on Sheet Pile Abutment/Wings (Fabricated Steel Railing – 29' – 6" Rail to Rail)
 - 22'-0" Single Span Adjacent Plank Beam Bridge on Conventional Concrete

Additionally there are eight culvert structures of the thirteen identified along the project routes as follows:

- County Road 85 (Erwin Rd)
 - 3'x3' R/C Box Culvert with concrete wingwalls
 - 5'x5' R/C Box Culvert with concrete wingwalls (does not cross road – diverts channel around rock outcrop under portion of road)
 - 5'x8' Precast R/C Box Culvert with gabion wingwalls/headwalls
 - 5'x5' R/C Box Culvert with concrete wingwalls (does not cross road – diverts channel around rock outcrop under portion of road)
 - 5'x8' Precast R/C Box Culvert with gabion wingwalls and concrete headwalls
- County Road 72 (Bard/Cassadaga Rd)
 - 6'x8' R/C Box Culvert with concrete wingwalls (runs diagonally through intersection of County Road 72 and County Road 85 near TriVal Farm)
 - 6'x9' R/C Box Culvert with concrete wingwalls (2' or less of fill)
 - 5'x12' R/C Box Culvert with concrete wingwalls/abutment (Fabricated Steel Railing – 29'-0" Rail to Rail)

2) Review and assessment of all existing bridge and culvert structures to determine disposition during delivery. Within the project limits, over 20 culverts of various materials and cover depths are present.

3) Based on the New York legal load and the truck configurations provided to Lochner by innogy, Lochner anticipates calculating the “worst-case” loading that can occur at any of these thirteen structures based on the provided truck configuration. Although, no lateral clearance issues at the structures were noted during the site visit and online research, Lochner will also confirm sufficient lateral clearance for each anticipated load configuration. Lastly, Lochner will also evaluate the need for steel plating for minor pipe culverts and underground utilities, if required

- Prepare final report documenting the roadway management plan (RMP).
- Provide one hard copy of each report and one DVD containing an electronic copy of the report and video to the owner and the RUA agency (if required).

Schedule of Work to be Completed

| Task | Anticipated Completion Date |
|---|------------------------------------|
| LiDAR Scan of Existing Roadway Condition | 9/28/2018 |
| High-Definition Video Log of Existing Roadway Condition | 9/28/2018 |
| Development of PCI to rate initial condition of the roadway | 10/12/2018 |
| Pavement Coring | 9/15/2018 |
| Falling Weight Deflectometer (FWD) | 9/15/2018 |
| Dynamic Cone Penetrometer (DCP) | 9/15/2018 |
| Pavement Analysis | 10/12/2018 |
| Existing Culvert/Structure Plan Research | 10/5/2018 |
| Existing Culvert/Structure Inspection and Evaluation | 10/5/2018 |
| Existing Culvert/Structure Analysis | 10/19/2018 |
| Recommendations for Structure Reinforcement/Repair | 10/26/2018 |
| Recommendations for Roadway Use | 10/26/2018 |
| Final Report Documenting the Roadway Management Plan (RMP) | 10/26/2018 |