Stantec Consulting Services Inc.
30 Park Drive, Topsham ME 04086-1737

December 3, 2021
File: 195602271

Attention: Rod Melanson
Director-Planning, Development & Codes
Town of Topsham
100 Main Street
Topsham, ME 04086

Dear Mr. Melanson,

Reference: Response to Site Design Associates December 1, 2021, Technical Review Comments

Noted below are responses to the technical review comments found in the Site Design Associates technical review letter of December 1, 2021. Our understanding is that final resolution of these comments can come after approval but before plan signature.

A. General

1) Generally, NFPA 1 requires a minimum 20 ft wide emergency access to the site, unless another width is approved by the authority having jurisdiction. We assume the fire chef is satisfied with the 16 ft wide access road proposed. We also noted that the detail for the access drive reflects an aggregate depth of 10”-24”, with no fabric or other structural support. Typically, 12” of subbase gravel and 3” of base gravel would be the minimum expected. We recommend a minimum aggregate depth of 15” be specified, versus the 10” shown, in order to provide further supportfor emergency vehicles.

RESPONSE: Plans will be modified to provide a minimum of 15” of depth.

2) The documents indicate that the operational, permanent access to the site will be from the intersection of Bay Park Drive and Lovers Lane. An improved access matching the width of the internal roads should be clearly shown on the site plans.We recommend a paved apron 50 ft in length be installed at the intersection with Lovers Lane.

RESPONSE: Post construction, the project will be visited a few times a year for mowing and maintenance. The existing entrance from the intersection of Bay Park Drive and Lovers Lane is sufficient for that purpose and no paving is needed.

3) The actual extent of site grading is unclear. Will the entire site be stripped andregraded? The extent of this should be clarified and shown on the drawings.

RESPONSE: The area within the fence line will be grubbed. However, the majority of the site will not have any grading requirements. Areas of anticipated grading are depicted by finish grade contours and spot elevations on sheets C-3 and C-4.

Reference: Response to Site Design Associates December 1, 2021, Technical Review Comments

4) All of the “North” drawings are missing the plan information in the lower leftcorner above the match line.

RESPONSE: Plans will be adjusted to depict all project areas in the vicinity of the match line.

5) Given the scale of the project, the planning board should consider requiring that theapplicant retain a third party inspector in accordance with DEP protocol, similar to the BTWD, Highland Green, and MSAD 75 high school projects.

RESPONSE: The project anticipates a third party inspector will be required by MDEP.

6) The Vegetation Management Plan suggests that herbicide use is an option for management. Section 225-60.19.E.3. of the code appears to prohibit the use ofherbicides.

RESPONSE: No herbicides will be used on site.

7) We have attached a copy of the DEP Stormwater Application Checklist. Thisshould be reviewed and the plans and documentation updated as necessary.

RESPONSE: Plans and documentation will be updated as necessary.

8) The stormwater management plan indicates that because the cover type characteristics within the project area will not change significantly, there will be nosignificant change in the stormwater runoff rate from the site. Further, the stormwater report states that “there will most likely not be an increase” in the stormwater runoff rate at the property line. Until the comments in B.4) below are addressed, it is not possible for us to form an opinion as to the validity of these conclusions.

RESPONSE: See response to B.4, below.

9) Can a calculation be provided which documents how the impervious and developedareas of the site are calculated, i.e. what components are included, such as, drives, pads, posts, lawn etc.?

RESPONSE: We will provide an itemized spreadsheet showing the areas that were calculated.

10) The post construction I and M plan should be supplemented/revised per DEPChapter 500 App.B.2.

RESPONSE: We will revise the post construction I&M plan.

11) Buffer inspection requirements should be included in the post construction I and Mplan.

RESPONSE: We will revise the post construction I&M plan.

12) An inspection form for each BMP should be provided as noted on the attachedcheck list.

RESPONSE: We will revise the BMP inspection forms.

13) Post construction documentation and recertification requirements should be addedto the I and M plan.

RESPONSE: We will revise the post construction I&M plan.

Reference: **Response to Site Design Associates December 1, 2021, Technical Review Comments**

B. Drawings

1) Drawings C-X, C-1, and C-2:

a. A relatively small laydown area is shown on the site plan (13,000 s.f. +/-). Based on our experience with similar projects, this will be insufficient for the placement of office trailers, structural material storage and assembly, soil material stockpiles, and employee parking for a project of this size. We were recently involved in a much smaller project (approximately 1/4 the size) with a laydown area of 42,000 sfwhich proved to be very limiting during construction.

RESPONSE: The current laydown is 17,000sf+/- and adequate for project purposes.

b. We recommend that a paved apron be constructed at the intersection of the temporary access road with Middlesex Road to minimize damage to Middlesex Road due to construction traffic. The apron should be 50 ft long, and have radii sufficient to accommodate ingress and egress for the largest design vehicle whichwill utilize the access road. (We assume a WB-50 or WB-62)

RESPONSE: A paved apron will be included for the entrance to the temporary access road.

c. Will there need to be any upgrades to existing utility poles or wires along LoversLane?

RESPONSE: Yes, CMP will rebuild the distribution line from Lovers Lane to Route 24.

d. The project information does not include any new developed area as defined underDEP Chapter 500. It appears new developed area will be created. Can this be clarified?

RESPONSE: The new developed area is the same as the impervious area. We are not creating any new lawn spaces as part of this project. The meadow area within the panels and the buffers is not considered developed area therefore the developed area is the same as the new impervious area.

e. Why are 7,195 s.f. of wetlands being cleared southerly of the project site?

RESPONSE: This clearing is to avoid shading of the solar panels.

f. Turnaround dimensions and radii should be shown.

RESPONSE: Turnaround dimensions/radii will be depicted on the plans.

g. Signage, including construction entrance signs and a stop sign, should be shown atForeside Road.

RESPONSE: This level of detail will be shown on construction plans.

2) Drawings C-3 and C-4:

a. More spot grades should be shown along the access roads and at the turnarounds.

RESPONSE: Additional spot grades will be added to the access road and turnarounds.

Reference: Response to Site Design Associates December 1, 2021, Technical Review Comments

b. Will any culverts be required at the low spots in the road?

RESPONSE: Culverts should not be required. The majority of the project area is effectively flat and concentrated flows will not be created. There is a small portion of the project in the southeastern area of the solar array that has existing terrain that directs water towards the proposed access road. The access road in this area is designed above existing grade and will create a natural ditch that directs water towards the nearby wetland. This is where surface water from this site area is naturally directed.

c. The details reflect a "Rock Sandwich". The locations where this will beconstructed should be identified.

RESPONSE: The rock sandwich is depicted as a hatch on all "southern" plan sheets. It is labeled on sheet C-2.

d. More existing and proposed contour labels should be added.

RESPONSE: More existing and proposed contour labels will be added.

e. Revegetation requirements and limits should be noted.

RESPONSE: The entire site, except access roads, will be revegetated.

f. Note 1, drawing C-3, indicates that excess material may be spread as necessary. What type of excess material and where would it be spread? It seems the intent ofthe plans is that all areas other than the road, inverter pads, and panel foundations are to be revegetated.

RESPONSE: Excess material could include topsoil from grubbing activities or additional material from the limited amount of regrading efforts required for solar foundation installation. All areas other than the road, inverter pads, and foundations will be revegetated.

g. Note 2 states that temporary widening of gravel access roads may occur to accommodate all construction vehicles. Can the required width be determined now? It seems a width of 16 ft should be sufficient to accommodate constructionvehicles.

RESPONSE: Temporary widening will be identified on the plans.

h. Test pit logs for the test pits noted on the drawings should be provided.

RESPONSE: Test pit logs will be provided.

3) Drawing C-5 and C-6:

a. The I and M notes should include the parties responsible for inspection andmaintenance.

RESPONSE: Responsible parties will be included on the I and M notes.

b. A construction schedule should be included on the drawing.

RESPONSE: The anticipated construction schedule is included Table 3 in the application.

Reference: Response to Site Design Associates December 1, 2021, Technical Review Comments

c. The I and M notes should be supplemented with additional information fromChapter 500, App. B, as applicable.

RESPONSE: We will revise the Erosion and Sedimentation Control Plan.

d. Chapter 500, App. C, items 6 and 7 should be added to the drawing.

RESPONSE: We will revise the Erosion and Sedimentation Control Plan.

e. The Erosion Control Notes should be supplemented with to be consistent withChapter 500, App. A, as applicable

RESPONSE: We will revise the Erosion and Sedimentation Control Plan.

f. Erosion Control Note L. should be expanded to define permanent and dormantseeding.

RESPONSE: We will revise the Erosion and Sedimentation Control Plan.

g. The temporary ditch stabilization referenced in Erosion Control Note V. should beshown on the plan.

RESPONSE: We don't anticipate needing ditch stabilization beyond loam and seed. If additional ditch stabilization is needed due to field conditions the locations will be determined in the field by the contractor.

h. Erosion Control Note Y. should be expanded to define the referenced standards.

RESPONSE: We will revise the Erosion and Sedimentation Control Plan.

i. What is the purpose of Erosion Control Note Z?

RESPONSE: Note Z will be removed.

j. Erosion control measures should be shown along the temporary access road.

RESPONSE: Erosion control measures will be depicted on the plans.

4) Drawing C-7, C-8, and C-9:

a. Contours should be labeled to provide information relative to the direction of surface water runoff. The points where stormwater runoff will leave the propertyshould be shown.

RESPONSE: Additional contour labels will be added. Stormwater runoff points will be added.

b. Soil boundaries and types should be darker so this information is legible.

RESPONSE: Soil information will be darkened.

c. Show the extent of each soil type in each watershed.

RESPONSE: We will revise the drainage plans.

Reference: Response to Site Design Associates December 1, 2021, Technical Review Comments

d. The purpose of drawing C-9 is to show what areas are being treated and how. Toclarify this drawing, the arrays should be lighter, and a larger scale provided, to show existing and proposed contours, and how the buffers meet the chapter 500 standards.

RESPONSE: The drawing will be revised to lighten the array and increase the scale.

5) Drawing D-1:

a. As previously noted, the minim thickness for the gravel access road should berevised.

RESPONSE: Minimum thickness of aggregate will be revised.

b. An MDOT specification should be provided for the common borrow material.

RESPONSE: An MDOT specification will be provided for common borrow material.

c. The typical road section should show the width, cross slope, side slopes, and backslopes.

RESPONSE: A typical road section will be revised/added to depict width, cross slope, side slopes, and back slopes.

d. Note 2 of the stone berm level spreader detail should be revised and thespecification in Table 5.4 of the BMP manual shown on the drawings.

RESPONSE: The stone bermed level lip spreader detail will be revised.

e. Section 5.4 of the BMP manual requires a minimum length of 20 ft for a stoneberm level spreader.

RESPONSE: Section 5.4 describes ditch turnout buffers. We have submitted and received approval from the DEP for countless buffers with stone bermed level lip spreaders (section 5.2) that have been less than 20'.

f. If the stone berm detail is referring to BL1, the relevant elevations should beshown.

RESPONSE: Typically, we don't provide this level of information in either the permit or construction level design. The finish grade will be determined based on the field conditions and typical detail. The typical detail covers all circumstances.

g. The slope application for erosion control mesh should be shown in plan view whererequired. The mesh should be specified.

RESPONSE: We don't anticipate needing erosion control mesh on site. If erosion control mesh is needed due to field conditions the locations will be determined in the field by the contractor.

Reference: **Response to Site Design Associates December 1, 2021, Technical Review Comments**

h. A typical section and a specification for the “meadow” to be established should beprovided.

RESPONSE: See permanent seeding note 1 on the Erosion and Sedimentation Control plan for the specified seed mix for the meadow. Vegetation cross section is typically not provided in either the permit or construction level plans.

i. A typical section and specifications for the gravel road restoration should beprovided.

RESPONSE: A detail for the gravel road restoration will be provided.

Regards,

Stantec Consulting Services Inc.

Brooke Barnes
Principal
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Fax: 207 729 2715
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Scarborough, ME 04074

T 207.879.1930
TRCcompanies.com

December 3, 2021

Mr. Rod Melanson
Planning Director, Town of Topsham

Sent via email to: rmelanson@topshammaine.com

Re: Hydrogeologic Opinion Regarding Groundwater Levels
Summit Ridge Energy
Topsham Solar Project
398 Foreside Road, Topsham, Maine

TRC Project Number: 410647.0TOP.0000

Dear Mr. Melanson:

TRC Companies, Inc. (TRC) has been requested by Summit Ridge Energy to provide the following hydrogeologic opinion regarding groundwater levels in the area of the proposed Topsham Solar Project.

Objective:

To provide a hydrogeologic opinion on whether the construction and operation of the Topsham Solar Project will affect groundwater levels in the area of the Bay Park neighborhood, using information available in the public record.

Background:

Water infiltration issues have existed since the 1980's in the Bay Park neighborhood to the west of the Project area as a result of shallow groundwater and a relatively flat hydraulic gradient.

The Topsham Planning Board has received comments from residents in the Bay Park neighborhood expressing concern that the development of the Topsham Solar Project, and conversion of the forested area to meadow, will exacerbate these infiltration issues.

The Planning Board has requested that a hydrogeologic opinion be submitted as part of the local permitting process to address the resident's concerns.

The Topsham Solar Project is located directly to the east of the Bay Park neighborhood.

Available Information and Discussion:

Geotechnical Logs (Sebago Technics, Inc, 2021)

In November of 2021, thirteen geotechnical test pits were installed to a depth between 36-inches to 45-inches within the Project area to support permitting and design. Test pits are numbered starting in the northwest and continuing to the southeast.

The results indicate generally sandy soil conditions and a groundwater level between 0-inches (surface) and greater than 44-inches. Where encountered, groundwater resided in fine and medium sand. In general, groundwater is shallower in the southern portion of the Project area. A groundwater confining layer (aquitard or aquiclude, etc.) does not appear to have been encountered.

The hydraulic conductivity of fine to medium sands, ranging from 2 to 20 feet per day, should allow for groundwater movement across the area following the hydraulic gradient.

In addition, the hydraulic conductivity for fine to medium sands was used to calibrate the groundwater model developed by Abbot for the Bay Park nationhood (Abbot, 2009). A hydraulic conductivity ranging from 2 to 20 feet per day is consistent with the range of hydraulic conductivities for fine to medium sand found in the literature (Domineco & Schwartz, 1990).

Geotechnical logs are attached as **Attachment 1**.

Array Technologies Rack System Cut Sheet

The racking system selected for this Project is Array Technologies' DuraTrack® HZ v3. This system uses driven post to provide support to the array.

While the detailed structural design has not been completed at this phase of the Project, TRC's experience is that typical driven posts of this type are sunk eight feet into the ground, on average, and are an approximately 6-inches by 4-inches I-beam in size. Posts are likely to be installed every 10 to 15-feet horizontally to support the panels.

Due the shallow depth of groundwater, the posts installed for this project will be driven into the groundwater table.

Given the hydraulic conductivity of site soils (2 to 20 ft/day) groundwater flow impediments are not anticipated to occur in the area of the Project due to the 10 to 15-foot spacing of posts.

The Array Technologies Rack System Cut Sheet is attached as **Attachment 2**.

Report of Groundwater Model Results, Bay Park Drainage Improvements Study, Topsham, Maine (Abbott Engineering, 2009)

As part of Snowden Consulting Engineers, Inc 2009 proposed Bay Park Groundwater Project, Abbott Engineering developed a groundwater model for the area for four scenarios:

1. Static conditions
2. Long-term lowering of the Town Ponds by 4 feet
3. New underdrains
4. Combined pond lowering and new underdrains

For the purposes of this letter, Scenario #2 is relevant for discussion as the proposed underdrains have not been installed; however, a drainage control structure was installed at the adjacent ponds to depress surface water levels by 4-feet and maintain them at that elevation.

Figure 3 (below, with approximate solar array outlined in green) of the Abbott Engineering report depicts the simulated water table with the Town ponds lowered by 4-feet (current configuration).

The model predicted that depressing the ponds by 4-feet will shift the groundwater gradient from flowing to the west or northwest (from the Project area towards or adjacent to the neighborhood) to the north or northeast (the Project area would be cross- to down gradient of the neighborhood). Based on a comparison to the calibrated model runs with no depression of the ponds (Figure 2 of Attachment 3), the model simulations showed that depressing the water levels in the ponds should have lowered water levels in the neighborhood by 1 to 2 feet.

A copy of Abbott Engineering's report is included as **Attachment 3**.

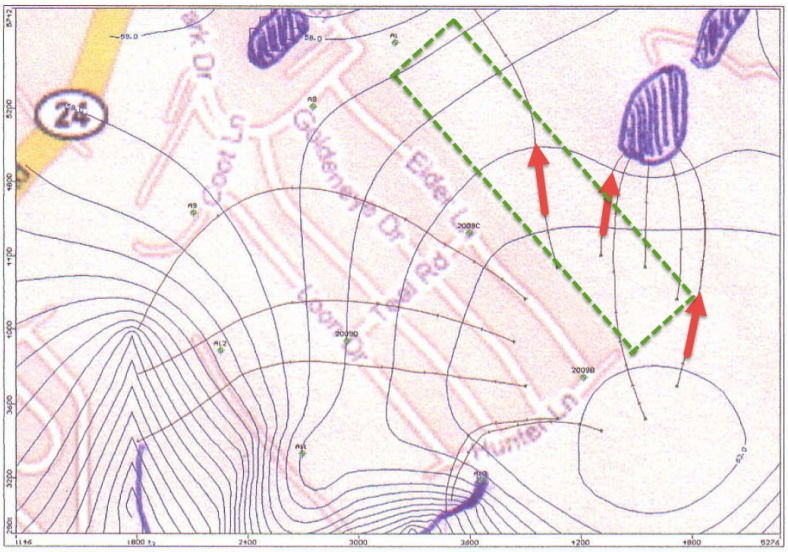

Figure 3

Simulated Water Table with Town Ponds lowered 4 feet.
1 Foot Contours

Bay Park Groundwater Project, Town Ponds Water Level Control Structure Design Plans (Snowden Consulting Engineers, 2009)

As part of Snowden Consulting Engineers' plan to address the water infiltration issues in the Bay Park neighborhood, they recommended that the two Town ponds be lowered by 4-feet to influence the local hydraulic gradient by depressing the potentiometric surface.

According to the Topsham Solid Waste Facility Manager, around 2009 the Town hired Crooker Construction to install a manhole structure approximately 16 feet deep in the pond, with piping that connects the two ponds. There is a baffle in the manhole structure that sets the water elevation of the ponds at the lower water level. When pond levels rise above the baffle elevation, that water is discharged via a gravity pipe to the nearby wooded area. As such, the water levels in these two ponds are controlled and maintained as recommended by Snowden Consulting Engineers.

A copy of Snowden Consulting Engineer's design plans for this structure is included as **Attachment 4**.

Hydrogeologic Opinion:

It is TRC's opinion that the construction and operation of the Topsham Solar Project is unlikely to significantly alter groundwater levels from current conditions in the area of the Bay Park neighborhood based on:

- The Town of Topsham's confirmation that the two ponds are maintained at 4-feet lower in elevation than prior to 2009;
- Abbott Engineering's groundwater model indicating that the local hydraulic gradient will flow from the Project area to the north/northeast (away from the Bay Park neighborhood) if the two ponds water level is depressed; and
- The additional information described in the sections above.

Please note, that to confirm this opinion and assess possible changes in groundwater elevation due to evapotranspiration loss from conversion of the forested area to meadow, additional data collection, modeling and field testing are needed.

Disclaimer:

This opinion is solely based on the limited information available in the public record. While TRC does not believe there to be inaccuracies in the information collected and opinions provided by others, we have not independently verified these results and assumptions for accuracy or completeness. No molding or field testing has been completed by TRC for this Project to further assess current conditions.

Sincerely,

TRC

Charles D. Springer, PG
Maine Licensed Geologist (GE# 524)
Northern New England Practice Leader
Engineering, Remediation, & Construction

Mark Bergeron, PE
Maine Professional Engineer (PE #9424)
Environmental Operations Leader – Maine
Planning, Permitting, & Licensing

CC: Ben Aparo, Summit Ridge Energy

Attachments:

1. Geotechnical Logs (Sebago technics, Inc, 2021)
2. Array Technologies Rack System Cut Sheet
3. Report of Groundwater Model Results, Bay Park Drainage Improvements Study, Topsham, Maine (Abbott Engineering, 2009)
4. Bay Park Groundwater Project, Town Ponds water level control structure Design Plans (Snowden Consulting Engineers, 2009)

FORM E Rev. 07/11

SOIL CONDITIONS SUMMARY TABLE

SUMMARY LOG OF SUBSURFACE EXPLORATIONS AT PROJECT SITES

Project Name:	Applicant Name:	Project Location (municipality):
TOPSHAM SOLAR PROJECT	MAINE DG HOLDCO, LLC	TOPSHAM

Lot No.	Exploration Symbol *(TP 1, B 2, etc.)*	☒ if at SSWD Field	Description of subsurface materials by: ● Soil profile/condition *(if by S.E.),* ● Soil series name *(if by C.S.S.),* or by ● Geologic unit *(if by C.G.)*	Depths to *(inches)*: Redoximorphic Features	Bedrock	Hydraulically Restrictive Layer	Limit of Exploration	Ground Surface Slope (%)	Ground Surface Elevation
N/A	TP-1	☐	ADAMS MEDIUM SAND	--	--		42	0-3	
N/A	TP-2	☐	ADAMS LOAMY SAND	--	--	--	40	0-3	
N/A	TP-3	☐	ADAMS LOAMY SAND	--	--	--	42	0-3	
N/A	TP-4	☐	ADAMS LOAMY SAND	--	--	--	42	0-3	
N/A	TP-5	☐	ADAMS LOAMY SAND	--	--	--	44	0-3	
N/A	TP-6	☐	CROGHAN SANDY LOAM	32	--	--	40	0-3	
N/A	TP-7	☐	NAUMBURG SANDY LOAM	14	--	--	44	0-3	
N/A	TP-8	☐	SWANTON FINE SAND	16	--	24	36	0-3	
N/A	TP-9	☐	ADAMS LOAMY SAND	--	--	--	44	0-3	
N/A	TP-10	☐	CROGHAN LOAMY SAND	36	--	--	45	0-3	
N/A	TP-11	☐	NAUMBURG FINE SAND	10	--	--	40	0-3	
N/A	TP-12	☐	NAUMBURG FINE SAND	20	--	--	36	0-3	
N/A	TP-13	☐	NAUMBURG FINE SAND	14	--	--	36	0-3	
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INVESTIGATOR INFORMATION AND SIGNATURE

Signature	Date
Anna K. Biddle	11/1/21
Name Printed	**Cert/Lic/Reg. #**
Anna K. Biddle	639

Qualification: ☐ Licensed Site Evaluator ☒ Certified Soil Scientist ☐ Certified Geologist ☐ Other:

STATE OF MAINE ANNA K. BIDDLE NO. 639 LICENSED SOIL SCIENTIST

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FORM F 21682-04

SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
TOPSHAM SOLAR PROJECT	MAINE DG HOLDCO, LLC	TOPSHAM

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-1** ■ Test Pit ☐ Boring

0-1 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistence	Color	Redox
		10YR 3/2	
		VERY	
SANDY		DARK	NONE
LOAM	FRIABLE	GRAYISH	OBSERVED
FILL		BROWN	
MEDIUM		2.5Y 5/4	
SAND		LT. OL. BROWN	NONE
			OBSERVED
LOAMY		10YR 4/3	
SAND		BROWN	
LIMIT OF EXCAVATION = 42"			

☐ hydric ■ non-hydric | Slope % 0-3 | Limiting factor >42" | ☐ ground water ☐ restrictive layer ☐ bedrock

L.S.S Soil Series / phase name: ADAMS | SED Drainage Class | A Hydrologic Group

L.S.E. Soil Classification: _____ Profile | _____ Drainage Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-2** ■ Test Pit ☐ Boring

0-1 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistence	Color	Redox
		10YR 3/3	
LOAMY		DARK	
SAND		BROWN	
	FRIABLE		NONE
		10YR 4/6	OBSERVED
		DARK	
		YELLOWISH	
		BROWN	
FINE		2.5Y 5/4	
SAND		LIGHT	
		OLIVE	
		BROWN	
LIMIT OF EXCAVATION = 40"			

☐ hydric ■ non-hydric | Slope % 0-3 | Limiting factor >40" | ☐ ground water ☐ restrictive layer ☐ bedrock

L.S.S Soil Series / phase name: ADAMS | SED Drainage Class | A Hydrologic Group

L.S.E. Soil Classification: _____ Profile | _____ Drainage Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-3** ■ Test Pit ☐ Boring

0-1 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistence	Color	Redox
LOAMY		7.5YR4/6	
SAND	FRIABLE	STRONG	
		BROWN	NONE
			OBSERVED
MEDIUM		2.5Y 5/4	
SAND		LIGHT	
		OLIVE	
		BROWN	
		2.5Y 4/3	
		OLIVE	
		BROWN	
		2.5Y 5/2	
		GRAYISH	
		BROWN	
LIMIT OF EXCAVATION = 42"			

☐ hydric ■ non-hydric | Slope % 0-3 | Limiting factor >42" | ☐ ground water ☐ restrictive layer ☐ bedrock

L.S.S Soil Series / phase name: ADAMS | SED Drainage Class | A Hydrologic Group

L.S.E. Soil Classification: _____ Profile | _____ Drainage Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-4** ■ Test Pit ☐ Boring

0-1 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistence	Color	Redox
LOAMY	FRIABLE	10YR 3/3	
SAND		DARK	
		BROWN	NONE
			OBSERVED
FINE		10YR 5/6	
SAND		YELLOWISH	
		BROWN	
MEDIUM			
SAND			
		2.5Y 5/4	
		LIGHT	
		OLIVE	
		BROWN	
LIMIT OF EXCAVATION = 42"			

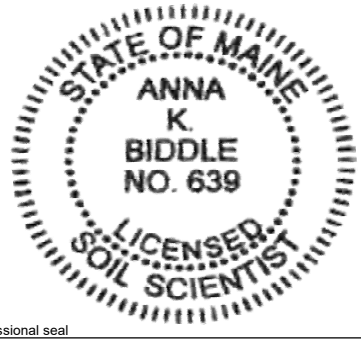
☐ hydric ■ non-hydric | Slope % 0-3 | Limiting factor >42" | ☐ ground water ☐ restrictive layer ☐ bedrock

L.S.S Soil Series / phase name: ADAMS | SED Drainage Class | A Hydrologic Group

L.S.E. Soil Classification: _____ Profile | _____ Drainage Class

Professional Endorsements *(as applicable)*

L.S.S	signature: Anna K. Biddle	Date: 11/1/21
	name printed/typed: Anna K. Biddle	Lic.#: 639
L.S.E.	signature:	Date:
	name printed/typed:	Lic.#:



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SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
TOPSHAM SOLAR PROJECT	MAINE DG HOLDCO, LLC	TOPSHAM

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-5** ■ Test Pit ☐ Boring

0-1 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistence	Color	Redox
LOAMY		10YR 3/2	NONE
SAND	FRIABLE	VERY	OBSERVED
		DARK	
		GRAYISH	
		BROWN	
		10YR 4/6	
		DARK	
		YELLOWISH	
		BROWN	
MEDIUM			
SAND		2.5Y 5/6	
FINE		LIGHT	
SAND		OLIVE	
		BROWN	
MEDIUM		2.5Y 5/4	
SAND		LIGHT	
		OLIVE	
		BROWN	
LIMIT OF EXCAVATION = 44"			

hydric	Slope %	Limiting factor	ground water
■ non-hydric	0-3	>44"	☐ restrictive layer
			☐ bedrock

L.S.S Soil Series / phase name: **ADAMS** | **SED** Drainage Class | **A** Hydrologic Group

L.S.E. Soil Classification: _____ Profile | _____ Drainage Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-6** ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistence	Color	Redox
SANDY		10YR 2/1	
LOAM	FRIABLE	BLACK	
MEDIUM		10YR 4/6	
SAND		DARK	
		YELLOWISH	
		BROWN	
		10YR 5/6	
		YELLOWISH	
		BROWN	
		2.5Y 6/3	COMMON, MEDIUM
		LIGHT	AND DISTICT
		YELLOWISH BROWN	
LIMIT OF EXCAVATION = 40"			

hydric	Slope %	Limiting factor	ground water
■ non-hydric	0-3	32"	☐ restrictive layer
			☐ bedrock

L.S.S Soil Series / phase name: **CROGHAN** | **MWD** Drainage Class | **A** Hydrologic Group

L.S.E. Soil Classification: _____ Profile | _____ Drainage Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-7** ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistence	Color	Redox
		7.5YR3/3	
SANDY	FRIABLE	DARK	
LOAM		BROWN	
FINE		2.5Y 5/4	
SAND		LIGHT	
		OLIVE	
		BROWN	
			COMMON, COARSE,
			AND DISTINCT
MEDIUM			
SAND			
LIMIT OF EXCAVATION = 44"			

hydric	Slope %	Limiting factor	■ ground water
■ non-hydric	0-3	14"	☐ restrictive layer
			☐ bedrock

L.S.S Soil Series / phase name: **NAUMBURG** | **SPD** Drainage Class | **D** Hydrologic Group

L.S.E. Soil Classification: _____ Profile | _____ Drainage Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-8** ■ Test Pit ☐ Boring

3-4 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

Texture	Consistence	Color	Redox
FINE		2.5Y 6/1	
SAND	FRIABLE	GRAY	
		7.5YR 3/3	
		DARK	
		BROWN	
		2.5Y 5/3	
LOAMY		LIGHT	MANY, COARSE,
FINE		OLIVE	AND PROMINENT
SAND		BROWN	
SILT		2.5Y 6/1	
LOAM	FIRM	GRAY	
LIMIT OF EXCAVATION = 36"			
(DEPLETED MATRIX / THICK DARK SURFACE)			

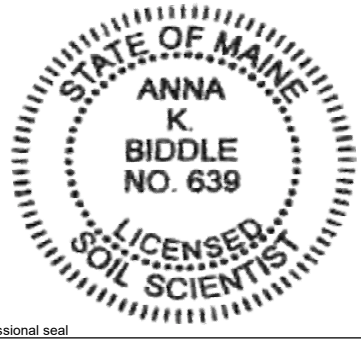
hydric	Slope %	Limiting factor	ground water
■ non-hydric	0-3	0"	☐ restrictive layer
			☐ bedrock

L.S.S Soil Series / phase name: **SWANTON** | **PD** Drainage Class | **D** Hydrologic Group

L.S.E. Soil Classification: _____ Profile | _____ Drainage Class

Professional Endorsements *(as applicable)*

L.S.S	signature: A K Biddle	Date: **11/1/21**
	name printed/typed: **Anna K. Biddle**	Lic.#: **639**
L.S.E.	PAG	Date:
	name printed/typed:	Lic.#:



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SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
TOPSHAM SOLAR PROJECT	MAINE DG HOLDCO, LLC	TOPSHAM

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-9** ■ Test Pit ☐ Boring

0-1 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

	Texture	Consistence	Color	Redox
0				
1				
2	LOAMY		10YR 3/3	
3	SAND	FRIABLE	DARK	
4			BROWN	
5				
6				NONE
7				OBSERVED
8				
9				
10				
12				
14			10YR 4/6	
16			DARK	
18			YELLOWISH	
20			BROWN	
	MEDIUM		2.5Y 5/4	
	SAND		LIGHT	
			OLIVE	
30			BROWN	
40				
	LIMIT OF EXCAVATION = 44"			
50				
60				

☐ hydric ■ non-hydric	Slope % 0-3	Limiting factor >44"	☐ ground water ☐ restrictive layer ☐ bedrock	
L.S.S	Soil Series / phase name: ADAMS	SED Drainage Class	A Hydrologic Group	
L.S.E.	Soil Classification: Profile	Drainage Class		

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-10** ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

	Texture	Consistence	Color	Redox
0				
1			10YR 3/3	
2	LOAMY		DARK	
3	SAND		BROWN	
4				
5				
6	MEDIUM		10YR 4/6	
7	SAND	FRIABLE	DARK	
8			YELLOWISH	
9			BROWN	
10				
12				
14				
16				
18				
20			10YR 5/6	
			YELLOWISH	
			BROWN	
26				
30			2.5Y 5/4	
			LIGHT	
			OLIVE	
36			BROWN	
			2.Y 6/3	COMMON, MEDIUM,
40			LIGHT YELLOWISH	AND DISTINCT
45			BROWN	
50	LIMIT OF EXCAVATION = 45"			
60				

☐ hydric ■ non-hydric	Slope % 0-3	Limiting factor 36"	■ ground water ☐ restrictive layer ☐ bedrock	
L.S.S	Soil Series / phase name: CROGHAN	MWD Drainage Class	A Hydrologic Group	
L.S.E.	Soil Classification: Profile	Drainage Class		

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-11** ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

	Texture	Consistence	Color	Redox
0				
1				
2	FINE		10YR 4/1	
3	SAND	FRIABLE	DARK	
4			GRAY	
5				
6				
7				
8				
9				
10				
12			5YR2.5/1	COMMON, MEDIUM,
14	LOAMY		GRAY	AND DISTINCT
16	FINE		7.5YR 3/4	
17	SAND	WEAKLY		
19		CEMENTED	7.5YR 5/6	
20			YELLOWISH	
22			RED	COMMON, COARSE,
24				AND DISTINCT
	FINE		2.5Y 5/4	
30	SAND		LIGHT OLIVE	
31			BROWN	
			2.5Y 6/1	
	MEDIUM	FRIABLE	GRAY	
	SAND			
40				
	LIMIT OF EXCAVATION = 40"			
50				
60				

☐ hydric ■ non-hydric	Slope % 0-3	Limiting factor 10"	■ ground water ☐ restrictive layer ☐ bedrock	
L.S.S	Soil Series / phase name: NAUMBURG	SPD Drainage Class	D Hydrologic Group	
L.S.E.	Soil Classification: Profile	Drainage Class		

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: **TP-12** ■ Test Pit ☐ Boring

2-3 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)

	Texture	Consistence	Color	Redox
0				
1				
2	FINE			
3	SAND	FRIABLE	2.5Y 6/1	
4			GRAY	
5				
6				
7				
8				
9				
10				
12				
14			7.5YR 3/3	
16			DARK	
18			BROWN	
20				
			2.5Y 5/3	COMMON, MEDIUM,
			LIGHT	AND DISTINCT
			OLIVE	
30			BROWN	
	LIMIT OF EXCAVATION = 36"			
40				
50				
60				
	(DEPLETED MATRIX / THICK DARK SURFACE)			

■ hydric ☐ non-hydric	Slope % 0-3	Limiting factor 0"	■ ground water ☐ restrictive layer ☐ bedrock	
L.S.S	Soil Series / phase name: NAUMBURG	PD Drainage Class	D Hydrologic Group	
L.S.E.	Soil Classification: Profile	Drainage Class		

Professional Endorsements *(as applicable)*

L.S.S	signature: Anna K. Biddle	Date:	11/1/21
	name printed/typed: Anna K. Biddle	Lic.#:	639
L.S.E.	signature:	Date:	
	name printed/typed:	Lic.#:	

STATE OF MAINE ANNA K. BIDDLE NO. 639 LICENSED SOIL SCIENTIST

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SOIL PROFILE/CLASSIFICATION INFORMATION

Detailed Description of Subsurface Conditions at Project Sites

Project Name:	Applicant Name:	Project Location (municipality):
TOPSHAM SOLAR PROJECT	MAINE DG HOLDCO, LLC	TOPSHAM

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: TP-13 ■ Test Pit ☐ Boring

1-2 " Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)	Texture	Consistence	Color	Redox
0–4	FINE SAND	FRIABLE	10YR 5/6 YELLOWISH BROWN	
16–24			2.5Y 4/4 OLIVE BROWN	COMMON, MEDIUM AND DISTINCT
24–36			2.5Y 5/4 LIGHT OLIVE BROWN	
36	LIMIT OF EXCAVATION = 36"			

☐ hydric ■ non-hydric | Slope %: 0-3 | Limiting factor: 14" | ■ ground water ☐ restrictive layer ☐ bedrock

L.S.S. Soil Series / phase name: NAUMBURG | SPD (Drainage Class) | D (Hydrologic Group)

L.S.E. Soil Classification: ______ Profile ______ Drainage Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: ______ ☐ Test Pit ☐ Boring

______" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)	Texture	Consistence	Color	Redox

☐ hydric ☐ non-hydric | Slope % | Limiting factor | ☐ ground water ☐ restrictive layer ☐ bedrock

L.S.S. Soil Series / phase name: ______ Drainage Class ______ Hydrologic Group

L.S.E. Soil Classification: ______ Profile ______ Drainage Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: ______ ☐ Test Pit ☐ Boring

______" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)	Texture	Consistence	Color	Redox

☐ hydric ☐ non-hydric | Slope % | Limiting factor | ☐ ground water ☐ restrictive layer ☐ bedrock

L.S.S. Soil Series / phase name: ______ Drainage Class ______ Hydrologic Group

L.S.E. Soil Classification: ______ Profile ______ Drainage Class

SOIL DESCRIPTION AND CLASSIFICATION

Exploration Symbol: ______ ☐ Test Pit ☐ Boring

______" Depth of Organic Horizon Above Mineral Soil

DEPTH BELOW MINERAL SOIL SURFACE (Inches)	Texture	Consistence	Color	Redox

☐ hydric ☐ non-hydric | Slope % | Limiting factor | ☐ ground water ☐ restrictive layer ☐ bedrock

L.S.S. Soil Series / phase name: ______ Drainage Class ______ Hydrologic Group

L.S.E. Soil Classification: ______ Profile ______ Drainage Class

Professional Endorsements *(as applicable)*

L.S.S	signature:	Date: 11/1/21
	name printed/typed: Anna K. Biddle	Lic.#: 639
L.S.E.	PAGE	Date:
	name printed/typed:	Lic.#:

STATE OF MAINE ANNA K. BIDDLE NO. 639 LICENSED SOIL SCIENTIST

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Sebago Technics, Inc.

ARRAY TECHNOLOGIES

FOLLOW THE SUN.
FOLLOW THE LEADER.

7%
LOWER
LCOE

31%
LOWER
LIFETIME
O&M

DuraTrack® HZ v3

Three decades of field-tested design improvements have resulted in the DuraTrack® HZ v3 — the most durable, reliable tracking system under the sun. While our single-bolt module clamp and forgiving tolerances streamline installation, and our flexibly linked architecture maximizes power density, it's our innovative use of fewer components and a failure-free wind management system that makes Array Technologies the best choice for solar trackers. **Better. Stronger. Smarter.**

HIGH POWER DENSITY.
Higher density means more power and more profit. DuraTrack HZ v3 offers the unique ability to maximize the power density of each site, boasting 100 modules per row and higher density than our closest competition.

LEADING TERRAIN ADAPTABILITY.
Our flexibly linked architecture, with articulating driveline joints and forgiving tolerances, creates the most adaptable system on the market for following natural land contours while creating the greatest power generation potential from every site.

FEWER COMPONENTS. GREATER RELIABILITY.
Array was founded on a philosophy of engineered simplicity. Minimizing potential failure points (167 times fewer components than competitors), DuraTrack HZ v3 consistently delivers higher reliability and superior uptime.

FAILURE-FREE WIND DESIGN.
DuraTrack HZ v3 was designed and field tested to withstand some of the harshest conditions on the planet. It is the only tracker on the market that reliably handles wind events with a fully integrated, fully mechanical, passive wind-load mitigation system without the need for complex communication systems, batteries, or power.

ZERO SCHEDULED MAINTENANCE.
Maintenance-free motors and gears, fewer moving parts, and industrial-grade components—what does this mean for our customers? No scheduled maintenance required. While our competitors average two unscheduled maintenance events per day, we average only one per year.

ARRAY TECHNOLOGIES

FOLLOW THE SUN. FOLLOW THE LEADER.

COST VERSUS VALUE

We believe value is more than the cost of a tracking system. It's about building with forgiving tolerances and fewer parts so construction crews can work efficiently. It means protecting your investment with a failure-free wind management system. It also includes increasing power density. But most of all, value is measured in operational uptime, or reliability.

THE GLOBAL LEADER IN RELIABILITY

Array has spent decades designing and perfecting the most reliable tracker on the planet. Fewer moving parts, stronger components and intelligent design that protects your investment in the harshest weather are but a few of the innovative differences that keep your system running flawlessly all day and you resting easy at night.

ARRAY TECHNOLOGIES, INC.

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Albuquerque, NM 87109 USA

+1 505.881.7567
+1 855.TRACKPV (872.2578)
+1.505.881.7572

sales@arraytechinc.com

arraytechinc.com

30 GW YEARS OF OPERATION

167× FEWER COMPONENTS THAN COMPETITIVE TRACKERS

STRUCTURAL & MECHANICAL FEATURES/SPECIFICATIONS

Tracking Type	Horizontal single axis
Less than 1 drive motor /MW	Up to 1.559 MW DC
String Voltage	Up to 1,500V DC
Maximum Linked Rows	32
Maximum Row Size	116 modules crystalline, and bifacial: 240 modules First Solar 4; 90 modules First Solar 6 and 6 Plus
Drive Type	Rotating gear drive
Motor Type	2 HP, 3 PH, 480V AC
East-West/North-South Dimensions	Site / module specific
Array Height	54" standard, adjustable (48" min height above grade)
Ground Coverage Ratio (GCR)	Flexible, 28–45% typical, others supported on request
Terrain Flexibility	N-S tolerance: 0-15% standard, 26% optional; Driveline: 40° in all directions
Modules Supported	Most commercially available, including framed and frameless thin film, crystalline silicon, hetero junction and bifacial.
Tracking Range of Motion	± 52° standard, ± 62° optional
Operating Temperature Range	-30°F to 140°F (-34°C to 60°C)
Module Configuration available.	Single-in-portrait standard, including bifacial. Four-in-landscape (thin film)
Module Attachment	Single fastener, high-speed mounting clamps with integrated grounding. Traditional rails for crystalline in landscape, custom racking for thin film and frameless crystalline and bifacial per manufacturer specs.
Materials	Pre-galv steel, HDG steel and aluminum structural members, as required
Allowable Wind Load (ASCE 7-10)	140 mph, 3-second gust exposure C
Wind Protection	Failure free passive mechanical system protects against wind damage without the use of complex communications systems, batteries — no power required

ELECTRONIC CONTROLLER FEATURES/SPECIFICATIONS

Solar Tracking Method	Algorithm with GPS input
Control Electronics	MCU plus Central Controller
Data Feed	MODBUS over Ethernet to SCADA system
Night-time Stow	Yes
Tracking Accuracy	± 2° standard, field adjustable
Backtracking	Yes

INSTALLATION, OPERATION & MAINTENANCE

Software	SmarTrack optimization available
PE Stamped Structural Calculations & Drawings	Yes
On-site Training and System Commissioning	Yes
Connection Type	Fully bolted connections, no welding
In-field Fabrication Required	No
Dry Slide Bearings and Articulating Driveline Connections	No lubrication required
Scheduled Maintenance	None required
Module Cleaning Compatibility	Robotic, Tractor, Manual

GENERAL

Annual Power Consumption (kWh per 1 MW)	400 kWh per MW per year, estimate

Abbott Engineering
51 Gerrish Lane, Durham, ME 04222
207-353-8442 ● mikeabbott@suscom-maine.net

October 8, 2009

AE09-006
modelletter

Boyd Snowden
Snowden Consulting Engineers, Inc.
34 Libby Hill Professional Building, Suite 2
Oakland, Maine 04963

Subject: Report of Groundwater Model Results
Bay Park Drainage Improvements Study
Topsham, Maine

Dear Boyd:

This letter report includes a summary of the groundwater modeling effort and results for the above referenced project. As presented at the October 1, 2009 Town of Topsham Selectmen's meeting, model simulations indicated that lowering the Transfer Stations ponds by 4 feet and installing new underdrain piping on Hunter Lane and Loon Drive will help to lower groundwater elevations in a portion of the Bay Park development and likely alleviate some of the basement flooding issues.

INTRODUCTION

The original objective of the modeling effort was to use model simulations to provide an assessment of the potential effectiveness of proposed storm water system modifications. In order to accomplish this, Abbott Engineering (AE) developed a computerized groundwater flow model that encompasses the Bay Park development and vicinity. The model was calibrated using data from a recent test boring program and previous studies (Gerber, 1981). Predictive model simulations were used to evaluate the potential lowering of the groundwater table that may result from improvements to the storm drain, as well as other changes including a proposed lowering of two pond levels on the nearby Town-owned Transfer Station property.

MODEL CODE SELECTION AND MODEL CONSTRUCTION

The focus of the modeling effort was on the groundwater system within the surficial (shallow) sand deposit, described in earlier studies as a low yielding sand aquifer (Gerber, 1981). In order to represent flow conditions in the sand, AE chose to use a three-dimensional model capable of simulating drains and other imposed hydraulic changes.

The selected software used for the hydraulic model was Visual Modflow (Version 4.0 by Waterloo Hydrogeologic, Inc. 2003 – original authors Guiguer and Franz), which uses the MODFLOW flow code. MODFLOW, (McDonald and Harbaugh, USGS, 1988) is a three

dimensional, finite difference, saturated flow model. The MODFLOW code is widely used and accepted for representative modeling purposes.

Discretization and Layering. This model has one layer only, representing the sand unit. The flow model was set up on a 100 x 100 grid and encompassed Bay Park and the surrounding area (see Figure 1, attached), inclusive of the areas modeled in the Gerber, 1981 study. The area included in the model is approximately 8,700 feet by 9,000 feet, or a total of approximately 2.9 square miles. Note that the Gerber model was developed to assess the potential water quality impacts of leachfields within the subdivision and was not used to study basement flooding issues.

Model Boundaries. Based on interpretation of the regional hydrology, the main controlling hydrologic boundaries near Bay Park are the numerous ponds and streams, which all discharge to the Androscoggin River. The River acts as a regional groundwater discharge feature and was represented in the model using constant head values coinciding with USGS topographic elevations. Other streams and surface water bodies were also input as discharge features with localized influence. Water enters the model as precipitation recharge in an area defined by the watershed boundaries.

Hydrogeologic Properties. Initial model parameter values were selected based on Site observations and data from previous studies (Gerber, 1981). Some of these values were modified during the calibration process. However, in order to maintain a representative model of the geologic setting, parameter values were kept within ranges as deemed appropriate according to the natural heterogeneity of the sand unit. The ranges of values for individual parameters used in the model are listed below:

Table 1
Flow Model Hydrogeologic Properties

	Hydraulic Conductivity (ft/day)	Effective Porosity	Specific Storage (1/ft)	Recharge (inches/year)
Value	2 to 20	0.25 to 0.3	.0001 to .0002	14 to 18

FLOW MODEL CALIBRATION

The flow model was calibrated to match the interpreted phreatic (unconfined shallow groundwater) water table surfaces as determined using water level elevations from the Gerber study in 1981 as well as information gathered during the current (2009) project. New data included water level measurements in several shallow test borings performed in Bay Park on August 5, 2009 and survey measurements of the Pelletier and Town Pond elevations in September 2009. Model calibration was accomplished by comparing simulated hydraulic head values with measured values at specified locations. Parameter values were adjusted as necessary throughout the model in order to obtain a simulated water table that closely matched the interpreted water table based on field data.

For each flow model simulation, a plot was generated to compare field water levels and those simulated by the model run. Calibration of the flow model was considered complete when a reasonable match was obtained between simulated and field measured values, as indicated by a correlation coefficient (Cc) of greater than 90 %. Figure 2 shows a plot of the simulated water table configuration in the Bay Park area.

It should be noted in Figure 2 that Town ponds are several feet higher in elevation than many of the other nearby drainage features (e.g., the Pelletier Pond). The Town Ponds are manmade ponds resulting from past mining of the sand and clay at those locations. In Figure 2, flow direction lines superimposed on the groundwater table contours indicate that water in the sand does not discharge into the ponds, due to their elevation. Based on this observation, it was determined that the ponds may provide an opportunity to move some of the water away from the residences at Bay Park, assuming the water levels could be lowered and the water made to outflow to a nearby stream located to the northeast of the project. On September 21, 2009, several high capacity pumps were installed in the larger of the two Town Ponds by the Topsham Public Works Department (PWD) and pumped for approximately 48 hours at rates ranging from 1000 gpm to 3000 gpm. This resulted in lowering the water level in that pond by about 1.75 feet. Measurement of groundwater levels in shallow piezometers installed on Lover's Land and Eider Lane during this test indicated that lowering of the ponds resulted in drawing down the groundwater table in that portion of Bay Park approximately 1 inch. This is a strong indication that the Town Ponds are in direct hydraulic connection with the shallow water beneath Bay Park and that long term lowering the Town Ponds will result in substantial lowering of the groundwater beneath some of the residences. To further calibrate the model, simulations of the test described above were performed and several minor adjustments were made until the model accurately represented the response of the groundwater system to this short term test.

PREDICTIVE MODELING

Predictive simulations included the following:

Long term lowering of the Town Ponds by 4 feet. This scenario assumes that water from the ponds will be controlled by an outflow structure and discharge to surface water streams draining into the Muddy River and eventually to the Androscoggin. As shown in Figure 3, the main result of lowering these ponds is that they become significant discharge features (as indicated by the flow arrows) and remove much of the groundwater from the Eider Lane side of Bay Park. This results in a lowering of the groundwater table in the order of 1 to 1.9 feet.

New underdrains. In this simulation, the Town Ponds are left at their original elevations. Underdrain improvements on Loon Drive and Hunter Lane are simulated. The discharge for these underdrains would be to the stream located southwest of the development, which acts as a discharge location for the existing system. For specifications of underdrain placement and elevations, refer to the design by Snowden Consulting Engineers, Inc. Figure 4 shows the

simulated water table and flow directions. Under this scenario, the model indicates that the water table may be lowered up to 1 foot in areas close to the proposed underdrain improvements.

Combined pond lowering and new underdrains. In this scenario, the Town Ponds would be lowered 4 feet and the underdrain improvements on Loon Drive and Hunter Land would be implemented. Based on model simulations, the water table in Bay Park would be lowered up to 3 feet. The greatest magnitude of water table drawdown would occur near the intersection of Eider Lane and Hunter Lane. The amount of drawdown would decrease towards the northwest. For example, maximum drawdown in the vicinity of Teal Rd. would be 2 feet or less (Figure 5).

It should be noted also that model simulations indicate that it may take up to 2 years to reach maximum drawdown. This will depend on the amount of rainfall and other factors that cannot be predicted in detail using the model.

MODEL LIMITATIONS

The groundwater flow model presented herein is only a mathematical representation of the groundwater system and geologic setting. Due to the natural complexity of these entities, a model can only achieve a simplified representation of the actual system and therefore must be considered as generalized screening tools for use in studying this site. Furthermore, the calibration and validation of any model is limited by the availability and accuracy of field data and historical records of site activities.

SUMMARY AND CONCLUSIONS

Based on the predictive simulations described above, lowing of the Town Ponds and installation of the proposed underdrain improvements should result in significant lowering of the groundwater table in portions of Bay Park. This will hopefully reduce some of the problems that residents have been experiencing with water in their basements by creating a new baseline water elevation and increasing the capacity of the groundwater system and underdrains to handle storm events.

Please feel free to call with any questions or comments.

Sincerely,

ABBOTT ENGINEERING

Michael D. Abbott, P.E., C.G.

Attachments

ATTACHMENT 1 – MODEL FIGURES

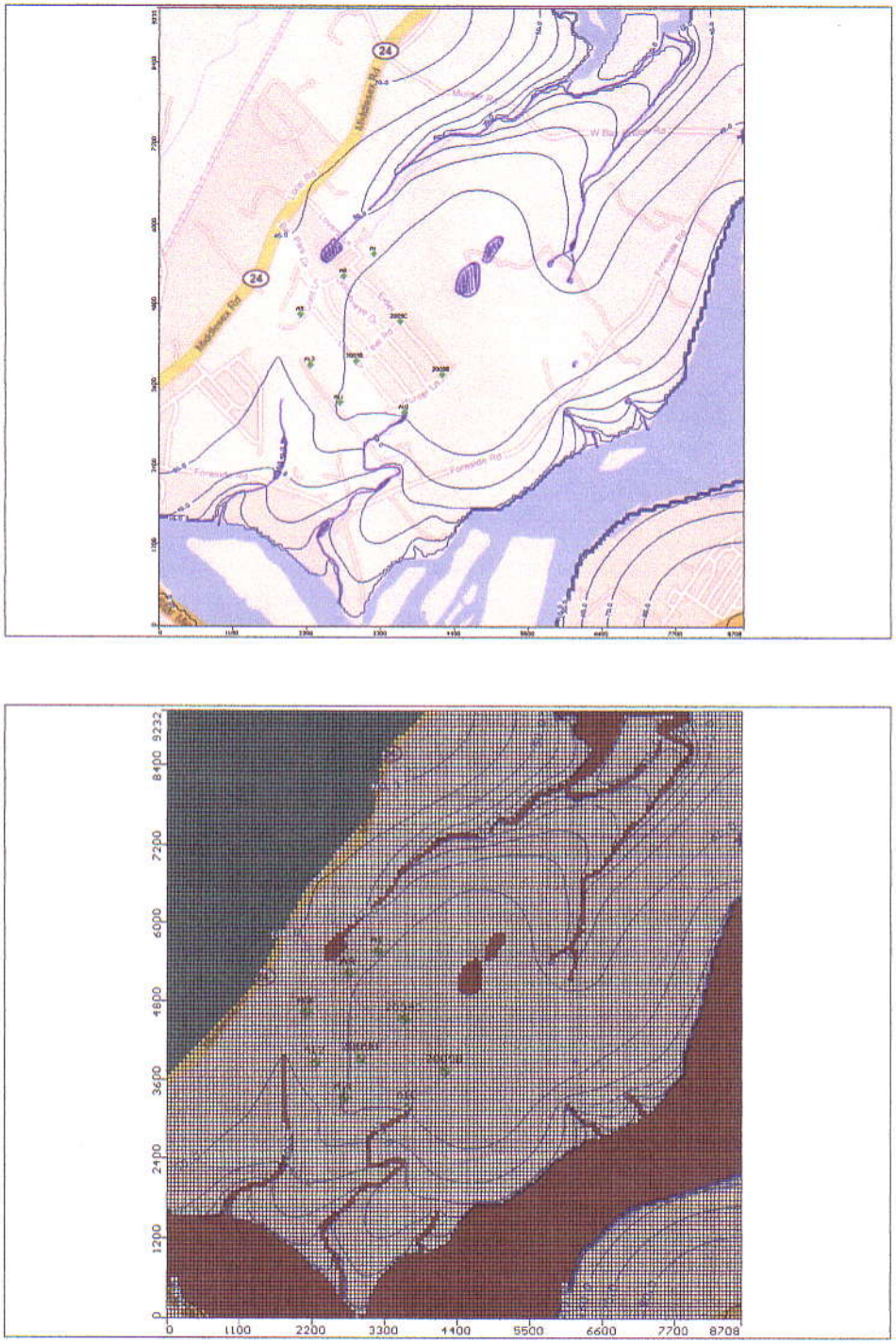


Figure 1

Model Region and Grid Configuration

ATTACHMENT 1 – MODEL FIGURES

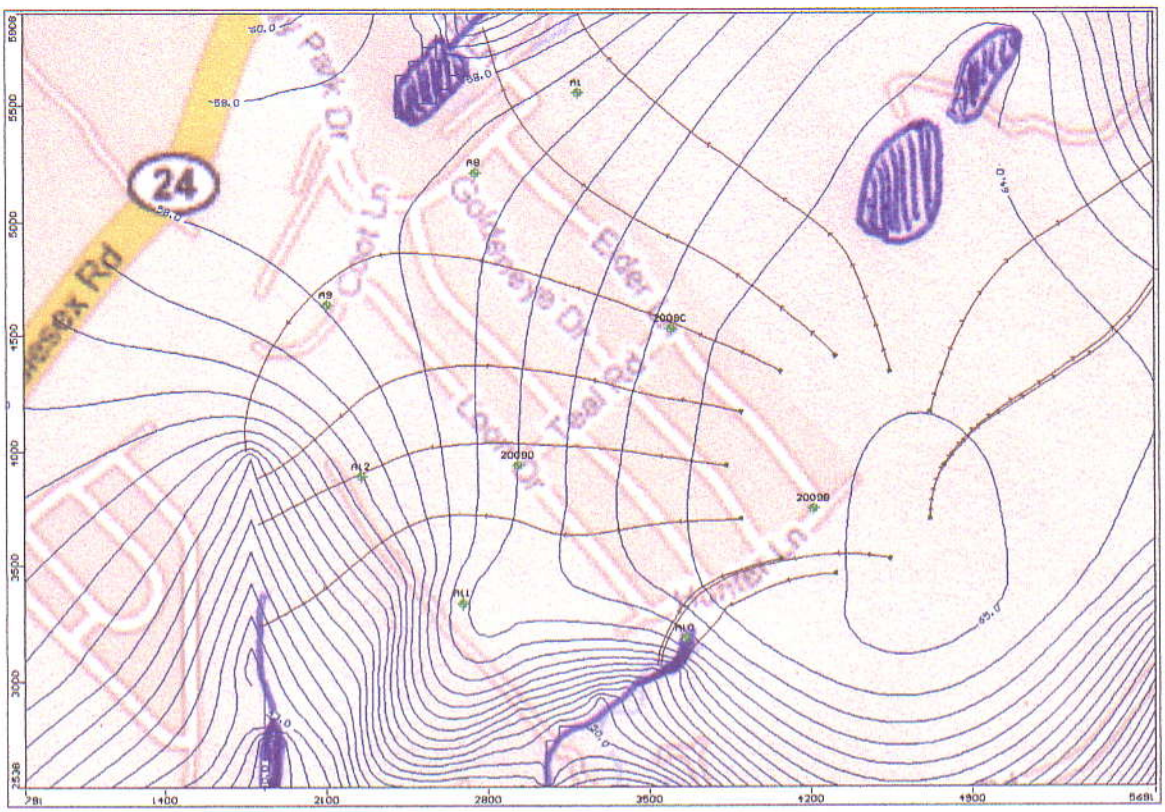


Figure 2

Calibrated Water Table
1 Foot Contours

ATTACHMENT 1 – MODEL FIGURES

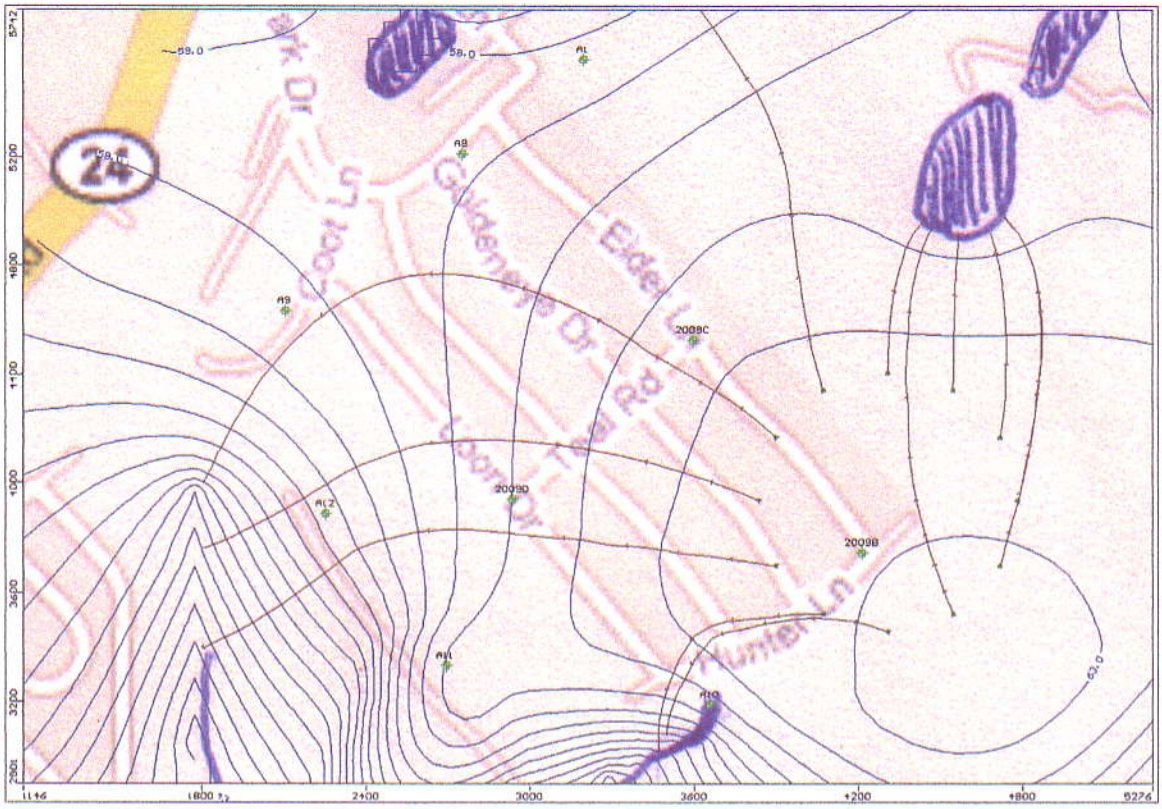


Figure 3

Simulated Water Table with Town Ponds lowered 4 feet.
1 Foot Contours

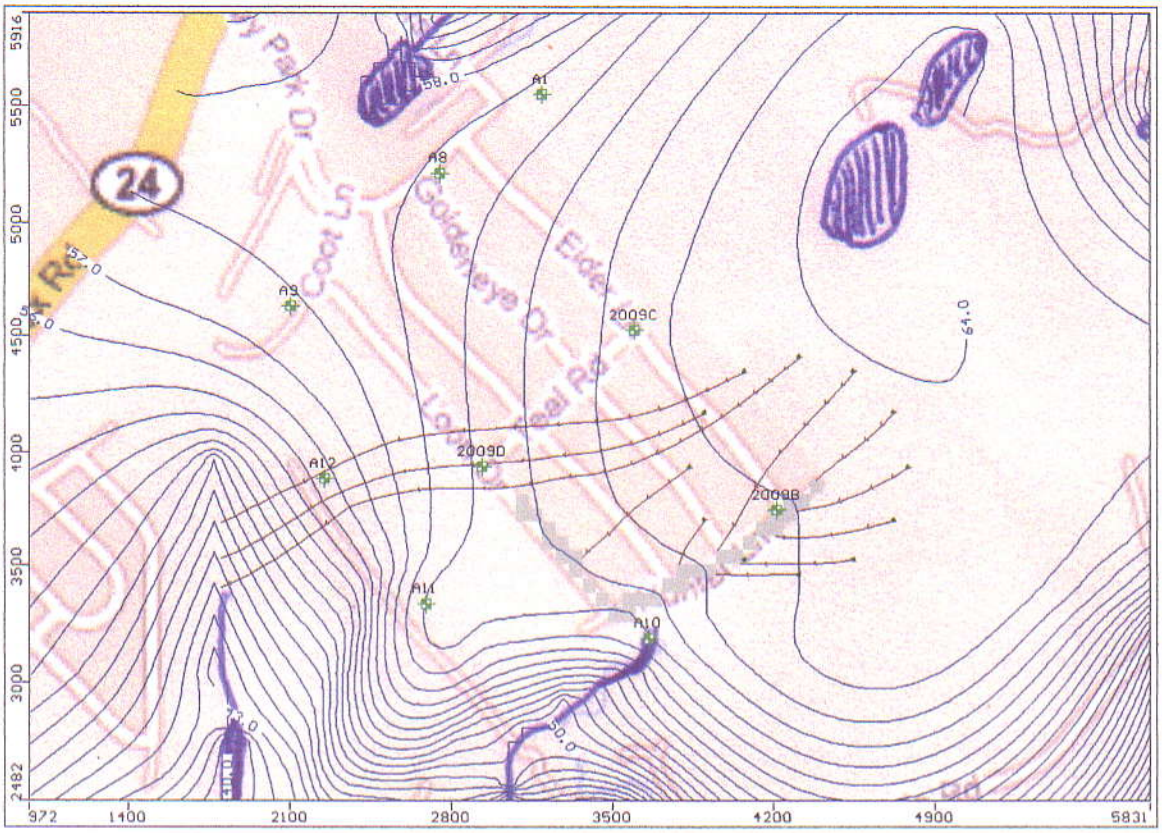


Figure 4

Simulated Water Table with Underdrain Improvements on Loon Dr. and Hunter Lane
1 Foot Contours

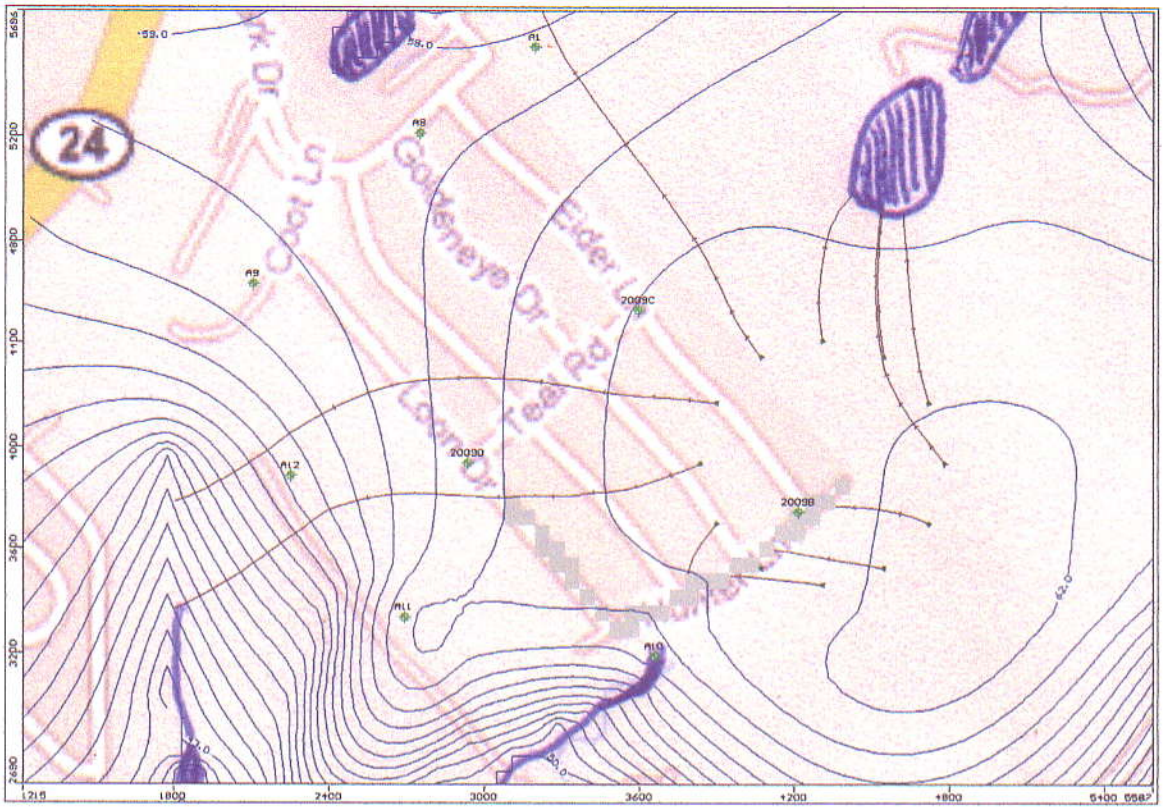


Figure 5

Simulated Water Table with Town Ponds Lowered (4 feet) and new Underdrains Installed (Loon Dr. and Hunter Ln.)

TBM No.	Description	Elev.
8	Paint mark in tree	72.90

POTENTIAL VERNAL POOL SITE, MAN-MADE, DELINEATED BY SW COLE ENGINEERS.

INSTALL APPROXIMATELY 400 L.F. OF VEGETATED PARABOLIC CHANNEL WITH 3 FOOT WIDE BOTTOM CHANNEL AT A SLOPE OF 0.01'/FT.

PT 23

INSTALL RIPRAP OUTLET PROTECTION FOR CULVERT PIPE. SEE DETAIL ON SHEET 2.

6' DIA. PRECAST DRAIN MANHOLE
RIM ELEV. 67.00
INV. IN - 15" DIA. (TROUT POND): 58.95
INV. IN - 15" DIA. (BASS POND): 58.95
INV. OUT - 62.00

60' @ 5%

EXISTING WETLAND AREA (TYP.)

Transfer Station Trout Pond Water Elevation prior to pumping 65.95

INSTALL APPROXIMATELY 470 L.F. OF 15" DIA. HDPE SMOOTH BORE CULVERT PIPE AT A SLOPE OF 0.0043'/FT.

TBM 8

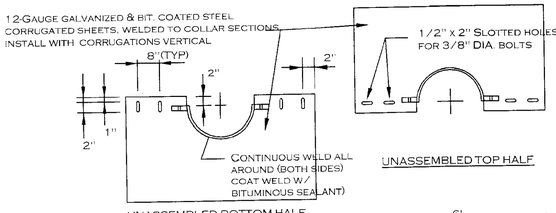
PROPOSED 6' DIA. PRECAST CONCRETE DRAIN MANHOLE WITH WIERS FOR PIPE FLOW FROM PONDS. SEE DETAIL ON THIS SHEET.

PT 24

INSTALL ANTI-SEEP COLLARS ON 15' DIA. HDPE CULVERT PIPE. SEE DETAIL ON THIS SHEET (TWO COLLARS PER PIPE)

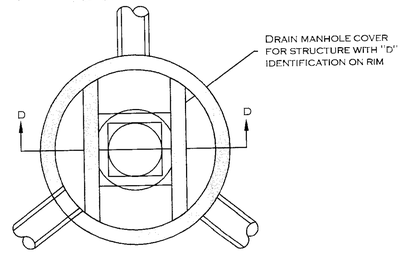
Transfer Station Bass Pond Water Elevation prior to pumping 66.41

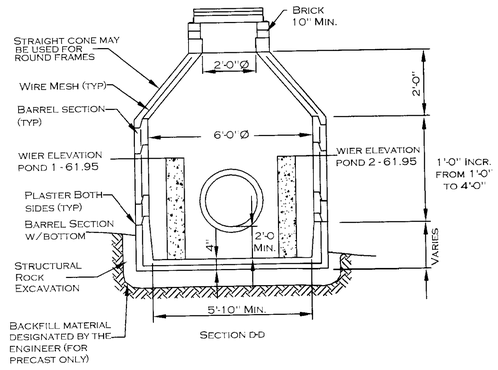
INSTALL APPROXIMATELY 150 L.F. OF 15" DIA. HDPE SMOOTH BORE CULVERT PIPE AT A SLOPE OF 0.003'/FT. EACH INLET PIPE SHALL CONTAIN STAINLESS STEEL 1" X 1" SCREEN MESH OVER INLET IN POND TO RESTRICT FISH AND DEBRIS PASSAGE INTO PIPING.



Anti Seep Collar Detail

NTS





DIMENSIONS ARE INTENDED TO BE NORMAL.

Precast Drainage Basin

NTS

Typical Construction Notes

NOTES:

1. EXISTING PROPERTY BOUNDARY LINES INDICATED ON THIS PLAN PROVIDED BY THE TOWN OF TOPSHAM GIS TAX MAP DATA BASE.
2. EXISTING CONTOUR DATA SHOWN ON THIS PLAN ARE 2 FOOT CONTOURS OBTAINED FROM THE MAINE GIS WEBSITE AND WERE OBTAINED FROM AERIAL PHOTOS. ONLY POND ELEVATIONS WERE SURVEYED. AERIAL 2 FOOT CONTOURS SHOULD BE VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION TO VERIFY THE ELEVATIONS INDICATED.
3. THE ELEVATIONS OF THE TWO PONDS INDICATED ON THIS PLAN, LOCATED WITHIN THE TOWN TRANSFER STATION SITE, WERE OBTAINED FROM SURVEY DATA PROVIDED BY BROKEN STONE LAND SURVEYORS.
4. ALL WORK WITHIN THE TOWN TRANSFER STATION SITE WILL REQUIRE APPROVAL BY THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION. IT IS ASSUMED THAT THE TRANSFER STATION SITE IS A PERMITTED SITE UNDER THE SITE LOCATION OF DEVELOPMENT STANDARDS. THE PROJECT WILL LIKELY REQUIRE A MINOR REVISION PERMIT APPLICATION TO THE DEPARTMENT.
5. ALL CULVERT INSTALLATIONS NOT IN STREAM CHANNELS ARE TO HAVE RIPRAP OUTLET PROTECTION IN ACCORDANCE WITH THE DETAILS PROVIDED ON SHEET 2 OF THIS PLAN SET.
6. ALL VEGETATED DITCH WATERWAYS PROVIDED ON THE PLAN SHALL BE INSTALLED WITH TEMPORARY STONE CHECK DAMS AT THE INTERVALS DESCRIBED IN THE DETAIL ON SHEET 8 OF THIS PLAN SET. STONE CHECK DAMS SHALL BE USED TO LIMIT SEDIMENTATION BEING CARRIED UNTIL THE PROJECT SITE IS ESTABLISHED. STONE CHECK DAMS SHALL BE REMOVED ONCE 75 PERCENT OF DITCH HAS ESTABLISHED ADEQUATE VEGETATION PROTECTION.
7. S.W. COLE ENGINEERS HAS REVIEWED THE LOCATION ALONG THE DRAINAGE PIPING AND PROPOSED DITCHWORK FOR WETLANDS. WETLAND AREAS HAVE BEEN IDENTIFIED ON THIS PLAN, AND WERE LOCATED WITH GPS INSTRUMENTATION.
8. THESE PLANS INDICATE LOCATIONS WHERE WOOD WASTE BERM AND SILT FENCE ARE REQUIRED FOR EROSION CONTROL. THE TOWN OR THEIR CONTRACTOR MAY USE EITHER SILT FENCE OR WOOD WASTE BERM IN THE LOCATIONS SHOWN. WOOD WASTE BERM SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE MOST RECENT STANDARDS AS PROVIDED UNDER THE MOST RECENT MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION EROSION CONTROL BMP MANUAL.
9. TEMPORARY BENCH MARK FOR THE SITE IMPROVEMENTS HAS BEEN SET BY BROKEN STONE LAND SURVEYORS. SITE LAYOUT FOR THE CONSTRUCTION SHALL BE COMPLETED BY OTHERS AT A LATER DATE.
10. CONTRACTOR MAY USE CLAY BARRIERS IN PLACE OF ANTI-SEEP COLLARS TO KEEP WATER FROM POND FROM FLOWING ALONG THE EXTERIOR OF THE DRAIN LINES.

Legend

	Existing	Proposed
Paved Road		
Contours	120	(120)
Rock Ex.		
Building		
Brook/Stream		
Gravel Road		
Tree Line		
Property Line		
Right of Way		
Tree		
Silt Fence		SF
Centerline		
Sewer Main		S
Water Main	10"W	10"W
Storm Sewer	SW	PSW
Storm Style		FSS
Water Style	WS	PWS
Underground Utility		PUE
Underground Utility	UT	PUT
Utility Pole		
Sign		
Drainage Manhole		□
Transformer		
Water Valve		
Sewer Manhole		
Catch Basin		
Curb Stop		
Test Borings		
Overhead Power	OE	P-OE
Overhead Guy Wire	GW	P-GW
Guy Wire Support		
Temporary Overhead Power		T-OE
Spot Elevation		100.14

No.	Revision	Date

Sheet Title: **Site Plan and Details**

Project Scale: Horizontal: 1"=100'

Plan Date: October 1, 2009

Project: **Bay Park Improvements**

Project Owner: Town of Topsham, 100 Main Street, Topsham, Maine 04086

Owner Address:

Project Address: Bay Park Neighborhood, Topsham, Maine

SNOWDEN CONSULTING ENGINEERS, INC.
34 Libby Hill Professional Building, Suite 2
Oakland, Maine 04963
Phone: 207-465-4400 Fax: 207-465-4441
Email: bsnowden@snowdenengineers.com

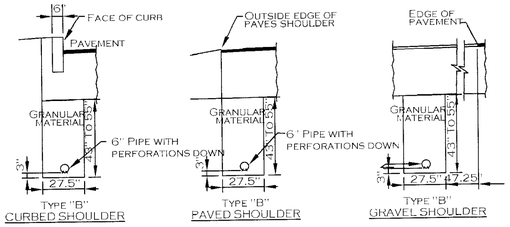
State of Maine — Boyd W. Snowden No. 7855 — Registered Professional Engineer

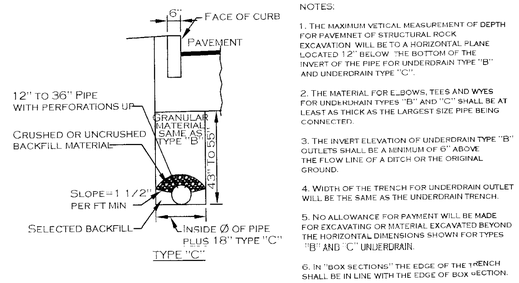
Final Plan

File Name:

Project No.: STW-09-217

Sheet No. 7





NOTES:

1. THE MAXIMUM VETICAL MEASUREMENT OF DEPTH FOR PAVEMNET OF STRUCTURAL ROCK EXCAVATION WILL BE TO A HORIZONTAL PLANE LOCATED 12" BELOW THE BOTTOM OF THE INVERT OF THE PIPE FOR UNDERDRAIN TYPE "B" AND UNDERDRAIN TYPE "C".

2. THE MATERIAL FOR ELBOWS, TEES AND WYES FOR UNDERDRAIN TYPES "B" AND "C" SHALL BE AT LEAST AS THICK AS THE LARGEST SIZE PIPE BEING CONNECTED.

3. THE INVERT ELEVATION OF UNDERDRAIN TYPE "B" OUTLETS SHALL BE A MINIMUM OF 6" ABOVE THE FLOW LINE OF A DITCH OR THE ORIGINAL GROUND.

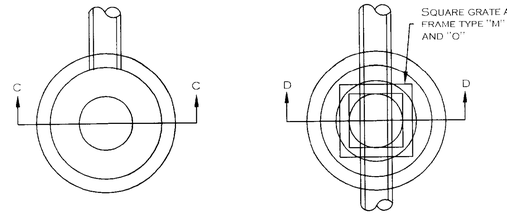
4. WIDTH OF THE TRENCH FOR UNDERDRAIN OUTLET WILL BE THE SAME AS THE UNDERDRAIN TRENCH.

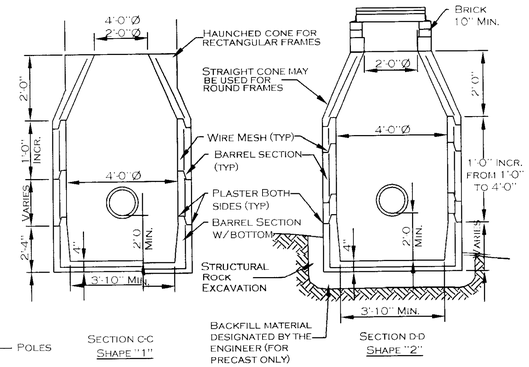
5. NO ALLOWANCE FOR PAYMENT WILL BE MADE FOR EXCAVATING OR MATERIAL EXCAVATED BEYOND THE HORIZONTAL DIMENSIONS SHOWN FOR TYPES "B" AND "C" UNDERDRAIN.

6. IN "BOX SECTIONS" THE EDGE OF THE TRENCH SHALL BE IN LINE WITH THE EDGE OF BOX SECTION.

7. ALL UNDERDRAIN SHALL CONTAIN GEOTEXTILE TO MAINTIAN SEPERATION OF GRANULAR MATERIAL AND CRUSHED BACKFILL MATERIAL. GEOTEXTILE SHALL ENCASE PIPE AND CRUSHED BACKFILL MATERIAL.

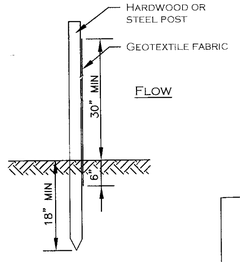
UNDERDRAIN DETAILS
NTS



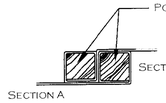


DIMENSIONS ARE INTENDED TO BE NORMAL

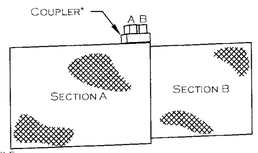
CATCH BASINS (PRECAST)
NTS



SIDE VIEW



TOP VIEW



JOINGING SECTIONS

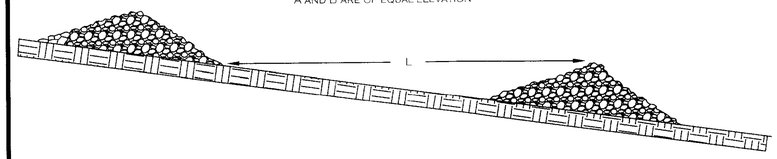
* THE COUPLER CAN BE ANY ACCEPTABLE DEVICE USED TO TIE THE POLES TOGETHER.

SLOPE (FT./FT)	LENGTH (FT.)
0.020	100
0.030	66
0.040	50
0.050	40
0.080	25
0.100	20
0.120	17
0.150	13

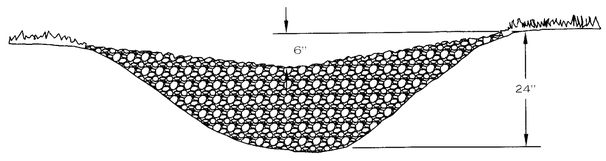
L = THE DISTANCE SUCH THAT POINTS A AND B ARE OF EQUAL ELEVATION

DEPENDING ON CONFIGURATION, ATTACH GEOTEXTILE TO WIRE MESH WITH HOG RINGS, TO STEEL POSTS WITH TIE WIRES AND TO WOOD POSTS WITH STAPLES. POST MAY BE WIRED TOGETHER WHEN JOINING SECTIONS.

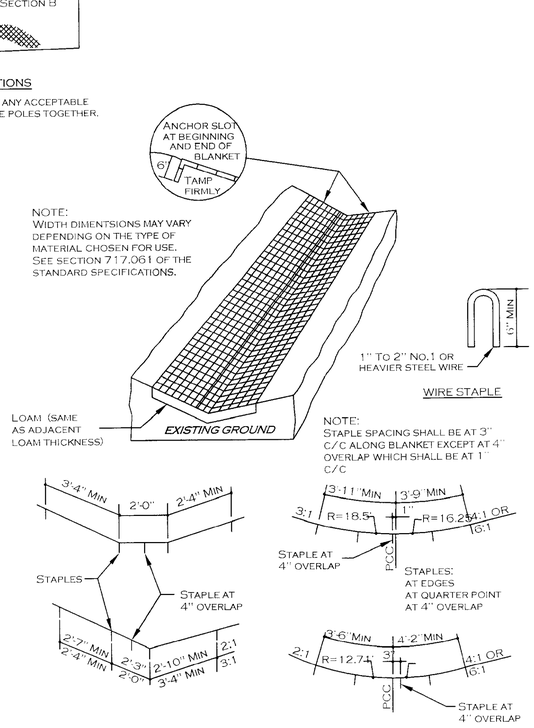
TEMPORARY SILT FENCE
NTS



SPACING BETWEEN CHECK DAMS
NTS



ROCK CHECK DAM
N.T.S.



TEMPORARY EROSION CONTROL BLANKET
NTS

EROSION AND SEDIMENTATION CONTROL PLAN

PROJECT DESCRIPTION
THIS EROSION AND SEDIMENTATION CONTROL PLAN HAS BEEN PREPAREDFOR THE BAY PARK AREA GROUNDWATER PROJECT LOCATED IN TOPSHAM, MAINE. THIS PROJECT INCLUDES THE INSTALLATION OF APPROXIMATELY 3,000 FEET OF NEW UNDERDRAIN PIPING TO BE INSTALLED ALONG PORTIONS OF LOON DRIVE AND HUNTER LANE WITHIN THE BAY PARK SUBDIVISION. THIS NEW UNDERDRAIN PIPE WILL REPLACE THE EXISTING UNDERDRAIN/STORMWATER SYSTEM CURRENTLY FOUND AT THE SITE. THE UNDERDRAIN PROJECT IN THESE AREAS ALSO INCLUDES THE INSTALLATION OF A NEW OUTLET PIPE TO BE LOCATED OFF HUNTER LANE. IN ADDITION TO THE NEW UNDERDRAIN DESCRIBED ABOVE, THIS PROJECT ALSO INCLUDES THE LOWERING OF TWO MANMADE PONDS WITH THE TOWN OF TOPSHAM TRANSFER STATION SITE. THE PONDS ARE PROPOSED TO BE LOWERED APPROXIMATELY 4 FEET USING A NEW STORM DRAIN PIPING SYSTEM AND VEGETATIVE DITCHING TO AN EXISTING DRAINAGE CHANNEL WITHIN THE SITE. SHEETS 1 THROUGH 6 OF THIS PLAN SET SHOW THE DESIGN OF THE UNDERDRAIN SYSTEM. SHEET 7 OF THIS PLAN SET SHOWS THE DESIGN OF THE POND LOWERING AT THE TRANSFER STATION SITE. UNDER EACH PROJECT, RUNOFF FLOWS THROUGH THESE STRUCTURES TO PROPOSED OUTLETS, THEN THROUGH EXISTING DRAINAGE CHANNELS AND STREAMS, EVENTUALLY OUTLETTING INTO THE ANDROSCOGGIN RIVER

EXISTING SITE CONDITIONS
THE BAY PARK UNDERDRAIN PROJECT IS LOCATED IN AN AREA THAT IS CURRENTLY DEVELOPED AS A RESIDENTIAL SUBDIVISION. MANY RESIDENTS WITHIN THIS PARK HAVE EXPERIENCED INCREASED GROUNDWATER ISSUES SINCE 2005 THAT HAVE CAUSED DAMAGE TO THEIR HOMES AND REQUIRED EXPENSIVE FULL BACKUP SUMP PUMPS TO CONTEND WITH THE INCREASED GROUNDWATER LEVELS. THE DRAINAGE PIPING FOR THE TWO PONDS AT THE TRANSFER STATION SITE IS PROPOSED TO TRAVEL THROUGH EXISTING MEADOW AND WOODED AREAS. THE MEADOW AREAS WERE PREVIOUSLY DISTURBED DURING CLOSURE OF THE LANDFILL. THE WOODED AREA AND MEADOW AREA WERE INSPECTED FOR WETLAND AREAS AND VERNAL POOL SITES NEAR THE PROJECT SITE. SOME MINOR FORESTED WETLAND AREAS WERE FOUND AT THE END OF THE VEGETATIVE CHANNEL PROPOSED TO DRAIN THE PONDS. A POTENTIAL VERNAL POOL WAS ALSO FOUND NEAR THE END OF THE VEGETATIVE CHANNEL.

ADJACENT AREAS
ADJACENT PROPERTIES INCLUDE:

BAY PARK UNDERDRAIN

1. WITHIN RESIDENTIAL NEIGHBORHOOD
2. WOODED AREA TO THE SOUTH
3. OTHER RESIDENTIAL SUBDIVISION TO THE WEST.
4. TOWN OF TOPSHAM TRANSFER STATION/WOODED AREA TO THE NORTHEAST.

TOPSHAM TRANSFER STATION SITE

1. WOODED AREAS AND MEADOW AREAS SURROUNDING SITE.

SOILS

THE SOILS WITHIN THE BAY PARK AREA SUBDIVION AND THE AREA OF THE PROPOSED STORM DRAIN PIPE AT THE TRANSFER STATION INCLUDE FINE TO MEDIUM SAND, WHICH IS PART OF A MAPPED SAND AND GRAVEL AQUIFER IN THE AREA.

EROSION AND SEDIMENTATION PLAN
THE EROSION AND SEDIMENTATION CONTROL PRACTICES INCLUDES THE USE OF HDPE SMOOTH BORE CORRUGATED STORM DRAIN AND PIPES, VEGETATED DITCHES WITH EROSION FABRIC, VEGETATIVE SLOPES, INLET AND OUTLET PROTECTION FOR STORM DRAIN AND UNDER DRAIN PIPING, STONE BERM LEVEL LIP SPREADERS, TEMPORARY HAY MULCH PLACED OVER DISTURBED SOILS, WOOD WASTE BERM SEDIMENTATION CONTROL AND SILT FENCE.

A. STRUCTURAL MEASURES
1. STORM DRAIN/UNDER DRAIN: SMOOTH BORE HDPE CULVERTS SHALL BE INSTALLED ACCORDING TO THE SIZE AND LOCATION ON THE DESIGN PLANS. THE STORM DRAIN AND UNDERDRAIN PIPING HAS BEEN DESIGNED TO ACCOMODATE A 25-YEAR STORM EVENT. ALL OUTLETS FOR THIS PIPING SHALL BE CONSTRUCTED WITH INLET AND OUTLET RIPRAP PROTECTION FOR EROSION CONTROL.

2. CATCH BASINS: CATCH BASINS HAVE BEEN PROPOSED AT LOCATIONS WITHIN THE BAY PARK AREA. THESE CATCH BASINS SHOULD CONTAIN "DANDY DROP INLET PROTECTION" FILTERS FROM MIRAFI OR APPROVED EQUAL ON EACH RIM AFTER INSTALLATION TO PREVENT SILT FLOWING WITH RUNOFF FROM ENTERING THE CATCH BASIN DURING CONSTRUCTION. THESE INLET PROTECTION FILTRATION SYSTEMS SHOULD BE CHECKED AND CLEANED REGULARLY BY THE CONTRACTOR. EACH SHOULD BE CHECKED WEEKLY, AND AFTER EACH RAIN EVENT.

3. SILT FENCE: SILT FENCE SHALL BE CONSTRUCTED AT THE LOCATIONS SHOWN ON THE PLANS. THE SILT FENCE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAIL ON THIS SHEET, AND SHALL BE INSTALLED PRIOR TO THE CONSTRUCTION OF ANY DITCHING OR GRUBBING FOR THE PROJECT AREAS. THE SILT FENCE WILL BE MAINTAINED WEEKLY DURING CONSTRUCTION AND AFTER RAIN EVENTS. THE SILT FENCE WILL REMAIN IN PLACE UNTIL THE SITE AREAS THEY ARE PROTECTING HAVE BEEN FULLY VEGETATED, AT WHICH TIME THEY SHOULD BE REMOVED.

B. VEGETATIVE MEASURES:
1. TOPSOIL STOCKPILING: TOPSOIL DURING SITE CONSTRUCTION SHALL BE STOCKPILED AND USED IN SITE RECLAMATION. STOCKPILES SHALL BE MULCHED WITH HAY UNTIL IT IS USED. MULCH SHALL BE APPLIED AT A RATE OF 90 LBS/1000 SQUARE FEET. SILT FENCE SHALL BE INSTALLED ON THE DOWN SLOPE SIDE OF THE TOPSOIL PILE TO PROVIDE A SEDIMENTATION BARRIER.
2. STUMP STOCKPILING: THE STUMPS SHALL BE STOCKPILED DURING THE SITE CONSTRUCTION IN A LOCATION THAT IS EASILY ACCESSIBLE FOR TRUCKS AND EQUIPMENT. THE STOCKPILE SHALL BE MULCHED WITH HAY UNTIL THEY ARE BURIED ON SITE OR GROUND FOR REUSE ON DISTURBED EDGES OF SITE. MULCH SHALL BE APPLIED AT A RATE OF 90 LBS/1000 SQUARE FEET. SILT FENCE SHALL BE INSTALLED ON THE DOWN SLOPE SIDE OF THE STUMP PILE TO PROVIDE A SEDIMENTATION BARRIER. STUMPS WITHIN THE ROAD RIGHT OF WAY WILL BE GROUND AND USED FOR CONSTRUCTION OF THE WOOD WASTE BERM.
3. PERMANENT SEEDING: ALL DISTURBED AREAS AND AREAS OF EXPOSED SOIL SHALL BE SEEDED WITH CONSERVATION MIX #2 AT A RATE OF 42 LBS./ACRE. THIS SHALL INCLUDE 20 LBS. CREEPING RED FESCUE, 2 LBS. REDTOP, AND 20 LBS. TALL FESCUE. LIME SHALL BE APPLIED AT A RATE OF 3 TONS/ACRE. HAY MULCH WILL BE APPLIED AT A RATE OF 90 LB/1000 SQUARE FEET. ALL VEGETATED WATERWAYS AND CRITICAL AREAS OF CONCENTRATED FLOW SHALL BE STABILIZED WITH GEOTEXTILE OR SIMILAR (AS SPECIFIED ON THIS SHEET). THIS SEEDING MIXTURE SHALL NOT APPLY TO UNDERDRAINED GRASS FILTERS. SEE SHEET 5 FOR GRASS FILTER SEEDING REQUIREMENTS.

SPECIAL PROVISIONS:
1. ALL DISTURBED AREAS FOR PIPING WILL BE MULCHED WITHIN THREE DAYS OF INITIAL DISTURBANCE OR PRIOR TO ANY STORM EVENT
2. ANY AREA TO HAVE A PERMANENT COVER OF VEGETATION SHALL HAVE LOAM, PERMANENT SEEDING, AND MULCH APPLIED WITHIN SEVEN DAYS OF COMPLETING THE FINAL GRADING FOR THAT AREA.
3. VEGETATIVE AND RIP-RAP DITCH LININGS WILL BE INSTALLED WITHIN 48 HOURS OF COMPLETING THE FINAL GRADING FOR ANY SECTION OF DITCH.
4. STORM DRAIN OUTLET PROTECTION WILL BE INSTALLED WITHIN 24 HOURS OF SETTING EACH CULVERT OR PIPE.
5. LIMIT THE GRUBBED AREA FOR SITE CONSTRUCTION TO THAT WHICH IS MANAGEABLE IN ORDER TO REDUCE POTENTIAL FOR HIGH LAND RUNOFF. COMPLETE CULVERTS, INLET AND OUTLET PROTECTION AND MULCH AREAS BEFORE MOVING TO A NEW AREA.
6. ALL SLOPES EXCEEDING 15 PERCENT SHALL BE REQUIRED TO HAVE ONE OF THE FOLLOWING CONTROL MEASURES APPLIED TO PREVENT SCOURING AND EROSION:
   A. MULCH SHALL BE APPLIED OVER THE LOAM AND SEED AND SHALL BE ANCHORED BY NETTING, OR
   B. EROSION CONTROL BLANKET SHALL BE APPLIED OVER THE LOAM AND SEED, OR
   C. MULCH SHALL BE APPLIED OVER LOAM AND SEED AND SHALL HAVE TACKIFIER SPRAYED OVER MULCH, OR
   D. HYDROSEEDING ONTO LOAM SURFACE WITH MULCH APPLIED AND TACKIFIER TO STABILIZE THE MULCH.

MAINTENTANCE
DURING THE PERIOD OF CONSTRUCTION AND/OR UNTIL LONG TERM PERMANENT VEGETATION HAS BEEN ESTABLISHED, THE SITE WILL BE MAINTAINED IN ACCORDANCE WITH THE FOLLOWING CRITERIA:
A. DISTURBED AREAS SHALL BE RESEEDED AND MULCHED AS NEEDED TO ENSURE ADEQUATE VEGETATION TO STABILIZE THE UNDERLYING SOILS.
B. WATERWAYS AND RIPRAP PLUNGE POOLS SHALL BE VISUALLY INSPECTED WEEKLY AND AFTER RAIN EVENTS DURING CONSTRUCTION PERIOD. THEY WILL BE RESTORED AS REQUIRED. REPAIRS WILL INCLUDE REPAIRS TO JUTE MESH, FILLING IN ERODED AREAS, RESEEDING AND REMULCHING AND PROVIDING ADDITIONAL MULCH.
C. HAY BALE BARRIERS, WOOD WASTE BERM AND SILT FENCE WILL BE INSPECTED WEEKLY AND WILL BE REPAIRED AS NEEDED. SUCH REPAIRS WILL INCLUDE REMOVAL OF SEDIMENT TRAPPED AGAINST SILT FENCE/WOOD WASTE BERM WHEN HEIGHT OF SEDIMENT CREATES A LOADING PROBLEM ON THE BARRIER, REPAIR OF WATERWAY AREAS, OR DETERIORATION OF THE BARRIERS.
D. ALL DISTURBED SOILS SHALL HAVE HAY MULCH APPLIED AT A RATE OF 90 LBS. PER 1000 SQUARE FEET WITHIN 48 HOURS OF THE DISTURBANCE OF THE SOIL, AND PRIOR TO ANY PREDICTABLE RAIN EVENT.

ALL MEASURES DESCRIBED ABOVE SHALL BE MAINTAINED AS DIRECTED IN THE LATEST EDITION OF BEST MANAGEMENT PRACTICES FOR EROSION AND SEDIMENTATION CONTROL.

SCHEDULING:
A. CLEARING AND GRUBBING SHALL TAKE PLACE TO OPEN THE SITES TO ALLOW EQUIPMENT TO ACCESS THE NEW SITE.
B. SILT FENCE BARRIERS WILL BE INSTALLED PRIOR TO ANY CONSTRUCTION ACTIVITIES. THE SILT FENCE SHALL BE INSTALLED IN AREAS AS SHOWN ON THE DESIGN PLANS.
C. SITE CONSTRUCTION SHALL BEGIN ONCE THE SILT FENCE IS COMPLETED AS SHOWN ON THE DESIGN PLANS. SITE CONSTRUCTION SHOULD BEGIN IN JUNE OF 2010.

WINTER STABILIZATION
1. STANDARD FOR TIMELY STABILIZATION OF DITCHES AND CHANNELS - THE CONTRACTOR WILL CONSTRUCT AND STABILIZE ALL STONE-LINED DITCHES AND CHANNELS ON THE SITE BY SEPTEMBER 15. THE CONTRACTOR WILL CONSTRUCT AND STABILIZE ALL GRASS-LINED DITCHES AND CHANNELS ON THE SITE BY SEPTEMBER 15. IF THE CONTRACTOR FAILS TO STABILIZE A DITCH OR CHANNEL TO BE GRASS-LINED BY SEPTEMBER 15, THEN THE CONTRACTOR WILL TAKE ON OF THE FOLLOWING ACTIONS TO STABILIZE THE DITCH FOR LATE FALL AND WINTER.
   I. INSTALL A SOD LINING IN THE DITCH - THE CONTRACTOR WILL LINE THE DITCH WITH PROPERLY INSTALLED SOD BY OCTOBER 1. PROPER INSTALLATION INCLUDES THE CONTRACTOR PINNING THE SOD ONTO THE SOIL WITH WIRE PINS, ROLLING THE SOD TO GUARANTEE CONTACT BETWEEN THE SOD AND UNDERLYING SOIL, AND ANCHORING SOD AT THE BASE OF THE DITCH WITH JUTE OR PLASTIC MESH TO PREVENT THE SOD FROM SLOUGHING DURING FLOW CONDITIONS. RO
   II. INSTALL A STONE LINING IN THE DITCH - THE CONTRACTOR WILL LINE THE DITCH WITH STONE RIPRAP BY NOVEMBER 15. THE DEVELOPMENT'S OWNER WILL HIRE A REGISTERED PROFESSIONAL ENGINEER TO DETERMINE THE STONE SIZE AND LINING THICKNESS NEEDED TO WITHSTAND THE ANTICIPATED FLOW VELOCITIES AND FLOW DEPTHS WITHIN THE DITCH. IF NECESSARY, THE CONTRACTOR WILL REGRADE THE DITCH PRIOR TO PLACING THE STONE LINING SO TO PREVENT THE STONE LINING FROM REDUCING THE DITCH'S CROSS-SECTIONAL AREA.
2. STANDARD FOR THE TIMELY STABILIZATION OF DISTURBED SLOPES - THE CONTRACTOR WILL CONSTRUCT AND STABILIZE STONE-COVERED SLOPES BY NOVEMBER 15. THE CONTRACTOR WILL SEED AND MULCH ALL SLOPES TO BE VEGETATED BY SEPTEMBER 15. THE DEPARTMENT WILL CONSIDER ANY AREA HAVING A GRADE GREATER THAN 8% TO BE A SLOPE. IF THE CONTRACTOR FAILS TO STABILIZE ANY SLOPE TO BE VEGETATED BY SEPTEMBER 15, THEN THE CONTRACTOR WILL TAKE ONE OF THE FOLLOWING ACTIONS TO STABILIZE THE SLOPE FOR LATE FALL AND WINTERED OV
   I. STABILIZE THE SOIL WITH TEMPORARY VEGETATION AND EROSION CONTROL MATS - BY OCTOBER 1 THE CONTRACTOR WILL SEED THE DISTURBED SLOPE WITH WINTER RYE AT A SEEDING RATE OF 3 POUNDS PER 1000 SQUARE FEET AND THEN INSTALL EROSION CONTROL MATS OR ANCHORED MULCH OVER THE SEEDING. THE CONTRACTOR WILL MONITOR GROWTH OF THE RYE OVER THE NEXT 30 DAYS. IF THE RYE FAILS TO GROW AT LEAST THREE INCHES OR FAILS TO COVER AT LEAST 75% OF THE SLOPE BY NOVEMBER 1, THEN THE CONTRACTOR WILL COVER THE SLOPE WITH A LAYER OF WOOD-WASTE COMPOST AS DESCRIBED IN ITEM III OF THIS STANDARD OR WITH STONE RIPRAP AS DESCRIBED IN ITEM IV OF THIS STANDARD.
   II. STABILIZE THE SLOPE WITH SOD - THE CONTRACTOR WILL STABILIZE THE DISTURBED SLOPE WITH PROPERLY INSTALLED SOD BY OCTOBER 1. PROPER INSTALLATION INCLUDES THE CONTRACTOR PINNING THE SOD ONTO THE SLOPE WITH WIRE PINS, ROLLING THE SOD TO GUARANTEE CONTACT BETWEEN THE SOD AND UNDERLYING SOIL, AND WATERING THE SOD TO PROMOTE ROOT GROWTH INTO THE DISTURBED SOIL. THE CONTPACTOR WILL NOT USE LATE-SEASON SOD INSTALLATION TO STABILIZE SLOPES HAVING A GRADE GREATER THAN 33% (3H:1V) OR HAVING GROUNDWATER SEEPS ON THE SLOPE FACE.
   III. STABILIZE THE SLOPE WITH WOOD-WASTE COMPOST - THE CONTRACTOR WILL PLACE A SIX-INCH LAYER OF WOOD-WASTE COMPOST ON THE SLOPE BY NOVEMBER 15. THE CONTRACTOR WILL NOT USE WOOD-WASTE COMPOST TO STABILIZE SLOPES HAVING GRADES GREATER THAN 50% (2H:1V) OR HAVING GROUNDWATER SEEPS ON THE SLOPE FACE.
   IV. STABILIZE THE SLOPE WITH STONE RIPRAP - THE CONTRACTOR WILL PLACE A LAYER OF STONE RIPRAP ON THE SLOPE BY NOVEMBER 15. THE DEVELOPMENT'S OWNER WILL HIRE A REGISTERED PROFESSIONAL ENGINEER TO DETERMINE THE STONE SIZE NEEDED FOR STABILITY ON THE SLOPE AND TO DESIGN A FILTER LAYER FOR UNDERNEATH THE RIPRAP.
3. STANDARD FOR TIMELY STABILIZATION OF DISTURBED SOILS - BY SEPTEMBER 15 THE CONTRACTOR WILL SEED AND MULCH ALL DISTURBED SOILS ON THE SITE. IF THE CONTRACTOR FAILS TO STABILIZE THESE SOILS BY THIS DATE, THEN THE CONTRACTOR WILL TAKE ONE OF THE FOLLOWING ACTIONS TO STABILIZE THE SOIL FOR LATE FALL AND WINTER.
   I. STABILIZE THE SOIL WITH TEMPORARY VEGETATION - BY OCTOBER 1 THE CONTRACTOR WILL SEED THE DISTURBED SOIL WITH WINTER RYE AT A SEEDING RATE OF 3 POUNDS PER 1000 SQUARE FEET, LIGHTLY MULCH THE SEEDED SOIL WITH HAY OR STRAW AT 75 POUNDS PER 1000 SQUARE FEET, AND ANCHOR THE MULCH WITH PLASTIC NETTING. THE CONTRACTOR WILL MONITOR GROWTH OF THE RYE OVER THE NEXT 30 DAYS. IF THE RYE FAILS TO GROW AT LEAST THREE INCHES OR FAILS TO COVER AT LEAST 75% OF THE DISTURBED SOIL BEFORE NOVEMBER 1, THEN THE CONTRACTOR WILL MULCH THE AREA FOR OVER-WINTER PROTECTION AS DESCRIBED IN ITEM III OF THIS STANDARD.
   II. STABILIZE THE SOIL WITH SOD - THE CONTRACTOR WILL STABILIZE THE DISTURBED SOIL WITH PROPERLY INSTALLED SOD BY OCTOBER 1. PROPER INSTALLATION INCLUDES THE CONTRACTOR PINNING THE SOD ONTO THE SOIL WITH WIRE PINS, ROLLING THE SOD TO GUARANTEE CONTACT BETWEEN THE SOD AND UNDERLYING SOIL, AND WATERING THE SOD TO PROMOTE ROOT GROWTH INTO THE DISTURBED SOIL.
   III. STABILIZE THE SOIL WITH MULCH - BY NOVEMBER 15 THE CONTRACTOR WILL MULCH THE DISTURBED SOIL BY SPREADING HAY OR STRAW AT A RATE OF AT LEAST 150 POUNDS PER 1000 SQUARE FEET ON THE AREA SO THAT NO SOIL IS VISIBLE THROUGH THE MULCH. IMMEDIATELY AFTER APPLYING THE MULCH, THE CONTRACTOR WILL ANCHOR THE MULCH WITH PLASTIC NETTING TO PREVENT WIND FROM MOVING THE MULCH OFF THE DISTURBED SOIL.

NO.	REVISION	DATE

SHEET TITLE
EROSION CONTROL PLAN AND DETAILS

PROJECT SCALE: HORIZONTAL: NTS
PLAN DATE: OCTOBER 1, 2009

PROJECT
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FINAL PLAN

FILE NAME: FINAL PLAN_10.01.09
PROJECT NO.: STW09-017

SHEET NO
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