

## **14. SOIL EROSION AND SEDIMENTATION CONTROL**

### **14.1. INTRODUCTION**

Atlantic Resource Consultants (ARC) has been retained for the preparation of soil erosion and sediment control plans for a new aquaculture facility and the associated site improvements on a parcel of land at 285 Northport Avenue in the City of Belfast, Maine. The majority of the site is currently vacant and includes the former Belfast Water District intake and treatment building from Belfast Reservoir Number One, the former water supply source for the City of Belfast. The remainder of the site is largely undeveloped and consists of mature woodland and grass pasture. This site topography slopes in a generally southeasterly direction towards the reservoir and drains via several steep gullies. The majority of these drain into the reservoir, with the exception of the easternmost feature that drains, via a culvert under Route One directly to Penobscot Bay.

The project proposes development of the site to construct a land-based aquaculture facility that will include two large buildings, each consisting of three modules, two smaller Smolt Buildings, a Processing Building, a Central Utility Plant and several other smaller support services and utility buildings. Access roads, parking areas, utility services and stormwater BMPs will be constructed to serve the facility. The overall area of development at the site is approximately 38 acres.

The development will be constructed in two major phases, and these will be further divided into smaller sub-phases in order to effectively manage the construction process and minimize the soil erosion and sediment control risks associated with earthwork development projects of this scale.

A detailed soil erosion and sediment control plan has been developed to guide the management of major earthwork activities at the site. This plan includes a detailed breakdown of project phasing to minimize the exposure of erodible soils and to prevent significant sediment transport both within the site, and to downstream receiving waters. The project Soil Erosion and Sediment Control Plan is intended to be a live document and will be regularly reviewed and amended throughout the construction process to ensure the continued effectiveness of the Best Management Practices at the site, and the adequate protection of downstream resources.

### **14.2. EXISTING SITE CONDITIONS AND SOIL TYPES**

The project site is located at 285 Northport Avenue in the City of Belfast, Maine. The current cover conditions at the site include the impervious paved, gravel and roof areas associated with the previous use. These are all adjacent to the Route One access driveway and encompass an area of approximately 3 acres that formed the Belfast Water District offices and equipment storage facility. The area of the site closest to Reservoir Number One is predominantly wooded, with some unmaintained woods roads providing informal trail access. The northern portion of the development site is currently grassed pasture and has been recently used as a hay field. The grassed area of the site is approximately 11 acres. The topography of the site slopes in a generally southwesterly direction towards the reservoir at an average gradient of between 2 and 3%. There are several steep gullies formed by drainageways that traverse the site. The westerly gullies drain to the reservoir, the easternmost drainageway discharges to a culvert under Route One, crossing the property to the south of the road, and discharging directly to the bay.

Predominant surface soil types at the site are identified as Boothbay and Swanville silt loams by the Natural Resource Conservation Service (NRCS) Web Soil Survey. The susceptibility of soils to erosion is

indicated on a relative "K" scale of values over a range of 0.02 to 0.69. The "K" value is frequently used with the universal soil loss equation. The higher values are indicative of the more erodible soils. The K values of the mapped soils at the project site are as follows:

Soil Name	Soil Description	K Value
Boothbay	Silt loam	0.37
Swanville	Silt loam	0.28

Based on a review of the K values, the onsite soils in the area exhibit low to moderately susceptible to erosion after the cover material is stripped.

A more detailed geotechnical investigation of the site has been undertaken by Ransom Consulting, Inc. The explorations generally found glaciomarine silt and clay deposits overlying glacial till and bedrock. A soft, compressible glaciomarine silt and clay deposit was identified and this is likely to consolidate under loading from proposed site fills and building foundations. The current development plan includes removal and off-site disposal of this problematic soil layer. The material will be replaced with imported Granular Borrow material to form a stable and competent subgrade for the proposed improvements.

Natural resource mapping on the site was undertaken in 2018 by Normandeau Associates as part of the site investigations for this project. The mapping identified a number of freshwater wetlands and streams at the site. The natural resources are described in detail in the wetland delineation report that accompanies this submission.

### **14.3. EXISTING EROSION PROBLEMS**

No significant existing erosion problems have been identified at the project site.

### **14.4. CRITICAL AREAS**

The critical areas of the site include the freshwater wetland resources downstream of the construction work area. There are also a number of streams on the project site that fall under the Natural Resource Protection Act jurisdiction. These streams are intermittent and have been designated with the prefix "S" as shown on Figure 14.1 on the following page. Non-jurisdictional drainages are designated with the prefix "D". Three streams extend off site and drain into the adjacent Reservoir One.

Following development of the site the lower reaches of these streams will have been cut off from the hydrological source which is primarily surface run off and groundwater discharge during seasonal high water tables.

To prevent these streams from drying up they will be fed by clean water from a series of foundation drains and bypass culverts that are intended to intercept groundwater from the site both during and post-construction. Riprap plunge pool outlets will be constructed at the discharge points of the new drains to dissipate flow velocities and allow non-erosive discharge to downstream receiving channels. The bypass culverts, foundation drains, and outlet locations are shown on the Soil Erosion and Sediment Control Phasing Plans (Sheets CE-111 to CE-118). In summary, the volume of water will be sufficient to maintain intermittent flows and the plunge pool outlet design will prevent erosion.

Critical resources downstream from the site include Belfast Reservoir Number One and Penobscot Bay.

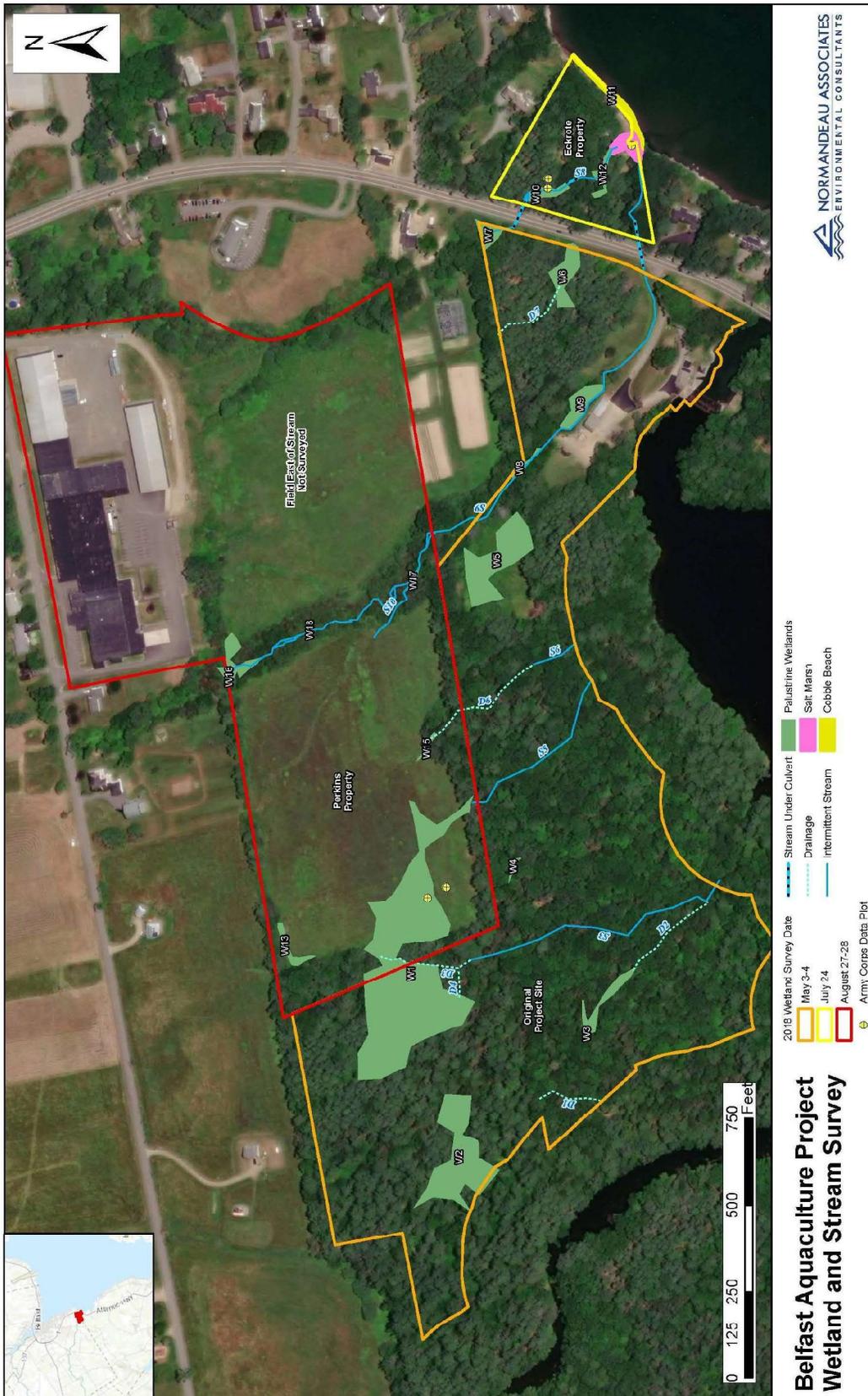


FIGURE 14.1

## 14.5. SOIL EROSION AND SEDIMENTATION CONTROL PLAN AIMS AND OBJECTIVES

The primary goals of the Soil Erosion and Sediment Control Plan for the project are to avoid and minimize the potential for soil erosion to the maximum extent practical, and to prevent sediment transport to downstream areas, receiving waters and natural resources. Measures will also be taken to ensure sediment is not tracked onto adjacent streets and that stockpiles of controlled imported construction materials are protected from potential contamination by native soils and other deleterious matter. In order to achieve these aims it will be essential to minimize exposure of native soil materials during construction and to install, observe and maintain a range of Best Management Practices.

The primary methods included in the Soil Erosion and Sedimentation Control Plan to be implemented for this project are as follows:

- Construction Phasing - The major earthwork activities will be phased to minimize the area of potentially erodible native soils exposed at any given time. This will minimize the potential for soil erosion and runoff contamination during inclement weather conditions. It will also reduce the potential for sediment transport and result in manageable quantities of accumulation in treatment Best Management Practices. A detailed construction and Soil Erosion and Sediment Control Phasing Plan is included in **Attachment A**.
- Diversion of Run-on from Upstream Areas – Diversion measures will be installed at the beginning of construction to capture and divert surface runoff and groundwater around the work area, reducing the need for de-watering in excavation areas.
- Perimeter Controls – Perimeter sediment barriers will be installed downstream of all work areas to prevent the transport of sediment to receiving waters and natural resources. Stabilized construction entrances (wheel cleaning pads) will be installed at all site entrances to prevent tracking of sediments onto roadways.
- Temporary Cover Materials – The plan includes the installation of temporary cover materials in some areas to prevent erosion from occurring during construction.
- Rapid Stabilization of Excavated Areas – Cover materials including geotextile fabric and imported granular borrow will be placed over exposed native soils immediately after excavation and subgrade preparation to minimize the period of soil exposure.
- Stabilization of drainage outlets and channels to avoid rill and gully erosion.
- Inlet Protection – Silt sacks and coir logs will be installed to protect drainage inlets and conveyances from sediment contamination.
- On-site sediment barriers - On-site measures to capture sediment (hay bales, silt fence, etc.) before it is conveyed to sediment sumps.
- Temporary Sediment Basins and Sumps – Sediment capture and treatment BMPs will be installed to provide detention, storage and treatment of any sediment contaminated runoff generated at the site.
- Permanent Measures – Stormwater BMPs, conveyances and stable permanent cover materials will be installed to provide long-term protection of the site and receiving waters.

## 14.6. DESCRIPTION AND LOCATION OF LIMITS OF ALL PROPOSED EARTH MOVEMENTS

The proposed project will require major earth moving at the site. The area of proposed development will cover approximately forty acres of the site in total. Substantial cuts and fills will be required to achieve the final grades for the development. Removal of the problematic compressible silt and clay deposits from beneath the proposed improvements will require large volumes of excavation, material export and import of replacement Granular Borrow materials to the site prior to construction of site improvements.

This obviously has major implications on the scope of earthwork required to prepare the site and on materials handling, haulage and disposal. It also presents a significant opportunity to rapidly stabilize the site at an earlier than normal stage of construction. The removal of fine-grained, native soil materials followed by immediate cover of exposed areas with imported granular borrow will effectively limit the potential for soil erosion and mobilization of fine sediments. Large areas of the site will be quickly stabilized, providing a sound working surface for construction

Careful phasing of the project will allow these activities to occur simultaneously, limiting the area of the site that is "open" (i.e. disturbed and not stabilized) at any given time. This will have the additional benefit of increasing the efficiency of materials haulage. Trucks exporting unsuitable materials from the site will be available to convey imported granular material as part of a round trip operation.

## **14.7. SOIL EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICES**

### **Construction Schedule**

The primary and most proactive best management practice for soil erosion and sediment control at the site is careful planning and phasing of construction tasks. The major earthwork activities have been broken into manageable phases in order to efficiently accomplish the necessary work while minimizing the risks associated with exposure of native fine-grained soils. The installation of Best Management Practices is integrated into the individual phases to ensure that effective diversion, cover and perimeter control measures are in place to protect the work area, limit soil exposure times and prevent transport of sediment to downstream areas. Major earthwork phasing is described in the narrative and shown on the Earthwork and Soil Erosion and Sediment Control Phasing Plans included in **Attachment A**, and in the project plan set.

### **Temporary Erosion/Sedimentation Control Measures**

As part of the site development, the Contractor will be obligated to implement the following erosion and sediment control devices. These devices shall be installed as indicated on the plans or as described within this report. For further reference on these devices, see the Maine Erosion and Sediment Control Best Management Practices (BMPs) Manual for Designers and Engineers, Maine DEP, October 2016.

1. Crushed stone stabilized construction entrances will be placed at any construction access points from adjacent streets, and at interior locations shown on the phasing plans. The locations of the construction entrances shown on the drawings should be considered illustrative and will need to be adjusted as appropriate and located at any area where there is the potential for tracking of mud and debris onto existing roads or streets. Stone stabilized construction entrances will require the stone to be removed and replaced, as it becomes covered or filled with mud and material tracked by vehicles exiting the site.
2. A Runoff Diversion Trench and upgradient silt fence barrier shall be installed at the northern side of the site prior to major earthmoving activities. The BMPs shall be installed in accordance with the details provided and are intended to divert surface runoff and groundwater around the construction area, minimizing the need for de-watering.
3. Bypass culverts will be installed in gullies and drainageways to intercept groundwater seeps, convey clean water through the construction area and maintain baseflow in downstream receiving channels.
4. Riprap plunge pool outlets shall be constructed at the end of bypass culverts and channels, to dissipate flow velocities and allow non-erosive discharge to downstream receiving channels.

5. Silt fence shall be installed down slope of any disturbed areas to trap runoff borne sediments. The silt fence shall be installed per the detail provided in the plan set and inspected immediately after each rainfall, and at least weekly in the absence of significant rainfall. The Contractor shall make repairs immediately if there are any signs of erosion or sedimentation below the fence line. If such erosion is observed, the Contractor shall take proactive action to identify the cause of the erosion and take action to avoid its recurrence. Proper placement of stakes and keying the bottom of the fabric into the ground is critical to the fence's effectiveness. If there are signs of undercutting at the center or the edges or impounding of large volumes of water behind the fence, the barrier shall be replaced with a stone check dam and measures taken to avoid the concentration of flows not intended to be directed to the silt fence. Wood chips from clearing can be used in front of the silt fence to provide an extra margin of safety and security for the silt fence. This practice is encouraged, provided the chips are removed when the fence is removed. Silt fencing with a maximum stake spacing of 6 feet should be used, unless the fence is supported by wire fence reinforcement of minimum 14 gauge and with a maximum mesh spacing of 6 inches, in which case stakes may be spaced a maximum of 10 feet apart. The bottom of the fence should be properly anchored a minimum of 6" per the plan detail and backfilled. Silt fence shall be installed along the downgradient side of construction work areas, with locations being adjusted along with the construction phasing areas. The Contractor may use erosion mix in place of single row silt fence barrier.
6. Twin rows of siltation fence with hay bales shall be installed at the foot of steep slopes and adjacent to protected natural resources (wetland areas).
7. Erosion Control Mix - Erosion control mix is a dense, processed mixture of intertwining shredded wood fragments and grit that will stabilize a site immediately without vegetation. This product may be used in place of silt fence to protect downstream areas not adjacent to natural resources. Erosion control mix consists primarily of organic material and may include: shredded bark, stump grindings, or partially composted wood products and shall be placed to form berms in accordance with the detail on the plan set. Care shall be taken to ensure berms are level and provide an even depth of protection throughout the length of the berm. The Contractor shall make repairs immediately if there are any signs of erosion or breaches in the berm, and supplement berms with additional material if settlement is observed.
8. Stone check dams, silt logs, or hay bale barriers will be installed at any evident concentrated flow discharge points during construction and earthwork operations.
9. All slopes steeper than 4:1 shall receive erosion control blankets, or temporary riprap stabilization. Where temporary riprap is used, slopes shall be stabilized with loam, seed and erosion control blanket, or sod when the riprap is removed for final stabilization. Slope stabilization fabric shall be a fully biodegradable double net, coir fiber blanket, anchored in accordance with manufacturers recommendations.
10. Areas of visible erosion and the temporary sediment sumps shall be stabilized with crushed stone. The size of the stone shall be determined by the Contractor's designated representative in consultation with the Owner.
11. Temporary sediment sumps and sediment basins will provide sedimentation control for stormwater runoff from disturbed areas during construction until stabilization has been achieved. The sides and floors of sediment basins shall be stabilized with geotextile fabric laid over prepared subgrade materials. Outlets shall be as shown on the construction drawings and shall include sand filters around all risers and outlet pipes.
12. Dirtbags™ will be required to be on site and available for construction dewatering. The Contractor will be required to provide four Dirtbags™ with one prepared for operation prior to commencing any trenching operations.

13. Silt logs may be used in areas where sheet flow drains off impervious surfaces to spread and filter the flow. Silt logs should be anchored in accordance with manufacturer recommendations.

### **Special Measures for Summer Construction**

The summer period is generally optimum for construction in Maine, but it is also the period when intense short duration storms are most common, making denuded areas very susceptible to erosion. Dust control needs to be the most stringent, and the potential to establish vegetation is often restricted by moisture deficit in the summer. During these periods, the Contractor must:

1. Implement a program to apply dust control measures on a daily basis except those days where precipitation is sufficient to suppress dust formation. This program shall extend to and include adjacent streets.
2. Spray any mulches with water after anchoring to dampen the soil and encourage early growth. Spraying may be required several times. Temporary seed may be required until the late summer seeding season.
3. Cover stockpiles of fine-grained materials, or excavated soils which are susceptible to erosion. To protect from the intense, short-duration storms which are more prevalent in the summer months.
4. Take additional steps when needed, including watering, or covering excavated materials to control fugitive dust emissions to minimize reductions in visibility and the airborne disbursement of fine-grained soils. This is particularly important given the potential presence of soil contaminants, and the proximity of along the adjacent streets and properties.
5. These measures may also be required in the spring and fall during the drier periods of these seasons.

### **Permanent Erosion Control Measures**

The following permanent erosion control measures have been designed as part of the Erosion/Sedimentation Control Plan:

1. The drainage conveyance systems have been designed to intercept and convey the 25-year storm.
2. All areas disturbed during construction, but not subject to other restoration (paving, riprap, etc.), will be loamed, limed, fertilized, mulched, and seeded. Fabric netting, anchored with staples, shall be placed over the mulch in areas where the finish grade slope is greater than 10 percent. Native topsoil shall be stockpiled and temporarily stabilized with seed and mulch and reused for final restoration when it is of sufficient quality.
3. Stormwater BMPs have been designed to capture, treat and discharge runoff from the developed areas of the site in a non-erosive manner to downstream receiving waters. Details of the Stormwater Management Plan are included in Section 12.
4. Catch basins shall be provided with sediment sumps for all outlet pipes that are 12" in diameter or greater or where winter sand use is contemplated. A sediment collection bag shall be installed in all basins.

### **Timing and Sequence of Erosion/Sedimentation Control Measures**

The following general construction sequence shall be followed to ensure the effectiveness of soil erosion and sediment control measures. The detailed phasing plan and narrative should be referred to for the delineation of individual construction phases and descriptions of the associated BMPs and work methods. It is anticipated that project earthwork progress and phasing will be reviewed throughout the project as part of the overall construction schedule management for the project. Therefore, the following is intended for outline guidance only.

1. Install construction entrances.
2. Install safety and construction fence to secure the site for clearing and mobilization.

3. Install perimeter siltation fence and erosion control barriers. Particular attention shall be paid to areas upstream of protected natural resources and in the vicinity of the streams at the project site. Signs shall be erected periodically along these perimeter barriers indicating that the downstream areas are off limits to all construction activities.
4. Install diversion BMPs and stabilized outlet plunge pools to convey water from upstream areas around the project site.
5. Install temporary sediment basins and sumps as shown on the project plans and details.
6. Construct activities on the site to optimize the handling of materials and restrict the denuded areas to the time stipulated, as described in the project phasing plan.
7. Install granular borrow and pavement gravel materials to raise the site to the design subgrade elevation.
8. Construct stabilized pads for foundation and building construction.
9. Maintain erosion controls and stabilized areas throughout the construction period.
10. Install binder pavement.
11. Landscape (loam and seed).
12. Install surface pavements.
13. Install striping, signage, and miscellaneous site improvements.
14. Review the site improvements, identify punch list items and required revisions.
15. Remove any temporary erosion control measures.

The Contractor must maintain an accurate set of record drawings indicating the date when an area is first denuded, the date of temporary stabilization, and the date of final stabilization. On October 1 of any calendar year, the Contractor shall submit a detailed plan for stabilizing the site for the winter and a description of what activities are planned during the winter.

#### **14.8. PERMIT REQUIREMENTS**

This project will require review and approval by Federal, State and Local Regulatory Authorities. Permit approvals from these bodies may include specific conditions related to soil erosion and sediment control in addition to the standards described below. The Owner and Contractor will be responsible for review of, and adherence to any and all specific permit conditions applicable to the project, and these will become part of the Contract Documents for the project.

The scale and nature of the project will require coverage under the Maine Pollutant Discharge Elimination System (MPDES) General Permit - Construction Activity. The following procedures will be required to meet the minimum regulatory standards associated with this permit:

##### **Preconstruction Conference**

Prior to any construction at the site, representatives of the Contractor, the Project Engineer, the Owner, Regulatory Agency Representatives and the City of Belfast City Engineer shall meet to discuss the scheduling of the site construction and the designation of the responsible parties for implementing the plan. The Contractor shall be responsible for scheduling the meeting. Prior to the meeting, the Contractor will prepare a detailed schedule and a marked-up site plan indicating areas and components of the work and key dates showing date of disturbance and completion of the work. The Contractor shall conduct a meeting with employees and sub-contractors to review the erosion control plan, the construction techniques which will be employed to implement the plan and provide a list of attendees and items discussed at the meeting to the Owner. Three copies of the schedule, the Contractor's meeting minutes, and marked-up site plan shall be provided to the Owner.

##### **Inspection of Soil Erosion and Sediment Control Measures**

The CM shall prepare a list and designate by name, address and telephone number all individuals who will be responsible for implementation, inspection, and maintenance of all erosion control measures identified within this section and as contained in the Erosion and Sedimentation Control Plan of the contract drawings. Specific responsibilities of the inspector(s) will include:

- Execution of the Contractor/Subcontractor Certification contained in **Attachment C** by any and all parties responsible for erosion control measures on the site.
- A weekly certification stating compliance, any deviations, and corrective measures necessary to comply with the erosion control requirements of this section shall be prepared and signed by the inspector(s).

Inspection of the project work site shall include:

1. Identification of proper erosion control measure installation in accordance with the erosion control detail sheet or as specified in this section.
2. Determine whether each erosion control measure is properly operating. If not, identify damage to the control device and determine remedial measures.
3. Identify areas which appear vulnerable to erosion and determine additional erosion control measures which should be used to improve conditions.
4. Inspect areas of recent seeding to determine percent catch of grass. A minimum catch of 90 percent is required prior to removal of erosion control measures.
5. All erosion controls shall be removed within 30 days of permanent stabilization except for mulch and netting not detrimental to the project. Removals shall include but not be limited to all silt fence, hay bales, inlet protection, and stone check dams.
6. Accumulated silt/sediment should be removed when the depth of sediment reaches 50 percent of the barrier height. Accumulated silt/sediment should be removed from behind silt fencing when the depth of the sediment reaches 6 inches.
7. Silt sacks should be removed and replaced at least every three months and at any time where the weekly inspection reveals that siltation has significantly retarded the rate of flow through the silt sack.
8. If inspection of the site indicates a change should be made to the erosion control plan, to either improve effectiveness or correct a site-specific deficiency, the inspector shall immediately implement the corrective measure and notify the Owner of the change.

A summary of standard Erosion Control Inspections is given in the table below. It is anticipated that inspection and maintenance tasks will be adapted throughout the project to reflect field conditions and construction progress:

EROSION AND SEDIMENT CONTROL MEASURES AND ACTIVITY	INSPECTION FREQUENCY		
	Weekly	Before & After a Storm	After Construction
<b>SEDIMENT BARRIERS</b>			
Sediment barriers are installed prior to soil disturbances	X	X	
Silt fences are keyed in and tight	X	X	
Barriers are repaired and replaced as necessary	X	X	
Barriers are removed when the site is stabilized - Silt fence should be cut at the ground surface			X
<b>TEMPORARY STABILIZATION</b>			
Areas are stabilized if idle for 14 days or more	X	X	

EROSION AND SEDIMENT CONTROL MEASURES AND ACTIVITY	INSPECTION FREQUENCY		
	Weekly	Before & After a Storm	After Construction
Daily stabilization within 100 ft of a natural resource	X	X	
<b>MULCH</b>			
Seed and mulch within 7 days of final grading. Ground is not visible	X	X	
Erosion control mix is 4-6 inch thick	X	X	
Erosion control blankets or hay mulch are anchored	X	X	
<b>VEGETATION</b>			
Vegetation provides 90% soil cover	X		X
Loam or soil amendment were provided	X		X
New seeded areas are mulched and protected from vehicle, foot traffic and runoff	X	X	X
Areas that will remain unworked for more than 1 year are vegetated with grass	X		
<b>SLOPES AND EMBANKMENTS</b>			
Final graded slopes and embankments are stabilized	X	X	X
Diversions are provided for areas with rill erosion	X	X	X
Areas steeper than 2:1 are riprapped	X		
Stones are angular, durable and various in size	X		
Riprap is underlain with a gravel layer or filter fabric	X		
<b>STORMWATER CHANNELS AND CULVERTS</b>			
Ditches and swales are permanently stabilized– channels that will be riprapped have been over-excavated	X	X	X
Ditches are clear of obstructions, accumulated sediments or debris	X	X	X
Ditch lining/bottoms are free of erosion	X	X	X
Check dams are spaced correctly to slow flow velocity	X		
Underlying filter fabric or gravel is not visible	X	X	X
Culvert aprons and plunge pools are sized for expected flows volume and velocity	X		
Stones are angular, durable and various in size	X		
Culverts are sized to avoid upgradient flooding	X	X	
Culvert protection extends to the maximum flow elevation within the ditch	X	X	X
Culvert is embedded, not hanging	X	X	X
<b>CATCH BASIN SYSTEMS</b>			
Catch basins are built properly	X		
Accumulated sediments and debris are removed from sump, grate and collection area		X	X
Floating debris and floating oils are removed from trap			X
<b>ROADWAYS AND PARKING SURFACES</b>			
The gravel pad at the construction entrance is clear from sediments	X	X	
Roads are crowned		X	X
Cross drainage (culvert) is provided	X		
False ditches (from winter sand) are graded		X	X
<b>BUFFERS</b>			
Buffers are free of erosion or concentrated flows		X	X

EROSION AND SEDIMENT CONTROL MEASURES AND ACTIVITY	INSPECTION FREQUENCY		
	Weekly	Before & After a Storm	After Construction
The downgradient of spreaders and turnouts is stable		X	X
Level spreaders are on the contour			X
The number of spreaders and ditch turnouts is adequate for flow distribution		X	X
Any sediment accumulation is removed from within spreader or turnouts		X	X
<b>STORMWATER BASINS AND TRAPS</b>			
Embankments are free of settlement, slope erosion, internal piping, and downstream swamping		X	X
All flow control structure or orifices are operational and clear of debris or sediments		X	X
Any pre-treatment structure that collects sediment or hydrocarbons is clean or maintained		X	X
Vegetated filters and infiltration basins have adequate grass growth			X
Any impoundment or forebay is free of sediment		X	X
<b>WINTER CONSTRUCTION (November 1st-April 15th)</b>			
Final graded areas are mulched daily at twice the normal rate with hay, and anchor (not on snow)	Daily		
A double row of sediment barrier is provided for all areas within 100 ft of a sensitive resource (use erosion control mix on frozen ground)	Daily		
Newly constructed ditches are ripped	Daily		
Slopes greater than 8% are covered with an erosion control blanket or a 4-inch layer of erosion control mix	Daily		
<b>HOUSEKEEPING PUNCH LIST</b>			
All disturbed areas are permanently stabilized, and plantings are established (grass seeds have germinated with 90% vegetative cover)			X
All trash, sediments, debris or any solid waste have been removed from stormwater channels, catch basins, detention structures, discharge points, etc.			X
All ESC devices have been removed: (silt fence and posts, diversions and sediment structures, etc.)			X
All deliverables (certifications, survey information, as-built plans, reports, notice of termination (NOT), etc.) in accordance with all permit requirements have been submitted to town, Maine DEP, association, owner, etc.			X

### Maintenance of Soil Erosion and Sediment Control Measures

The following general maintenance requirements shall apply to the installed erosion control BMPs. Additional maintenance may be required based on field conditions, or at the recommendation of the Project Engineer, Third Party Inspector, Owners Representative, or regulatory authorities:

1. Stabilized Construction Entrances - Stone stabilized construction entrances will require the stone to be removed and replaced, as it becomes covered or filled with mud and material tracked by vehicles exiting the site.
2. The surface of the Runoff Diversion Trench shall be inspected on a weekly basis and cleared of any accumulating surface debris that could reduce the capacity of the BMP to divert surface

water. The outlets should be inspected to ensure that groundwater flows are being adequately conveyed around the construction area.

3. The upgradient (diversion) silt fence barrier shall be repaired or replaced immediately if any breaches are found, or there are signs of undercutting. Sediment and debris shall be removed from the upstream side of the barrier periodically. The downstream ends of the barrier should be checked for any erosion caused by concentrated flows running along the barrier. These areas should be repaired immediately with stone check dams to prevent further damage.
4. Inlets and outlets of bypass culverts shall be cleared of accumulating debris and any signs of erosion shall be repaired immediately with riprap.
5. Riprap plunge pool outlets shall be cleared of debris and monitored for sediment accumulation. If sediment reaches a depth of six inches, it shall be removed, and the plunge pool repaired or re-constructed.
6. Silt Fence Barriers - The Contractor shall make repairs immediately if there are any signs of erosion or sedimentation below the fence line. If such erosion is observed, the Contractor shall take proactive action to identify the cause of the erosion and take action to avoid its reoccurrence. If there are signs of undercutting at the center or the edges or impounding of large volumes of water behind the fence, the barrier shall be replaced with a stone check dam and measures taken to avoid the concentration of flows not intended to be directed to the silt fence.
7. Silt Fence Haybale Barriers – The Contractor shall maintain the silt fence as described above. Should the central haybale barrier deteriorate, or show signs of contamination, the material shall be removed and replaced.
8. Erosion Control Mix – The Contractor shall maintain erosion control berms to ensure they remain level and continue to provide an even depth of protection throughout the length of the berm. The Contractor shall make repairs immediately if there are any signs of erosion or breaches in the berm, and supplement berms with additional material if settlement is observed.
9. Stone check dams, silt logs, or hay bale barriers installed at concentrated flow discharge points shall be inspected and cleared of accumulated debris periodically. If sediment accumulation is observed, this shall be removed when it reaches a depth of not more than six inches.
10. Slopes stabilized with erosion control blankets, or temporary riprap stabilization shall be inspected and repaired if any signs of rill erosion or stone displacement are observed. Sloughing of slopes or evidence of slip, rotational or base failure shall be reported immediately to the project engineer for design of remedial actions.
11. Any open graded areas of visible erosion and the temporary sediment sumps shall be stabilized with crushed stone. The size of the stone shall be determined by the contractor's designated representative in consultation with the Owner.
12. Temporary sediment sumps and sediment basins shall be inspected on a weekly basis. Routine maintenance shall include the removal of debris around inlets and outlets, repair of any uneven areas on basin berms, repair of any observed rill erosion in embankments and replacement of bench and outlet control filter material when slow drainage is observed.
13. Anchoring of silt logs shall be checked on a weekly basis. These shall be removed and replaced when clogged with sediment.
14. Mulched areas shall be repaired when ground is visible through the mulch layer. Anchoring of erosion control blankets and hay mulch shall be repaired if any evidence of separation is observed.
15. Vegetated areas shall be over-seeded and stabilized where 90% cover is not achieved.

### **Reporting Requirements**

In addition to the weekly certifications, the inspector(s) shall maintain written reports recording construction activities on site which include:

1. Dates when major grading activities occur in a particular areas of the site.
2. Dates when major construction activities cease in a particular area, either temporarily or permanently.
3. Dates when an area is stabilized.
4. Inspection of the project work site on a weekly basis and after each significant rainfall event (0.25 inch or more within any consecutive 24-hour period) during construction until permanent erosion control measures have been properly installed and the site has been stabilized.
5. A log (report) must be kept summarizing the scope of the inspection, name(s) and qualifications of the personnel making the inspection, the date(s) of the inspection, and major observations relating to operation of erosion and sedimentation controls and pollution prevention measures. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and location(s) where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken.

#### **Record Keeping**

1. All certifications, inspection forms, and written reports prepared by the inspector(s) shall be filed with the Owner, and the Permit File contained on the project site, and available for inspection and review upon request. All written certifications, inspection forms, and written reports must be filed within one (1) week of the inspection date.
2. Inspections Reports and Logs must be made accessible to regulatory agency staff and a copy must be provided upon request.
3. Copies of all reports must be kept on file and available upon request for a period of at least three years from the completion of permanent stabilization.

### **14.9. CONSTRUCTION PROCUREMENT AND ADMINISTRATION**

The project will be constructed by a Construction Manager under contract to the Owner/Applicant. The Construction Manager will submit a detailed schedule for the completion of the work, broken into specific tasks, with anticipated milestones and completion dates, at the start of construction. The project schedule will be reviewed at regular bi-weekly project meetings, with updates and amendments to be recorded in the project file.

The work will be conducted in sections which will limit the amount of exposed area to those areas in which work is expected to be undertaken during the next 30 days. Exposed areas will be covered and stabilized as rapidly as practical. All areas will be permanently stabilized within 7 days of final grading and temporarily stabilized within 7 days of initial disturbance or before a predicted storm event of over ½" of rain. The area of denuded, non-stabilized construction shall be limited to the minimum area practicable. An area shall be considered to be denuded until the subbase gravel is installed in parking areas, or the areas of future loam and seed have been loamed, seeded, and mulched, or stabilized with erosion control blanket.

The Contractor must maintain an accurate set of record drawings indicating the date when an area is first denuded, the date of temporary stabilization, and the date of final stabilization. On October 1 of any calendar year, the Contractor shall submit a detailed plan for stabilizing the site for the winter and a description of what activities are planned during the winter.

The Contractor must install any added measures which may be necessary to control erosion/sedimentation and fugitive dust emissions from the site, with adjustments made dependent upon forecasted and actual site and weather conditions.

The Contractor has sole responsibility for complying with the erosion/sediment control report, including control of fugitive dust, and shall be responsible for any monetary penalties resulting from failure to comply with these standards.

Once construction has been completed, long-term maintenance of the stormwater management system will be the responsibility of the applicant. Operations & Maintenance items with a list of maintenance requirements and frequency are listed at the end of Section 12 of the Maine DEP Permit Application.

## **Attachments**

Attachment A – Soil Erosion and Sediment Control Phasing Plans and Narrative

Attachment B – Temporary Sediment Basin Sizing Calculations

Attachment C - Sample Erosion Control Compliance Certification and Inspection Forms

## **ATTACHMENT A**

**Major Earthwork Phasing Narrative & Soil Erosion and Sediment  
Control Phasing Plans**

## **PHASING OF MAJOR EARTHWORK ACTIVITIES**

The following is intended to convey the phased progression of major earthwork activities from stripping and grubbing of areas of new development to stabilization of prepared subgrades. In the case of the building pads, subgrade will be formed in compacted Granular Borrow material that will be imported to replace the unsuitable native clay soils beneath the future structures. The roadways providing access to and from construction areas will be paved. Riprap stone will be used to provide temporary and permanent stabilization to slopes and storm drain outlets. The remaining laydown areas and pads will be brought to subgrade in stable granular gravel and crushed stone materials.

It should be noted that subgrade stabilization in the areas described below will not conclude the site/civil works in these areas. Subsequent earth moving activities will include foundation construction, building pad preparation, roadway and stormwater BMP construction, and final hardscaping and landscaping throughout the development area. However, all of these subsequent activities will take place on a stable, prepared granular surface. From the perspective of soil erosion and sediment control, the site will be considered stable once the excavation and exposure of native soils has been completed and stable cover material has been installed across the site.

The major earthwork activities will be divided into several phases to carefully manage the risk associated with exposure of native soils and to minimize the potential for soil erosion and sediment transport. The phases of work are described below and shown on the accompanying drawings.

### **SITE CLEARING**

1. Site Layout - Upon receipt of all permit approvals and after holding pre-construction meetings with regulatory authorities and other stakeholders, the Phase 1 area of the project and tree clearing limits will be defined using stakes and fencing.
2. Site Clearing – Once the clearing limits have been established, clearly marked and approved by the Owner, the Phase 1 area will be cleared of major trees and vegetation. The clearing for Phase 1 may be undertaken in phases, as opposed to at one time, in order to minimize the cleared area to that needed for the next phase of construction.
3. A stabilized construction entrance will be installed at the end of the existing paved driveway to provide wheel cleaning for traffic exiting the site during this phase, and a stable, gravel laydown pad will be constructed on the existing cleared area at the edge of the woodland. Access to the interior of the site will be via existing woods roads. Additional stabilized haul roads will be established throughout the Phase 1 area as the work progresses, and perimeter erosion controls will be established as access becomes available to areas that have been logged.

### **PHASE 1A – SITE MOBILIZATION**

1. Runoff Diversions – Prior to any grubbing or major earthwork, diversion BMPs will be installed around the upslope perimeter of the site. This will include silt fence barriers to direct surface runoff entering the site around the work area. A diversion trench will be constructed along the upper perimeter of the site to intercept additional surface water and groundwater at the upstream side of the project site. Underdrain piping will convey the intercepted flow around the work area before discharging, via outlet plunge pools to existing natural drainageways. Bypass culverts will also be installed in interior drainage channels that will be impacted during the initial work phases. These

are designed to intercept internal surface water runoff and groundwater flow and divert it around the work area before draining, via stabilized outlet plunge pools into existing channels. The underdrain pipes in the diversion trenches and the bypass culverts installed in the drainage channels will remain in place at the end of construction. These will drain on-site groundwater to the headwaters of the natural drainageways that will remain in place after construction of the facility, providing baseflow to maintain these resources. Temporary access roads will be constructed to facilitate installation of the diversion BMPs and outlet plunge pools.

2. Establishment of site access, laydown area, offices and storage -
  - a. Perimeter erosion controls will be installed in all downstream Phase 1A areas where these are not already installed during the tree clearing operations prior to any further work at the site.
  - b. The major site improvement work will start with the establishment of a stable access road into the work area. The road will be constructed along the line of the permanent driveway and extend to the site office area before heading west through the site to the Phase 1 Building area.
  - c. The site laydown area will be established in the southeast corner of the main site and will have an area of approximately 80,000sf. The area will be stripped and grubbed, graded and covered with a woven geotextile fabric. Panel drains will be placed on the geotextile fabric to ensure that the area remains dry and stable. Granular Borrow will then be added to stabilize the area and bring it to grade.
  - d. The site office and storage area is located at the northeast corner of the main site and has an area of approximately 15,000sf. Once the main laydown area is stabilized, this area will be stripped and grubbed, graded and covered with a woven geotextile and brought to grade in the same manner as the laydown area.
3. Installation of stabilized construction accesses for further phases of work – Two further stabilized construction accesses will be constructed at the entries to the work area at the west end of Phase 1A. These will protect the completed work area from tracked sediments originating from the Phase 1B work.
4. Phase 1A will also include the preparation of the building pad at the new Water and Wastewater Treatment Plant located towards the site entrance. A temporary crossing will be constructed over the intermittent stream to allow access to this area of the site without disturbing the existing channel. Construction of the permanent crossing will be undertaken in the low flow summer period between July 1<sup>st</sup> and September 1<sup>st</sup>. The drainage channel will be maintained through the crossing during construction of the arch culvert abutments. Sheet piling, or other stabilization measures will be used to confine the work area and protect the edges of the channel. Riprap stone scour protection will be installed at the edges of the channel to protect the structure from erosion. Construction of headwalls, wing walls and backfill material will then proceed after the arch structure is installed.
5. Pad preparation for the WTP/WWTP will require excavation of the existing topsoil and overburden materials and the construction of a stabilized working pad to allow access for construction equipment to work on the new building. The stabilized pad area at this location is approximately 35,000sf.

## **PHASE 1B – CONSTRUCTION PHASE 1 – CENTRAL CORRIDOR WEST**

1. Construction of Temporary Sediment Basins and Stabilized Outlets – The first phase of new construction will begin with the installation of temporary sediment basins at the locations of new stormwater BMPs at the west end of the Phase 1 construction area and along the southern perimeter of the work area. These are designed to receive runoff from exposed areas of the site and filter the water through sand bedding and underdrain backfill before allowing it to discharge to established downstream drainageways. These BMPs will be installed and stabilized prior to exposure of the upstream contributing work areas.
6. Additional bypass culverts will also be installed in interior drainage channels that will be impacted during the Phase 1B work. These are designed to intercept surface water runoff and groundwater flow around the work area and will discharge into stabilized outlet plunge pools before draining into existing natural drainage channels. These bypass culverts will remain in place after construction of the facility, providing groundwater baseflow to maintain these resources.
2. Construction of Phase 1B Access Roads – Access roads will be extended from the stabilized construction entrances installed in Phase 1A to the western work area. Temporary stabilized roads will be constructed and modified as work progresses from west to east. The roads will be completed once the building area is brought to subgrade elevation.
3. Construction of the new facility will require the excavation and removal of a significant layer of unsuitable compressible clay materials that have been identified beneath the building footprints. This material extends to an elevation of approximately 54 feet in this area of the site. This material is not suitable for re-use and will be excavated for disposal off site. As soon as subgrade elevations are established a layer of woven geotextile will be placed on the prepared subgrade and imported Granular Borrow will be placed in compacted lifts to the design subgrade.
  - a. Excavation of unsuitable material and the stabilization with Granular Borrow will proceed from west to east starting in the area of the new Smolt Building. The western area will be stabilized and filled as the excavation proceeds to the east, minimizing the area of open exposed soils to less than 80,000sf at any given time.
  - b. Edge drains will be installed at the foot of the excavation as it progresses. These will effectively drain the granular fill material to ensure that the surface of the construction area remains dry and stable. The underdrains will discharge, via a stabilized riprap outlet plunge pool to the downstream receiving channel.
  - c. Foundation and building construction will commence at the western end of the site as the earthwork moves eastward. The establishment of stabilized subgrades for Phase 1B will end at the eastern end of the new Smolt Buildings. switch yard, just north of the laydown area.

## **PHASE 1C – CONSTRUCTION PHASE 1 - CENTRAL CORRIDOR EAST**

1. Construction of Phase 1C will start once Phase 1B has been brought to subgrade with stable granular material.
2. Construction of Phase 1C Access Roads – Access roads will be constructed between the Smolt Buildings and Oxygen storage area. The roads will be completed once the building area is brought to subgrade elevation and will allow access around the eastern edge of the Smolt Buildings.
3. The Phase 1C Building pad preparation will start at the Oxygen Storage Area and proceed west to east across the site. As described in Phase 1B, above construction of new buildings will require the

excavation and removal of a significant layer of unsuitable compressible clay materials. This material extends to an elevation of approximately 54 feet in this area of the site. This material is not suitable for re-use and will be excavated for disposal off site. As soon as subgrade elevations are established a layer of woven geotextile will be placed on the prepared subgrade and imported Granular Borrow will be placed in compacted lifts to the design subgrade.

- a. Excavation of unsuitable material and the stabilization with Granular Borrow will proceed from west to east starting in the area of the new Smolt Building. The western area will be stabilized and filled as the excavation proceeds to the east, minimizing the area of open exposed soils to less than 80,000sf at any given time.
- b. Edge drains will be installed at the foot of the excavation as it progresses. These will effectively drain the granular fill material to ensure that the surface of the construction area remains dry and stable. The underdrains will discharge, via a stabilized riprap outlet plunge pool to the downstream receiving channel.
- c. Foundation and building construction will commence at the western end of the site as the earthwork moves eastward. The establishment of stabilized subgrades for Phase 1C will end at the eastern end of the new Switch Yard, just north of the laydown area.

#### **PHASE 1D – CONSTRUCTION PHASE 1 - MODULE 1-3 AREA WEST**

1. Construction of Phase 1D will start once Phase 1C has been brought to subgrade with stable granular material.
2. Construction of Phase 1D Access Roads – Access roads will be constructed around the western end of the Phase 1 Module Building, and along the northern side of the building, proceeding from west to east. The roads will be completed once the building area is brought to subgrade elevation and will allow access around the perimeter of the Module 1 Building.
3. Phase 1D building pad construction will proceed in a similar manner to the Central Corridor work, from west to east in the area of the new Grow Module Buildings. Similar to Phase 1B and 1C, this area of new construction will require the excavation and removal of a significant layer of unsuitable compressible clay materials that have been identified beneath the building footprints. This material extends to an elevation of approximately 54 feet in this area of the site. This material is not suitable for re-use and will be excavated for disposal off site. As soon as subgrade elevations are established a layer of woven geotextile will be placed on the prepared subgrade and imported Granular Borrow will be placed in compacted lifts to the design subgrade.
  - a. Excavation of unsuitable material and the stabilization with Granular Borrow will proceed from west to east starting in the area of the Module 1. The western area will be stabilized and filled as the excavation proceeds to the east, minimizing the area of open exposed soils to less than 80,000sf at any given time.
  - b. Edge drains will be installed at the foot of the excavation as it progresses. These will effectively drain the granular fill material to ensure that the surface of the construction area remains dry and stable. The underdrains will connect to the previously installed diversion culvert, which drains, via a stabilized riprap outlet plunge pool to the downstream receiving channel.
  - c. Foundation and building construction will commence at the western end of the site as the earthwork moves eastward. The establishment of stabilized subgrades for Phase 1D will end approximately half way along the Phase 1 Grow Module Building.

## **PHASE 1E – CONSTRUCTION PHASE 1 - MODULE 1-3 AREA EAST**

1. Construction of Phase 1E will start once Phase 1D has been brought to subgrade with stable granular material.
2. Construction of Phase 1E Access Roads – Access roads will be constructed around the remainder of the northern side of the Phase 1 Module Building, proceeding from west to east. The roads will be completed once the building area is brought to subgrade elevation and will allow access around the entire perimeter of the Module 1 Building.
3. Phase 1E building pad construction will proceed in a similar manner to the previous work at the site. The unsuitable clay material extends to an elevation of approximately 54 feet in this area of the site. This material is not suitable for re-use and will be excavated for disposal off site. As soon as subgrade elevations are established a layer of woven geotextile will be placed on the prepared subgrade and imported Granular Borrow will be placed in compacted lifts to the design subgrade.
  - a. Excavation of unsuitable material and the stabilization with Granular Borrow will proceed from west to east starting at the end of the Phase 1D area. The western area will be stabilized and filled as the excavation proceeds to the east, minimizing the area of open exposed soils to less than 80,000sf at any given time.
  - b. Edge drains will be installed at the foot of the excavation as it progresses. These will effectively drain the granular fill material to ensure that the surface of the construction area remains dry and stable. The underdrains will connect to the previously installed diversion culvert, which drains, via a stabilized riprap outlet plunge pool to the downstream receiving channel.
  - c. Foundation and building construction will commence at the western end of the Phase 1E area as the earthwork moves eastward. The establishment of stabilized subgrades for Phase 1E will end at the eastern end of the Phase 1 Grow Module Building.

## **PHASE 1 FINISH**

1. Upon completion of the major earthwork activities associated with Phase 1 of the project, the interior finishes and landscaping will be installed. It is anticipated that this work will progress with the completion of the remaining building work, so that installed finishes are not damaged by any ongoing construction.
2. Once the final finishes and landscaping is installed and the Phase 1 area of the site is permanently stabilized, the temporary erosion control measures, including perimeter controls will be removed. Portions of the perimeter controls downstream of the Phase 2 work area will remain in place pending the start of that phase of work.
3. Temporary sediment basins will be removed and permanent stormwater BMPs will be installed as construction progresses and the upstream contributing areas are stabilized.

## **PHASE 2 SITE CLEARING**

1. Construction of Phase 2 will start once Phase 1 construction is complete and the site has been completely stabilized.
2. Site Layout - After holding the required Phase 2 pre-construction meetings, the Phase 2 area of the project and tree clearing limits will be defined using stakes and fencing.
3. Site Clearing – Once the clearing limits have been established, clearly marked and approved by the Owner, the Phase 2 area will be cleared of major trees and vegetation.

4. A stabilized construction entrance will be installed at the intersection of the main driveway with the southern roadway leading to the Phase 2 area, to provide wheel cleaning for traffic exiting the site during this phase. Access to the interior of the site will be via existing woods roads. Additional stabilized haul roads will be established throughout the Phase 2 area as the work progresses.
5. Perimeter Erosion Controls – The Phase 2 perimeter erosion controls will be installed at the downstream side of the site as the clearing progresses. This will connect to the previously installed Phase 1 perimeter controls, where these remain.

## **PHASE 2A – CONSTRUCTION PHASE 2 - MODULE 4-6 AREA WEST**

1. Construction of Phase 2A will start once the phase 2 clearing is complete and access is available to the work area.
2. Bypass Culverts – New riprap stone outlet plunge pools will be constructed in the natural drainageways immediately downstream of the Phase 2 work area. The phase 1 plunge pools will be removed and the bypass culverts installed in the drainageways during the first phase of the project will be extended through the Phase 2 construction area to outlet to the newly installed underdrains.
3. Temporary Sediment Basin – Sediment basin 4 will be installed prior to exposure of the upstream contributing work areas. This is designed to receive runoff from exposed areas of the site and filter the water through sand bedding and underdrain backfill before allowing it to discharge to established downstream drainageways.
4. Construction of Phase 2 Access Roads – Access roads will be constructed around the western end and southern side of the Phase 2 Module Building, proceeding from west to east. The roads will be completed once the building area is brought to subgrade elevation and will allow access around the perimeter of the Module 2 Building.
5. Phase 2A building pad construction will proceed in a similar manner to the Central Corridor work, from west to east in the area of the new Grow Module Buildings. Similar to previous phases of construction, the areas of new construction will require the excavation and removal of a significant layer of unsuitable compressible clay materials that have been identified beneath the building footprints. This material extends to an elevation of approximately 43 feet in this area of the site. This material is not suitable for re-use and will be excavated for disposal off site. As soon as subgrade elevations are established a layer of woven geotextile will be placed on the prepared subgrade and imported Granular Borrow will be placed in compacted lifts to the design subgrade.
  - a. Excavation of unsuitable material and the stabilization with Granular Borrow will proceed from west to east starting in the area of the Module 4 and proceeding into Module 5. The western area will be stabilized and filled as the excavation proceeds to the east, minimizing the area of open exposed soils to less than 80,000sf at any given time.
6. Foundation and building construction will commence at the western end of the site as the earthwork moves eastward. The establishment of stabilized subgrades for Phase 2A will end approximately half way along the Phase 2 Grow Module Building.

## **PHASE 2B – CONSTRUCTION PHASE 2 - MODULE 4-6 AREA EAST**

1. Construction of Phase 2B will start once Phase 2A construction is complete and stabilized.
2. Building pad preparation for the southern module buildings will proceed eastwards from the end of Phase 2A, and across the site that was temporarily stabilized as a construction laydown area.

As soon as subgrade elevations are established a layer of woven geotextile will be placed on the prepared subgrade and imported Granular Borrow will be placed in compacted lifts to the design subgrade.

- a. Excavation of unsuitable material and the stabilization with Granular Borrow will proceed from west to east starting in the area of the Module 5 and proceeding into Module 6. The western area will be stabilized and filled as the excavation proceeds to the east, minimizing the area of open exposed soils to less than 80,000sf at any given time.
3. Foundation and building construction will commence at the western end of the site as the earthwork moves eastward. The establishment of stabilized subgrades for Phase 2B will end at the eastern end of the Phase 2 Grow Module Building, and will complete the major earthwork activities associated with the construction of the facility. Once the site is fully stabilized, the perimeter erosion control BMPs will be removed and the surrounding areas will be permanently stabilized.

## **PHASE 2 FINISH**

1. Upon completion of the major earthwork activities associated with Phase 2 of the project, the interior finishes and landscaping will be installed. It is anticipated that this work will progress with the completion of the remaining building work, so that installed finishes are not damaged by any ongoing construction.
2. Once the final finishes and landscaping is installed and the site is permanently stabilized, the temporary erosion control measures, including perimeter controls will be removed.
3. The final temporary sediment basin will be removed and permanent stormwater system will be installed as construction progresses and the upstream contributing areas are stabilized.
4. Stormwater BMPs and other critical elements of the site infrastructure will be maintained by the Owner in accordance with local, State and federal standards and permit conditions.

**NORDIC AQUAFARMS SOIL EROSION AND SEDIMENT CONTROL PHASING SUMMARY**

PHASE	PRIMARY TASKS	PERMANENTLY STABILIZED AREA - START OF PHASE	TOTAL WORK AREA	MAXIMUM OPEN AREA - GRUBBED AND NOT STABILIZED	SSC BMPs	AREA OF NEW ROADS	AREA OF NEW PADS	OTHER STABILIZED AREAS	PERMANENTLY STABILIZED AREA - END OF PHASE	ANTICIPATED TIMELINE
PHASE 1 CLEARING	Site Layout - Layout Phase 1 Limits of Work and tree clearing limits Installation of Stabilized Access Installation of Perimeter Erosion Controls Site Clearing – Logging and Clearing of Vegetation	22,000	795,000	0	Stabilized Construction Entrances Stabilized Haul Roads Stabilized Laydown Area Temporary Stream Crossing	0	0	0	26,000	2-4 weeks
PHASE 1A	Installation of Additional Perimeter Erosion Controls Construction of Runoff Diversions and Bypass Culverts Establishment of site access, laydown area, offices and storage -	26,000	610,000	80,000	Stabilized Construction Entrances Silt Fence Silt fence/haybale barrier Erosion berms Temporary riprap slope stabilization Diversion trench Outlet plunge pools Bypass culverts Stabilized gravel pads	51,000	130,000	60,000	267,000	6-8 weeks
PHASE 1B	Construction of Temporary Sediment Basins and Stabilized Outlets Construction of Phase 1B Access Roads Excavation of unsuitable soils and subgrade preparation Pad and foundation preparation - Smolt Building	267,000	409,600	80,000	Temporary sediment basins Bench drain outlets Diversion trench Bypass culverts Building pad stabilization	260,600	104,200	60,000	691,800	8-10 weeks
PHASE 1C	Construction of Phase 1C Access Roads Excavation of unsuitable soils and subgrade preparation - Pad and foundation prep. - Oxygen Storage, Process, CUP, Switch Yard	691,800	143,600	80,000	Building pad stabilization	0	108,000	30,000	829,800	4-6 weeks
PHASE 1D	Construction of Phase 1D Access Roads Excavation of unsuitable soils and subgrade preparation - Pad and foundation preparation - Phase 1 Module Buildings West	829,800	199,200	80,000	Building pad stabilization	26,200	150,000	15,000	1,021,000	5-6 weeks
PHASE 1E	Construction of Phase 1E Access Roads Excavation of unsuitable soils and subgrade preparation - Pad and foundation preparation - Phase 1 Module Buildings East	1,021,000	214,500	80,000	Building pad stabilization	18,500	180,000	15,000	1,234,500	5-6 weeks
PHASE 1 FINISH	Landscaping, hardscaping and finish surface work in interior areas of Phase 1 work area, filling of temporary ponds, final stormwater BMPs	1,234,500	160,000	0	None	0	0	85,000	1,319,500	4-6 weeks
PHASE 2 CLEARING	Site Layout - Layout Phase 2 Limits of Work and tree clearing limits Installation of Perimeter Erosion Controls Connect Perimeter Erosion Controls to remaining Phase 1 BMPs Site Clearing – Logging and Clearing of Vegetation	1,319,500	290,000	0	Silt fence/haybale barrier Stabilized Haul Roads Stabilized Laydown Area (in place)	0	0	0	1,319,500	2-4 weeks
PHASE 2A	Construction of Phase 2A Access Roads Pad and foundation preparation - Phase 2 Module Buildings West	1,319,500	220,000	80,000	Temporary sediment basin Building pad stabilization Bypass culverts	44,000	161,000	15,000	1,539,500	5-6 weeks
PHASE 2B	Construction of Phase 2B Access Roads Pad and foundation preparation - Phase 2 Module Buildings East	1,539,500	195,500	80,000	Building pad stabilization	0	90,000	25,000	1,654,500	5-6 weeks

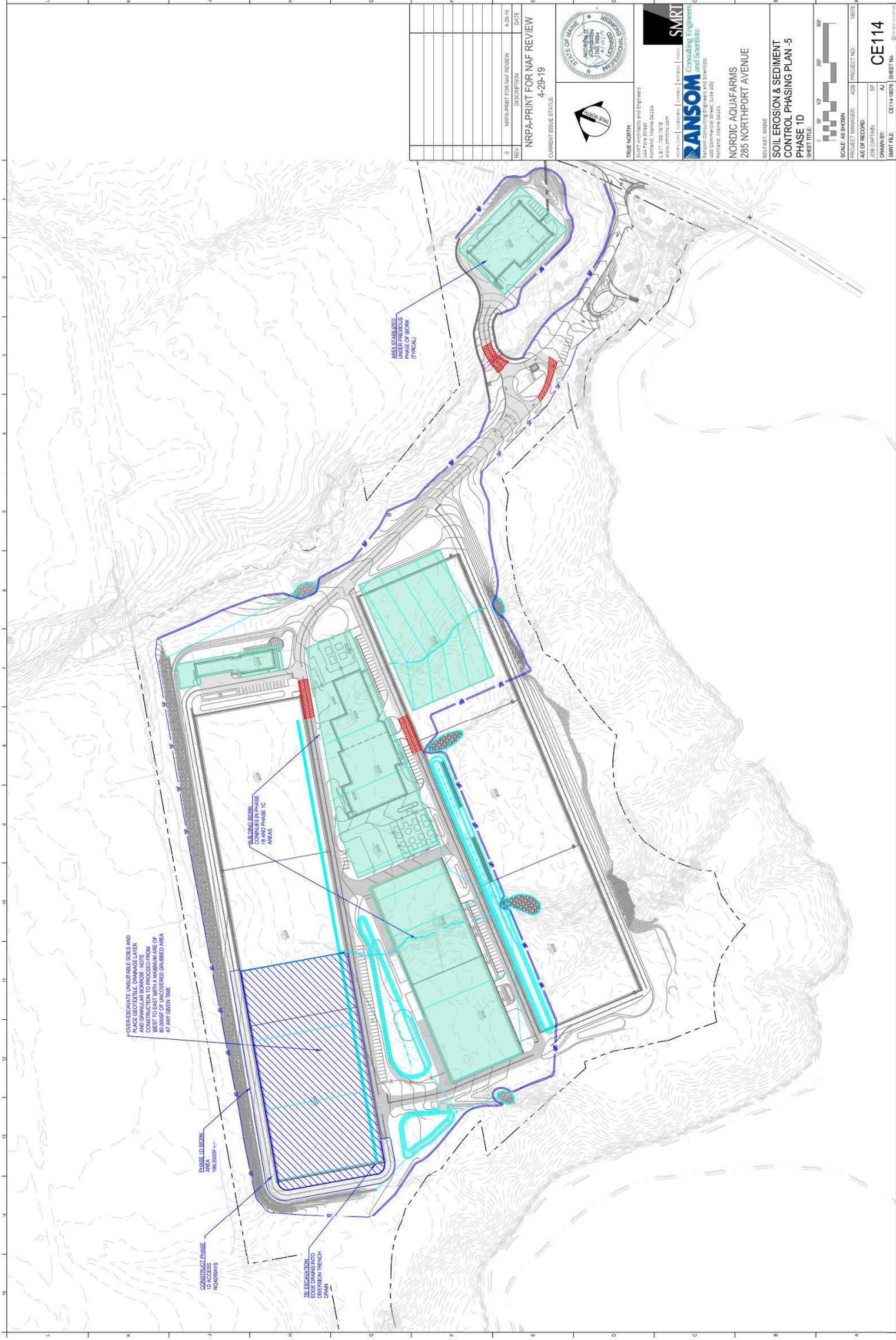
NOTE: AREAS ASSOCIATED WITH EACH PHASE ARE APPROXIMATE AND INTENDED TO GIVE AN OVERVIEW OF THE CONSTRUCTION PHASING





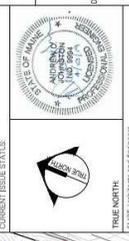






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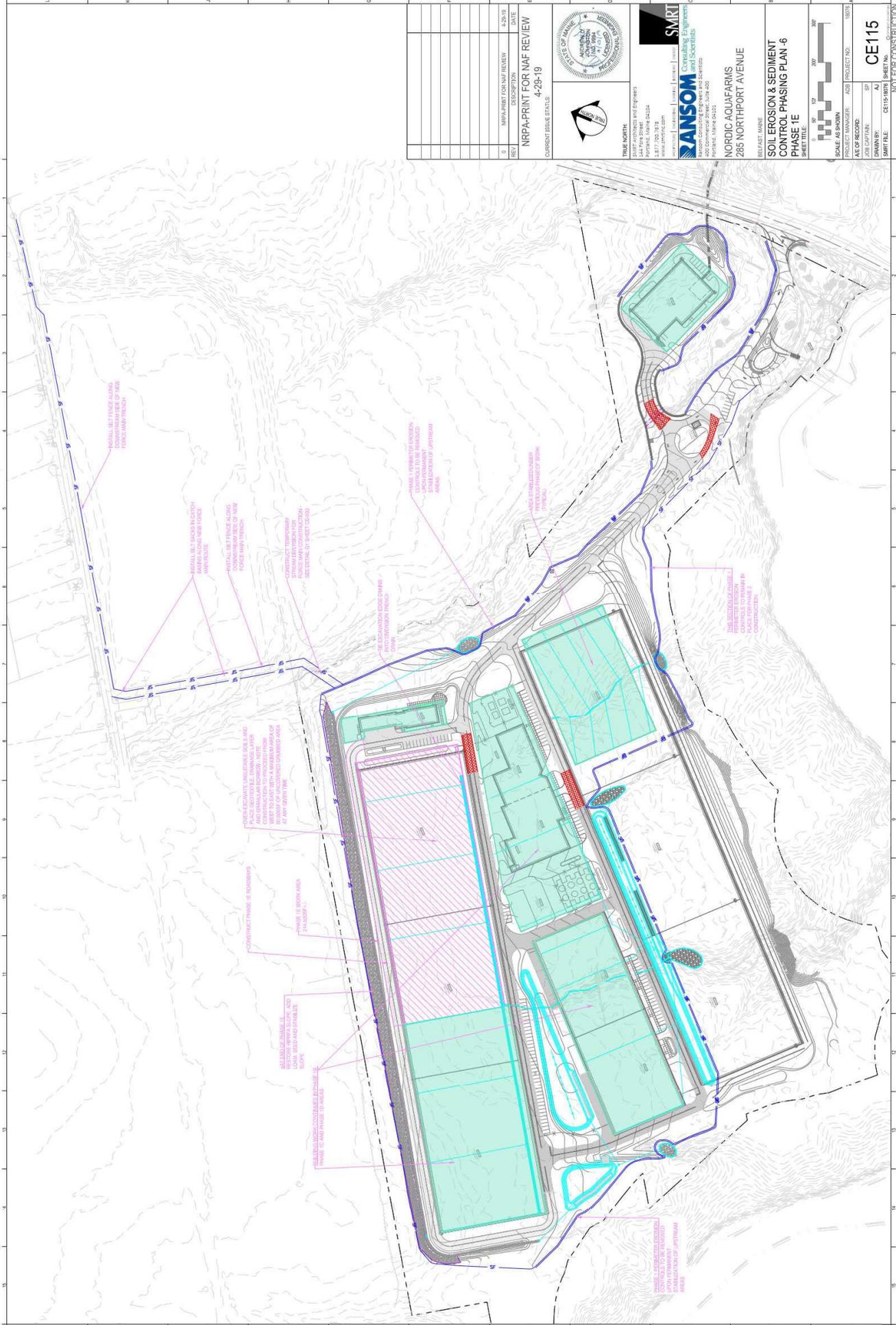
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 400 Commercial Street, Suite 400  
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**NORDIC AQUAFARMS**  
 285 NORTHPORT AVENUE

BEF EAST MAINE  
**SOIL EROSION & SEDIMENT CONTROL PHASING PLAN -5**  
**PHASE 1D**  
 SHEET TITLE

SCALE AS SHOWN  
 PROJECT MANAGER: ADB | PROJECT NO.: 19075  
 AEGIP RECORD: 03  
 DRAWING NO.: 50  
 SHEET NO.: 4  
 SMART FILE: CE114-19075 SHEET NO. 04

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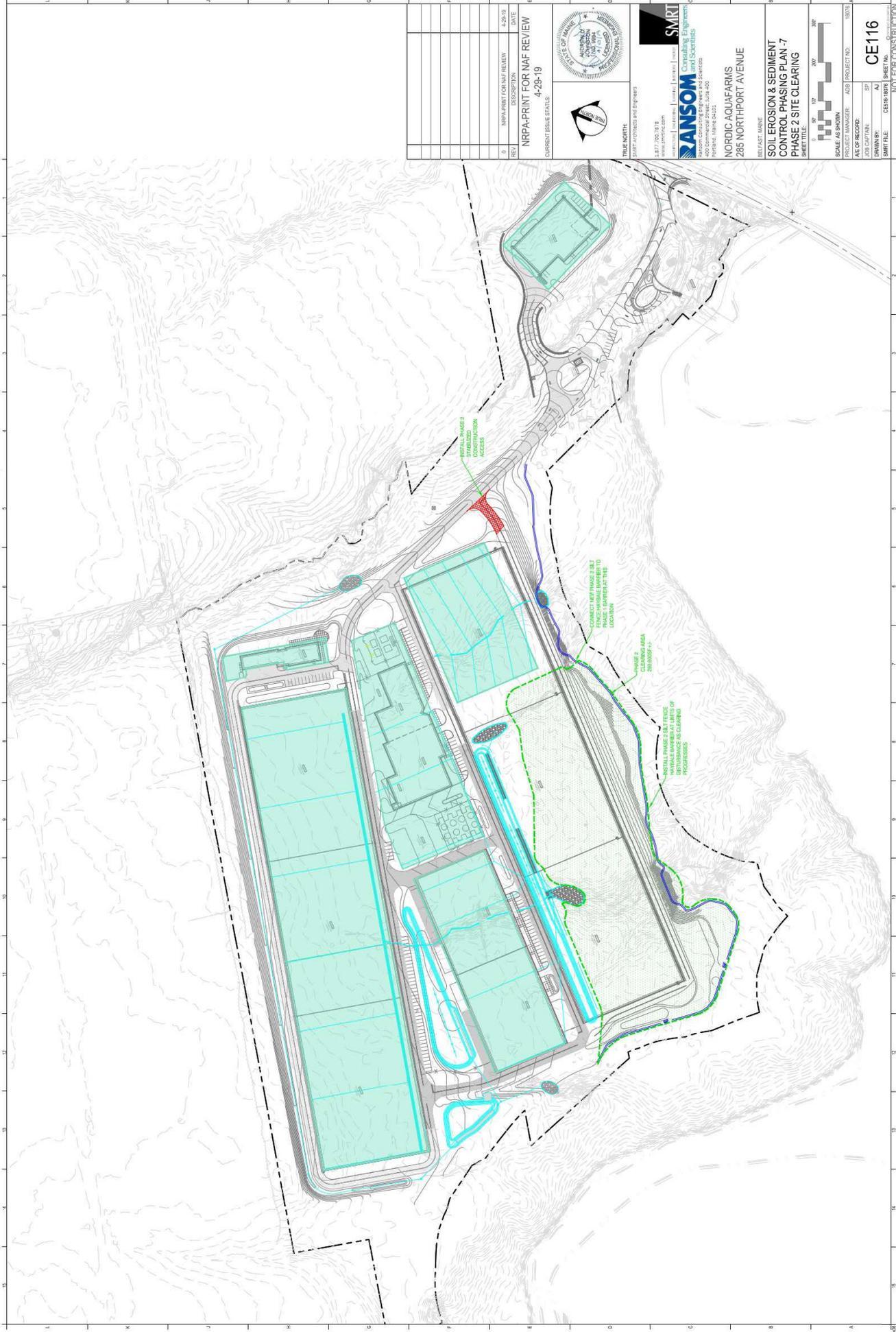
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**NORDIC AQUAFARMS**  
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 BEEFEST MAINE  
**SOIL EROSION & SEDIMENT CONTROL PHASING PLAN -6**  
**PHASE 1E**  
 SHEET TITLE:

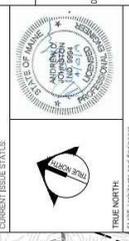
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 AEG RECORDS: 00  
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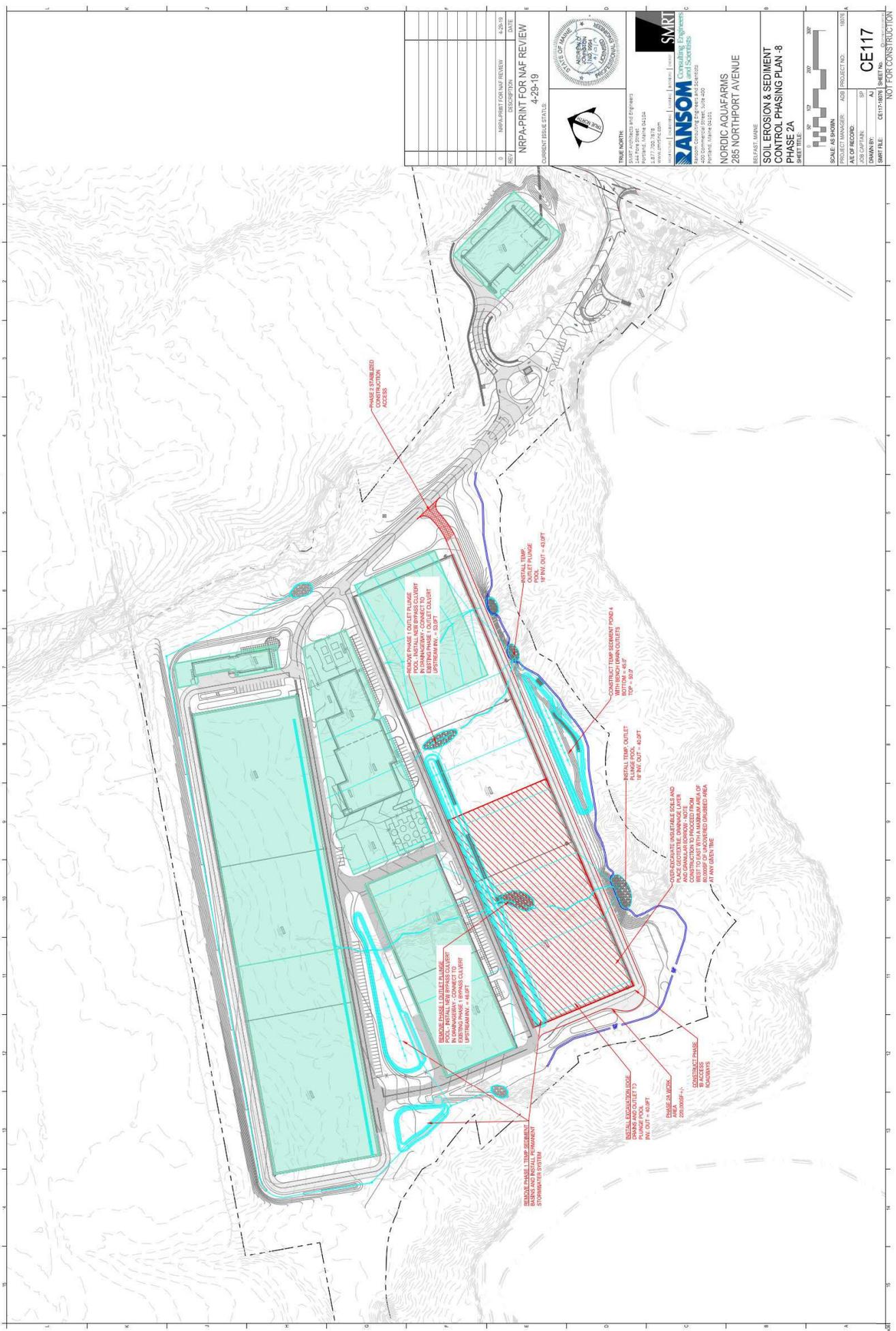
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**NORDIC AQUAFARMS**  
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BEFORE MAINE  
**SOIL EROSION & SEDIMENT CONTROL PHASING PLAN - 7**  
**PHASE 2 SITE CLEARING**  
SHEET TITLE:

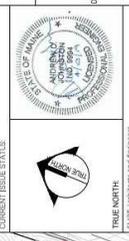
SCALE AS SHOWN  
PROJECT MANAGER: ADB | PROJECT NO: 19076  
A.E.P. RECORD: 03  
DATE: 04/29/19  
DRAWN BY: ADB  
SMART FILE: CE116 | SHEET NO. 07

**CE116**  
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REV	DESCRIPTION	DATE
0	ISSUED FOR MAF REVIEW	4-29-19

NRPA-PRINT FOR MAF REVIEW  
4-29-19  
CURRENT ISSUE STATUS



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RANSOM CONSULTING ENGINEERS  
400 Commercial Street, Suite 400  
Portland, Maine 04101

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Consulting Engineers  
400 Commercial Street, Suite 400  
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**NORDIC AQUAFARMS**  
285 NORTHPORT AVENUE

BEFAST MAINE  
**SOIL EROSION & SEDIMENT CONTROL PHASING PLAN - 8**  
PHASE 2A  
SHEET TITLE

SCALE AS SHOWN  
PROJECT MANAGER: ADB | PROJECT NO.: 19076  
DATE RECORDED: 05/01/19  
DRAWN BY: ADB  
CHECKED BY: ADB  
SMART FILE: CE117-19076 | SHEET NO. 8

**CE117**  
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## **ATTACHMENT B**

### **Temporary Sediment Basin Sizing Calculations**

# NORDIC AQUAFARMS PROJECT BELFAST, MAINE

## TEMPORARY SEDIMENT BASIN SIZING CALCULATIONS

### Introduction

Four temporary sediment basins have been designed to capture and treat runoff from construction areas where native soil materials will be exposed during earthwork activities. In each case, the basins have been sized to operate under the "worst case" scenario as viewed from a soil erosion and sediment control perspective. Site construction activities will be carefully phased to minimize the potential for soil erosion and sediment transport.

The project will require the excavation and removal of a large quantity of unsuitable silt and clay material from beneath the proposed building footprints. Native soils will be excavated from these areas, the subgrade materials will be covered with a geotextile fabric and the excavation will be backfilled with imported granular borrow. Once covered with granular borrow, the area is considered stable from a soil erosion perspective and the pervious nature of the replacement material will significantly reduce surface runoff to downstream areas. Therefore, the most critical period for the sediment basins will be during initial excavation of the native material, when up to 80,000sf is exposed and the remainder of the area is cleared (but not grubbed) in preparation for construction. Each of the basins has been designed for this case.

### Design Summary

The basins are designed to drain via underdrained gravel benches, with overflow risers and to accommodate intermediate storm event flows. An emergency overflow is provided at each structure to pass flows from the most severe storm events. The bench drains are 8ft wide and 125ft long, giving 1,000sf of infiltration area. Assuming an average infiltration rate through the gravel material of 10mins/inch, gives and average infiltration outflow of 0.14cfs for each bench drain.

Sediment Basin Numbers 1, 3 and 4 include baffles along the center of each basin between the inlet side and the outlet bench drains. These are necessary to create longer flow paths, and promote increased settling of sediments suspended in the influent to the basins.

The layout and details of the temporary sediment basins are included on the Soil Erosion and Sediment Control Detail Sheets in the plan set. The attached HydroCAD model outputs demonstrate that the one-inch storm (90% probability event) passes solely through the gravel bench drain in each case.

The 10-year storm event passes through the basins with the bench drains and risers operating only.

The emergency overflow weirs will operate during larger storm events.

Output tables showing the permanent pool and potential sediment storage capacity of each basin are included with the HydroCAD results.

The soil loss summary shows the anticipated volume of sediment discharge to the basins from each working area. The anticipated soil volumes in each case equate to significantly less than six inches over the area of the proposed basins.

## HydroCAD Model Output



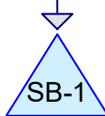
PHASE 1D WORK AREA



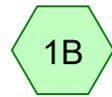
SEDIMENT BASIN 2



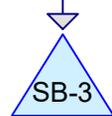
PHASE 1E WORK AREA



SEDIMENT BASIN 1



PHASE 1B WORK AREA



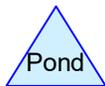
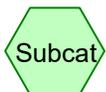
SEDIMENT BASIN 3



PHASE 2A WORK AREA



SEDIMENT BASIN 4



# NAF Sediment Basin Sizing

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Type III 24-hr Custom Rainfall=1.00"

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Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

<b>Subcatchment 1B: PHASE 1B WORK AREA</b>	Runoff Area=400,619 sf 0.00% Impervious Runoff Depth=0.17" Tc=10.0 min CN=85 Runoff=1.18 cfs 0.133 af
<b>Subcatchment 1D: PHASE 1D WORK AREA</b>	Runoff Area=175,700 sf 0.00% Impervious Runoff Depth=0.25" Tc=10.0 min CN=88 Runoff=0.91 cfs 0.085 af
<b>Subcatchment 1E: PHASE 1E WORK AREA</b>	Runoff Area=195,500 sf 0.00% Impervious Runoff Depth=0.25" Tc=10.0 min CN=88 Runoff=1.02 cfs 0.095 af
<b>Subcatchment 2A: PHASE 2A WORK AREA</b>	Runoff Area=220,000 sf 0.00% Impervious Runoff Depth=0.22" Tc=10.0 min CN=87 Runoff=0.97 cfs 0.094 af
<b>Pond SB-1: SEDIMENT BASIN 1</b>	Peak Elev=62.07' Storage=53,626 cf Inflow=1.02 cfs 0.095 af Outflow=0.14 cfs 0.095 af
<b>Pond SB-2: SEDIMENT BASIN 2</b>	Peak Elev=61.64' Storage=24,789 cf Inflow=0.91 cfs 0.085 af Primary=0.14 cfs 0.085 af Secondary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.085 af
<b>Pond SB-3: SEDIMENT BASIN 3</b>	Peak Elev=57.07' Storage=45,251 cf Inflow=1.18 cfs 0.133 af Primary=0.28 cfs 0.133 af Secondary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.133 af
<b>Pond SB-4: SEDIMENT BASIN 4</b>	Peak Elev=48.09' Storage=38,577 cf Inflow=0.97 cfs 0.094 af Primary=0.14 cfs 0.094 af Secondary=0.00 cfs 0.000 af Outflow=0.14 cfs 0.094 af
<b>Total Runoff Area = 22.769 ac Runoff Volume = 0.407 af Average Runoff Depth = 0.21"</b>	
<b>100.00% Pervious = 22.769 ac 0.00% Impervious = 0.000 ac</b>	

# NAF Sediment Basin Sizing

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## Summary for Subcatchment 1B: PHASE 1B WORK AREA

Runoff = 1.18 cfs @ 12.18 hrs, Volume= 0.133 af, Depth= 0.17"

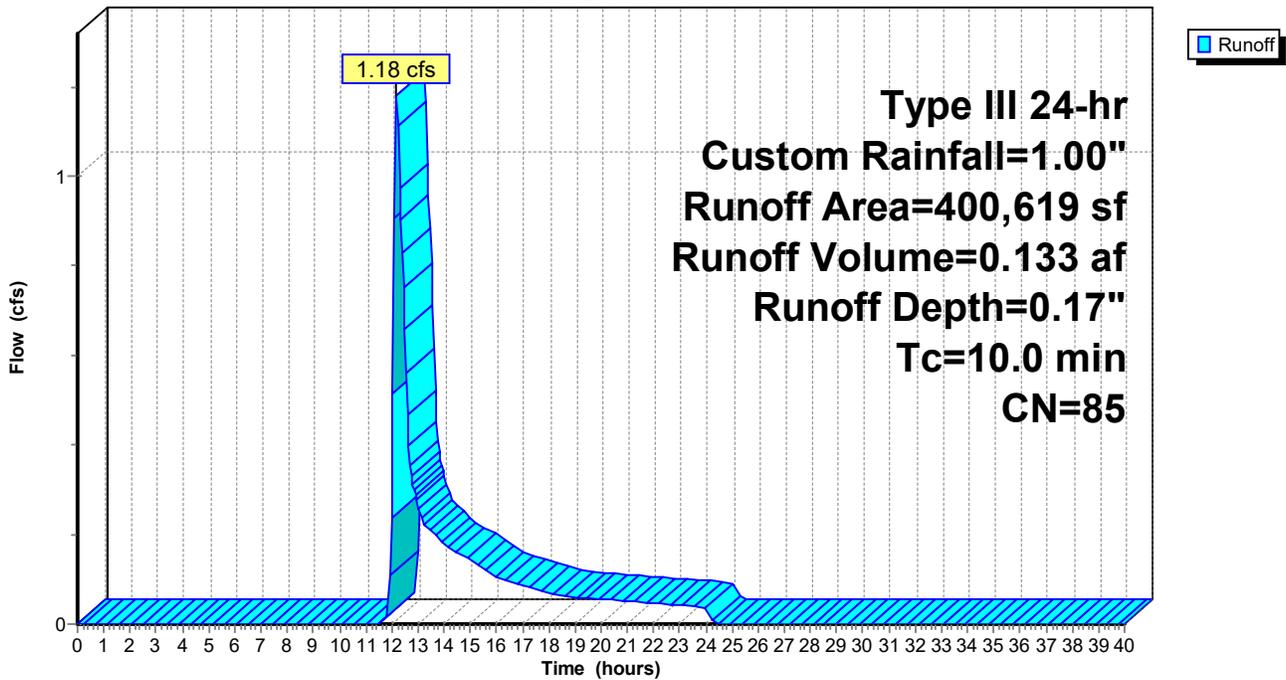
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
Type III 24-hr Custom Rainfall=1.00"

Area (sf)	CN	Description
80,000	94	Fallow, bare soil, HSG D
320,619	83	Brush, Poor, HSG D
400,619	85	Weighted Average
400,619		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 1B: PHASE 1B WORK AREA

Hydrograph



# NAF Sediment Basin Sizing

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Type III 24-hr Custom Rainfall=1.00"

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## Summary for Subcatchment 1D: PHASE 1D WORK AREA

Runoff = 0.91 cfs @ 12.16 hrs, Volume= 0.085 af, Depth= 0.25"

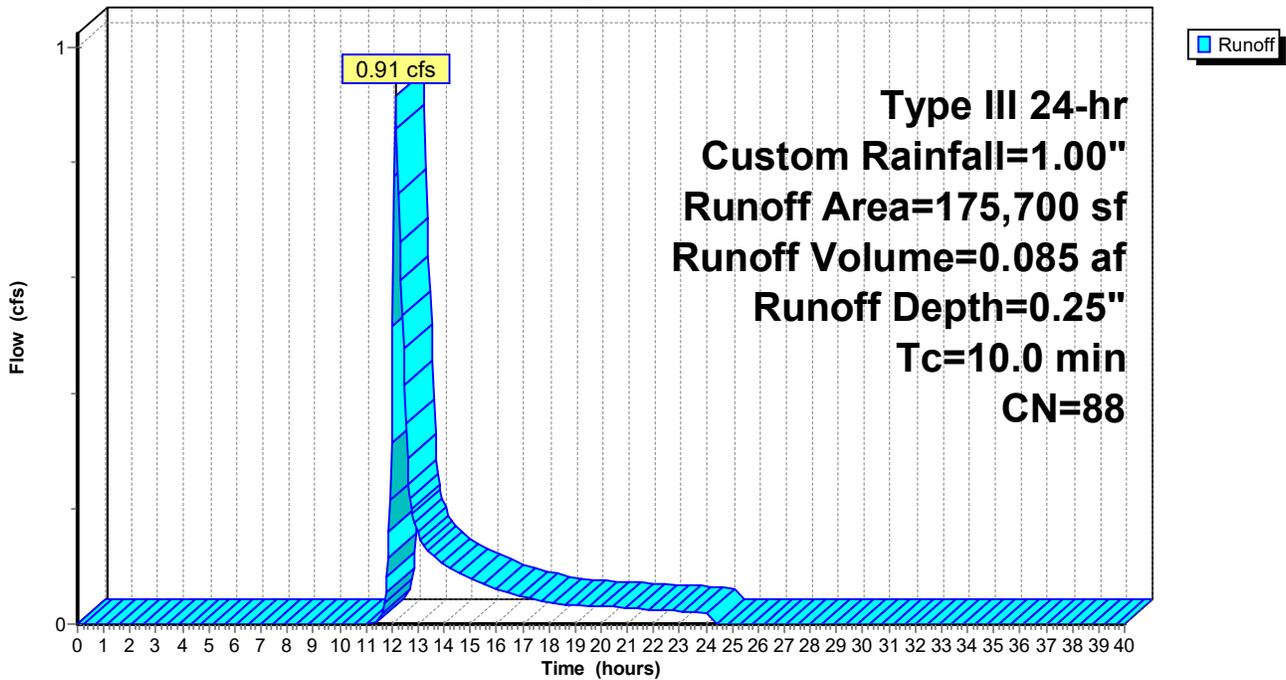
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Type III 24-hr Custom Rainfall=1.00"

Area (sf)	CN	Description
80,000	94	Fallow, bare soil, HSG D
95,700	83	Brush, Poor, HSG D
175,700	88	Weighted Average
175,700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 1D: PHASE 1D WORK AREA

Hydrograph



# NAF Sediment Basin Sizing

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Type III 24-hr Custom Rainfall=1.00"

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## Summary for Subcatchment 1E: PHASE 1E WORK AREA

Runoff = 1.02 cfs @ 12.16 hrs, Volume= 0.095 af, Depth= 0.25"

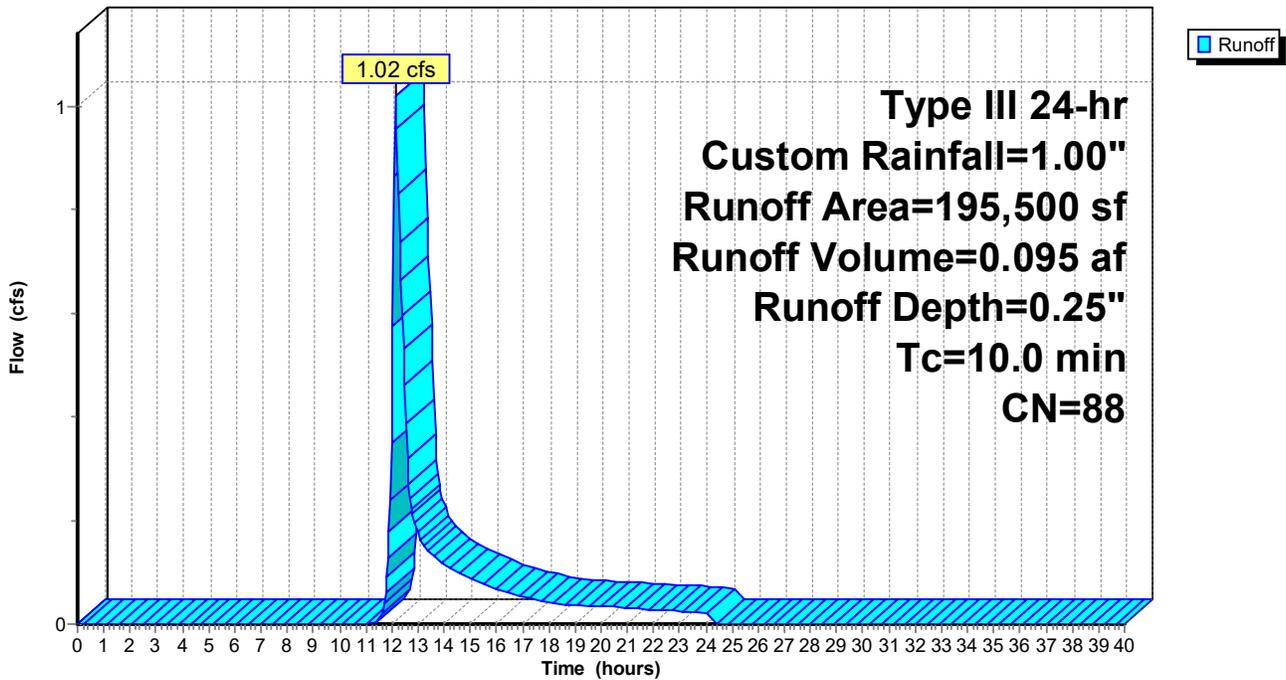
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
Type III 24-hr Custom Rainfall=1.00"

Area (sf)	CN	Description
80,000	94	Fallow, bare soil, HSG D
115,500	83	Brush, Poor, HSG D
195,500	88	Weighted Average
195,500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 1E: PHASE 1E WORK AREA

Hydrograph



# NAF Sediment Basin Sizing

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## Summary for Subcatchment 2A: PHASE 2A WORK AREA

Runoff = 0.97 cfs @ 12.16 hrs, Volume= 0.094 af, Depth= 0.22"

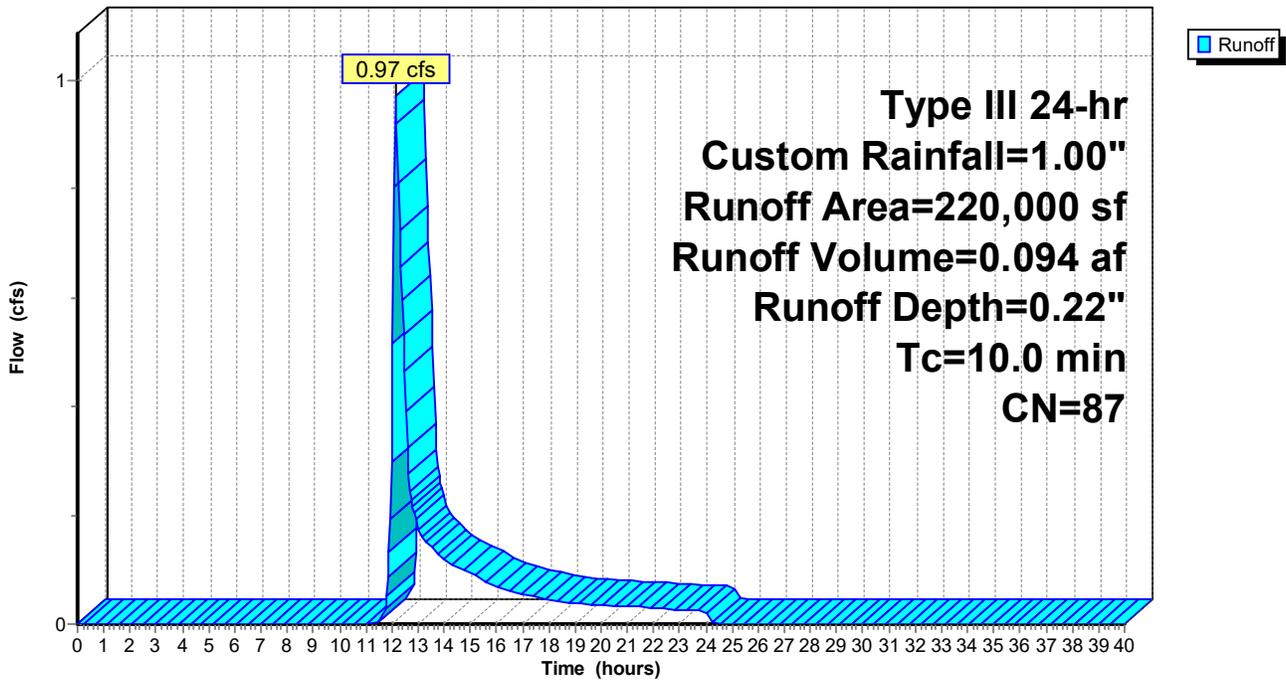
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
Type III 24-hr Custom Rainfall=1.00"

Area (sf)	CN	Description
80,000	94	Fallow, bare soil, HSG D
140,000	83	Brush, Poor, HSG D
220,000	87	Weighted Average
220,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 2A: PHASE 2A WORK AREA

Hydrograph



# NAF Sediment Basin Sizing

Type III 24-hr Custom Rainfall=1.00"

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## Summary for Pond SB-1: SEDIMENT BASIN 1

Inflow Area = 4.488 ac, 0.00% Impervious, Inflow Depth = 0.25" for Custom event  
 Inflow = 1.02 cfs @ 12.16 hrs, Volume= 0.095 af  
 Outflow = 0.14 cfs @ 12.40 hrs, Volume= 0.095 af, Atten= 86%, Lag= 14.4 min  
 Primary = 0.14 cfs @ 12.40 hrs, Volume= 0.095 af

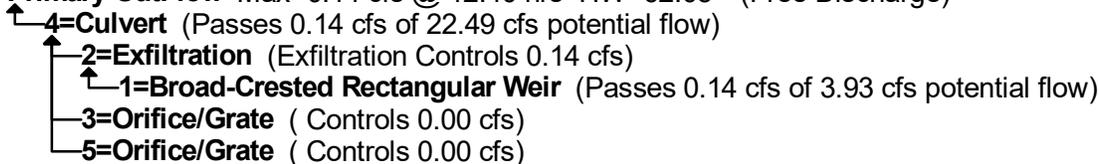
Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Starting Elev= 62.00' Surf.Area= 21,234 sf Storage= 52,122 cf  
 Peak Elev= 62.07' @ 13.40 hrs Surf.Area= 21,366 sf Storage= 53,626 cf (1,504 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= 143.4 min ( 1,024.2 - 880.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	98,359 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	14,450	0	0
60.00	16,235	15,343	15,343
61.00	18,045	17,140	32,483
62.00	21,234	19,640	52,122
63.00	23,110	22,172	74,294
64.00	25,020	24,065	98,359

Device	Routing	Invert	Outlet Devices
#1	Device 2	62.00'	<b>125.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Device 4	62.00'	<b>0.14 cfs Exfiltration when above 62.00'</b>
#3	Device 4	62.67'	<b>12.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#4	Primary	58.00'	<b>24.0" Round Culvert</b> L= 220.0' Ke= 0.500 Inlet / Outlet Invert= 58.00' / 57.00' S= 0.0045 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#5	Device 4	63.05'	<b>48.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=0.14 cfs @ 12.40 hrs HW=62.05' (Free Discharge)



**NAF Sediment Basin Sizing**

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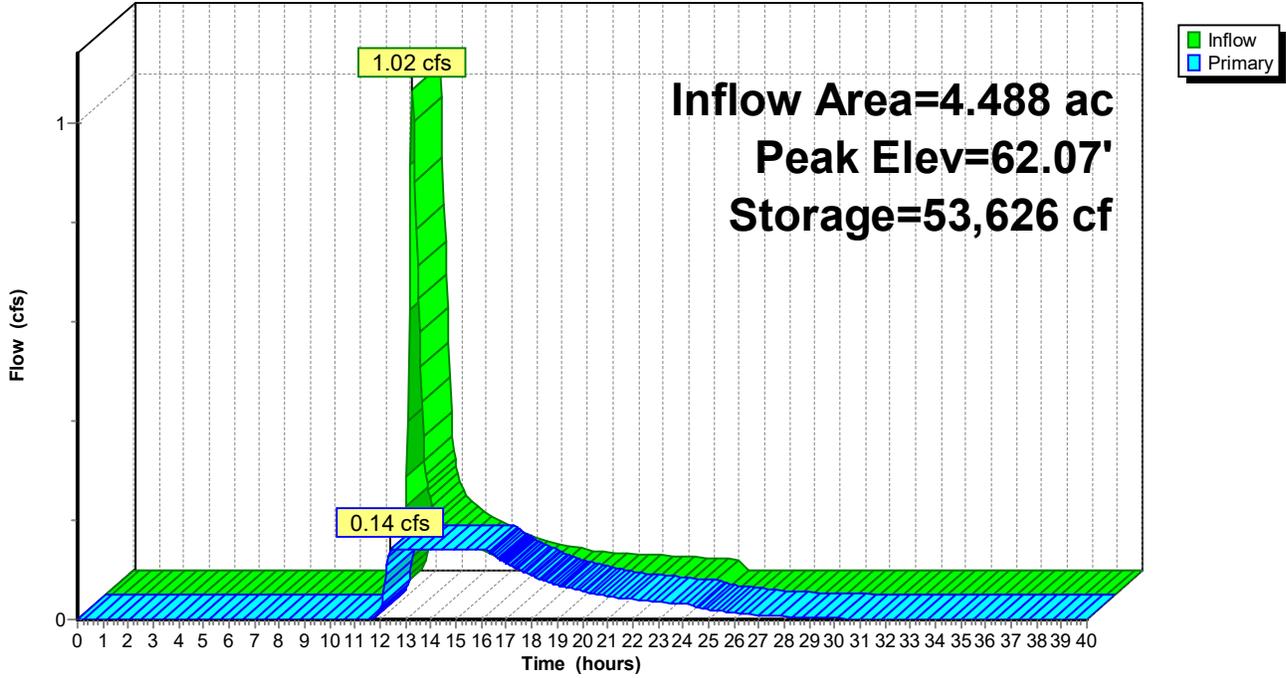
Type III 24-hr Custom Rainfall=1.00"

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**Pond SB-1: SEDIMENT BASIN 1**

Hydrograph



# NAF Sediment Basin Sizing

Type III 24-hr Custom Rainfall=1.00"

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## Summary for Pond SB-2: SEDIMENT BASIN 2

Inflow Area = 4.034 ac, 0.00% Impervious, Inflow Depth = 0.25" for Custom event  
 Inflow = 0.91 cfs @ 12.16 hrs, Volume= 0.085 af  
 Outflow = 0.14 cfs @ 12.15 hrs, Volume= 0.085 af, Atten= 85%, Lag= 0.0 min  
 Primary = 0.14 cfs @ 12.15 hrs, Volume= 0.085 af  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Starting Elev= 61.50' Surf.Area= 8,610 sf Storage= 23,563 cf  
 Peak Elev= 61.64' @ 13.13 hrs Surf.Area= 8,891 sf Storage= 24,789 cf (1,226 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= 88.7 min ( 969.5 - 880.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	49,004 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	5,440	0	0
59.00	6,132	5,786	5,786
60.00	6,855	6,494	12,280
61.00	7,605	7,230	19,510
62.00	9,614	8,610	28,119
63.00	10,437	10,026	38,145
64.00	11,281	10,859	49,004

Device	Routing	Invert	Outlet Devices
#1	Device 5	61.50'	<b>100.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Device 3	62.00'	<b>10.0" Horiz. Orifice/Grate X 2.00</b> C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	<b>12.0" Round Culvert</b> L= 100.0' Ke= 0.500 Inlet / Outlet Invert= 59.00' / 58.00' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#4	Secondary	63.00'	<b>20.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#5	Device 3	61.50'	<b>0.14 cfs Exfiltration when above 61.50'</b>

# NAF Sediment Basin Sizing

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**Primary OutFlow** Max=0.14 cfs @ 12.15 hrs HW=61.55' (Free Discharge)

↑ **3=Culvert** (Passes 0.14 cfs of 4.92 cfs potential flow)

↑ **2=Orifice/Grate** (Controls 0.00 cfs)

↑ **5=Exfiltration** (Exfiltration Controls 0.14 cfs)

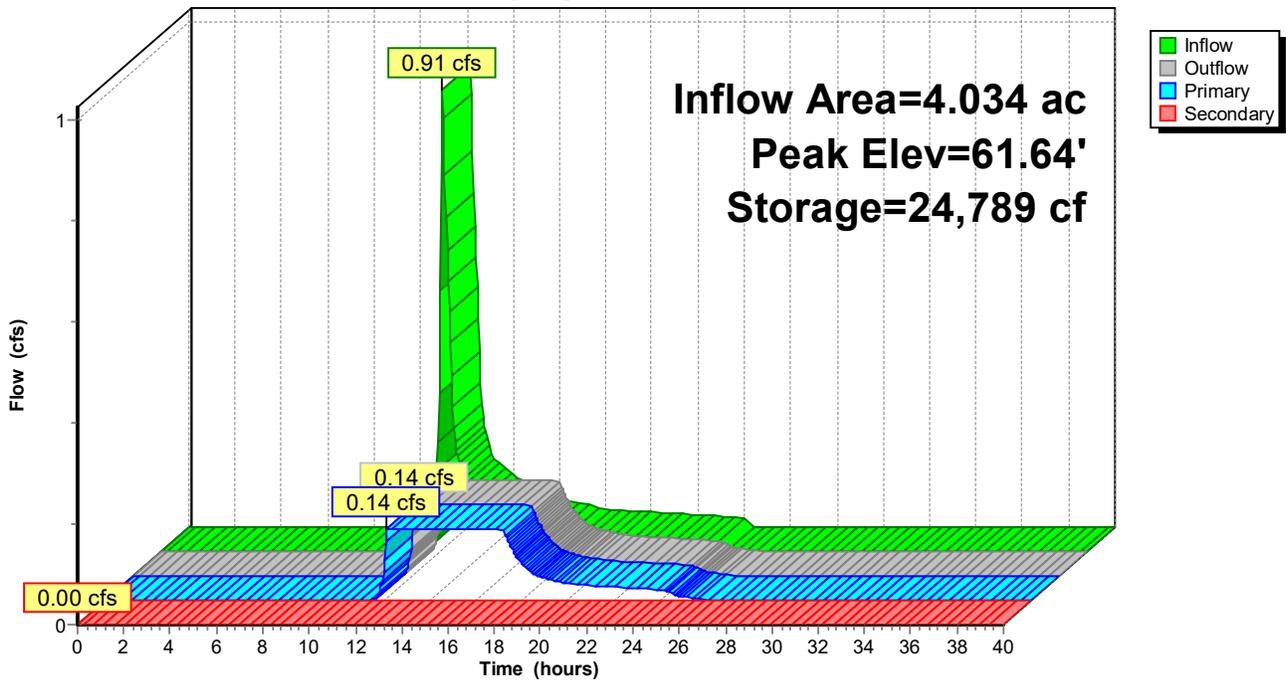
↑ **1=Broad-Crested Rectangular Weir** (Passes 0.14 cfs of 2.73 cfs potential flow)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=61.50' (Free Discharge)

↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

## Pond SB-2: SEDIMENT BASIN 2

Hydrograph



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## Summary for Pond SB-3: SEDIMENT BASIN 3

Inflow Area = 9.197 ac, 0.00% Impervious, Inflow Depth = 0.17" for Custom event  
 Inflow = 1.18 cfs @ 12.18 hrs, Volume= 0.133 af  
 Outflow = 0.28 cfs @ 12.40 hrs, Volume= 0.133 af, Atten= 76%, Lag= 13.5 min  
 Primary = 0.28 cfs @ 12.40 hrs, Volume= 0.133 af  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Starting Elev= 57.00' Surf.Area= 21,708 sf Storage= 43,774 cf  
 Peak Elev= 57.07' @ 12.93 hrs Surf.Area= 21,919 sf Storage= 45,251 cf (1,477 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= 70.0 min ( 973.9 - 904.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	54.00'	93,433 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
54.00	9,552	0	0
55.00	12,557	11,055	11,055
56.00	15,587	14,072	25,127
57.00	21,708	18,648	43,774
58.00	24,827	23,268	67,042
59.00	27,955	26,391	93,433

Device	Routing	Invert	Outlet Devices
#1	Device 2	57.00'	<b>50.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Device 4	57.00'	<b>0.28 cfs Exfiltration when above 57.00'</b>
#3	Device 4	57.50'	<b>12.0" Horiz. Orifice/Grate X 4.00</b> C= 0.600 Limited to weir flow at low heads
#4	Primary	54.50'	<b>12.0" Round Culvert X 2.00</b> L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 54.50' / 54.00' S= 0.0083 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#5	Secondary	58.15'	<b>20.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

# NAF Sediment Basin Sizing

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**Primary OutFlow** Max=0.28 cfs @ 12.40 hrs HW=57.05' (Free Discharge)

↑ **4=Culvert** (Passes 0.28 cfs of 10.25 cfs potential flow)

↑ **2=Exfiltration** (Exfiltration Controls 0.28 cfs)

↑ **1=Broad-Crested Rectangular Weir** (Passes 0.28 cfs of 1.51 cfs potential flow)

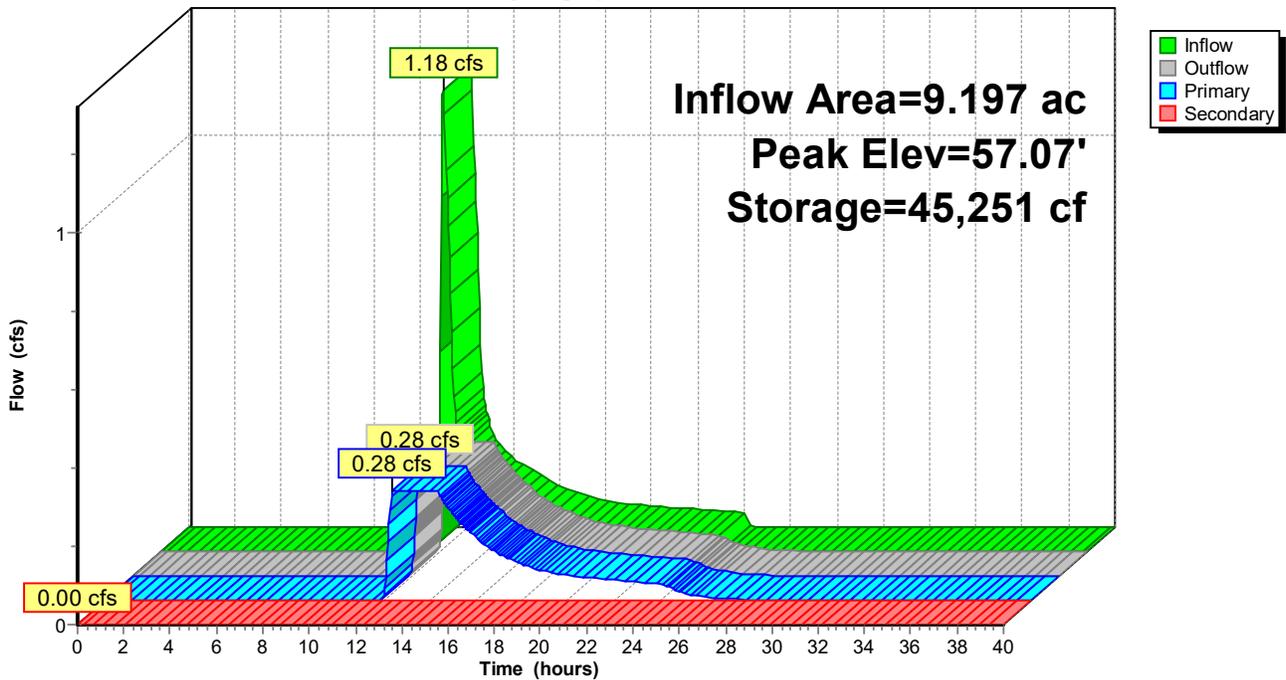
↑ **3=Orifice/Grate** (Controls 0.00 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=57.00' (Free Discharge)

↑ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

## Pond SB-3: SEDIMENT BASIN 3

Hydrograph



# NAF Sediment Basin Sizing

Type III 24-hr Custom Rainfall=1.00"

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## Summary for Pond SB-4: SEDIMENT BASIN 4

Inflow Area = 5.051 ac, 0.00% Impervious, Inflow Depth = 0.22" for Custom event  
 Inflow = 0.97 cfs @ 12.16 hrs, Volume= 0.094 af  
 Outflow = 0.14 cfs @ 12.30 hrs, Volume= 0.094 af, Atten= 86%, Lag= 8.1 min  
 Primary = 0.14 cfs @ 12.30 hrs, Volume= 0.094 af  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Starting Elev= 48.00' Surf.Area= 15,504 sf Storage= 37,176 cf  
 Peak Elev= 48.09' @ 13.49 hrs Surf.Area= 15,653 sf Storage= 38,577 cf (1,401 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= 121.5 min ( 1,009.7 - 888.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	45.00'	71,536 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
45.00	9,398	0	0
46.00	11,011	10,205	10,205
47.00	13,714	12,363	22,567
48.00	15,504	14,609	37,176
49.00	17,163	16,334	53,510
50.00	18,889	18,026	71,536

Device	Routing	Invert	Outlet Devices
#1	Device 2	48.00'	<b>125.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Device 4	48.00'	<b>0.14 cfs Exfiltration when above 48.00'</b>
#3	Device 4	48.50'	<b>12.0" Horiz. Orifice/Grate X 2.00</b> C= 0.600 Limited to weir flow at low heads
#4	Primary	45.00'	<b>12.0" Round Culvert</b> L= 170.0' Ke= 0.500 Inlet / Outlet Invert= 45.00' / 43.00' S= 0.0118 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#5	Secondary	49.10'	<b>20.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

# NAF Sediment Basin Sizing

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Type III 24-hr Custom Rainfall=1.00"

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**Primary OutFlow** Max=0.14 cfs @ 12.30 hrs HW=48.05' (Free Discharge)

↳ **4=Culvert** (Passes 0.14 cfs of 5.16 cfs potential flow)

↳ **2=Exfiltration** (Exfiltration Controls 0.14 cfs)

↳ **1=Broad-Crested Rectangular Weir** (Passes 0.14 cfs of 3.97 cfs potential flow)

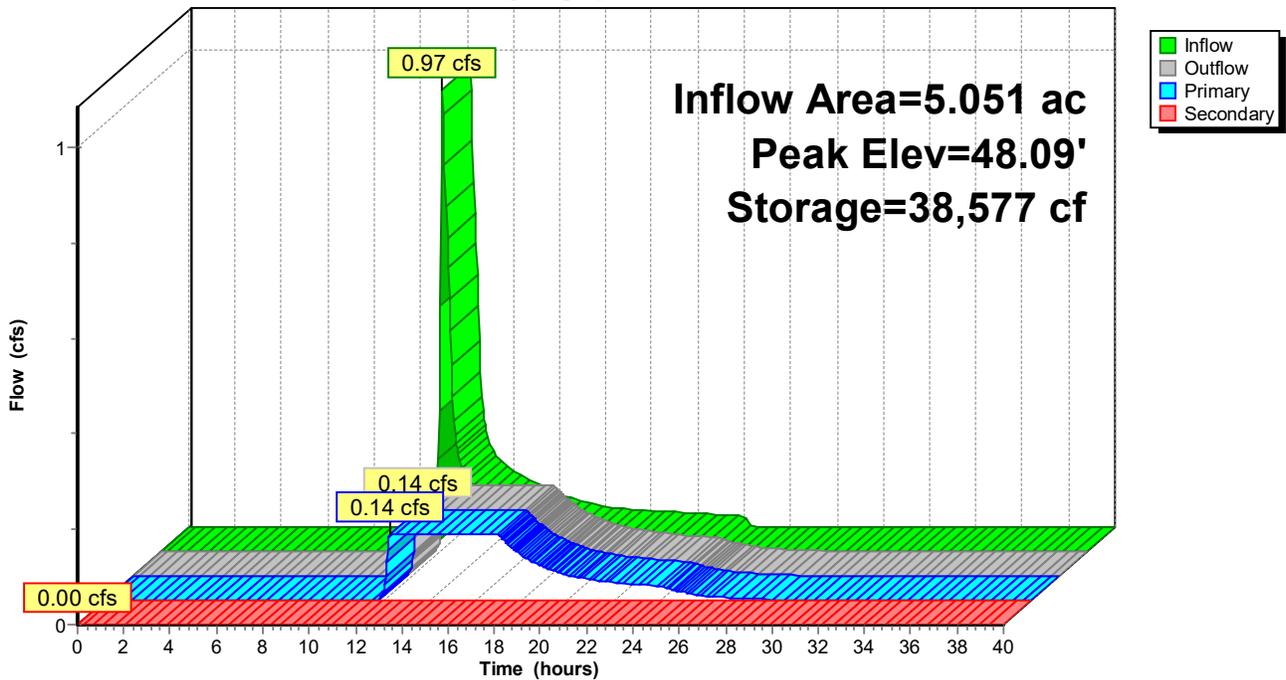
↳ **3=Orifice/Grate** (Controls 0.00 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=48.00' (Free Discharge)

↳ **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

## Pond SB-4: SEDIMENT BASIN 4

Hydrograph





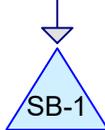
PHASE 1D WORK AREA



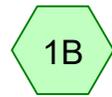
SEDIMENT BASIN 2



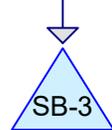
PHASE 1E WORK AREA



SEDIMENT BASIN 1



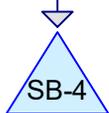
PHASE 1B WORK AREA



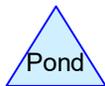
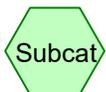
SEDIMENT BASIN 3



PHASE 2A WORK AREA



SEDIMENT BASIN 4



**Routing Diagram for NAF Sediment Basin Sizing**  
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# NAF Sediment Basin Sizing

Type III 24-hr 10-Year Storm Rainfall=4.20"

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Time span=0.00-40.00 hrs, dt=0.05 hrs, 801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

<b>Subcatchment 1B: PHASE 1B WORK AREA</b>	Runoff Area=400,619 sf 0.00% Impervious Runoff Depth=2.64" Tc=10.0 min CN=85 Runoff=24.47 cfs 2.021 af
<b>Subcatchment 1D: PHASE 1D WORK AREA</b>	Runoff Area=175,700 sf 0.00% Impervious Runoff Depth=2.92" Tc=10.0 min CN=88 Runoff=11.74 cfs 0.980 af
<b>Subcatchment 1E: PHASE 1E WORK AREA</b>	Runoff Area=195,500 sf 0.00% Impervious Runoff Depth=2.92" Tc=10.0 min CN=88 Runoff=13.07 cfs 1.090 af
<b>Subcatchment 2A: PHASE 2A WORK AREA</b>	Runoff Area=220,000 sf 0.00% Impervious Runoff Depth=2.82" Tc=10.0 min CN=87 Runoff=14.29 cfs 1.187 af
<b>Pond SB-1: SEDIMENT BASIN 1</b>	Peak Elev=63.06' Storage=75,726 cf Inflow=13.07 cfs 1.090 af Outflow=2.61 cfs 0.925 af
<b>Pond SB-2: SEDIMENT BASIN 2</b>	Peak Elev=62.88' Storage=36,944 cf Inflow=11.74 cfs 0.980 af Primary=5.08 cfs 0.980 af Secondary=0.00 cfs 0.000 af Outflow=5.08 cfs 0.980 af
<b>Pond SB-3: SEDIMENT BASIN 3</b>	Peak Elev=58.13' Storage=70,321 cf Inflow=24.47 cfs 2.021 af Primary=12.29 cfs 2.021 af Secondary=0.00 cfs 0.000 af Outflow=12.29 cfs 2.021 af
<b>Pond SB-4: SEDIMENT BASIN 4</b>	Peak Elev=49.12' Storage=55,575 cf Inflow=14.29 cfs 1.187 af Primary=5.80 cfs 1.177 af Secondary=0.21 cfs 0.003 af Outflow=6.01 cfs 1.180 af
<b>Total Runoff Area = 22.769 ac Runoff Volume = 5.279 af Average Runoff Depth = 2.78"</b>	
<b>100.00% Pervious = 22.769 ac 0.00% Impervious = 0.000 ac</b>	

# NAF Sediment Basin Sizing

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Type III 24-hr 10-Year Storm Rainfall=4.20"

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## Summary for Subcatchment 1B: PHASE 1B WORK AREA

Runoff = 24.47 cfs @ 12.14 hrs, Volume= 2.021 af, Depth= 2.64"

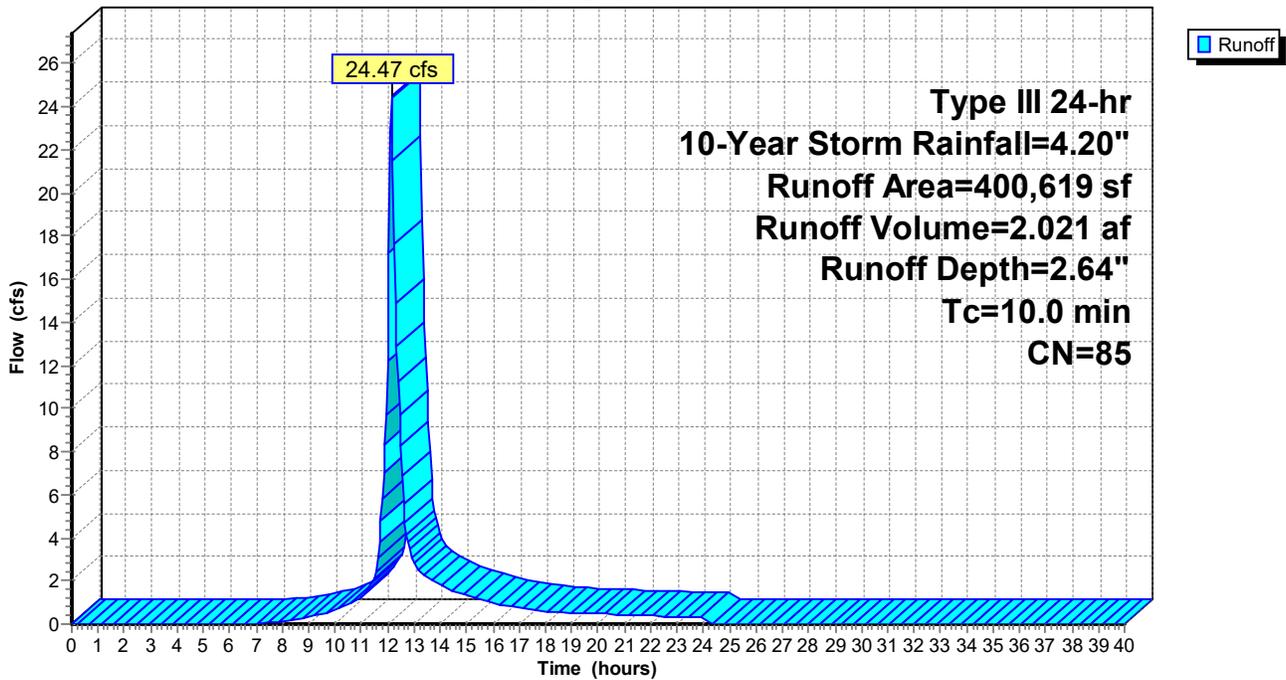
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Storm Rainfall=4.20"

Area (sf)	CN	Description
80,000	94	Fallow, bare soil, HSG D
320,619	83	Brush, Poor, HSG D
400,619	85	Weighted Average
400,619		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 1B: PHASE 1B WORK AREA

Hydrograph



# NAF Sediment Basin Sizing

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Type III 24-hr 10-Year Storm Rainfall=4.20"

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## Summary for Subcatchment 1D: PHASE 1D WORK AREA

Runoff = 11.74 cfs @ 12.14 hrs, Volume= 0.980 af, Depth= 2.92"

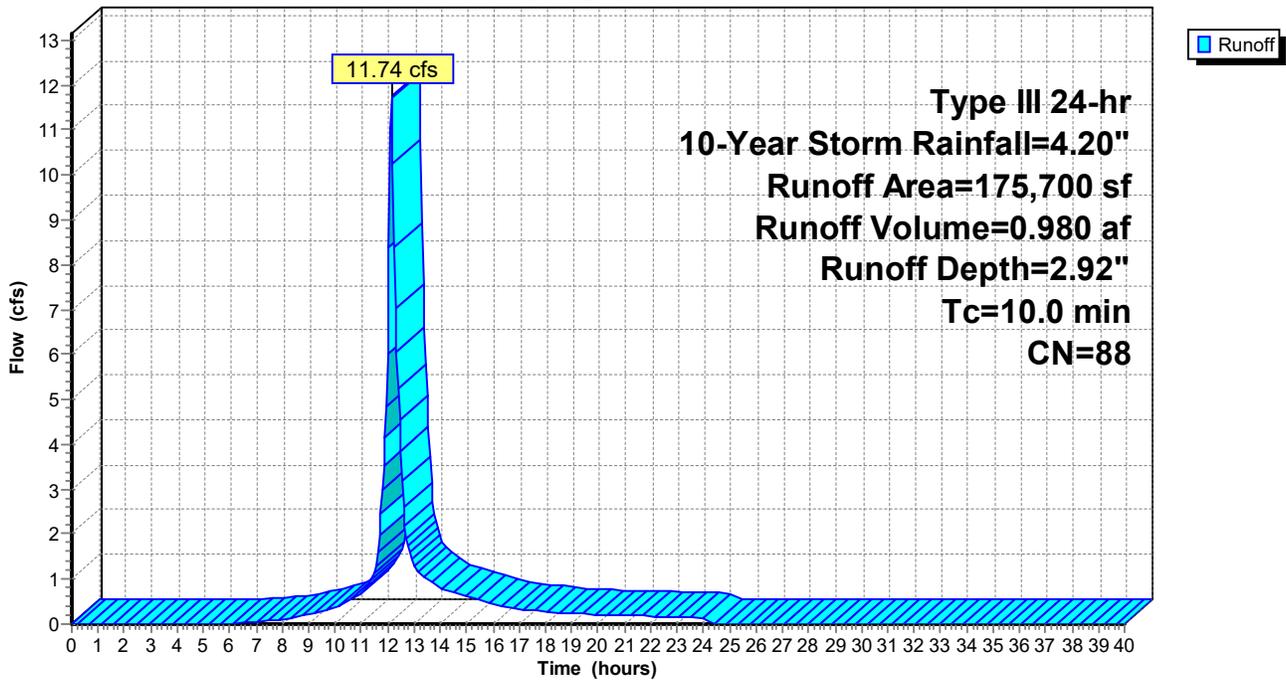
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 10-Year Storm Rainfall=4.20"

Area (sf)	CN	Description
80,000	94	Fallow, bare soil, HSG D
95,700	83	Brush, Poor, HSG D
175,700	88	Weighted Average
175,700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 1D: PHASE 1D WORK AREA

Hydrograph



# NAF Sediment Basin Sizing

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Type III 24-hr 10-Year Storm Rainfall=4.20"

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## Summary for Subcatchment 1E: PHASE 1E WORK AREA

Runoff = 13.07 cfs @ 12.14 hrs, Volume= 1.090 af, Depth= 2.92"

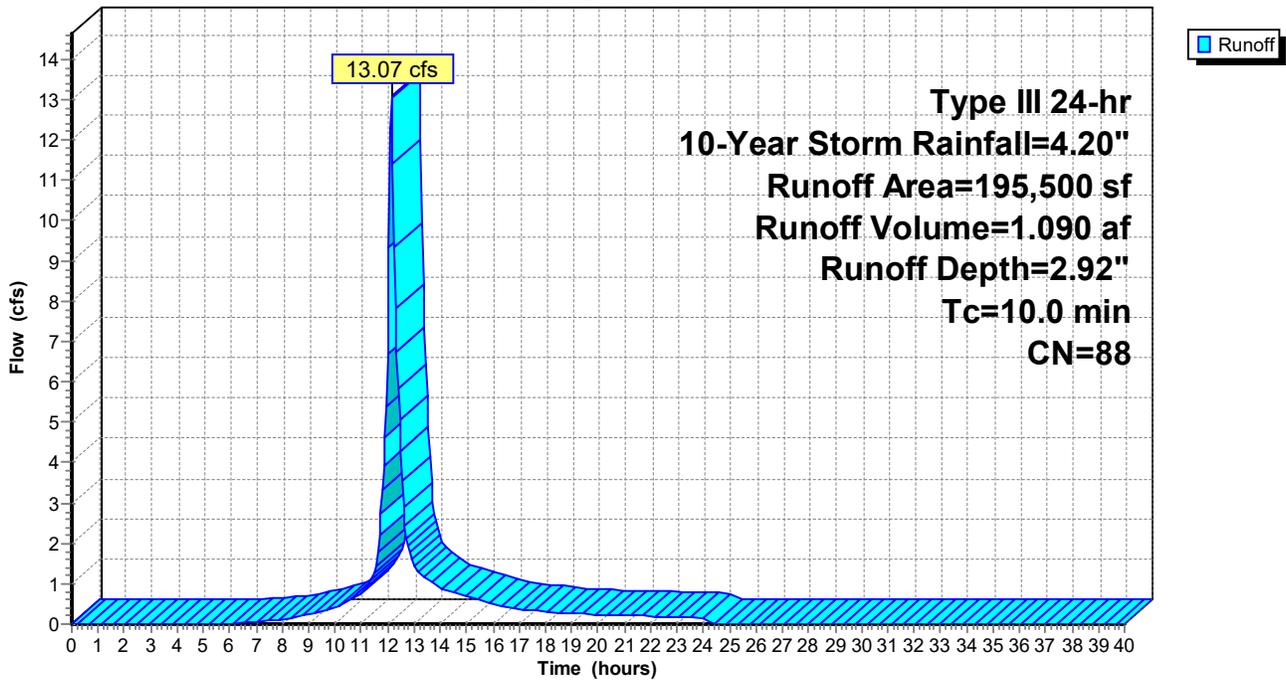
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Storm Rainfall=4.20"

Area (sf)	CN	Description
80,000	94	Fallow, bare soil, HSG D
115,500	83	Brush, Poor, HSG D
195,500	88	Weighted Average
195,500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 1E: PHASE 1E WORK AREA

Hydrograph



# NAF Sediment Basin Sizing

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Type III 24-hr 10-Year Storm Rainfall=4.20"

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## Summary for Subcatchment 2A: PHASE 2A WORK AREA

Runoff = 14.29 cfs @ 12.14 hrs, Volume= 1.187 af, Depth= 2.82"

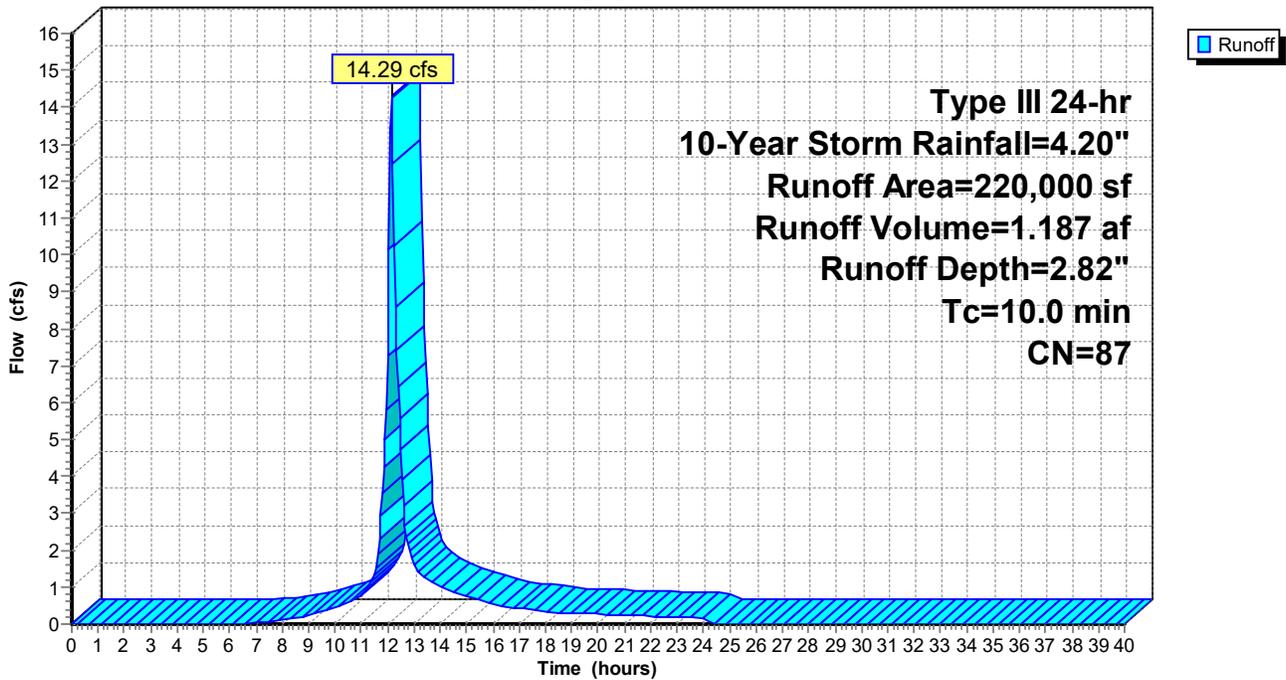
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Storm Rainfall=4.20"

Area (sf)	CN	Description
80,000	94	Fallow, bare soil, HSG D
140,000	83	Brush, Poor, HSG D
220,000	87	Weighted Average
220,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

## Subcatchment 2A: PHASE 2A WORK AREA

Hydrograph



# NAF Sediment Basin Sizing

Type III 24-hr 10-Year Storm Rainfall=4.20"

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## Summary for Pond SB-1: SEDIMENT BASIN 1

Inflow Area = 4.488 ac, 0.00% Impervious, Inflow Depth = 2.92" for 10-Year Storm event  
 Inflow = 13.07 cfs @ 12.14 hrs, Volume= 1.090 af  
 Outflow = 2.61 cfs @ 12.63 hrs, Volume= 0.925 af, Atten= 80%, Lag= 29.4 min  
 Primary = 2.61 cfs @ 12.63 hrs, Volume= 0.925 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Starting Elev= 62.00' Surf.Area= 21,234 sf Storage= 52,122 cf  
 Peak Elev= 63.06' @ 12.63 hrs Surf.Area= 23,228 sf Storage= 75,726 cf (23,604 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= 308.7 min ( 1,116.7 - 808.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	59.00'	98,359 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
59.00	14,450	0	0
60.00	16,235	15,343	15,343
61.00	18,045	17,140	32,483
62.00	21,234	19,640	52,122
63.00	23,110	22,172	74,294
64.00	25,020	24,065	98,359

Device	Routing	Invert	Outlet Devices
#1	Device 2	62.00'	<b>125.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Device 4	62.00'	<b>0.14 cfs Exfiltration when above 62.00'</b>
#3	Device 4	62.67'	<b>12.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#4	Primary	58.00'	<b>24.0" Round Culvert</b> L= 220.0' Ke= 0.500 Inlet / Outlet Invert= 58.00' / 57.00' S= 0.0045 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#5	Device 4	63.05'	<b>48.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=2.56 cfs @ 12.63 hrs HW=63.06' (Free Discharge)

- ↑ **4=Culvert** (Passes 2.56 cfs of 25.94 cfs potential flow)
- ↑ **2=Exfiltration** (Exfiltration Controls 0.14 cfs)
- ↑ **1=Broad-Crested Rectangular Weir** (Passes 0.14 cfs of 365.31 cfs potential flow)
- ↑ **3=Orifice/Grate** (Orifice Controls 2.37 cfs @ 3.01 fps)
- ↑ **5=Orifice/Grate** (Weir Controls 0.05 cfs @ 0.35 fps)

**NAF Sediment Basin Sizing**

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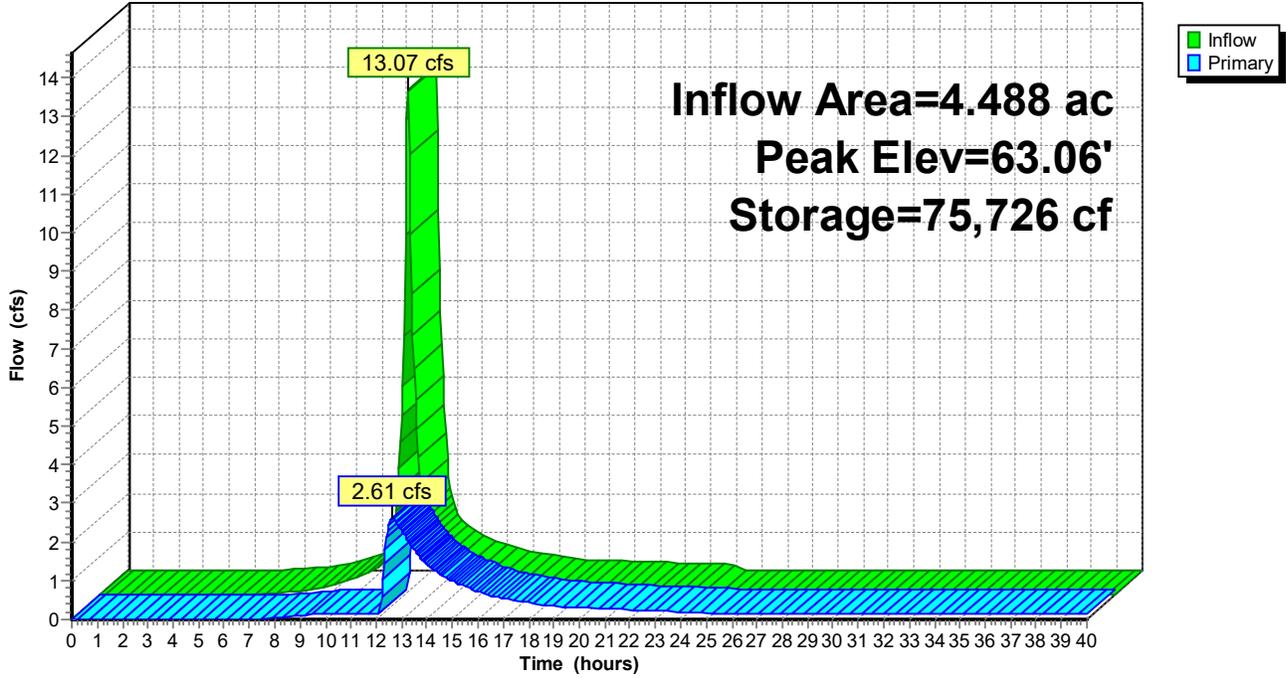
Type III 24-hr 10-Year Storm Rainfall=4.20"

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**Pond SB-1: SEDIMENT BASIN 1**

Hydrograph



# NAF Sediment Basin Sizing

Type III 24-hr 10-Year Storm Rainfall=4.20"

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## Summary for Pond SB-2: SEDIMENT BASIN 2

Inflow Area = 4.034 ac, 0.00% Impervious, Inflow Depth = 2.92" for 10-Year Storm event  
 Inflow = 11.74 cfs @ 12.14 hrs, Volume= 0.980 af  
 Outflow = 5.08 cfs @ 12.41 hrs, Volume= 0.980 af, Atten= 57%, Lag= 16.4 min  
 Primary = 5.08 cfs @ 12.41 hrs, Volume= 0.980 af  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Starting Elev= 61.50' Surf.Area= 8,610 sf Storage= 23,563 cf  
 Peak Elev= 62.88' @ 12.41 hrs Surf.Area= 10,342 sf Storage= 36,944 cf (13,381 cf above start)

Plug-Flow detention time= 499.1 min calculated for 0.439 af (45% of inflow)  
 Center-of-Mass det. time= 135.0 min ( 943.0 - 808.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	58.00'	49,004 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.00	5,440	0	0
59.00	6,132	5,786	5,786
60.00	6,855	6,494	12,280
61.00	7,605	7,230	19,510
62.00	9,614	8,610	28,119
63.00	10,437	10,026	38,145
64.00	11,281	10,859	49,004

Device	Routing	Invert	Outlet Devices
#1	Device 5	61.50'	<b>100.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Device 3	62.00'	<b>10.0" Horiz. Orifice/Grate X 2.00</b> C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	<b>12.0" Round Culvert</b> L= 100.0' Ke= 0.500 Inlet / Outlet Invert= 59.00' / 58.00' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#4	Secondary	63.00'	<b>20.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#5	Device 3	61.50'	<b>0.14 cfs Exfiltration when above 61.50'</b>

# NAF Sediment Basin Sizing

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Type III 24-hr 10-Year Storm Rainfall=4.20"

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**Primary OutFlow** Max=5.08 cfs @ 12.41 hrs HW=62.88' (Free Discharge)

↑ **3=Culvert** (Passes 5.08 cfs of 6.08 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 4.94 cfs @ 4.52 fps)

↑ **5=Exfiltration** (Exfiltration Controls 0.14 cfs)

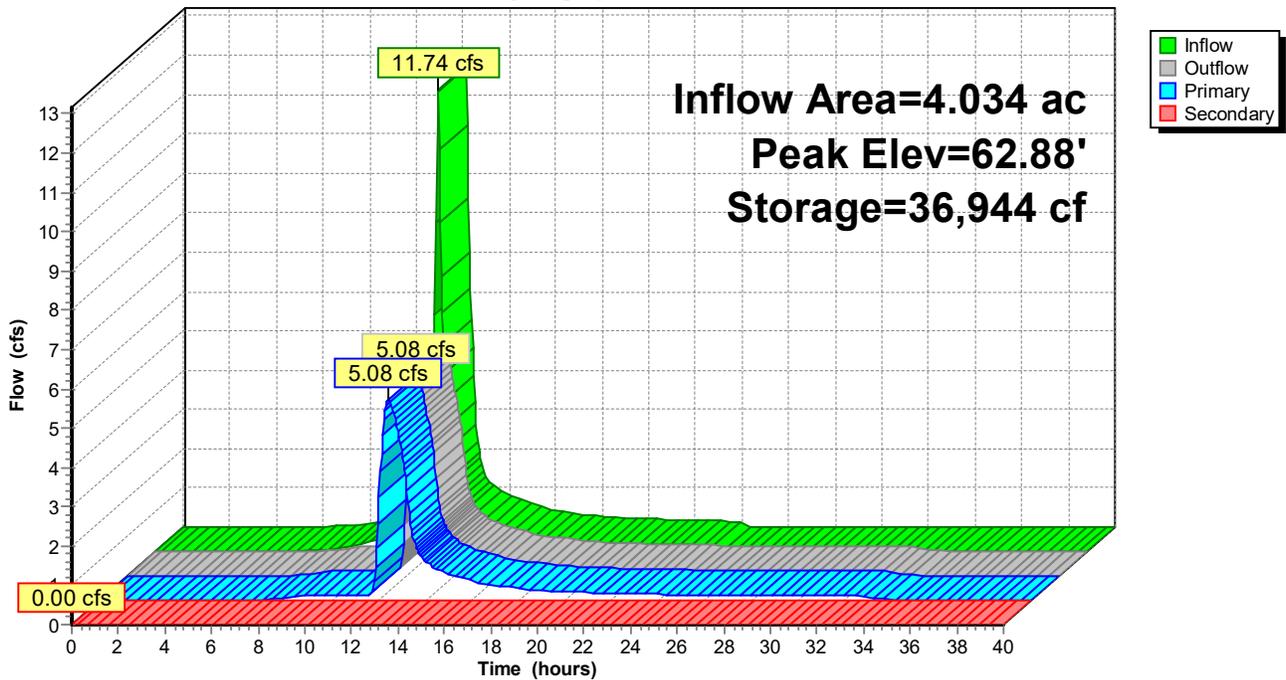
↑ **1=Broad-Crested Rectangular Weir** (Passes 0.14 cfs of 449.61 cfs potential flow)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=61.50' (Free Discharge)

↑ **4=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond SB-2: SEDIMENT BASIN 2

Hydrograph



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## Summary for Pond SB-3: SEDIMENT BASIN 3

Inflow Area = 9.197 ac, 0.00% Impervious, Inflow Depth = 2.64" for 10-Year Storm event  
 Inflow = 24.47 cfs @ 12.14 hrs, Volume= 2.021 af  
 Outflow = 12.29 cfs @ 12.37 hrs, Volume= 2.021 af, Atten= 50%, Lag= 13.6 min  
 Primary = 12.29 cfs @ 12.37 hrs, Volume= 2.021 af  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Starting Elev= 57.00' Surf.Area= 21,708 sf Storage= 43,774 cf  
 Peak Elev= 58.13' @ 12.37 hrs Surf.Area= 25,237 sf Storage= 70,321 cf (26,547 cf above start)

Plug-Flow detention time= 507.4 min calculated for 1.016 af (50% of inflow)  
 Center-of-Mass det. time= 161.1 min ( 979.3 - 818.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	54.00'	93,433 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
54.00	9,552	0	0
55.00	12,557	11,055	11,055
56.00	15,587	14,072	25,127
57.00	21,708	18,648	43,774
58.00	24,827	23,268	67,042
59.00	27,955	26,391	93,433

Device	Routing	Invert	Outlet Devices
#1	Device 2	57.00'	<b>50.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Device 4	57.00'	<b>0.28 cfs Exfiltration when above 57.00'</b>
#3	Device 4	57.50'	<b>12.0" Horiz. Orifice/Grate X 4.00</b> C= 0.600 Limited to weir flow at low heads
#4	Primary	54.50'	<b>12.0" Round Culvert X 2.00</b> L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 54.50' / 54.00' S= 0.0083 ' / Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#5	Secondary	58.15'	<b>20.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

# NAF Sediment Basin Sizing

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**Primary OutFlow** Max=12.28 cfs @ 12.37 hrs HW=58.13' (Free Discharge)

↑ **4=Culvert** (Passes 12.28 cfs of 12.65 cfs potential flow)

↑ **2=Exfiltration** (Exfiltration Controls 0.28 cfs)

↑ **1=Broad-Crested Rectangular Weir** (Passes 0.28 cfs of 161.20 cfs potential flow)

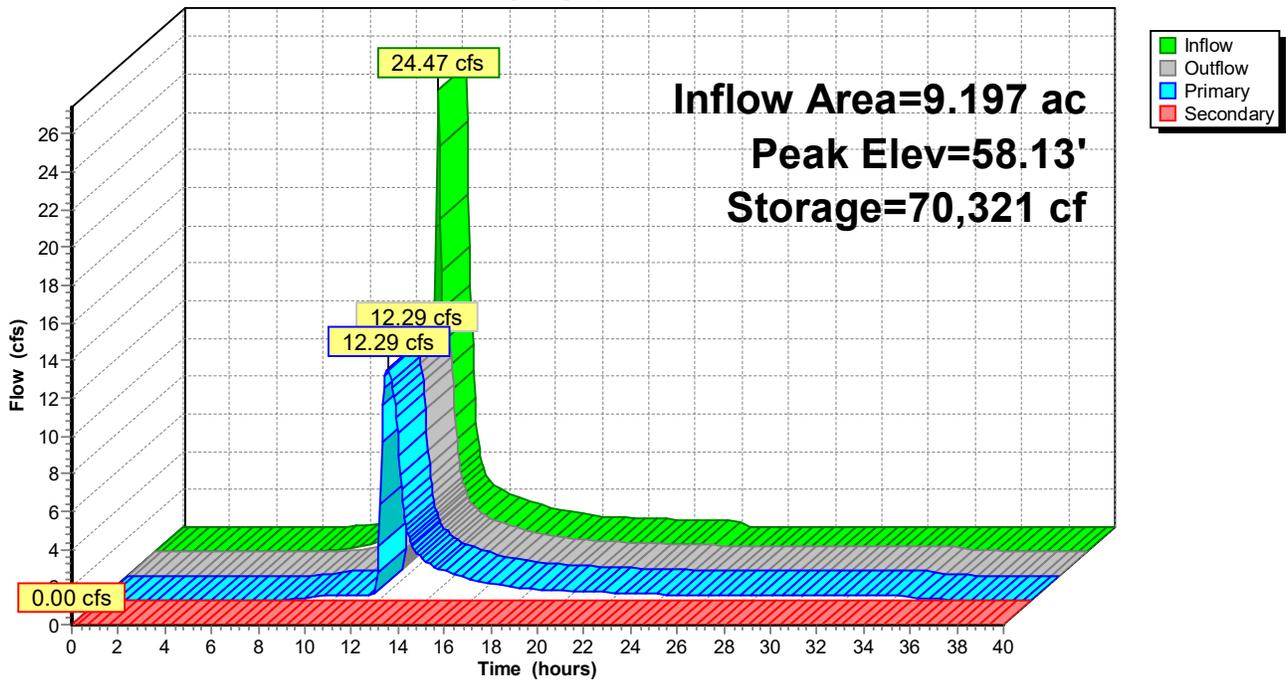
↑ **3=Orifice/Grate** (Orifice Controls 12.00 cfs @ 3.82 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=57.00' (Free Discharge)

↑ **5=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond SB-3: SEDIMENT BASIN 3

Hydrograph



# NAF Sediment Basin Sizing

Type III 24-hr 10-Year Storm Rainfall=4.20"

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## Summary for Pond SB-4: SEDIMENT BASIN 4

Inflow Area = 5.051 ac, 0.00% Impervious, Inflow Depth = 2.82" for 10-Year Storm event  
 Inflow = 14.29 cfs @ 12.14 hrs, Volume= 1.187 af  
 Outflow = 6.01 cfs @ 12.43 hrs, Volume= 1.180 af, Atten= 58%, Lag= 17.0 min  
 Primary = 5.80 cfs @ 12.43 hrs, Volume= 1.177 af  
 Secondary = 0.21 cfs @ 12.43 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 0.00-40.00 hrs, dt= 0.05 hrs  
 Starting Elev= 48.00' Surf.Area= 15,504 sf Storage= 37,176 cf  
 Peak Elev= 49.12' @ 12.43 hrs Surf.Area= 17,369 sf Storage= 55,575 cf (18,399 cf above start)

Plug-Flow detention time= 934.2 min calculated for 0.326 af (27% of inflow)  
 Center-of-Mass det. time= 211.9 min ( 1,023.4 - 811.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	45.00'	71,536 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
45.00	9,398	0	0
46.00	11,011	10,205	10,205
47.00	13,714	12,363	22,567
48.00	15,504	14,609	37,176
49.00	17,163	16,334	53,510
50.00	18,889	18,026	71,536

Device	Routing	Invert	Outlet Devices
#1	Device 2	48.00'	<b>125.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Device 4	48.00'	<b>0.14 cfs Exfiltration when above 48.00'</b>
#3	Device 4	48.50'	<b>12.0" Horiz. Orifice/Grate X 2.00</b> C= 0.600 Limited to weir flow at low heads
#4	Primary	45.00'	<b>12.0" Round Culvert</b> L= 170.0' Ke= 0.500 Inlet / Outlet Invert= 45.00' / 43.00' S= 0.0118 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#5	Secondary	49.10'	<b>20.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

# NAF Sediment Basin Sizing

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**Primary OutFlow** Max=5.80 cfs @ 12.43 hrs HW=49.12' (Free Discharge)

↑ **4=Culvert** (Barrel Controls 5.80 cfs @ 7.38 fps)

↑ **2=Exfiltration** (Passes < 0.14 cfs potential flow)

↑ **1=Broad-Crested Rectangular Weir** (Passes < 396.88 cfs potential flow)

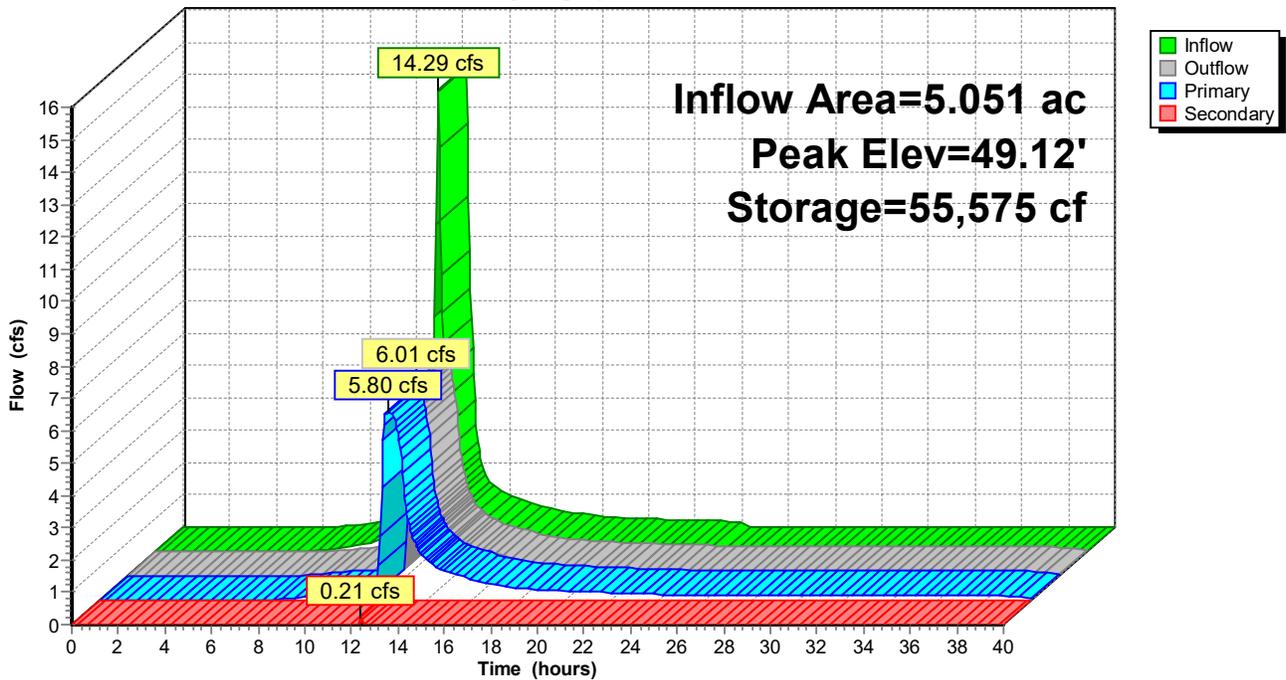
↑ **3=Orifice/Grate** (Passes < 5.95 cfs potential flow)

**Secondary OutFlow** Max=0.12 cfs @ 12.43 hrs HW=49.12' (Free Discharge)

↑ **5=Broad-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.33 fps)

## Pond SB-4: SEDIMENT BASIN 4

Hydrograph



# NAF Sediment Basin Sizing

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## Stage-Area-Storage for Pond SB-1: SEDIMENT BASIN 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
59.00	14,450	0	61.70	20,277	45,895
59.05	14,539	725	61.75	20,437	46,913
59.10	14,629	1,454	61.80	20,596	47,939
59.15	14,718	2,188	61.85	20,756	48,973
59.20	14,807	2,926	61.90	20,915	50,015
59.25	14,896	3,668	61.95	21,075	51,064
59.30	14,985	4,415	62.00	21,234	52,122
59.35	15,075	5,167	62.05	21,328	53,186
59.40	15,164	5,923	62.10	21,422	54,255
59.45	15,253	6,683	62.15	21,515	55,328
59.50	15,343	7,448	62.20	21,609	56,406
59.55	15,432	8,217	62.25	21,703	57,489
59.60	15,521	8,991	62.30	21,797	58,577
59.65	15,610	9,770	62.35	21,891	59,669
59.70	15,700	10,552	62.40	21,984	60,766
59.75	15,789	11,340	62.45	22,078	61,867
59.80	15,878	12,131	62.50	22,172	62,974
59.85	15,967	12,927	62.55	22,266	64,084
59.90	16,056	13,728	62.60	22,360	65,200
59.95	16,146	14,533	62.65	22,453	66,320
60.00	16,235	15,343	62.70	22,547	67,445
60.05	16,325	16,157	62.75	22,641	68,575
60.10	16,416	16,975	62.80	22,735	69,710
60.15	16,506	17,798	62.85	22,829	70,849
60.20	16,597	18,626	62.90	22,922	71,992
60.25	16,688	19,458	62.95	23,016	73,141
60.30	16,778	20,294	63.00	23,110	74,294
60.35	16,869	21,136	63.05	23,205	75,452
60.40	16,959	21,981	63.10	23,301	76,615
60.45	17,050	22,832	63.15	23,396	77,782
60.50	17,140	23,686	63.20	23,492	78,954
60.55	17,230	24,546	63.25	23,588	80,131
60.60	17,321	25,409	63.30	23,683	81,313
60.65	17,411	26,278	63.35	23,779	82,499
60.70	17,502	27,150	63.40	23,874	83,691
60.75	17,593	28,028	63.45	23,970	84,887
60.80	17,683	28,910	63.50	24,065	86,088
60.85	17,774	29,796	63.55	24,160	87,293
60.90	17,864	30,687	63.60	24,256	88,504
60.95	17,955	31,583	63.65	24,351	89,719
61.00	18,045	32,483	63.70	24,447	90,939
61.05	18,204	33,389	63.75	24,543	92,164
61.10	18,364	34,303	63.80	24,638	93,393
61.15	18,523	35,225	63.85	24,734	94,627
61.20	18,683	36,155	63.90	24,829	95,867
61.25	18,842	37,093	63.95	24,925	97,110
61.30	19,002	38,040	64.00	<b>25,020</b>	<b>98,359</b>
61.35	19,161	38,994			
61.40	19,321	39,956			
61.45	19,480	40,926			
61.50	19,640	41,904			
61.55	19,799	42,890			
61.60	19,958	43,884			
61.65	20,118	44,885			

# NAF Sediment Basin Sizing

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## Stage-Area-Storage for Pond SB-2: SEDIMENT BASIN 2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
58.00	5,440	0	63.40	10,775	42,387
58.10	5,509	547	63.50	10,859	43,469
58.20	5,578	1,102	63.60	10,943	44,559
58.30	5,648	1,663	63.70	11,028	45,657
58.40	5,717	2,231	63.80	11,112	46,764
58.50	5,786	2,807	63.90	11,197	47,880
58.60	5,855	3,389	64.00	<b>11,281</b>	<b>49,004</b>
58.70	5,924	3,978			
58.80	5,994	4,573			
58.90	6,063	5,176			
59.00	6,132	5,786			
59.10	6,204	6,403			
59.20	6,277	7,027			
59.30	6,349	7,658			
59.40	6,421	8,297			
59.50	6,494	8,942			
59.60	6,566	9,595			
59.70	6,638	10,256			
59.80	6,710	10,923			
59.90	6,783	11,598			
60.00	6,855	12,280			
60.10	6,930	12,969			
60.20	7,005	13,666			
60.30	7,080	14,370			
60.40	7,155	15,081			
60.50	7,230	15,801			
60.60	7,305	16,528			
60.70	7,380	17,262			
60.80	7,455	18,003			
60.90	7,530	18,753			
61.00	7,605	19,510			
61.10	7,806	20,280			
61.20	8,007	21,071			
61.30	8,208	21,881			
61.40	8,409	22,712			
61.50	8,610	23,563			
61.60	8,810	24,434			
61.70	9,011	25,325			
61.80	9,212	26,236			
61.90	9,413	27,168			
62.00	9,614	28,119			
62.10	9,696	29,085			
62.20	9,779	30,058			
62.30	9,861	31,040			
62.40	9,943	32,030			
62.50	10,026	33,029			
62.60	10,108	34,036			
62.70	10,190	35,050			
62.80	10,272	36,074			
62.90	10,355	37,105			
63.00	10,437	38,145			
63.10	10,521	39,192			
63.20	10,606	40,249			
63.30	10,690	41,314			

# NAF Sediment Basin Sizing

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## Stage-Area-Storage for Pond SB-3: SEDIMENT BASIN 3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
54.00	9,552	0	56.70	19,872	37,537
54.05	9,702	481	56.75	20,178	38,538
54.10	9,853	970	56.80	20,484	39,555
54.15	10,003	1,467	56.85	20,790	40,587
54.20	10,153	1,971	56.90	21,096	41,634
54.25	10,303	2,482	56.95	21,402	42,696
54.30	10,453	3,001	57.00	21,708	43,774
54.35	10,604	3,527	57.05	21,864	44,863
54.40	10,754	4,061	57.10	22,020	45,960
54.45	10,904	4,603	57.15	22,176	47,065
54.50	11,055	5,152	57.20	22,332	48,178
54.55	11,205	5,708	57.25	22,488	49,298
54.60	11,355	6,272	57.30	22,644	50,427
54.65	11,505	6,844	57.35	22,800	51,563
54.70	11,656	7,423	57.40	22,956	52,707
54.75	11,806	8,009	57.45	23,112	53,858
54.80	11,956	8,603	57.50	23,268	55,018
54.85	12,106	9,205	57.55	23,423	56,185
54.90	12,256	9,814	57.60	23,579	57,360
54.95	12,407	10,430	57.65	23,735	58,543
55.00	12,557	11,055	57.70	23,891	59,734
55.05	12,708	11,686	57.75	24,047	60,932
55.10	12,860	12,325	57.80	24,203	62,138
55.15	13,011	12,972	57.85	24,359	63,353
55.20	13,163	13,627	57.90	24,515	64,574
55.25	13,315	14,288	57.95	24,671	65,804
55.30	13,466	14,958	58.00	24,827	67,042
55.35	13,618	15,635	58.05	24,983	68,287
55.40	13,769	16,320	58.10	25,140	69,540
55.45	13,921	17,012	58.15	25,296	70,801
55.50	14,072	17,712	58.20	25,453	72,069
55.55	14,223	18,419	58.25	25,609	73,346
55.60	14,375	19,134	58.30	25,765	74,630
55.65	14,526	19,857	58.35	25,922	75,923
55.70	14,678	20,587	58.40	26,078	77,223
55.75	14,830	21,324	58.45	26,235	78,530
55.80	14,981	22,070	58.50	26,391	79,846
55.85	15,133	22,823	58.55	26,547	81,169
55.90	15,284	23,583	58.60	26,704	82,501
55.95	15,436	24,351	58.65	26,860	83,840
56.00	15,587	25,127	58.70	27,017	85,187
56.05	15,893	25,914	58.75	27,173	86,542
56.10	16,199	26,716	58.80	27,329	87,904
56.15	16,505	27,533	58.85	27,486	89,274
56.20	16,811	28,366	58.90	27,642	90,653
56.25	17,117	29,215	58.95	27,799	92,039
56.30	17,423	30,078	59.00	<b>27,955</b>	<b>93,433</b>
56.35	17,729	30,957			
56.40	18,035	31,851			
56.45	18,341	32,760			
56.50	18,648	33,685			
56.55	18,954	34,625			
56.60	19,260	35,580			
56.65	19,566	36,551			

# NAF Sediment Basin Sizing

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## Stage-Area-Storage for Pond SB-4: SEDIMENT BASIN 4

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
45.00	9,398	0	47.70	14,967	32,605
45.05	9,479	472	47.75	15,057	33,356
45.10	9,559	948	47.80	15,146	34,111
45.15	9,640	1,428	47.85	15,236	34,871
45.20	9,721	1,912	47.90	15,325	35,635
45.25	9,801	2,400	47.95	15,415	36,403
45.30	9,882	2,892	48.00	15,504	37,176
45.35	9,963	3,388	48.05	15,587	37,953
45.40	10,043	3,888	48.10	15,670	38,735
45.45	10,124	4,392	48.15	15,753	39,520
45.50	10,205	4,901	48.20	15,836	40,310
45.55	10,285	5,413	48.25	15,919	41,104
45.60	10,366	5,929	48.30	16,002	41,902
45.65	10,446	6,449	48.35	16,085	42,704
45.70	10,527	6,974	48.40	16,168	43,510
45.75	10,608	7,502	48.45	16,251	44,321
45.80	10,688	8,035	48.50	16,334	45,135
45.85	10,769	8,571	48.55	16,416	45,954
45.90	10,850	9,111	48.60	16,499	46,777
45.95	10,930	9,656	48.65	16,582	47,604
46.00	11,011	10,205	48.70	16,665	48,435
46.05	11,146	10,758	48.75	16,748	49,271
46.10	11,281	11,319	48.80	16,831	50,110
46.15	11,416	11,887	48.85	16,914	50,954
46.20	11,552	12,461	48.90	16,997	51,801
46.25	11,687	13,042	48.95	17,080	52,653
46.30	11,822	13,629	49.00	17,163	53,510
46.35	11,957	14,224	49.05	17,249	54,370
46.40	12,092	14,825	49.10	17,336	55,234
46.45	12,227	15,433	49.15	17,422	56,103
46.50	12,363	16,048	49.20	17,508	56,977
46.55	12,498	16,669	49.25	17,595	57,854
46.60	12,633	17,298	49.30	17,681	58,736
46.65	12,768	17,933	49.35	17,767	59,622
46.70	12,903	18,574	49.40	17,853	60,513
46.75	13,038	19,223	49.45	17,940	61,408
46.80	13,173	19,878	49.50	18,026	62,307
46.85	13,309	20,540	49.55	18,112	63,210
46.90	13,444	21,209	49.60	18,199	64,118
46.95	13,579	21,885	49.65	18,285	65,030
47.00	13,714	22,567	49.70	18,371	65,946
47.05	13,803	23,255	49.75	18,458	66,867
47.10	13,893	23,947	49.80	18,544	67,792
47.15	13,982	24,644	49.85	18,630	68,722
47.20	14,072	25,346	49.90	18,716	69,655
47.25	14,162	26,051	49.95	18,803	70,593
47.30	14,251	26,762	50.00	<b>18,889</b>	<b>71,536</b>
47.35	14,341	27,477			
47.40	14,430	28,196			
47.45	14,520	28,920			
47.50	14,609	29,648			
47.55	14,698	30,380			
47.60	14,788	31,118			
47.65	14,877	31,859			

## Nordic Aquafarms

### Summary of Soil Loss During Construction

Phase	Working Area	Working Area	RUSLE2 Soil Loss	Working Area Soil Loss	Non-Working Area	Non-Working Area	RUSLE2 Soil Loss	RUSLE2 Soil Loss	Non-Working Area Soil Loss	Total Phase Soil Loss
	sf	ac	Tons/ac/yr	cf/yr	sf	ac	Tons/ac/yr	cf/ac/yr	cf/yr	cf/yr
1A	80000	1.84	14.90	456.08	489000	11.23	5.80	96.67	1085.17	1541.25
1B	80000	1.84	14.90	459.14	328600	7.54	5.80	96.67	729.22	1188.35
1C	80000	1.84	14.90	459.14	63600	1.46	5.80	96.67	141.14	600.28
1D	80000	1.84	14.90	459.14	119200	2.74	5.80	96.67	264.52	723.66
1E	80000	1.84	14.90	459.14	134500	3.09	5.80	96.67	298.48	757.61
2A	80000	1.84	14.90	459.14	140000	3.21	5.80	96.67	310.68	769.82
2B	80000	1.84	14.90	459.14	115500	2.65	5.80	96.67	256.31	715.45

Assumes soil unit weight of 120lbs/cu.ft



# VA RUSLE2 Profile Printout w/ Details

Detailed printout of RUSLE2 calculation for one field, one management alternative

## I. Client/Field ID & Summary

**Client/Owner name:** SMRT/Nordic Aquafarms  
**Field name:** Nordic Aquafarms  
**Project #:** 18-041  
**Location:** USA\Maine\Waldo County

Printout date: March 18, 2019

Prepared by (name): Atlantic Resource Consultants, LLC

USDA Service Center/Location:

Narrative description of profile, field, and/or management:

Info: Major earthwork operations- exposed areas

Notes on collection of input data, field visits, etc.:

None

Summary of RUSLE2 output:

<u>Soil Loss</u>	<u>Soil Quality</u>
Soil loss for cons. plan: 15 t/ac/yr. T value: 5.0 t/ac/yr.	Soil conditioning index (SCI): -1.0 Avg. annual slope STIR: 5.20

Recommendations / Comments:

## II. RUSLE2 Profile Input

### 1. CLIMATE (R FACTOR)

- Climate Location: USA\Maine\Waldo County (R Factor: 110 US)

### 2. SOIL (K FACTOR)

- Predominant Soil: Waldo County, Maine\BoB Boothbay silt loam, 3 to 8 percent slopes\Boothbay Silt loam 86% (Erodibility: 0.37 US)
- T value: 5.0 t/ac/yr.

### 3. TOPOGRAPHY (LS FACTOR)

- RUSLE Slope length (along slope): 300 ft
- Avg. slope steepness: 2.0 %

### 4. CROP MANAGEMENT (C FACTOR)

- Crop management narrative description / background info:

*Info:*

- Rotation Duration: 1 yr.
- Crops / vegetations in rotation and long-term yield averages:

<i>Vegetation</i>	<i>Yield units</i>	<i># yield units, #/ac</i>
No Vegetation		

- Field operation dates and descriptions, manure application rates, etc.:

<i>Date</i>	<i>Operation</i>	<i>Vegetation</i>	<i>Yield (harv. units)</i>	<i>Type of cover material</i>	<i>Cover matl add/remove, lb/ac</i>
4/15/19	Bulldozer, filling/leveling				

External residue (i.e., manure) application rates in RUSLE2 are expressed in lbs. of “effective” dry matter per acre. For liquid, slurry, poultry, and semi-solid manures, “effective” dry matter in = 50% of actual dry matter

- Additional RUSLE2 crop management info:
  - Rock cover: 0 %
  - Adjust res. burial level: Normal res. burial
  - RUSLE2 management file name: Base management: Strip/Barrier Managements\Bare ground; rough surface\*

## **5. SUPPORT PRACTICES (P FACTOR)**

- Contouring: a. rows up-and-down hill (Actual row grade: 2.0%)
- Strips/barriers: (none)
- Diversion/terrace, sediment basin: (none)
- Subsurface drainage: (none)

## **6. RUSLE2 SOFTWARE DETAILS**

- Program version: Mar 27, 2017
- Database name: MOSES 2016
- Profile file name: profiles/default

## **III. RUSLE2 Profile Output & Definitions**

### **1. SURFACE RESIDUE COVER ESTIMATES:**

Long-term average predicted surface residue cover after each field operation:

<i>Date</i>	<i>Operation</i>	<i>Vegetation</i>	<i>Surf. res. cov. after op, %</i>
4/15/19	Bulldozer, filling/leveling		0

One way to verify whether RUSLE2 is properly modeling a situation is to check these long-term average surface residue results. An unexpectedly high or low surface residue cover value after a particular operation indicates that the choice of operation or some other input in the calculation (such as vegetation or yield) should be reviewed.

RUSLE2 counts as surface residue **only** material lying flat on the soil surface (automatically adjusted for overlap). RUSLE2 does **not** count the following as surface residue cover: (a) above-ground or standing material (including live canopy cover and standing dead residue) or (b) buried material (including live roots and dead plant residue). RUSLE2 does account for the erosion control value of standing and buried material when calculating soil loss.

Therefore, these surface residue numbers are most useful for analyzing annual cropping systems in which field operations routinely bury and/or flatten most residue and in which surface residue plays a leading role in erosion prevention. When analyzing results for cropping systems involving perennials and/or no-till planting into large amounts of standing residue (such as a chemically killed cover crop), also consult RUSLE2 canopy cover estimates (available in the VA Basic User Template 2007 Profile Screen).

## **2. SOIL LOSS ESTIMATES:**

- Soil loss for conservation planning:
  - Soil loss for cons. plan: 15 t/ac/yr.
  - T value: 5.0 t/ac/yr.

Estimate of average annual rainfall-induced soil loss (detachment of soil particles & transport downhill) over the length of the modeled slope. It is critical to understand that this value represents a long-term (20- to 30-year) average, not a prediction of actual soil loss in any single year. This is the number to use for conservation planning and to compare with the field's "T" soil loss tolerance value. This number is a measure of the likelihood of degradation by erosion of the soil resource in upslope (steeper) areas of the field. Very little credit is given for any sediment deposition that may occur towards the bottom of the modeled slope (for example, due to an end-of-slope filter strip), because upslope areas are still being degraded.

- Sediment Delivery:
  - Sediment delivery: 14.9 t/ac/yr.

Estimate of the amount of sediment delivered by runoff to the end of the modeled slope. This is RUSLE2's best estimate of long-term average "edge of field" soil loss. Full credit is given for any sediment deposition that occurs anywhere on the modeled slope due to reductions in slope grade, filter strips, terraces, etc. This number is not used for conservation planning but may be used for other environmental applications (e.g., P-Index). In many cases, RUSLE2 users will model slopes as uniform with no structural practices, vegetative features (filter strips), or breaks in topography that result in sediment deposition. In this typical situation, results for sediment delivery and soil loss for conservation planning will be identical.

## **3. SOIL QUALITY SCORES:**

- Soil Conditioning Index:
  - Soil conditioning index (SCI): -1.0

Soil organic matter (SOM) or soil carbon (C) trend score. If SCI is negative (less than zero), SOM and soil C and soil quality are predicted to decline over time on the modeled slope under the modeled management system. If SCI is positive (greater than zero), SOM and soil C and soil quality are predicted to stay the same or to increase over time. SCI scores usually range from -1 to +1 in typical VA situations, although more extreme values are possible. SCI is an index score (no units) designed solely for comparing the relative impact of different management alternatives on long-term soil quality trends. When calculating SCI, RUSLE2 considers three key factors: (1) amount of surface and subsurface biomass returned to the soil; (2) tillage-induced oxidation of soil carbon; and (3) predicted sheet & rill erosion. Climate and soil type inputs are also considered due to the influence of these factors on soil C oxidation trends.

- Soil Tillage Intensity Rating (STIR):

- Avg. annual slope STIR: 5.20 (averaged across all years in the rotation)

- STIR value for each individual crop (or vegetation record) in the rotation:

<i>Veg.</i>	<i>STIR value</i>	<i>Start date</i>	<i>End date, m/d/y</i>

Measure of intensity of tillage or soil disturbance. STIR is an index (no units) designed solely for comparing the relative impact of different management alternatives on soil disturbance. STIR increases with increasing tillage and can range from 0 to 200+. Average annual STIR values reflect the total amount of soil disturbance that occurs during the overall rotation, averaged across the number of years in the rotation. STIR values can also be calculated for individual crops. The STIR for an individual crop represents the sum of all soil disturbance associated with establishing and harvesting that crop. Both types of STIR values are shown above. STIR values in the 5 to 20 range are typical of no-till crops and/or continuous no-till or low soil disturbance cropping systems. In long rotations with a mix of tilled and no-till and/or perennial crops, the average annual STIR for the overall rotation may be relatively low even if significant tillage occurs in individual years and STIR values for one or more crops in the rotation are relatively high.



# VA RUSLE2 Profile Printout w/ Details

Detailed printout of RUSLE2 calculation for one field, one management alternative

## I. Client/Field ID & Summary

**Client/Owner name:** SMRT/Nordic Aquafarms  
**Field name:** Nordic Aquafarms  
**Project #:** 18-041  
**Location:** USA\Maine\Waldo County

Printout date: March 18, 2019

Prepared by (name): Atlantic Resource Consultants, LLC

USDA Service Center/Location:

Narrative description of profile, field, and/or management:

Info: Cleared areas – not yet grubbed

Notes on collection of input data, field visits, etc.:

None

Summary of RUSLE2 output:

<u>Soil Loss</u>	<u>Soil Quality</u>
Soil loss for cons. plan: 5.8 t/ac/yr. T value: 5.0 t/ac/yr.	Soil conditioning index (SCI): -0.3 Avg. annual slope STIR: 0

Recommendations / Comments:

## II. RUSLE2 Profile Input

### 1. CLIMATE (R FACTOR)

- Climate Location: USA\Maine\Waldo County (R Factor: 110 US)

### 2. SOIL (K FACTOR)

- Predominant Soil: Waldo County, Maine\BoB Boothbay silt loam, 3 to 8 percent slopes\Boothbay Silt loam 86% (Erodibility: 0.37 US)
- T value: 5.0 t/ac/yr.

### 3. TOPOGRAPHY (LS FACTOR)

- RUSLE Slope length (along slope): 300 ft
- Avg. slope steepness: 2.0 %

### 4. CROP MANAGEMENT (C FACTOR)

- Crop management narrative description / background info:

*Info:*

- Rotation Duration: 1 yr.
- Crops / vegetations in rotation and long-term yield averages:

<i>Vegetation</i>	<i>Yield units</i>	<i># yield units, #/ac</i>
No Vegetation		

- Field operation dates and descriptions, manure application rates, etc.:

<i>Date</i>	<i>Operation</i>	<i>Vegetation</i>	<i>Yield (harv. units)</i>	<i>Type of cover material</i>	<i>Cover matl add/remove, lb/ac</i>
4/15/19	No Operation				

External residue (i.e., manure) application rates in RUSLE2 are expressed in lbs. of "effective" dry matter per acre. For liquid, slurry, poultry, and semi-solid manures, "effective" dry matter in = 50% of actual dry matter

- Additional RUSLE2 crop management info:
  - Rock cover: 0 %
  - Adjust res. burial level: Normal res. burial
  - RUSLE2 management file name: Base management: Strip/Barrier Managements\Bare ground; rough surface\*

## **5. SUPPORT PRACTICES (P FACTOR)**

- Contouring: a. rows up-and-down hill (Actual row grade: 2.0%)
- Strips/barriers: (none)
- Diversion/terrace, sediment basin: (none)
- Subsurface drainage: (none)

## **6. RUSLE2 SOFTWARE DETAILS**

- Program version: Mar 27, 2017
- Database name: MOSES 2016
- Profile file name: profiles\Nordic Aquafarms

## **III. RUSLE2 Profile Output & Definitions**

### **1. SURFACE RESIDUE COVER ESTIMATES:**

Long-term average predicted surface residue cover after each field operation:

<i>Date</i>	<i>Operation</i>	<i>Vegetation</i>	<i>Surf. res. cov. after op, %</i>
4/15/19	No operation		0

One way to verify whether RUSLE2 is properly modeling a situation is to check these long-term average surface residue results. An unexpectedly high or low surface residue cover value after a particular operation indicates that the choice of operation or some other input in the calculation (such as vegetation or yield) should be reviewed.

RUSLE2 counts as surface residue **only** material lying flat on the soil surface (automatically adjusted for overlap). RUSLE2 does **not** count the following as surface residue cover: (a) above-ground or standing material (including live canopy cover and standing dead residue) or (b) buried material (including live roots and dead plant residue). RUSLE2 does account for the erosion control value of standing and buried material when calculating soil loss.

Therefore, these surface residue numbers are most useful for analyzing annual cropping systems in which field operations routinely bury and/or flatten most residue and in which surface residue plays a leading role in erosion prevention. When analyzing results for cropping systems involving perennials and/or no-till planting into large amounts of standing residue (such as a chemically killed cover crop), also consult RUSLE2 canopy cover estimates (available in the VA Basic User Template 2007 Profile Screen).

## **2. SOIL LOSS ESTIMATES:**

- Soil loss for conservation planning:
  - Soil loss for cons. plan: 5.8 t/ac/yr.
  - T value: 5.0 t/ac/yr.

Estimate of average annual rainfall-induced soil loss (detachment of soil particles & transport downhill) over the length of the modeled slope. It is critical to understand that this value represents a long-term (20- to 30-year) average, not a prediction of actual soil loss in any single year. This is the number to use for conservation planning and to compare with the field's "T" soil loss tolerance value. This number is a measure of the likelihood of degradation by erosion of the soil resource in upslope (steeper) areas of the field. Very little credit is given for any sediment deposition that may occur towards the bottom of the modeled slope (for example, due to an end-of-slope filter strip), because upslope areas are still being degraded.

- Sediment Delivery:
  - Sediment delivery: 5.77 t/ac/yr.

Estimate of the amount of sediment delivered by runoff to the end of the modeled slope. This is RUSLE2's best estimate of long-term average "edge of field" soil loss. Full credit is given for any sediment deposition that occurs anywhere on the modeled slope due to reductions in slope grade, filter strips, terraces, etc. This number is not used for conservation planning but may be used for other environmental applications (e.g., P-Index). In many cases, RUSLE2 users will model slopes as uniform with no structural practices, vegetative features (filter strips), or breaks in topography that result in sediment deposition. In this typical situation, results for sediment delivery and soil loss for conservation planning will be identical.

## **3. SOIL QUALITY SCORES:**

- Soil Conditioning Index:
  - Soil conditioning index (SCI): -0.3

Soil organic matter (SOM) or soil carbon (C) trend score. If SCI is negative (less than zero), SOM and soil C and soil quality are predicted to decline over time on the modeled slope under the modeled management system. If SCI is positive (greater than zero), SOM and soil C and soil quality are predicted to stay the same or to increase over time. SCI scores usually range from -1 to +1 in typical VA situations, although more extreme values are possible. SCI is an index score (no units) designed solely for comparing the relative impact of different management alternatives on long-term soil quality trends. When calculating SCI, RUSLE2 considers three key factors: (1) amount of surface and subsurface biomass returned to the soil; (2) tillage-induced oxidation of soil carbon; and (3) predicted sheet & rill erosion. Climate and soil type inputs are also considered due to the influence of these factors on soil C oxidation trends.

- Soil Tillage Intensity Rating (STIR):

- Avg. annual slope STIR: 0 (averaged across all years in the rotation)

- STIR value for each individual crop (or vegetation record) in the rotation:

<i>Veg.</i>	<i>STIR value</i>	<i>Start date</i>	<i>End date, m/d/y</i>

Measure of intensity of tillage or soil disturbance. STIR is an index (no units) designed solely for comparing the relative impact of different management alternatives on soil disturbance. STIR increases with increasing tillage and can range from 0 to 200+. Average annual STIR values reflect the total amount of soil disturbance that occurs during the overall rotation, averaged across the number of years in the rotation. STIR values can also be calculated for individual crops. The STIR for an individual crop represents the sum of all soil disturbance associated with establishing and harvesting that crop. Both types of STIR values are shown above. STIR values in the 5 to 20 range are typical of no-till crops and/or continuous no-till or low soil disturbance cropping systems. In long rotations with a mix of tilled and no-till and/or perennial crops, the average annual STIR for the overall rotation may be relatively low even if significant tillage occurs in individual years and STIR values for one or more crops in the rotation are relatively high.

## **ATTACHMENT C**

**Sample Erosion Control Compliance Certification and Inspection  
Forms**

## CONTRACTOR/SUBCONTRACTOR CERTIFICATION

### PROJECT INFORMATION

Project Name:

Address:

### CONTRACTOR/SUBCONTRACTOR INFORMATION

Firm Name:

Address:

Telephone:

Type of Firm:

### CERTIFICATION STATEMENT

"I certify under penalty of law that I understand the terms and conditions of the Maine Construction General Permit (MCGP) permit that authorizes the stormwater discharges associated with construction activity from the project site identified as part of this certification."

---

Signature

---

Typed Name

---

Title

---

Date

# Soil Erosion and Sedimentation Control WEEKLY INSPECTION REPORT

Sheet \_\_\_ of \_\_\_

Project Name: \_\_\_\_\_  
File No. \_\_\_\_\_

Inspection Date: \_\_\_\_\_ Time: \_\_\_\_\_ Inspected by: \_\_\_\_\_

### STAGE OF CONSTRUCTION

___ Pre-Construction Conference	___ Rough Grading	___ Finish Grading
___ Clearing and Grubbing	___ Building Construction	___ Final Stabilization

### INSPECTION CHECKLIST

**Yes No NA**

- |                          |                          |                          |   |
|--------------------------|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Have Soil Erosion and Sediment Control BMPs been installed in accordance with the plans and/or specifications?      |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are SESC measures operating effectively?  |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Have all SESC control repairs and sediment removal been performed?  |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are properties and waterways downstream from development adequately protected from erosion and sediment deposition? |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are soil and mud kept off public roadways at intersections with site access roads?                                  |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Have all exposed areas requiring temporary or permanent stabilization been stabilized?                              |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are soil stock piles adequately stabilized with seeding and/or sediment trapping measures?                          |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Is there evidence of scouring velocities in runoff from construction areas?   |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are sediment basins installed and operating where needed?   |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are finished cut and fill slopes adequately stabilized?   |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are on-site channels, inlets and outlets adequately stabilized?   |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Do all operational storm sewer inlets have adequate inlet protection?   |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are storm water conveyance channels adequately stabilized with channel lining and/or outlet protection?             |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Are utility trenches stabilized properly?   |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Is there evidence of siltation, or sediment transport in receiving waterways?                                       |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Have all temporary control structures that are no longer needed been removed?                                       |

Report Date \_\_\_\_\_

Sheet      of     

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Verbal/Written notification given to:

<b>Name</b>	<b>Organisation</b>	<b>Email Address</b>	<b>Sent</b>
Andrew Johnston	ARC	<a href="mailto:andyj@arc-maine.com">andyj@arc-maine.com</a>	
	NAF		
	Maine DEP		
	City of Belfast		

Report by: \_\_\_\_\_ Date: \_\_\_\_\_

# POST-RAINFALL INSPECTION REPORT

Sheet \_\_\_ of \_\_\_

Project Name: \_\_\_\_\_

File No. \_\_\_\_\_

Inspection Date: \_\_\_\_\_ Time: \_\_\_\_\_ Inspected by: \_\_\_\_\_

Total Rainfall Received: \_\_\_\_\_ Duration Of Storm Event: \_\_\_\_\_

### STAGE OF CONSTRUCTION

Pre-Construction Conference       Rough Grading       Finish Grading  
 Clearing and Grubbing       Building Construction       Final Stabilization

### INSPECTION CHECKLIST

**Yes No NA**

- Have Soil Erosion and Sediment Control BMPs been installed in accordance with the plans and/or specifications?
- Are SESC measures operating effectively?
- Have all SESC control repairs and sediment removal been performed?
- Are properties and waterways downstream from development adequately protected from erosion and sediment deposition
- Are soil and mud kept off public roadways at intersections with site access roads?
- Have all exposed areas requiring temporary or permanent stabilization been stabilized?
- Are soil stock piles adequately stabilized with seeding and/or sediment trapping measures?
- Is there evidence of scouring velocities in runoff from construction areas?
- Are sediment basins installed and operating where needed?
- Are finished cut and fill slopes adequately stabilized?
- Are on-site channels, inlets and outlets adequately stabilized?
- Do all operational storm sewer inlets have adequate inlet protection?
- Are storm water conveyance channels adequately stabilized with channel lining and/or outlet protection?
- Are utility trenches stabilized properly?
- Is there evidence of siltation, or sediment transport in receiving waterways?
- Have all temporary control structures that are no longer needed been removed?

Report Date \_\_\_\_\_

Sheet \_\_\_\_ of \_\_\_\_

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Verbal/Written notification given to:

Name	Organisation	Email Address	Sent
Andrew Johnston	ARC	<a href="mailto:andyj@arc-maine.com">andyj@arc-maine.com</a>	
	NAF		
	Maine DEP		
	City of Belfast		

Report by: \_\_\_\_\_ Date: \_\_\_\_\_