August 30, 2016

Amanda Lessard, Planner
Town of Windham
8 School Road
Windham, Maine 04062

Landing Real Estate Office, 79 Tandberg Trail
Response to Peer Review Comments

Dear Amanda:

Our office has received the review comments for the Landing Real Estate Office project from Will Haskell, P.E. of Gorrill-Palmer Engineers, dated August 24, 2016, and we have prepared the following responses. For clarity, each comment is provided below in italics, followed by our response.

Application

1. *The stormwater report indicates that there will be insignificant increases in peak flows at study points SP1 and SP2. Per the Ordinance Section 812.E, a waiver request shall be submitted with documentation to satisfy the waiver criteria, as noted in Section 812.E.1.a.1.*

   A formal waiver request for insignificant increases in peak flow rates from the project site, including information to satisfy the waiver criteria in Section 812.E.1.a.1 is provided in a Revised Stormwater Management Report, attached to this response letter.

2. *The project site is located in the NPDES MS4 area and will be subject to the Post-Construction Stormwater Ordinance (Chapter 144).*

   A site specific Inspection & Maintenance Manual has been developed for the proposed Stormwater Management System and is included in the Revised Stormwater Management Report.

3. *The project is subject to the Commercial District Design Guidelines. A narrative should be submitted showing how those guidelines are met.*

   A narrative describing how the project meets the Commercial District Design Guidelines is attached.

Plans

Sheet C-3.0

4. *The southwest corner of the proposed building appears to be very close to the building setback. Confirm that the building foundation/footing and the eaves will not extend over the building setback.*

   The building will meet all setback requirements.

Sheet C-4.0

5. *Based on discussions with the Public Works Director, our understanding is that private drainage from an enclosed drainage system cannot be connected to the public storm drain system, therefore, CB2 shall not be connected to the relocated CB1. This will require that the stormwater management design for this project be revisited.*

   Proposed catch basin CB2 has been eliminated. See the response to comment #7 for more information on the redesigned infiltration basin.

6. *Plans indicate to relocate and reset an existing Type F Basin (CB1) along Tandberg Trail. Based on a site visit, the condition of this existing CB appears to be in reasonably good condition and appears to have a plugged inlet pipe hole on the property side. If the basin is damaged during the relocation process, it would need to be replaced.*

   Noted.

7. *Proposed CB2 is located in the road right-of-way. We recommend this be relocated outside the right-of-way. The current design of the stormwater infiltration basin allows stormwater to pond into the road right-of-way. The basin should be redesigned to keep the ponded water completely on the property.*

   Proposed catch basin CB2 has been eliminated, and the infiltration basin has been revised to keep ponding water completely on the project site. The depth of the infiltration basin has been increased by one foot in order to increase its capacity. The basin will now retain and infiltrate all runoff from the 25-year design storm event. A grass spillway has been designed on the north side of the basin to convey runoff toward Tandberg Trail and the relocated catch basin CB1 in the event of a storm greater than the 25-year design storm or if the basin were to become clogged.

8. *The proposed water service, if necessary, will require excavation in Tandberg Trail and will require inspection of the trench restoration by the Town Engineer.*

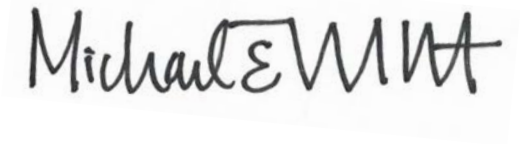
   Noted.

9. *While this is considered a minor site plan and technically does not require stormwater quality treatment, a stormwater buffer has been proposed along the rear property line. It appears that this buffer is important in achieving stormwater quantity reductions for the project, therefore, we recommend that the proposed stormwater buffer be permanently marked as recommended in the Maine DEP buffer standards. A note to this effect should be added to the plans. In addition, a note should be added to the plan that no changes to the buffer are allowed without approval of the Planning Board.*

   The suggested notes have been added to the revised Site Layout Plan (Sheet C-3.0).

We believe that the information provided above and on the attached plans and supporting materials adequately addresses all of the comments received. Please contact me if you have any additional questions or comments.

Sincerely,
TERRADYN CONSULTANTS LLC



Michael E. Tadema-Wielandt, P.E.
Vice President

Enc.

cc. Jarod Robie

COMMERCIAL DISTRICT DESIGN STANDARDS

Landing Real Estate Office
79 Tandberg Trail, Windham, Maine
Zoning District: C-1

A. ARCHITECTURE/BUILDING

1. Building Style
   The proposed project is not a national franchise prototype.

2. Materials
   Traditional siding materials common to northern New England will be used on the proposed building. The siding will be a combination of clapboard and shingles. No awnings are proposed.

3. Color
   The building will be painted a traditional New England color, and will not be high intensity, high reflectance, chrome, metallic, or fluorescent.

4. Roofline
   The proposed building will feature several rooflines with varying pitch. The minimum roof pitch will be 5.5:12. The roofing material will be 30-year architectural asphalt shingles. No mechanical equipment will be located on the roof.

5. Façade
   The building façade was designed to create the look of a traditional New England home. The first floor facing Tandberg Trail will feature a covered porch and residential scale windows trimmed to match the residential style.

6. Building Style Coordination
   This standard is not applicable. The project will only feature one building.

7. Entrance
   The primary building entrance, located at the front of the building, will be highly visible and accessed from the front porch. A second entrance at the back of the building will be located on the southeast corner of the building.

8. Architectural Details
   The building will feature traditional New England architectural details designed to be proportional to the scale and design of the building.

B. SITE/PARKING

5. Screening – parking **(OPTIONAL)**
   Evergreen buffers are proposed on the east and west sides of the site, where the project abuts residential development. The plantings are intended to provide attractive year round buffering from both sides.

6. Screening – utilities & service areas / structures
   The proposed dumpster will be entirely screened with a 7' high architectural fence enclosure. The fence gates will feature bracing to prevent sagging. A detail of the enclosure is provided on the design drawings.

7. Parking Lot Landscaping **(OPTIONAL)**
   The proposed parking areas are small and include landscaping at the end of each row of spaces. No more than 5 contiguous spaces are grouped without landscaping. Proposed trees will provide shade without blocking visibility, and plantings around the perimeter of the parking area are tolerant of snow and salt.

8. Low-Impact Design Stormwater **(OPTIONAL)**
   Low impact development strategies are proposed on the site, including an infiltration area at the north end of the site, a vegetated buffer at the south end of the site, and a drip edge infiltration strip along the west side of the building. Drainage patterns will remain similar to the pre-development condition, and an emphasis is placed on using smaller, localized stormwater management practices to infiltrate runoff into the ground.

C. Landscaping / Lighting

1. Lighting/Photometric Plan
   Site lighting will be provided by three building mounted fixtures in locations shown on the Site Layout Plan (Sheet C-3.0). Additionally, four recessed lights will be installed in the porch ceiling at the front of the building. Catalog cut sheets of the proposed wall packs are provided in Attachment H of the Site Plan Application.

2. Lighting coordinated with architecture
   Site lighting was chosen to enhance the building architecture, and will not create glare or distraction. No neon bulbs will be used.

3. Lighting coordinated with landscaping
   Proposed site lighting fixtures and trees were located so that lighting will not be affected as the trees reach their mature size.

4. Existing Trees Preserved **(Optional)**
   Existing vegetation will be preserved to the greatest extent possible. Trees and shrubs at the south end of the site will be preserved and will be used as a vegetated buffer for stormwater runoff.

5. Snow storage designated
   Snow will be pushed to the perimeter of the site in the locations identified on the Site Layout Plan (Sheet C-3.0). Snow will not be stored in the infiltration basin or the vegetated buffer.

6. Planting variety **(Optional)**
   An effort was made to use plants that exhibit seasonal color and interesting texture, including Red Maples, which features red buds in winter, flowers in spring, leafstalks in summer, and foliage in autumn. Birdsnest Spruce, and evergreen shrub will also be used along the back of the building to separate the building from the parking area.

7. Planting suitability **(Optional)**
   The proposed plantings are low maintenance and resistant to insects, drought, disease and are tolerant to salt. All proposed plant species are proven to be hardy enough to tolerate the proposed conditions in Maine.

8. Mass Plantings **(Optional)**
   A mass of evergreen shrubs will be planted along the back of the building as a foundation planting.

9. Illumination Levels **(Optional)**
   The relatively small scale of the proposed development allows site lighting to be accomplished exclusively with building mounted light fixtures. Fixtures will be lower than the recommended 20’ – 30’ height.

D. Bike/Ped

1. Internal walkways
   This standard is not applicable because no public sidewalk exists on the south side of Tandberg Trail.

2. Links to community
   Properties immediately adjacent to the project site are residential. Internal pedestrian connections to these properties are not appropriate.

4. Sidewalks
   The applicant will pay the North Windham Sidewalk Impact Fee in accordance with Section 1200 of the Windham Land Use Ordinance.

5. Crosswalks
   No crosswalks are required or proposed on the site. Sidewalks do not cross commercial driveways or roads.

6. Bike parking/racks
   A bollard style bicycle rack for two bikes is located at the northwest corner of the building.

LANDING REAL ESTATE OFFICE
79 TANDBERG TRAIL
WINDHAM, MAINE

STORMWATER MANAGEMENT REPORT

PREPARED FOR:

ROBIE BUILDERS
742 ROOSEVELT TRAIL
WINDHAM, MAINE 04062

PREPARED BY:

TERRADYN CONSULTANTS LLC
PO BOX 339
NEW GLOUCESTER, MAINE 04260

AUGUST 2016
REVISED 8-30-2016

INTRODUCTION

Terradyn Consultants LLC has been retained by Robie Builders to assist with site design and permit applications for a proposed two story commercial building at 79 Tandberg Trail in Windham, Maine.

The project is required to meet the stormwater management standards of Section 812(E) of the Town of Windham Land Use Ordinance. The standards require that peak flow rates for stormwater discharges be limited to pre-development levels for the 2-year, 10-year, and 25-year design storm events.

The proposed project includes construction of a two story, 1,290 square foot (footprint) commercial office building with associated parking, sidewalks, and utility infrastructure. The project will result in approximately 14,806 square feet of developed area and 9,689 square feet of impervious area. This report analyzes the effect that the proposed project is expected to have on adjacent and downstream properties and waterways.

EXISTING PROJECT SITE

The project site is 0.35 acres in size and is located on the southeast side of Tandberg Trail (Rt. 115), approximately 600 feet east of Route 302. The site is located within the Commercial-1 (C-1) zoning district and is currently owned by Jack and Rose, LLC, who has hired Robie Builders to develop the proposed project on its behalf.

The site is currently comprised of meadow grasses with several individual trees on the east and west property boundaries. Residential homes abut the site to the east and west, and the parcel to the south is undeveloped forest. Commercial uses, including a veterinary hospital, are located across Tandberg Trail from the site. Based on historic aerial photography, it appears that a single family house previously existed on the site but was removed sometime between 2006 and 2010. The site is relatively flat, sloping gently from north to south at 1% - 2%. Stormwater runoff generally drains off the site at the southeastern property boundary via surface flow. Runoff is believed to be tributary to the Presumpscot River.

No unique natural areas, including floodplains, deer wintering areas, significant fisheries and wildlife habitats, scenic areas, habitat for rare and endangered plants and animals, and historic and archeological resources, are known to exist on the site. The site is located on a significant sand and gravel aquifer, mapped by the Maine Geological Survey.

Existing utilities in the vicinity of the project include a 12” water main on the north side of Tandberg Trail, a shallow storm drain network in Tandberg Trail, and overhead electric and telecommunications lines. Because the site was previously developed, existing surficial soils may not be native. The Natural Resource Conservation Commission (NRCS) classifies onsite soils as Loamy Sand. Test pits performed on the site confirm the existence of approximately 12” of sandy loam over sand and gravel. Evidence of groundwater was not found within 48” of the ground surface, which was the limit of the test pits.

Existing conditions figures with the project site identified are provided in Attachment C of the Site Plan Application, including a USGS map, aerial photo, NRCS Medium Intensity Soils map, and Abutters map.

PROPOSED PROJECT

The proposed project includes construction of a two story, 1,290 square foot (footprint) commercial office building with associated parking, sidewalks, and utility infrastructure. The site will feature eleven total parking spaces, including three spaces in front of the building and eight behind. The site driveway, which will provide access to both parking areas, will be located on the east side of the site.

The project will result in approximately 14,806 square feet of developed area and 9,689 square feet of impervious area.

Stormwater runoff will generally split at the center of the proposed building. Runoff north of the building will flow north, toward Tandberg Trail, to an infiltration basin that will be located north of the parking area. Runoff south of the building will flow south to a forested buffer, generally following pre-development runoff patterns.

METHODOLOGY OF ANALYSIS – STORMWATER QUANTITY

A hydrologic analysis of pre-development and post-development conditions has been conducted based upon the methodology contained in the USDA Soil Conservation Service's Technical Releases No. 20 and 55 (SCS TR-20 and TR-55). For Cumberland County, Maine, a 24-hour SCS Type III storm distribution was used for the analysis using the following storm frequencies and rainfall amounts, per Maine DEP Chapter 500:

Storm Event	24-Hour Rainfall
2–Year Storm	3.1 inches
10–Year Storm	4.6 inches
25–Year Storm	5.8 inches

Land use, cover, delineation of watershed subcatchments, hydraulic flow paths, and hydrologic soil group (HSG) types were obtained using the following data:

1. North Windham, Maine USGS 7.5 minute quadrangle map.

2. NRCS Medium Intensity Soils Survey.

3. Orthoimagery, GeoLibrary 6in 2012, from Maine Office of GIS

4. Existing conditions topographic survey, provided by Wayne T. Wood & Co. of Gray, Maine

5. Field reconnaissance by Terradyn Consultants.

Runoff curve numbers, time of concentration, and travel time data were established based on methods outlined in the USDA TR-55 manual.

PRE-DEVELOPMENT CONDITIONS

In the pre-development condition, three subcatchments, tributary to three Study Points were identified to study the effect of the proposed development on the peak rates of runoff from the site. Study Point SP1 represents the southern property boundary, where runoff leaves the site via overland flow.

Study Point SP2 represents the northern site boundary, adjacent to Tandberg Trail. Subcatchment 2 is tributary to SP2. Runoff tributary to SP2 eventually enters the storm drain network within Tandberg Trial via an existing catch basin located adjacent to the site.

Study Point SP3 represents the eastern site boundary. Runoff from subcatchment 3 is tributary to SP3.

The following is a summary of the characteristics of the pre-development subcatchments.

Pre-Development Conditions			
Subarea	**Area (s.f.)**	**CN**	**Time of Concentration (minutes)**
1	12,794	30	15.2
2	2,950	30	14.5
3	1,008	30	5.0

A Pre-development Watershed Map, showing sub-watershed boundaries, time of concentration flow paths, and Study Points, is provided in Appendix A. The Pre-development HydroCAD model is attached in Appendix B.

Peak rates of runoff at the Study Points, computed for the existing condition are as follows:

Pre-Development Peak Rates of Runoff (cfs)			
Study Point	**2-Year**	**10-Year**	**25-Year**
SP1	0.0	0.0	0.0
SP2	0.0	0.0	0.0
SP3	0.0	0.0	0.0

In the pre-development condition, the model predicts that no runoff will leave the site. These pre-development peak rates of runoff are a baseline used for comparison to post-development rates.

POST-DEVELOPMENT CONDITIONS

The proposed post-development condition includes the construction of the building, driveway, parking, and lawn areas. An infiltration basin will also be constructed at the north end of the site to provide stormwater treatment as well as peak flow attenuation at Study Point SP2. The project is expected to result in an increase in impervious area of approximately 9,689 sq. ft. Five post-development subcatchments tributary to four Study Points were identified and defined in the post-development hydrologic model.

Subcatchment 10 includes the southern half of the building roof and the area south of the building. Runoff will sheet flow into a stormwater buffer located off the southern edge of the parking area, prior to reaching Study Point SP1.

Subcatchment 20 includes the northern half of the building roof and the area north of the building. Runoff from subcatchment 20 will flow to the proposed infiltration basin located at the north end of the site. Runoff that exceeds the capacity of the infiltration basin will flow to Study Point SP2 and the storm drain network in Tandberg Trial.

Subcatchment 30 contains a small lawn area east of the site driveway. Runoff from subcatchment 30 will flow overland across the eastern property boundary, represented by Study Point SP3.

Subcatchment 40 contains a small lawn area west of the building and parking areas. Runoff from subcatchment 40 will flow overland across the western property boundary, represented by Study Point SP4.

Subcatchment 50 includes a portion of the site driveway, adjacent to Tandberg Trail. Because of flat nature of the site, runoff from this area is difficult to capture and direct to the infiltration basin or another BMP, and will flow directly onto Tandberg Trail, where it will enter the storm drain network.

The following is a summary of the characteristics of the post-development subareas described above.

Post-Development Conditions			
Subarea	**Area (s.f.)**	**CN**	**Time of Concentration (minutes)**
10	7,264	74	15.2
20	5,975	79	5.0
30	1,207	39	5.0
40	786	39	5.0
50	1,510	81	5.0

A Post-development Watershed Map, showing sub-watershed boundaries, time of concentration flow paths, and Study Points, is provided in Appendix A. The Post-development HydroCAD model is attached in Appendix C.

Peak rates of runoff at the Study Points, computed for the proposed condition are as follows:

Post-Development Peak Rates of Runoff (cfs)			
	2-Year	**10-Year**	**25-Year**
SP1	0.1	0.3	0.4
SP2	0.1	0.1	0.2
SP3	0.0	0.0	0.0
SP4	0.0	0.0	0.0

STORMWATER PEAK FLOW RATE ANALYSIS

The results of the pre-development and post-development models were analyzed at the defined Points of Interest described above. The direct comparison of the pre-development and post-development conditions at the Study Points are as follows:

Peak Runoff Flow Rates Comparison								
Storm Event	**Study Point SP1**		**Study Point SP2**		**Study Point SP3**		**Study Point SP4**	
	Pre-Dev. Peak Rate (cfs)	**Post-Dev. Peak Rate (cfs)**	**Pre-Dev. Peak Rate (cfs)**	**Post-Dev. Peak Rate (cfs)**	**Pre-Dev. Peak Rate (cfs)**	**Post-Dev. Peak Rate (cfs)**	**Pre-Dev. Peak Rate (cfs)**	**Post-Dev. Peak Rate (cfs)**
2-Year	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
10-Year	0.0	0.3	0.0	0.1	0.0	0.0	0.0	0.0
25-Year	0.0	0.4	0.0	0.2	0.0	0.0	0.0	0.0

According to the models, no runoff will leave the site at Study Points SP3 and SP4 in the design storm events. At SP1 and SP2, small increases in peak rates of runoff compared to existing rates are expected as a result of the proposed project. The predicted increases in peak flow rates are insignificant, and the applicant requests a waiver from the Approval Criteria in the Windham Land Use Ordinance for insignificant increases in peak flow rates. More information is provided below.

WAIVER REQUEST

Insignificant increases in peak flow rates are predicted at study points SP1 and SP2 as a result of the project. The applicant requests a waiver from the Approval Criteria in the Windham Land Use Ordinance for insignificant increases in peak flow rates.

SP1

At SP1, which represents the site's southern boundary, increases of 0.1, 0.3, and 0.4 cfs are predicted in the 2-year, 10-year, and 25-year design storm events, respectively. Stormwater detention in the southern portion of the site is not feasible. The site is flat in this area and does not feature enough elevation change to provide an outlet for a traditional detention structure.

Further, it is believed that a wooded buffer between the proposed development and the southern property boundary is more desirable and will be easier to maintain than clearing the existing vegetation in order to build a structural flow control BMP.

The downstream property currently consists of undeveloped woodland owned by RSU-14. The run-on to the abutting property at SP2 is expected to infiltrate into the sandy soils, and will have no impact on downstream flow controls or conveyance structures.

SP2

At SP2, which represents the site's northern boundary, increases of 0.1, 0.1, and 0.2 cfs are predicted in the 2-year, 10-year, and 25-year design storm events, respectively. Runoff tributary to SP2 comes from Subcatchment 50, which includes a portion of the proposed site driveway. Because of flat nature of the site, runoff from this area is difficult to capture and direct to the infiltration basin or another BMP. No changes in the project layout or density would change this. Runoff at SP2 will enter the public storm drain network via a catch basin located in Tandberg Trail. Our office is not aware of existing capacity constraints within the storm drain network. The low peak flow rates (0.1-0.2 cfs) are expected to have no impact on downstream flow controls or conveyance structures.

WATER QUALITY PROVISIONS

The project is not required to meet stormwater quality standards. However, the proposed infiltration basin, roof dripline filter, and stormwater buffer will provide treatment in accordance with Maine Department of Environmental Protection (MDEP) standards for Subcatchments 10 and 20. All three BMPs were designed in accordance with the MDEP BMP Technical Design Manual. Design calculations are provided in Appendix D.

INSPECTION & MAINTENANCE OF FACILITIES

Regular inspection and maintenance of the entire stormwater management system is crucial to the long term effectiveness of the system. To this end, a stormwater management Inspection & Maintenance Plan has been developed for the site and is provided in Appendix E.

EROSION & SEDIMENTATION CONTROL

A site specific Erosion & Sedimentation Control Plan has been developed for the project. Means and methods to control erosion and sedimentation during and after construction are detailed in the erosion control plan, narrative, and construction details, which are included directly on the project drawings for ease of reference during construction.

CONCLUSIONS

With the implementation of the stormwater measures described above and detailed on the project drawings the proposed project is not expected to have a detrimental effect on downstream properties or waterbodies.

APPENDICES

A – Pre and Post-Development Watershed Maps
B – Pre-development HydroCAD Model
C – Post-development HydroCAD Model
D – BMP Design Calculations
E – Inspection & Maintenance Plan

APPENDIX A

Pre & Post-Development Watershed Maps

WATERSHED LEGEND

WATERSHED BOUNDARY

Tc FLOWPATH A B

SUBCATCHMENT 5

POND 3

REACH 1

GRID NORTH

(18,023/237)
Aaron S. Bennett
N/F

(30,002/222)
Unit No. 14 Regional
School
N/F

(16,593/239)
David H. Sawyer
N/F

SP1

SP2

SP3

1

2

3

A

B

C

D

Area:
0.35 acres
15,370 sq.ft.

SF
L=62'
S=0.005

SCF
L=80'
S=0.005

SCF
L=45'
S=0.005

GRAPHIC SCALE

10 0 5 10 20 40

(IN FEET)
1 inch =10 ft.

PRELIMINARY - NOT FOR CONSTRUCTION

STATE OF MAINE
MICHAEL E. TADEMA-WIELANDT
No. 11967
REGISTERED PROFESSIONAL ENGINEER

P.E.: MICHAEL E. TADEMA-WIELANDT

NO.	DATE	REVISIONS	APPD BY
1	8-10-16	SUBMITTED TO TOWN OF WINDHAM FOR SITE PLAN APPROVAL	MTW

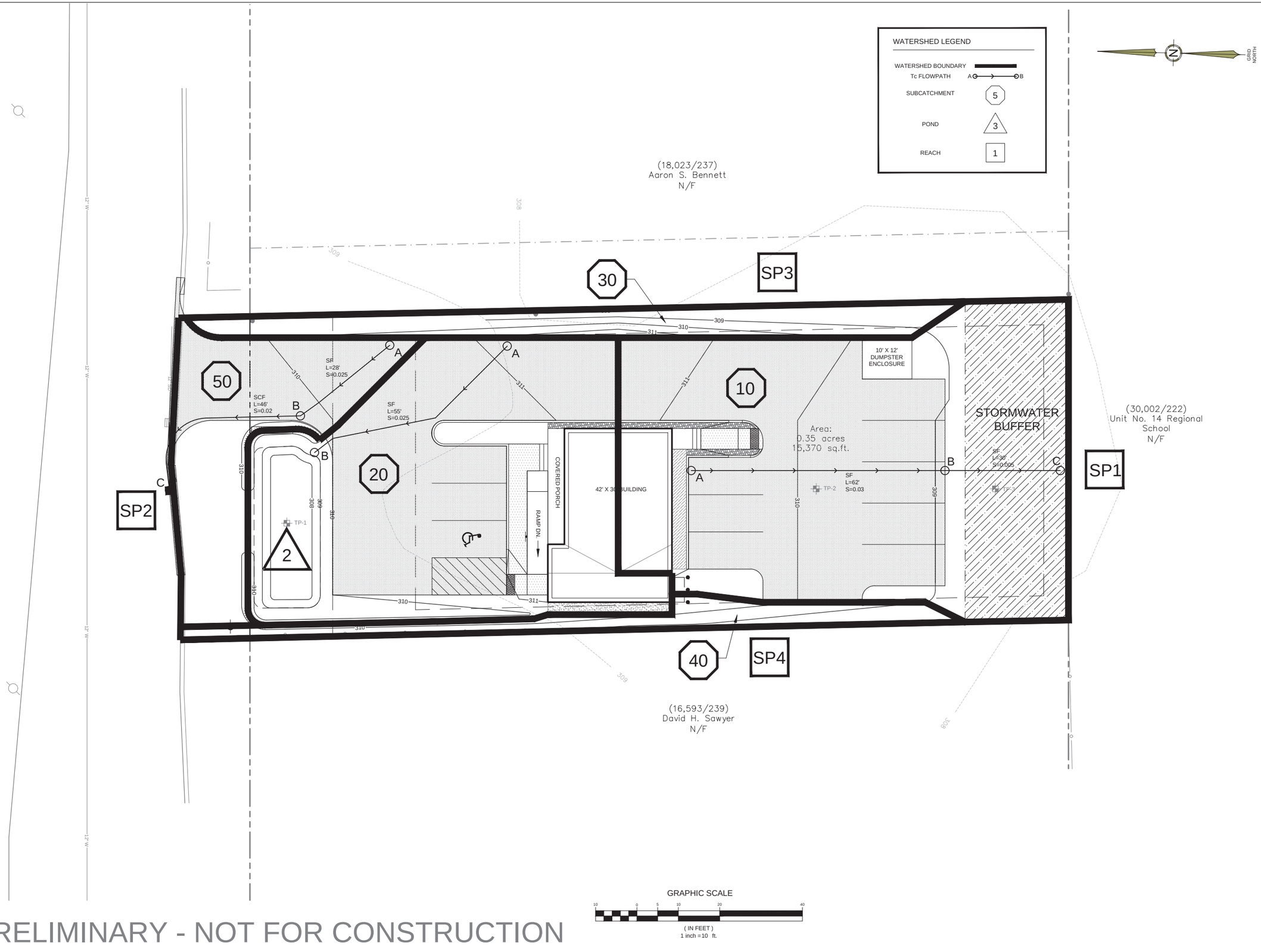
TERRADYN CONSULTANTS, LLC
P.O. Box 339
111 Elderberry Lane
New Gloucester, ME 04260
Office: (207) 926-5111
Fax: (207) 221-1317
www.terradynconsultants.com

Civil Engineering - Land Planning - Stormwater Design - Environmental Permitting

SHEET DESCRIPTION
LANDING REAL ESTATE OFFICE
79 TANDBERG TRAIL, WINDHAM, MAINE
PRE-DEVELOPMENT WATERSHED PLAN

PREPARED FOR
ROBIE BUILDERS
472 ROOSEVELT TRAIL
WINDHAM, MAINE 04062

DATE:	3-3-2016
SCALE:	1"=10'
DESIGNED:	MTW
JOB NO:	1565
FILE: 1607-WATERSHED.DWG	
SHEET	WS-1



PRELIMINARY - NOT FOR CONSTRUCTION

STATE OF MAINE
MICHAEL E. TADEMA-WIELANDT
No. 11587
REGISTERED PROFESSIONAL ENGINEER

P.E.: MICHAEL E. TADEMA-WIELANDT

NO.	DATE	REVISIONS	APPD BY
2	8-30-16	REVISED PER PEER REVIEW COMMENTS	MTW
1	8-10-16	SUBMITTED TO TOWN OF WINDHAM FOR SITE PLAN APPROVAL	MTW

Permitting

TERRADYN CONSULTANTS, LLC
Civil Engineering - Land Planning - Stormwater Design - Environmental Permitting
P.O. Box 339
111 Elderberry Lane
New Gloucester, ME 04260
Office: (207) 926-5111
Fax: (207) 221-1317
www.terradynconsultants.com

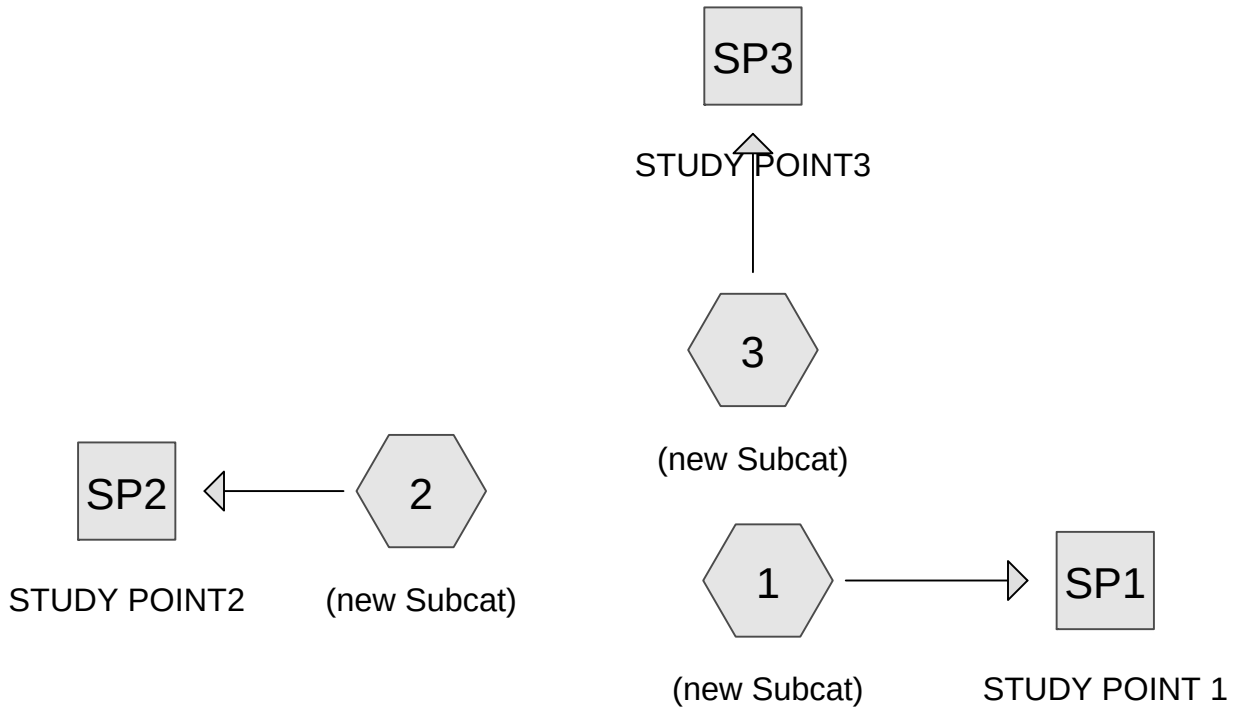
SHEET DESCRIPTION
LANDING REAL ESTATE OFFICE
79 TANDBERG TRAIL, WINDHAM, MAINE
POST-DEVELOPMENT WATERSHED PLAN

PREPARED FOR
ROBIE BUILDERS
472 ROOSEVELT TRAIL
WINDHAM, MAINE 04062

DATE:	3-3-2016
SCALE:	1"=10'
DESIGNED:	MTW
JOB NO:	1565
FILE:	1607-WATERSHED.DWG
SHEET	WS-2

APPENDIX B

Predevelopment Runoff Calculations



Subcat Reach Pond Link

Drainage Diagram for 1607-PRE
Prepared by Terradyn Consultants, Printed 8/12/2016

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: (new Subcat) Runoff Area=12,794 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=187' Slope=0.0050 '/' Tc=15.2 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 2: (new Subcat) Runoff Area=2,950 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=50' Slope=0.0050 '/' Tc=14.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 3: (new Subcat) Runoff Area=1,008 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=10' Slope=0.0050 '/' Tc=5.0 min CN=30 Runoff=0.00 cfs 0.000 af

Reach SP1: STUDY POINT 1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP2: STUDY POINT2 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP3: STUDY POINT3 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 1: (new Subcat)

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
3,024	30	Woods, Good, HSG A
9,770	30	Brush, Good, HSG A
12,794	30	Weighted Average
12,794		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	62	0.0050	0.09		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
1.3	80	0.0050	1.06		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
2.1	45	0.0050	0.35		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
15.2	187	Total			

Summary for Subcatchment 2: (new Subcat)

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
2,950	30	Brush, Good, HSG A
2,950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	50	0.0050	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"

Summary for Subcatchment 3: (new Subcat)

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
1,008	30	Brush, Good, HSG A
1,008		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	10	0.0050	0.04		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
1.0					**Direct Entry, 5 MINUTE MINIMUM TC**
5.0	10	Total			

Summary for Reach SP1: STUDY POINT 1

Inflow Area = 0.294 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP2: STUDY POINT2

Inflow Area = 0.068 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP3: STUDY POINT3

Inflow Area = 0.023 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: (new Subcat) Runoff Area=12,794 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=187' Slope=0.0050 '/' Tc=15.2 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 2: (new Subcat) Runoff Area=2,950 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=50' Slope=0.0050 '/' Tc=14.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 3: (new Subcat) Runoff Area=1,008 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=10' Slope=0.0050 '/' Tc=5.0 min CN=30 Runoff=0.00 cfs 0.000 af

Reach SP1: STUDY POINT 1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP2: STUDY POINT2 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP3: STUDY POINT3 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 1: (new Subcat)

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
3,024	30	Woods, Good, HSG A
9,770	30	Brush, Good, HSG A
12,794	30	Weighted Average
12,794		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	62	0.0050	0.09		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
1.3	80	0.0050	1.06		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
2.1	45	0.0050	0.35		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
15.2	187	Total			

Summary for Subcatchment 2: (new Subcat)

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
2,950	30	Brush, Good, HSG A
2,950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	50	0.0050	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"

Summary for Subcatchment 3: (new Subcat)

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
1,008	30	Brush, Good, HSG A
1,008		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	10	0.0050	0.04		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
1.0					**Direct Entry, 5 MINUTE MINIMUM TC**
5.0	10	Total			

Summary for Reach SP1: STUDY POINT 1

Inflow Area = 0.294 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-YR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP2: STUDY POINT2

Inflow Area = 0.068 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-YR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP3: STUDY POINT3

Inflow Area = 0.023 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-YR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: (new Subcat) Runoff Area=12,794 sf 0.00% Impervious Runoff Depth>0.03"
Flow Length=187' Slope=0.0050 '/' Tc=15.2 min CN=30 Runoff=0.00 cfs 0.001 af

Subcatchment 2: (new Subcat) Runoff Area=2,950 sf 0.00% Impervious Runoff Depth>0.03"
Flow Length=50' Slope=0.0050 '/' Tc=14.5 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 3: (new Subcat) Runoff Area=1,008 sf 0.00% Impervious Runoff Depth>0.03"
Flow Length=10' Slope=0.0050 '/' Tc=5.0 min CN=30 Runoff=0.00 cfs 0.000 af

Reach SP1: STUDY POINT 1 Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach SP2: STUDY POINT2 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP3: STUDY POINT3 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment 1: (new Subcat)

Runoff = 0.00 cfs @ 16.94 hrs, Volume= 0.001 af, Depth> 0.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
3,024	30	Woods, Good, HSG A
9,770	30	Brush, Good, HSG A
12,794	30	Weighted Average
12,794		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	62	0.0050	0.09		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.10"
1.3	80	0.0050	1.06		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
2.1	45	0.0050	0.35		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
15.2	187	Total			

Summary for Subcatchment 2: (new Subcat)

Runoff = 0.00 cfs @ 16.94 hrs, Volume= 0.000 af, Depth> 0.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
2,950	30	Brush, Good, HSG A
2,950		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	50	0.0050	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"

Summary for Subcatchment 3: (new Subcat)

Runoff = 0.00 cfs @ 16.76 hrs, Volume= 0.000 af, Depth> 0.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
1,008	30	Brush, Good, HSG A
1,008		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	10	0.0050	0.04		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.10"
1.0					**Direct Entry, 5 MINUTE MINIMUM TC**
5.0	10	Total			

Summary for Reach SP1: STUDY POINT 1

Inflow Area = 0.294 ac, 0.00% Impervious, Inflow Depth > 0.03" for 25-YR event
Inflow = 0.00 cfs @ 16.94 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 16.94 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP2: STUDY POINT2

Inflow Area = 0.068 ac, 0.00% Impervious, Inflow Depth > 0.03" for 25-YR event
Inflow = 0.00 cfs @ 16.94 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 16.94 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

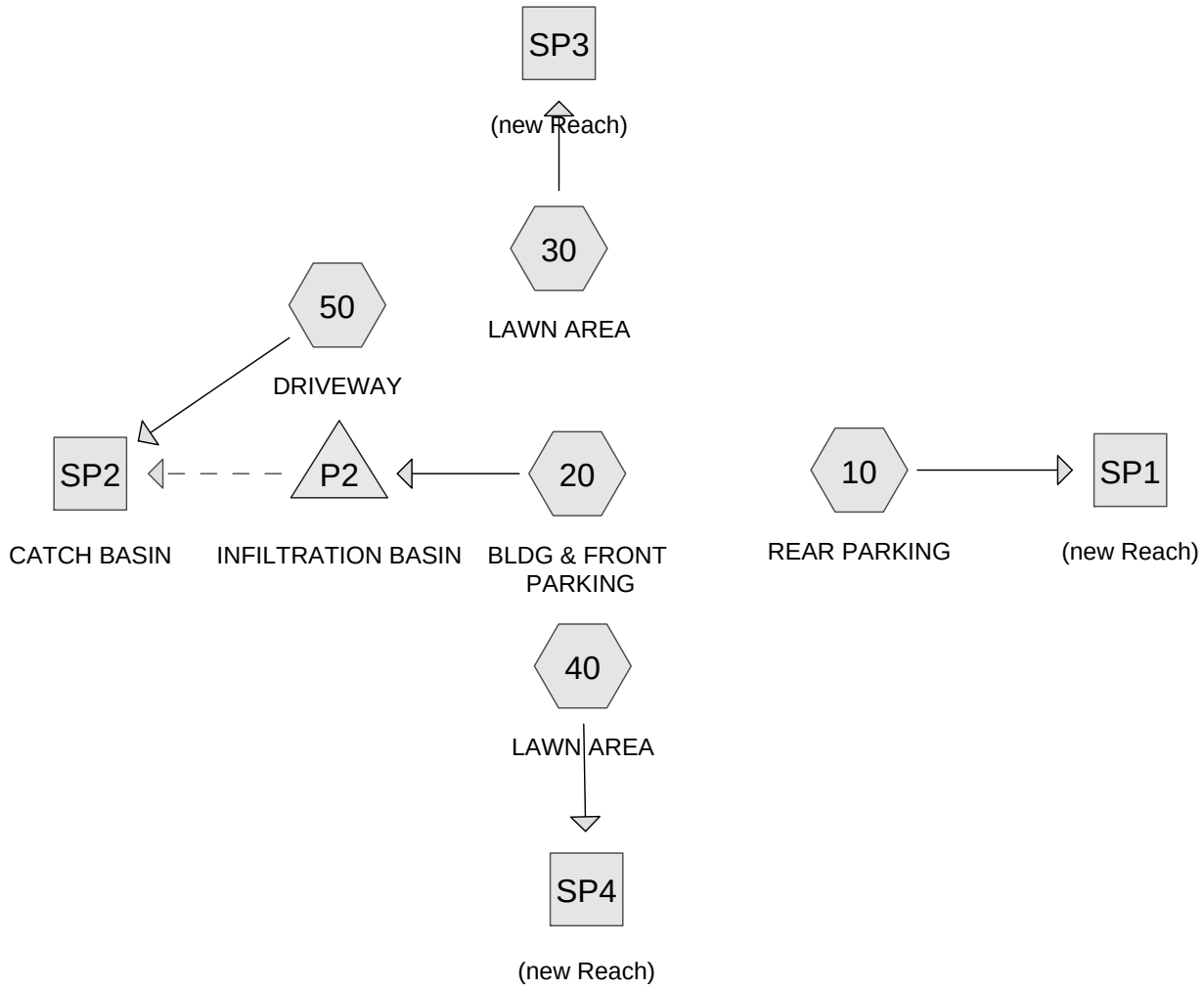
Summary for Reach SP3: STUDY POINT3

Inflow Area = 0.023 ac, 0.00% Impervious, Inflow Depth > 0.03" for 25-YR event
Inflow = 0.00 cfs @ 16.76 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 16.76 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

APPENDIX C

Postdevelopment Runoff Calculations



Subcat Reach Pond Link

Drainage Diagram for 1607-POST
Prepared by Terradyn Consultants, Printed 8/30/2016

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10: REAR PARKING Runoff Area=7,264 sf 62.36% Impervious Runoff Depth>0.88"
Flow Length=92' Tc=15.2 min CN=74 Runoff=0.13 cfs 0.012 af

Subcatchment 20: BLDG & FRONT Runoff Area=5,975 sf 68.47% Impervious Runoff Depth>1.16"
Flow Length=55' Slope=0.0250 '/' Tc=5.0 min CN=79 Runoff=0.20 cfs 0.013 af

Subcatchment 30: LAWN AREA Runoff Area=1,207 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 40: LAWN AREA Runoff Area=786 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 50: DRIVEWAY Runoff Area=1,510 sf 70.66% Impervious Runoff Depth>1.29"
Flow Length=74' Tc=5.0 min CN=81 Runoff=0.06 cfs 0.004 af

Reach SP1: (new Reach) Inflow=0.13 cfs 0.012 af
Outflow=0.13 cfs 0.012 af

Reach SP2: CATCH BASIN Inflow=0.06 cfs 0.004 af
Outflow=0.06 cfs 0.004 af

Reach SP3: (new Reach) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP4: (new Reach) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond P2: INFILTRATION BASIN Peak Elev=308.23' Storage=256 cf Inflow=0.20 cfs 0.013 af
Outflow=0.02 cfs 0.012 af

Summary for Subcatchment 10: REAR PARKING

Runoff = 0.13 cfs @ 12.23 hrs, Volume= 0.012 af, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
4,530	98	Paved parking, HSG A
797	39	>75% Grass cover, Good, HSG A
1,937	32	Woods/grass comb., Good, HSG A
7,264	74	Weighted Average
2,734		37.64% Pervious Area
4,530		62.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	62	0.0300	1.45		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
14.5	30	0.0050	0.03		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.10"
15.2	92	Total			

Summary for Subcatchment 20: BLDG & FRONT PARKING

Runoff = 0.20 cfs @ 12.08 hrs, Volume= 0.013 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
4,091	98	Paved parking, HSG A
1,884	39	>75% Grass cover, Good, HSG A
5,975	79	Weighted Average
1,884		31.53% Pervious Area
4,091		68.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	55	0.0250	1.31		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
4.3					**Direct Entry, 5 MINUTE MIN. Tc**
5.0	55	Total			

Summary for Subcatchment 30: LAWN AREA

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
1,207	39	>75% Grass cover, Good, HSG A
1,207		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, 5 MINUTE MIN. Tc**

Summary for Subcatchment 40: LAWN AREA

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
786	39	>75% Grass cover, Good, HSG A
786		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, 5 MINUTE MIN. Tc**

Summary for Subcatchment 50: DRIVEWAY

Runoff = 0.06 cfs @ 12.08 hrs, Volume= 0.004 af, Depth> 1.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.10"

Area (sf)	CN	Description
1,067	98	Paved parking, HSG A
443	39	>75% Grass cover, Good, HSG A
1,510	81	Weighted Average
443		29.34% Pervious Area
1,067		70.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	28	0.0250	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
0.3	46	0.0200	2.87		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
4.3					**Direct Entry, 5 MINUTE MIN. Tc**
5.0	74	Total			

Summary for Reach SP1: (new Reach)

Inflow Area = 0.167 ac, 62.36% Impervious, Inflow Depth > 0.88" for 2-YR event
Inflow = 0.13 cfs @ 12.23 hrs, Volume= 0.012 af
Outflow = 0.13 cfs @ 12.23 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP2: CATCH BASIN

Inflow Area = 0.035 ac, 70.66% Impervious, Inflow Depth > 1.29" for 2-YR event
Inflow = 0.06 cfs @ 12.08 hrs, Volume= 0.004 af
Outflow = 0.06 cfs @ 12.08 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP3: (new Reach)

Inflow Area = 0.028 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP4: (new Reach)

Inflow Area = 0.018 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond P2: INFILTRATION BASIN

Inflow Area = 0.137 ac, 68.47% Impervious, Inflow Depth > 1.16" for 2-YR event
Inflow = 0.20 cfs @ 12.08 hrs, Volume= 0.013 af
Outflow = 0.02 cfs @ 13.02 hrs, Volume= 0.012 af, Atten= 89%, Lag= 56.0 min
Discarded = 0.02 cfs @ 13.02 hrs, Volume= 0.012 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 308.23' @ 13.02 hrs Surf.Area= 388 sf Storage= 256 cf

Plug-Flow detention time= 142.1 min calculated for 0.012 af (92% of inflow)
Center-of-Mass det. time= 116.0 min (922.7 - 806.7)

Volume	Invert	Avail.Storage	Storage Description
#1	307.00'	1,308 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
307.00	0	0	0
308.00	345	173	173
309.00	532	439	611
310.00	862	697	1,308

Device	Routing	Invert	Outlet Devices
#1	Discarded	307.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 13.02 hrs HW=308.23' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10: REAR PARKING Runoff Area=7,264 sf 62.36% Impervious Runoff Depth>1.89"
Flow Length=92' Tc=15.2 min CN=74 Runoff=0.30 cfs 0.026 af

Subcatchment 20: BLDG & FRONT Runoff Area=5,975 sf 68.47% Impervious Runoff Depth>2.29"
Flow Length=55' Slope=0.0250 '/' Tc=5.0 min CN=79 Runoff=0.40 cfs 0.026 af

Subcatchment 30: LAWN AREA Runoff Area=1,207 sf 0.00% Impervious Runoff Depth>0.10"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 40: LAWN AREA Runoff Area=786 sf 0.00% Impervious Runoff Depth>0.10"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 50: DRIVEWAY Runoff Area=1,510 sf 70.66% Impervious Runoff Depth>2.46"
Flow Length=74' Tc=5.0 min CN=81 Runoff=0.11 cfs 0.007 af

Reach SP1: (new Reach) Inflow=0.30 cfs 0.026 af
Outflow=0.30 cfs 0.026 af

Reach SP2: CATCH BASIN Inflow=0.11 cfs 0.007 af
Outflow=0.11 cfs 0.007 af

Reach SP3: (new Reach) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP4: (new Reach) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond P2: INFILTRATION BASIN Peak Elev=308.96' Storage=592 cf Inflow=0.40 cfs 0.026 af
Outflow=0.03 cfs 0.019 af

Summary for Subcatchment 10: REAR PARKING

Runoff = 0.30 cfs @ 12.22 hrs, Volume= 0.026 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
4,530	98	Paved parking, HSG A
797	39	>75% Grass cover, Good, HSG A
1,937	32	Woods/grass comb., Good, HSG A
7,264	74	Weighted Average
2,734		37.64% Pervious Area
4,530		62.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	62	0.0300	1.45		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
14.5	30	0.0050	0.03		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.10"
15.2	92	Total			

Summary for Subcatchment 20: BLDG & FRONT PARKING

Runoff = 0.40 cfs @ 12.08 hrs, Volume= 0.026 af, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
4,091	98	Paved parking, HSG A
1,884	39	>75% Grass cover, Good, HSG A
5,975	79	Weighted Average
1,884		31.53% Pervious Area
4,091		68.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	55	0.0250	1.31		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
4.3					**Direct Entry, 5 MINUTE MIN. Tc**
5.0	55	Total			

Summary for Subcatchment 30: LAWN AREA

Runoff = 0.00 cfs @ 14.56 hrs, Volume= 0.000 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
1,207	39	>75% Grass cover, Good, HSG A
1,207		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, 5 MINUTE MIN. Tc**

Summary for Subcatchment 40: LAWN AREA

Runoff = 0.00 cfs @ 14.56 hrs, Volume= 0.000 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
786	39	>75% Grass cover, Good, HSG A
786		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, 5 MINUTE MIN. Tc**

Summary for Subcatchment 50: DRIVEWAY

Runoff = 0.11 cfs @ 12.08 hrs, Volume= 0.007 af, Depth> 2.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.60"

Area (sf)	CN	Description
1,067	98	Paved parking, HSG A
443	39	>75% Grass cover, Good, HSG A
1,510	81	Weighted Average
443		29.34% Pervious Area
1,067		70.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	28	0.0250	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
0.3	46	0.0200	2.87		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
4.3					**Direct Entry, 5 MINUTE MIN. Tc**
5.0	74	Total			

Summary for Reach SP1: (new Reach)

Inflow Area = 0.167 ac, 62.36% Impervious, Inflow Depth > 1.89" for 10-YR event
Inflow = 0.30 cfs @ 12.22 hrs, Volume= 0.026 af
Outflow = 0.30 cfs @ 12.22 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP2: CATCH BASIN

Inflow Area = 0.035 ac, 70.66% Impervious, Inflow Depth > 2.46" for 10-YR event
Inflow = 0.11 cfs @ 12.08 hrs, Volume= 0.007 af
Outflow = 0.11 cfs @ 12.08 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP3: (new Reach)

Inflow Area = 0.028 ac, 0.00% Impervious, Inflow Depth > 0.10" for 10-YR event
Inflow = 0.00 cfs @ 14.56 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 14.56 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP4: (new Reach)

Inflow Area = 0.018 ac, 0.00% Impervious, Inflow Depth > 0.10" for 10-YR event
Inflow = 0.00 cfs @ 14.56 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 14.56 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond P2: INFILTRATION BASIN

Inflow Area = 0.137 ac, 68.47% Impervious, Inflow Depth > 2.29" for 10-YR event
Inflow = 0.40 cfs @ 12.08 hrs, Volume= 0.026 af
Outflow = 0.03 cfs @ 13.68 hrs, Volume= 0.019 af, Atten= 93%, Lag= 96.1 min
Discarded = 0.03 cfs @ 13.68 hrs, Volume= 0.019 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 308.96' @ 13.68 hrs Surf.Area= 525 sf Storage= 592 cf

Plug-Flow detention time= 198.6 min calculated for 0.019 af (74% of inflow)
Center-of-Mass det. time= 136.9 min (928.3 - 791.4)

Volume	Invert	Avail.Storage	Storage Description
#1	307.00'	1,308 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
307.00	0	0	0
308.00	345	173	173
309.00	532	439	611
310.00	862	697	1,308

Device	Routing	Invert	Outlet Devices
#1	Discarded	307.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 13.68 hrs HW=308.96' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10: REAR PARKING Runoff Area=7,264 sf 62.36% Impervious Runoff Depth>2.80"
Flow Length=92' Tc=15.2 min CN=74 Runoff=0.44 cfs 0.039 af

Subcatchment 20: BLDG & FRONT Runoff Area=5,975 sf 68.47% Impervious Runoff Depth>3.28"
Flow Length=55' Slope=0.0250 '/' Tc=5.0 min CN=79 Runoff=0.56 cfs 0.037 af

Subcatchment 30: LAWN AREA Runoff Area=1,207 sf 0.00% Impervious Runoff Depth>0.32"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment 40: LAWN AREA Runoff Area=786 sf 0.00% Impervious Runoff Depth>0.32"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 50: DRIVEWAY Runoff Area=1,510 sf 70.66% Impervious Runoff Depth>3.47"
Flow Length=74' Tc=5.0 min CN=81 Runoff=0.15 cfs 0.010 af

Reach SP1: (new Reach) Inflow=0.44 cfs 0.039 af
Outflow=0.44 cfs 0.039 af

Reach SP2: CATCH BASIN Inflow=0.15 cfs 0.010 af
Outflow=0.15 cfs 0.010 af

Reach SP3: (new Reach) Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach SP4: (new Reach) Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond P2: INFILTRATION BASIN Peak Elev=309.46' Storage=890 cf Inflow=0.56 cfs 0.037 af
Outflow=0.04 cfs 0.025 af

Summary for Subcatchment 10: REAR PARKING

Runoff = 0.44 cfs @ 12.21 hrs, Volume= 0.039 af, Depth> 2.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
4,530	98	Paved parking, HSG A
797	39	>75% Grass cover, Good, HSG A
1,937	32	Woods/grass comb., Good, HSG A
7,264	74	Weighted Average
2,734		37.64% Pervious Area
4,530		62.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	62	0.0300	1.45		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
14.5	30	0.0050	0.03		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.10"
15.2	92	Total			

Summary for Subcatchment 20: BLDG & FRONT PARKING

Runoff = 0.56 cfs @ 12.08 hrs, Volume= 0.037 af, Depth> 3.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
4,091	98	Paved parking, HSG A
1,884	39	>75% Grass cover, Good, HSG A
5,975	79	Weighted Average
1,884		31.53% Pervious Area
4,091		68.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	55	0.0250	1.31		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
4.3					**Direct Entry, 5 MINUTE MIN. Tc**
5.0	55	Total			

Summary for Subcatchment 30: LAWN AREA

Runoff = 0.00 cfs @ 12.35 hrs, Volume= 0.001 af, Depth> 0.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
1,207	39	>75% Grass cover, Good, HSG A
1,207		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, 5 MINUTE MIN. Tc**

Summary for Subcatchment 40: LAWN AREA

Runoff = 0.00 cfs @ 12.35 hrs, Volume= 0.000 af, Depth> 0.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
786	39	>75% Grass cover, Good, HSG A
786		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, 5 MINUTE MIN. Tc**

Summary for Subcatchment 50: DRIVEWAY

Runoff = 0.15 cfs @ 12.08 hrs, Volume= 0.010 af, Depth> 3.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=5.80"

Area (sf)	CN	Description
1,067	98	Paved parking, HSG A
443	39	>75% Grass cover, Good, HSG A
1,510	81	Weighted Average
443		29.34% Pervious Area
1,067		70.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	28	0.0250	1.15		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.10"
0.3	46	0.0200	2.87		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
4.3					**Direct Entry, 5 MINUTE MIN. Tc**
5.0	74	Total			

Summary for Reach SP1: (new Reach)

Inflow Area = 0.167 ac, 62.36% Impervious, Inflow Depth > 2.80" for 25-YR event
Inflow = 0.44 cfs @ 12.21 hrs, Volume= 0.039 af
Outflow = 0.44 cfs @ 12.21 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP2: CATCH BASIN

Inflow Area = 0.035 ac, 70.66% Impervious, Inflow Depth > 3.47" for 25-YR event
Inflow = 0.15 cfs @ 12.08 hrs, Volume= 0.010 af
Outflow = 0.15 cfs @ 12.08 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP3: (new Reach)

Inflow Area = 0.028 ac, 0.00% Impervious, Inflow Depth > 0.32" for 25-YR event
Inflow = 0.00 cfs @ 12.35 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 12.35 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP4: (new Reach)

Inflow Area = 0.018 ac, 0.00% Impervious, Inflow Depth > 0.32" for 25-YR event
Inflow = 0.00 cfs @ 12.35 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 12.35 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Pond P2: INFILTRATION BASIN

Inflow Area = 0.137 ac, 68.47% Impervious, Inflow Depth > 3.28" for 25-YR event
Inflow = 0.56 cfs @ 12.08 hrs, Volume= 0.037 af
Outflow = 0.04 cfs @ 13.77 hrs, Volume= 0.025 af, Atten= 93%, Lag= 101.8 min
Discarded = 0.04 cfs @ 13.77 hrs, Volume= 0.025 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Peak Elev= 309.46' @ 13.77 hrs Surf.Area= 684 sf Storage= 890 cf

Plug-Flow detention time= 205.3 min calculated for 0.025 af (67% of inflow)
Center-of-Mass det. time= 136.5 min (919.6 - 783.2)

Volume	Invert	Avail.Storage	Storage Description
#1	307.00'	1,308 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
307.00	0	0	0
308.00	345	173	173
309.00	532	439	611
310.00	862	697	1,308

Device	Routing	Invert	Outlet Devices
#1	Discarded	307.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 13.77 hrs HW=309.46' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.04 cfs)

APPENDIX D

BMP Design Calculations

INFILTRATION BASIN DESIGN

Total Tributary Area:	5,975	SF	
Impervious Area:	4,091	SF	
Landscape Area:	1,884	SF	
Required Storage Volume:	404	CF	1" x Imp. Area + 0.4" x LS Area

STAGE STORAGE

ELEVATION	AREA (SF)	INCREMENTAL VOLUME (CF)	TOTAL VOLUME (CF)	
307	184	0	0	<-- Surface of Basin
308	345	265	265	
309	532	439	703	
309.5	697	307	1010	<-- Outlet Elevation
310	862	390	1400	

ROOF DRIPLINE FILTER SIZING CALCULATIONS

EAST SIDE OF BUIDLING

UNIT STORAGE VOLUME CALCULATION:	
[L] ROOF LENGTH (FT)	7
[D] RAINFALL DEPTH (IN)	1
[US] REQUIRED RUNOFF STORAGE PER LINEAR FOOT (CF) = [L][D]/12	0.58
STONE RESERVOIR DEPTH CALCULATION	
[P] STONE POROSITY	40%
[W] DRIPEDGE WIDTH (IN)	36
STONE RESERVOIR DEPTH (IN) = [US]/[P][W/12]	5.83

APPENDIX E

STORMWATER MANAGEMENT INSPECTION & MAINTENANCE PLAN

INSPECTION & MAINTENANCE PLAN OF STORMWATER MANAGEMENT FACILITIES
FOR:
LANDING REAL ESTATE OFFICE
79 TANDBERG TRAIL
WINDHAM, MAINE

Project Owner/Developer: Jack & Rose, LLC
44 Exchange Street, Suite 200
Portland, ME 04101

Responsible Party: Jack & Rose, LLC
44 Exchange Street, Suite 200
Portland, ME 04101

Prepared By: Terradyn Consultants, LLC
PO Box 339
111 Elderberry Lane
New Gloucester, ME 04260
(207) 926-5111

List of Stormwater Measures:
Vegetated Swales
Roadways & Parking Surfaces
Infiltration Basin
Roof Dripline Filter
Wooded Stormwater Buffer

Introduction:
Regular inspection and maintenance of the entire stormwater management system is crucial to the long term effectiveness of the system. The owner is responsible for regular inspection and maintenance of all stormwater management structures, the establishment of any contract services required to implement the program, and keeping records and a maintenance log book of inspection and maintenance activities. At a minimum, the inspection and maintenance activities outlined herein should be performed at the recommended intervals.

Inspection & Maintenance Tasks:
Inspections should be performed by qualified erosion control professional. NOTE: The following are excerpts from the Maine Department of Environmental Protection's *Stormwater Management for Maine, Volume III BMPs Technical Design Manual*, dated January 2006.

VEGETATED SWALES:

1. Mowing: Grass should not be trimmed extremely short, as this will reduce the filtering effect of the swale (MPCA, 1989). The cut vegetation should be removed to prevent the decaying organic litter from adding pollutants to the discharge from the swale. The mowed height of the grass should be 2-4 inches taller than the maximum flow depth of the design water quality storm. A minimum mow height of 6 inches is generally recommended (Galli, 1993).

2. Routine Maintenance and Inspection: The area should be inspected for failures following heavy rainfall and repaired as necessary for newly formed channels or gullies, reseeding/ sodding of bare spots, removal of trash, leaves and/or accumulated sediments, the control of woody or other undesirable vegetation and to check the condition and integrity of the check dams.

3. Aeration: The buffer strip may require periodic mechanical aeration to restore infiltration capacity. This aeration must be done during a time when the area can be reseeded and mulched prior to any significant rainfall.

4. Erosion: It is important to install erosion and sediment control measures to stabilize this area as soon as possible and to retain any organic matter in the bottom of the trench.

5. Fertilization: Routine fertilization and/or use of pesticides is strongly discouraged. If complete re-seeding is necessary, half the original recommended rate of fertilizer should be applied with a full rate of seed.

6. Sediment Removal: The level of sediment deposition in the channel should be monitored regularly, and removed from grassed channels before permanent damage is done to the grassed vegetation, or if infiltration times are longer than 12 hours. Sediment should be removed from riprap channels when it reduces the capacity of the channel.

ROADWAYS & PARKING SURFACES:

Paved surfaces shall be swept or vacuumed at least twice annually in the spring to remove all winter sand and periodically during the year on an as-needed basis to minimize the transport of sediment during rainfall events.

INFILTRATION BASIN:

Preventive maintenance is vital for the long-term effectiveness of an infiltration system. Since infiltration is less conspicuous than most BMPs, it is easy to overlook during maintenance inspections. The following criteria apply to all infiltration systems.

1. Basin Inspections: Inspections of infiltration basins should be conducted on a semi-annual basis and following major storms. Timely maintenance is critical, as poor maintenance practices can result in loss of infiltration capacity. Conduct the inspections after large storms to check for

surface ponding at the inlet that may indicate clogging. The basin will need to be rehabilitated if it fails to drain before the next rain event or 72 hours.

2. Drainage Area: Inspect the basin's drainage area semi-annually for eroding soil and other sediment sources and repair eroding areas immediately or control sediment sources (such as stockpiles of winter sand, by removing them from the basin's drainage area or surrounding them with sediment control BMPs).

3. Mowing: A basin with a turf lining should have its side-slopes and floor mowed no more than twice a year to prevent woody growth. Mowing operations may be difficult since the basin floor may remain wet for extended periods. If a low-maintenance vegetation is used, basin mowing can be performed in the normally dry months. Clippings should be removed to minimize the amount of organic material accumulating in the basin.

4. Pedestrian Access: Limit access to turf lined basins to passive recreational activities. Do not use the basin for a playing field, as heavy foot traffic can compact the soil surface.

5. Fertilization: Fertilization of the area over the infiltration bed should be avoided unless absolutely necessary to establish vegetation.

6. Snow Storage: Snow removed from any on-site or off-site areas may not be stored over an infiltration area, with the exception of storage on permeable pavement.

7. Pollution-Control Devices: Pollution-control devices such as oil-water separators, skimmers, and booms should be inspected regularly to determine if they need to be cleaned or replaced.

8. Sediment Removal and Maintenance of System Performance: Sediment must be removed from the system at least annually to prevent deterioration of system performance. The pre-treatment inlets should be checked and cleaned out when accumulated sediment occupies more than 10% of the available capacity. This can be done manually or by a vacuum pump. Inlet and outlet pipes should be checked for clogging. Accumulated grease and oil from separator devices should be removed frequently and disposed of in accordance with applicable state and local regulations. The system must be rehabilitated or replaced if its performance is degraded to the point that applicable stormwater standards are not met.

9. Pretreatment Buffer Strips: If a grass buffer strip is used in conjunction with the infiltration BMP it should have vigorous and dense vegetation. Bare spots or eroded areas should be repaired and/or re-seeded or re-sodded. Watering and/or fertilization should be provided during the first few months after the strip is established, and may be needed in times of drought. Grass filter strips should be mowed regularly to prevent the uncontrolled growth of weeds, but filter strip performance will be impaired if the grass is cut too short.

ROOF DRIPLINE FILTER

A dripline filter bed needs to be maintained like any other filter basin. The maintenance activities for the grass underdrained soil filter apply equally to this type of structure. Any debris must be removed from the reservoir course. These structures are part of the stormwater management plan for the project and cannot be paved over or altered in any way. No gutter may be installed on the roof line.

VEGETATED STORMWATER BUFFER

Buffers should be inspected annually for evidence of erosion or concentrated flows through or around the buffer. All eroded areas should be repaired, seeded and mulched.

1. Mowing: Meadow buffers may be mown no more than twice per year. They may not be maintained as a lawn.

2. Access and Use: Buffers should not be traversed by all-terrain vehicles or other vehicles. Activities within buffers should be conducted so as not to damage vegetation, disturb any organic duff layer, or expose soil.

3. Inspections: Conduct periodic "buffer walks" to inspect the condition of the buffer network.

Stormwater Management Facilities Inspection & Maintenance Log Landing Real Estate, 79 Tandberg Trail, Windham, ME			
BMP's	**Date Inspected**	**Repairs Needed?**	**Date Repaired**
Example	5/11/14	Y	5/15/14
1. Vegetated Swales			
2. Roadways and Parking Surfaces			
3. Infiltration Basin			
4. Roof Dripline Filter			
5. Vegetated Stormwater Buffer			

Detailed Repair Notes:		
BMP Type	**Date**	**Description of Repair Made**
2	4/15/14	Swept and Vacuumed (Example)