



October 10, 2013

Ms. Cindy Mulkey, Program Administrator
Office of Siting Coordination
Department of Environmental Protection
3900 Commonwealth Blvd., MS#48
Tallahassee, FL 32399-3000

RE: Florida Power & Light Company
Cape Canaveral Energy Center
Power Plant Site Certification No. PA 08-54C
Post-Certification Amendment
Pavilion, Warehouse, & Miscellaneous Storage Building

Dear Ms. Mulkey,

Florida Power & Light Company (FPL) is requesting a post certification amendment to the Site Certification for FPL's Cape Canaveral Energy Center (CCEC), pursuant to Section XXXI, Environmental Resources, in the Conditions of Certification. The purpose of this amendment request is to obtain approval for improvements to the southern portion of the CCEC property, the area that is currently being used for a temporary construction area. This 8.2 acre area is located south and west of the circulating water intake canal and is in a transient state as construction on the main plant nears completion. This area was originally used for recreation, parking, storage, and building space.

Included in the attached package are the construction design and stormwater calculations. The proposed plans include the construction design for three new buildings: a pavilion, miscellaneous storage building, and a warehouse. Once the construction of the site is complete, FPL will apply for a modification to the current Industrial Wastewater Permit No. FL0001473 to manage the discharge on the south portion of the site. There will be no additional domestic or sanitary wastewater generated by the construction or use of these new buildings. There are no wetlands or threatened or endangered species on this site.

Thank you for your attention to and consideration of FPL's request to amend the Site Certification for CCEC. If you have any questions regarding this submittal, please do not hesitate to contact me at 561-691-2808 or Stacy Foster at 561-691-7065.

Sincerely yours,
Florida Power & Light Company

Matthew J. Raffenberg
Director, FPL Licensing and Permitting

cc: Ashley Pinnock, FPL Legal

0	ISSUED FOR CONSTRUCTION			
NO	REVISIONS	DATE	DSNR	APPD DM



FPL®

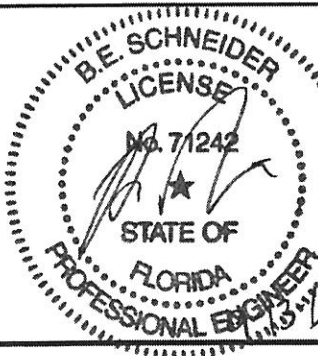
ZACHRY

ZACHRY ENGINEERING CORPORATION - 1515 ARAPAHOE ST., TOWER 1, SUITE 900; DENVER, CO 80202-4256
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CAPE CANAVERAL ENERGY CENTER UNIT 3

GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT



DATE 9-13-13	DSNR B. Schneider	APPD DM D. Moore	APPD DM <i>[Signature]</i>
REPORT NUMBER A008710-RPTS006	PAGES 235	REV 0	

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Appendices:

- A. Arial Photo
- B. Project Location
- C. Existing Drainage Patterns
- D. Manatee Refuge Operational Drainage Plan
- E. USDA Soil Report
- F. Precipitation Data for Melbourne, Florida
- G. Drainage Network Overall View
- H. Drainage Network Schematic
- I. Tide Datum Elevations
- J. Excerpt From Terracon Geotechnical Engineering Report
- K. Water Quality Calculations
- L. 10 and 25 – Year StormNET Input and Output for Existing Conditions
- M. Stage - Area - Volume Relationships
- N. 10 – Year StormNET Input and Output for Proposed Conditions
- O. 25 – Year StormNET Input and Output for Proposed Conditions
- P. 100 – Year StormNET Input and Output for Proposed Conditions
- Q. Pond Recovery Calculations

Attachments:

- A. General Arrangement – D008710-STWL00005 SHT 01
- B. Erosion Control Plan – D008710-STWS00004 SHT 03 and SHT 05
- C. Rough Grades – D008710-STFS00015 SHT 01 and SHT 02
- D. Finished Grades – D008710-STFS00016 SHT 01 and SHT 02
- E. Pipe Layout – D008710-STFS00017 SHT 01 and SHT 02

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1.0 Purpose and Scope

- 1.1 The purpose of this report is to calculate the appropriate grading, pond sizing, and structure sizing for the Cape Canaveral Energy Center East Property Improvement. The report calculations will determine peak runoff from the proposed site, peak runoff to drainage structures, verify that the stormwater ponds contain the required water quality volume required by the St. John's Water Management District and verify that the ponds and outlet structures reduce peak discharge from the developed site to a level that is less than or equal to that of the existing site. This report will also provide the information required to obtain an Environmental Resource Stormwater Permit in accordance with Chapter 62-25 and Chapter 62-330 F.A.C. and that the project meets the requirements set forth by St. John's Water Management District.

1.1.1 General Site Conditions

- 1.1.1.1 Florida Power & Light Company (FPL) has been engaged in a conversion of Cape Canaveral Energy Center since 2010. The project was originally permitted with FDEP through the Site Certification Application dated December 2008. The original project is located between Cocoa and Titusville, Florida. The site is bounded on the east by the Intracoastal Waterway/Indian River and on the west by U.S. 1 in Section 19, Township 23S, Range 36E of Brevard County, Florida. The original permitting for the site included the main construction site as well as temporary construction areas that were to be restored to near their original condition at the completion of the project. The proposed improvement in this report is for permanent improvements to an area that is currently being used for a temporary construction area. This 8.2 acre area is located south and west of the circulating water intake canal. This area is in a transient state as construction on the main plant nears completion. An aerial photograph of the site in its transient condition is depicted in Appendix A. The project location is depicted in Appendix B. The exact project boundary is shown in Appendix C, which is a survey of the site.
- 1.1.1.2 The existing site was originally used for recreation, parking, storage, and building space. An original site survey before the start of the Cape Canaveral improvement is attached as Appendix C. The original site is 44.7% impervious due to a large amount of asphalt on the west for a parking lot. Permeable areas consisted of well drained grass. During construction activities, much of the existing permeable areas were covered with limerock base for parking and construction roadways. The existing asphalt remained. As depicted in Appendix C, the site generally drains to the east away from US 1 toward the Indian River. A catch basin was provided to drain the parking area on the west side of the improvement area. The storm sewer pipe that this basin attaches to also connects to catch basins that drain the roadside ditches on US 1. The pipe directly discharges into the circulating water inlet canal which connects to the Indian River. This pipe and its outfall are sketched on Appendix C. The pipe will remain in place since the US 1 drainage is outside the scope of this project, but the

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catch basin that drains the parking lot will be blocked off. The remainder of the site sheet flows into the intake canal and Indian River so there is not a defined outfall point. Two catch basins were originally located at the east end of the site, but have since been rendered nonfunctional by construction activity. They will be removed as part of this improvement.

The project receives a very limited amount of water from offsite drainage. Most significant drainage comes from the vicinity of US 1 and will continue to be routed beneath the project via the stormwater discharge pipe. There is a residential area immediately south of the project. Since drainage is to the east, only water from the immediate vicinity of nearby properties will enter the site depending on the specific topography of the landscaping.

Before this area was used for construction activities and after the original survey was done, a manatee refuge heating project was constructed within the project area. This project placed some transformers, pumps, control panels, and piping within the project boundary. Though meant to be temporary, this improvement is scheduled to become permanent. An operational drainage plan was designed by AECOM in 2011 for this improvement that was intended to meet SJWMD standards and is attached as Appendix D. The boundaries of this improvement are shown approximately on Appendix C. This drainage scheme will be removed as part of this project and the drainage for this equipment will be included in the overall project.

- 1.1.1.3 A USDA Soil Report is attached as Appendix E. This report shows the majority of the proposed site to be Pomello-Urban land complex. This soil is well drained and is of USDA Hydrologic Group A, demonstrating a superior hydraulic conductivity. Ground water is estimated to be 24 to 42 inches below ground surface. The remaining unpaved portion of the site is Myakka – Urban Land Complex. This is a poorly drained soil with a high hydraulic conductivity. The Hydrologic Soil Group is B if the soil is not saturated. The depth to water table is estimated at 6 to 18 inches.
- 1.1.1.4 No geotechnical investigation has been performed on this side of the circulating water intake canal for this project. Borings were taken for the main plant, and these are thought adequate to characterize the soil for permeability, but not for ground water level due to the five foot elevation difference between the two portions of plant. For this project, the ground surface near the east end of the proposed large pond ranges from around 2.6 to 3.5 feet NAVD 1988. The ordinary high water for the Indian River is given as -0.24 feet NAVD 1988 as shown on Appendix C. During construction activities, there has not been standing water that would indicate a high ground water table and there were no wetlands prior to construction in this area. The seasonal high ground water table is therefore conservatively estimated to be 1 foot NAVD due to the proximity to the Indian River. This water table is most likely to range from 0 to 0.5 feet NAVD during the dry season.

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Some very small retention ponds are proposed to be placed immediately next to the existing sea wall near the existing boat ramp. These ponds are within 5 feet of the water's edge. Because of the proximity of the Indian River, the seasonal high ground water at these small ponds will be taken as 0.5 NAVD. The vertical seawall that rises to elevation 2.0 NAVD will prevent groundwater from rising higher than this because it will interrupt the groundwater flow net from the adjacent Indian River.

Precipitation data for the nearest NOAA weather site is attached as Appendix F. The data shows that Melbourne, Florida received 6.91 inches of rain in July.

1.1.2 Post-Development Project Site Conditions

- 1.1.2.1 There are no permitted outfalls for this portion of the Cape Canaveral Energy Center. An existing point discharge via a 42 inch corrugated metal pipe draining the west parking lot and portions of U.S. 1 is located near Lat. 28° 28' 04.80", Long. 80° 45' 52.12". The remainder of this site sheet flows into the circulating water intake canal and Indian River. This project proposes to create a point discharge into the Indian River at Lat. 28° 28' 01.41", Long. 80° 45' 42.51" and eliminate overall sheet flow and direct flow from the parking lot into the Indian River. Water will be routed through a pond which discharges at the new discharge location. The portions of U.S. 1 which directly drain to the circulating water intake canal will continue to do so.
- 1.1.2.2 The existing site does not receive water from existing stormwater systems as a point discharge. There is a limited amount of sheet flow from adjoining properties to the south due to grading in the immediate area of the property. Water from US 1 travels under the site via underground stormwater piping and then discharges into the circulating water intake canal. Because the site discharges into the Indian River, a tide controlled body, there will be no downstream stormwater management system affected by this project.
- 1.1.2.3 By survey, the ordinary high water line for the Indian River is -0.24 feet NAVD 88. An elevation of 1.05 feet NAVD 88 was obtained from NOAA for the mean high – higher water elevation. 1.05 feet NAVD was used for the discharge water elevation. Reference Appendix I for tidal datums.

1.1.3 Construction Plans

- 1.1.3.1 Note that construction plans are drawn in "plant" coordinates instead of true coordinates. North on the drawing will vary from "true" north. "True" north is represented on the north arrow for each drawing.
- 1.1.3.2 For a layout of proposed construction, see Attachment A – General Arrangement
- 1.1.3.3 For erosion and sediment control plans, including measures to be implemented during construction, see Attachment B – Erosion Control Plan
- 1.1.3.4 For information in drainage divides and grades in landscaped areas, see Attachment C

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– Rough Grades. Note that rough grades shown are 6 inches below final grades.

1.1.3.5 For project land use and cover, wet season water table, design water elevation, and elevations for storage of water treatment volume the vegetative cover plan, roadway and parking pavement, concrete surfaces, permanent erosion control measures, and grassing and planting of treatment system earth surfaces, see Attachment D – Finished Grades.

1.1.3.6 For details of the oil and grease control structure, outfall structure, tailwater on the outfall structure as well as treatment pool elevation see Appendix E – Piping.

2.0 Design Methodology

- 2.1 This report is developed in accordance with the requirements of the Florida Department of Environmental Protection (FDEP) regulations for Stormwater Discharge (Chapter 62-25, F.A.C) and Environmental Resource Permitting (ERP) (Chapter 62-330, F.A.C.). The rules of the St. John's Water Management District are adopted by reference. This report is further developed in conformance to the Engineering Procurement and Construction Contract between Florida Power & Light and Zachry Engineering. The ponds will be designed as dry retention ponds. The site will consist of a large retention pond which receives runoff from the storm sewer which drains the majority of the project area. The large pond will discharge through a new discharge structure on the east side of the pond into a new point discharge into the Indian River. The overall flow of the site is from west to east. Additionally, five shallow ponds immediately next to the sea wall will receive runoff from the edges of the site that cannot drain to the large pond due to their low elevation. The seawall was conceptualized as a broad crested weir for the design of these ponds. As shown in Appendix G– Drainage Network Overall View the site will carry the water to the ponds via sheet flow and a series of catch basins and storm pipes.
- 2.2 Water quality for the site is provided by the use of retention ponds. St. John's Water Management District requires ½" over the project site or 1 ¼" over the impervious area, whichever is greater, to be retained for water quality. Since the project is utilizing on-line retention, an additional ½" over the project site must be retained. Finally, since the Indian River is considered a Class II surface water, an additional 50% over that retained for online treatment must be retained.
- 2.3 The St. John's Water Management District stormwater management guidelines state that discharge rates off the site will be limited to historic discharge rates for a 25 year – 24 hour storm. In addition, since this project is in the Upper St. John's River Hydrologic Basin, the project must also be checked using the 10 year – 24 hour storm per 40C-41 F.A.C. Drainage structures were designed not to be damaged by the 100 year – 24 hour storm.
- 2.4 The rainfall distribution used to develop hydrographs is SCS Type II FL. St. John's Water Management District allows for using SCS curves and the Santa Barbara Urban Hydrograph to develop the runoff from the site. Using the SCS curves, rainfall rates from the SCS Type II FL distribution, and routing with the Santa Barbara Urban Hydrograph, a discharge rate was calculated for both the pre and post development conditions of the site.

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- 2.5 St. John's Water Management District requires that the retention ponds infiltrate the entire capacity of retained water quality volume within 72 hours. Pond recovery was calculated using the procedure outlined in the St. John's Water Management Applicants Handbook: Regulation of Stormwater Management Systems, Section 26.3.5 – Methodology for Analyzing Recovery by Lateral Saturated Flow by Hand.
- 2.6 Since this area is not a public access area and there are space restrictions due to existing vegetation, a side slope of 3H:1V was used on ponds per 9.3.1 of the Applicants Handbook. This area serves a parking lot, therefore a skimmer will be provided on the outfall structure which extends below the weir elevation for oil control. The outfall structure for the primary pond will set the control elevation by way of a concrete weir. Smaller retention areas around the edge of the site are meant to catch water that could not be routed to the main pond. These retention areas do not serve parking areas and therefore will not be provided with a skimmer. The control elevation for these ponds is set by allowing water to flow over the edge of the area as conceptualized by a broadcrested weir.
- 2.7 Hydraulics and peak discharge for the project were modeled using Boss International's StormNET program, Version 4.21.0 dated Dec 4, 2009. The project options were set to use the Santa Barbara Urban Hydrograph for hydrology, the Hydrodynamic method for routing between links, and the Hazen-Williams equation for force the main equation.

3.0 Design Inputs

- 3.1 The 10 year, 24 hour storm event rainfall depth is: 8 inches – Technical Paper No. 40 (1963).
- 3.2 The 25 year, 24 hour storm event rainfall depth is: 9.5 inches– Technical Paper No. 40 (1963).
- 3.3 The 100 year, 24 hour storm event rainfall depth is: 12 inches– Technical Paper No. 40 (1963).
- 3.4 The time of concentration used in all sub areas is 8 minutes due to the size of the drainage areas and their imperviousness.
- 3.5 Soils are SCS Hydrologic Group A per Appendix E unless they are located in the bottom of the pond, then they are considered SCS Hydrologic Group D. Per McCuen (2005) lawns and open spaces for group A that are in fair condition have a curve number of 49. Group D soils have a curve number of 89. Impervious areas were assigned a curve number of 98.
- 3.6 Smooth walled corrugated HDPE will be used for underground piping. This pipe is very smooth. A conservative value of 0.0014 was assigned for Manning's roughness.
- 3.7 The mean high-higher water level is given in Appendix I as 1.05 NAVD 88. The top of the seawall is a minimum of elevation 2, NAVD 88. The lowest discharge point for stormwater outfalls is the lowest point on the seawall, elevation 2.0. Data is taken from Trident Pier in Titusville, Florida.
- 3.8 Groundwater is 1.0 foot NAVD 88 for the majority of the site. The edge near the water is 0.5 NAVD 88.

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4.0 Assumptions

- 4.1 Soils have a similar hydraulic conductivity to those of the main site. An excerpt from the report giving hydraulic conductivities at the main site is provided as Appendix J.
- 4.2 Ground water for this improvement is lower than that of the main site because the site is lower and closer to the water. Ground water mounding will not be as prominent in this area.
- 4.3 All elevations are in NAVD 88 unless stated otherwise.

5.0 References

- 5.1 Florida Power & Light: Final Turnkey Engineering, Procurement, and Construction Agreement for Combined-Cycle Generation Facility. Appendix A: Scope of Work. (2010) Cocoa Beach, FL: Florida Power & Light.
- 5.2 Mays, Larry W. (2001) Stormwater Collection Systems Design Handbook. New York, NY: McGraw-Hill.
- 5.3 McCuen, R. (2005). Hydrologic Analysis and Design. Upper Saddle River, NJ: Pearson/Prentice Hall.
- 5.4 St. John's Water Management District. (2010, December). Applicant's Handbook: Regulation of Stormwater Management Systems Chapter 40C-42, F.A.C.
- 5.5 Terracon. (2010). Cape Canaveral Supplemental Geotechnical Engineering Report.
- 5.6 United States Department of Commerce. (1963) Technical Paper No. 40. Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years. Washington, DC.

6.0 Calculations

- 6.1 Reference Appendix G - Drainage Areas for a depiction of the breakdown of the drainage areas used and represented areas of imperviousness. The total imperviousness of the site was calculated by adding the impervious areas for each basin together. Total areas of each basin were also added together to obtain the site area. The permeable area was calculated through subtraction of the two numbers. The areas were measured directly out of CAD. See Appendix M - Stage - Area - Volume Relationships for a breakdown of the calculations.
- 6.2 Hydrographs were developed for drainage basins by first assigning curve numbers for the impervious and permeable areas within the drainage basin. These curve numbers describe how much water the basin will absorb or store and how much rainfall will run off of the area. The curve numbers are determined from hydrologic soil group and area usage as stated in Section 3. A composite curve number was used in pond drainage areas due to the small size of the pond relative to the entire drainage area. This curve number was calculated by assigning a curve number of 89 over the percentage area of the bottom of the ponds.

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- 6.3 The time of concentration was taken as 8 minutes for all basins. The size of the basins will result in a time of concentration that is below or near this number. This number will result in conservative peak flows for the existing condition and proposed basins.
- 6.4 Pond volume and discharge were calculated using a stage storage relationship. Areas of contours for each pond were measured at 6 inch contour intervals from CAD. These areas are shown in Appendix K – Water Quality Calculations. Volumes were determined for spreadsheet values by interpreting volumes between measured elevations based on the average areas of contours multiplied by the depth. The volumes were interpolated at intervals by developing a polynomial using regression analysis via Microsoft Excel's ANOVA function. The volume that corresponded to the required water quality was used to set the weir height. Contour areas were also programmed into the StormNET program. The program interpolates the areas to develop the stage-storage relationship in the exact same way that volumes were interpolated in Excel. Weirs were programmed into StormNET using actual values for crest elevation and width. The top of the skimmer was programmed into StormNET as the overflow weir height for events which exceed the 25 year event. These inputs are all summarized in Appendix N – 10 – Year StormNET Input and Output.
- 6.5 Structures were sized to accommodate both the 25 year and 100 year 24 hour storm. 10 year calculations were run, but did not control. Structures were sized so that the ponds would not overtop and the 100 year storm would not cause overland flow from one basin to another.
- 6.6 Recovery calculations for each pond were performed based on St. John's Regulation of Stormwater Management Handbook. Calculations were performed for each pond based on the average width, length, and depth of the pond. Values for saturated hydraulic conductivity were used from the geotechnical report performed on the opposite side of the intake canal. The lowest value of the sample was used. A safety factor of 2 was applied to this.
- 6.7 The existing site was modeled as a single basin flowing into the Indian River. This basin was assigned a conservative time of concentration value of 8 minutes. A peak flow was determined for the 10 and 25 year events in Appendix L - 10 and 25 – Year StormNET Input and Output for Existing Conditions

7.0 Summary of Results

- 7.1 As shown in Appendix L, the existing site discharges at a rate of 25.23 CFS for the 25 year event. The 10 year event discharges at 19.74 CFS.
- 7.2 Reference Appendix K - Water Quality Calculations for the results of the water quality calculations. The requirement to retain 150% of 1.25 inches of rain over the impervious area plus ½ inch of rain over the entire site controlled the overall design. As shown in the individual pond calculations, weir elevations were set at or above the elevation required to meet water quality volume in each retention area. The sum of these areas will therefore exceed the total water quality volume required for the entire site.
- 7.3 As shown in Appendix O – 25 – Year StormNET Input and Output, the sum of outflows from the

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retention areas to the Indian River is 23.10 cfs. This is less than the existing 25 year outflow of 25.23 cfs. The 10 year outflow is 15.84 cfs. This is less than the existing 10 year outflow of 19.74 cfs. The large pond has 0.72 feet of freeboard for the 10 year event, 0.58 feet of freeboard for the 25 year event, and 0.36 feet of freeboard for the 100 year event. The pond is not overtopped. The outflow channel flows at 89% of capacity during the 100 year event.

- 7.4 The pond recovery calculations show that all 5 retention areas recover in at most three days. The large pond recovers approximately in exactly three days (note that plug flow was used so this recovery time is conservative). The smaller retention areas all recover in less than one day due to their depth in relation to their height above ground water. Two of these areas recover from vertical unsaturated infiltration alone. Reference Appendix Q – Pond Recovery for details.

8.0 Conclusions

- 8.1 The ponds meet the overall water quality volume requirement of 1.14 acre-feet. A total of 1.18 acre-feet of water quality volume is provided on the site. The discharge of 23.10 cfs for the 25 year storm is below the required discharge of 25.23 cfs. All retention areas recover in three days or less.

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APPENDIX A

ARIAL PHOTO



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APPENDIX B

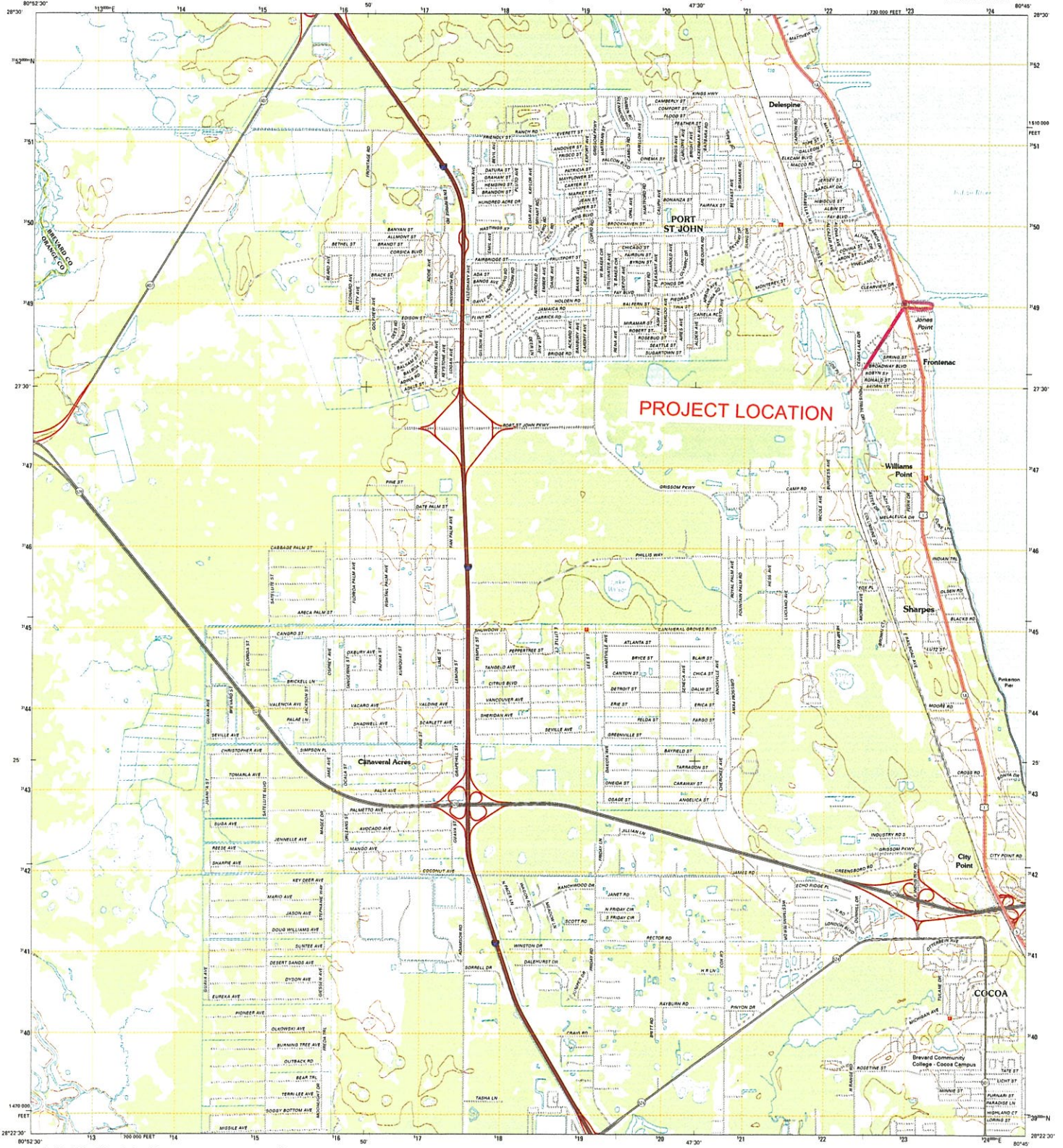
PROJECT LOCATION



U.S. DEPARTMENT OF THE INTERIOR
U. S. GEOLOGICAL SURVEY



SHARPES QUADRANGLE
FLORIDA
7.5-MINUTE SERIES

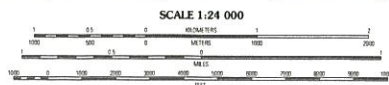


PROJECT LOCATION

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84) Projection and
1,800-meter grid. Universal Transverse Mercator, Zone 17N
10,000-foot scale. Florida Coordinate System of 1983 (not
used).

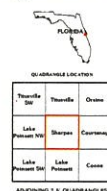
Imagery:.....NAP, May 2010 - June 2010
Roads:.....©2006-2011 TomTom
Name:.....©2011
Hydrography:.....National Hydrography Dataset, 2010
Contours:.....National Elevation Dataset, 2012
Boundaries:.....Census, BNC, INC, USGS, 1972 - 2010

UTM (Zone 18N) and NAD83 (North
American Datum of 1983) coordinates
U.S. National Grid
100,000 Square Feet
1:100,000
1:100,000



CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1983

This map was produced in conformance with the
National Computer Program US Top Product Standard, 2011
A metadata file associated with this product is draft version 0.6.3

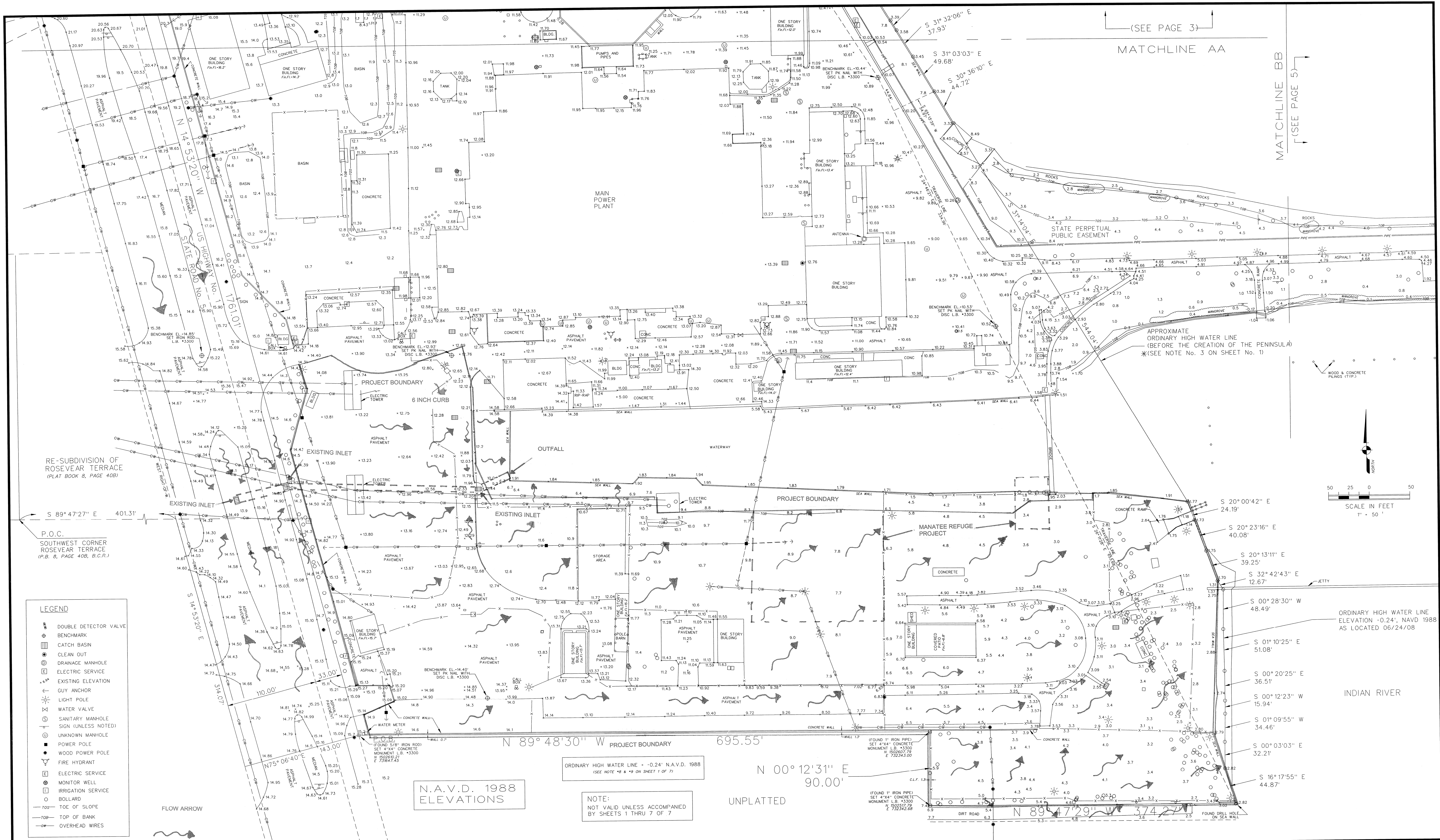


SHARPES, FL
2012

ZACHRY	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

APPENDIX C

EXISTING DRAINAGE PATTERNS



AVIROM & ASSOCIATES, INC.
SURVEYING & MAPPING
50 S.W. 2ND AVENUE, SUITE 102
BOCA RATON, FLORIDA 33432
TEL. (561) 392-2594, FAX (561) 394-7125
www.AVIROM-SURVEY.com

SCALE	1" = 50'
DATE	06/24/08
BY	A.M.R.
CK'D.	M.D.A.
F.B.	S1
PG.	70

REVISIONS
REVISE LEGAL - ADD PENINSULA
REVISE BOUNDARY TO INCLUDE SUBMERGED LANDS
REVISE SURVEY PER BREVARD CO. LETTER

DATE	F.B. / PG.	BY	CK'D
07/29/08	S-3 / 63	A.M.R.	M.D.A.
09/10/08	-	A.M.R.	M.D.A.
01/26/09	-	A.M.R.	M.D.A.

REVISIONS
REVISE LEGAL - ADD PENINSULA
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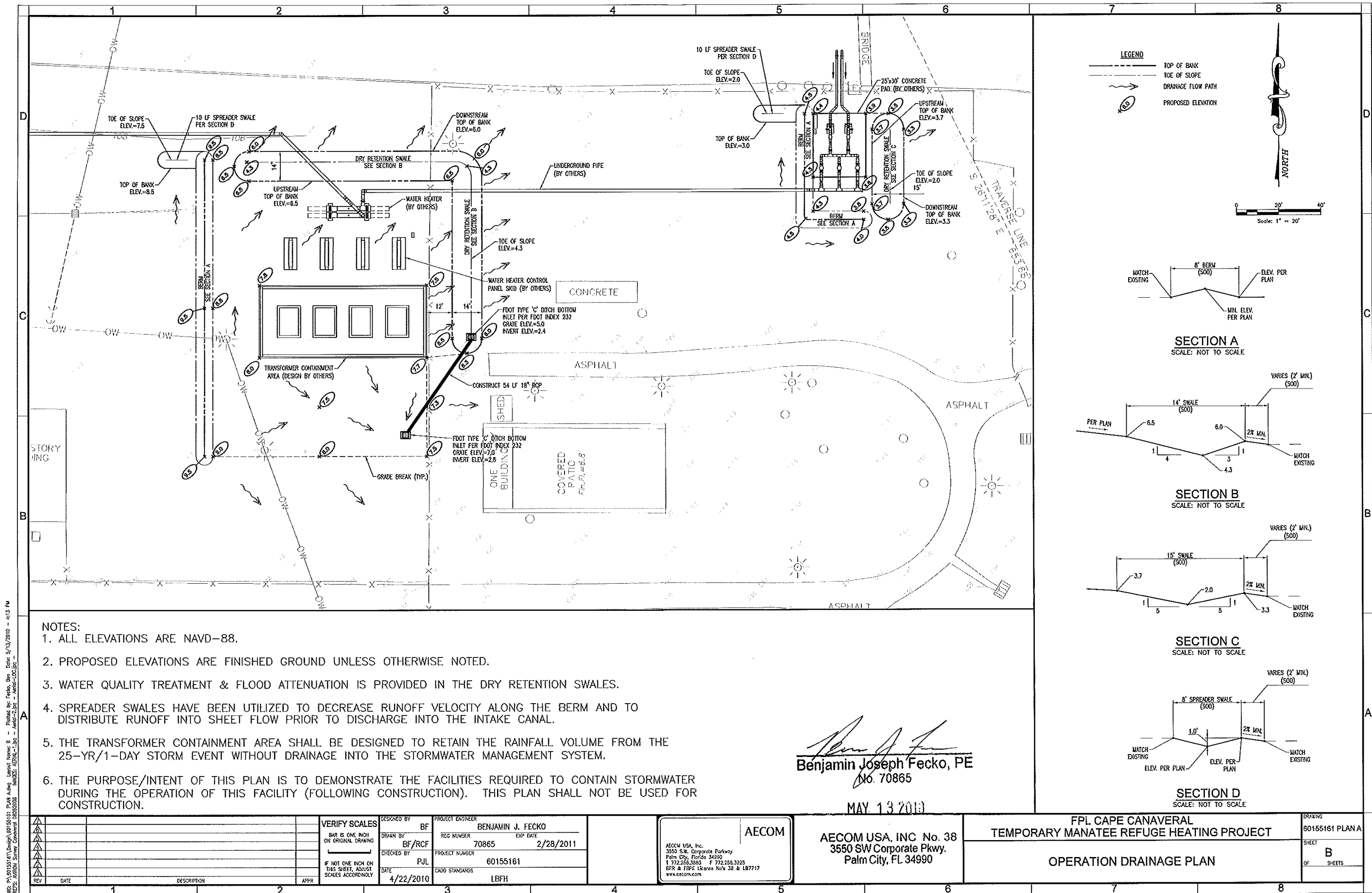
**TOPOGRAPHIC
SURVEY**
CAPE CANAVERAL
PLANT
SECTION 19, TOWNSHIP 23 S., RANGE 36 E.
BREVARD COUNTY
FLORIDA.

SHEET
4
OF
7

	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

APPENDIX D

MANATEE REFUGE OPERATIONAL DRAINAGE PLAN



DWG: P:\0155161\Drawings\0155161 PLAN A.dwg Layout: Name: B - Printed By: Fecko, Ben Date: 5/13/2010 - 4:13 PM
XREFS: ARDRI Survey Coverd 0055008 NOTES: USUAL - L100 - Aerial - LOC: B1

- NOTES:
1. ALL ELEVATIONS ARE NAVD-88.
 2. PROPOSED ELEVATIONS ARE FINISHED GROUND UNLESS OTHERWISE NOTED.
 3. WATER QUALITY TREATMENT & FLOOD ATTENUATION IS PROVIDED IN THE DRY RETENTION SWALES.
 4. SPREADER SWALES HAVE BEEN UTILIZED TO DECREASE RUNOFF VELOCITY ALONG THE BERM AND TO DISTRIBUTE RUNOFF INTO SHEET FLOW PRIOR TO DISCHARGE INTO THE INTAKE CANAL.
 5. THE TRANSFORMER CONTAINMENT AREA SHALL BE DESIGNED TO RETAIN THE RAINFALL VOLUME FROM THE 25-YR/1-DAY STORM EVENT WITHOUT DRAINAGE INTO THE STORMWATER MANAGEMENT SYSTEM.
 6. THE PURPOSE/INTENT OF THIS PLAN IS TO DEMONSTRATE THE FACILITIES REQUIRED TO CONTAIN STORMWATER DURING THE OPERATION OF THIS FACILITY (FOLLOWING CONSTRUCTION). THIS PLAN SHALL NOT BE USED FOR CONSTRUCTION.

Benjamin Joseph Fecko, PE
Benjamin Joseph Fecko, PE
No. 70865

MAY 13 2010

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ZACHRY	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
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APPENDIX E

USDA SOIL REPORT



United States
Department of
Agriculture



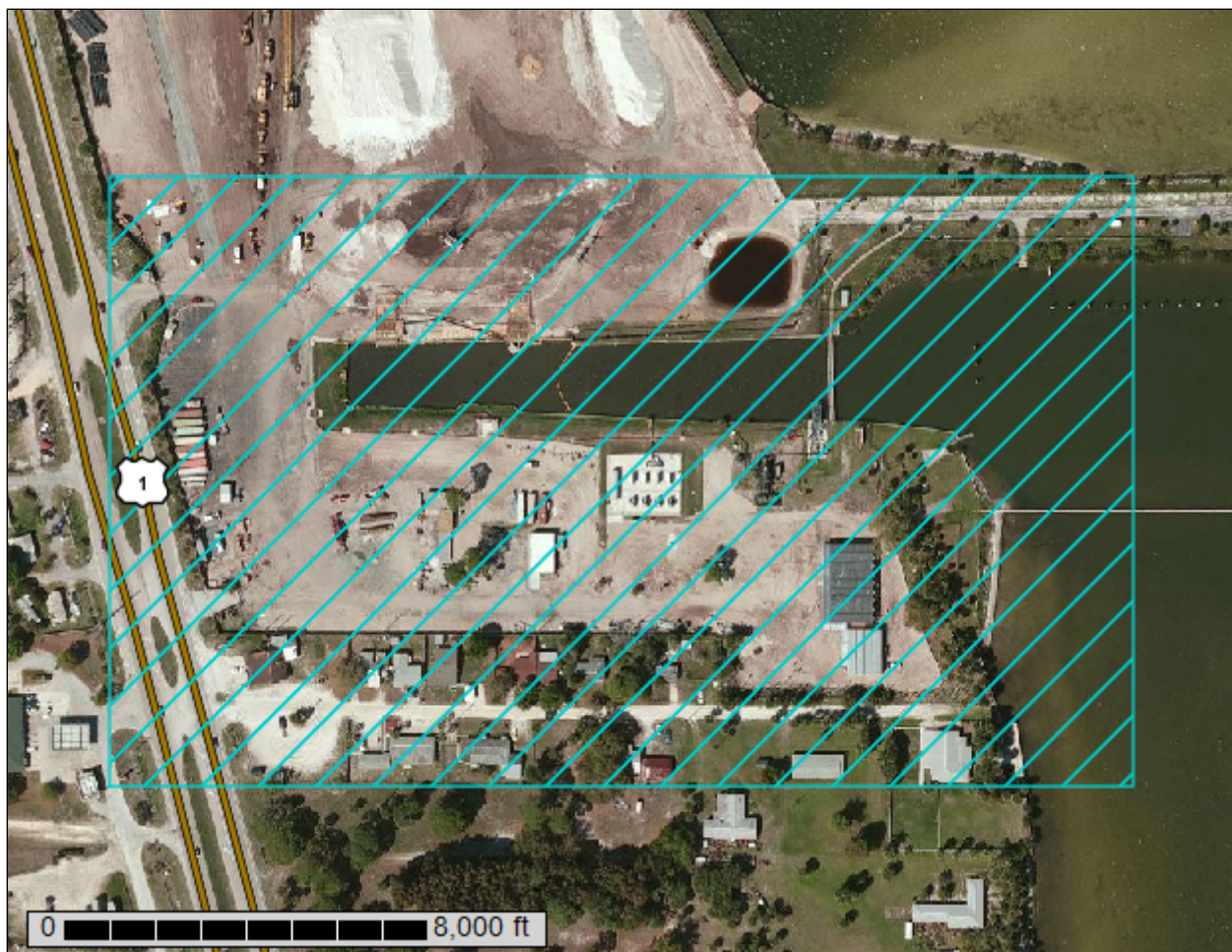
NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Brevard County, Florida

Southern Improvement Soils Map



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://soils.usda.gov/sqi/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<http://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://soils.usda.gov/contact/state_offices/).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means

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Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

Water Features

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Brevard County, Florida
Survey Area Data: Version 10, Jun 7, 2012

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 12, 2011—Mar 13, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Brevard County, Florida (FL009)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10	Canaveral-Urban land complex	1.3	4.9%
39	Myakka-Urban land complex	5.3	20.1%
50	Pomello-Urban land complex	8.8	33.6%
69	Urban land	5.8	22.1%
100	Waters of the Atlantic Ocean	5.1	19.3%
Totals for Area of Interest		26.3	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments

on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Brevard County, Florida

10—Canaveral-Urban land complex

Map Unit Setting

Elevation: 10 to 100 feet

Mean annual precipitation: 49 to 57 inches

Mean annual air temperature: 68 to 75 degrees F

Frost-free period: 350 to 365 days

Map Unit Composition

Canaveral and similar soils: 50 percent

Urban land: 40 percent

Minor components: 10 percent

Description of Canaveral

Setting

Landform: Ridges on marine terraces, flats on marine terraces

Landform position (three-dimensional): Interfluve

Down-slope shape: Convex

Across-slope shape: Linear

Parent material: Sandy marine deposits

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very high (19.98 to 50.02 in/hr)

Depth to water table: About 30 to 60 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 15 percent

Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)

Sodium adsorption ratio, maximum: 6.0

Available water capacity: Very low (about 1.4 inches)

Interpretive groups

Farmland classification: Not prime farmland

Land capability (nonirrigated): 6s

Hydrologic Soil Group: A

Other vegetative classification: Forage suitability group not assigned (G156BC999FL)

Typical profile

0 to 6 inches: Sand

6 to 12 inches: Sand

12 to 80 inches: Coarse sand

Description of Urban Land

Setting

Landform: Marine terraces

Landform position (three-dimensional): Interfluve, tal

Down-slope shape: Linear

Custom Soil Resource Report

Across-slope shape: Linear

Parent material: No parent material

Interpretive groups

Farmland classification: Not prime farmland

Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

Minor Components

Anclote

Percent of map unit: 4 percent

Landform: — error in exists on —

Landform position (three-dimensional): Talf

Down-slope shape: Linear

Across-slope shape: Linear

Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

Myakka

Percent of map unit: 3 percent

Landform: Flats on marine terraces

Landform position (three-dimensional): Talf

Down-slope shape: Convex

Across-slope shape: Linear

Ecological site: South Florida Flatwoods (R155XY003FL)

Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

Pompano

Percent of map unit: 3 percent

Landform: Flats on marine terraces

Landform position (three-dimensional): Talf

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: Slough (R155XY011FL)

Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

39—Myakka-Urban land complex

Map Unit Setting

Mean annual precipitation: 49 to 57 inches

Mean annual air temperature: 68 to 75 degrees F

Frost-free period: 350 to 365 days

Map Unit Composition

Myakka and similar soils: 45 percent

Urban land: 40 percent

Minor components: 15 percent

Description of Myakka

Setting

Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.57 to 1.98 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water capacity: Low (about 4.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4w
Hydrologic Soil Group: B/D
Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

Typical profile

0 to 8 inches: Sand
8 to 22 inches: Sand
22 to 35 inches: Sand
35 to 46 inches: Sand
46 to 63 inches: Sand

Description of Urban Land

Setting

Landform: Marine terraces
Landform position (three-dimensional): Interfluve, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: No parent material

Interpretive groups

Farmland classification: Not prime farmland
Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

Minor Components

Pomello

Percent of map unit: 5 percent
Landform: Flats on marine terraces, rises on marine terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex

Custom Soil Resource Report

Across-slope shape: Linear
Ecological site: Sand Pine Scrub (R155XY001FL)
Other vegetative classification: Forage suitability group not assigned (G156BC999FL)

Eaugallie

Percent of map unit: 5 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: South Florida Flatwoods (R155XY003FL)
Other vegetative classification: Forage suitability group not assigned (G156BC999FL)

Immokalee

Percent of map unit: 5 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: South Florida Flatwoods (R155XY003FL)
Other vegetative classification: Forage suitability group not assigned (G156BC999FL)

50—Pomello-Urban land complex

Map Unit Setting

Mean annual precipitation: 49 to 57 inches
Mean annual air temperature: 68 to 75 degrees F
Frost-free period: 350 to 365 days

Map Unit Composition

Pomello and similar soils: 50 percent
Urban land: 40 percent
Minor components: 10 percent

Description of Pomello

Setting

Landform: Rises on marine terraces, flats on marine terraces
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained

Custom Soil Resource Report

Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water capacity: Low (about 3.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6s
Hydrologic Soil Group: A
Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

Typical profile

0 to 3 inches: Sand
3 to 50 inches: Sand
50 to 62 inches: Sand
62 to 80 inches: Sand

Description of Urban Land

Setting

Landform: Marine terraces
Landform position (three-dimensional): Interfluve, talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: No parent material

Interpretive groups

Farmland classification: Not prime farmland
Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

Minor Components

Myakka

Percent of map unit: 5 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: South Florida Flatwoods (R155XY003FL)
Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

Immokalee

Percent of map unit: 5 percent
Landform: Flats on marine terraces
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Linear
Ecological site: South Florida Flatwoods (R155XY003FL)
Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

69—Urban land

Map Unit Composition

Urban land: 100 percent

Description of Urban Land

Setting

Landform: Marine terraces

Landform position (three-dimensional): Interfluve, tal

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: No parent material

Interpretive groups

Farmland classification: Not prime farmland

Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

100—Waters of the Atlantic Ocean

Map Unit Composition

Waters of the atlantic ocean: 100 percent

Description of Waters Of The Atlantic Ocean

Interpretive groups

Farmland classification: Not prime farmland

Other vegetative classification: Forage suitability group not assigned
(G156BC999FL)

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ZACHRY	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013	
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APPENDIX F

PRECIPITATION DATA FOR MELBOURNE, FLORIDA

[[HDD](#) (BASE 65)]
 TOTAL THIS MO. 0 CLEAR (SCALE 0-3) 20
[DPTR](#) [FM](#) [NORMAL](#) 0 [PTCLDY](#) (SCALE 4-7) 2
 TOTAL [FM](#) JUL 1 0 CLOUDY (SCALE 8-10) 0
[DPTR](#) [FM](#) [NORMAL](#) 0

[[CDD](#) (BASE 65)]
 TOTAL THIS MO. 404
[DPTR](#) [FM](#) [NORMAL](#) 30 [PRESSURE DATA]
 TOTAL [FM](#) JAN 1 2293 HIGHEST [SLP](#) M ON M
[DPTR](#) [FM](#) [NORMAL](#) 215 LOWEST [SLP](#) 29.90 ON 14

[REMARKS]

National Weather Service
 National Weather Service National Headquarters
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 Silver Spring, MD 20910
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[VSBY](#) 1/2 MILE OR LESS
 8 = [SMOKE](#) OR [HAZE](#)
 9 = [BLOWING SNOW](#)
 X = [TORNADO](#)

[NO. OF DAYS WITH]		[WEATHER - DAYS WITH]	
MAX 32 OR BELOW:	0	0.01 INCH OR MORE:	19
MAX 90 OR ABOVE:	8	0.10 INCH OR MORE:	12
MIN 32 OR BELOW:	0	0.50 INCH OR MORE:	5
MIN 0 OR BELOW:	0	1.00 INCH OR MORE:	2

[\[HDD \(BASE 65\) \]](#)
 TOTAL THIS MO. 0
[DPTR FM NORMAL](#) 0
 TOTAL [FM JUL 1](#) 0
[DPTR FM NORMAL](#) 0

		CLEAR (SCALE 0-3)	26
		PTCLDY (SCALE 4-7)	5
		CLOUDY (SCALE 8-10)	0

[\[CDD \(BASE 65\) \]](#)
 TOTAL THIS MO. 530
[DPTR FM NORMAL](#) 14
 TOTAL [FM JAN 1](#) 1889
[DPTR FM NORMAL](#) 185

[PRESSURE DATA]
 HIGHEST [SLP](#) 30.18 ON 30
 LOWEST [SLP](#) 29.88 ON 12

[REMARKS]
 7/21/13 TEMPERATURES FROM MLBF1 COOP SITE
 #FINAL-07-13#

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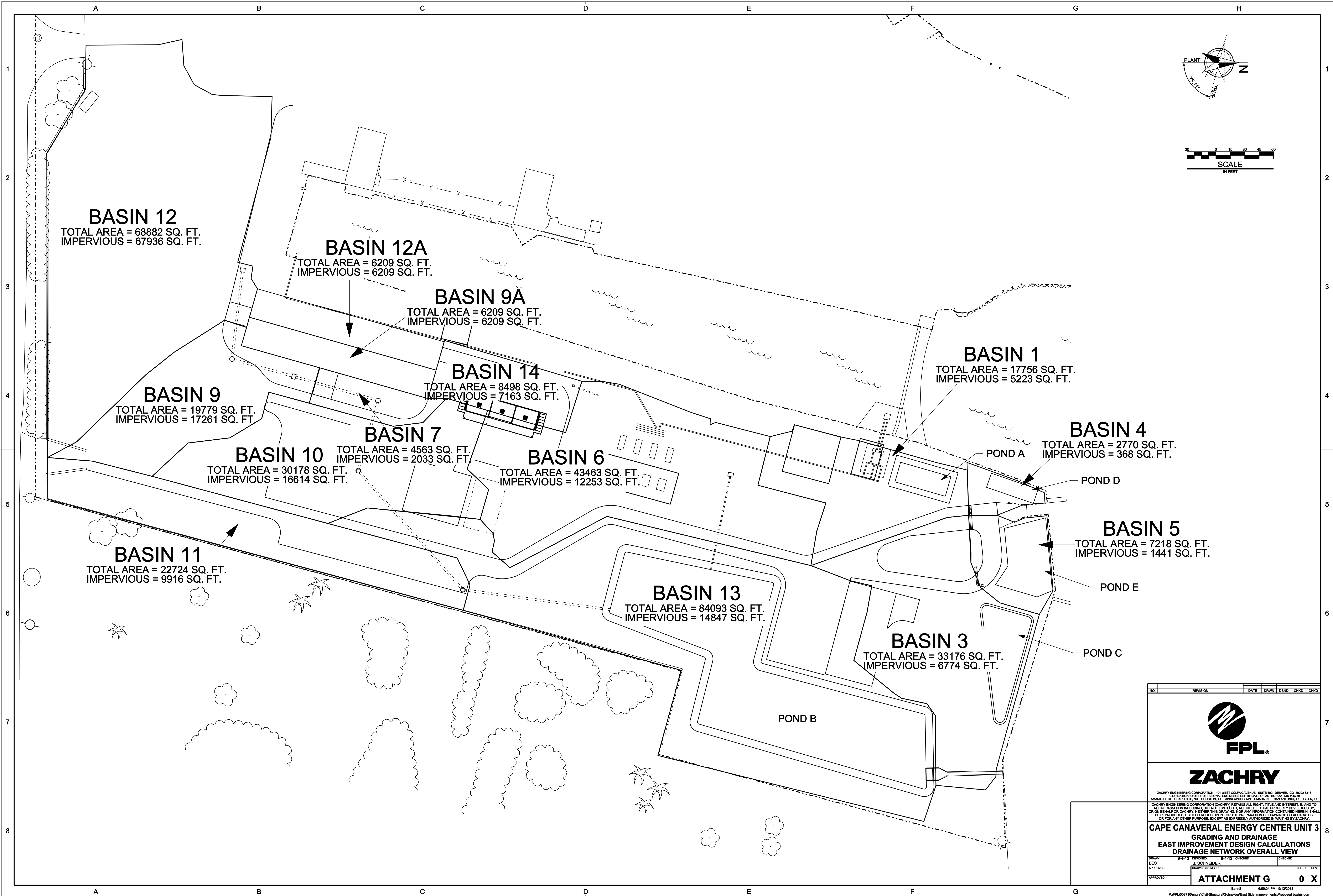
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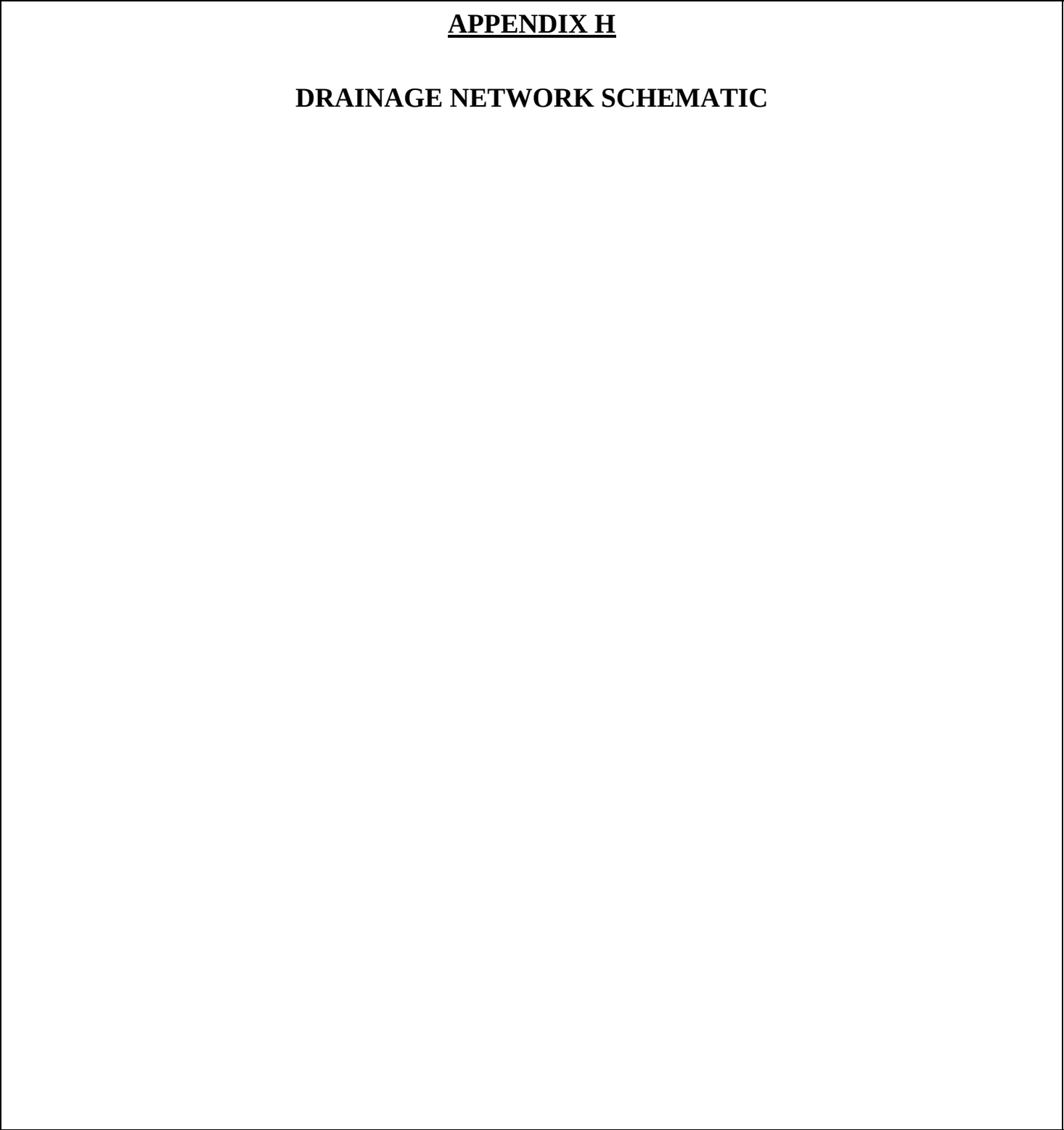
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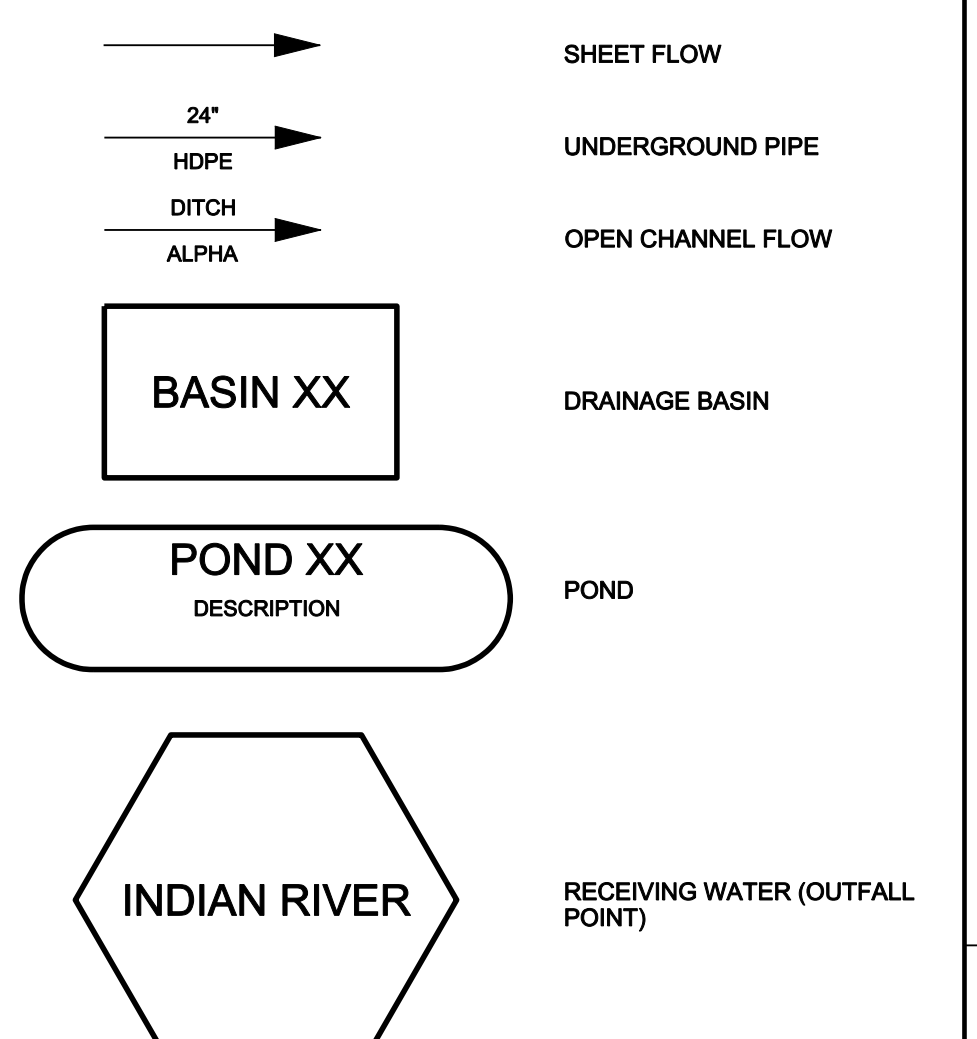
APPENDIX G

DRAINAGE NETWORK OVERALL VIEW



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APPENDIX I

TIDE DATUM ELEVATIONS

Sep 4 2013 14:57 GMT ELEVATIONS ON STATION DATUM
National Ocean Service (NOAA)

Station:	8721604	T.M.:	75 W
Name:	Trident Pier, FL	Units:	Feet
Status:	Accepted (Jul 19 2011)	Epoch:	1983-2001
		Datum:	STND

Datum	Value	Description
<u>MHHW</u>	21.89	Mean Higher-High Water
<u>MHW</u>	21.54	Mean High Water
<u>NAVD88</u>	20.84	North American Vertical Datum of 1988
<u>DTL</u>	19.93	Mean Diurnal Tide Level
<u>MSL</u>	19.86	Mean Sea Level
<u>MTL</u>	19.85	Mean Tide Level
<u>MLW</u>	18.15	Mean Low Water
<u>MLLW</u>	17.98	Mean Lower-Low Water
<u>STND</u>	0.00	Station Datum
<u>GT</u>	3.91	Great Diurnal Range
<u>MN</u>	3.39	Mean Range of Tide
<u>DHO</u>	0.35	Mean Diurnal High Water Inequality
<u>DLO</u>	0.17	Mean Diurnal Low Water Inequality
<u>HWI</u>	0.21	Greenwich High Water Interval (in Hours)
<u>LWI</u>	6.39	Greenwich Low Water Interval (in Hours)
Maximum	25.91	Highest Observed Water Level
Max Date	20040926	Highest Observed Water Level Date
Max Time	09:36	Highest Observed Water Level Time
Minimum	16.12	Lowest Observed Water Level
Min Date	20090112	Lowest Observed Water Level Date
Min Time	07:06	Lowest Observed Water Level Time
<u>HAT</u>	23.42	Highest Astronomical Tide
HAT Date	19931016	Highest Astronomical Tide Date
HAT Time	12:48	Highest Astronomical Tide Time
<u>LAT</u>	16.77	Lowest Astronomical Tide
LAT Date	19970208	Lowest Astronomical Tide Date
LAT Time	06:36	Lowest Astronomical Tide Time

Tidal Datum Analysis Period: 01/01/1997 - 12/31/2006
03/01/2008 - 02/28/2011

Click [HERE](#) for further station information including New Epoch products.

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APPENDIX J

EXCERPT FROM TERRACON GEOTECHNICAL ENGINEERING REPORT

Our recommendations regarding design and construction of stormwater management facilities are provided in the following sections.

4.2 Earthwork

We anticipate retention pond construction will be initiated by stripping any remaining debris from demolition of the old power plant. Stripping depths between our boring locations and across the site could vary and we recommend actual stripping depths be evaluated by a representative of Terracon during construction. Soil placed within the vicinity of the proposed retention ponds should not be placed with more compactive effort than necessary to shape the soil. An exception would be placement of fill around the retaining wall around a portion of the perimeter of Pond A. Recommendations for earthwork pertaining to structures, contained within our previous report, should be followed in this area. When design plans are available for the retaining wall, Terracon should be afforded the opportunity to review them to verify the applicability of our recommendations.

Engineered fill should meet the following material property requirements:

Fill Type	USCS Classification	Acceptable Location for Placement
General ¹	SP to SP-SM (fines content < 7 percent)	All locations and elevations
¹ . More specifically, fill placed within the vicinity of the proposed retention ponds should be of similar permeability to the in-place soils, including as measured in our laboratory.		

4.3 Stormwater Retention

It is our opinion that the proposed stormwater retention facilities could be constructed to function as required if the recommended site preparation procedures are implemented at the site. Our recommended design parameters and a summary of our recovery analyses are presented in the following sections. Stormwater facilities considered within this supplemental scope include dry retention Ponds A, B, and C as well as the dry retention pond within the containment berm at the north end of the site (referenced herein as Pond containment).

4.3.1 Design Parameters

Terracon considered the clayey soils of Stratum 3 to be the confining layer for the purpose of this supplemental scope. Based on our field exploration, including verification provided by our supplemental hand auger borings, Terracon notes the encountered groundwater table was encountered between elevations 1 foot and 1.5 feet at the corresponding boring locations. Accordingly, we estimate the seasonal high water table will be at elevation 4.4 feet at Pond A, elevation 4.0 at Pond B, and elevation 3.5 at Pond C and Pond containment. The in place sands

and the specified composition of new fill, which shall have permeability rates similar to the in place sands as noted in Section 4.2 of this supplemental report, includes fine sands and sands with a moderate amount of fines (silt). Soils meeting these criteria generally have a fillable porosity (η) of 30 percent, the value used in our recovery analyses.

Composite samples were collected from Borings SB-15 and SB-7, representing Ponds A and B. These samples were submitted to permeability testing in our laboratory. There was not enough sample remaining from Boring SB-2, so the technician who performed Hand Auger Borings HA-2 and HA-7 collected a bulk sample of the recently excavated subgrade soil from around the location of SB-2. This sample was also submitted to laboratory permeability testing. These samples yielded measured permeability rates of 11.1 feet/day, 8.4 feet/day, and 14.3 feet/day. These rates should be considered representative of the unsaturated vertical infiltration rate, though an appropriate factor of safety (at least 2.0) should be applied to the measured rates when use for stormwater design and recovery analysis. Based on our experience with similar soils, Terracon estimates horizontal saturated hydraulic conductivity rates slightly greater than the vertical permeability rates, as noted in the following table. The following table summarizes our recommended stormwater management system design parameters.

Parameter	Pond A	Pond B	Pond C	Pond containment
Estimated Confining Layer Elevation, B	-48.5 feet	-47.5 feet	-42.5 feet	-42.5 feet
Estimated Seasonal High Water Table Elevation, WT	4.41 feet	4 feet	3.50 feet	3.50 feet
Unsaturated Vertical Infiltration Rate, k_v	7 feet/day	4 feet/day	5.05 feet/day	5.05 feet/day
Horizontal Saturated Hydraulic Conductivity, k_H	9.30 feet/day	5.50 feet/day	7.30 feet/day	7.30 feet/day
Fillable Porosity, η	30 percent	30 percent	30 percent	30 percent

Stage storage relationships for each stormwater retention facility were provided by Zachry Engineering, Inc., as were the water quality volumes. These data are included within the appended recovery analysis outputs.

Because certain design conditions exist, certain considerations/modifications needed to be made to our PONDS analyses from basic, isolated pond recovery analyses. Among these was a reduction of the horizontal saturated hydraulic conductivity rate for Pond A based on the partially walled perimeter (partial depth wall). This reduction was calculated using the method in the PONDS technical memorandum [How To Modify The Horizontal Hydraulic Conductivity](#)

Value To Model The Effect Of A Partially Penetrating or Completely Penetrating Retaining Wall (or Clay Core) Around A Retention Pond revision dated January 28, 2009. Because the areal shape of the Pond C and Pond containment are irregular, we calculated their effective length and width by the method described in PONDS technical memorandum Calculating Effective Length and Width of a Pond dated January 21, 2008. However, because these ponds also have a shared boundary, we reduced their effective perimeters by the shared length and recalculated a reduced effective width and length of the pervious pavement by the first method described in PONDS technical memorandum Modeling a Pond with a Shared Boundary dated February 3, 2009. For both ponds, we maintained nearly the same length to width ratio. The values in the preceding table consider the reductions/modifications described in this paragraph.

4.3.2 Recovery Analysis

We analyzed the recovery of the water quality volume for each pond using version 3.3.0229 of the engineering software PONDS. Using the design parameters and modeling modifications described above, we calculate that all three retention ponds (including the pervious pavement) recover the water quality volume within 72 hours as required. Our recovery analyses are included in Appendix C.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical

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APPENDIX K

WATER QUALITY CALCULATIONS

Cape Canaveral East Water Quality Calculations

OVERALL SITE		
Sub Area	ALL	
Pervious	4.16141	50.99%
Impervious	4.000161	49.01%
Total	8.16157	

Required Retention 1.135123 acre ft 150%(1.25" over impervious + 0.5" over everything)
 1.020196 acre ft 150%(0.5" from all + 0.5" from all)

POND A		
Sub Area	1	
Pervious	0.287718	70.58%
Impervious	0.119904	29.42%
Total	0.407622	

Required Retention 0.044211 acre ft 150%(1.25" over impervious + 0.5" over everything)

POND B												
Sub Area	6	7	9	9A	10	11	12	12A	13	14	SUM	
Pervious	0.716483	0.058081	0.057805	0	0.311387	0.294031	0.021717	0	1.589669	0.030647383	3.079821	45.54%
Impervious	0.28129	0.046671	0.396258	0.142539	0.381405	0.22764	1.559596	0.142539	0.34084	0.164439853	3.683219	54.46%
Total	0.997773	0.104752	0.454063	0.142539	0.692792	0.521671	1.581313	0.142539	1.93051	0.195087236	6.763039	

Required Retention 0.998193 acre ft 150%(1.25" over impervious + 0.5" over everything)

POND C		
Sub Area	3	
Pervious	0.606107	79.58%
Impervious	0.15551	20.42%
Total	0.761616	

Required Retention 0.071899 acre ft 150%(1.25" over impervious + 0.5" over everything)

POND D		
Sub Area	4	
Pervious	0.055142	86.71%
Impervious	0.008448	13.29%
Total	0.06359	

Required Retention 0.005294 acre ft 150%(1.25" over impervious + 0.5" over everything)

POND E		
Sub Area	5	
Pervious	0.132622	80.04%
Impervious	0.033081	19.96%
Total	0.165702	

Required Retention 0.015525 acre ft 150%(1.25" over impervious + 0.5" over everything)

* UNITS ARE IN ACRES UNLESS STATED OTHERWISE

Provided Water Quality	
OVERALL SITE	
Required Water Quality	1.1351 acre-ft
Provided Water Quality	1.1810 acre-ft

POND A	
Weir Elevation	3.50 ft
Required Water Quality	0.0442 acre-ft
Provided Water Quality	0.0525 acre-ft

POND B	
Weir Elevation	4.30 ft
Required Water Quality	0.9982 acre-ft
Provided Water Quality	1.0294 acre-ft

POND C	
Weir Elevation	2.80 ft
Required Water Quality	0.0719 acre-ft
Provided Water Quality	0.0769 acre-ft

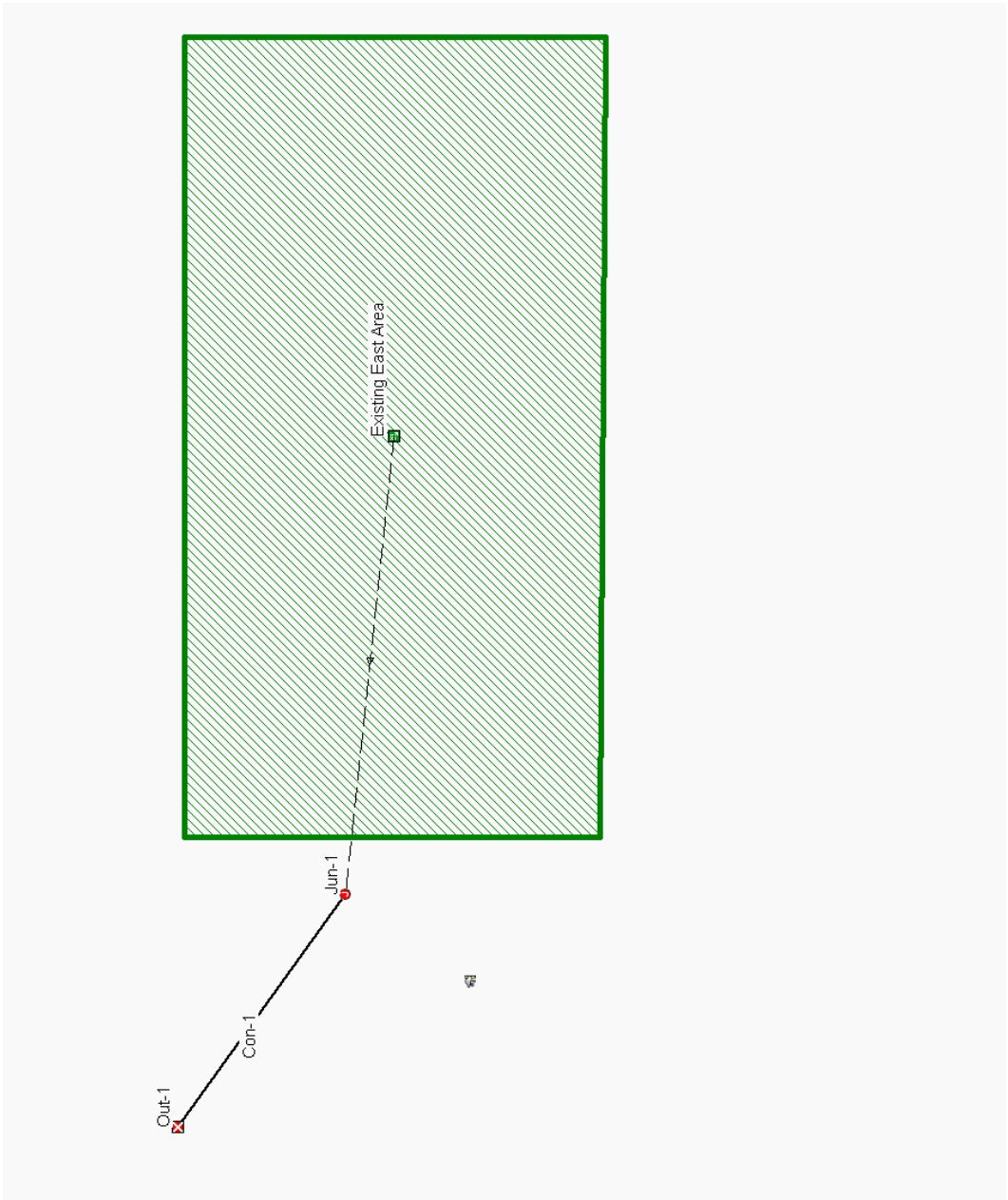
POND D	
Weir Elevation	1.75 ft
Required Water Quality	0.0053 acre-ft
Provided Water Quality	0.0063 acre-ft

POND E	
Weir Elevation	1.70 ft
Required Water Quality	0.0155 acre-ft
Provided Water Quality	0.0159 acre-ft

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APPENDIX L

10 AND 25 – YEAR STORMNET INPUT AND OUTPUT FOR EXISTING CONDITIONS



StormNET

Project Description

Project File Name : before pre existing east side.SPF
Project Description :

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method Santa Barbara UH
Time of Concentration (TOC) Method SCS TR-55
Link Routing Method Kinematic Wave
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On May 02, 2013 00:00:00
End Analysis On May 03, 2013 12:00:00
Start Reporting On May 02, 2013 00:00:00
Antecedent Dry Days 0 days
Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
Reporting Time Step 0 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Subbasin Summary

SN Subbasin ID	Area	Impervious Area	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
	(ft ²)	(%)			(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1 Existing East Area	356139.98	44.00	98.00	49.00	8.00	4.62	37.74	19.74	0 00:08:00

Node Summary

SN	Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
			(ft)	(ft)	(ft)	(ft)	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1	Jun-1	Junction	12.00	14.00	12.00	18.00	19.74	12.00	0.00	2.00	0 00:00	0.00	0.00
2	Out-1	OutFall	11.00				19.74	11.00					

Link Summary

SN ID	Element Type	From (Inlet Node)	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)
1	Con-1	Pipe	Jun-1	Out-1	67.18	0.00	0.00	0.0000	0.000	0.0150	19.74	0.00	0.00	0.00	0.00	0.00

Subbasin Hydrology

Subbasin : Existing East Area

Input Data

Area (ft²) 356139.98
Impervious Area (%) 44.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID Gage-1

Composite Curve Number

Soil/Surface Description	Area (ft ²)	Soil Group	Curve Number
Composite Area & Weighted CN	356139.98		70.56

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

T_c = Time of Concentration (hrs)
n = Manning's Roughness
L_f = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
S_f = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (S_f^{0.5}) (unpaved surface)
V = 20.3282 * (S_f^{0.5}) (paved surface)
V = 15.0 * (S_f^{0.5}) (grassed waterway surface)
V = 10.0 * (S_f^{0.5}) (nearly bare & untilled surface)
V = 9.0 * (S_f^{0.5}) (cultivated straight rows surface)
V = 7.0 * (S_f^{0.5}) (short grass pasture surface)
V = 5.0 * (S_f^{0.5}) (woodland surface)
V = 2.5 * (S_f^{0.5}) (forest w/heavy litter surface)
T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hrs)
L_f = Flow Length (ft)
V = Velocity (ft/sec)
S_f = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^{2/3}) * (S_f^{0.5})) / n
R = A_q / W_p
T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hrs)
L_f = Flow Length (ft)
R = Hydraulic Radius (ft)
A_q = Flow Area (ft²)
W_p = Wetted Perimeter (ft)
V = Velocity (ft/sec)
S_f = Slope (ft/ft)
n = Manning's Roughness

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 4.62
Peak Runoff (cfs) 19.74
Weighted Curve Number 70.56
Time of Concentration (days hh:mm:ss) 0 00:08:00

Junction Input

SN	Element ID	Invert Elevation	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Jun-1	12.00	14.00	2.00	12.00	0.00	18.00	4.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
		(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1	Jun-1	19.74	19.74	12.00	0.00	0.00	2.00	12.00	0.00	0 00:00	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	No. of Barrels
1	Con-1	67.18	0.00	-12.00	0.00	-11.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	1

Pipe Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(ft)		(min)	
1 Con-1	19.74	0 12:10	0.00	0.00	0.00	0.00	0.00	0.00	

Project Description

Project File Name : before pre existing east side.SPF
Project Description :

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method Santa Barbara UH
Time of Concentration (TOC) Method SCS TR-55
Link Routing Method Kinematic Wave
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On May 02, 2013 00:00:00
End Analysis On May 03, 2013 12:00:00
Start Reporting On May 02, 2013 00:00:00
Antecedent Dry Days 0 days
Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
Reporting Time Step 0 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Subbasin Summary

SN Subbasin ID	Area	Impervious Area	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
	(ft ²)	(%)			(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1 Existing East Area	356139.98	44.00	98.00	49.00	9.50	5.80	47.44	25.23	0 00:08:00

Node Summary

SN	Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
			(ft)	(ft)	(ft)	(ft)	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1	Jun-1	Junction	12.00	14.00	12.00	18.00	25.23	12.00	0.00	2.00	0 00:00	0.00	0.00
2	Out-1	OutFall	11.00				25.23	11.00					

Link Summary

SN ID	Element Type	From (Inlet Node)	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)
1	Con-1	Pipe	Jun-1	Out-1	67.18	0.00	0.00	0.0000	0.000	0.0150	25.23	0.00	0.00	0.00	0.00	0.00

Subbasin Hydrology

Subbasin : Existing East Area

Input Data

Area (ft²) 356139.98
Impervious Area (%) 44.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID Gage-1

Composite Curve Number

Soil/Surface Description	Area (ft ²)	Soil Group	Curve Number
Composite Area & Weighted CN	356139.98		70.56

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

T_c = Time of Concentration (hrs)
n = Manning's Roughness
L_f = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
S_f = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (S_f^{0.5}) (unpaved surface)
V = 20.3282 * (S_f^{0.5}) (paved surface)
V = 15.0 * (S_f^{0.5}) (grassed waterway surface)
V = 10.0 * (S_f^{0.5}) (nearly bare & untilled surface)
V = 9.0 * (S_f^{0.5}) (cultivated straight rows surface)
V = 7.0 * (S_f^{0.5}) (short grass pasture surface)
V = 5.0 * (S_f^{0.5}) (woodland surface)
V = 2.5 * (S_f^{0.5}) (forest w/heavy litter surface)
T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hrs)
L_f = Flow Length (ft)
V = Velocity (ft/sec)
S_f = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^{2/3}) * (S_f^{0.5})) / n
R = A_q / W_p
T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hrs)
L_f = Flow Length (ft)
R = Hydraulic Radius (ft)
A_q = Flow Area (ft²)
W_p = Wetted Perimeter (ft)
V = Velocity (ft/sec)
S_f = Slope (ft/ft)
n = Manning's Roughness

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 5.80
Peak Runoff (cfs) 25.23
Weighted Curve Number 70.56
Time of Concentration (days hh:mm:ss) 0 00:08:00

Junction Input

SN	Element ID	Invert Elevation	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Jun-1	12.00	14.00	2.00	12.00	0.00	18.00	4.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
		(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1	Jun-1	25.23	25.23	12.00	0.00	0.00	2.00	12.00	0.00	0 00:00	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Average Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	No. of Barrels
		(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(in)	(in)					(cfs)	
1	Con-1	67.18	0.00	-12.00	0.00	-11.00	0.0000	Dummy	0.000	0.000	0.0150	0.5000	0.5000	0.0000	0.00	1

Pipe Results

SN	Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number
		(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(ft)		(min)	
1	Con-1	25.23	0 12:10	0.00	0.00	0.00	0.00	0.00	0.00	

	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

APPENDIX M

STAGE AREA VOLUME RELATIONSHIPS

Pond A Stage - Area - Volume Relationship

EI	Area		
2	1166	Pond bottom	2
2.5	1485		
3	1836		
3.5	2220		
4	5601		

Elevation	Area	Volume ft3	Volume acre ft	
2	1166.05	0	0.0000	2
2.1	1227.21	119.663	0.0027	2.1
2.2	1289.67	245.507	0.0056	2.2
2.3	1353.43	377.662	0.0087	2.3
2.4	1418.49	516.258	0.0119	2.4
2.5	1484.85	661	0.0152	2.5
2.6	1552.51	813	0.0187	2.6
2.7	1621.47	972	0.0223	2.7
2.8	1691.73	1138	0.0261	2.8
2.9	1763.29	1310	0.0301	2.9
3	1836.15	1490	0.0342	3
3.1	1910.31	1678	0.0385	3.1
3.2	1985.77	1873	0.0430	3.2
3.3	2062.53	2075	0.0476	3.3
3.4	2140.59	2285	0.0525	3.4
3.5	2219.95	2503	0.0575	3.5
3.6	2896.2	2759	0.0633	3.6
3.7	3572.4	3082	0.0708	3.7
3.8	4248.6	3473	0.0797	3.8
3.9	4924.8	3932	0.0903	3.9
4	5601	4458	0.1023	4

Pond B - Area - Volume Relationship

EI	Area		
2.5	28621	Pond bottom	2.9
3	30156		
3.5	31710		
4	33282		
4.5	34873		
5	36482		
5.5	38109		

Elevation	Area	Volume ft3	Volume acre ft	Elevation
2.5	28620.83	0	0.0000	2.5
2.6	28926.44	0	0.0000	2.6
2.7	29232.78	0	0.0000	2.7
2.8	29539.85	0	0.0000	2.8
2.9	29847.67	0	0.0000	2.9
3	30156.21	3000	0.0689	3
3.1	30465.5	6031	0.1385	3.1
3.2	30775.52	9093	0.2088	3.2
3.3	31086.28	12186	0.2798	3.3
3.4	31397.77	15311	0.3515	3.4
3.5	31710	18466	0.4239	3.5
3.6	32022.97	21653	0.4971	3.6
3.7	32336.67	24871	0.5710	3.7
3.8	32651.11	28120	0.6455	3.8
3.9	32966.28	31401	0.7209	3.9
4	33282.19	34713	0.7969	4
4.1	33598.84	38057	0.8737	4.1
4.2	33916.22	41433	0.9512	4.2
4.3	34234.34	44841	1.0294	4.3
4.4	34553.19	48280	1.1084	4.4
4.5	34872.79	51751	1.1880	4.5
4.6	35193.11	55255	1.2685	4.6
4.7	35514.18	58790	1.3496	4.7
4.8	35835.98	62357	1.4315	4.8
4.9	36158.51	65957	1.5142	4.9
5	36481.79	69589	1.5975	5
5.1	36805.79	73254	1.6817	5.1
5.2	37130.54	76950	1.7665	5.2
5.3	37456.02	80680	1.8522	5.3
5.4	37782.24	84442	1.9385	5.4
5.5	38109.19	88236	2.0256	5.5
5.6	38436.88	92064	2.1135	5.6
5.7	38765.31	95924	2.2021	5.7
5.8	39094.47	99817	2.2915	5.8
5.9	39424.37	103743	2.3816	5.9
6	39755	107702	2.4725	6

Pond C Stage - Area - Volume Relationship

EI	Area	
2	3743	Pond bottom
2.5	4444	
3	14851	

Elevation	Area	Volume ft ³	Volume acre ft
2	3743	0	0
2.1	3883.2	381.31	0.008754
2.2	4023.4	776.64	0.017829
2.3	4163.6	1185.99	0.027227
2.4	4303.8	1609.36	0.036946
2.5	4444	2046.75	0.046987
2.6	6525.4	2595.22	0.059578
2.7	8606.8	3351.83	0.076947
2.8	10688.2	4316.58	0.099095
2.9	12769.6	5489.47	0.126021
3	14851	6870.5	0.157725

Pond D Stage - Area - Volume Relationship

EI	Area		
1.5	733	Pond bottom	1.5
1.75	1062		

Elevation	Area	Volume ft ³	Volume acre ft	
1.5	797	0	0	1.5
1.51	821.08	8.0904	0.000186	1.51
1.52	845.16	16.4216	0.000377	1.52
1.53	869.24	24.9936	0.000574	1.53
1.54	893.32	33.8064	0.000776	1.54
1.55	917.4	42.86	0.000984	1.55
1.56	941.48	52.1544	0.001197	1.56
1.57	965.56	61.6896	0.001416	1.57
1.58	989.64	71.4656	0.001641	1.58
1.59	1013.72	81.4824	0.001871	1.59
1.6	1037.8	91.74	0.002106	1.6
1.61	1061.88	102.2384	0.002347	1.61
1.62	1085.96	112.9776	0.002594	1.62
1.63	1110.04	123.9576	0.002846	1.63
1.64	1134.12	135.1784	0.003103	1.64
1.65	1158.2	146.64	0.003366	1.65
1.66	1182.28	158.3424	0.003635	1.66
1.67	1206.36	170.2856	0.003909	1.67
1.68	1230.44	182.4696	0.004189	1.68
1.69	1254.52	194.8944	0.004474	1.69
1.7	1278.6	207.56	0.004765	1.7
1.71	1302.68	220.4664	0.005061	1.71
1.72	1326.76	233.6136	0.005363	1.72
1.73	1350.84	247.0016	0.00567	1.73
1.74	1374.92	260.6304	0.005983	1.74
1.75	1399	274.5	0.006302	1.75
1.76	1423.08	288.6104	0.006626	1.76
1.77	1447.16	302.9616	0.006955	1.77
1.78	1471.24	317.5536	0.00729	1.78
1.79	1495.32	332.3864	0.007631	1.79
1.8	1519.4	347.46	0.007977	1.8

Pond E Stage - Area - Volume Relationship

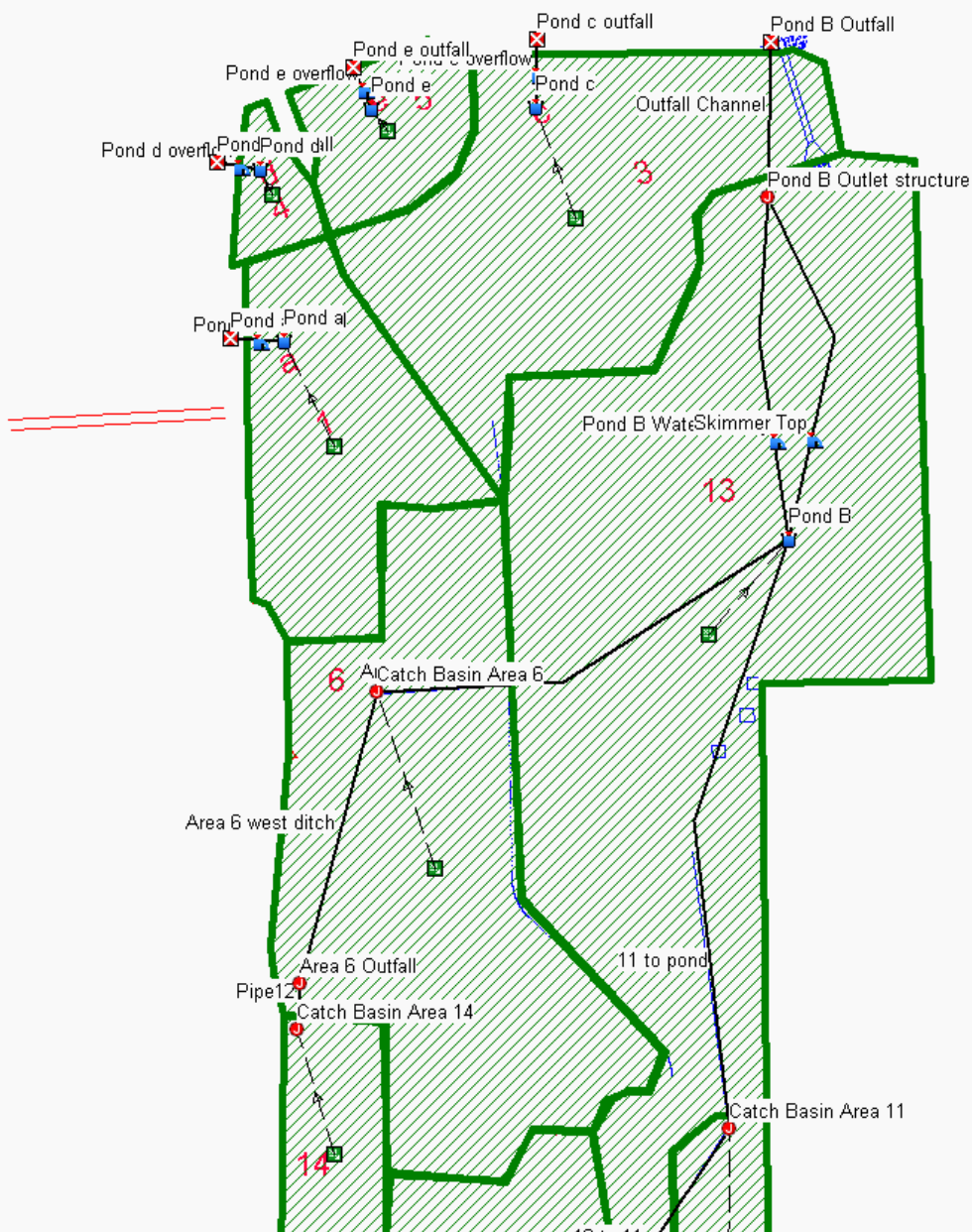
EI	Area		
1.5	3382	Pond bottom	1.5
1.75	3569		

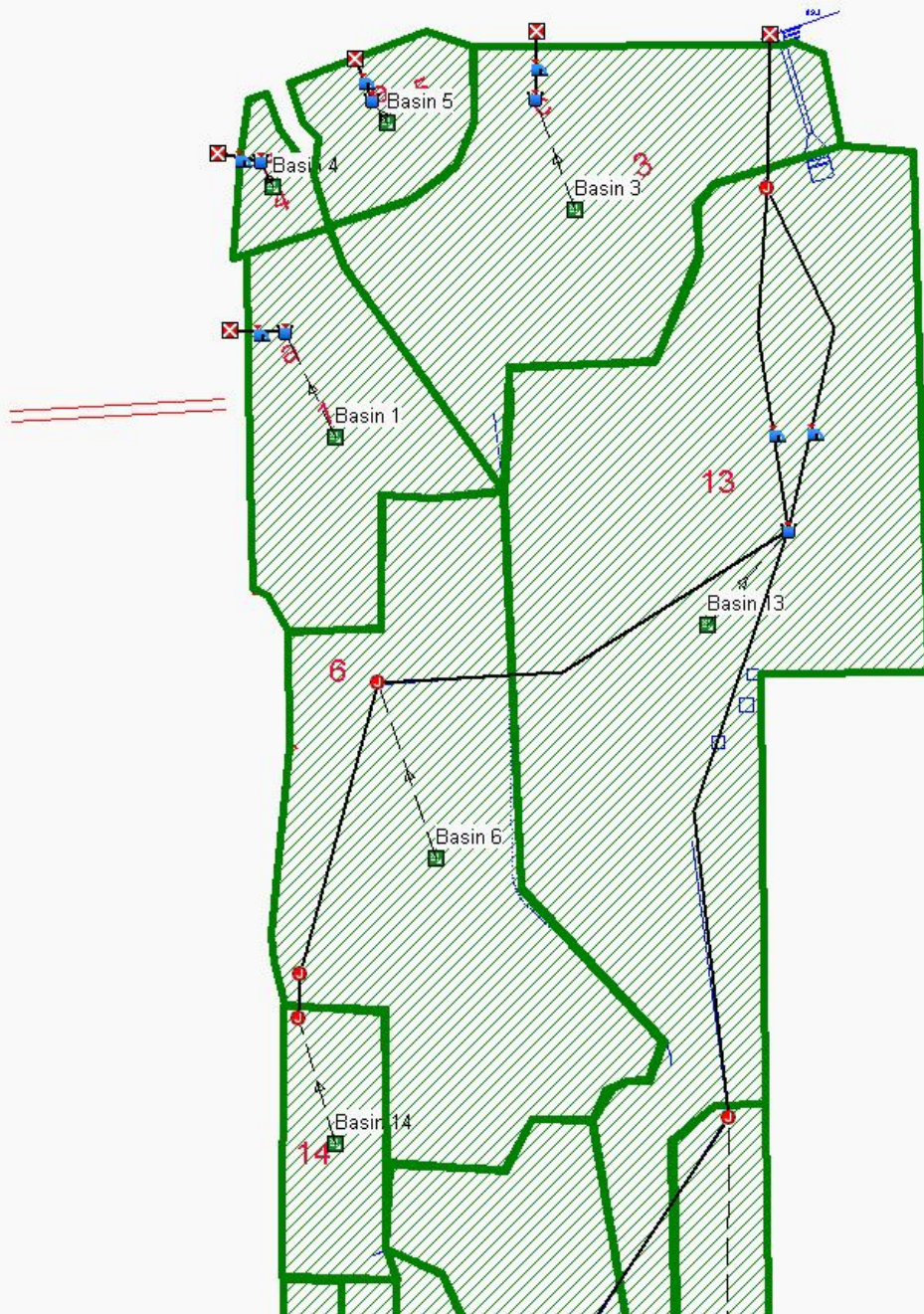
Elevation	Area	Volume ft ³	Volume acre ft	
1.5	3382	0	0	1.5
1.51	3389.48	33.8574	0.000777	1.51
1.52	3396.96	67.7896	0.001556	1.52
1.53	3404.44	101.7966	0.002337	1.53
1.54	3411.92	135.8784	0.003119	1.54
1.55	3419.4	170.035	0.003903	1.55
1.56	3426.88	204.2664	0.004689	1.56
1.57	3434.36	238.5726	0.005477	1.57
1.58	3441.84	272.9536	0.006266	1.58
1.59	3449.32	307.4094	0.007057	1.59
1.6	3456.8	341.94	0.00785	1.6
1.61	3464.28	376.5454	0.008644	1.61
1.62	3471.76	411.2256	0.00944	1.62
1.63	3479.24	445.9806	0.010238	1.63
1.64	3486.72	480.8104	0.011038	1.64
1.65	3494.2	515.715	0.011839	1.65
1.66	3501.68	550.6944	0.012642	1.66
1.67	3509.16	585.7486	0.013447	1.67
1.68	3516.64	620.8776	0.014253	1.68
1.69	3524.12	656.0814	0.015062	1.69
1.7	3531.6	691.36	0.015871	1.7
1.71	3539.08	726.7134	0.016683	1.71
1.72	3546.56	762.1416	0.017496	1.72
1.73	3554.04	797.6446	0.018311	1.73
1.74	3561.52	833.2224	0.019128	1.74
1.75	3569	868.875	0.019947	1.75
1.76	3576.48	904.6024	0.020767	1.76
1.77	3583.96	940.4046	0.021589	1.77
1.78	3591.44	976.2816	0.022412	1.78
1.79	3598.92	1012.233	0.023238	1.79
1.8	3606.4	1048.26	0.024065	1.8

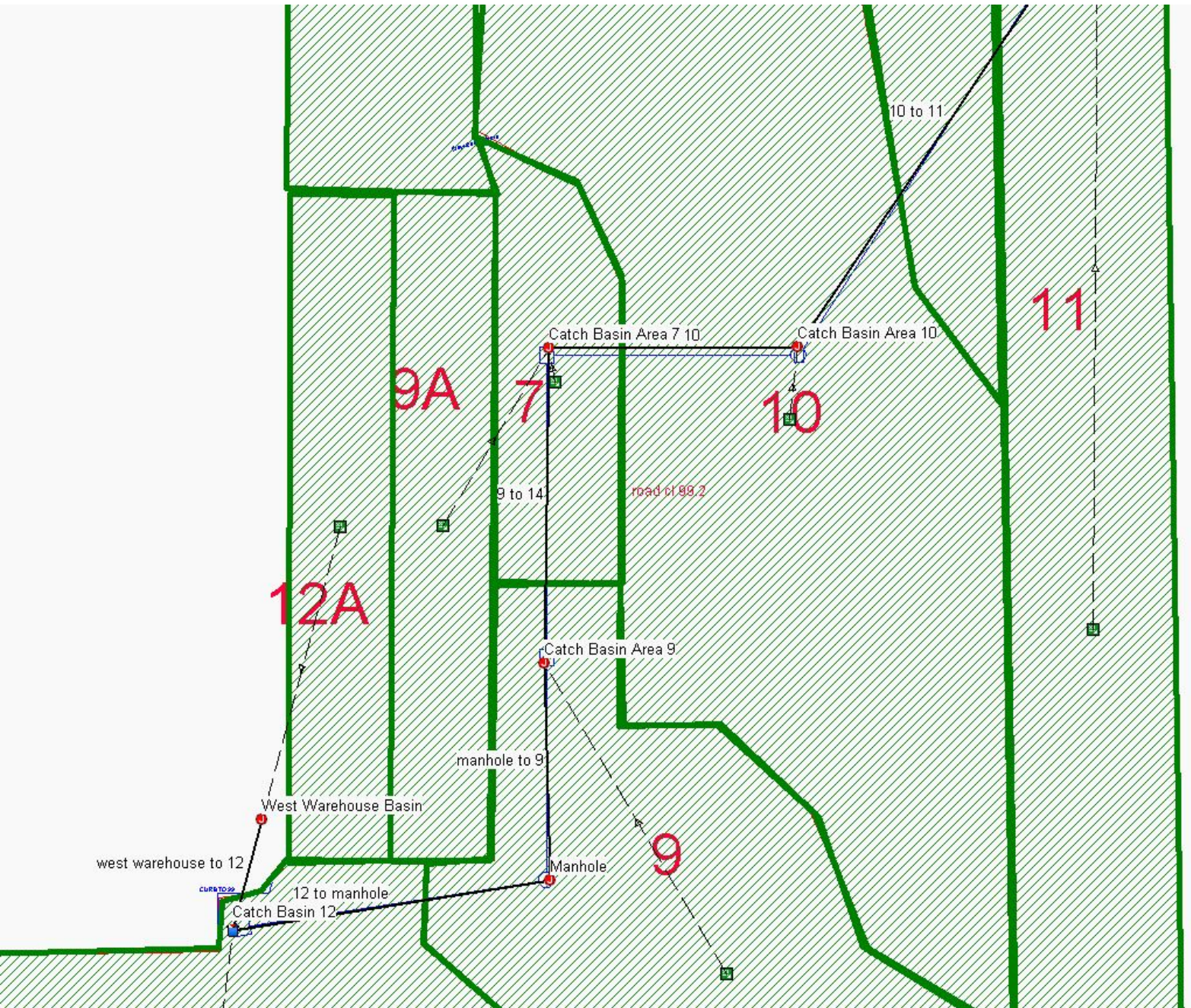
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	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

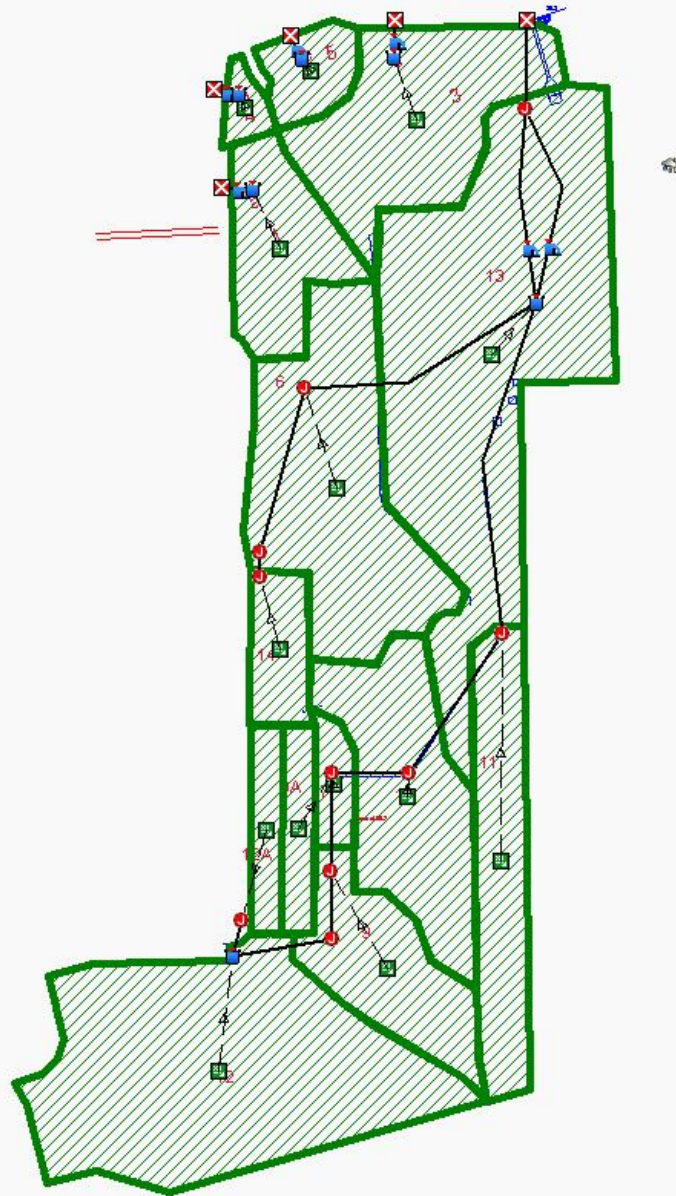
APPENDIX N

10 – YEAR STORMNET INPUT AND OUTPUT FOR PROPOSED CONDITONS









Project Description

Project File Name : east area improvement rev 2 NAVD elevations.SPF
Project Description :

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method Santa Barbara UH
Time of Concentration (TOC) Method SCS TR-55
Link Routing Method Hydrodynamic
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On Aug 05, 2013 00:00:00
End Analysis On Aug 06, 2013 12:00:00
Start Reporting On Aug 05, 2013 00:00:00
Antecedent Dry Days 0 days
Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
Reporting Time Step 0 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ft ²)	(%)			(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1	Basin 1	17756.01	29.00	98.00	52.25	8.00	4.02	1.64	0.87	0 00:08:00
2	Basin 10	30178.02	55.00	98.00	49.00	8.00	5.23	3.63	1.90	0 00:08:00
3	Basin 11	22723.99	44.00	98.00	49.00	8.00	4.62	2.41	1.26	0 00:08:00
4	Basin 12	68881.99	99.00	98.00	49.00	8.00	7.70	12.18	6.50	0 00:08:00
5	Basin 12A	6209.00	100.00	98.00	49.00	8.00	7.76	1.11	0.59	0 00:02:00
6	Basin 13	84093.02	18.00	98.00	64.30	8.00	4.53	8.74	4.99	0 00:08:00
7	Basin 14	8497.99	84.00	98.00	49.00	8.00	6.86	1.34	0.71	0 00:08:00
8	Basin 3	33175.99	20.00	98.00	53.96	8.00	3.69	2.81	1.53	0 00:08:00
9	Basin 4	2769.98	13.00	98.00	60.61	8.00	3.97	0.25	0.14	0 00:08:00
10	Basin 5	7217.98	20.00	98.00	69.50	8.00	5.08	0.84	0.48	0 00:08:00
11	Basin 6	43462.99	28.00	98.00	49.00	8.00	3.72	3.71	1.94	0 00:08:00
12	Basin 7	4563.00	45.00	98.00	49.00	8.00	4.67	0.49	0.26	0 00:08:00
13	Basin 9	19778.98	87.00	98.00	49.00	8.00	7.03	3.19	1.70	0 00:08:00
14	Basin 9A	6209.00	100.00	98.00	49.00	8.00	7.76	1.11	0.59	0 00:02:00

Node Summary

SN Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
		(ft)	(ft)	(ft)	(ft)	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1 Area 6 Outfall	Junction	7.50	8.50	7.50	8.50	0.71	7.85	0.00	0.65	0 00:00	0.00	0.00
2 Catch Basin Area 10	Junction	4.33	10.00	4.33	10.00	11.52	6.40	0.00	3.60	0 00:00	0.00	0.00
3 Catch Basin Area 11	Junction	2.60	10.00	2.60	10.00	12.78	5.31	0.00	4.69	0 00:00	0.00	0.00
4 Catch Basin Area 14	Junction	7.66	10.00	7.66	10.00	0.71	8.05	0.00	1.95	0 00:00	0.00	0.00
5 Catch Basin Area 6	Junction	2.33	5.50	2.33	5.50	2.63	5.34	0.00	1.66	0 00:00	0.00	0.00
6 Catch Basin Area 7	Junction	4.47	11.00	4.47	11.00	9.62	6.94	0.00	4.06	0 00:00	0.00	0.00
7 Catch Basin Area 9	Junction	5.25	11.75	5.25	11.75	8.78	7.62	0.00	4.13	0 00:00	0.00	0.00
8 Manhole	Junction	5.25	13.00	5.25	13.00	7.09	8.38	0.00	4.62	0 00:00	0.00	0.00
9 Pond B Outlet structure	Junction	2.90	5.50	2.90	5.50	13.44	3.83	0.00	2.26	0 00:00	0.00	0.00
10 West Warehouse Basin	Junction	8.00	13.00	8.00	13.00	0.59	9.28	0.00	3.72	0 00:00	0.00	0.00
11 Pond a outfall	OutFall	1.70				0.73	1.70					
12 Pond B Outfall	OutFall	1.70				13.44	1.70					
13 Pond c outfall	OutFall	1.70				1.05	1.70					
14 Pond d outfall	OutFall	1.70				0.14	1.70					
15 Pond e outfall	OutFall	1.70				0.48	1.70					
16 Catch Basin 12	Storage Node	6.76	12.50	6.76		7.09	9.23				0.00	0.00
17 Pond a	Storage Node	2.00	4.00	2.00		0.87	3.52				0.00	0.00
18 Pond B	Storage Node	2.90	5.50	2.90		20.32	4.78				0.00	0.00
19 Pond c	Storage Node	2.00	3.00	2.00		1.53	2.82				0.00	0.00
20 Pond d	Storage Node	1.50	1.80	1.50		0.14	1.76				0.00	0.00
21 Pond e	Storage Node	1.50	1.80	1.50		0.48	1.72				0.00	0.00

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)
1 10 to 11	Pipe	Catch Basin Area 10	Catch Basin Area 11	165.00	5.08	4.08	0.6061	24.000	0.0140	11.52	16.35	0.70	5.46	1.28	0.64	0.00
2 11 to pond	Pipe	Catch Basin Area 11	Pond B	154.00	3.83	2.90	0.6039	24.000	0.0140	12.76	16.32	0.78	5.11	1.61	0.80	0.00
3 12 to manhole	Pipe	Catch Basin 12	Manhole	93.00	7.99	7.44	0.5914	18.000	0.0140	7.09	7.50	0.94	4.95	1.13	0.76	0.00
4 14 to 10	Pipe	Catch Basin Area 7	Catch Basin Area 10	75.00	5.70	5.26	0.5867	24.000	0.0140	9.62	16.09	0.60	4.96	1.19	0.59	0.00
5 9 to 14	Pipe	Catch Basin Area 9	Catch Basin Area 7	91.00	6.48	5.95	0.5824	24.000	0.0140	8.78	16.03	0.55	4.96	1.10	0.55	0.00
6 Area 6 Drain	Pipe	Catch Basin Area 6	Pond B	99.30	3.31	2.90	0.4129	12.000	0.0140	2.61	2.13	1.23	3.33	1.00	1.00	904.00
7 manhole to 9	Pipe	Manhole	Catch Basin Area 9	67.00	7.19	6.73	0.6866	18.000	0.0140	7.09	8.08	0.88	5.05	1.11	0.74	0.00
8 Pipe12	Pipe	Catch Basin Area 14	Area 6 Outfall	28.76	7.66	7.50	0.5563	12.000	0.0140	0.71	2.47	0.29	2.74	0.37	0.37	0.00
9 west warehouse to 12	Pipe	West Warehouse Basin	Catch Basin 12	10.00	8.09	7.99	1.0001	8.000	0.0140	0.59	1.12	0.53	1.69	0.67	1.00	51.00
10 Area 6 west ditch	Channel	Area 6 Outfall	Catch Basin Area 6	130.40	7.50	6.00	1.1504	12.000	0.0700	0.69	25.07	0.03	0.61	0.25	0.25	0.00
11 Outfall Channel	Channel	Pond B Outlet structure	Pond B Outfall	58.00	2.90	2.50	0.6897	18.000	0.0150	13.44	30.56	0.44	5.11	0.88	0.58	0.00
12 Pond a	Weir	Pond a	Pond a outfall		2.00	1.70				0.73						
13 Pond B Water Quality	Weir	Pond B	Pond B Outlet structure		2.90	2.90				13.44						
14 Pond c overflow	Weir	Pond c	Pond c outfall		2.00	1.70				1.05						
15 Pond d overflow	Weir	Pond d	Pond d outfall		1.50	1.70				0.14						
16 Pond e overflow	Weir	Pond e	Pond e outfall		1.50	1.70				0.48						
17 Skimmer Top	Weir	Pond B	Pond B Outlet structure		2.90	2.90				0.00						

Subbasin Hydrology

Subbasin : Basin 1

Input Data

Area (ft²) 17756.01
Impervious Area (%) 29.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 52.25
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft ²)	Soil Group	Curve Number
Composite Area & Weighted CN	17756.01		65.5175

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

T_c = Time of Concentration (hrs)
n = Manning's Roughness
L_f = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
S_f = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (S_f^{0.5}) (unpaved surface)
V = 20.3282 * (S_f^{0.5}) (paved surface)
V = 15.0 * (S_f^{0.5}) (grassed waterway surface)
V = 10.0 * (S_f^{0.5}) (nearly bare & untilled surface)
V = 9.0 * (S_f^{0.5}) (cultivated straight rows surface)
V = 7.0 * (S_f^{0.5}) (short grass pasture surface)
V = 5.0 * (S_f^{0.5}) (woodland surface)
V = 2.5 * (S_f^{0.5}) (forest w/heavy litter surface)
T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hrs)
L_f = Flow Length (ft)
V = Velocity (ft/sec)
S_f = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^{2/3}) * (S_f^{0.5})) / n
R = A_q / W_p
T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hrs)
L_f = Flow Length (ft)
R = Hydraulic Radius (ft)
A_q = Flow Area (ft²)
W_p = Wetted Perimeter (ft)
V = Velocity (ft/sec)
S_f = Slope (ft/ft)
n = Manning's Roughness

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 4.02
Peak Runoff (cfs) 0.87
Weighted Curve Number 65.52
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 10

Input Data

Area (ft²) 30178.02
Impervious Area (%) 55.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	30178.02		75.95

Time of Concentration

User-Defined TOC override (minutes): 8.00

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 5.23
Peak Runoff (cfs) 1.90
Weighted Curve Number 75.95
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 11

Input Data

Area (ft²) 22723.99
Impervious Area (%) 44.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	22723.99		70.56

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 4.62
Peak Runoff (cfs) 1.26
Weighted Curve Number 70.56
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 12

Input Data

Area (ft²) 68881.99
Impervious Area (%) 99.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	68881.99		97.51

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 7.70
Peak Runoff (cfs) 6.50
Weighted Curve Number 97.51
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 12A

Input Data

Area (ft²) 6209.00
Impervious Area (%) 100.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	6209.00		98

Time of Concentration

User-Defined TOC override (minutes): 2

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 7.76
Peak Runoff (cfs) 0.59
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:02:00

Subbasin : Basin 13

Input Data

Area (ft²) 84093.02
Impervious Area (%) 18.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 64.30
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	84093.02		70.366

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 4.53
Peak Runoff (cfs) 4.99
Weighted Curve Number 70.37
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 14

Input Data

Area (ft²) 8497.99
Impervious Area (%) 84.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	8497.99		90.16

Time of Concentration

User-Defined TOC override (minutes): 8.00

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 6.86
Peak Runoff (cfs) 0.71
Weighted Curve Number 90.16
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 3

Input Data

Area (ft²) 33175.99
Impervious Area (%) 20.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 53.96
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	33175.99		62.768

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 3.69
Peak Runoff (cfs) 1.53
Weighted Curve Number 62.77
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 4

Input Data

Area (ft²) 2769.98
Impervious Area (%) 13.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 60.61
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	2769.98		65.4707

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 3.97
Peak Runoff (cfs) 0.14
Weighted Curve Number 65.47
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 5

Input Data

Area (ft²) 7217.98
Impervious Area (%) 20.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 69.50
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	7217.98		75.2

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 5.08
Peak Runoff (cfs) 0.48
Weighted Curve Number 75.20
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 6

Input Data

Area (ft²) 43462.99
Impervious Area (%) 28.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	43462.99		62.72

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 3.72
Peak Runoff (cfs) 1.94
Weighted Curve Number 62.72
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 7

Input Data

Area (ft²) 4563.00
Impervious Area (%) 45.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	4563.00		71.05

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 4.67
Peak Runoff (cfs) 0.26
Weighted Curve Number 71.05
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 9

Input Data

Area (ft²) 19778.98
Impervious Area (%) 87.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	19778.98		91.63

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 7.03
Peak Runoff (cfs) 1.70
Weighted Curve Number 91.63
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 9A

Input Data

Area (ft²) 6209.00
Impervious Area (%) 100.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	6209.00		98

Time of Concentration

User-Defined TOC override (minutes): 2

Subbasin Runoff Results

Total Rainfall (in) 8.00
Total Runoff (in) 7.76
Peak Runoff (cfs) 0.59
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:02:00

Junction Input

SN	Element ID	Invert Elevation	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Area 6 Outfall	7.50	8.50	1.00	7.50	0.00	8.50	0.00	0.00	0.00
2	Catch Basin Ar	4.33	10.00	5.68	4.33	0.00	10.00	0.00	777.00	0.00
3	Catch Basin Ar	2.60	10.00	7.40	2.60	0.00	10.00	0.00	48.00	0.00
4	Catch Basin Ar	7.66	10.00	2.34	7.66	0.00	10.00	0.00	37.00	0.00
5	Catch Basin Ar	2.33	5.50	3.17	2.33	0.00	5.50	0.00	123.00	0.00
6	Catch Basin Ar	4.47	11.00	6.53	4.47	0.00	11.00	0.00	634.00	0.00
7	Catch Basin Ar	5.25	11.75	6.50	5.25	0.00	11.75	0.00	494.00	0.00
8	Manhole	5.25	13.00	7.75	5.25	0.00	13.00	0.00	0.00	0.00
9	Pond B Outlet :	2.90	5.50	2.60	2.90	0.00	5.50	0.00	0.00	0.00
10	West Warehou	8.00	13.00	5.00	8.00	0.00	13.00	0.00	0.00	0.00

Junction Results

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Area 6 Outfall	0.71	0.00	7.85	0.35	0.00	0.65	7.62	0.12	0 12:13	0 00:00	0.00	0.00
2 Catch Basin Area 10	11.52	1.90	6.40	2.07	0.00	3.60	5.35	1.02	0 12:09	0 00:00	0.00	0.00
3 Catch Basin Area 11	12.78	1.26	5.31	2.71	0.00	4.69	4.32	1.72	0 12:11	0 00:00	0.00	0.00
4 Catch Basin Area 14	0.71	0.71	8.05	0.39	0.00	1.95	7.75	0.09	0 12:10	0 00:00	0.00	0.00
5 Catch Basin Area 6	2.63	1.94	5.34	3.01	0.00	1.66	4.12	1.79	0 12:18	0 00:00	0.00	0.00
6 Catch Basin Area 7	9.62	0.84	6.94	2.47	0.00	4.06	5.94	1.47	0 12:09	0 00:00	0.00	0.00
7 Catch Basin Area 9	8.78	1.70	7.62	2.37	0.00	4.13	6.71	1.46	0 12:08	0 00:00	0.00	0.00
8 Manhole	7.09	0.00	8.38	3.13	0.00	4.62	7.39	2.14	0 12:08	0 00:00	0.00	0.00
9 Pond B Outlet structure	13.44	0.00	3.83	0.93	0.00	2.26	3.05	0.15	0 12:32	0 00:00	0.00	0.00
10 West Warehouse Basin	0.59	0.59	9.28	1.28	0.00	3.72	8.27	0.27	0 12:08	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Average Slope	Shape	Height	Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate
		(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(ft)	(ft)					(cfs)	
1	Area 6 west ditch	130.40	7.50	0.00	6.00	3.67	1.1504	Triangular	1.000	35.000	0.0700	0.0000	0.0000	0.0000	0.00	No
2	Outfall Channel	58.00	2.90	0.00	2.50	0.80	0.6897	Rectangular	1.500	3.000	0.0150	0.5000	0.0000	0.0000	0.00	No

Channel Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(ft)		(min)	
1 Area 6 west ditch	0.69	0 12:13	25.07	0.03	0.61	0.25	0.25	0.00	
2 Outfall Channel	13.44	0 12:32	30.56	0.44	5.11	0.88	0.58	0.00	

Pipe Input

SN Element ID	Length	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Average Pipe Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	No. of Barrels
1 10 to 11	165.00	5.08	0.76	4.08	1.48	0.6061	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
2 11 to pond	154.00	3.83	1.23	2.90	0.00	0.6039	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
3 12 to manhole	93.00	7.99	1.23	7.44	2.19	0.5914	Circular	18.000	18.000	0.0140	0.5000	0.0000	0.0000	0.00	1
4 14 to 10	75.00	5.70	1.23	5.26	0.94	0.5867	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
5 9 to 14	91.00	6.48	1.23	5.95	1.48	0.5824	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
6 Area 6 Drain	99.30	3.31	0.98	2.90	0.00	0.4129	Circular	12.000	12.000	0.0140	0.5000	0.0000	0.0000	0.00	1
7 manhole to 9	67.00	7.19	1.94	6.73	1.48	0.6866	Circular	18.000	18.000	0.0140	0.5000	0.0000	0.0000	0.00	1
8 Pipe12	28.76	7.66	0.00	7.50	0.00	0.5563	Circular	12.000	12.000	0.0140	0.5000	0.0000	0.0000	0.00	1
9 west warehouse to 12	10.00	8.09	0.09	7.99	1.23	1.0001	Circular	8.040	8.040	0.0140	0.5000	0.0000	0.0000	0.00	1

Pipe Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(ft)		(min)	
1 10 to 11	11.52	0 12:09	16.35	0.70	5.46	1.28	0.64	0.00	
2 11 to pond	12.76	0 12:09	16.32	0.78	5.11	1.61	0.80	0.00	
3 12 to manhole	7.09	0 12:08	7.50	0.94	4.95	1.13	0.76	0.00	
4 14 to 10	9.62	0 12:09	16.09	0.60	4.96	1.19	0.59	0.00	
5 9 to 14	8.78	0 12:08	16.03	0.55	4.96	1.10	0.55	0.00	
6 Area 6 Drain	2.61	0 12:12	2.13	1.23	3.33	1.00	1.00	904.00	
7 manhole to 9	7.09	0 12:08	8.08	0.88	5.05	1.11	0.74	0.00	
8 Pipe12	0.71	0 12:08	2.47	0.29	2.74	0.37	0.37	0.00	
9 west warehouse to 12	0.59	0 12:08	1.12	0.53	1.69	0.67	1.00	51.00	

Storage Nodes

Storage Node : Catch Basin 12

Input Data

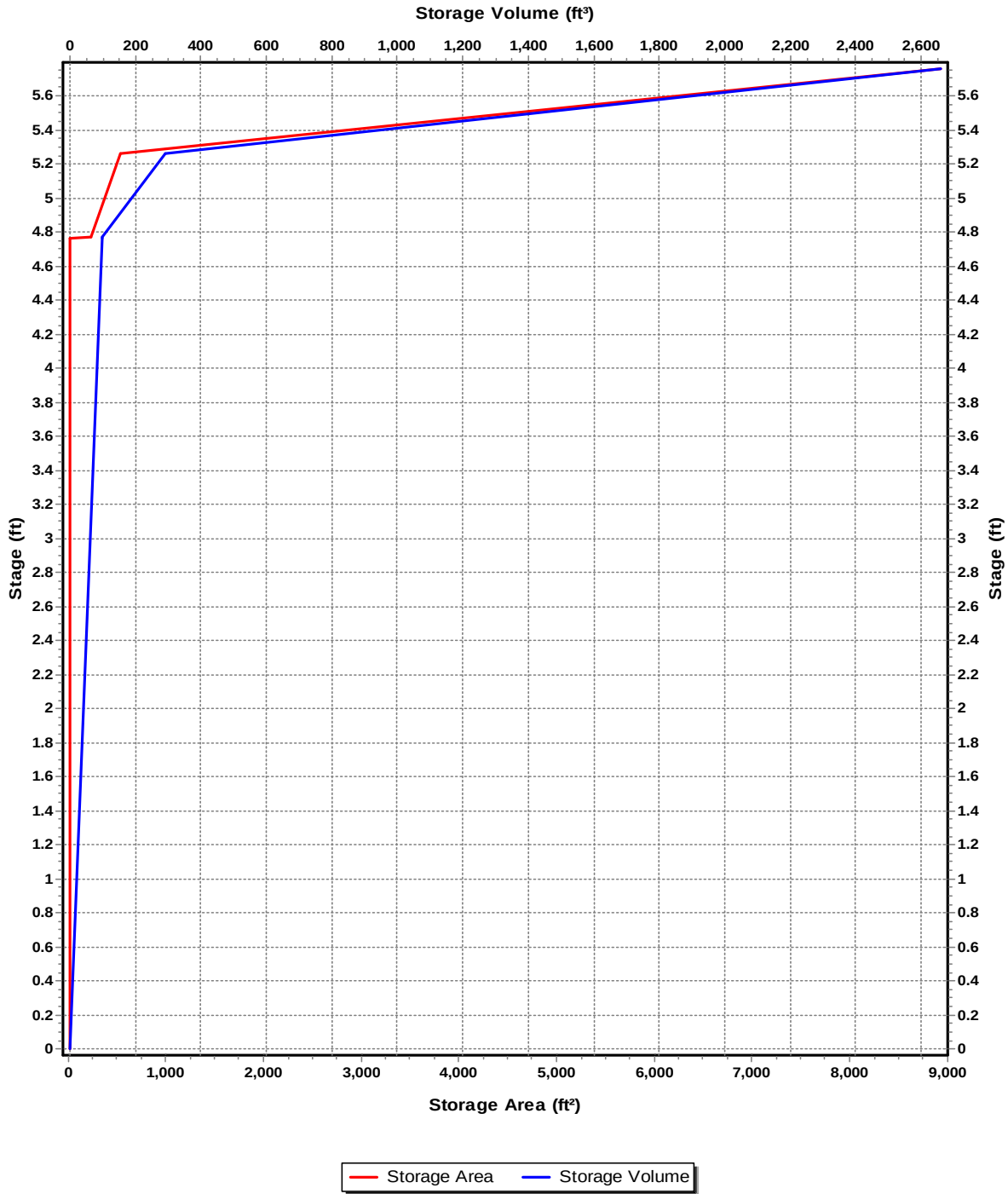
Invert Elevation (ft)	6.76
Max (Rim) Elevation (ft)	12.50
Max (Rim) Offset (ft)	5.74
Initial Water Elevation (ft)	6.76
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Parking Lot

Stage	Storage Area	Storage Volume
(ft)	(ft²)	(ft³)
0	20.76	0.000
4.76	20.76	98.82
4.77	238	100.11
5.26	542	291.21
5.76	8934	2660.21

Storage Area Volume Curves



Storage Node : Catch Basin 12 (continued)

Output Summary Results

Peak Inflow (cfs)	7.09
Peak Lateral Inflow (cfs)	6.50
Peak Outflow (cfs)	7.09
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	9.23
Max HGL Depth Attained (ft)	2.47
Average HGL Elevation Attained (ft)	8.22
Average HGL Depth Attained (ft)	1.46
Time of Max HGL Occurrence (days hh:mm)	0 12:08
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond a

Input Data

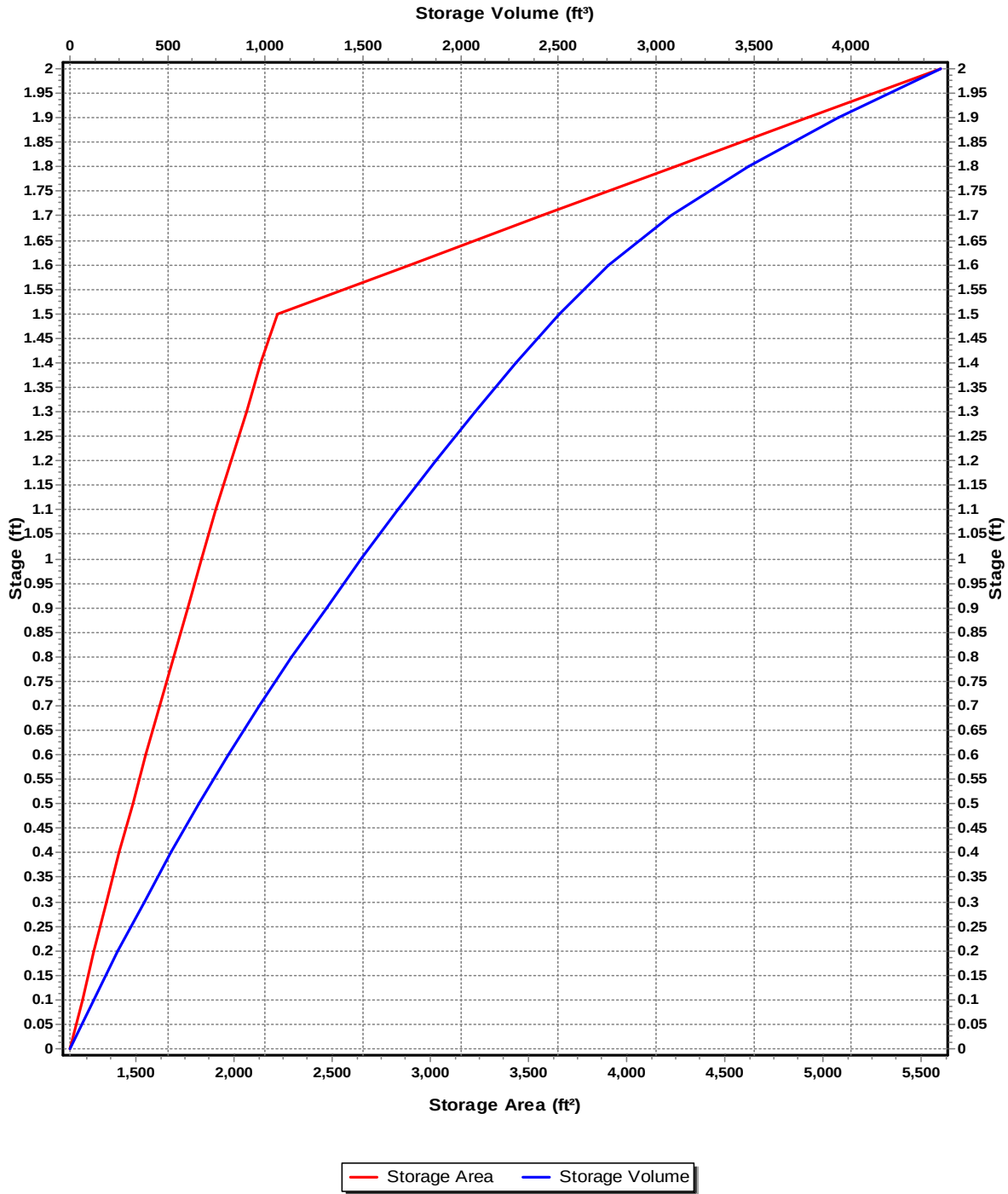
Invert Elevation (ft)	2.00
Max (Rim) Elevation (ft)	4.00
Max (Rim) Offset (ft)	2.00
Initial Water Elevation (ft)	2.00
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond a

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	1166.05	0.000
0.1	1227.21	119.66
0.2	1289.67	245.50
0.3	1353.43	377.66
0.4	1418.49	516.26
0.5	1484.85	661.43
0.6	1552.51	813.30
0.7	1621.47	972.00
0.8	1691.73	1137.66
0.9	1763.29	1310.41
1	1836.15	1490.38
1.1	1910.31	1677.70
1.2	1985.77	1872.50
1.3	2062.53	2074.92
1.4	2140.59	2285.08
1.5	2219.95	2503.11
1.6	2896.2	2758.92
1.7	3572.4	3082.35
1.8	4248.6	3473.40
1.9	4924.8	3932.07
2	5601	4458.36

Storage Area Volume Curves



Storage Node : Pond a (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1	Pond a	Trapezoidal	No	3.50	1.50	65.00	0.70	3.37

Output Summary Results

Peak Inflow (cfs)	0.87
Peak Lateral Inflow (cfs)	0.87
Peak Outflow (cfs)	0.73
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	3.52
Max HGL Depth Attained (ft)	1.52
Average HGL Elevation Attained (ft)	3.09
Average HGL Depth Attained (ft)	1.09
Time of Max HGL Occurrence (days hh:mm)	0 12:25
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond B

Input Data

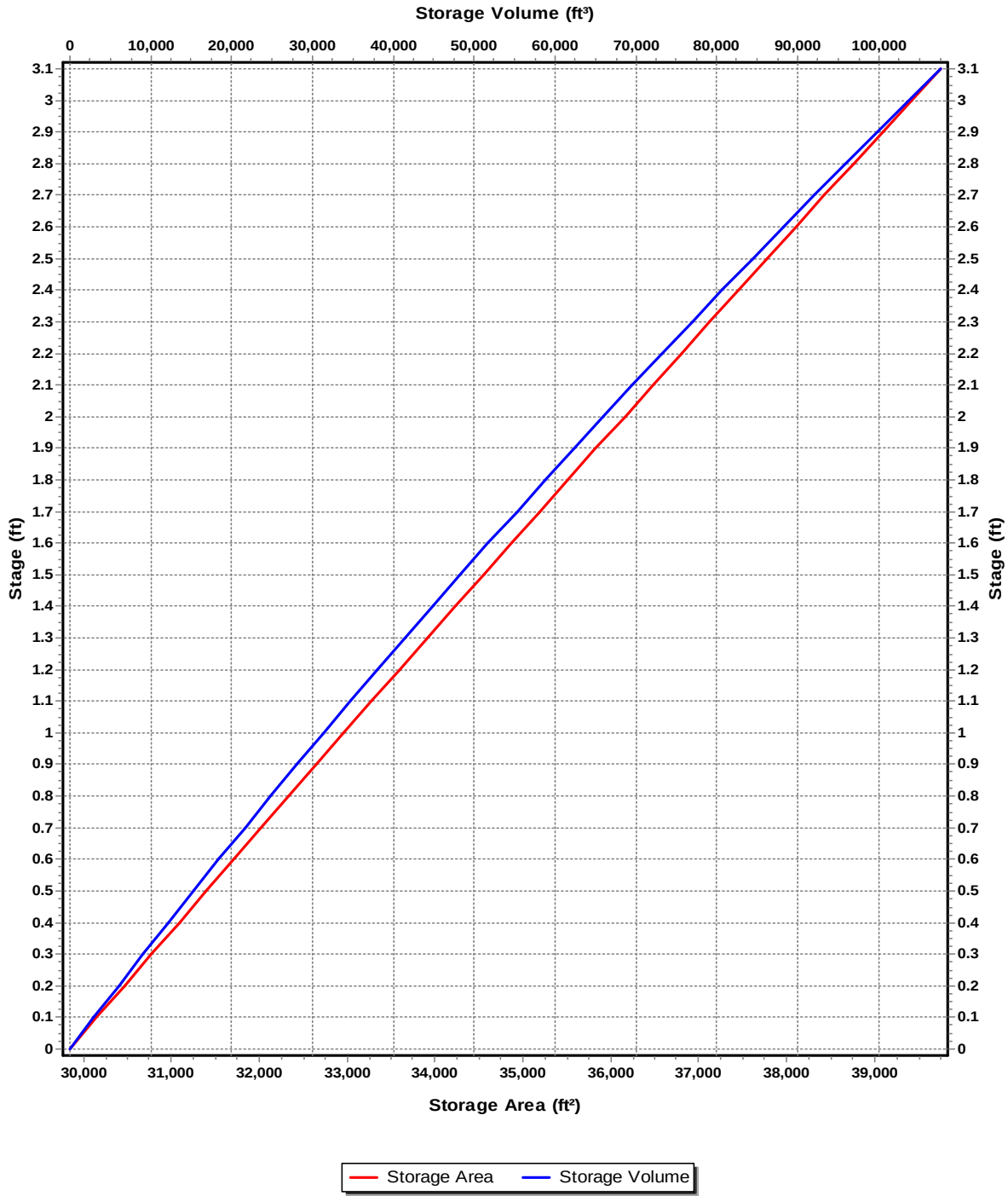
Invert Elevation (ft)	2.90
Max (Rim) Elevation (ft)	5.50
Max (Rim) Offset (ft)	2.60
Initial Water Elevation (ft)	2.90
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Big Pond

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	29847.66571	0.000
0.1	30156.21429	3000.19
0.2	30465.49905	6031.28
0.3	30775.52	9093.33
0.4	31086.27714	12186.42
0.5	31397.77048	15310.62
0.6	31710	18466.01
0.7	32022.96571	21652.66
0.8	32336.66762	24870.64
0.9	32651.10571	28120.03
1	32966.28	31400.90
1.1	33282.19048	34713.32
1.2	33598.83714	38057.37
1.3	33916.22	41433.12
1.4	34234.33905	44840.65
1.5	34553.19429	48280.03
1.6	34872.78571	51751.33
1.7	35193.11333	55254.62
1.8	35514.17714	58789.98
1.9	35835.97714	62357.49
2	36158.51333	65957.21
2.1	36481.78571	69589.22
2.2	36805.79429	73253.60
2.3	37130.53905	76950.42
2.4	37456.02	80679.75
2.5	37782.23714	84441.66
2.6	38109.19048	88236.23
2.7	38436.88	92063.53
2.8	38765.30571	95923.64
2.9	39094.46762	99816.63
3	39424.36571	103742.57
3.1	39755	107701.54

Storage Area Volume Curves



Storage Node : Pond B (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1	Pond B Water Quality	Rectangular	No	4.30	1.40	12.00	0.60	3.37
2	Skimmer Top	Rectangular	No	5.00	2.10	12.00	1.08	3.37

Output Summary Results

Peak Inflow (cfs)	20.32
Peak Lateral Inflow (cfs)	4.99
Peak Outflow (cfs)	13.44
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	4.78
Max HGL Depth Attained (ft)	1.88
Average HGL Elevation Attained (ft)	4.04
Average HGL Depth Attained (ft)	1.14
Time of Max HGL Occurrence (days hh:mm)	0 12:32
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond c

Input Data

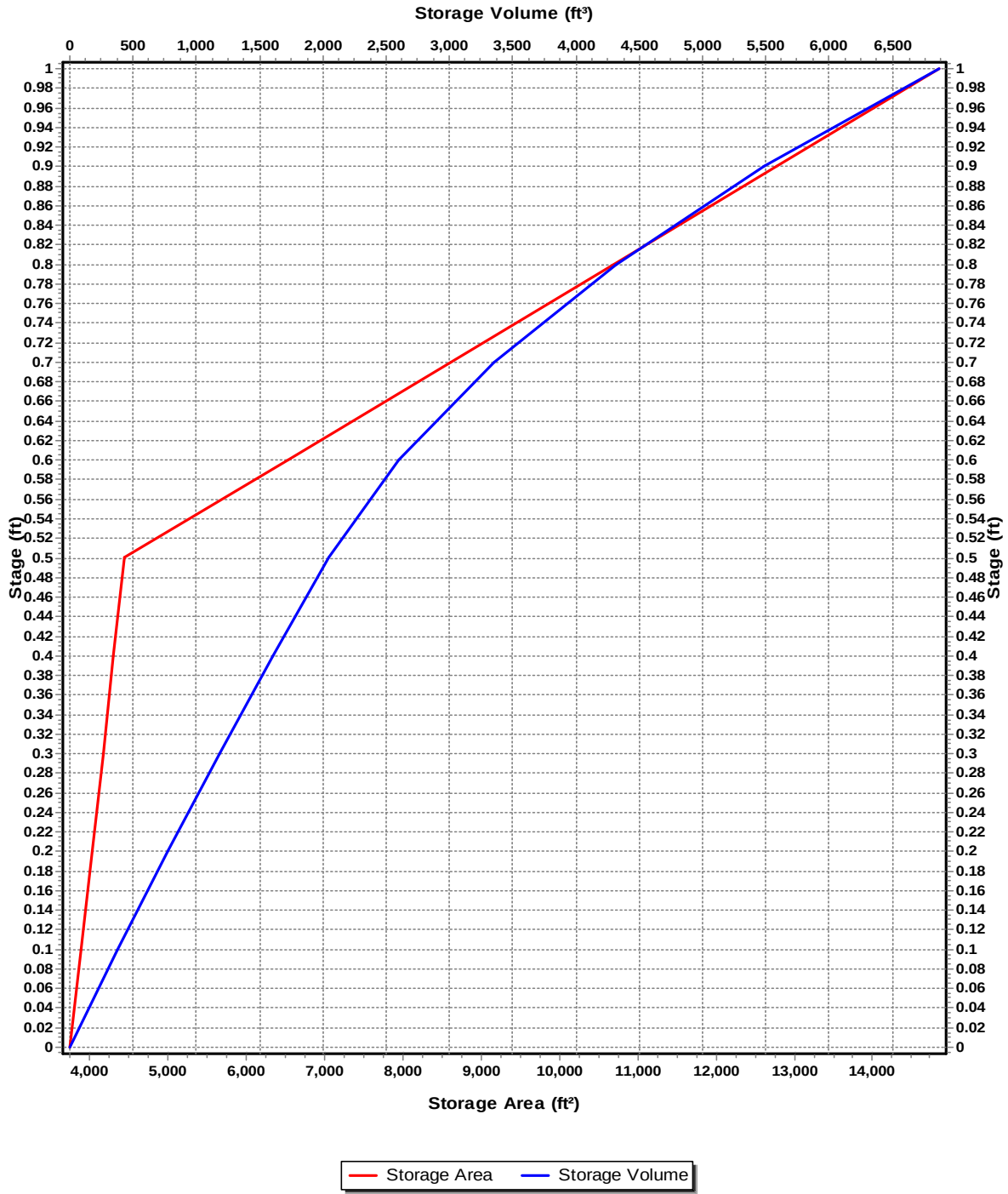
Invert Elevation (ft)	2.00
Max (Rim) Elevation (ft)	3.00
Max (Rim) Offset (ft)	1.00
Initial Water Elevation (ft)	2.00
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond c

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	3743	0.000
0.1	3883.2	381.31
0.2	4023.4	776.64
0.3	4163.6	1185.99
0.4	4303.8	1609.36
0.5	4444	2046.75
0.6	6525.4	2595.22
0.7	8606.8	3351.83
0.8	10688.2	4316.58
0.9	12769.6	5489.47
1	14851	6870.50

Storage Area Volume Curves



Storage Node : Pond c (continued)

Outflow Weirs

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1 Pond c overflow	Trapezoidal	No	2.80	0.80	148.00	0.20	3.37

Output Summary Results

Peak Inflow (cfs)	1.53
Peak Lateral Inflow (cfs)	1.53
Peak Outflow (cfs)	1.05
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	2.82
Max HGL Depth Attained (ft)	0.82
Average HGL Elevation Attained (ft)	2.57
Average HGL Depth Attained (ft)	0.57
Time of Max HGL Occurrence (days hh:mm)	0 12:33
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond d

Input Data

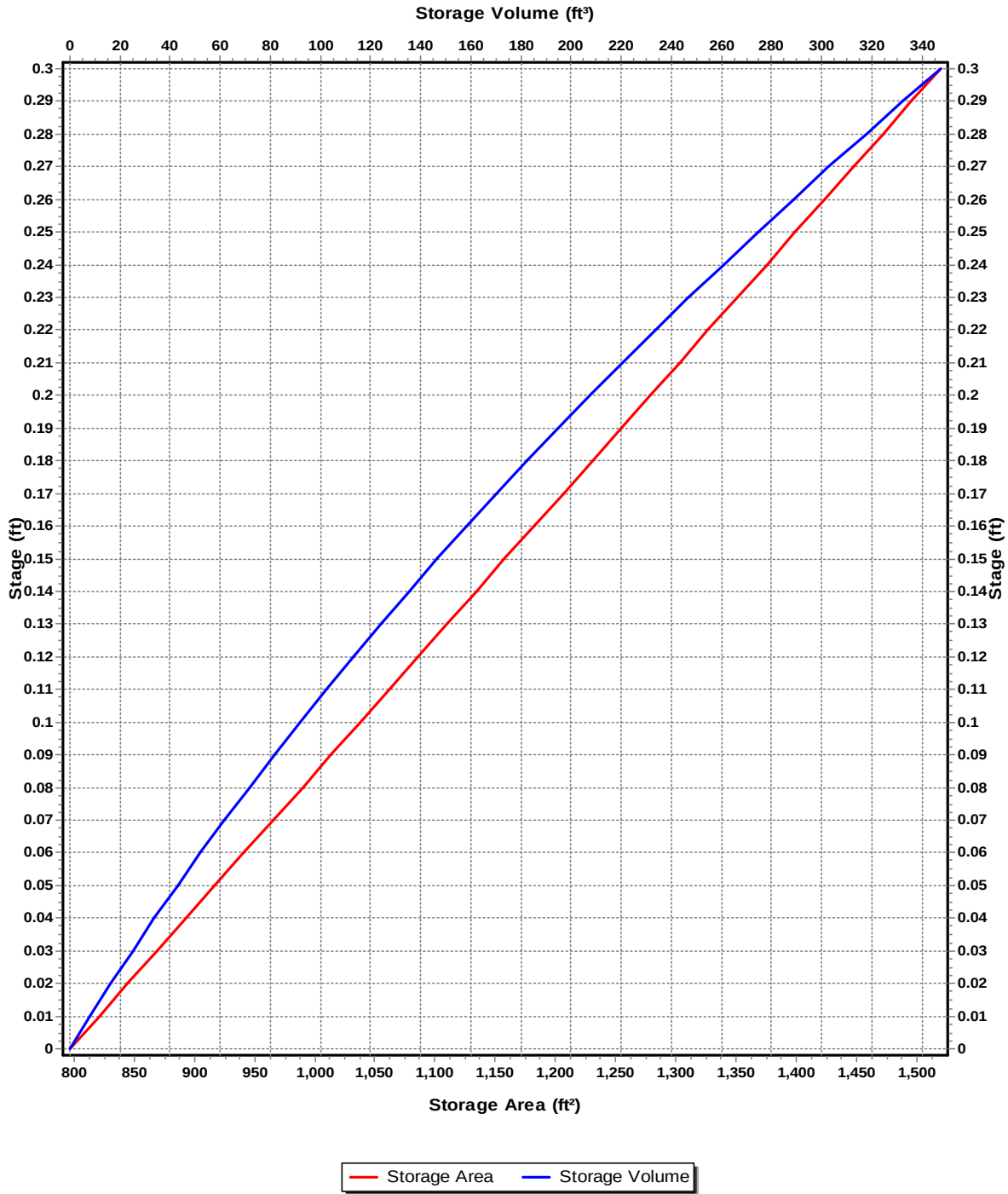
Invert Elevation (ft)	1.50
Max (Rim) Elevation (ft)	1.80
Max (Rim) Offset (ft)	0.30
Initial Water Elevation (ft)	1.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond d

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	797	0.000
0.01	821.08	8.09
0.02	845.16	16.42
0.03	869.24	24.99
0.04	893.32	33.80
0.05	917.4	42.85
0.06	941.48	52.14
0.07	965.56	61.68
0.08	989.64	71.46
0.09	1013.72	81.48
0.1	1037.8	91.74
0.11	1061.88	102.24
0.12	1085.96	112.98
0.13	1110.04	123.96
0.14	1134.12	135.18
0.15	1158.2	146.64
0.16	1182.28	158.34
0.17	1206.36	170.28
0.18	1230.44	182.46
0.19	1254.52	194.88
0.2	1278.6	207.55
0.21	1302.68	220.46
0.22	1326.76	233.61
0.23	1350.84	247.00
0.24	1374.92	260.63
0.25	1399	274.50
0.26	1423.08	288.61
0.27	1447.16	302.96
0.28	1471.24	317.55
0.29	1495.32	332.38
0.3	1519.4	347.45

Storage Area Volume Curves



Storage Node : Pond d (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1	Pond d overflow	Trapezoidal	No	1.75	0.25	51.00	0.30	3.37

Output Summary Results

Peak Inflow (cfs)	0.14
Peak Lateral Inflow (cfs)	0.14
Peak Outflow (cfs)	0.14
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	1.76
Max HGL Depth Attained (ft)	0.26
Average HGL Elevation Attained (ft)	1.68
Average HGL Depth Attained (ft)	0.18
Time of Max HGL Occurrence (days hh:mm)	0 12:18
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond e

Input Data

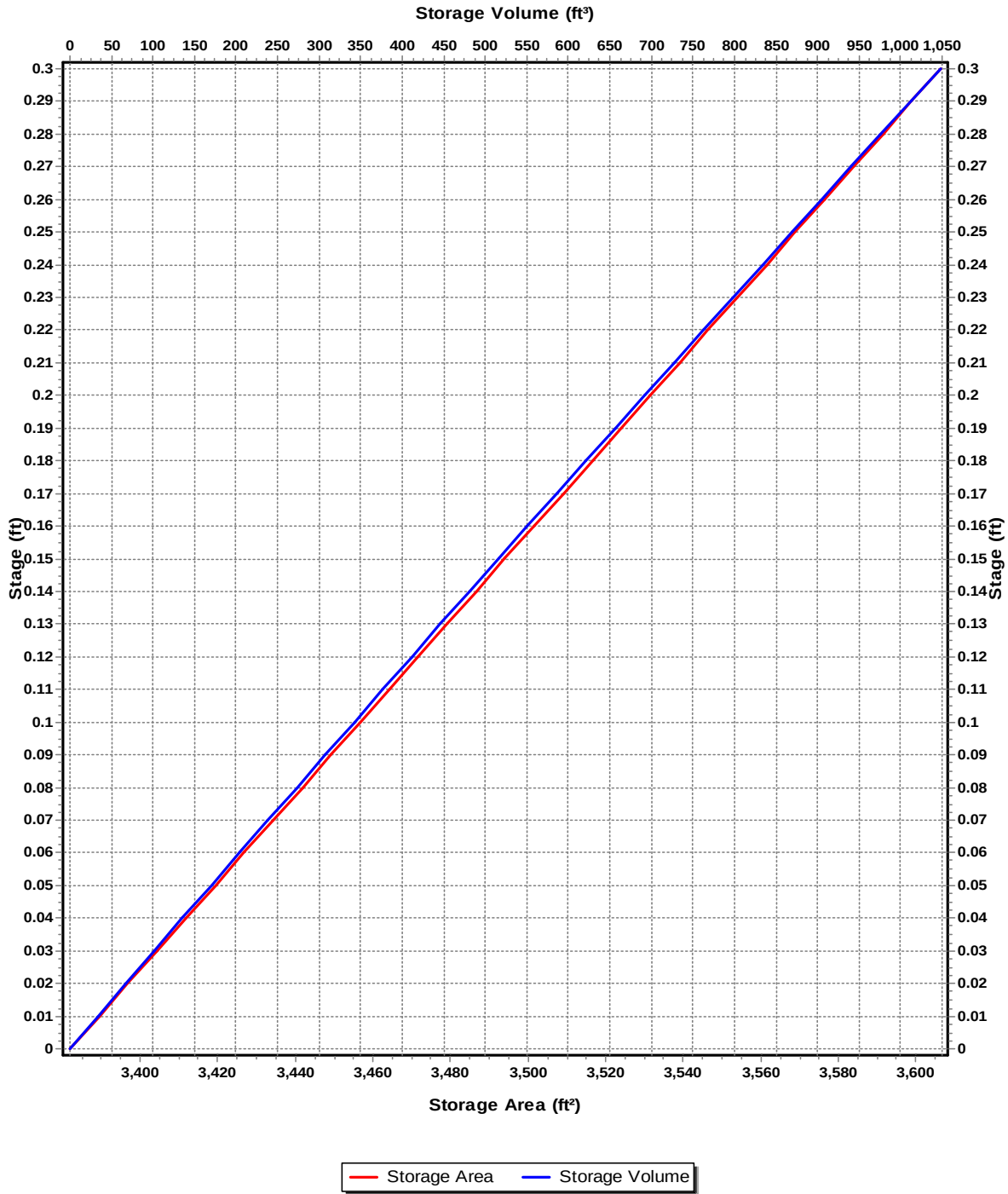
Invert Elevation (ft)	1.50
Max (Rim) Elevation (ft)	1.80
Max (Rim) Offset (ft)	0.30
Initial Water Elevation (ft)	1.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond e

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	3382	0.000
0.01	3389.48	33.86
0.02	3396.96	67.79
0.03	3404.44	101.80
0.04	3411.92	135.88
0.05	3419.4	170.04
0.06	3426.88	204.27
0.07	3434.36	238.58
0.08	3441.84	272.96
0.09	3449.32	307.42
0.1	3456.8	341.95
0.11	3464.28	376.56
0.12	3471.76	411.24
0.13	3479.24	446.00
0.14	3486.72	480.83
0.15	3494.2	515.73
0.16	3501.68	550.71
0.17	3509.16	585.76
0.18	3516.64	620.89
0.19	3524.12	656.09
0.2	3531.6	691.37
0.21	3539.08	726.72
0.22	3546.56	762.15
0.23	3554.04	797.65
0.24	3561.52	833.23
0.25	3569	868.88
0.26	3576.48	904.61
0.27	3583.96	940.41
0.28	3591.44	976.29
0.29	3598.92	1012.24
0.3	3606.4	1048.27

Storage Area Volume Curves



Storage Node : Pond e (continued)

Outflow Weirs

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1 Pond e overflow	Trapezoidal	No	1.70	0.20	75.00	0.50	3.37

Output Summary Results

Peak Inflow (cfs)	0.48
Peak Lateral Inflow (cfs)	0.48
Peak Outflow (cfs)	0.48
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	1.72
Max HGL Depth Attained (ft)	0.22
Average HGL Elevation Attained (ft)	1.65
Average HGL Depth Attained (ft)	0.15
Time of Max HGL Occurrence (days hh:mm)	0 12:12
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

APPENDIX O

25 – YEAR STORMNET INPUT AND OUTPUT FOR PROPOSED CONDITIONS

Project Description

Project File Name : east area improvement rev 2 NAVD elevations.SPF
Project Description :

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method Santa Barbara UH
Time of Concentration (TOC) Method SCS TR-55
Link Routing Method Hydrodynamic
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On Aug 05, 2013 00:00:00
End Analysis On Aug 06, 2013 12:00:00
Start Reporting On Aug 05, 2013 00:00:00
Antecedent Dry Days 0 days
Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
Reporting Time Step 0 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ft ²)	(%)			(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1	Basin 1	17756.01	29.00	98.00	52.25	9.50	5.17	2.11	1.15	0 00:08:00
2	Basin 10	30178.02	55.00	98.00	49.00	9.50	6.48	4.49	2.38	0 00:08:00
3	Basin 11	22723.99	44.00	98.00	49.00	9.50	5.80	3.03	1.61	0 00:08:00
4	Basin 12	68881.99	99.00	98.00	49.00	9.50	9.20	14.54	7.73	0 00:08:00
5	Basin 12A	6209.00	100.00	98.00	49.00	9.50	9.26	1.32	0.70	0 00:02:00
6	Basin 13	84093.02	18.00	98.00	64.30	9.50	5.81	11.21	6.45	0 00:08:00
7	Basin 14	8497.99	84.00	98.00	49.00	9.50	8.27	1.61	0.86	0 00:08:00
8	Basin 3	33175.99	20.00	98.00	53.96	9.50	4.83	3.68	2.04	0 00:08:00
9	Basin 4	2769.98	13.00	98.00	60.61	9.50	5.18	0.33	0.19	0 00:08:00
10	Basin 5	7217.98	20.00	98.00	69.50	9.50	6.42	1.06	0.62	0 00:08:00
11	Basin 6	43462.99	28.00	98.00	49.00	9.50	4.82	4.80	2.58	0 00:08:00
12	Basin 7	4563.00	45.00	98.00	49.00	9.50	5.86	0.61	0.33	0 00:08:00
13	Basin 9	19778.98	87.00	98.00	49.00	9.50	8.46	3.84	2.04	0 00:08:00
14	Basin 9A	6209.00	100.00	98.00	49.00	9.50	9.26	1.32	0.70	0 00:02:00

Node Summary

SN Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
		(ft)	(ft)	(ft)	(ft)	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1 Area 6 Outfall	Junction	7.50	8.50	7.50	8.50	0.86	7.88	0.00	0.62	0 00:00	0.00	0.00
2 Catch Basin Area 10	Junction	4.33	10.00	4.33	10.00	13.86	6.64	0.00	3.36	0 00:00	0.00	0.00
3 Catch Basin Area 11	Junction	2.60	10.00	2.60	10.00	15.45	5.68	0.00	4.32	0 00:00	0.00	0.00
4 Catch Basin Area 14	Junction	7.66	10.00	7.66	10.00	0.86	8.08	0.00	1.92	0 00:00	0.00	0.00
5 Catch Basin Area 6	Junction	2.33	5.50	2.33	5.50	3.41	6.00	0.00	1.00	0 00:00	0.00	0.00
6 Catch Basin Area 7	Junction	4.47	11.00	4.47	11.00	11.48	7.14	0.00	3.86	0 00:00	0.00	0.00
7 Catch Basin Area 9	Junction	5.25	11.75	5.25	11.75	10.46	7.77	0.00	3.98	0 00:00	0.00	0.00
8 Manhole	Junction	5.25	13.00	5.25	13.00	8.43	8.59	0.00	4.41	0 00:00	0.00	0.00
9 Pond B Outlet structure	Junction	2.90	5.50	2.90	5.50	19.28	4.11	0.00	1.97	0 00:00	0.00	0.00
10 West Warehouse Basin	Junction	8.00	13.00	8.00	13.00	0.70	9.60	0.00	3.40	0 00:00	0.00	0.00
11 Pond a outfall	OutFall	1.70				1.13	1.70					
12 Pond B Outfall	OutFall	1.70				19.28	1.70					
13 Pond c outfall	OutFall	1.70				1.89	1.70					
14 Pond d outfall	OutFall	1.70				0.19	1.70					
15 Pond e outfall	OutFall	1.70				0.61	1.70					
16 Catch Basin 12	Storage Node	6.76	12.50	6.76		8.43	9.53				0.00	0.00
17 Pond a	Storage Node	2.00	4.00	2.00		1.15	3.53				0.00	0.00
18 Pond B	Storage Node	2.90	5.50	2.90		25.22	4.92				0.00	0.00
19 Pond c	Storage Node	2.00	3.00	2.00		2.04	2.82				0.00	0.00
20 Pond d	Storage Node	1.50	1.80	1.50		0.19	1.76				0.00	0.00
21 Pond e	Storage Node	1.50	1.80	1.50		0.61	1.72				0.00	0.00

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)
1 10 to 11	Pipe	Catch Basin Area 10	Catch Basin Area 11	165.00	5.08	4.08	0.6061	24.000	0.0140	13.85	16.35	0.85	5.45	1.57	0.79	0.00
2 11 to pond	Pipe	Catch Basin Area 11	Pond B	154.00	3.83	2.90	0.6039	24.000	0.0140	15.40	16.32	0.94	5.18	1.89	0.94	0.00
3 12 to manhole	Pipe	Catch Basin 12	Manhole	93.00	7.99	7.44	0.5914	18.000	0.0140	8.43	7.50	1.12	5.11	1.32	0.88	0.00
4 14 to 10	Pipe	Catch Basin Area 7	Catch Basin Area 10	75.00	5.70	5.26	0.5867	24.000	0.0140	11.48	16.09	0.71	4.96	1.41	0.71	0.00
5 9 to 14	Pipe	Catch Basin Area 9	Catch Basin Area 7	91.00	6.48	5.95	0.5824	24.000	0.0140	10.46	16.03	0.65	5.15	1.24	0.62	0.00
6 Area 6 Drain	Pipe	Catch Basin Area 6	Pond B	99.30	3.31	2.90	0.4129	12.000	0.0140	3.40	2.13	1.60	4.33	1.00	1.00	919.00
7 manhole to 9	Pipe	Manhole	Catch Basin Area 9	67.00	7.19	6.73	0.6866	18.000	0.0140	8.42	8.08	1.04	5.31	1.26	0.84	0.00
8 Pipe12	Pipe	Catch Basin Area 14	Area 6 Outfall	28.76	7.66	7.50	0.5563	12.000	0.0140	0.86	2.47	0.35	2.96	0.40	0.40	0.00
9 west warehouse to 12	Pipe	West Warehouse Basin	Catch Basin 12	10.00	8.09	7.99	1.0001	8.000	0.0140	0.70	1.12	0.63	2.01	0.67	1.00	60.00
10 Area 6 west ditch	Channel	Area 6 Outfall	Catch Basin Area 6	130.40	7.50	6.00	1.1504	12.000	0.0700	0.83	25.07	0.03	0.64	0.27	0.27	0.00
11 Outfall Channel	Channel	Pond B Outlet structure	Pond B Outfall	58.00	2.90	2.50	0.6897	18.000	0.0150	19.28	30.56	0.63	5.64	1.14	0.76	0.00
12 Pond a	Weir	Pond a	Pond a outfall		2.00	1.70				1.13						
13 Pond B Water Quality	Weir	Pond B	Pond B Outlet structure		2.90	2.90				19.28						
14 Pond c overflow	Weir	Pond c	Pond c outfall		2.00	1.70				1.89						
15 Pond d overflow	Weir	Pond d	Pond d outfall		1.50	1.70				0.19						
16 Pond e overflow	Weir	Pond e	Pond e outfall		1.50	1.70				0.61						
17 Skimmer Top	Weir	Pond B	Pond B Outlet structure		2.90	2.90				0.00						

Subbasin Hydrology

Subbasin : Basin 1

Input Data

Area (ft²) 17756.01
Impervious Area (%) 29.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 52.25
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft ²)	Soil Group	Curve Number
Composite Area & Weighted CN	17756.01		65.5175

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

T_c = Time of Concentration (hrs)
n = Manning's Roughness
L_f = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
S_f = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (S_f^{0.5}) (unpaved surface)
V = 20.3282 * (S_f^{0.5}) (paved surface)
V = 15.0 * (S_f^{0.5}) (grassed waterway surface)
V = 10.0 * (S_f^{0.5}) (nearly bare & untilled surface)
V = 9.0 * (S_f^{0.5}) (cultivated straight rows surface)
V = 7.0 * (S_f^{0.5}) (short grass pasture surface)
V = 5.0 * (S_f^{0.5}) (woodland surface)
V = 2.5 * (S_f^{0.5}) (forest w/heavy litter surface)
T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hrs)
L_f = Flow Length (ft)
V = Velocity (ft/sec)
S_f = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^{2/3}) * (S_f^{0.5})) / n
R = A_q / W_p
T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hrs)
L_f = Flow Length (ft)
R = Hydraulic Radius (ft)
A_q = Flow Area (ft²)
W_p = Wetted Perimeter (ft)
V = Velocity (ft/sec)
S_f = Slope (ft/ft)
n = Manning's Roughness

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 5.17
Peak Runoff (cfs) 1.15
Weighted Curve Number 65.52
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 10

Input Data

Area (ft²) 30178.02
Impervious Area (%) 55.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	30178.02		75.95

Time of Concentration

User-Defined TOC override (minutes): 8.00

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 6.48
Peak Runoff (cfs) 2.38
Weighted Curve Number 75.95
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 11

Input Data

Area (ft²) 22723.99
Impervious Area (%) 44.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	22723.99		70.56

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 5.80
Peak Runoff (cfs) 1.61
Weighted Curve Number 70.56
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 12

Input Data

Area (ft²) 68881.99
Impervious Area (%) 99.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	68881.99		97.51

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 9.20
Peak Runoff (cfs) 7.73
Weighted Curve Number 97.51
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 12A

Input Data

Area (ft²) 6209.00
Impervious Area (%) 100.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	6209.00		98

Time of Concentration

User-Defined TOC override (minutes): 2

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 9.26
Peak Runoff (cfs) 0.70
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:02:00

Subbasin : Basin 13

Input Data

Area (ft²) 84093.02
Impervious Area (%) 18.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 64.30
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	84093.02		70.366

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 5.81
Peak Runoff (cfs) 6.45
Weighted Curve Number 70.37
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 14

Input Data

Area (ft²) 8497.99
Impervious Area (%) 84.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	8497.99		90.16

Time of Concentration

User-Defined TOC override (minutes): 8.00

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 8.27
Peak Runoff (cfs) 0.86
Weighted Curve Number 90.16
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 3

Input Data

Area (ft²) 33175.99
Impervious Area (%) 20.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 53.96
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	33175.99		62.768

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 4.83
Peak Runoff (cfs) 2.04
Weighted Curve Number 62.77
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 4

Input Data

Area (ft²) 2769.98
Impervious Area (%) 13.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 60.61
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	2769.98		65.4707

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 5.18
Peak Runoff (cfs) 0.19
Weighted Curve Number 65.47
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 5

Input Data

Area (ft²) 7217.98
Impervious Area (%) 20.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 69.50
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	7217.98		75.2

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 6.42
Peak Runoff (cfs) 0.62
Weighted Curve Number 75.20
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 6

Input Data

Area (ft²) 43462.99
Impervious Area (%) 28.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	43462.99		62.72

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 4.82
Peak Runoff (cfs) 2.58
Weighted Curve Number 62.72
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 7

Input Data

Area (ft²) 4563.00
Impervious Area (%) 45.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	4563.00		71.05

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 5.86
Peak Runoff (cfs) 0.33
Weighted Curve Number 71.05
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 9

Input Data

Area (ft²) 19778.98
Impervious Area (%) 87.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	19778.98		91.63

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 8.46
Peak Runoff (cfs) 2.04
Weighted Curve Number 91.63
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 9A

Input Data

Area (ft²) 6209.00
Impervious Area (%) 100.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	6209.00		98

Time of Concentration

User-Defined TOC override (minutes): 2

Subbasin Runoff Results

Total Rainfall (in) 9.50
Total Runoff (in) 9.26
Peak Runoff (cfs) 0.70
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:02:00

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Area 6 Outfall	7.50	8.50	1.00	7.50	0.00	8.50	0.00	0.00	0.00
2	Catch Basin Ar	4.33	10.00	5.68	4.33	0.00	10.00	0.00	777.00	0.00
3	Catch Basin Ar	2.60	10.00	7.40	2.60	0.00	10.00	0.00	48.00	0.00
4	Catch Basin Ar	7.66	10.00	2.34	7.66	0.00	10.00	0.00	37.00	0.00
5	Catch Basin Ar	2.33	5.50	3.17	2.33	0.00	5.50	0.00	123.00	0.00
6	Catch Basin Ar	4.47	11.00	6.53	4.47	0.00	11.00	0.00	634.00	0.00
7	Catch Basin Ar	5.25	11.75	6.50	5.25	0.00	11.75	0.00	494.00	0.00
8	Manhole	5.25	13.00	7.75	5.25	0.00	13.00	0.00	0.00	0.00
9	Pond B Outlet :	2.90	5.50	2.60	2.90	0.00	5.50	0.00	0.00	0.00
10	West Warehou	8.00	13.00	5.00	8.00	0.00	13.00	0.00	0.00	0.00

Junction Results

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Area 6 Outfall	0.86	0.00	7.88	0.38	0.00	0.62	7.63	0.13	0 12:13	0 00:00	0.00	0.00
2 Catch Basin Area 10	13.86	2.38	6.64	2.31	0.00	3.36	5.38	1.05	0 12:10	0 00:00	0.00	0.00
3 Catch Basin Area 11	15.45	1.61	5.68	3.08	0.00	4.32	4.36	1.76	0 12:13	0 00:00	0.00	0.00
4 Catch Basin Area 14	0.86	0.86	8.08	0.42	0.00	1.92	7.76	0.10	0 12:10	0 00:00	0.00	0.00
5 Catch Basin Area 6	3.41	2.58	6.00	3.67	0.00	1.00	4.18	1.85	0 12:14	0 00:00	0.00	0.00
6 Catch Basin Area 7	11.48	1.03	7.14	2.67	0.00	3.86	5.97	1.50	0 12:09	0 00:00	0.00	0.00
7 Catch Basin Area 9	10.46	2.04	7.77	2.52	0.00	3.98	6.73	1.48	0 12:08	0 00:00	0.00	0.00
8 Manhole	8.43	0.00	8.59	3.34	0.00	4.41	7.42	2.17	0 12:08	0 00:00	0.00	0.00
9 Pond B Outlet structure	19.28	0.00	4.11	1.21	0.00	1.97	3.08	0.18	0 12:27	0 00:00	0.00	0.00
10 West Warehouse Basin	0.70	0.70	9.60	1.60	0.00	3.40	8.30	0.30	0 12:08	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Average Slope	Shape	Height	Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flap Flow Gate
		(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(ft)	(ft)					(cfs)
1	Area 6 west ditch	130.40	7.50	0.00	6.00	3.67	1.1504	Triangular	1.000	35.000	0.0700	0.0000	0.0000	0.0000	0.00 No
2	Outfall Channel	58.00	2.90	0.00	2.50	0.80	0.6897	Rectangular	1.500	3.000	0.0150	0.5000	0.0000	0.0000	0.00 No

Channel Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(ft)		(min)	
1 Area 6 west ditch	0.83	0 12:13	25.07	0.03	0.64	0.27	0.27	0.00	
2 Outfall Channel	19.28	0 12:27	30.56	0.63	5.64	1.14	0.76	0.00	

Pipe Input

SN Element ID	Length	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Average Pipe Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	No. of Barrels
1 10 to 11	165.00	5.08	0.76	4.08	1.48	0.6061	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
2 11 to pond	154.00	3.83	1.23	2.90	0.00	0.6039	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
3 12 to manhole	93.00	7.99	1.23	7.44	2.19	0.5914	Circular	18.000	18.000	0.0140	0.5000	0.0000	0.0000	0.00	1
4 14 to 10	75.00	5.70	1.23	5.26	0.94	0.5867	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
5 9 to 14	91.00	6.48	1.23	5.95	1.48	0.5824	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
6 Area 6 Drain	99.30	3.31	0.98	2.90	0.00	0.4129	Circular	12.000	12.000	0.0140	0.5000	0.0000	0.0000	0.00	1
7 manhole to 9	67.00	7.19	1.94	6.73	1.48	0.6866	Circular	18.000	18.000	0.0140	0.5000	0.0000	0.0000	0.00	1
8 Pipe12	28.76	7.66	0.00	7.50	0.00	0.5563	Circular	12.000	12.000	0.0140	0.5000	0.0000	0.0000	0.00	1
9 west warehouse to 12	10.00	8.09	0.09	7.99	1.23	1.0001	Circular	8.040	8.040	0.0140	0.5000	0.0000	0.0000	0.00	1

Pipe Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(ft)		(min)	
1 10 to 11	13.85	0 12:09	16.35	0.85	5.45	1.57	0.79	0.00	
2 11 to pond	15.40	0 12:10	16.32	0.94	5.18	1.89	0.94	0.00	
3 12 to manhole	8.43	0 12:08	7.50	1.12	5.11	1.32	0.88	0.00	
4 14 to 10	11.48	0 12:09	16.09	0.71	4.96	1.41	0.71	0.00	
5 9 to 14	10.46	0 12:08	16.03	0.65	5.15	1.24	0.62	0.00	
6 Area 6 Drain	3.40	0 12:12	2.13	1.60	4.33	1.00	1.00	919.00	
7 manhole to 9	8.42	0 12:08	8.08	1.04	5.31	1.26	0.84	0.00	
8 Pipe12	0.86	0 12:08	2.47	0.35	2.96	0.40	0.40	0.00	
9 west warehouse to 12	0.70	0 12:08	1.12	0.63	2.01	0.67	1.00	60.00	

Storage Nodes

Storage Node : Catch Basin 12

Input Data

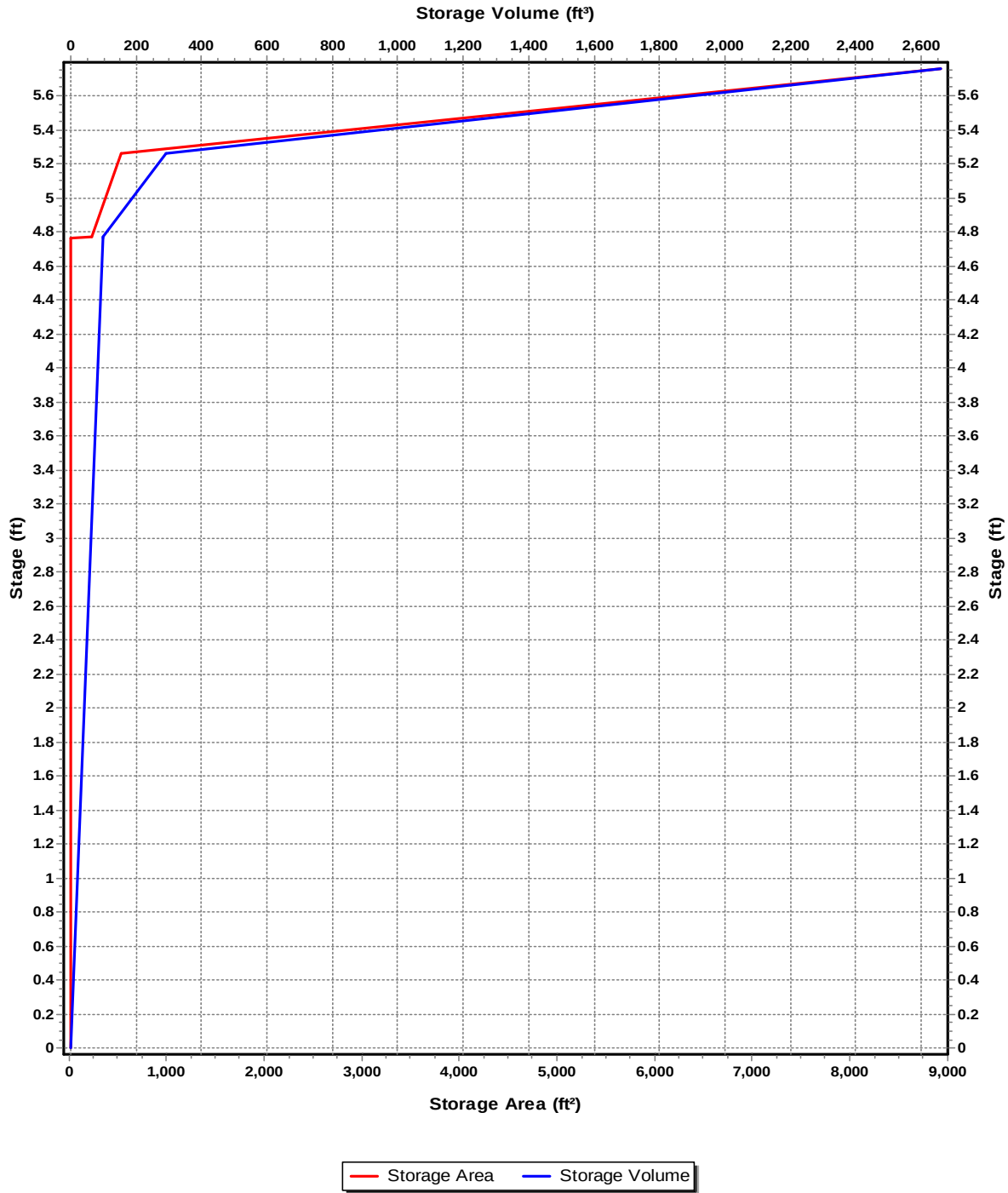
Invert Elevation (ft)	6.76
Max (Rim) Elevation (ft)	12.50
Max (Rim) Offset (ft)	5.74
Initial Water Elevation (ft)	6.76
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Parking Lot

Stage	Storage Area	Storage Volume
(ft)	(ft²)	(ft³)
0	20.76	0.000
4.76	20.76	98.82
4.77	238	100.11
5.26	542	291.21
5.76	8934	2660.21

Storage Area Volume Curves



Storage Node : Catch Basin 12 (continued)

Output Summary Results

Peak Inflow (cfs)	8.43
Peak Lateral Inflow (cfs)	7.73
Peak Outflow (cfs)	8.43
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	9.53
Max HGL Depth Attained (ft)	2.77
Average HGL Elevation Attained (ft)	8.25
Average HGL Depth Attained (ft)	1.49
Time of Max HGL Occurrence (days hh:mm)	0 12:08
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond a

Input Data

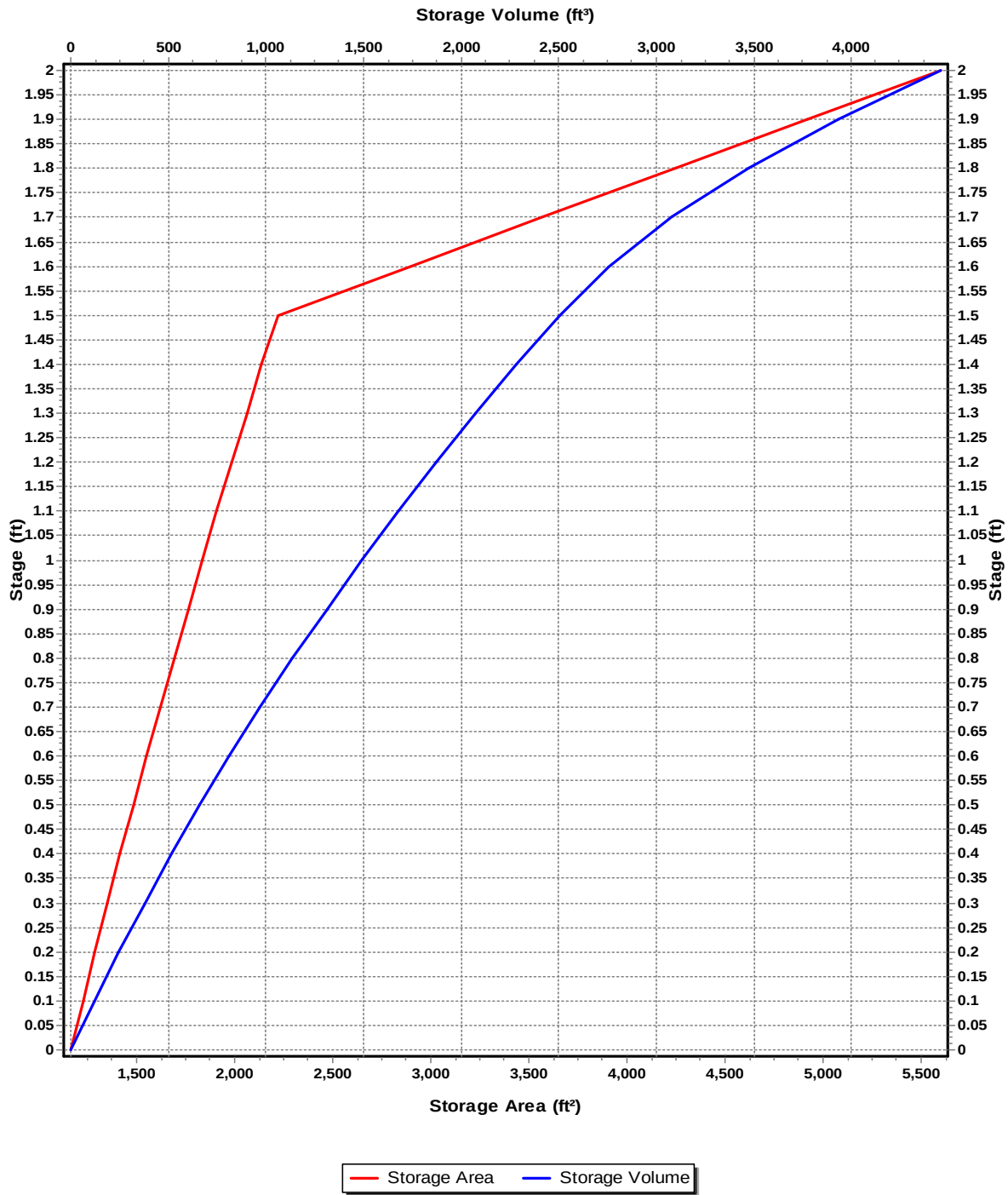
Invert Elevation (ft)	2.00
Max (Rim) Elevation (ft)	4.00
Max (Rim) Offset (ft)	2.00
Initial Water Elevation (ft)	2.00
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond a

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	1166.05	0.000
0.1	1227.21	119.66
0.2	1289.67	245.50
0.3	1353.43	377.66
0.4	1418.49	516.26
0.5	1484.85	661.43
0.6	1552.51	813.30
0.7	1621.47	972.00
0.8	1691.73	1137.66
0.9	1763.29	1310.41
1	1836.15	1490.38
1.1	1910.31	1677.70
1.2	1985.77	1872.50
1.3	2062.53	2074.92
1.4	2140.59	2285.08
1.5	2219.95	2503.11
1.6	2896.2	2758.92
1.7	3572.4	3082.35
1.8	4248.6	3473.40
1.9	4924.8	3932.07
2	5601	4458.36

Storage Area Volume Curves



Storage Node : Pond a (continued)

Outflow Weirs

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1 Pond a	Trapezoidal	No	3.50	1.50	65.00	0.70	3.37

Output Summary Results

Peak Inflow (cfs)	1.15
Peak Lateral Inflow (cfs)	1.15
Peak Outflow (cfs)	1.13
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	3.53
Max HGL Depth Attained (ft)	1.53
Average HGL Elevation Attained (ft)	3.11
Average HGL Depth Attained (ft)	1.11
Time of Max HGL Occurrence (days hh:mm)	0 12:14
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond B

Input Data

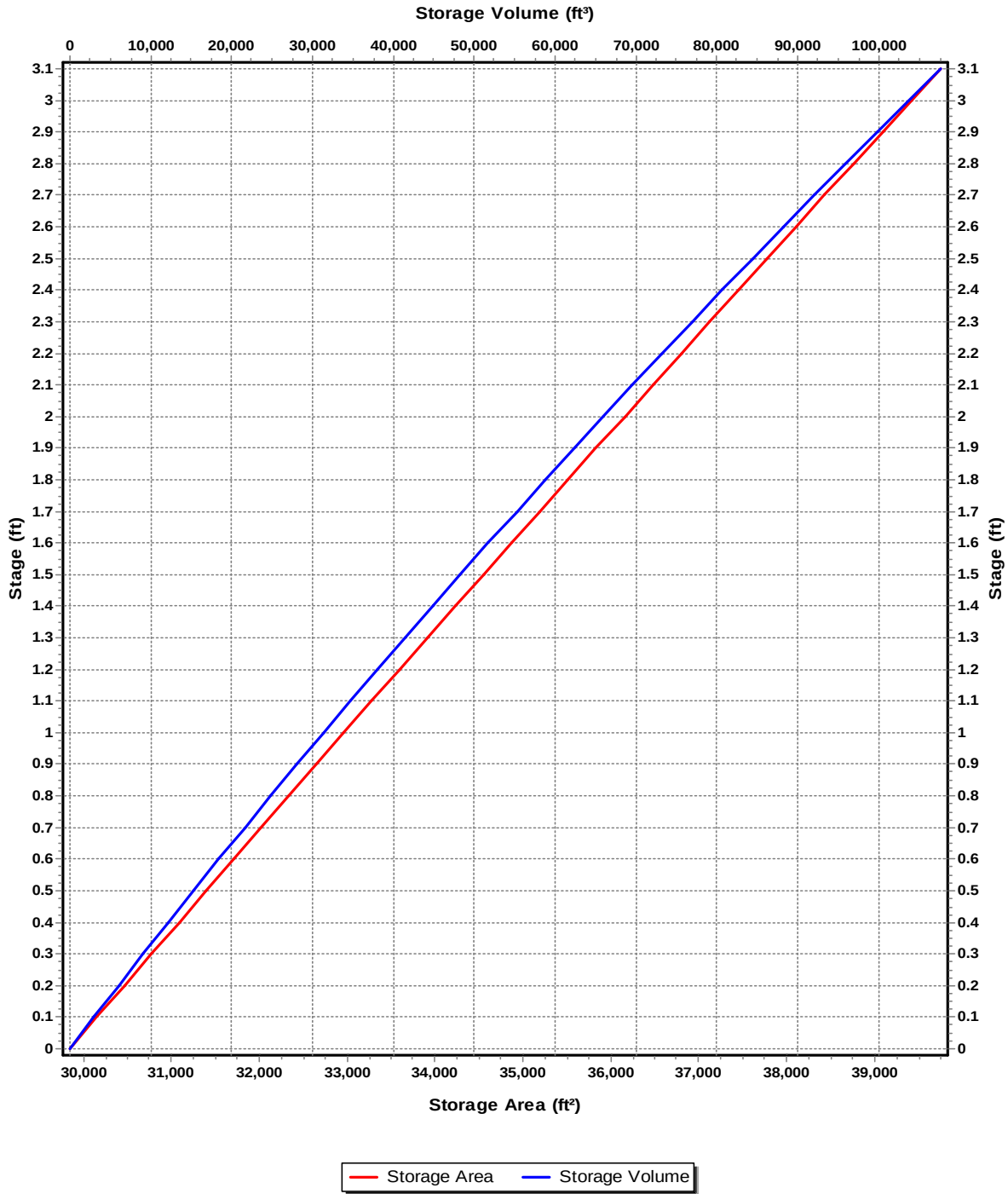
Invert Elevation (ft)	2.90
Max (Rim) Elevation (ft)	5.50
Max (Rim) Offset (ft)	2.60
Initial Water Elevation (ft)	2.90
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Big Pond

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	29847.66571	0.000
0.1	30156.21429	3000.19
0.2	30465.49905	6031.28
0.3	30775.52	9093.33
0.4	31086.27714	12186.42
0.5	31397.77048	15310.62
0.6	31710	18466.01
0.7	32022.96571	21652.66
0.8	32336.66762	24870.64
0.9	32651.10571	28120.03
1	32966.28	31400.90
1.1	33282.19048	34713.32
1.2	33598.83714	38057.37
1.3	33916.22	41433.12
1.4	34234.33905	44840.65
1.5	34553.19429	48280.03
1.6	34872.78571	51751.33
1.7	35193.11333	55254.62
1.8	35514.17714	58789.98
1.9	35835.97714	62357.49
2	36158.51333	65957.21
2.1	36481.78571	69589.22
2.2	36805.79429	73253.60
2.3	37130.53905	76950.42
2.4	37456.02	80679.75
2.5	37782.23714	84441.66
2.6	38109.19048	88236.23
2.7	38436.88	92063.53
2.8	38765.30571	95923.64
2.9	39094.46762	99816.63
3	39424.36571	103742.57
3.1	39755	107701.54

Storage Area Volume Curves



Storage Node : Pond B (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1	Pond B Water Quality	Rectangular	No	4.30	1.40	12.00	0.60	3.37
2	Skimmer Top	Rectangular	No	5.00	2.10	12.00	1.08	3.37

Output Summary Results

Peak Inflow (cfs)	25.22
Peak Lateral Inflow (cfs)	6.45
Peak Outflow (cfs)	19.28
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	4.92
Max HGL Depth Attained (ft)	2.02
Average HGL Elevation Attained (ft)	4.09
Average HGL Depth Attained (ft)	1.19
Time of Max HGL Occurrence (days hh:mm)	0 12:27
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond c

Input Data

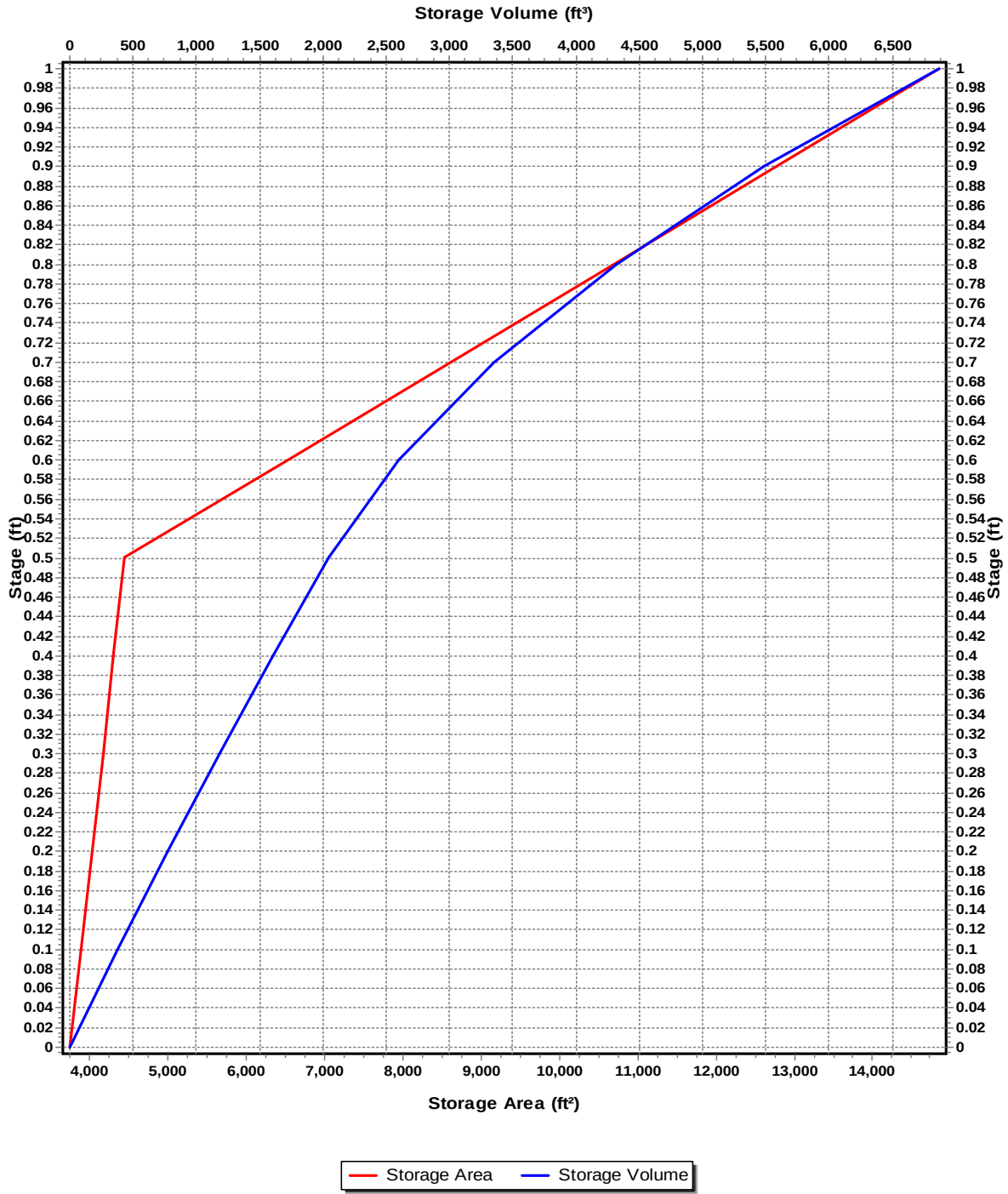
Invert Elevation (ft)	2.00
Max (Rim) Elevation (ft)	3.00
Max (Rim) Offset (ft)	1.00
Initial Water Elevation (ft)	2.00
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond c

Stage (ft)	Storage Area (ft ²)	Storage Volume (ft ³)
0	3743	0.000
0.1	3883.2	381.31
0.2	4023.4	776.64
0.3	4163.6	1185.99
0.4	4303.8	1609.36
0.5	4444	2046.75
0.6	6525.4	2595.22
0.7	8606.8	3351.83
0.8	10688.2	4316.58
0.9	12769.6	5489.47
1	14851	6870.50

Storage Area Volume Curves



Storage Node : Pond c (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1	Pond c overflow	Trapezoidal	No	2.80	0.80	148.00	0.20	3.37

Output Summary Results

Peak Inflow (cfs)	2.04
Peak Lateral Inflow (cfs)	2.04
Peak Outflow (cfs)	1.89
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	2.82
Max HGL Depth Attained (ft)	0.82
Average HGL Elevation Attained (ft)	2.58
Average HGL Depth Attained (ft)	0.58
Time of Max HGL Occurrence (days hh:mm)	0 12:20
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond d

Input Data

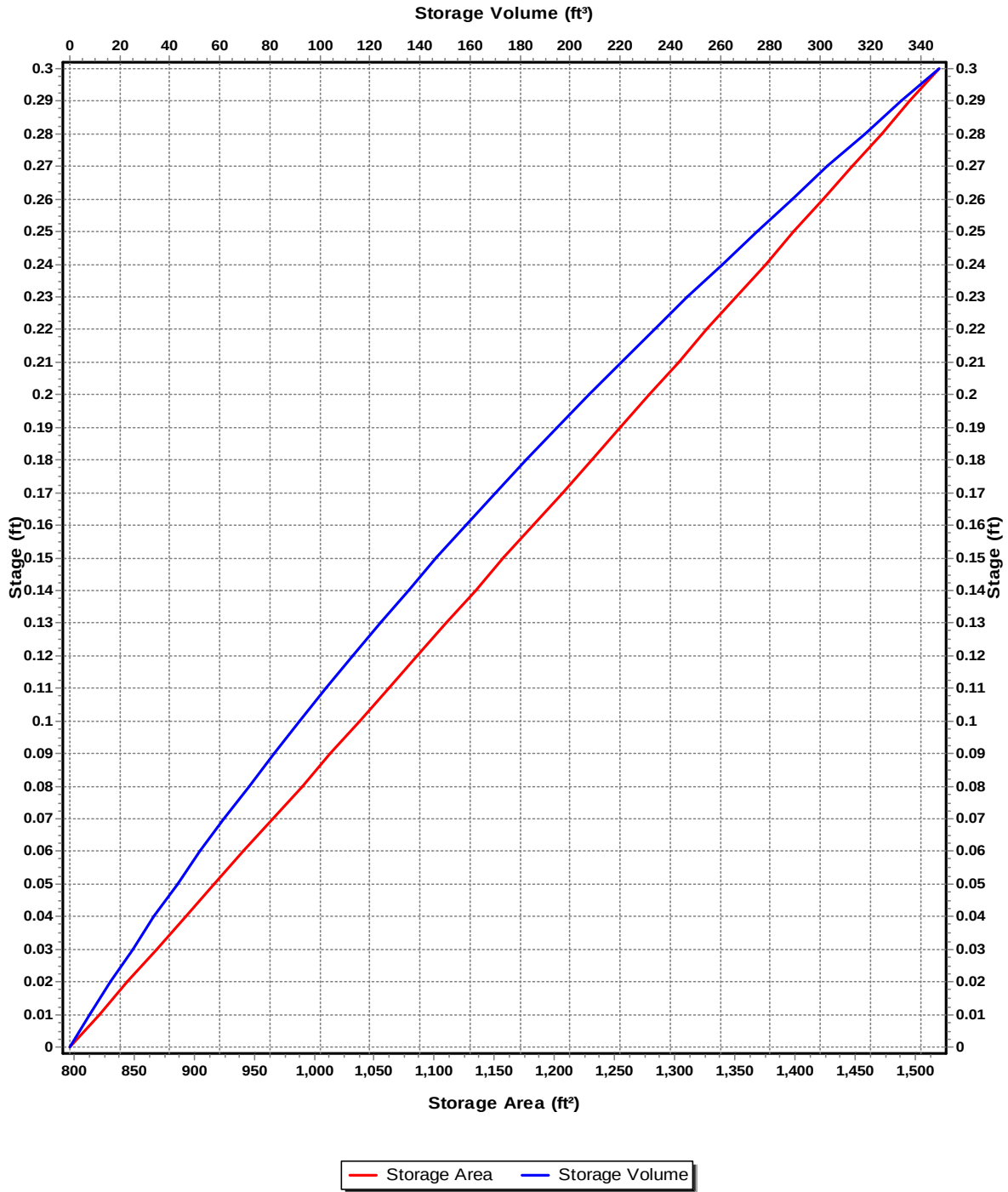
Invert Elevation (ft)	1.50
Max (Rim) Elevation (ft)	1.80
Max (Rim) Offset (ft)	0.30
Initial Water Elevation (ft)	1.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond d

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	797	0.000
0.01	821.08	8.09
0.02	845.16	16.42
0.03	869.24	24.99
0.04	893.32	33.80
0.05	917.4	42.85
0.06	941.48	52.14
0.07	965.56	61.68
0.08	989.64	71.46
0.09	1013.72	81.48
0.1	1037.8	91.74
0.11	1061.88	102.24
0.12	1085.96	112.98
0.13	1110.04	123.96
0.14	1134.12	135.18
0.15	1158.2	146.64
0.16	1182.28	158.34
0.17	1206.36	170.28
0.18	1230.44	182.46
0.19	1254.52	194.88
0.2	1278.6	207.55
0.21	1302.68	220.46
0.22	1326.76	233.61
0.23	1350.84	247.00
0.24	1374.92	260.63
0.25	1399	274.50
0.26	1423.08	288.61
0.27	1447.16	302.96
0.28	1471.24	317.55
0.29	1495.32	332.38
0.3	1519.4	347.45

Storage Area Volume Curves



Storage Node : Pond d (continued)

Outflow Weirs

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1 Pond d overflow	Trapezoidal	No	1.75	0.25	51.00	0.30	3.37

Output Summary Results

Peak Inflow (cfs)	0.19
Peak Lateral Inflow (cfs)	0.19
Peak Outflow (cfs)	0.19
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	1.76
Max HGL Depth Attained (ft)	0.26
Average HGL Elevation Attained (ft)	1.68
Average HGL Depth Attained (ft)	0.18
Time of Max HGL Occurrence (days hh:mm)	0 12:12
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond e

Input Data

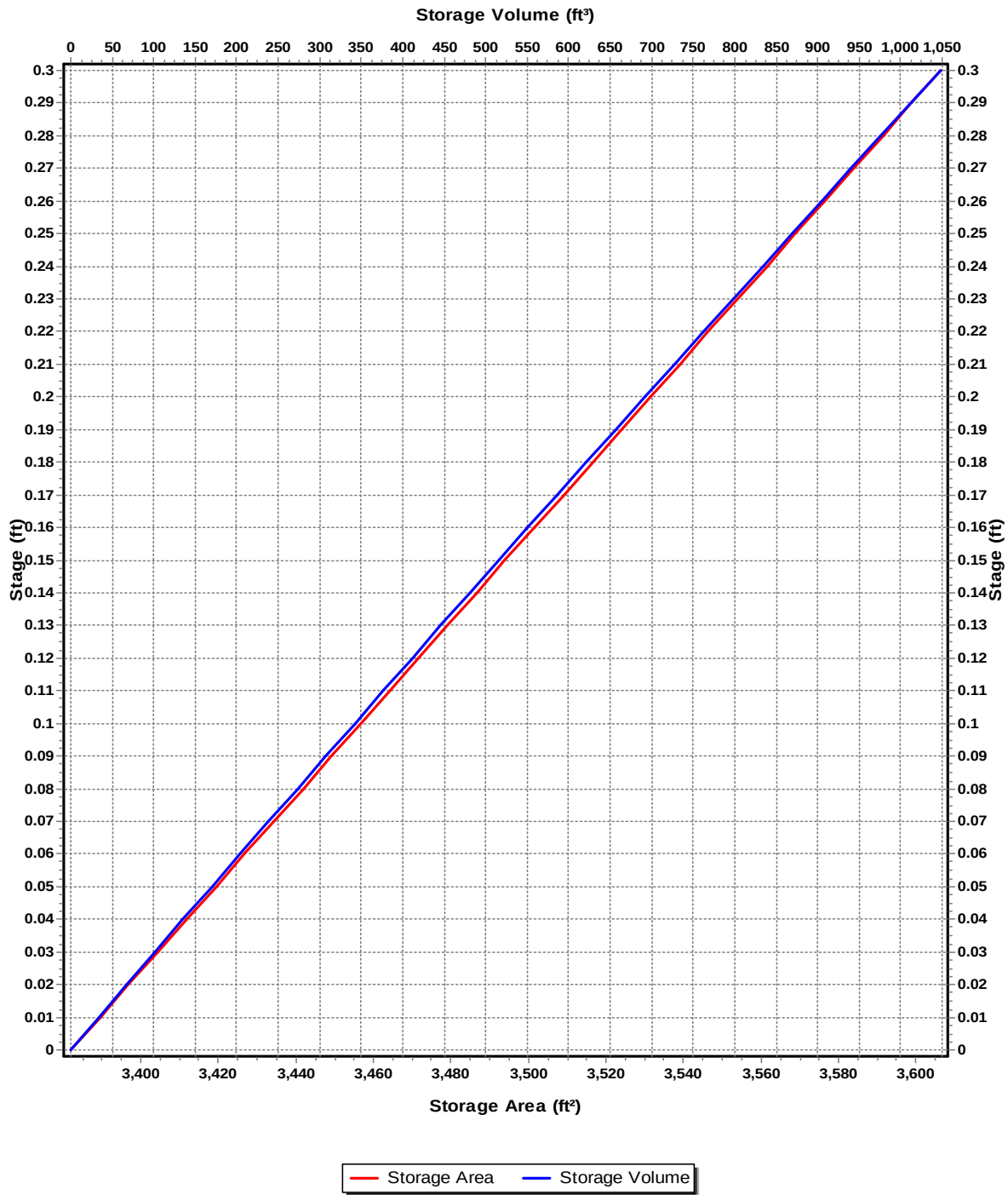
Invert Elevation (ft)	1.50
Max (Rim) Elevation (ft)	1.80
Max (Rim) Offset (ft)	0.30
Initial Water Elevation (ft)	1.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond e

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	3382	0.000
0.01	3389.48	33.86
0.02	3396.96	67.79
0.03	3404.44	101.80
0.04	3411.92	135.88
0.05	3419.4	170.04
0.06	3426.88	204.27
0.07	3434.36	238.58
0.08	3441.84	272.96
0.09	3449.32	307.42
0.1	3456.8	341.95
0.11	3464.28	376.56
0.12	3471.76	411.24
0.13	3479.24	446.00
0.14	3486.72	480.83
0.15	3494.2	515.73
0.16	3501.68	550.71
0.17	3509.16	585.76
0.18	3516.64	620.89
0.19	3524.12	656.09
0.2	3531.6	691.37
0.21	3539.08	726.72
0.22	3546.56	762.15
0.23	3554.04	797.65
0.24	3561.52	833.23
0.25	3569	868.88
0.26	3576.48	904.61
0.27	3583.96	940.41
0.28	3591.44	976.29
0.29	3598.92	1012.24
0.3	3606.4	1048.27

Storage Area Volume Curves



Storage Node : Pond e (continued)

Outflow Weirs

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1 Pond e overflow	Trapezoidal	No	1.70	0.20	75.00	0.50	3.37

Output Summary Results

Peak Inflow (cfs)	0.61
Peak Lateral Inflow (cfs)	0.61
Peak Outflow (cfs)	0.61
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	1.72
Max HGL Depth Attained (ft)	0.22
Average HGL Elevation Attained (ft)	1.66
Average HGL Depth Attained (ft)	0.16
Time of Max HGL Occurrence (days hh:mm)	0 12:11
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

APPENDIX P

100 – YEAR STORMNET INPUT AND OUTPUT FOR PROPOSED CONDITIONS

Project Description

Project File Name : east area improvement rev 2 NAVD elevations.SPF
Project Description :

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method Santa Barbara UH
Time of Concentration (TOC) Method SCS TR-55
Link Routing Method Hydrodynamic
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On Aug 05, 2013 00:00:00
End Analysis On Aug 06, 2013 12:00:00
Start Reporting On Aug 05, 2013 00:00:00
Antecedent Dry Days 0 days
Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
Reporting Time Step 0 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Impervious Area Curve Number	Pervious Area Curve Number	Total Rainfall	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ft²)	(%)			(in)	(in)	(ac-in)	(cfs)	(days hh:mm:ss)
1	Basin 1	17756.01	29.00	98.00	52.25	12.00	7.21	2.94	1.63	0 00:08:00
2	Basin 10	30178.02	55.00	98.00	49.00	12.00	8.65	5.99	3.22	0 00:08:00
3	Basin 11	22723.99	44.00	98.00	49.00	12.00	7.88	4.11	2.23	0 00:08:00
4	Basin 12	68881.99	99.00	98.00	49.00	12.00	11.69	18.48	9.78	0 00:08:00
5	Basin 12A	6209.00	100.00	98.00	49.00	12.00	11.76	1.68	0.89	0 00:02:00
6	Basin 13	84093.02	18.00	98.00	64.30	12.00	8.03	15.50	8.97	0 00:08:00
7	Basin 14	8497.99	84.00	98.00	49.00	12.00	10.65	2.08	1.10	0 00:08:00
8	Basin 3	33175.99	20.00	98.00	53.96	12.00	6.85	5.22	2.96	0 00:08:00
9	Basin 4	2769.98	13.00	98.00	60.61	12.00	7.32	0.47	0.27	0 00:08:00
10	Basin 5	7217.98	20.00	98.00	69.50	12.00	8.73	1.45	0.84	0 00:08:00
11	Basin 6	43462.99	28.00	98.00	49.00	12.00	6.78	6.76	3.72	0 00:08:00
12	Basin 7	4563.00	45.00	98.00	49.00	12.00	7.95	0.83	0.45	0 00:08:00
13	Basin 9	19778.98	87.00	98.00	49.00	12.00	10.86	4.93	2.62	0 00:08:00
14	Basin 9A	6209.00	100.00	98.00	49.00	12.00	11.76	1.68	0.89	0 00:02:00

Node Summary

SN Element ID	Element Type	Invert Elevation	Ground/Rim (Max) Elevation	Initial Water Elevation	Surcharge Elevation	Peak Inflow	Max HGL Elevation Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
		(ft)	(ft)	(ft)	(ft)	(cfs)	(ft)	(ft)	(ft)	(days hh:mm)	(ac-in)	(min)
1 Area 6 Outfall	Junction	7.50	8.50	7.50	8.50	1.10	7.88	0.00	0.62	0 00:00	0.00	0.00
2 Catch Basin Area 10	Junction	4.33	10.00	4.33	10.00	17.73	8.11	0.00	1.89	0 00:00	0.00	0.00
3 Catch Basin Area 11	Junction	2.60	10.00	2.60	10.00	19.95	6.71	0.00	3.29	0 00:00	0.00	0.00
4 Catch Basin Area 14	Junction	7.66	10.00	7.66	10.00	1.10	8.11	0.00	1.89	0 00:00	0.00	0.00
5 Catch Basin Area 6	Junction	2.33	5.50	2.33	5.50	4.96	6.92	0.00	0.08	0 00:00	0.00	0.00
6 Catch Basin Area 7	Junction	4.47	11.00	4.47	11.00	14.52	8.63	0.00	2.37	0 00:00	0.00	0.00
7 Catch Basin Area 9	Junction	5.25	11.75	5.25	11.75	13.19	9.12	0.00	2.63	0 00:00	0.00	0.00
8 Manhole	Junction	5.25	13.00	5.25	13.00	10.58	10.19	0.00	2.81	0 00:00	0.00	0.00
9 Pond B Outlet structure	Junction	2.90	5.50	2.90	5.50	27.11	4.50	0.00	1.59	0 00:00	0.00	0.00
10 West Warehouse Basin	Junction	8.00	13.00	8.00	13.00	0.89	11.66	0.00	1.34	0 00:00	0.00	0.00
11 Pond a outfall	OutFall	1.70				1.63	1.70					
12 Pond B Outfall	OutFall	1.70				27.11	1.70					
13 Pond c outfall	OutFall	1.70				2.95	1.70					
14 Pond d outfall	OutFall	1.70				0.27	1.70					
15 Pond e outfall	OutFall	1.70				0.83	1.70					
16 Catch Basin 12	Storage Node	6.76	12.50	6.76		10.67	11.55				0.00	0.00
17 Pond a	Storage Node	2.00	4.00	2.00		1.63	3.54				0.00	0.00
18 Pond B	Storage Node	2.90	5.50	2.90		32.95	5.14				0.00	0.00
19 Pond c	Storage Node	2.00	3.00	2.00		2.96	2.83				0.00	0.00
20 Pond d	Storage Node	1.50	1.80	1.50		0.27	1.76				0.00	0.00
21 Pond e	Storage Node	1.50	1.80	1.50		0.84	1.72				0.00	0.00

Link Summary

SN Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)
1 10 to 11	Pipe	Catch Basin Area 10	Catch Basin Area 11	165.00	5.08	4.08	0.6061	24.000	0.0140	17.73	16.35	1.08	5.64	2.00	1.00	23.00
2 11 to pond	Pipe	Catch Basin Area 11	Pond B	154.00	3.83	2.90	0.6039	24.000	0.0140	19.95	16.32	1.22	6.35	2.00	1.00	26.00
3 12 to manhole	Pipe	Catch Basin 12	Manhole	93.00	7.99	7.44	0.5914	18.000	0.0140	10.58	7.50	1.41	5.99	1.50	1.00	19.00
4 14 to 10	Pipe	Catch Basin Area 7	Catch Basin Area 10	75.00	5.70	5.26	0.5867	24.000	0.0140	14.52	16.09	0.90	4.92	2.00	1.00	20.00
5 9 to 14	Pipe	Catch Basin Area 9	Catch Basin Area 7	91.00	6.48	5.95	0.5824	24.000	0.0140	13.18	16.03	0.82	5.14	2.00	1.00	14.00
6 Area 6 Drain	Pipe	Catch Basin Area 6	Pond B	99.30	3.31	2.90	0.4129	12.000	0.0140	4.16	2.13	1.96	5.30	1.00	1.00	945.00
7 manhole to 9	Pipe	Manhole	Catch Basin Area 9	67.00	7.19	6.73	0.6866	18.000	0.0140	10.57	8.08	1.31	5.98	1.50	1.00	17.00
8 Pipe12	Pipe	Catch Basin Area 14	Area 6 Outfall	28.76	7.66	7.50	0.5563	12.000	0.0140	1.10	2.47	0.45	4.00	0.42	0.42	0.00
9 west warehouse to 12	Pipe	West Warehouse Basin	Catch Basin 12	10.00	8.09	7.99	1.0001	8.000	0.0140	0.88	1.12	0.79	2.53	0.67	1.00	71.00
10 Area 6 west ditch	Channel	Area 6 Outfall	Catch Basin Area 6	130.40	7.50	6.00	1.1504	12.000	0.0700	1.71	25.07	0.07	0.74	0.61	0.61	0.00
11 Outfall Channel	Channel	Pond B Outlet structure	Pond B Outfall	58.00	2.90	2.50	0.6897	18.000	0.0150	27.11	30.56	0.89	6.31	1.43	0.95	0.00
12 Pond a	Weir	Pond a	Pond a outfall		2.00	1.70					1.63					
13 Pond B Water Quality	Weir	Pond B	Pond B Outlet structure		2.90	2.90				25.09						
14 Pond c overflow	Weir	Pond c	Pond c outfall		2.00	1.70				2.95						
15 Pond d overflow	Weir	Pond d	Pond d outfall		1.50	1.70				0.27						
16 Pond e overflow	Weir	Pond e	Pond e outfall		1.50	1.70				0.83						
17 Skimmer Top	Weir	Pond B	Pond B Outlet structure		2.90	2.90				2.02						

Subbasin Hydrology

Subbasin : Basin 1

Input Data

Area (ft²) 17756.01
Impervious Area (%) 29.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 52.25
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft ²)	Soil Group	Curve Number
Composite Area & Weighted CN	17756.01		65.5175

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

$$T_c = (0.007 * ((n * L_f)^{0.8})) / ((P^{0.5}) * (S_f^{0.4}))$$

Where :

T_c = Time of Concentration (hrs)
n = Manning's Roughness
L_f = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
S_f = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (S_f^{0.5}) (unpaved surface)
V = 20.3282 * (S_f^{0.5}) (paved surface)
V = 15.0 * (S_f^{0.5}) (grassed waterway surface)
V = 10.0 * (S_f^{0.5}) (nearly bare & untilled surface)
V = 9.0 * (S_f^{0.5}) (cultivated straight rows surface)
V = 7.0 * (S_f^{0.5}) (short grass pasture surface)
V = 5.0 * (S_f^{0.5}) (woodland surface)
V = 2.5 * (S_f^{0.5}) (forest w/heavy litter surface)
T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hrs)
L_f = Flow Length (ft)
V = Velocity (ft/sec)
S_f = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^{2/3}) * (S_f^{0.5})) / n
R = A_q / W_p
T_c = (L_f / V) / (3600 sec/hr)

Where :

T_c = Time of Concentration (hrs)
L_f = Flow Length (ft)
R = Hydraulic Radius (ft)
A_q = Flow Area (ft²)
W_p = Wetted Perimeter (ft)
V = Velocity (ft/sec)
S_f = Slope (ft/ft)
n = Manning's Roughness

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 7.21
Peak Runoff (cfs) 1.63
Weighted Curve Number 65.52
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 10

Input Data

Area (ft²) 30178.02
Impervious Area (%) 55.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	30178.02		75.95

Time of Concentration

User-Defined TOC override (minutes): 8.00

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 8.65
Peak Runoff (cfs) 3.22
Weighted Curve Number 75.95
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 11

Input Data

Area (ft²) 22723.99
Impervious Area (%) 44.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	22723.99		70.56

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 7.88
Peak Runoff (cfs) 2.23
Weighted Curve Number 70.56
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 12

Input Data

Area (ft²) 68881.99
Impervious Area (%) 99.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	68881.99		97.51

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 11.69
Peak Runoff (cfs) 9.78
Weighted Curve Number 97.51
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 12A

Input Data

Area (ft²) 6209.00
Impervious Area (%) 100.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	6209.00		98

Time of Concentration

User-Defined TOC override (minutes): 2

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 11.76
Peak Runoff (cfs) 0.89
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:02:00

Subbasin : Basin 13

Input Data

Area (ft²) 84093.02
Impervious Area (%) 18.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 64.30
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	84093.02		70.366

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 8.03
Peak Runoff (cfs) 8.97
Weighted Curve Number 70.37
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 14

Input Data

Area (ft²) 8497.99
Impervious Area (%) 84.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	8497.99		90.16

Time of Concentration

User-Defined TOC override (minutes): 8.00

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 10.65
Peak Runoff (cfs) 1.10
Weighted Curve Number 90.16
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 3

Input Data

Area (ft²) 33175.99
Impervious Area (%) 20.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 53.96
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	33175.99		62.768

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 6.85
Peak Runoff (cfs) 2.96
Weighted Curve Number 62.77
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 4

Input Data

Area (ft²) 2769.98
Impervious Area (%) 13.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 60.61
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	2769.98		65.4707

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 7.32
Peak Runoff (cfs) 0.27
Weighted Curve Number 65.47
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 5

Input Data

Area (ft²) 7217.98
Impervious Area (%) 20.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 69.50
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	7217.98		75.2

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 8.73
Peak Runoff (cfs) 0.84
Weighted Curve Number 75.20
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 6

Input Data

Area (ft²) 43462.99
Impervious Area (%) 28.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	43462.99		62.72

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 6.78
Peak Runoff (cfs) 3.72
Weighted Curve Number 62.72
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 7

Input Data

Area (ft²) 4563.00
Impervious Area (%) 45.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	4563.00		71.05

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 7.95
Peak Runoff (cfs) 0.45
Weighted Curve Number 71.05
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 9

Input Data

Area (ft²) 19778.98
Impervious Area (%) 87.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	19778.98		91.63

Time of Concentration

User-Defined TOC override (minutes): 8

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 10.86
Peak Runoff (cfs) 2.62
Weighted Curve Number 91.63
Time of Concentration (days hh:mm:ss) 0 00:08:00

Subbasin : Basin 9A

Input Data

Area (ft²) 6209.00
Impervious Area (%) 100.00
Impervious Area Curve Number 98.00
Pervious Area Curve Number 49.00
Rain Gage ID 25 Year 24 Hour

Composite Curve Number

Soil/Surface Description	Area (ft²)	Soil Group	Curve Number
Composite Area & Weighted CN	6209.00		98

Time of Concentration

User-Defined TOC override (minutes): 2

Subbasin Runoff Results

Total Rainfall (in) 12.00
Total Runoff (in) 11.76
Peak Runoff (cfs) 0.89
Weighted Curve Number 98.00
Time of Concentration (days hh:mm:ss) 0 00:02:00

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	Area 6 Outfall	7.50	8.50	1.00	7.50	0.00	8.50	0.00	0.00	0.00
2	Catch Basin Ar	4.33	10.00	5.68	4.33	0.00	10.00	0.00	777.00	0.00
3	Catch Basin Ar	2.60	10.00	7.40	2.60	0.00	10.00	0.00	48.00	0.00
4	Catch Basin Ar	7.66	10.00	2.34	7.66	0.00	10.00	0.00	37.00	0.00
5	Catch Basin Ar	2.33	5.50	3.17	2.33	0.00	5.50	0.00	123.00	0.00
6	Catch Basin Ar	4.47	11.00	6.53	4.47	0.00	11.00	0.00	634.00	0.00
7	Catch Basin Ar	5.25	11.75	6.50	5.25	0.00	11.75	0.00	494.00	0.00
8	Manhole	5.25	13.00	7.75	5.25	0.00	13.00	0.00	0.00	0.00
9	Pond B Outlet :	2.90	5.50	2.60	2.90	0.00	5.50	0.00	0.00	0.00
10	West Warehou	8.00	13.00	5.00	8.00	0.00	13.00	0.00	0.00	0.00

Junction Results

SN Element ID	Peak Inflow	Peak Lateral Inflow	Max HGL Elevation Attained	Max HGL Depth Attained	Max Surcharge Depth Attained	Min Freeboard Attained	Average HGL Elevation Attained	Average HGL Depth Attained	Time of Max HGL Occurrence	Time of Peak Flooding Occurrence	Total Flooded Volume	Total Time Flooded
	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(days hh:mm)	(days hh:mm)	(ac-in)	(min)
1 Area 6 Outfall	1.10	0.00	7.88	0.38	0.00	0.62	7.64	0.14	0 12:01	0 00:00	0.00	0.00
2 Catch Basin Area 10	17.73	3.22	8.11	3.78	0.00	1.89	5.46	1.13	0 12:11	0 00:00	0.00	0.00
3 Catch Basin Area 11	19.95	2.23	6.71	4.11	0.00	3.29	4.43	1.83	0 12:12	0 00:00	0.00	0.00
4 Catch Basin Area 14	1.10	1.10	8.11	0.45	0.00	1.89	7.77	0.11	0 12:08	0 00:00	0.00	0.00
5 Catch Basin Area 6	4.96	3.72	6.92	4.59	0.00	0.08	4.30	1.97	0 12:23	0 00:00	0.00	0.00
6 Catch Basin Area 7	14.52	1.34	8.63	4.16	0.00	2.37	6.04	1.57	0 12:11	0 00:00	0.00	0.00
7 Catch Basin Area 9	13.19	2.62	9.12	3.87	0.00	2.63	6.80	1.55	0 12:10	0 00:00	0.00	0.00
8 Manhole	10.58	0.00	10.19	4.94	0.00	2.81	7.49	2.24	0 12:10	0 00:00	0.00	0.00
9 Pond B Outlet structure	27.11	0.00	4.50	1.60	0.00	1.59	3.13	0.23	0 12:26	0 00:00	0.00	0.00
10 West Warehouse Basin	0.89	0.89	11.66	3.66	0.00	1.34	8.37	0.37	0 12:10	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Average Slope	Shape	Height	Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flap Flow Gate
		(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(ft)	(ft)					(cfs)
1	Area 6 west ditch	130.40	7.50	0.00	6.00	3.67	1.1504	Triangular	1.000	35.000	0.0700	0.0000	0.0000	0.0000	0.00 No
2	Outfall Channel	58.00	2.90	0.00	2.50	0.80	0.6897	Rectangular	1.500	3.000	0.0150	0.5000	0.0000	0.0000	0.00 No

Channel Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(ft)		(min)	
1 Area 6 west ditch	1.71	0 12:02	25.07	0.07	0.74	0.61	0.61	0.00	
2 Outfall Channel	27.11	0 12:26	30.56	0.89	6.31	1.43	0.95	0.00	

Pipe Input

SN Element ID	Length	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Average Pipe Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	No. of Barrels
1 10 to 11	165.00	5.08	0.76	4.08	1.48	0.6061	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
2 11 to pond	154.00	3.83	1.23	2.90	0.00	0.6039	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
3 12 to manhole	93.00	7.99	1.23	7.44	2.19	0.5914	Circular	18.000	18.000	0.0140	0.5000	0.0000	0.0000	0.00	1
4 14 to 10	75.00	5.70	1.23	5.26	0.94	0.5867	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
5 9 to 14	91.00	6.48	1.23	5.95	1.48	0.5824	Circular	24.000	24.000	0.0140	0.5000	0.0000	0.0000	0.00	1
6 Area 6 Drain	99.30	3.31	0.98	2.90	0.00	0.4129	Circular	12.000	12.000	0.0140	0.5000	0.0000	0.0000	0.00	1
7 manhole to 9	67.00	7.19	1.94	6.73	1.48	0.6866	Circular	18.000	18.000	0.0140	0.5000	0.0000	0.0000	0.00	1
8 Pipe12	28.76	7.66	0.00	7.50	0.00	0.5563	Circular	12.000	12.000	0.0140	0.5000	0.0000	0.0000	0.00	1
9 west warehouse to 12	10.00	8.09	0.09	7.99	1.23	1.0001	Circular	8.040	8.040	0.0140	0.5000	0.0000	0.0000	0.00	1

Pipe Results

SN Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number
	(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(ft)		(min)	
1 10 to 11	17.73	0 12:08	16.35	1.08	5.64	2.00	1.00	23.00	
2 11 to pond	19.95	0 12:08	16.32	1.22	6.35	2.00	1.00	26.00	
3 12 to manhole	10.58	0 12:07	7.50	1.41	5.99	1.50	1.00	19.00	
4 14 to 10	14.52	0 12:08	16.09	0.90	4.92	2.00	1.00	20.00	
5 9 to 14	13.18	0 12:08	16.03	0.82	5.14	2.00	1.00	14.00	
6 Area 6 Drain	4.16	0 12:21	2.13	1.96	5.30	1.00	1.00	945.00	
7 manhole to 9	10.57	0 12:07	8.08	1.31	5.98	1.50	1.00	17.00	
8 Pipe12	1.10	0 12:08	2.47	0.45	4.00	0.42	0.42	0.00	
9 west warehouse to 12	0.88	0 12:08	1.12	0.79	2.53	0.67	1.00	71.00	

Storage Nodes

Storage Node : Catch Basin 12

Input Data

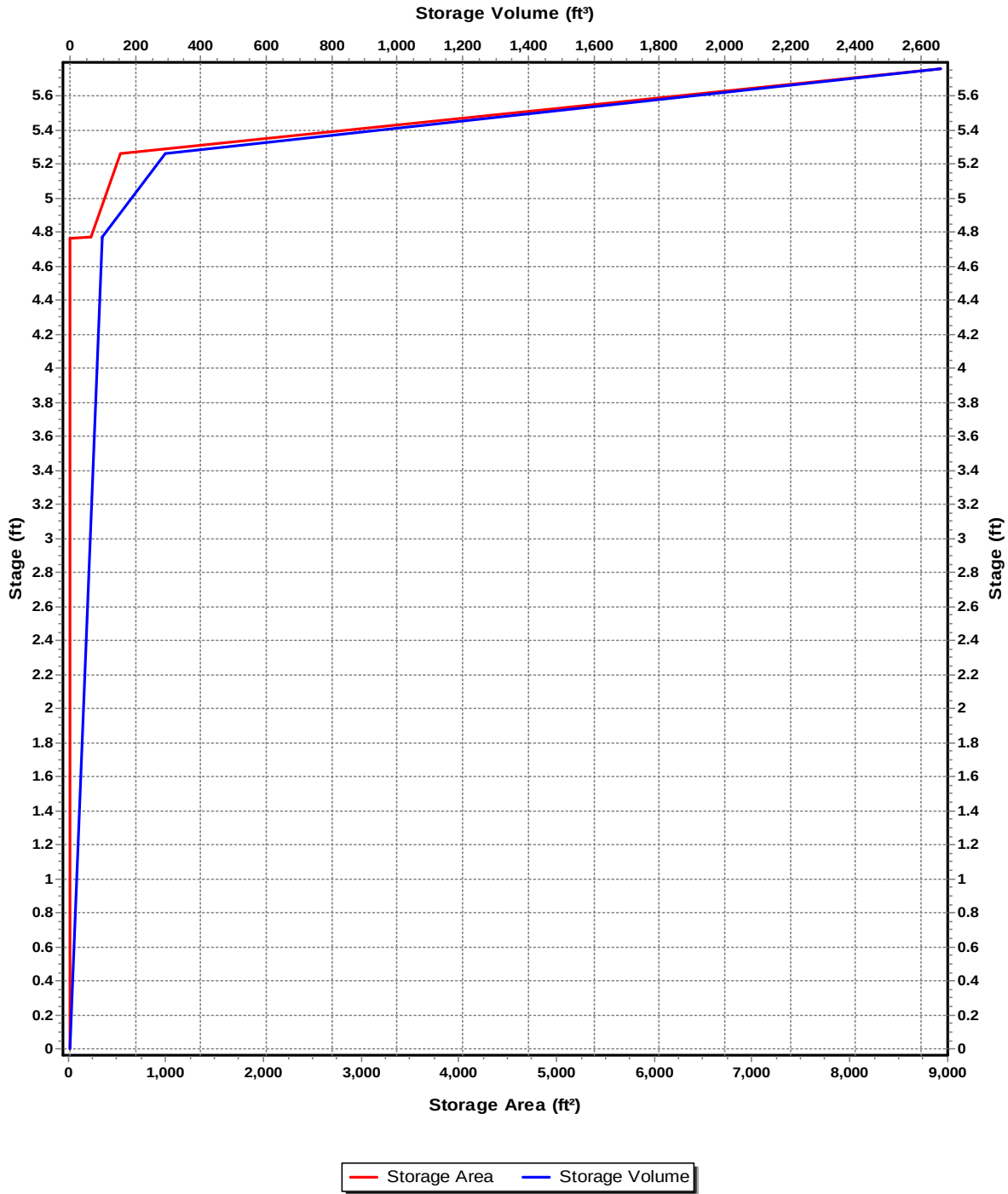
Invert Elevation (ft)	6.76
Max (Rim) Elevation (ft)	12.50
Max (Rim) Offset (ft)	5.74
Initial Water Elevation (ft)	6.76
Initial Water Depth (ft)	0.00
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Parking Lot

Stage	Storage Area	Storage Volume
(ft)	(ft²)	(ft³)
0	20.76	0.000
4.76	20.76	98.82
4.77	238	100.11
5.26	542	291.21
5.76	8934	2660.21

Storage Area Volume Curves



Storage Node : Catch Basin 12 (continued)

Output Summary Results

Peak Inflow (cfs)	10.67
Peak Lateral Inflow (cfs)	9.78
Peak Outflow (cfs)	10.58
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	11.55
Max HGL Depth Attained (ft)	4.79
Average HGL Elevation Attained (ft)	8.32
Average HGL Depth Attained (ft)	1.56
Time of Max HGL Occurrence (days hh:mm)	0 12:10
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond a

Input Data

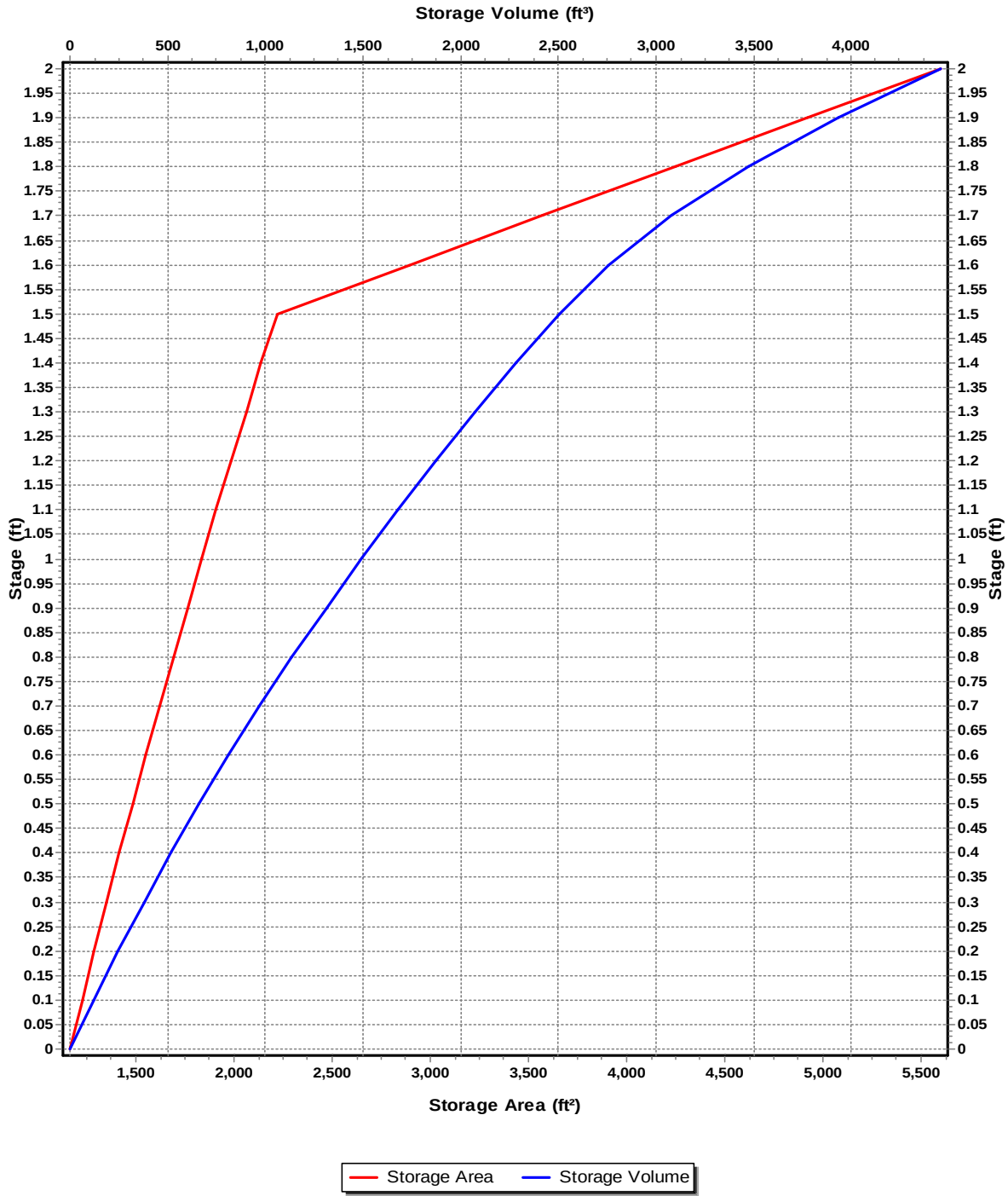
Invert Elevation (ft)	2.00
Max (Rim) Elevation (ft)	4.00
Max (Rim) Offset (ft)	2.00
Initial Water Elevation (ft)	2.00
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond a

Stage (ft)	Storage Area (ft ²)	Storage Volume (ft ³)
0	1166.05	0.000
0.1	1227.21	119.66
0.2	1289.67	245.50
0.3	1353.43	377.66
0.4	1418.49	516.26
0.5	1484.85	661.43
0.6	1552.51	813.30
0.7	1621.47	972.00
0.8	1691.73	1137.66
0.9	1763.29	1310.41
1	1836.15	1490.38
1.1	1910.31	1677.70
1.2	1985.77	1872.50
1.3	2062.53	2074.92
1.4	2140.59	2285.08
1.5	2219.95	2503.11
1.6	2896.2	2758.92
1.7	3572.4	3082.35
1.8	4248.6	3473.40
1.9	4924.8	3932.07
2	5601	4458.36

Storage Area Volume Curves



Storage Node : Pond a (continued)

Outflow Weirs

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1 Pond a	Trapezoidal	No	3.50	1.50	65.00	0.70	3.37

Output Summary Results

Peak Inflow (cfs)	1.63
Peak Lateral Inflow (cfs)	1.63
Peak Outflow (cfs)	1.63
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	3.54
Max HGL Depth Attained (ft)	1.54
Average HGL Elevation Attained (ft)	3.15
Average HGL Depth Attained (ft)	1.15
Time of Max HGL Occurrence (days hh:mm)	0 12:12
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond B

Input Data

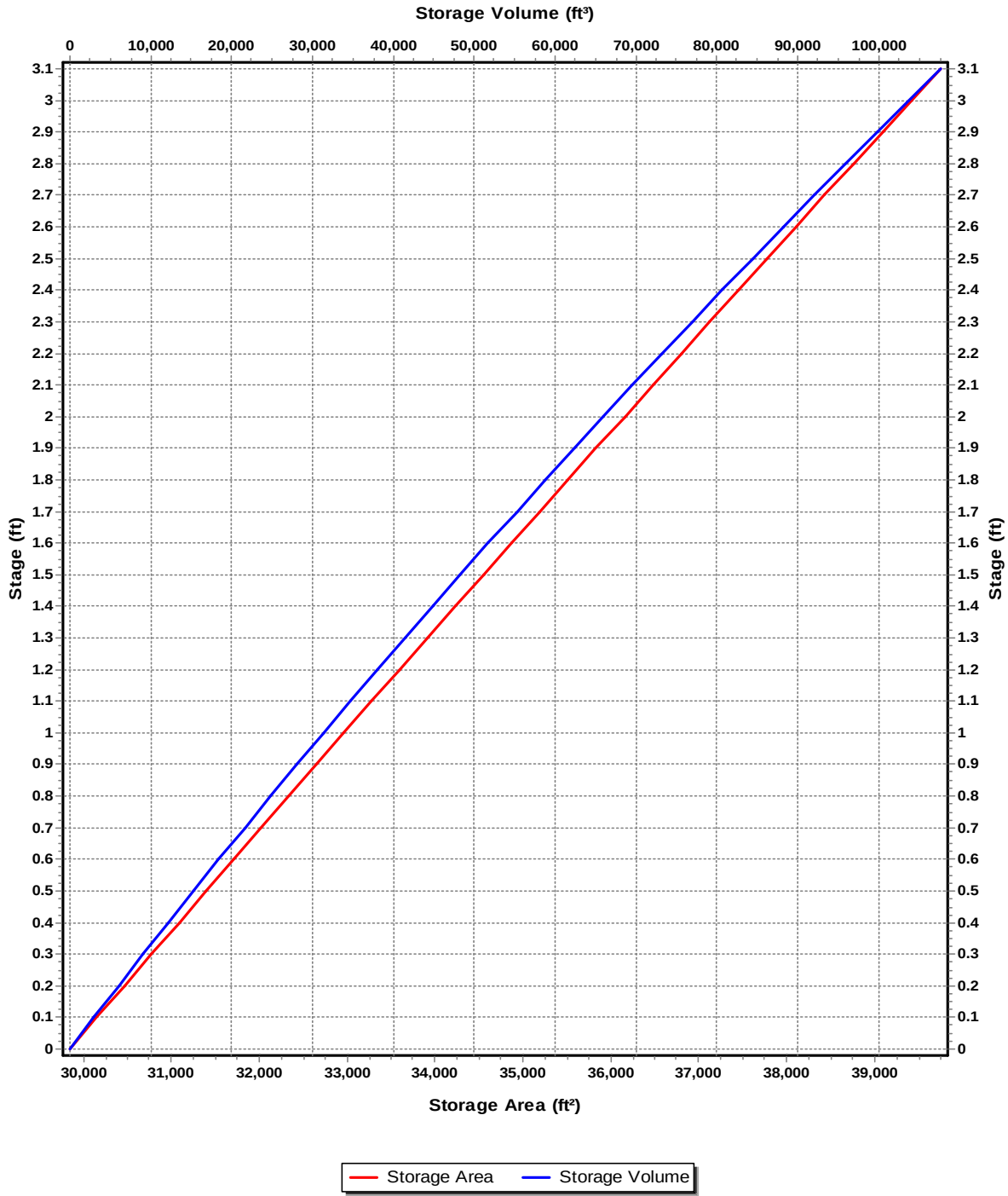
Invert Elevation (ft)	2.90
Max (Rim) Elevation (ft)	5.50
Max (Rim) Offset (ft)	2.60
Initial Water Elevation (ft)	2.90
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Big Pond

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	29847.66571	0.000
0.1	30156.21429	3000.19
0.2	30465.49905	6031.28
0.3	30775.52	9093.33
0.4	31086.27714	12186.42
0.5	31397.77048	15310.62
0.6	31710	18466.01
0.7	32022.96571	21652.66
0.8	32336.66762	24870.64
0.9	32651.10571	28120.03
1	32966.28	31400.90
1.1	33282.19048	34713.32
1.2	33598.83714	38057.37
1.3	33916.22	41433.12
1.4	34234.33905	44840.65
1.5	34553.19429	48280.03
1.6	34872.78571	51751.33
1.7	35193.11333	55254.62
1.8	35514.17714	58789.98
1.9	35835.97714	62357.49
2	36158.51333	65957.21
2.1	36481.78571	69589.22
2.2	36805.79429	73253.60
2.3	37130.53905	76950.42
2.4	37456.02	80679.75
2.5	37782.23714	84441.66
2.6	38109.19048	88236.23
2.7	38436.88	92063.53
2.8	38765.30571	95923.64
2.9	39094.46762	99816.63
3	39424.36571	103742.57
3.1	39755	107701.54

Storage Area Volume Curves



Storage Node : Pond B (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1	Pond B Water Quality	Rectangular	No	4.30	1.40	12.00	0.60	3.37
2	Skimmer Top	Rectangular	No	5.00	2.10	12.00	1.08	3.37

Output Summary Results

Peak Inflow (cfs)	32.95
Peak Lateral Inflow (cfs)	8.97
Peak Outflow (cfs)	27.11
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	5.14
Max HGL Depth Attained (ft)	2.24
Average HGL Elevation Attained (ft)	4.17
Average HGL Depth Attained (ft)	1.27
Time of Max HGL Occurrence (days hh:mm)	0 12:26
Total Exfiltration Volume (1000-ft ³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond c

Input Data

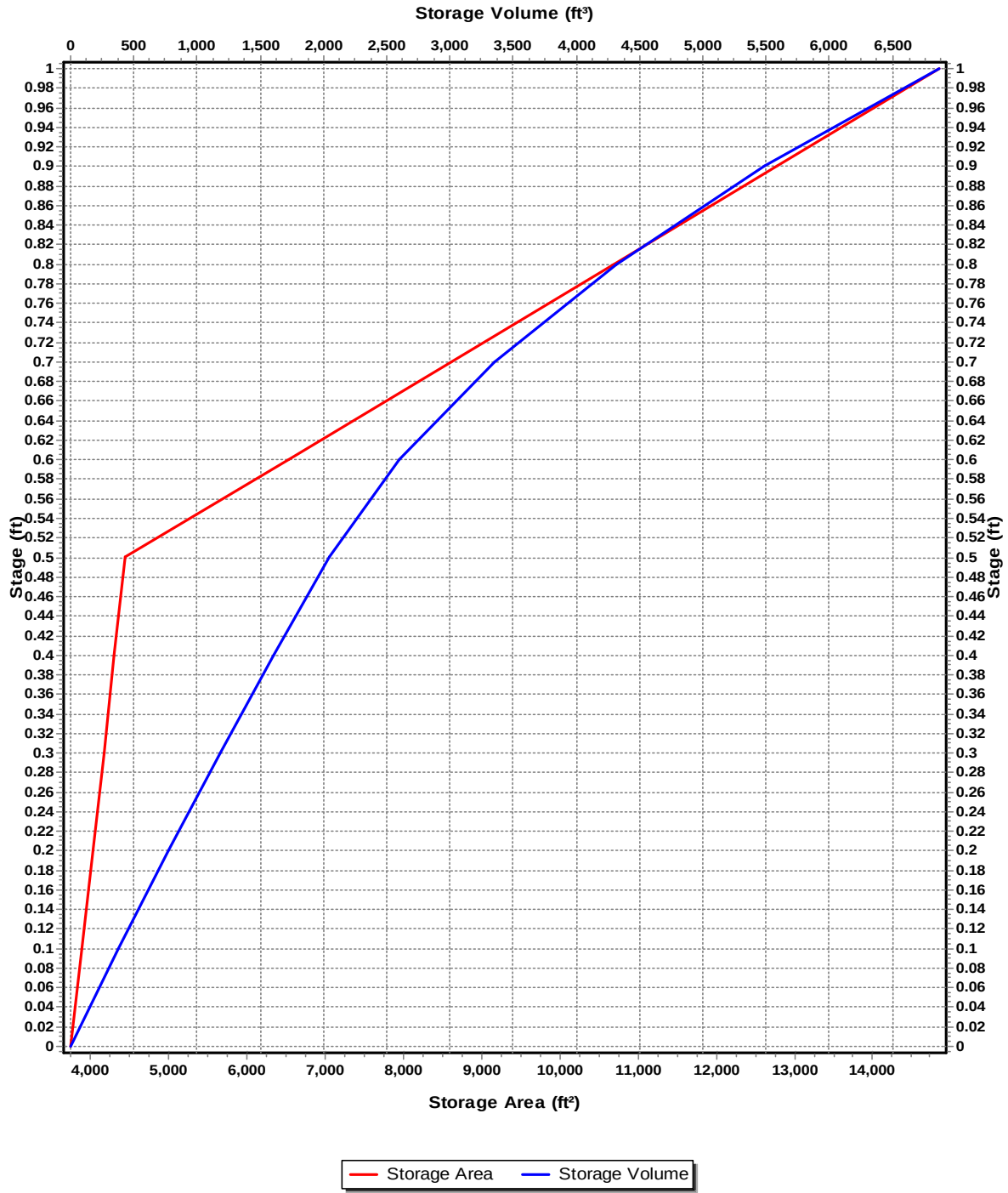
Invert Elevation (ft)	2.00
Max (Rim) Elevation (ft)	3.00
Max (Rim) Offset (ft)	1.00
Initial Water Elevation (ft)	2.00
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond c

Stage (ft)	Storage Area (ft ²)	Storage Volume (ft ³)
0	3743	0.000
0.1	3883.2	381.31
0.2	4023.4	776.64
0.3	4163.6	1185.99
0.4	4303.8	1609.36
0.5	4444	2046.75
0.6	6525.4	2595.22
0.7	8606.8	3351.83
0.8	10688.2	4316.58
0.9	12769.6	5489.47
1	14851	6870.50

Storage Area Volume Curves



Storage Node : Pond c (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1	Pond c overflow	Trapezoidal	No	2.80	0.80	148.00	0.20	3.37

Output Summary Results

Peak Inflow (cfs)	2.96
Peak Lateral Inflow (cfs)	2.96
Peak Outflow (cfs)	2.95
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	2.83
Max HGL Depth Attained (ft)	0.83
Average HGL Elevation Attained (ft)	2.61
Average HGL Depth Attained (ft)	0.61
Time of Max HGL Occurrence (days hh:mm)	0 12:12
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond d

Input Data

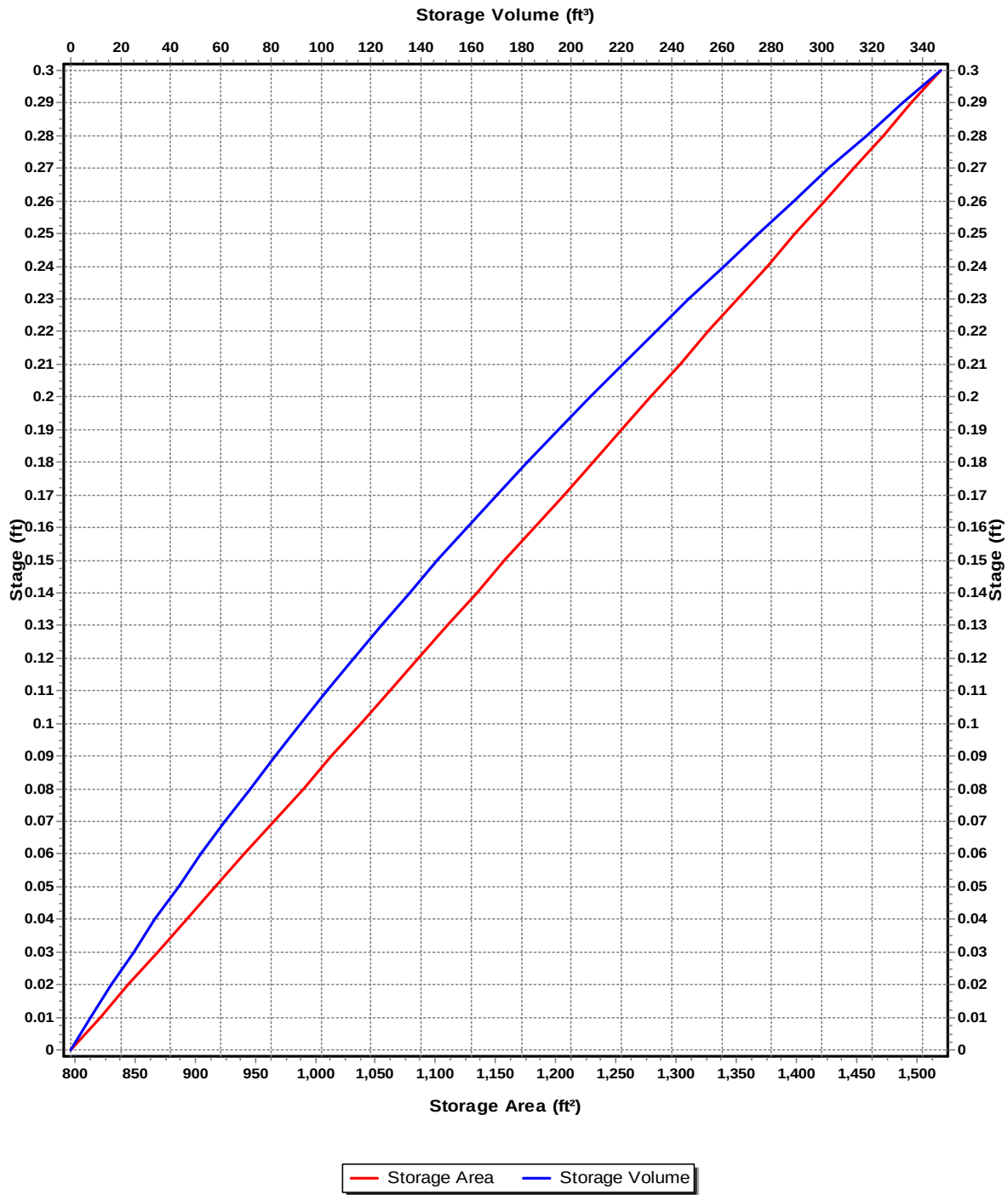
Invert Elevation (ft)	1.50
Max (Rim) Elevation (ft)	1.80
Max (Rim) Offset (ft)	0.30
Initial Water Elevation (ft)	1.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond d

Stage (ft)	Storage Area (ft ²)	Storage Volume (ft ³)
0	797	0.000
0.01	821.08	8.09
0.02	845.16	16.42
0.03	869.24	24.99
0.04	893.32	33.80
0.05	917.4	42.85
0.06	941.48	52.14
0.07	965.56	61.68
0.08	989.64	71.46
0.09	1013.72	81.48
0.1	1037.8	91.74
0.11	1061.88	102.24
0.12	1085.96	112.98
0.13	1110.04	123.96
0.14	1134.12	135.18
0.15	1158.2	146.64
0.16	1182.28	158.34
0.17	1206.36	170.28
0.18	1230.44	182.46
0.19	1254.52	194.88
0.2	1278.6	207.55
0.21	1302.68	220.46
0.22	1326.76	233.61
0.23	1350.84	247.00
0.24	1374.92	260.63
0.25	1399	274.50
0.26	1423.08	288.61
0.27	1447.16	302.96
0.28	1471.24	317.55
0.29	1495.32	332.38
0.3	1519.4	347.45

Storage Area Volume Curves



Storage Node : Pond d (continued)

Outflow Weirs

SN	Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1	Pond d overflow	Trapezoidal	No	1.75	0.25	51.00	0.30	3.37

Output Summary Results

Peak Inflow (cfs)	0.27
Peak Lateral Inflow (cfs)	0.27
Peak Outflow (cfs)	0.27
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	1.76
Max HGL Depth Attained (ft)	0.26
Average HGL Elevation Attained (ft)	1.69
Average HGL Depth Attained (ft)	0.19
Time of Max HGL Occurrence (days hh:mm)	0 12:12
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

Storage Node : Pond e

Input Data

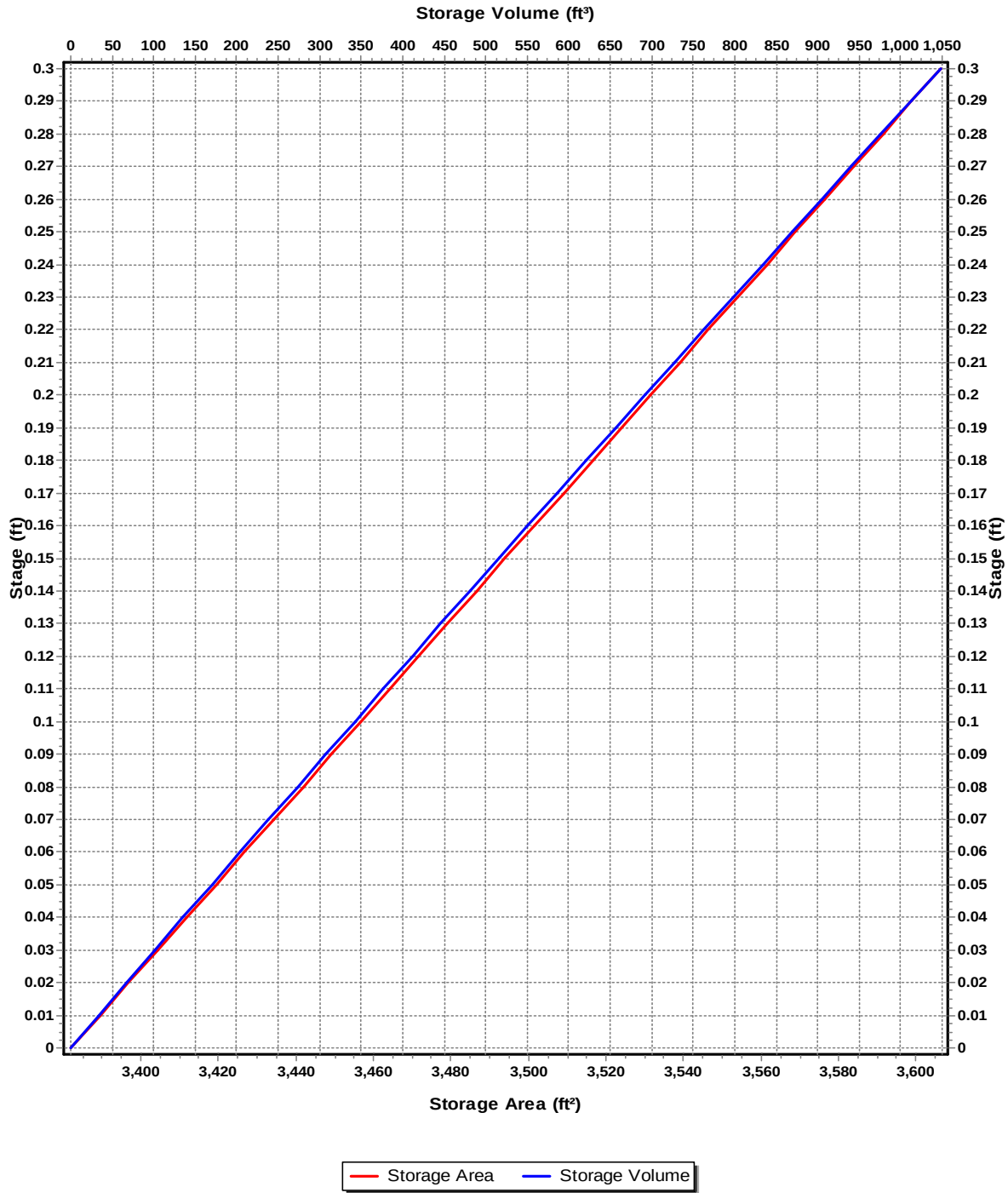
Invert Elevation (ft)	1.50
Max (Rim) Elevation (ft)	1.80
Max (Rim) Offset (ft)	0.30
Initial Water Elevation (ft)	1.50
Initial Water Depth (ft)	0.00
Ponded Area (ft ²)	0.00
Evaporation Loss	0.00

Storage Area Volume Curves

Storage Curve : Pond e

Stage	Storage Area	Storage Volume
(ft)	(ft ²)	(ft ³)
0	3382	0.000
0.01	3389.48	33.86
0.02	3396.96	67.79
0.03	3404.44	101.80
0.04	3411.92	135.88
0.05	3419.4	170.04
0.06	3426.88	204.27
0.07	3434.36	238.58
0.08	3441.84	272.96
0.09	3449.32	307.42
0.1	3456.8	341.95
0.11	3464.28	376.56
0.12	3471.76	411.24
0.13	3479.24	446.00
0.14	3486.72	480.83
0.15	3494.2	515.73
0.16	3501.68	550.71
0.17	3509.16	585.76
0.18	3516.64	620.89
0.19	3524.12	656.09
0.2	3531.6	691.37
0.21	3539.08	726.72
0.22	3546.56	762.15
0.23	3554.04	797.65
0.24	3561.52	833.23
0.25	3569	868.88
0.26	3576.48	904.61
0.27	3583.96	940.41
0.28	3591.44	976.29
0.29	3598.92	1012.24
0.3	3606.4	1048.27

Storage Area Volume Curves



Storage Node : Pond e (continued)

Outflow Weirs

SN Element ID	Weir Type	Flap Gate	Crest Elevation (ft)	Crest Offset (ft)	Length (ft)	Total Height (ft)	Discharge Coefficient
1 Pond e overflow	Trapezoidal	No	1.70	0.20	75.00	0.50	3.37

Output Summary Results

Peak Inflow (cfs)	0.84
Peak Lateral Inflow (cfs)	0.84
Peak Outflow (cfs)	0.83
Peak Exfiltration Flow Rate (cfm)	0.00
Max HGL Elevation Attained (ft)	1.72
Max HGL Depth Attained (ft)	0.22
Average HGL Elevation Attained (ft)	1.67
Average HGL Depth Attained (ft)	0.17
Time of Max HGL Occurrence (days hh:mm)	0 12:10
Total Exfiltration Volume (1000-ft³)	0.000
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0.00

ZACHRY	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013	
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006		REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT			

APPENDIX Q

POND RECOVERY CALCULATIONS

Recovery Calculation for Pond A

Unsaturated Vertical Infiltration Rate (Design) kv	4 <---S.F. = 2.0
Horizontal Saturated Hydraulic Conductivity (Design), kh	5.5 <---S.F. = 2.0
Fillable Porosity, f	0.3
Confining Layer Elevation	-35.00 ft
Ground water elevation	1.00 ft
Pond Bottom	2.00 ft
Control Elevation	3.50 ft
Control Depth (hv)	1.50 ft
hb (height of basin above groundwater table)	1.00 ft
hu (height of water to saturate soil)	0.30 ft
Area of Bottom of Pond	1166 ft ²
Volume of Water Absorbed	350 ft ³
New Water Level (begin saturated lateral flow)	3.20 ft
Volume remaining for saturated lateral flow	1935 ft ³
Time for vertical saturation	0.1 days
h2 Water Depth From Bottom of Pond	1.20 ft
HT (Water Level Above Groundwater Table)	2.20 ft
Fy	0.5 <-Fy to use on dimensionless curve
L/W ratio	2.6
Avg Length	54 ft
Avg W	21 ft
Fx	0.85
H (thickness of aquifer)	36.00 ft
D (average thickness)	37.10 ft
Lateral Saturated Flow Time	0.7 days
Total Recovery time	0.8 days

Input
 Calculated

Recovery Calculation for Pond B

Unsaturated Vertical Infiltration Rate (Design) kv	4 <---S.F. = 2.0
Horizontal Saturated Hydraulic Conductivity (Design), kh	5.5 <---S.F. = 2.0
Fillable Porosity, f	0.3
Confining Layer Elevation	-35.00 ft
Ground water elevation	1.00 ft
Pond Bottom	2.90 ft
Control Elevation	4.30 ft
Control Depth (hv)	1.40 ft
hb (height of basin above groundwater table)	1.90 ft
hu (height of water to saturate soil)	0.57 ft
Area of Bottom of Pond	28621 ft ²
Volume of Water Absorbed	16314 ft ³
New Water Level (begin saturated lateral flow)	3.80 ft
Volume remaining for saturated lateral flow	28527 ft ³
Time for vertical saturation	0.1 days
h2 Water Depth From Bottom of Pond	0.90 ft
HT (Water Level Above Groundwater Table)	2.80 ft
Fy	0.7 <-Fy to use on dimensionless curve
L/W ratio	6.0
Avg Length	446 ft
Avg W	74 ft
Fx	1.53
H (thickness of aquifer)	36.00 ft
D (average thickness)	37.40 ft
Lateral Saturated Flow Time	2.8 days
Total Recovery time	3.0 days

Input
 Calculated

Recovery Calculation for Pond C

Unsaturated Vertical Infiltration Rate (Design) kv	4 <---S.F. = 2.0	
Horizontal Saturated Hydraulic Conductivity (Design), kh	5.5 <---S.F. = 2.0	
Fillable Porosity, f	0.3	
Confining Layer Elevation	-35.00 ft	
Ground water elevation	1.00 ft	
Pond Bottom	2.00 ft	
Control Elevation	2.80 ft	
Control Depth (hv)	0.80 ft	
hb (height of basin above groundwater table)	1.00 ft	
hu (height of water to saturate soil)	0.30 ft	
Area of Bottom of Pond	3743 ft ²	
Volume of Water Absorbed	1123 ft ³	
New Water Level (begin saturated lateral flow)	2.50 ft	
Volume remaining for saturated lateral flow	2229 ft ³	
Time for vertical saturation	0.1 days	
h2 Water Depth From Bottom of Pond	0.50 ft	
HT (Water Level Above Groundwater Table)	1.50 ft	
Fy	0.7 <-Fy to use on dimensionless curve	
L/W ratio	4.8	
Avg Length	134 ft	
Avg W	28 ft	
Fx	1.2	
H (thickness of aquifer)	36.00 ft	
D (average thickness)	36.75 ft	
Lateral Saturated Flow Time	0.7 days	
Total Recovery time	0.7 days	

Input
 Calculated

Recovery Calculation for Pond D

Unsaturated Vertical Infiltration Rate (Design) kv	4 <---S.F. = 2.0
Horizontal Saturated Hydraulic Conductivity (Design), kh	5.5 <---S.F. = 2.0
Fillable Porosity, f	0.3
Confining Layer Elevation	-35.00 ft
Ground water elevation	0.50 ft
Pond Bottom	1.50 ft
Control Elevation	1.75 ft
Control Depth (hv)	0.25 ft
hb (height of basin above groundwater table)	1.00 ft
hu (height of water to saturate soil)	0.37 ft
Area of Bottom of Pond	733 ft ²
Volume of Water Absorbed	275 ft ³
New Water Level (begin saturated lateral flow)	1.50 ft
Volume remaining for saturated lateral flow	0 ft ³
Time for vertical saturation	0.1 days
h2 Water Depth From Bottom of Pond	0.00 ft
HT (Water Level Above Groundwater Table)	1.00 ft
Fy	1.0 <-Fy to use on dimensionless curve
L/W ratio	3.2
Avg Length	51 ft
Avg W	16 ft
Fx	99999
H (thickness of aquifer)	35.50 ft
D (average thickness)	36.00 ft
Lateral Saturated Flow Time	0.0 days
Total Recovery time	0.1 days

Input
 Calculated

THIS POND IS ENTIRELY CONTROLLED BY VERTICAL UNSATURATED INFILTRATION

Recovery Calculation for Pond E

Unsaturated Vertical Infiltration Rate (Design) kv	4 <---S.F. = 2.0
Horizontal Saturated Hydraulic Conductivity (Design), kh	5.5 <---S.F. = 2.0
Fillable Porosity, f	0.3
Confining Layer Elevation	-35.00 ft
Ground water elevation	0.50 ft
Pond Bottom	1.50 ft
Control Elevation	1.70 ft
Control Depth (hv)	0.20 ft
hb (height of basin above groundwater table)	1.00 ft
hu (height of water to saturate soil)	0.20 ft
Area of Bottom of Pond	3382 ft ²
Volume of Water Absorbed	691 ft ³
New Water Level (begin saturated lateral flow)	1.50 ft
Volume remaining for saturated lateral flow	0 ft ³
Time for vertical saturation	0.1 days
h2 Water Depth From Bottom of Pond	0.00 ft
HT (Water Level Above Groundwater Table)	1.00 ft
Fy	1.0 <-Fy to use on dimensionless curve
L/W ratio	1.4
Avg Length	72 ft
Avg W	50 ft
Fx	999999
H (thickness of aquifer)	35.50 ft
D (average thickness)	36.00 ft
Lateral Saturated Flow Time	0.0 days
Total Recovery time	0.1 days

Input
 Calculated

THIS POND IS ENTIRELY CONTROLLED BY VERTICAL UNSATURATED INFILTRATION

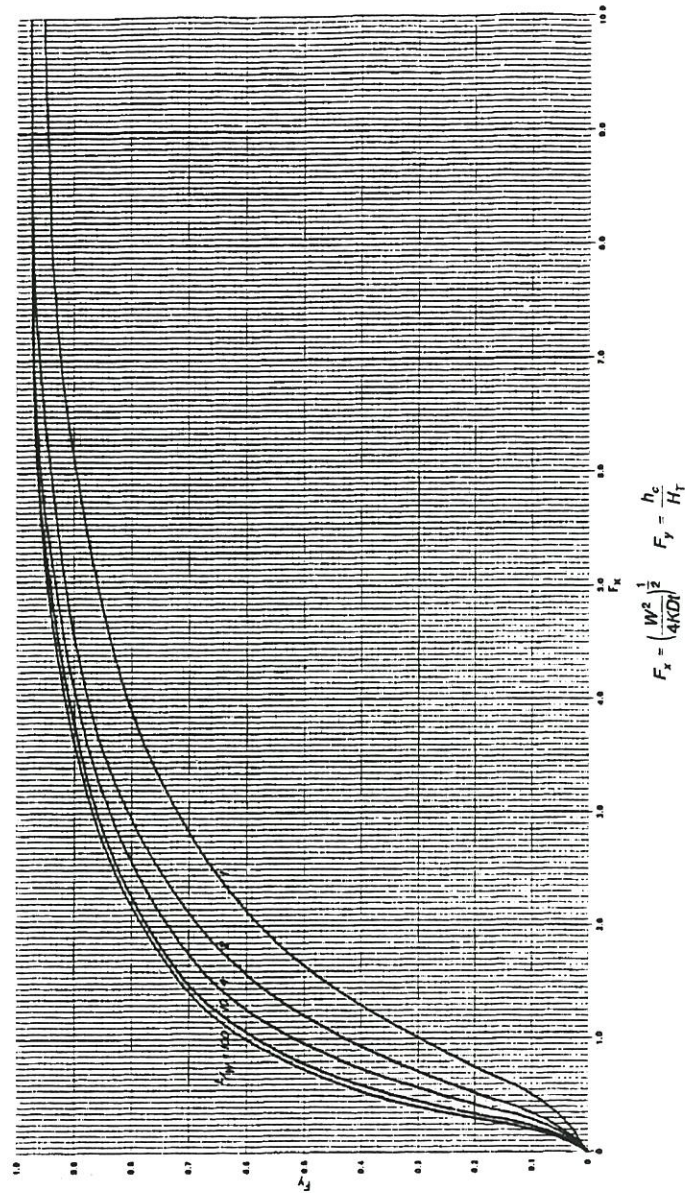


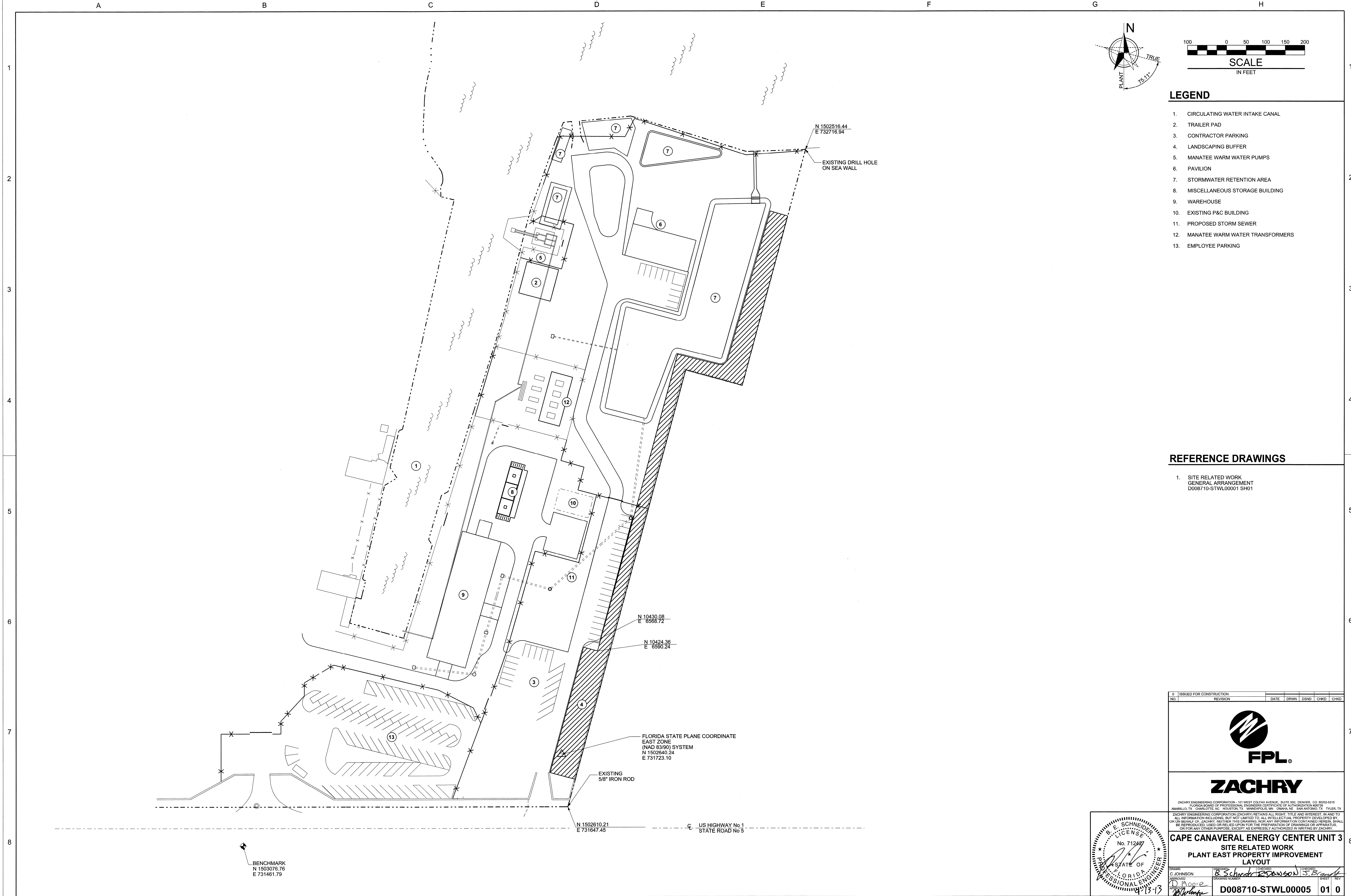
Figure 26-8. Dimensionless Curves Relating Basin Design Parameters to Basin Water Level in a Rectangular Retention Basin Over an Unconfined Aquifer ($f = 0.4$) (Source: Andreyev and Wiseman, 1989).

	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

ATTACHMENT A

GENERAL ARRANGEMENT

D008710-STWL00005 SHT 01



LEGEND

1. CIRCULATING WATER INTAKE CANAL
2. TRAILER PAD
3. CONTRACTOR PARKING
4. LANDSCAPING BUFFER
5. MANATEE WARM WATER PUMPS
6. PAVILION
7. STORMWATER RETENTION AREA
8. MISCELLANEOUS STORAGE BUILDING
9. WAREHOUSE
10. EXISTING P&C BUILDING
11. PROPOSED STORM SEWER
12. MANATEE WARM WATER TRANSFORMERS
13. EMPLOYEE PARKING

REFERENCE DRAWINGS

1. SITE RELATED WORK
GENERAL ARRANGEMENT
D008710-STWL00001 SH01

ISSUED FOR CONSTRUCTION		REVISION		DATE	DRWN	DSND	CHKD	CHKD
								
								
ZACHRY ENGINEERING CORPORATION - 101 WEST COLFAX AVENUE, SUITE 500, DENVER, CO 80202-0315 FLORIDA BOARD OF PROFESSIONAL ENGINEERS CERTIFICATE OF AUTHORIZATION #0779 AMARILLO, TX CHARLOTTE, NC HOUSTON, TX MINNEAPOLIS, MN OMAHA, NE SAN ANTONIO, TX TYLER, TX ZACHRY ENGINEERING CORPORATION (ZACHRY) RETAINS ALL RIGHT, TITLE AND INTEREST, IN AND TO ALL INFORMATION INCLUDING, BUT NOT LIMITED TO, ALL INTELLECTUAL PROPERTY DEVELOPED BY, OR ON BEHALF OF, ZACHRY. NEITHER THIS DRAWING, NOR ANY INFORMATION CONTAINED HEREIN, SHALL BE REPRODUCED, USED OR RELIED UPON FOR THE PREPARATION OF DRAWINGS OR APPARATUS, OR FOR ANY OTHER PURPOSE, EXCEPT AS EXPRESSLY AUTHORIZED IN WRITING BY ZACHRY.								
CAPE CANAVERAL ENERGY CENTER UNIT 3 SITE RELATED WORK PLANT EAST PROPERTY IMPROVEMENT LAYOUT								
DRAWN C. JOHNSON	DESIGNED B. SCHNEIDER	CHECKED S. BRANT						
APPROVED D. JOHNSON	DRAWING NUMBER D008710-STWL00005	SHEET 01	REV 0					

	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

ATTACHMENT B

EROSION CONTROL PLAN

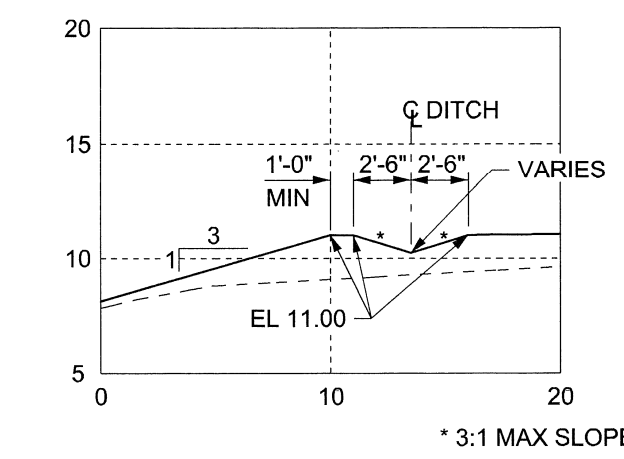
D008710-STWS00004 SHT 03 and SHT 05

	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

ATTACHMENT C

ROUGH GRADES

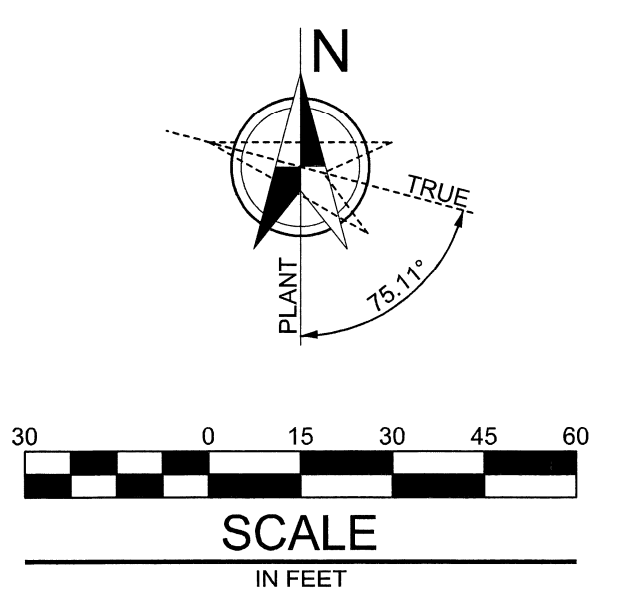
D008710-STFS00015 SHT 01 and SHT 02



SECTION 1 S00015 01

ESTIMATED EARTHWORK QUANTITIES*	
	PLANT EAST PROPERTY
CUT **	7550 CY
FILL ***	440 CY
BALANCE	7110 CY
AREA DISTURBED	23040 SY
FILL MATERIAL	ENGINEERED STRUCTURAL FILL

* - QUANTITIES DO NOT INCLUDE BULKING OR SHRINKING FACTOR. (1:1 RATIO)
** - CUT QUANTITY SHOWN INCLUDES CUT QUANTITY FOR SITE EXCAVATION.
*** - FILL QUANTITY SHOWN DOES NOT INCLUDE REUSED TOPSOIL.



LEGEND

- FLOW INDICATOR
- CONCRETE (APPROXIMATE SIZE AND LOCATIONS)
- XX.XX - ROUGH GRADE SPOT ELEVATION (SEE NOTE 2)
- EXISTING STRUCTURE
- PROPOSED GRADING BOUNDARY
- PROJECT BOUNDARY

GENERAL NOTES

- ELEVATIONS SHOWN ARE NAVD 88 ELEVATIONS.
- ALL GRADE ELEVATIONS ARE ROUGH GRADES UNLESS NOTED. (APPROX 6" BELOW FINISHED GRADES.)
- ROUGH GRADES UNDER PAVED SECTIONS SHOWN 6" BELOW TOP OF PAVEMENT. ACTUAL ROUGH GRADE ELEVATION WILL VARY BASED ON ROAD SECTIONS SHOWN ON REF DWG #4.
- CONTOURS SHOWN AT 6" INCREMENTS ARE ROUGH GRADES WITHIN PROPOSED CONSTRUCTION. (APPROX 6" BELOW FINISHED GRADES.) AND CONTOURS SHOWN IN EXISTING AREAS ARE FINISHED GRADE.
- MAX SLOPE OF 6:1 UNLESS NOTED.

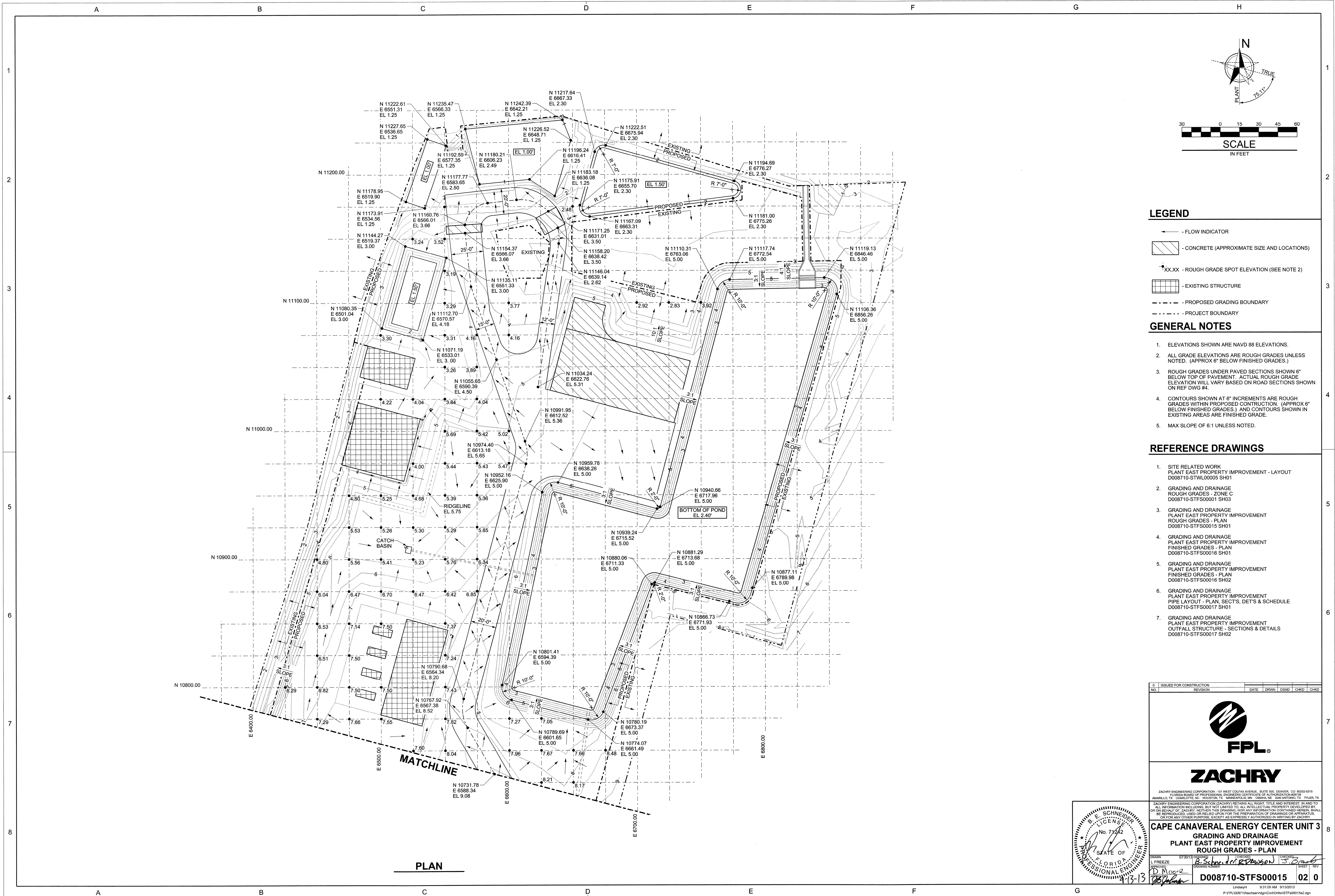
REFERENCE DRAWINGS

- SITE RELATED WORK
PLANT EAST PROPERTY IMPROVEMENT - LAYOUT
D008710-STWL00005 SH01
- GRADING AND DRAINAGE
ROUGH GRADES - ZONE C
D008710-STFS00001 SH03
- GRADING AND DRAINAGE
PLANT EAST PROPERTY IMPROVEMENT
ROUGH GRADES - PLAN
D008710-STFS00015 SH02
- GRADING AND DRAINAGE
PLANT EAST PROPERTY IMPROVEMENT
FINISHED GRADES - PLAN
D008710-STFS00016 SH01
- GRADING AND DRAINAGE
PLANT EAST PROPERTY IMPROVEMENT
PIPE LAYOUT - PLAN, SECTS, DET'S & SCHEDULE
D008710-STFS00017 SH01



PLAN

0	ISSUED FOR CONSTRUCTION	NO.	REVISION	DATE	DRWN	CSND	CHKD	CHGD
ZACHRY								
ZACHRY ENGINEERING CORPORATION - 101 WEST COLFAX AVENUE, SUITE 500, DENVER, CO 80202-0015 FLORIDA BOARD OF PROFESSIONAL ENGINEERS CERTIFICATE OF AUTHORIZATION #00789 AMARILLO, TX CHARLOTTE, NC HOUSTON, TX MINNEAPOLIS, MN OKLAHOMA CITY, OK SAN ANTONIO, TX TYLER, TX								
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CAPE CANAVERAL ENERGY CENTER UNIT 3								
GRADING AND DRAINAGE								
PLANT EAST PROPERTY IMPROVEMENT								
ROUGH GRADES - PLAN								
DRWN	07/30/13	CHKD	07/30/13	DATE	07/30/13	BY	07/30/13	REV
L. FREEZE		B. SCHNEIDER						
D. MOORE								
D008710-STFS00015				01		0		



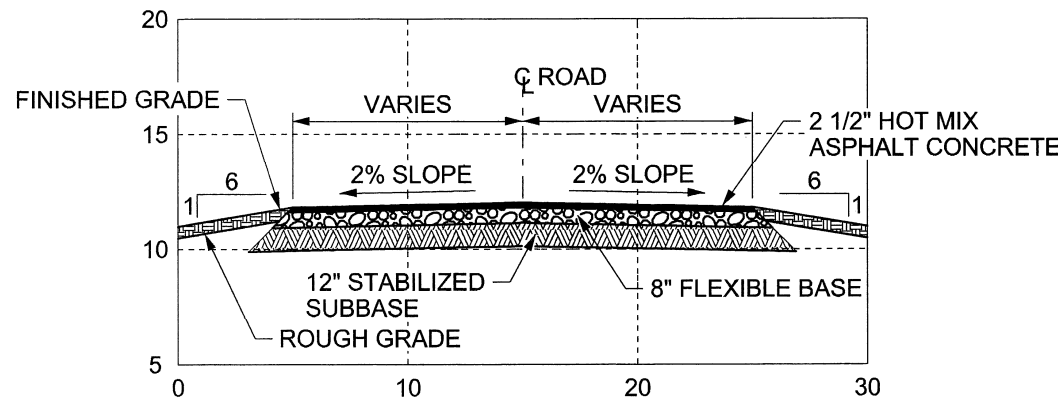
	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

ATTACHMENT D

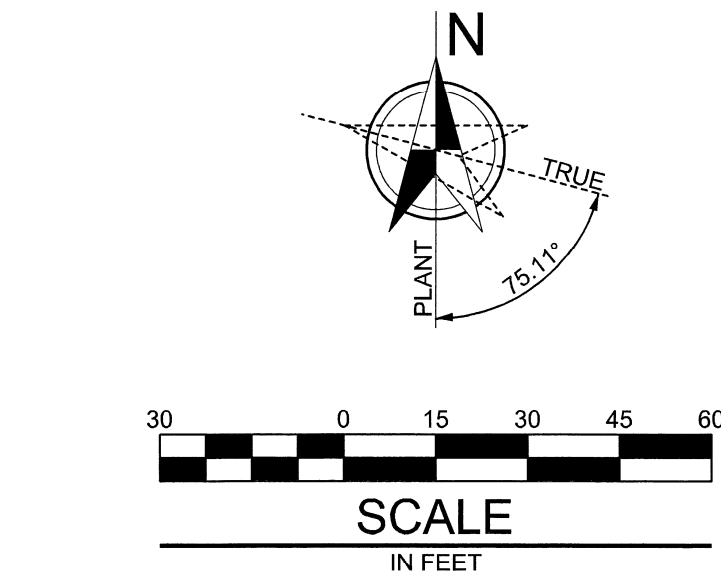
FINISHED GRADES

D008710-STFS00016 SHT 01 and SHT 02

Project Land Use and Land Cover		
	Acres	Percent
Building/Equipment	0.61	7.43%
Parking and Roadway	3.34	40.87%
Contact	0.06	0.72%
Pond	0.89	10.96%
Landscape Buffer/Existing	0.88	10.78%
Grass	2.39	29.28%
Total Plant East Property	8.16	100.00%



TYP ROADWAY SECTION



LEGEND

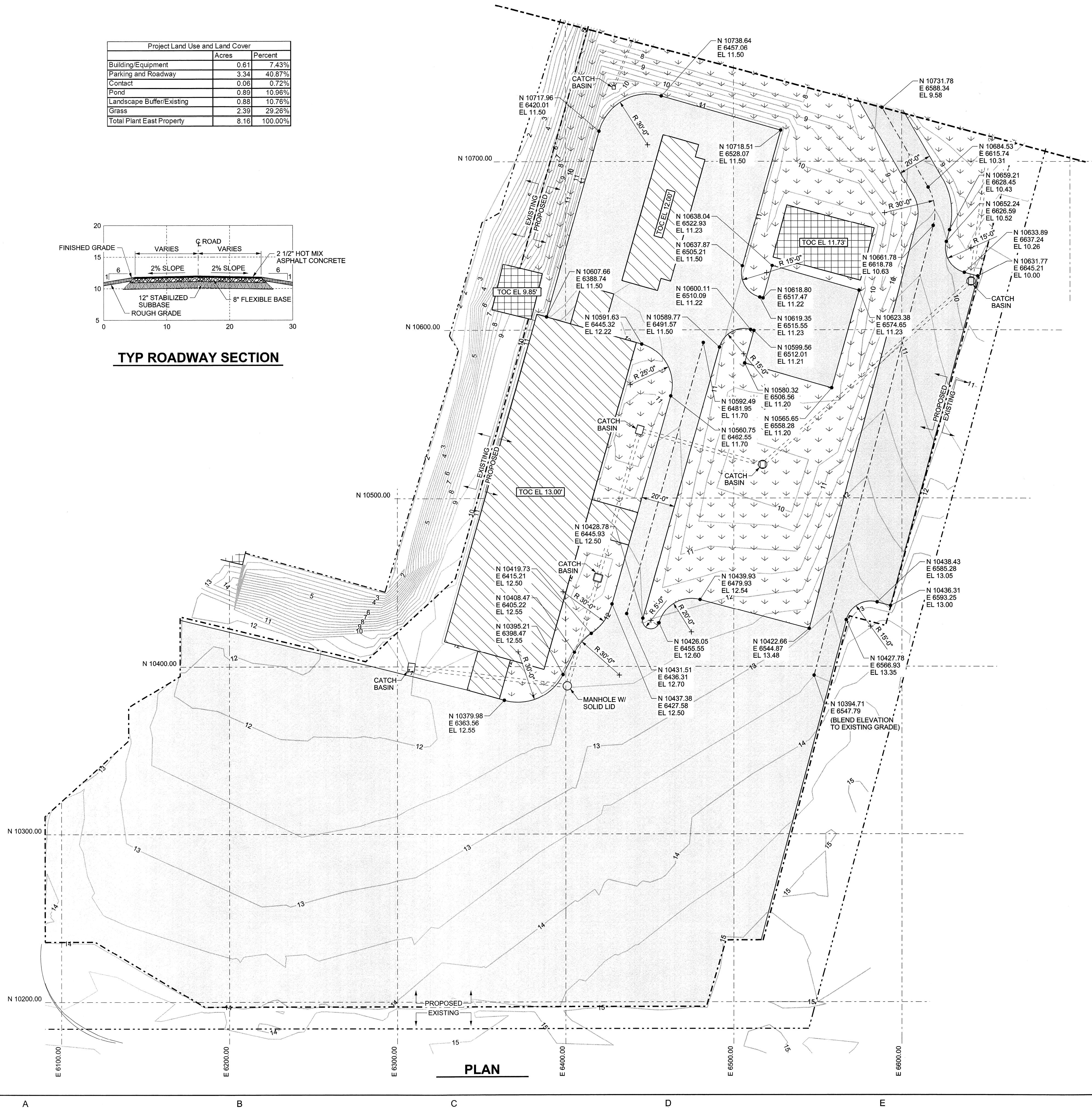
- CONCRETE (APPROXIMATE SIZE AND LOCATIONS)
- EXISTING STRUCTURE
- ASPHALT
- SOD WITH TOPSOIL (6" MIN)
- SOD (SEE NOTE #4)
- PROPOSED GRADING BOUNDARY
- PROJECT BOUNDARY

GENERAL NOTES

- ELEVATIONS SHOWN ARE NAVD 88 ELEVATIONS.
- ALL GRADE ELEVATIONS ARE FINISHED GRADES UNLESS NOTED.
- CONTOURS SHOWN AT 6" INCREMENTS ARE ROUGH GRADES WITHIN PROPOSED CONSTRUCTION. (APPROX 6" BELOW FINISHED GRADES.) AND CONTOURS SHOWN IN EXISTING AREAS ARE FINISHED GRADE.
- REMOVE TOP 6" OF ROUGH GRADE FROM BOTTOM OF POND AT THE COMPLETION OF CONSTRUCTION AND EROSION STABILIZATION FOR THE SITE. FILL WITH 12" OF CLEAN SAND PRIOR TO SOD.

REFERENCE DRAWINGS

- SITE RELATED WORK
PLANT EAST PROPERTY IMPROVEMENT - LAYOUT
D008710-STVL00005 SH01
- GRADING AND DRAINAGE
FINISHED GRADES - ZONE C
D008710-STFS00002 SH03
- GRADING AND DRAINAGE
PLANT EAST PROPERTY IMPROVEMENT
ROUGH GRADES - PLAN
D008710-STFS00015 SH01
- GRADING AND DRAINAGE
PLANT EAST PROPERTY IMPROVEMENT
FINISHED GRADES - PLAN
D008710-STFS00016 SH02
- GRADING AND DRAINAGE
PLANT EAST PROPERTY IMPROVEMENT
PIPE LAYOUT - PLAN, SECT'S, DET'S & SCHEDULE
D008710-STFS00017 SH01



PLAN

NO.	ISSUED FOR CONSTRUCTION	REVISION	DATE	DRWN	DSND	CHGD	CHGD
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ZACHRY

ZACHRY ENGINEERING CORPORATION - 101 WEST COLFAX AVENUE, SUITE 500, DENVER, CO 80202-5315
FLORIDA BOARD OF PROFESSIONAL ENGINEERING CERTIFICATE OF AUTHORIZATION ABE 799
AMARILLO, TX CHARLOTTE, NC HOUSTON, TX MINNEAPOLIS, MN OMAHA, NE SAN ANTONIO, TX TYLER, TX

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CAPE CANAVERAL ENERGY CENTER UNIT 3

GRADING AND DRAINAGE
PLANT EAST PROPERTY IMPROVEMENT
FINISHED GRADES - PLAN

DRAWN: 07/30/13 BY: [Signature] CHECKED: [Signature] SHEET: 01 OF 01

PROJECT: D008710-STFS00016 01 0

UNDERSY: 9/30/38 AM 8/13/2013

P:\FPL\008710\Zachry\eng\civ\Ortho\STFS000161.dgn

	CLIENT NAME: FPL	NAME: B. SCHNEIDER	DATE: 9/5/2013
	PROJECT NUMBER / NAME: 008710 / CAPE CANAVERAL ENERGY CENTER	CALC NO: A008710-RPTS006	REV: 0
STANDARD CALCULATION SHEET	TITLE: GRADING AND DRAINAGE PLANT EAST PROPERTY IMPROVEMENT		

ATTACHMENT E

PIPING LAYOUT

D008710 – STFS00017 SHT 01 and SHT 02

