PLANNING BOARD
AGENDA

January 13, 2015

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Currituck County
Planning Board Agenda
Historic Currituck County Courthouse
Tuesday, January 13, 2015, 7:00 PM

Work Session
6:30 p.m.

7:00 p.m. Call to Order

A. Pledge of Allegiance and Moment of Silence
B. Announce Quorum Being Met
C. Approval of Agenda
D. Ask for Disqualifications

Item 1 Approval of December 9, 2014 Minutes

Item 2 Election of Officers
- Chairman
- Vice-Chairman

OLD BUSINESS:

NEW BUSINESS:

Item 3 **PB 87-56 Monteray Shores, Phase 3 (Corolla Bay, Section II):** Request for preliminary plat/use permit approval for 36 residential lots located within Corolla Bay on the west side of NC 12 as a southern extension of Cruz Bay Court in Corolla, Tax Map 115, Parcel 3XB, Poplar Branch Township.

Adjourn

Currituck County
Agenda Item Summary Sheet

Agenda Item Title

PB 87-56 Monteray Shores – Corolla Bay, Section II: Request for preliminary plat/use permit approval for 36 residential lots located within Corolla Bay on the west side of NC 12 as a southern extension of Cruz Bay Court in Corolla, Tax Map 115, Parcel 3XB, Poplar Branch Township.

Brief Description of Agenda Item

Northeastern North Carolina Properties, LLC is requesting preliminary plat/use permit approval for 36 residential lots within the Corolla Bay development. The request is to complete the remaining phase of the Corolla Bay residential development on the west side of NC 12. There are no changes proposed to the open space calculations, commercial allocation, or residential densities of Monteray Shores.

Board Action Requested

Action

Person Submitting Agenda Item

Donna Voliva

Presenter of Agenda Item

Donna Voliva

CASE ANALYSIS FOR THE
PLANNING BOARD
DATE: January 13, 2015
PB 87-56 Monteray Shores, Phase III - Corolla Bay, Section II Preliminary Plat/ Use Permit

ITEM: PB 87-56 Monteray Shores, Phase III – Corolla Bay, Section II Preliminary Plat/Use Permit

LOCATION: Cruz Bay Court, Corolla, Poplar Branch Township

TAX ID: 0115-000-03XB-0000

ZONING DISTRICT: Single Family Residential Outer Banks (SFO) with PUD overlay

PRESENT USE: Undeveloped

OWNER: Northeastern North Carolina Properties, LLC
6001 Harbour View Boulevard
Suffolk, VA 23435

APPLICANT: Herbert Hamlet
Northeastern North Carolina Properties, LLC
6001 Harbour View Boulevard
Suffolk, VA 23435

LAND USE/ZONING OF SURROUNDING PROPERTY:

	Land Use	**Zoning**
NORTH:	Residential/Undeveloped	SFO w/PUD overlay
SOUTH	Residential	SFO w/PUD overlay
EAST:	Residential/Undeveloped	SFO w/PUD overlay
WEST:	Currituck Sound	N/A

LAND USE PLAN CLASSIFICATION: The 2006 Land Use Plan classifies the site as Full Service within the Corolla subarea.

SIZE OF SITE: 13.799 acres (Corolla Bay, Section 2)

NUMBER OF UNITS: 36 residential lots (Phase II)

PROJECT DENSITY: 2.6 units per acre (Corolla Bay, Section 2 property)
2.05 units per acre (entire Monteray Shores PUD)

UTILITIES: The water will be provided by the Southern Outer Banks water system (SOBWS). Carolina Water Service, Inc. of North Carolina will provide sanitary sewer utility needs for this phase of development for a combined maximum capacity of 38,880 gallons per day.

PUD ALLOCATION: There are no changes proposed to the PUD allocations.

Total Tract	355.60 acres
Commercial Allocation	36.32 acres
Open Space	131.13 acres

I. NARRATIVE OF REQUEST:

1. The applicant is requesting preliminary plat/use permit approval of 36 residential lots within Corolla Bay, Section II
2. The amended sketch plan and special use permit was approved by the Board of Commissioners February 20, 2006.
3. Due to environmental constraints the 2006 plan was reconfigured as shown on the proposed preliminary plat.
4. The proposed development is located at a proposed terminus of the Mid-Currituck Bridge (STIP R-2576 preferred alternative MCB4). Right of way acquisition has not occurred.

II. USE PERMIT REVIEW STANDARDS:

Use Permit Criteria and Preliminary Staff Findings:

Use permits (UP) are intended to allow the Board of Commissioners flexibility in the administration of the UDO. Through the UP procedure, property uses which would otherwise be considered undesirable in certain districts can be developed subject to conditions of approval to minimize any negative effects they might have on surrounding properties.

In order to approve a UP, certain criteria must be satisfied. The criteria and preliminary staff findings of fact are outlined as follows:

1. *The use will not endanger the public health or safety.*

   Preliminary Staff Findings:

   a. Community water and sanitary sewer will be provided to the proposed development.
   b. The roadway shall be built to NCDOT construction standards.
   c. Stormwater will be collected and managed by means acceptable to the state and county.

   The evidence in the record at this time supports the finding that the use will not endanger the public health or safety.

2. *The use will not injure the value of adjoining or abutting lands and will be in harmony with the area in which it is located.*

   Preliminary Staff Findings:

   a. The proposed phase II of this development is consistent with the phase I portion of the development completed in 2007 in that the lot sizes and density are similar and would be in harmony with the adjoining properties.
   b. No evidence has been submitted that this proposed project will decrease the property values of adjoining or abutting lands.

The evidence in the record at this time supports the finding that the use will not injure the value of adjoining or abutting lands and will be in harmony with the area in which it is located.

3. *The use will be in conformity with the Land Use Plan or other officially adopted plans.*
Preliminary Staff Findings:
The 2006 Land Use Plan classifies this site as Full Service within the Corolla subarea.

The Full Service area identifies a residential base development density to be 2 units per acre, but could be increased to 3-4 units per acre through overlay zoning depending upon services available and potential impacts on the surrounding area.

The policy emphasis for the Corolla subarea is to allow for predominately medium density residential development (2 to 3 units per acre) with minimal commercial development arranged in clusters. An overall density of no more than 3 units per acre should apply to PUDs with a mandated 30% permanent open space requirement.

The proposed use is in keeping with the policies of the plan, some of which are:

POLICY HN1: Currituck County shall encourage development to occur at densities appropriate for the location. LOCATION AND DENSITY FACTORS shall include whether the development is within an environmentally suitable area, the type and capacity of sewage treatment available to the site, the adequacy of transportation facilities providing access to the site, and the proximity of the site to existing and planned urban services. For example, projects falling within the Full Services areas of the Future Land Use Map would be permitted a higher density because of the availability of infrastructure as well as similarity to the existing development pattern. Such projects could be developed at a density of two (2) or more dwelling units per acre. Projects within areas designated as Limited Service would be permitted a density of one (1) to one and one half (1.5) units per acre depending upon the surrounding development pattern and availability of resources. Projects within areas designated as Rural or Conservation by the Future Land Use Plan would be permitted a much lower density of 1 dwelling unit per 3 acres because of the lack of infrastructure in the area, the existing low density development pattern, and presence of environmentally sensitive natural areas.

POLICY HN3: Currituck County shall especially encourage two forms of residential development, each with the objective of avoiding traditional suburban sprawl:
1. OPEN SPACE DEVELOPMENTS that cluster homes on less land, preserving permanently dedicated open space and often employ on-site or community sewage treatment. These types of developments are likely to occur primarily in the Conservation, Rural, and to a certain extent the Limited Service areas identified on the Future Land Use Map.
2. COMPACT, MIXED USE DEVELOPMENTS or DEVELOPMENTS NEAR A MIXTURE OF USES that promote a return to balanced, self-supporting community centers generally served by centralized water and sewer. The types of development are contemplated for the Full Service Areas identified on the Future Land Use Map.

The evidence in the record at this time supports the finding the use will be in conformity with the Land Use Plan and other officially adopted plans.

4. The use will not exceed the county's ability to provide adequate public facilities, including, but not limited to, schools, fire and rescue, law enforcement, and other county facilities. Applicable state standards and guidelines shall be followed for determining when public facilities are adequate. Such facilities must be in place or programmed to be in place within two years after the initial approval of the plan (sketch plan in the case of major subdivisions).

   Preliminary Staff Findings:

   a. The student generation rates are not applied to residential subdivisions located on the outer banks.
   b. SOBWS will provide water service for the proposed lots within this development. The sanitary sewer services provider, Carolina Water Service, Inc. of North Carolina, will provide sewer needs for the proposed lots within this development for a combined maximum capacity of 38,880 gallons per day.

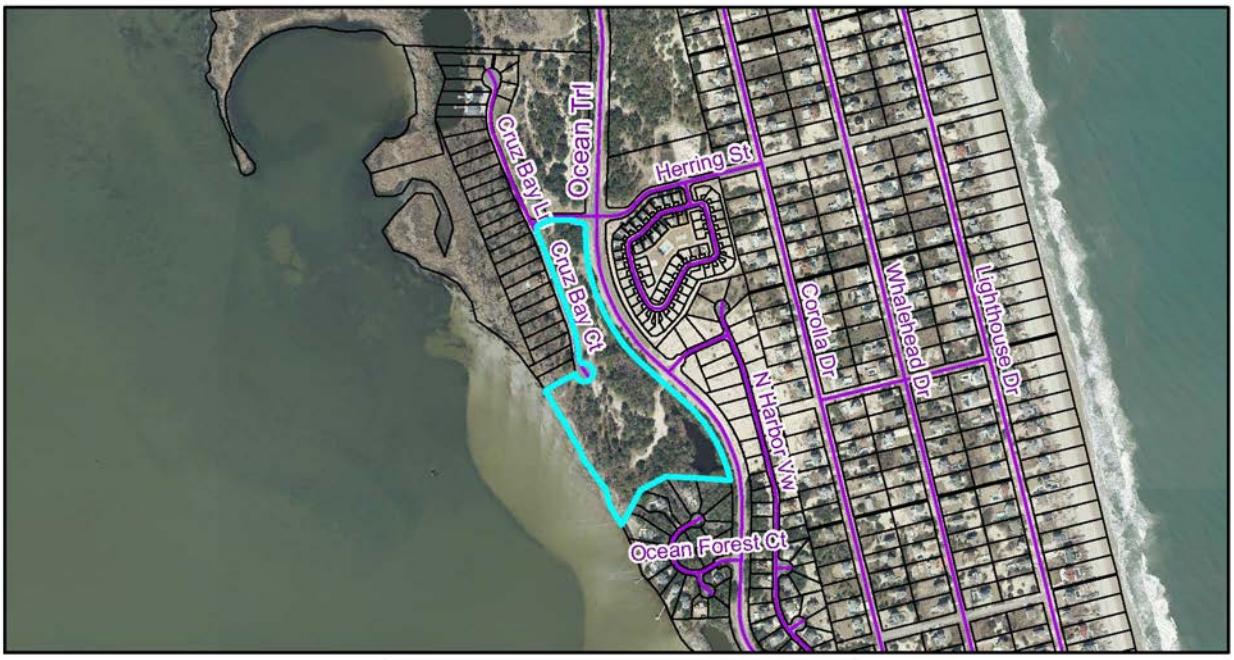
   The evidence in the record at this time supports the finding the use will not exceed the county's ability to provide adequate public facilities.

III. TECHNICAL REVIEW COMMITTEE RECOMMENDATION:

Pursuant to the Unified Development Ordinance, the Technical Review Committee recommends approval subject to the following plan corrections:

1. All stormwater and utility infrastructure located on individual lots shall be located within a utility/stormwater/drainage easement.
2. The NCDENR stormwater permit shall be updated or modified to provide the actual lot sizes and coverage allocations for each lot prior to recording the final plat.

THE APPLICATION AND RELATED MATERIALS ARE AVAILABLE ON THE COUNTY'S WEBSITE
http://www.co.currituck.nc.us/planning-board-minutes-current.cfm



PB 87-56 Monteray Shores, Corolla Bay, Section 2
Aerial

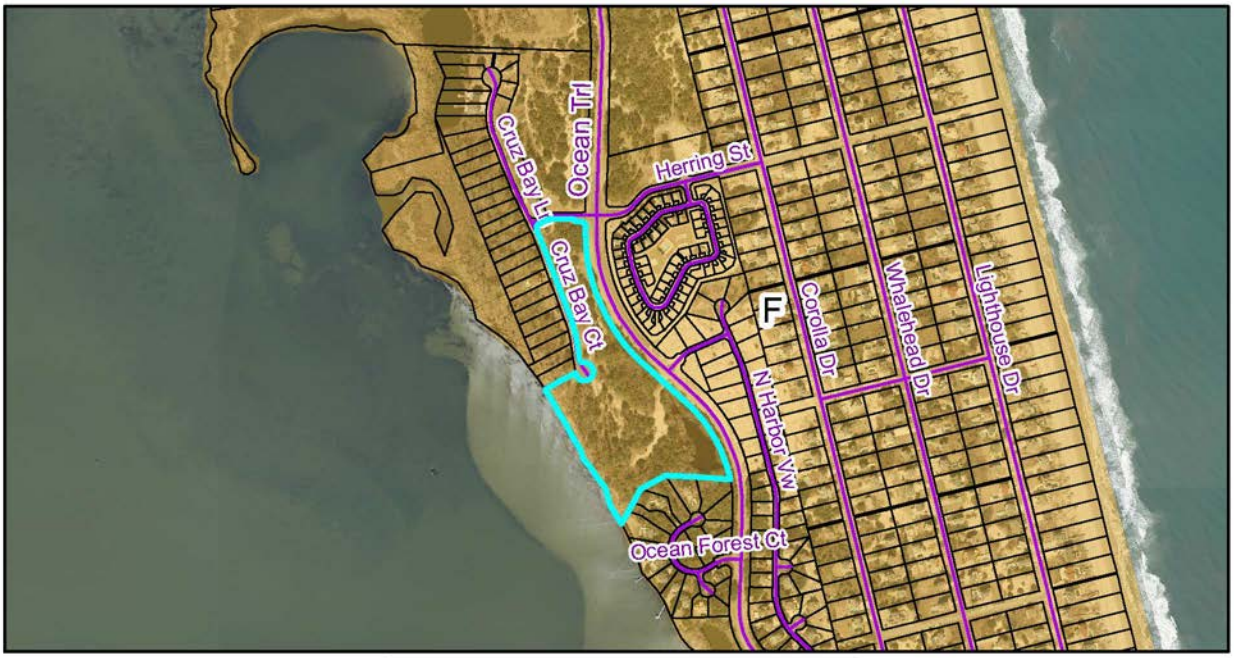
0 375 750 1,500 Feet

Currituck County Planning & Community Development

PB 87-56 Monteray Shores, Corolla Bay, Section 2
Zoning

0 375 750 1,500 Feet

Currituck County Planning & Community Development



PB 87-56 Monteray Shores, Corolla Bay, Section 2
LUP Classification

0 375 750 1,500 Feet

Currituck County
Planning & Community
Development

To: Herbert Hamlet, Northeastern North Carolina Properties, LLC
Coastal Engineering

From: Donna Voliva, Senior Planner

Date: December 17, 2014

Subject: PB 87-56 Corolla Bay, Phase 2 Preliminary Plat/Construction Drawings
TRC Comments

The following comments have been received for Corolla Bay, Phase 2 preliminary plat/construction drawings. The preliminary plat will require Planning Board recommendation and Board of Commission's action. The preliminary plat comments listed below must be addressed and resubmitted by December 22, 2014 in order to be placed on the January 13, 2015 Planning Board meeting. TRC comments are valid for six months from the date of the TRC meeting.

Planning, Donna Voliva

Reviewed

1. Correct the title of the Certification of Stormwater Improvements to be Improvements Certificate.
2. The certificate titled Improvements Certificate should be removed.
3. Provide the Floodplain Statement.
4. Correct the zoning of the property to be SFO with PUD overlay.
5. Provide the delineation of the flood zones. The boundary line and zones are not clear.
6. Please clarify the finished floor elevation.
7. The base zoning district of all properties adjacent to this development is SFO. The properties located in Monteray Shores contain a PUD overlay.
8. Connecting Corolla Bike, Pedestrian, Access and Wayfinding Plan indicates a proposed trail to be located along the western side of NC 12.
9. The proposed modified construction drawing indicates stormwater pipes along the rear and side of lots 46, 47, 48, 49, 50, and 70. Permanent infrastructure shall be located in a utility/stormwater/drainage easement when located on individual properties.
10. The proposed pier and gazebo platform improvements shall connect to the sidewalks.
11. Provide a proposed lighting detail.
12. Have there been any major changes to the shoreline since the August 2003 aerial photography?
13. Clarify if the proposed 10' drainage easement located between lots 69 and 70 will be an easement within the open space.
14. Are there plans to improve the 20' access easement located between lots 49 and 50?
15. The 10' access easement located between lots 44 and 45 appear to be a right of way; please clarify.
16. Clarify the active, passive and visual open space allocations.
17. The NCDENR stormwater permit indicates lot sizes that are not consistent with the proposed preliminary plat. Please clarify.

18. Clarify if the CAMA and Erosion and Sedimentation Control Permit are valid.
19. Provide a copy of the landscape plan, traffic control sign placement, and sight plans.

Currituck County Engineer, Eric Weatherly
Currituck Soil and Water, Mike Doxey

Reviewed

1. Not sure how you ended your meeting with Mitch and Carlos – so I'm still wondering which ordinance we are reviewing this development under. In the end, I don't think it really matters because the most restrictive, and current ordinance is actually being met (10yr post cannot exceed 2yr pre, wooded). This was taken out of the narrative (the 10yr post is listed as 20.95cfs in the calculations, but that doesn't make a difference):

Pre-Development Off-Site Stormwater Discharge		Post-Development Off-Site Stormwater Discharge	
1-Year	35.12 C.F.S.	1-Year	4.29 C.F.S.
2-Year	46.76 C.F.S.	2-Year	6.90 C.F.S.
10-Year	82.12 C.F.S.	10-Year	19.82 C.F.S.
25-Year	100.46 C.F.S.	25-Year	25.60 C.F.S.

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Currituck County Utilities, Pat Irwin

Reviewed

1. Tie the 6" waterline from Bonaire Court to the existing waterline on NC 12. Place two valves at the tee.
2. Show the change on the plans where the 8" waterline on Cruz Bay Lane decreases to a 6" waterline.
3. The service line detail shows a ¾" service line connecting to dual meters this line is not large enough.
4. Use the current approved Currituck County specifications for waterline infrastructure. They are attached.

Albemarle Regional Health Services, Joe Hobbs

Reviewed

1. DEVELOPER NEEDS TO CONSULT WITH NC DIVISION OF WATER RESOURCES (WASHINGTON REGIONAL OFFICE) AT 252-946-6481 FOR ANY WASTEWATER SYSTEM APPROVALS FOR THIS SUB-DIVISION.

Currituck County Fire Marshal, James Mims 252-232-6641

Reviewed

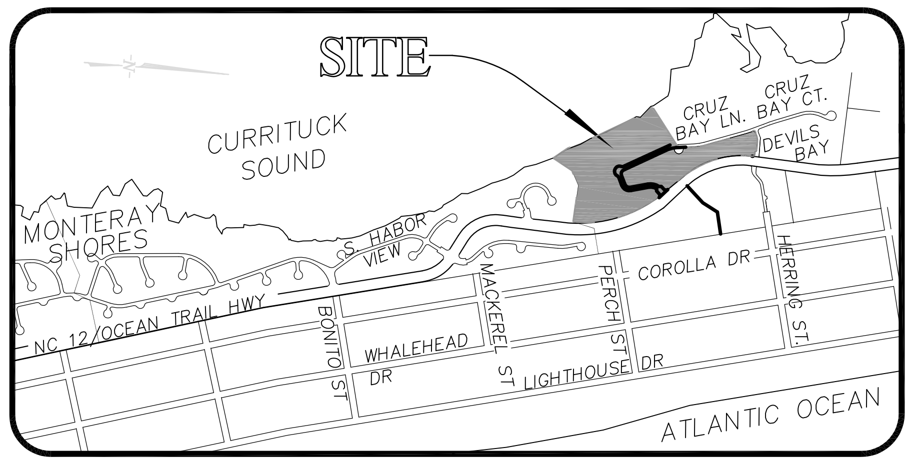
1. The proposed construction needed fire flow may not exceed the available fire flow of the site using the ISO method. Proposed structures greater than 4,800 sq. ft. will require calculation as commercial structures using the ISO method.

US Postal Service, Corolla Postmaster

1. Please contact the local postmaster (Corolla) to determine the mode of delivery and type of delivery equipment.

Comments were not received from:

Currituck County Building Inspections, Spence Castello



VICINITY MAP
Scale: 1"=2,000'±

LEGEND:

- ⊡ – EXISTING CONCRETE MONUMENT
- ◉ – EXISTING IRON ROD
- ◎ – EXISTING IRON PIPE
- ○ – SET IRON ROD
- △ – PK NAIL
- ○ CALCULATED POINT
- ◫ TELEPHONE PEDESTAL
- (T) TOTAL DISTANCE
- (R) RADIAL DISTANCE
- (8,109s.f) NET USABLE AREA
- MIN. B.P.E. = 6.50± MINIMUM BUILDING PAD ELEVATION
- M.I.C.= 3,375 S.F. MAXIMUM IMPERVIOUS COVERAGE
- LOT LINE
- BOUNDARY LINE
- 404 WETLAND
- SHORELINE
- EXISTING R/W
- PROPOSED R/W
- TIE LINE
- EASEMENT LINE
- FUTURE LOT LINE
- CENTERLINE OF R/W
- CAMA LINE
- FLOODZONE

MONTERAY SHORES, P.U.D. OPEN SPACE RATIONALE

TOTAL OPEN SPACE = 131.13 ACRES
PERCENT OF OPEN SPACE = 131.13 ACRES/355.60 ACRES = 36.10% (35% REQUIRED)

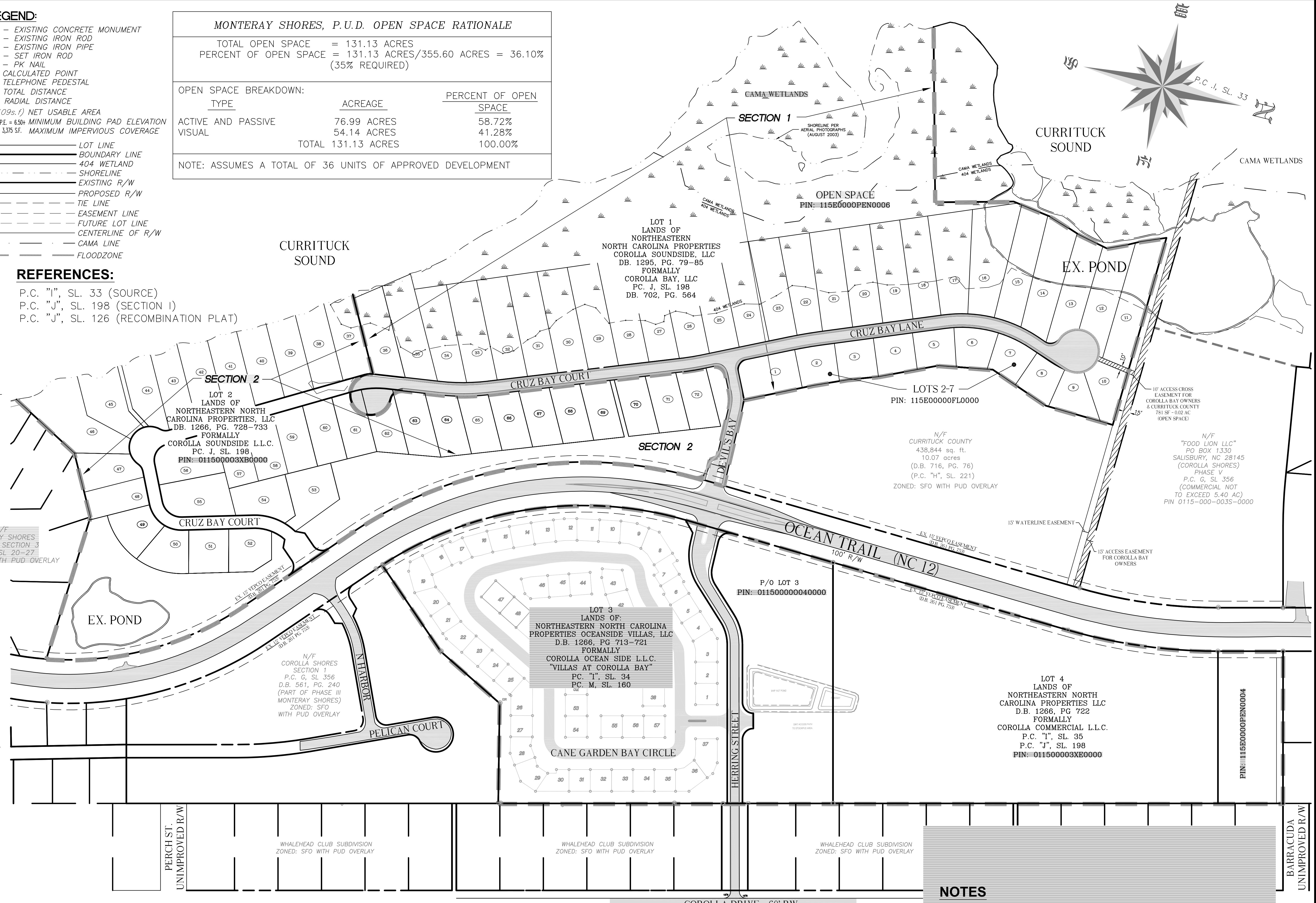
OPEN SPACE BREAKDOWN:

TYPE	ACREAGE	PERCENT OF OPEN SPACE
ACTIVE AND PASSIVE	76.99 ACRES	58.72%
VISUAL	54.14 ACRES	41.28%
TOTAL	131.13 ACRES	100.00%

NOTE: ASSUMES A TOTAL OF 36 UNITS OF APPROVED DEVELOPMENT

REFERENCES:

P.C. "I", SL. 33 (SOURCE)
P.C. "J", SL. 198 (SECTION I)
P.C. "J", SL. 126 (RECOMBINATION PLAT)



CERTIFICATE OF APPROVAL

I HEREBY CERTIFY THAT THE SUBDIVISION SHOWN ON THIS PLAT IS IN ALL RESPECTS IN COMPLIANCE WITH THE CURRITUCK COUNTY UNIFIED DEVELOPMENT ORDINANCE AND, THEREFORE, THIS PLAT HAS BEEN APPROVED BY THE CURRIUTCK COUNTY TECHNICAL REVIEW COMMITTEE AND SIGNED BY THE ADMINISTRATOR, SUBJECT TO ITS BEING RECORDED IN THE CURRITUCK COUNTY REGISTRY WITHIN 90 DAYS OF THE DATE BELOW.

ADMINISTRATOR   DATE

A.E.C. CERTIFICATE

THIS SUBDIVISION (OR PORTIONS THEREOF) ARE LOCATED WITHIN AN AREA OF ENVIRONMENTAL CONCERN.

LOCAL PERMIT OFFICER   DATE

IMPROVEMENTS CERTIFICATION

I HEREBY CERTIFY THAT ALL IMPROVEMENTS REQUIRED BY CURRITUCK COUNTY UNIFIED DEVELOPMENT ORDINANCE HAVE BEEN INSTALLED IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS PREPARED BY COASTAL ENGINEERING AND SURVEYING, INC, AND SAID IMPROVEMENTS COMPLY WITH CURRITUCK COUNTY SPECIFICATIONS.

NORTH CAROLINA PROFESSIONAL SEAL 14071 ENGINEER CARLOS F. GOMEZ

CARLOS F. GOMEZ   DATE

CERTIFICATION FOR PRIVATE STREETS

I HEREBY CERTIFY THAT THE PRIVATE STREETS SHOWN ON THIS PLAT ARE INTENDED FOR PRIVATE USE AND WILL REMAIN UNDER THE CONTROL, MAINTENANCE AND RESPONSIBILITY OF THE DEVELOPER AND/OR A HOMEOWNER'S ASSOCIATION AND ACKNOWLEDGE THAT SOME PUBLIC SERVICES MAY NOT BE PROVIDED DUE TO THE PRIVATE NATURE OF THE ROAD.

HERBERT HAMLIT C/O NORTHEASTERN NORTH CAROLINA PROPERTIES, LLC   DATE

CERTIFICATE OF OWNERSHIP & DEDICATION

I HEREBY CERTIFY THAT I AM THE OWNER OF THE PROPERTY DESCRIBED HEREON, WHICH PROPERTY IS LOCATED WITHIN THE SUBDIVISION REGULATIONS JURISDICTION OF CURRITUCK COUNTY, THAT I HEREBY FREELY ADOPT THIS PLAT OF SUBDIVISION AND DEDICATE TO PUBLIC USE ALL AREA SHOWN ON THIS PLAT AS STREETS, UTILITIES, ALLEYS WALKS, RECREATION AND PARKS, OPEN SPACE AND EASEMENTS, EXCEPT THOSE SPECIFICALLY INDICATED AS PRIVATE AND THAT I WILL MAINTAIN ALL SUCH AREAS UNTIL THE OFFER OF DEDICATION IS ACCEPTED BY THE APPROPRIATE PUBLIC AUTHORITY OR HOME OWNERS ASSOCIATION. ALL PROPERTY SHOWN ON THIS PLAT AS DEDICATED FOR A PUBLIC USE SHALL BE DEEMED TO BE DEDICATED FOR ANY OTHER PUBLIC USE AUTHORIZED BY LAW WHEN SUCH USE IS APPROVED BY THE APPROPRIATE PUBLIC AUTHORITY IN THE PUBLIC INTEREST.

HERBERT HAMLIT C/O NORTHEASTERN NORTH CAROLINA PROPERTIES, LLC   DATE

CERTIFICATE OF SURVEY & ACCURACY

I HEREBY CERTIFY THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION, A DEED DESCRIPTION RECORDED IN BOOK D.B. 702, PG. 564 OF THE CURRITUCK COUNTY REGISTRY; THAT THE ERROR OF CLOSURE AS CALCULATED BY LATITUDES AND DEPARTURES IS 1:10,000+; THAT THE BOUNDARIES NOT SURVEYED ARE SHOWN AS BROKEN LINES PLOTTED FROM INFORMATION FOUND IN PLAT CABINET J, PLAT SLIDE 198, AND THAT THIS MAP WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

I ALSO CERTIFY THAT THIS PLAT IS OF A SURVEY THAT CREATES A SUBDIVISION OF LAND WITHIN CURRITUCK COUNTY THAT HAS AN ORDINANCE THAT REGULATES PARCELS OF LAND.

WITNESS MY HAND AND SEAL THIS _____ DAY OF ______________ 2014.

NORTH CAROLINA REGISTERED SEAL L-3241 LAND SURVEYOR CARLOS F. GOMEZ

P.L.S.   L-3241

NOTARY CERTIFICATE

STATE OF ____________________

COUNTY OF ____________________

I, ______________________, A NOTARY PUBLIC OF______________ COUNTY,

NORTH CAROLINA, DO HEREBY CERTIFY THAT ___________________________

PERSONALLY APPEARED BEFORE ME THIS DAY AND ACKNOWLEDGED THE DUE EXECUTION OF THE FOREGOING CERTIFICATE.

WITNESS MY HAND AND SEAL THIS ______ DAY OF __________, 2014.

NOTARY PUBLIC

MY COMMISSION EXPIRES : ____________________

REVIEW OFFICERS CERTIFICATE

STATE OF NORTH CAROLINA
COUNTY OF CURRITUCK

I, ______________________________, REVIEW OFFICER OF CURRITUCK COUNTY, CERTIFY THAT THE PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIREMENTS FOR RECORDING.

REVIEW OFFICER   DATE

EASEMENT ESTABLISHMENT STATEMENT:

A 10 FOOT EASEMENT FOR UTILITIES AND DRAINAGE ALONG REAR AND SIDE PROPERTY LINES AND A 15 FOOT EASEMENT ALONG THE FRONT PROPERTY LINE IS HEREBY ESTABLISHED

STORMWATER STATEMENT:

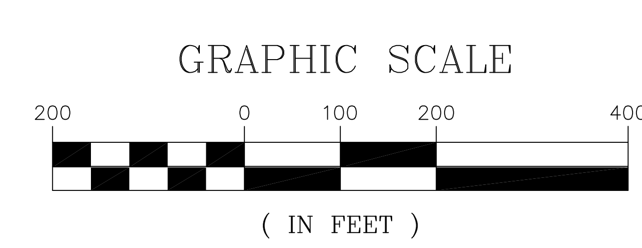
NO MORE THAT 35-45% OF ANY LOT SHALL BE COVERED BY IMPERVIOUS STRUCTURES AND MATERIALS, INCLUDING ASPHALT, GRAVEL, CONCRETE, BRICK STONE, SLATE, OR SIMILAR MATERIAL, NOT INCLUDING WOOD DECKING TO THE WATER SURFACE OF SWIMMING POOLS. THIS COVENANT IS INTENDED TO ENSURE COMPLIANCE WITH THE STORM WATER PERMIT NUMBER SW7050220MOD ISSUED BY THE STATE OF NORTH CAROLINA. THE COVENANT MAY NOT BE CHANGED OR DELETED WITHOUT THE CONSENT OF THE STATE. FILLING IN OR PIPING OF ANY VEGETATIVE CONVEYANCES (DITCHES, SWALES, ETC..) ASSOCIATED WITH THIS DEVELOPMENT, EXCEPT FOR AVERAGE DRIVEWAY CROSSINGS, IS STRICTLY PROHIBITED BY ANY PERSON. LOT COVERAGE ALLOWANCE PROVIDE IN THE CURRITUCK COUNTY UDO MAY BE DIFFERENT THAT THE NC STATE STORM WATER PERMIT SW7050220MOD THE MOST RESTRICTIVE LOT COVERAGE SHALL APPLY.

WETLAND STATEMENT:

PROPERTY ON THIS PLAT MAY CONTAIN 404 WETLANDS AND MAY NOT REQUIRE U.S. CORP OF ENGINEERS APPROVAL PRIOR TO DEVELOPMENT OF THE PROPERTY.

FLOODWAY / FLOOD PLAIN STATEMENT:

USE OF LAND WITHIN A FLOODWAY OR FLOOD PLAIN IS SUBSTANTIALLY RESTRICTED BY THE CURRITUCK COUNTY UNIFIED DEVELOPMENT ORDINANCE.



NOTES

1) OWNERS: NORTHEASTERN NORTH CAROLINA PROPERTIES, LLC
6001 HARBOUR VIEW BOULEVARD
SUFFOLK, VA 23435
(252) 453-3600
2) ZONING: SFO WITH PUD OVERLAY
3) TOTAL SITE AREA - SECTION II = 13.799 ACS.
OPEN SPACE (INCLUDING 404 WETLANDS) - SECTION II = 3.978 ACS.
RESIDENTIAL LOTS - SECTION II = 8.986 ACS.
PROPOSED RIGHT OF WAY AREA = 0.835 AC.
TOTAL NUMBER OF LOTS IN SECTION II: 36 LOTS
MINIMUM LOT SIZE: 7,500 sf (3,750 sf allowed to be wetlands)
AREAS CALCULATED BY COORDINATE METHOD.
4) TOTAL LINEAR FOOTAGE OF STREET - SECTION II
CRUZ BAY COURT = 1,035 LF
TOTAL = 1,035 LF
5) LOT SUBJECT TO EASEMENTS & COVENANTS OF RECORD.
6) THIS SURVEY IS SUBJECT TO ANY FACTS THAT MIGHT BE FOUND IN A FULL & ACCURATE TITLE SEARCH.
7) PROPERTY IS LOCATED IN F.I.R.M. ZONES AS SHOWN.
MAP NO.3720993600J, DATED, 9-20-06.
USE OF LAND WITHIN THE FLOODWAY OR FLOODPLAIN AND FLOOD ZONES SUBJECT TO CHANGE BY FEMA.
8) ALL DISTANCES ARE HORIZONTAL GROUND DISTANCES UNLESS OTHERWISE NOTED.
9) THERE IS A 10' DRAINAGE & UTILITY EASEMENT ON ALL SIDE & REAR PROPERTY LINES AND 15' EASEMENT ALONG THE FRONT.
10) SETBACKS
FRONT = 20'
SIDE = 10'
REAR = 25'
CORNER SIDE = 20'
11) 404 WETLANDS AS PER WETLAND DELINEATION MAP PREPARED BY COASTAL ENGINEERING & SURVEYING AND SIGNED BY U.S.A.C.E. REPRESENTATIVE T.A. STEFFANS AND DATED 12-28-05.
12) PROPERTY RECOMBINED AS PER P.C. "J", SL. 126 & 128
13) MINIMUM DEVELOPMENT BUILDING PAD ELEVATION IS 7.72 M.S.L. (18 INCHES ABOVE THE 10 YEAR STORM EVENT.) (1929 NGVD DATUM)
14) OPEN SPACE AND STREETS WILL BE OWNED AND MAINTAINED BY DEVELOPER OR FUTURE HOMEOWNERS ASSOCIATION.
15) MINIMUM 12"X20 L.F. (R.C.P.) OR (H.D.P.E.) DRIVEWAY CULVERT SHALL BE PLACED IN STORM DRAINAGE SWALE ALONG RIGHT OF WAY OF CRUZ BAY COURT FOR THE DEVELOPMENT LOTS: 37-72.
16) PROPOSED COMMUNITY PIER SHALL CONNECT INTO THE DEVELOPMENTS SIDEWALK SYSTEM.
17. FUTURE ROADSIDE TREE PRESERVATION INTENDED TO BE CREDITED TOWARD STREET TREES AS REQUIRED BY THE GOVERNING UNIFIED DEVELOPMENT ORDINANCE.

P.O. BOX 1129
4425 N CROATAN HWY
KITTY HAWK, N.C. 27949
(252)-261-4151
(252)-261-1333
C-0836
Civil - Structural
Site Development
Coastal
ENGINEERING & SURVEYING, INC.

REVISIONS

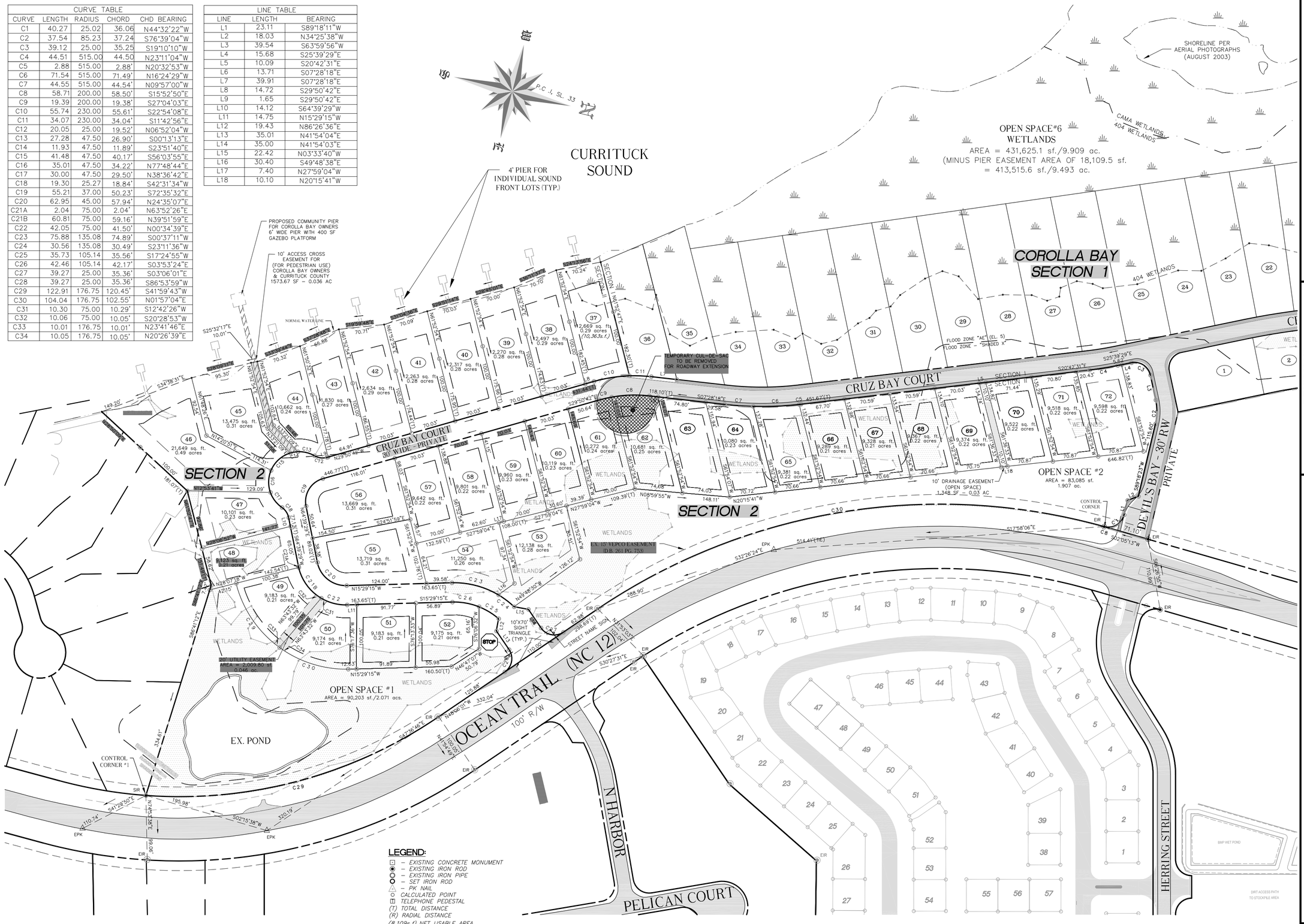
NO.	DATE	DESCRIPTION	BY
1	4/18/05	PER CURRITUCK COUNTY TRC	CLE
2	07/14/05	PER CURRITUCK COUNTY TRC	EZT
3	08/26/05	PER CURRITUCK COUNTY TRC	HDD
4	10/05/05	PER CURRITUCK COUNTY PLANNING BOARD	JCN
5	04/10/06	PER CURRITUCK COUNTY COMMENTS	MMH
6	12/22/14	PER CURRITUCK COUNTY COMMENTS	MMH

MONTERAY SHORES P.U.D. PHASE III
COROLLA BAY - SECTION II
POPLAR BRANCH TWSP   CURRITUCK COUNTY   NORTH CAROLINA
PRELIMINARY PLAT - LOTS 37 THRU 72

DATE: 11/25/14	SCALE: 1"=200'
CHECKED: CFG	DRAWN: MMH
PROJECT NO: P641.14	
CAD FILE: P641 PP SECII	
SHEET: 1 OF 3	

CURVE TABLE				
CURVE	LENGTH	RADIUS	CHORD	CHD BEARING
C1	40.27	25.02	36.06	N44°32'22"W
C2	37.54	85.23	37.24	S76°39'04"W
C3	39.12	25.00	35.25	S19°10'10"W
C4	44.51	515.00	44.50	N23°11'04"W
C5	2.88	515.00	2.88'	N20°32'53"W
C6	71.54	515.00	71.49'	N16°24'29"W
C7	44.55	515.00	44.54'	N09°57'00"W
C8	58.71	200.00	58.50'	S15°52'50"E
C9	19.39	200.00	19.38'	S27°04'03"E
C10	55.74	230.00	55.61'	S22°54'08"E
C11	34.07	230.00	34.04'	S11°42'56"E
C12	20.05	25.00	19.52'	N06°52'04"W
C13	27.28	47.50	26.90'	S00°13'13"E
C14	11.93	47.50	11.89'	S23°51'40"E
C15	41.48	47.50	40.17'	S56°03'55"E
C16	35.01	47.50	34.22'	N77°48'44"E
C17	30.00	47.50	29.50'	N38°36'42"E
C18	19.30	25.27	18.84'	S42°31'34"W
C19	55.21	37.00	50.23'	S72°35'32"E
C20	62.95	45.00	57.94'	N24°35'07"E
C21A	2.04	75.00	2.04'	N63°52'26"E
C21B	60.81	75.00	59.16'	N39°51'59"E
C22	42.05	75.00	41.50'	N00°34'39"E
C23	75.88	135.08	74.89'	S00°37'11"W
C24	30.56	135.08	30.49'	S23°11'36"W
C25	35.73	105.14	35.56'	S17°24'55"W
C26	42.46	105.14	42.17'	S03°53'24"E
C27	39.27	25.00	35.36'	S03°06'01"E
C28	39.27	25.00	35.36'	S86°53'59"W
C29	122.91	176.75	120.45'	S41°59'43"W
C30	104.04	176.75	102.55'	N01°57'04"E
C31	10.30	75.00	10.29'	S12°42'26"W
C32	10.06	75.00	10.05'	S20°28'53"W
C33	10.01	176.75	10.01'	N23°41'46"E
C34	10.05	176.75	10.05'	N20°26'39"E

LINE TABLE		
LINE	LENGTH	BEARING
L1	23.11	S89°18'11"W
L2	18.03	N34°25'38"W
L3	39.54	S63°59'56"W
L4	15.68	S25°39'29"E
L5	10.09	S20°42'31"E
L6	13.71	S07°28'18"E
L7	39.91	S07°28'18"E
L8	14.72	S29°50'42"E
L9	1.65	S29°50'42"E
L10	14.12	S64°39'29"W
L11	14.75	N15°29'15"W
L12	19.43	N86°26'36"E
L13	35.01	N41°54'04"E
L14	35.00	N41°54'03"E
L15	22.42	N03°33'40"W
L16	30.40	S49°48'38"E
L17	7.40	N27°59'04"W
L18	10.10	N20°15'41"W



LEGEND:

- ⊡ – EXISTING CONCRETE MONUMENT
- ◉ – EXISTING IRON ROD
- ○ – EXISTING IRON PIPE
- ○ – SET IRON ROD
- △ – PK NAIL
- ○ CALCULATED POINT
- ◫ TELEPHONE PEDESTAL
- (T) TOTAL DISTANCE
- (R) RADIAL DISTANCE
- (8,109s.f.) NET USABLE AREA
- MIN. B.P.E. = 6.50ft MINIMUM BUILDING PAD ELEVATION
- M.I.C.= 3,375 S.F. MAXIMUM IMPERVIOUS COVERAGE
- LOT LINE
- BOUNDARY LINE
- 404 WETLAND
- SHORELINE
- EXISTING R/W
- PROPOSED R/W
- TIE LINE
- EASEMENT LINE
- FUTURE LOT LINE
- CENTERLINE OF R/W
- CAMA LINE
- FLOODZONE

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)

1 inch = 100 ft.

Coastal
P.O. BOX 1129
4425 N CROATAN HWY
KITTY HAWK, N.C. 27949
(252)-261-4151
(252)-261-1333
C-0836
Civil – Structural
Site Development
ENGINEERING & SURVEYING, INC.

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	4/16/05	PER CURRITUCK COUNTY TRC	CLE
2	07/14/05	PER CURRITUCK COUNTY TRC	EZT
3	08/26/05	PER CURRITUCK COUNTY TRC	HDD
4	10/05/05	PER CURRITUCK COUNTY PLANNING BOARD	JON
5	04/10/06	PER CURRITUCK COUNTY COMMENTS	MMH
6	12/22/14	PER CURRITUCK COUNTY COMMENTS	MMH

MONTERAY SHORES P.U.D. PHASE III

COROLLA BAY - SECTION II

POPLAR BRANCH TWSP CURRITUCK COUNTY NORTH CAROLINA

PRELIMINARY PLAT - LOTS 37 THRU 72

DATE: 11/25/14	SCALE: 1"=100'
CHECKED: CFG	DRAWN: MMH
PROJECT NO: P641.14	
CAD FILE: P641 PP SECII	
SHEET: 2 OF 3	

LEGEND:

- ⊡ – EXISTING CONCRETE MONUMENT
- ◉ – EXISTING IRON ROD
- ◎ – EXISTING IRON PIPE
- O – SET IRON ROD
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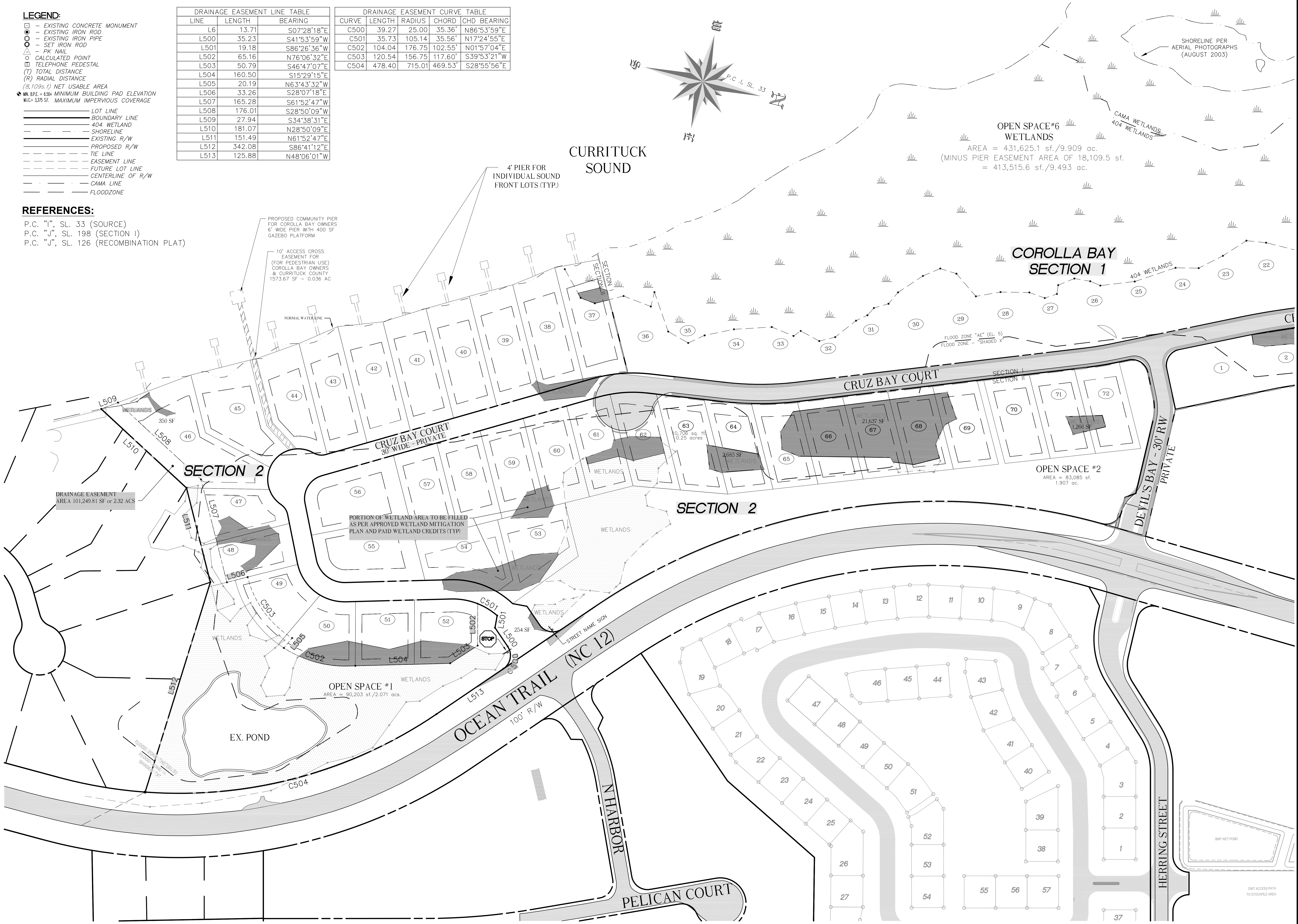
- PROPOSED R/W
- TIE LINE
- EASEMENT LINE
- FUTURE LOT LINE
- CENTERLINE OF R/W
- CAMA LINE
- FLOODZONE

REFERENCES:

P.C. "I", SL. 33 (SOURCE)
P.C. "J", SL. 198 (SECTION I)
P.C. "J", SL. 126 (RECOMBINATION PLAT)

DRAINAGE EASEMENT LINE TABLE		
LINE	LENGTH	BEARING
L6	13.71	S07°28'18"E
L500	35.23	S41°53'59"W
L501	19.18	S86°26'36"W
L502	65.16	N76°06'32"E
L503	50.79	S46°47'07"E
L504	160.50	S15°29'15"E
L505	20.19	N63°43'32"W
L506	33.26	S28°07'18"E
L507	165.28	S61°52'47"W
L508	176.01	S28°50'09"W
L509	27.94	S34°38'31"E
L510	181.07	N28°50'09"E
L511	151.49	N61°52'47"E
L512	342.08	S86°41'12"E
L513	125.88	N48°06'01"W

DRAINAGE EASEMENT CURVE TABLE				
CURVE	LENGTH	RADIUS	CHORD	CHD BEARING
C500	39.27	25.00	35.36'	N86°53'59"E
C501	35.73	105.14	35.56'	N17°24'55"E
C502	104.04	176.75	102.55'	N01°57'04"E
C503	120.54	156.75	117.60'	S39°53'21"W
C504	478.40	715.01	469.53'	S28°55'56"E



GRAPHIC SCALE

100 0 50 100 200

(IN FEET)
1 inch = 100 ft.

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MONTERAY SHORES P.U.D. PHASE III

COROLLA BAY - SECTION II

POPLAR BRANCH TWSP CURRITUCK COUNTY NORTH CAROLINA

PRELIMINARY PLAT - LOTS 37 THRU 72

DATE: 11/25/14	SCALE: 1"=100'
CHECKED: CFG	DRAWN: MMH
PROJECT NO: P641.14	
CAD FILE: P641 PP SECII	
SHEET: 3 OF 3	

The Great Dismal Swamp RestorationBank, LLC

P. O. Box 6186
Chesapeake, VA 23323

Phone (757) 487-3441
Fax (757) 487-8680

May 1, 2014

Mr. Kyle Barnes
US Army Corps of Engineers
2407 West 5th Street
Washington, NC 27889

RE: SAW 2008-00770

Dear Mr. Barnes:

As per government approval, we have sold 0.20 Riparian mitigation credits, and 5.08 Non-Riparian mitigation credits to permittee Corolla Bay, LLC. The project is located in Currituck, NC. The Corps project number is as follows: SAW-2008-00770.

I am enclosing the current status sheet for credits available at Timberlake Mitigation Bank. Thank you.

Sincerely,

Beverly M. White
Accounting - GDSRB

CC: File

	LINE	LENGTH	BEARING
"Z" SERIES	L7	33.43	S 03°03'04" E
	L8	42.21	S 23°20'14" E
	L9	19.57	S 58°22'01" E
	L10	46.08	S 18°16'21" E
	L11	54.94	S 00°05'30" W
	L12	30.77	S 07°58'04" E
	L13	43.58	S 46°45'00" E
	L14	42.27	S 40°54'53" E
	L15	36.08	S 13°07'21" E
	L16	66.98	S 32°29'47" E
	L17	53.90	S 20°40'59" E
	L18	17.16	S 09°16'58" W
	L19	25.01	S 04°12'55" E
	L20	27.25	S 36°10'27" E
	L21	13.87	N 84°11'34" E
	L22	19.94	S 32°28'33" E
	L23	25.59	S 05°56'14" W
	L24	44.85	S 13°11'09" E
	L25	38.96	S 23°49'43" E
	L26	46.48	S 35°26'43" W
	L27	26.46	S 03°45'46" W
	L28	29.36	S 37°05'49" E
	L29	46.37	S 47°24'27" E
	L30	23.17	S 64°03'27" E
"V" SERIES	L31	23.68	S 30°02'53" E
	L32	15.13	S 62°12'05" E
	L33	19.72	S 39°20'17" E
	L34	41.28	S 52°12'11" E
	L35	25.55	S 27°53'45" E
	L36	32.85	S 14°41'53" W
	L37	13.63	S 48°42'54" E
	L38	36.61	S 08°22'06" W
	L39	59.07	S 17°21'00" E
	L40	46.61	S 25°42'49" E
	L41	28.08	S 38°41'13" E
	L42	35.88	S 15°37'02" W

	LINE	LENGTH	BEARING
"V" SERIES	L43	64.97	S 56°50'32" W
	L44	23.00	S 89°55'12" E
	L45	45.49	S 07°04'27" W
	L46	46.13	S 28°12'00" E
	L47	23.74	S 07°09'45" W
	L48	50.93	S 47°06'07" W
	L49	7.90	N 58°36'31" E
	L50	22.95	N 29°43'25" E
	L51	22.76	N 08°03'36" E
	L52	13.22	S 29°16'05" E
	L53	17.10	S 08°27'39" W
	L54	26.36	S 45°26'31" W
	L55	11.37	S 26°41'31" E
	L56	7.35	S 56°00'29" E
"D" SERIES	L119	19.95	N 26°38'17" W
	L120	22.46	N 17°59'03" W
	L121	42.48	N 81°31'45" W
	L122	31.16	S 70°31'29" W
	L123	39.71	S 69°19'58" W
	L124	14.80	S 81°23'22" W
	L125	36.85	N 50°28'51" W
	L126	48.06	N 33°46'47" W
	L127	12.90	N 89°36'52" W
	L128	24.89	N 26°27'29" W
	L129	39.28	N 12°03'10" W
	L130	39.00	N 20°04'40" E
	L131	37.15	S 58°03'35" E
	L132	23.62	N 81°00'14" E
	L133	25.97	S 59°55'16" E
	L134	16.71	N 67°15'08" E
	L135	31.22	N 02°04'16" E
	L136	20.66	N 59°00'36" E
	L137	25.29	S 47°26'28" E
	L138	27.81	S 52°56'05" E
	L139	39.96	S 59°56'59" E
	L140	32.66	N 89°45'41" E
"F" SERIES	L144	22.96	N 09°43'41" W
	L145	20.67	N 76°52'22" W
	L146	31.61	S 59°41'34" W
	L147	33.63	S 31°48'26" E
	L148	47.38	S 72°04'58" E

	LINE	LENGTH	BEARING
	L149	21.51	N 14°42'49" W
	L150	12.53	N 28°51'14" W
"J" SERIES	L190	39.79	N 53°49'22" W
	L191	27.30	N 13°44'28" W
	L192	42.44	N 37°57'14" W
	L193	39.20	N 09°18'59" E
	L194	14.32	N 60°09'58" E
	L195	33.10	S 81°17'25" E
	L196	18.02	S 04°22'03" E
	L197	46.50	S 03°26'52" W
	L198	43.59	S 19°07'09" E
	L199	18.35	S 03°12'32" E
"K" SERIES	L202	23.95	N 10°39'24" W
	L203	37.06	N 00°13'56" W
	L204	37.70	N 04°41'12" W
	L205	43.92	N 03°07'27" E
	L206	34.05	N 13°41'21" W
	L207	39.86	N 28°03'58" W
	L208	33.53	N 50°25'56" W
	L209	36.97	N 09°36'44" E
	L210	43.12	S 49°54'51" E
	L211	38.85	S 61°43'53" E
	L212	44.68	S 00°39'45" E
	L213	42.25	S 18°07'04" E
	L214	46.47	S 12°44'02" E
	L215	29.85	S 05°22'17" E
	L216	44.14	S 08°24'01" E
	L217	41.66	S 47°04'18" W
	L218	20.12	N 62°34'11" W
"U" SERIES	L223	49.99	N 14°38'52" W
	L224	65.56	N 21°08'38" W
	L225	45.66	N 27°02'13" W
	L226	37.24	N 36°08'46" E
	L227	53.03	N 17°49'05" W
	L228	26.74	N 31°47'51" W
	L229	45.24	N 67°00'12" W
	L230	38.74	N 11°59'48" E
	L231	74.14	N 02°01'47" W
	L232	105.92	N 06°44'44" W
	L233	101.02	N 11°32'24" E

	LINE	LENGTH	BEARING
"G" SERIES	L326	18.25	S05°32'40"W
	L327	66.79	S02°38'36"E
	L328	37.30	N69°26'35"E
	L329	19.14	N03°18'09"E
	L330	26.76	N22°09'49"W
	L331	26.44	N15°10'42"W
	L332	12.86	N16°44'58"W
	L333	19.37	S59°08'15"W
"U" SERIES	L234	53.42	N 18°03'29" E
	L235	56.60	N 11°39'12" E
	L236	51.62	N 06°25'07" W
	L237	75.02	N 28°02'14" W
	L238	46.29	N 46°26'29" W
	L239	31.11	N 00°17'32" W
	L240	41.96	N 09°01'38" E
	L241	40.46	N 09°50'00" E
	L242	14.85	S 85°52'42" W
	L243	24.05	S 29°45'31" W
	L244	32.31	S 00°00'13" W
	L245	33.52	S 40°36'21" W
	L246	14.04	S 68°46'22" W
	L247	28.31	S 86°10'00" W
	L248	18.55	N 68°42'23" W
	L249	33.82	N 22°04'32" E
	L250	25.51	N 07°11'27" E
	L251	29.43	N 54°51'14" E
	L252	35.70	N 04°37'59" W
"W" SERIES	L253	20.40	N 63°17'49" E
	L254	30.81	S 35°45'28" E
	L255	36.42	S 09°57'35" E
	L256	28.40	S 33°15'10" E
	L257	30.48	S 37°48'05" W
	L258	8.60	N 56°57'44" W
	L259	17.76	N 05°39'17" E
	L260	28.17	N 18°13'05" W
"X" SERIES	L261	56.34	N 26°30'58" W
	L262	24.75	N 30°53'35" E
	L263	15.38	N 47°06'45" W
	L264	23.51	S 51°42'03" W
	L265	24.15	S 44°47'44" E
TIES	L268	23.87	S 26°48'25" E
	L269	35.45	S 13°37'19" W
	L274	98.92	N 18°56'36" W
	L275	114.48	N 14°11'42" W
	L277	23.84	N 37°20'49" W
	L278	28.21	N 30°18'28" W
"I" SERIES	L300	29.80	N54°22'31"E
	L301	33.58	N26°51'31"W
	L302	18.27	N39°50'49"W
	L303	21.69	S25°13'50"W
	L304	43.39	S15°55'53"E

	LINE	LENGTH	BEARING
"B" SERIES	L411	26.17	S48°41'25"E
	L412	11.99	N36°57'24"E
	L413	17.96	N44°17'27"W
	L414	25.56	N63°50'28"W
	L415	25.21	N53°43'56"W
	L416	13.77	S70°52'11"W
	L417	20.68	S27°03'22"W
	L418	31.55	S25°55'32"E
	L419	20.63	S00°39'55"W
	L420	18.51	S41°44'37"W
	L421	17.05	S36°44'49"E
	L422	11.26	N49°24'44"E
	L423	18.55	S75°47'49"E
	L424	21.49	S37°05'43"E
	L425	21.50	S09°41'32"W
	L426	37.75	S58°57'40"W
	L427	26.87	N56°57'25"W
	L428	27.01	S80°13'48"W
	L429	17.21	S24°01'58"E
	L430	21.61	N84°26'26"E
	L431	26.74	S64°56'14"E
	L432	16.00	S14°59'54"W
	L433	15.33	S74°49'29"E
	L434	35.65	S70°28'53"E
	L435	16.94	N58°55'30"E
"R" SERIES	L436	25.59	N04°47'57"W
	L437	25.74	N29°24'53"W
	L438	25.59	N07°31'40"E
	L439	10.32	N19°33'01"E
	L440	19.12	S88°38'47"E
	L441	26.49	N42°07'05"E
	L442	13.98	S51°30'35"E
	L443	343.18	S86°43'13"E
	L444	235.79	N18°55'27"W
"C" SERIES	L305	43.32	S56°47'20"W
	L306	40.77	S23°36'08"E
	L307	37.46	S20°31'30"E
	L308	46.76	S21°56'10"E
	L309	71.36	S19°42'46"E
	L310	47.19	S23°32'35"E
	L311	33.81	S71°39'00"E
	L312	27.17	N72°06'38"E
	L313	28.65	N08°14'30"E
	L314	19.68	N30°58'27"W
	L315	42.53	N08°17'12"W
	L316	34.45	N13°32'25"W
	L317	47.27	N09°50'01"W
	L318	26.18	N48°21'31"E
	L319	33.12	N19°19'21"W
	L320	22.35	N06°53'59"W
	L321	20.19	N74°07'27"W
	L322	27.24	S60°27'31"W
	L323	14.45	N80°20'20"W
	L324	18.83	N76°56'49"W
	L325	20.37	N41°20'06"W
	L334	20.62	S35°51'26"E
	L335	34.50	S28°31'55"E

	LINE	LENGTH	BEARING
"D" SERIES	L336	28.14	S21°21'38"E
	L337	35.27	S22°39'47"E
	L338	24.68	S40°09'57"E
	L339	14.74	N64°28'39"E
	L340	19.47	N03°30'12"W
	L341	39.91	N18°50'20"W
	L342	21.96	N18°03'30"W
	L343	35.79	N08°49'17"W
	L344	33.73	N36°24'15"W
	L345	33.04	N17°20'31"W
	L346	26.02	N16°46'11"E
	L347	24.20	N09°00'04"W
	L348	30.00	N07°15'54"W
	L349	14.44	N55°36'09"W
	L350	8.20	N55°30'18"W
"E" SERIES	L351	48.67	N58°21'07"W
	L352	17.60	S33°20'51"E
	L353	15.07	S19°35'09"E
	L354	15.47	S44°24'41"E
	L355	31.73	S15°42'57"E
	L356	22.32	S79°02'56"E
	L357	19.74	N47°44'13"E
	L358	17.36	N02°47'08"W
	L359	33.94	N56°48'10"W
"B" SERIES	L360	54.93	N41°11'36"W
	L361	40.53	N27°32'20"W
	L362	34.32	N38°10'32"W
	L363	43.30	N67°50'08"W
	L364	44.68	N67°33'09"W
	L365	21.17	N17°59'41"W
	L366	43.06	N46°46'32"W
	L367	31.05	N38°03'17"W
	L368	26.43	N46°08'38"W
	L369	30.83	N10°55'57"W
	L370	30.42	N73°40'20"W
	L371	25.25	S16°59'13"E
	L372	34.53	S10°05'08"W
	L373	17.07	S12°25'04"E
	L374	42.15	S07°48'27"E
	L375	21.17	S16°54'58"E
	L376	15.22	S48°22'27"E
	L377	31.11	S18°22'28"E
	L378	33.39	S05°36'45"E
	L379	33.08	S00°08'47"W
	L380	29.20	S36°12'40"E
	L381	33.23	S14°55'56"E
	L382	22.28	S51°55'21"E
	L383	18.18	S81°41'45"E
	L384	30.47	N85°48'30"E
	L385	14.31	S69°26'08"E
	L386	28.31	S18°09'04"E
	L387	19.12	S49°39'16"W
	L388	14.45	N78°01'38"W
	L389	15.80	N79°00'19"W
	L390	19.71	S54°13'44"W
	L391	20.82	N52°09'18"W
	L392	18.92	N53°20'12"W
	L393	11.14	S29°03'50"W
	L394	22.25	S37°07'13"E
	L395	26.59	S05°16'04"W
	L396	16.22	S60°37'30"W
	L397	22.96	N67°16'54"W
	L398	18.65	S48°45'16"W
	L399	17.99	S44°57'33"E
	L400	25.42	S64°28'19"E
	L401	26.15	S26°35'22"W
	L402	28.14	N34°34'40"W
	L403	7.94	S67°25'52"W
	L404	25.55	S37°15'23"W
	L405	34.56	S45°10'50"W
	L406	28.18	S70°00'00"W
	L407	13.16	N46°58'56"W
	L408	25.99	N23°18'16"W
	L409	35.80	N06°15'44"W
	L410	17.88	N81°28'57"E
	L411	26.17	S48°41'25"E

NOTES:

1) CONTACT: COROLLA BAY, L.L.C
821 OCEAN TRAIL, SUITE 4
COROLLA, NC 27927
(252) 453-3600

2) TOTAL WETLAND AREA: 604,575.9 sf = 13.879 AC

3) SOURCE DEED AS RECORDED IN D.B. 365, PG. 374, C.C.R

WETLANDS CERTIFICATION

THIS CERTIFIES THAT THIS COPY OF THIS PLAT ACCURATELY DEPICTS THE BOUNDARY OF THE JURISDICTION OF SECTION 404 OF THE CLEAN WATER ACT UNDER THE PRESENT LAW AND REGULATIONS AS DETERMINED BY THE UNDERSIGNED ON THIS DATE. UNLESS THERE IS A CHANGE IN THE LAW OR OUR PUBLISHED REGULATIONS, THIS DETERMINATION OF SECTION 404 JURISDICTION MAY BE RELIED UPON FOR A PERIOD NOT TO EXCEED FIVE (5) YEARS FROM THIS DATE. THIS DETERMINATION WAS MADE UTILIZING THE 1987 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL

NAME OF CORPS OF ENGINEERS REPRESENTATIVE — DATE

TITLE

SURVEYORS CERTIFICATE

I, CARLOS F. GOMEZ , CERTIFY THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION, THAT THE BOUNDARIES NOT ACTUALLY SURVEYED ARE SHOWN AS BROKEN LINES PLOTTED FROM INFORMATION FOUND IN EXISTING RECORDS AND THAT THIS MAP WAS NOT PREPARED TO BE RECORDED. THE RATIO OF PRECISION IS 1:10000+ BY LAT. & DEP. WITNESS MY HAND AND SEAL THIS 9th DAY OF MAY, 2005.

P.L.S. — L-3241

GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
1 inch = 100 ft.

P.O. Box 1129
934 W. Kitty Hawk Rd.
Kitty Hawk, N.C. 27949
(252)-261-4151
(252)-261-1333

Coastal ENGINEERING & SURVEYING, INC.
Civil – Structural
Site Development

REVISIONS

NO.	DATE	DESCRIPTION	BY
1	5/09/05	SOUND FRONT WETLANDS	EZT
2	5/31/05	REVISION PER ENV.	EZT
3	6/15/05	REVISION PER ENV.	EZT
4	6/22/05	REVISION PER ENV.	EZT
5	11/04/05	REVISIONS PER RESTAKING OF J & K	JCN
6	03/10/06	RE-DELINEATED WETLANDS	MMH
7	4/26/10	REVIEW & SIGNED	CFG

COROLLA BAY

COROLLA BAY, LLC

POPLAR BRANCH TWSP — CURRITUCK COUNTY — NORTH CAROLINA

WETLAND DELINEATION MAP

DATE: 04/05/05 | SCALE: 1"= 100'
CHECKED: CFG | DRAWN: CLE
PROJECT NO: P432
CAD FILE: P432-wetlandsR1
SHEET: 1 OF 1

November 26, 2014

Northeastern North Carolina Properties, LLC
6001 Harbour View Boulevard
Suffolk, VA 23435

Re: Corolla Bay Section II, lots 37 through 72 located on the west “sound” side of Hwy. 12
Monteray Shores P.U.D. Phase III, Corolla, Currituck County, NC
Sanitary Sewer Utility, Willingness to Serve, Capacity Commitment letter

To Whom It May Concern,

Carolina Water Service, Inc. of North Carolina ("CWSNC") provides sanitary sewer utility service to the Monteray Shores and adjacent developments and of which encompass the above referenced project and property. CWSNC is a franchised and regulated public utility company in the state of North Carolina.

CWSNC is willing and able to provide the sanitary sewer utility needs for the above referenced lots for a combined maximum capacity of Thirty Eight Thousand, Eight Hundred and Eighty (38,880) gallons per day.

Should you have any questions, please do not hesitate to contact me directly in our Charlotte Office at 704-525-7990 or by email at mjlashua@uiwater.com.

Thank you for your attention.

Sincerely,

Martin Lashua
Vice President of Operations

Cc: Danny Lassiter
Eddie Baldwin
Carlos Gomez, Coastal Engineering

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Division of Environmental Health
Public Water Supply Section

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Terry L. Pierce, Director
Jessica G. Miles, Section Chief

August 26, 2005

Mr. Daniel F. Scanlon, II
Southern Outer Banks Water System
Post Office Box 39
Currituck, North Carolina 27929

Re: Water Main Extension
Southern Outer Banks Water System
Corolla Bay
PWS ID: 60-27-001, Currituck County

Dear Mr. Scanlon:

Enclosed please find one copy of the "Application for Approval..." together with one copy of the referenced plans and specifications bearing the Division of Environmental Health stamp of approval for the referenced project. These plans and specifications are approved under Division of Environmental Health serial number 05-01219, dated August 25, 2005.

Plans and specifications prepared by Carlos R. Gomez, P.E., call for extending the Southern Outer Banks water distribution system by installing approximately 818 feet of 12-inch and 3,271 feet of 8-inch water main, valves and other appurtenances to provide service to Corolla Bay mixed-use development located off Ocean Trail (Highway 12).

Please note that an "Authorization to Construct" requires both this approval of Engineering Plans and Specifications and submittal of a complete Water System Management Plan. No construction shall be undertaken, and no contract for construction, alteration, or installations shall be entered into until the Department issues an Authorization to Construct letter in accordance with 15A NCAC 18C .0305(a).

These plans and specifications in the foregoing application are approved insofar as the protection of public health is concerned as provided in the rules, standards and criteria adopted under the authority of Chapter 130A-317 of the General Statues. This approval does not constitute a warranty of the design, construction or future operation of the water system.

One copy of each enclosed document is being forwarded to our Washington Regional Office. The third copy is being retained in our permanent files.

If we can be of further service, please call on us at (919) 733-2460.

Sincerely,

Tony C. Chen, P.E.
Lead Engineer, Plan Review
Technical Services Branch

TCC/SMC/db

Enclosures: Approval Documents

cc: Fred Hill, Regional Engineer
Currituck County Health Department
Coastal Engineering & Surveying, Inc.

Coastal Engineering & Survey
934 West Kitty Hawk Road
Entrance #3
Kitty Hawk,NC 27949

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Division of Environmental Health
Public Water Supply Section

Michael F. Easley, Governor
William G. Ross Jr., Secretary
Terry L. Pierce, Director
Jessica G. Miles, Section Chief

August 26, 2005

DANIEL F SCANLON, II
P O Box 39
Currituck,NC 27929

Re: **Authorization to Construct**
COROLLA BAY
SOUTHERN OUTER BANKS WTR SYST
CURRITUCK County 6027001

Dear Applicant:

This letter is to confirm that a complete Engineer's Report and a Water System Management Plan have been received, and that engineering plans and specifications have been approved by the Department for **COROLLA BAY, DEH Serial No. 0501219.**

The Authorization to Construct is valid for 24 months from the date of this letter. Authorization to Construct may be extended if the Rules Governing Public Water Supplies and site conditions have not changed. The Authorization to Construct and the engineering plans and specifications approval letter, shall be posted at the primary entrance of the job site before and during construction.

Approval must be secured from the Department before any construction or installation if:

- Deviation from the approved engineering plans and specifications is necessary; or
- There are changes in site conditions affecting capacity, hydraulic conditions, operating units, the function of water treatment processes, the quality of water to be delivered, or conditions imposed by the Department in any approval letters.

Upon completion of the construction or modification and in accordance with Rule .0303, the applicant shall submit a certification statement directly to Siraj M. Chohan of this office. This statement must be signed and sealed by a registered professional engineer stating that construction was completed in accordance with approved engineering plans and specifications, including any provisions stipulated in the Department's engineering plan and specification approval letter. Prior to Final Approval, the applicant shall submit a signed certification stating that the requirements in 15A NCAC 18C .0307 (d) and (e) have been satisfied and if applicable, a completed application for an Operating Permit and fee. Once the certification statements and operating permit application and fee, if applicable, are received and determined adequate, the Department will grant Final Approval in accordance with Rule .0309 (a). Therefore, no construction, alteration, or expansion of a water system shall be placed into service until Final Approval has been issued by the Department.

If we can be of further assistance, please call (919) 733-2321.

Sincerely,

Tony C. Chen, P.E.
Technical Services Branch
Public Water Supply Section

TCC:SMC

cc: FRED HILL, Regional Supervisor
Coastal Engineering & Survey

State of North Carolina
Department of Environment and Natural Resources

Public Water System Authorization to Construct

Public Water System Name and PWSID No. (*if available*):	SOUTHERN OUTER BANKS WTR SYST 6027001
Project Name:	COROLLA BAY
Serial No.	0501219
Issue Date:	08/25/2005
Expiration Date:	24 months after Issue Date

In accordance with NCAC 18C .0305, this Authorization to Construct must be posted for inspection at the primary entrance to the job site during construction.

PRE-DEVELOPMENT
STORMWATER DRAINAGE PLAN

Prepared For

COROLLA BAY

(72 Lot Residential Development)

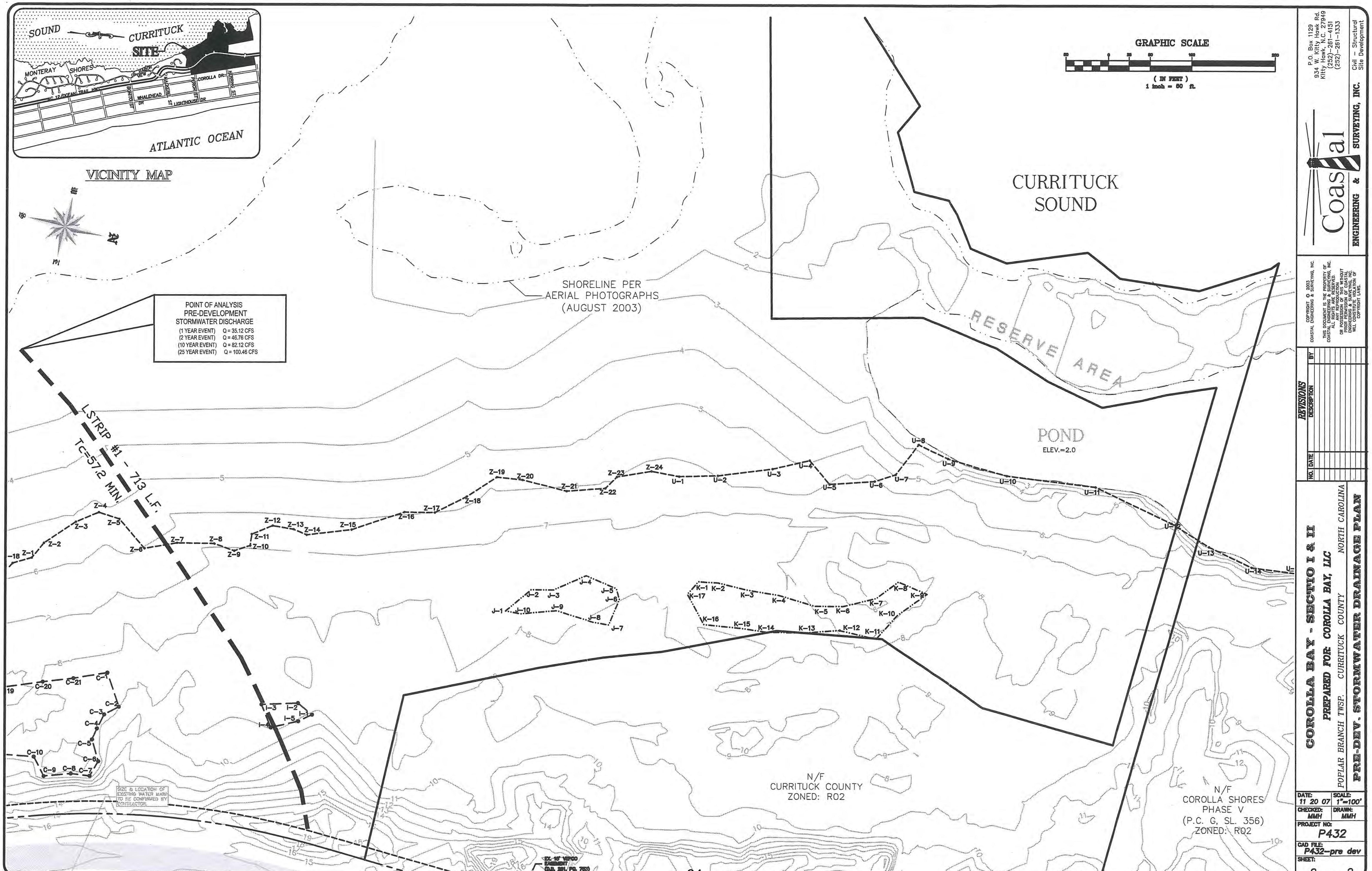
Located on

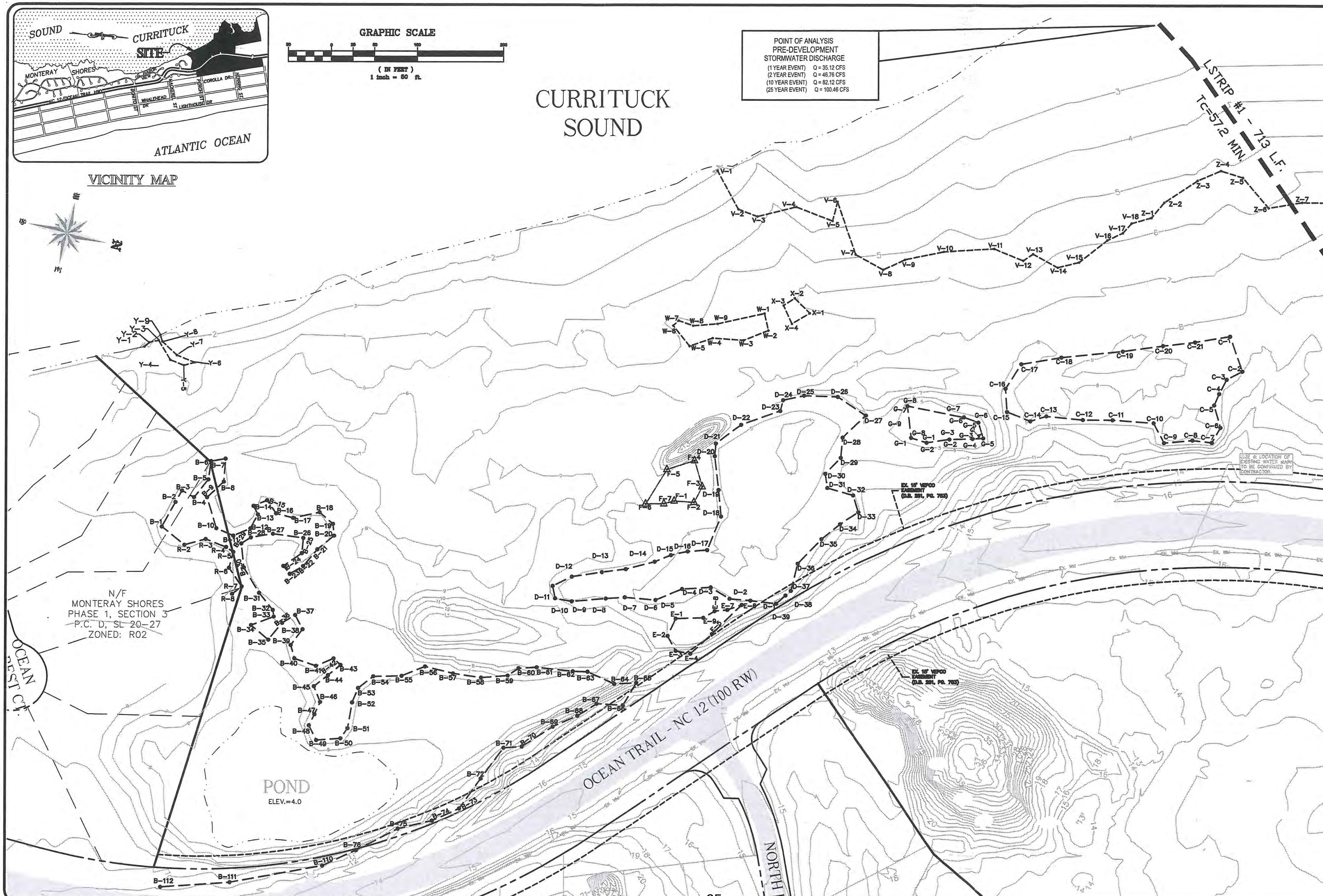
OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007


SOUND
CURRITUCK
SITE
MONTERAY SHORES
ATLANTIC OCEAN
VICINITY MAP
GRAPHIC SCALE
(IN FEET)
1 inch = 50 ft.
CURRITUCK SOUND
SHORELINE PER AERIAL PHOTOGRAPHS (AUGUST 2003)
POINT OF ANALYSIS
PRE-DEVELOPMENT
STORMWATER DISCHARGE
(1 YEAR EVENT) Q = 35.12 CFS
(2 YEAR EVENT) Q = 46.76 CFS
(10 YEAR EVENT) Q = 82.12 CFS
(25 YEAR EVENT) Q = 100.46 CFS
RESERVE AREA
POND
ELEV.=2.0
LSTRIP #1 - 713 L.F.
TC=57.2 MIN.
N/F
CURRITUCK COUNTY
ZONED: R02
N/F
COROLLA SHORES
PHASE V
(P.C. G, SL. 356)
ZONED: R02
SIZE & LOCATION OF EXISTING WATER MAIN TO BE CONFIRMED BY CONTRACTOR
P.O. Box 1129
934 W. Kitty Hawk Rd.
Kitty Hawk, N.C. 27949
(252)-261-4151
(252)-261-1333
Civil - Structural
Site Development
Coastal
ENGINEERING & SURVEYING, INC.
REVISIONS
NO. | DATE | DESCRIPTION | BY
COROLLA BAY - SECTION I & II
PREPARED FOR: COROLLA BAY, LLC
POPLAR BRANCH TWSP. CURRITUCK COUNTY NORTH CAROLINA
PRE-DEV. STORMWATER DRAINAGE PLAN
DATE: 11 20 07
SCALE: 1"=100'
CHECKED: MMH
DRAWN: MMH
PROJECT NO: P432
CAD FILE: P432-pre dev
SHEET: 2 OF 2



P.O. Box 1129
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Kitty Hawk, N.C. 27949
(252)-261-4151
(252)-261-1333

Coastal ENGINEERING & SURVEYING, INC.
Civil - Structural
Site Development

REVISIONS

NO.	DATE	DESCRIPTION	BY

COROLLA BAY - SECTIO I & II

PREPARED FOR: COROLLA BAY, LLC

POPLAR BRANCH TWSP. CURRITUCK COUNTY NORTH CAROLINA

PRE-DEV. STORMWATER DRAINAGE PLAN

DATE: 11 20 07	SCALE: 1"=100'
CHECKED: MMH	DRAWN: MMH
PROJECT NO: P432	
CAD FILE: P432-pre dev	
SHEET: 1 OF 2	

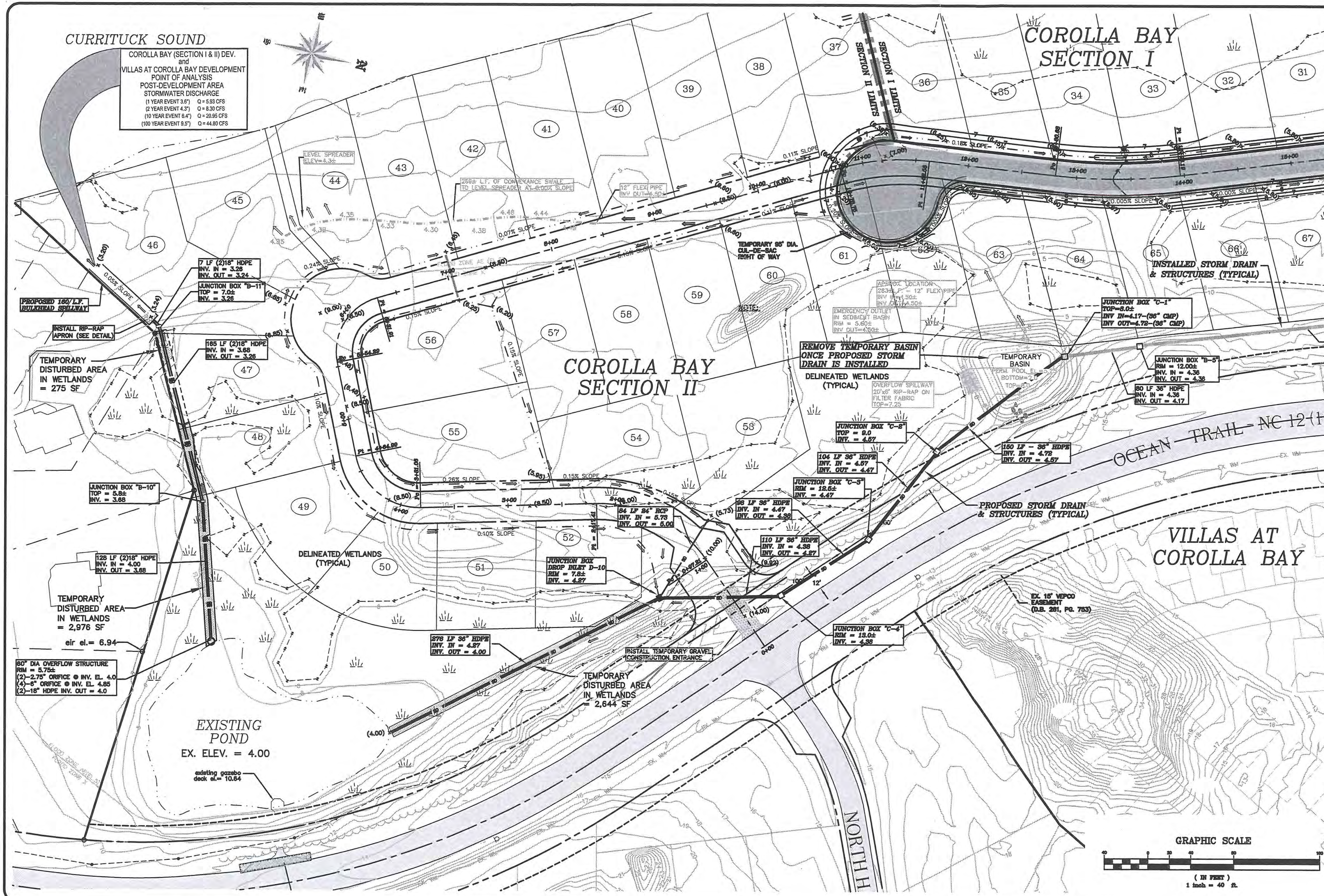
POST-DEVELOPMENT
STORMWATER DRAINAGE PLAN

Prepared For

COROLLA BAY
(72 Lot Residential Development)

Located on
OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:
COASTAL ENGINEERING & SURVEYING
16 November 2007
Revised: 4/28/08


CURRITUCK SOUND
COROLLA BAY (SECTION I & II) DEV. and VILLAS AT COROLLA BAY DEVELOPMENT POINT OF ANALYSIS POST-DEVELOPMENT AREA STORMWATER DISCHARGE
(1 YEAR EVENT 3.6") Q = 5.93 CFS
(2 YEAR EVENT 4.3") Q = 8.30 CFS
(10 YEAR EVENT 6.4") Q = 20.95 CFS
(100 YEAR EVENT 9.5") Q = 44.80 CFS
COROLLA BAY SECTION I
SECTION I LIMITS
SECTION II LIMITS
COROLLA BAY SECTION II
VILLAS AT COROLLA BAY
OCEAN TRAIL NC 12
EXISTING POND
EX. ELEV. = 4.00
existing gazebo deck el.= 10.64
TEMPORARY DISTURBED AREA IN WETLANDS = 275 SF
TEMPORARY DISTURBED AREA IN WETLANDS = 2,976 SF
TEMPORARY DISTURBED AREA IN WETLANDS = 2,644 SF
DELINEATED WETLANDS (TYPICAL)
PROPOSED 160/L.F. BULKHEAD SPILLWAY
INSTALL RIP-RAP APRON (SEE DETAIL)
JUNCTION BOX "B-11" TOP = 7.0± INV. = 3.26
JUNCTION BOX "B-10" TOP = 5.8± INV. = 3.68
60" DIA OVERFLOW STRUCTURE RIM = 5.75± (2)-2.75" ORIFICE @ INV. EL. 4.0 (4)-6" ORIFICE @ INV. EL. 4.85 (2)-18" HDPE INV. OUT = 4.0
eir el.= 6.94
TEMPORARY 95' DIA. CUL-DE-SAC RIGHT OF WAY
REMOVE TEMPORARY BASIN ONCE PROPOSED STORM DRAIN IS INSTALLED
TEMPORARY BASIN
INSTALLED STORM DRAIN & STRUCTURES (TYPICAL)
PROPOSED STORM DRAIN & STRUCTURES (TYPICAL)
JUNCTION BOX "C-1" TOP=8.0± INV IN=4.17-(36" CMP) INV OUT=4.72-(36" CMP)
JUNCTION BOX "B-5" RIM = 12.00± INV. IN = 4.36 INV. OUT = 4.36
JUNCTION BOX "C-2" TOP = 9.0 INV. = 4.57
JUNCTION BOX "C-3" RIM = 12.6± INV. = 4.47
JUNCTION BOX "C-4" RIM = 13.0± INV. = 4.38
JUNCTION BOX DROP INLET D-10 RIM = 7.8± INV. = 4.27
276 LF 36" HDPE INV. IN = 4.27 INV. OUT = 4.00
INSTALL TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
EX. 15' VEPCO EASEMENT (D.B. 261, PG. 753)
GRAPHIC SCALE
(IN FEET)
1 inch = 40 ft.

P.O. Box 1129
934 W. Kitty Hawk Rd.
Kitty Hawk, N.C. 27949
(252)-261-4151
(252)-261-1333

Civil - Structural
Site Development

Coastal ENGINEERING & SURVEYING, INC.

NO.	DATE	REVISIONS DESCRIPTION	BY

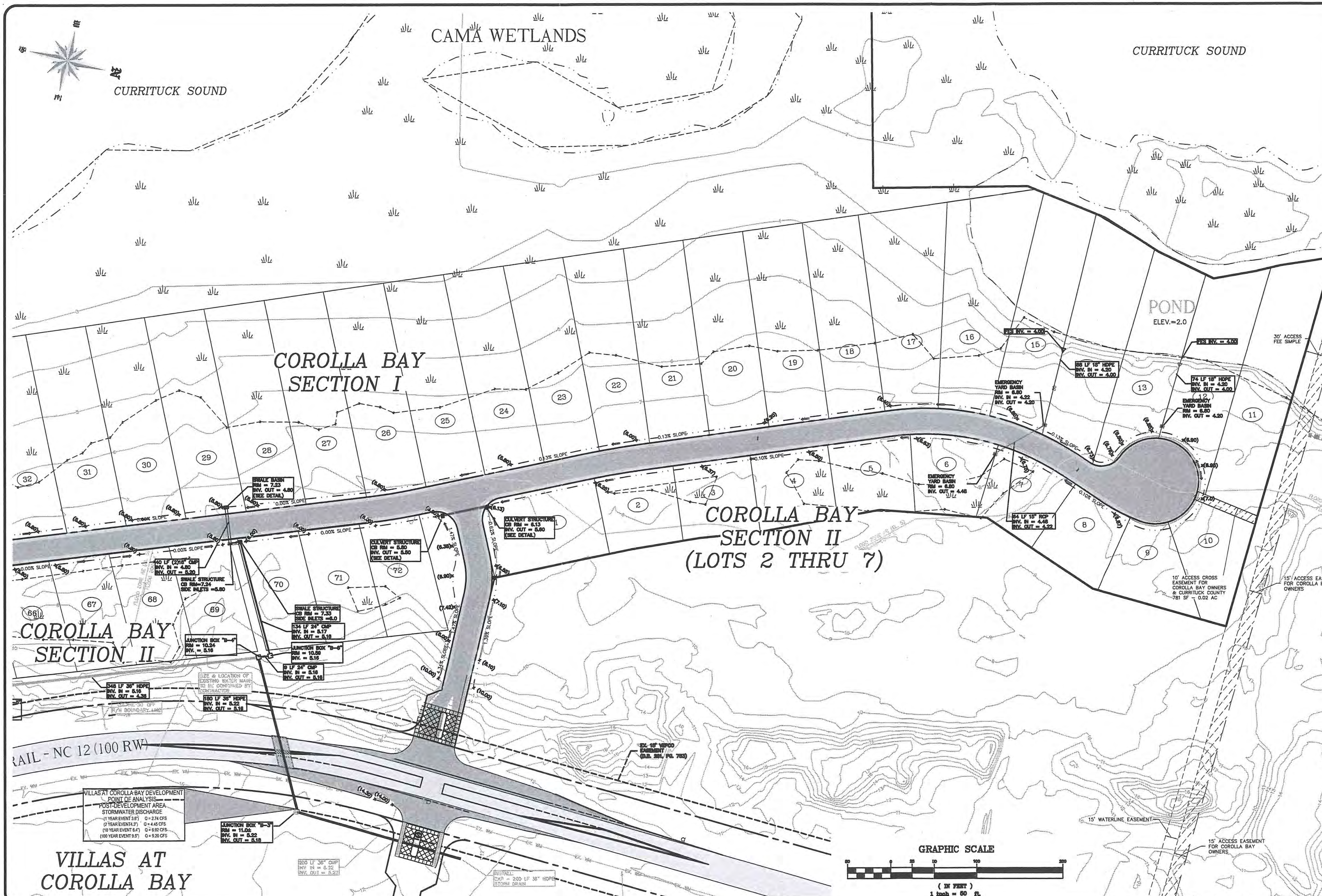
COROLLA BAY - SECTION I & II

PREPARED FOR: COROLLA BAY, LLC

POPLAR BRANCH TWSP. CURRITUCK COUNTY NORTH CAROLINA

POST DEV. STORMWATER DRAINAGE PLAN

DATE: 11 20 07	SCALE: 1"=40'
CHECKED: MMH	DRAWN: MMH
PROJECT NO: P432	
CAD FILE: P432 POST DEV	
SHEET: 1 of 2	



Coastal ENGINEERING & SURVEYING, INC.

P.O. Box 1129
934 W. Kitty Hawk Rd.
Kitty Hawk, N.C. 27949
(252)-261-4151
(252)-261-1333

Civil – Structural
Site Development

REVISIONS

NO.	DATE	DESCRIPTION	BY

COROLLA BAY - SECTIO I & II

PREPARED FOR: COROLLA BAY, LLC

POPLAR BRANCH TWSP. CURRITUCK COUNTY NORTH CAROLINA

POST DEV. STORMWATER DRAINAGE PLAN

DATE: 11 20 07	SCALE: 1"=50'
CHECKED: MMH	DRAWN: MMH
PROJECT NO: P432	
CAD FILE: P432 POST DEV	
SHEET: 2 of 2	

POST-DEVELOPMENT VELOCITY CALCULATIONS
(for propose swales)

Prepared For
COROLLA BAY
(72 Lot Residential Development)
Located on
OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:
COASTAL ENGINEERING & SURVEYING
16 November 2007

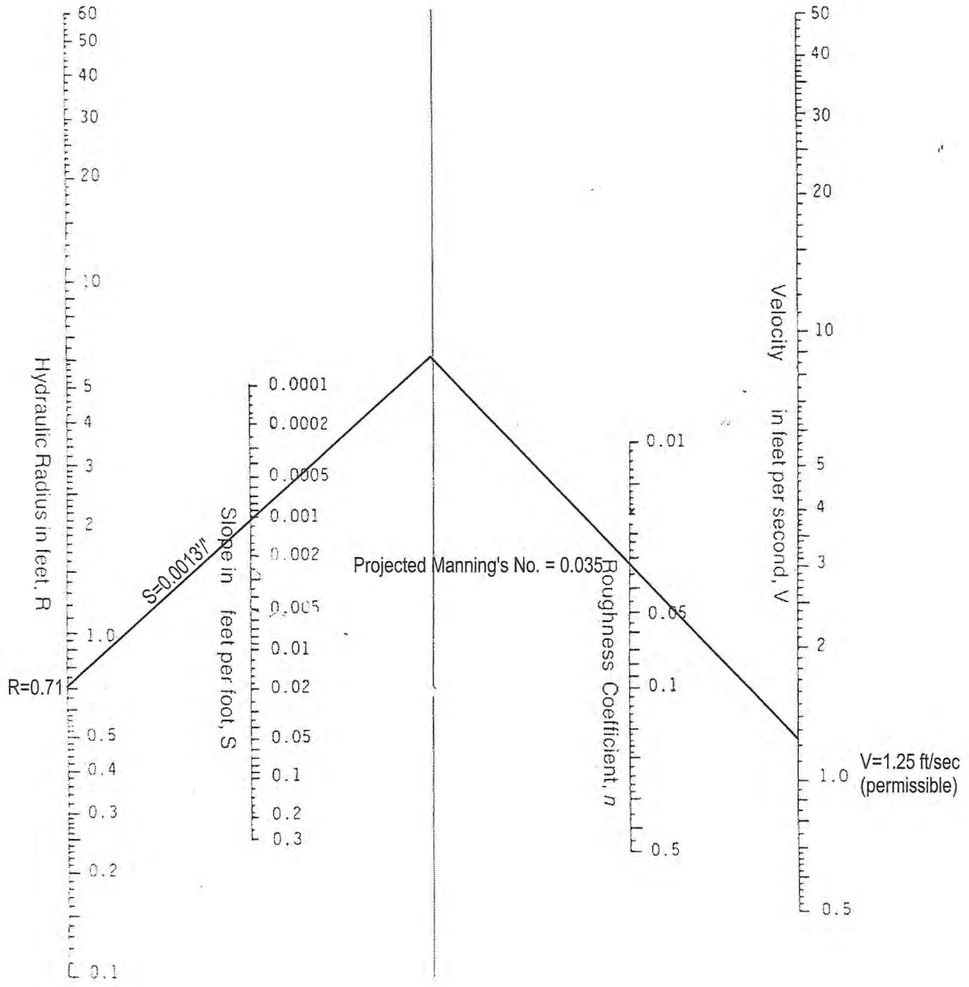


Figure 8.05a Nomograph for solution of Manning equation.

Velocity = 1.22 ft/sec < 1.25 ft/sec - ok

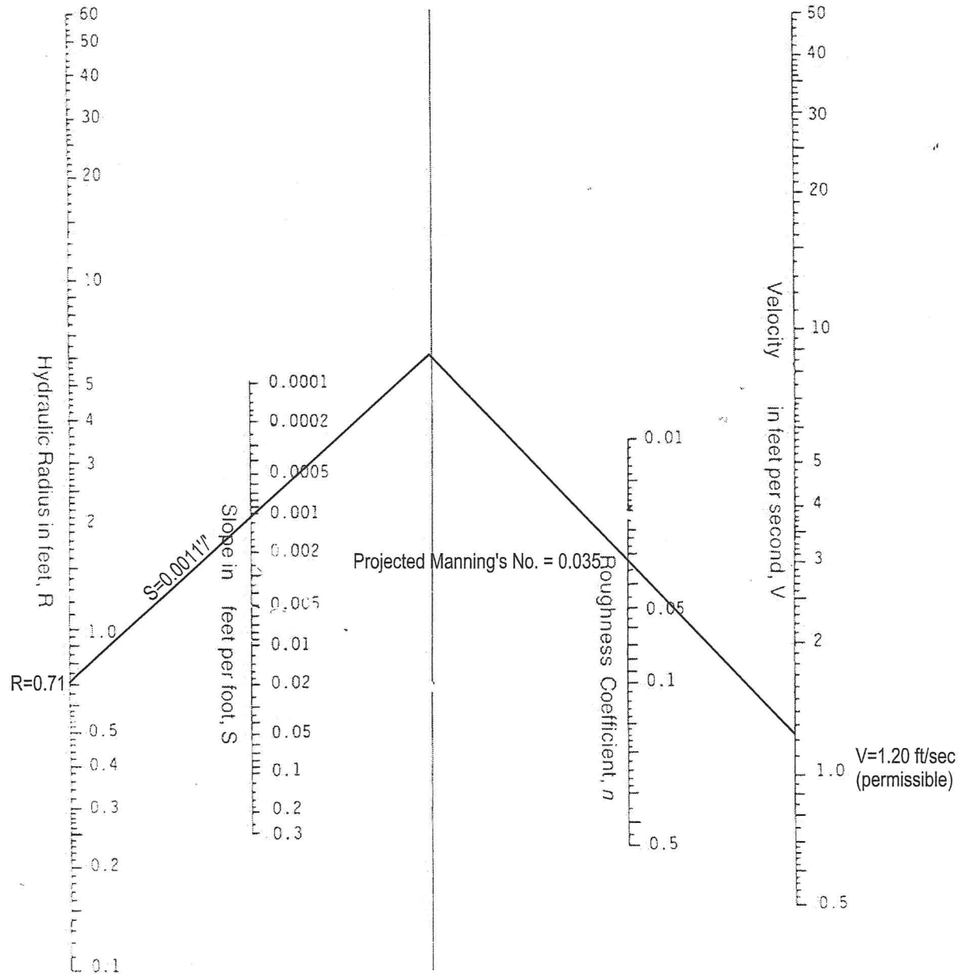


Figure 8.05a Nomograph for solution of Manning equation.

Velocity = 1.12 ft/sec < 1.20 ft/sec - ok

P432 - COROLLA BAY
RIGHT OF WAY GRASS SWALE (AREA #3)
V= 7.22 CFS OR 1.07 ft/sec (10 yr. storm event)

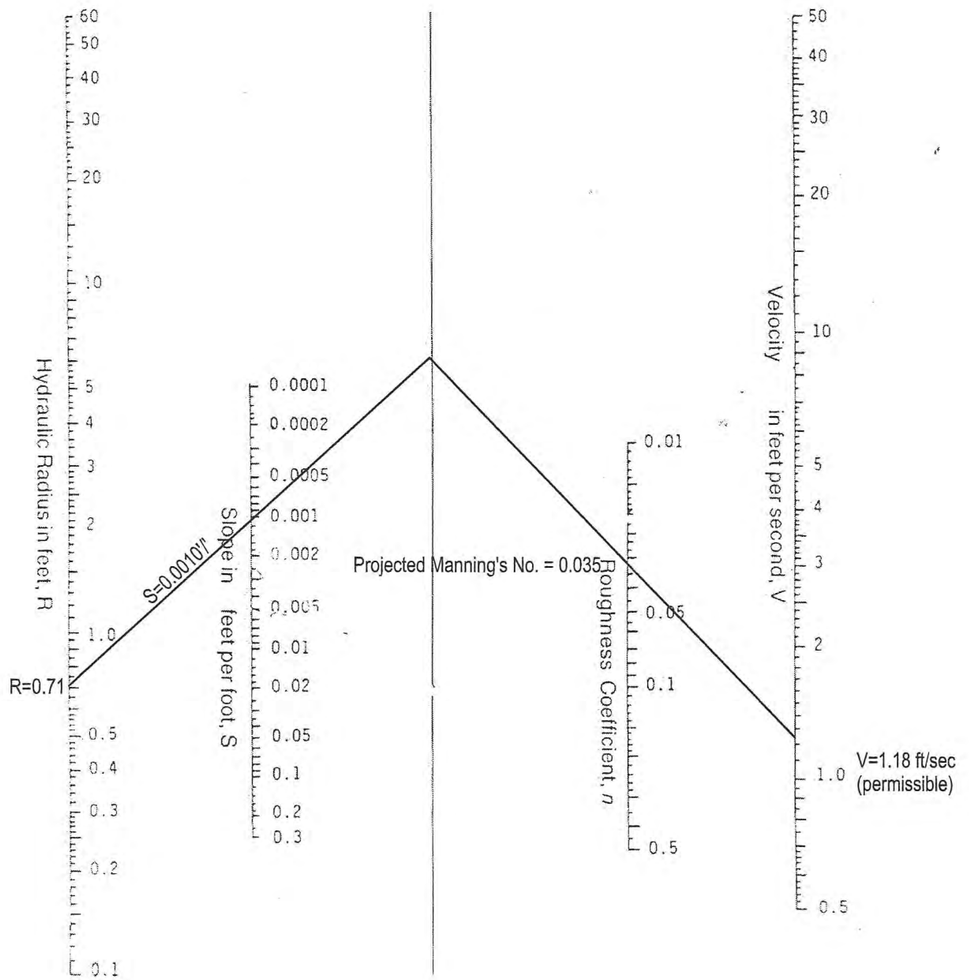


Figure 8.05a Nomograph for solution of Manning equation.

Velocity = 1.10 ft/sec < 1.18 ft/sec - ok

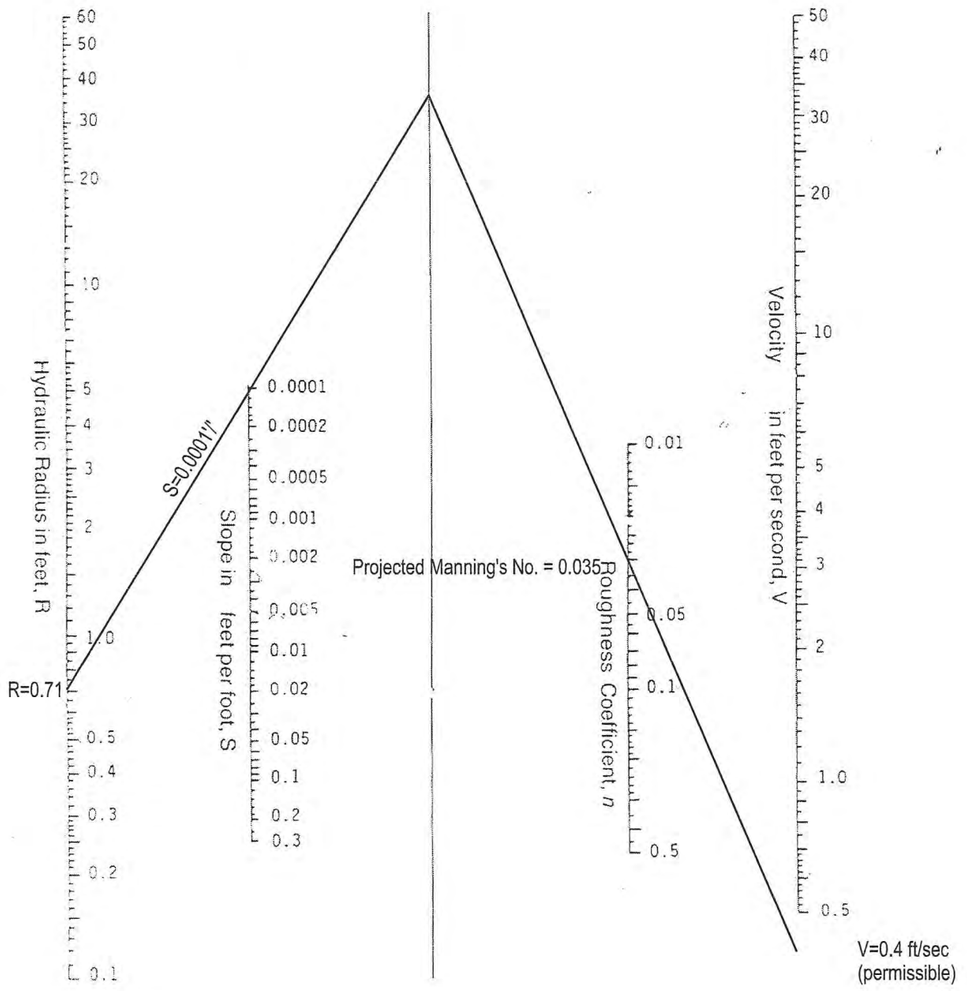


Figure 8.05a Nomograph for solution of Manning equation.

Velocity = 0.34 ft/sec < 0.4 ft/sec - ok

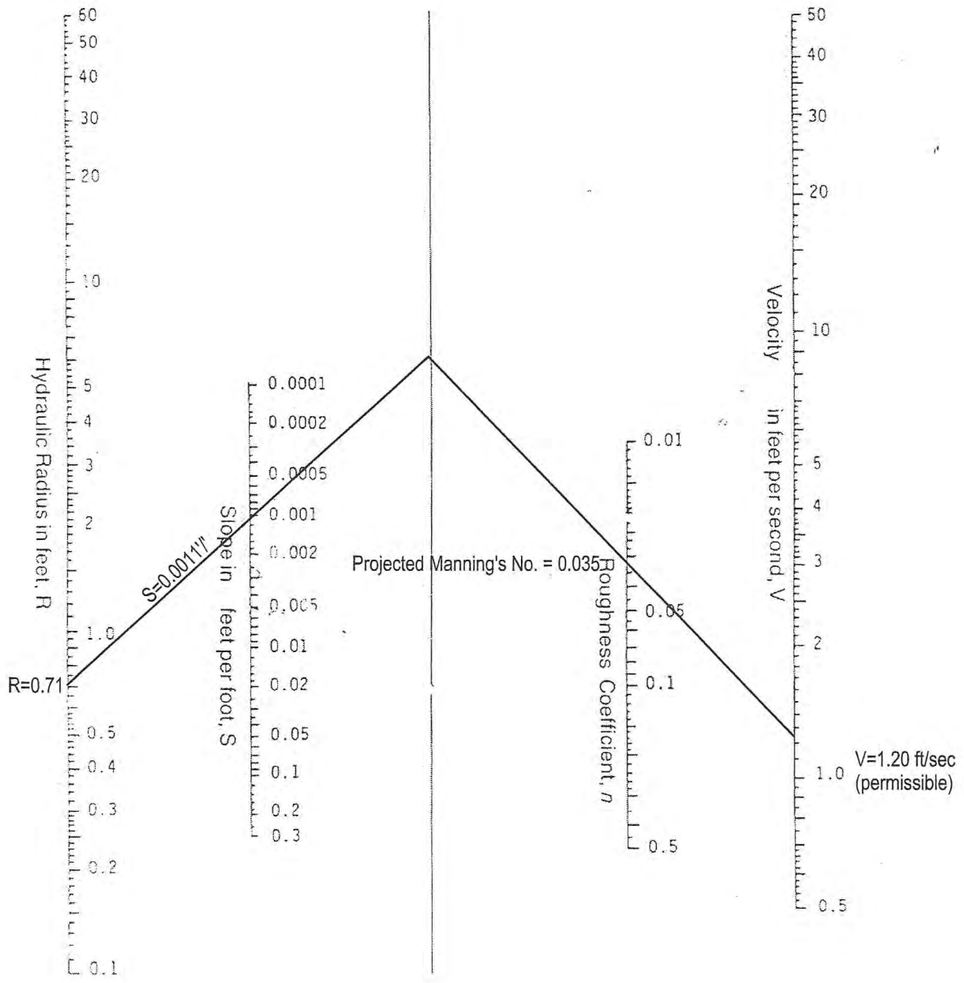


Figure 8.05a Nomograph for solution of Manning equation.

Velocity = 1.15 ft/sec < 1.20 ft/sec - ok

P432 - COROLLA BAY
RIGHT OF WAY GRASS SWALE (AREA #6)
V= 6.04 CFS OR 0.89 ft/sec (10 yr. storm event)

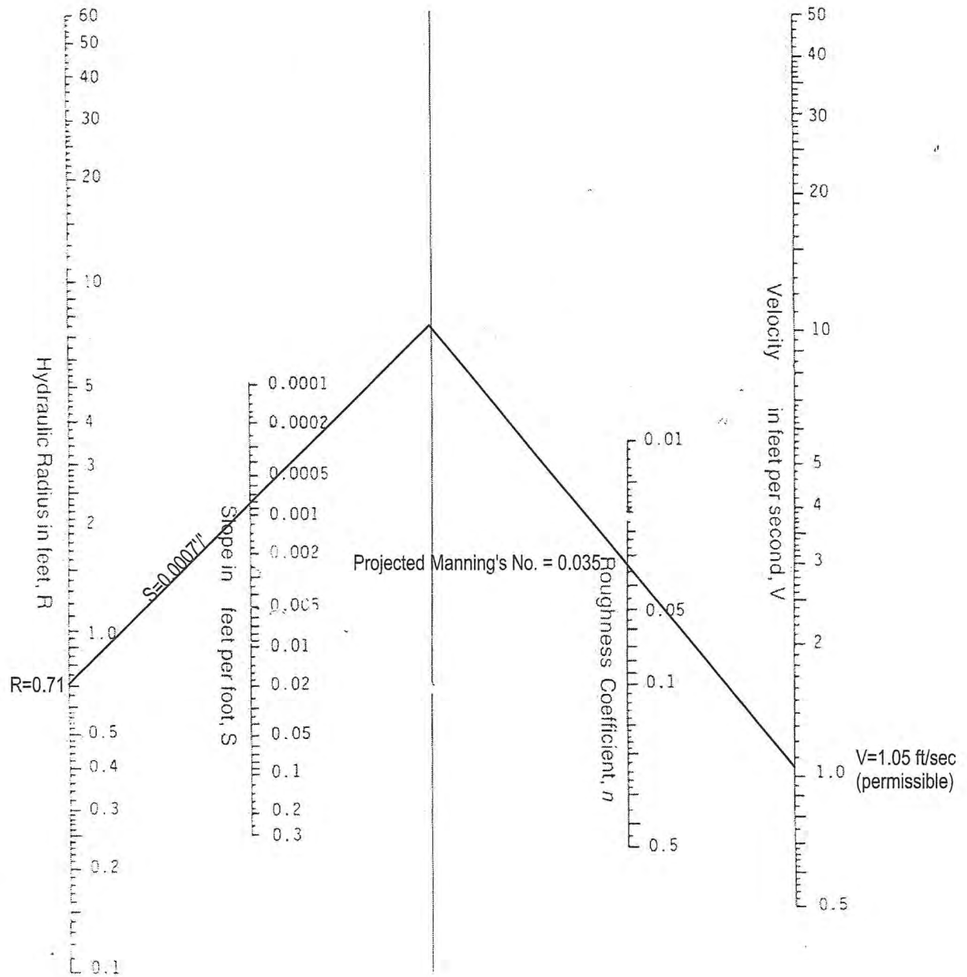


Figure 8.05a Nomograph for solution of Manning equation.

Velocity = 0.89 ft/sec < 1.05 ft/sec - ok

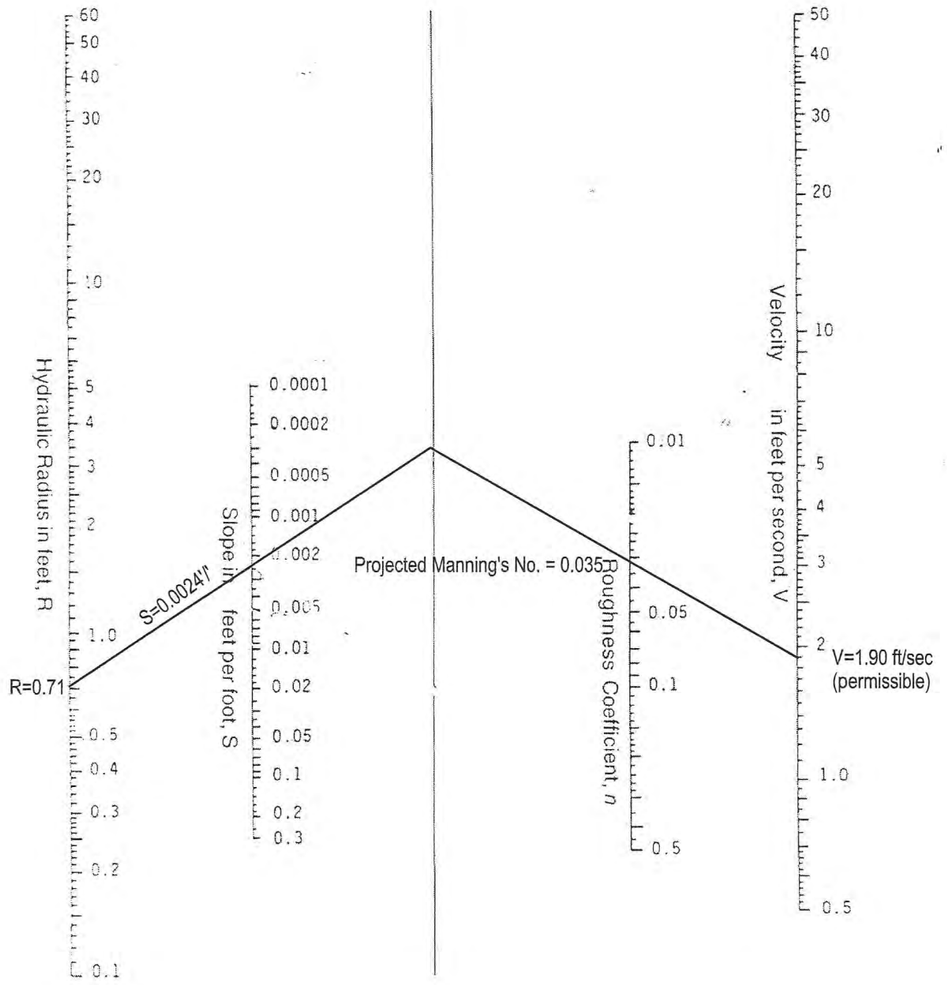


Figure 8.05a Nomograph for solution of Manning equation.

Velocity = 1.66 ft/sec < 1.90 ft/sec - ok

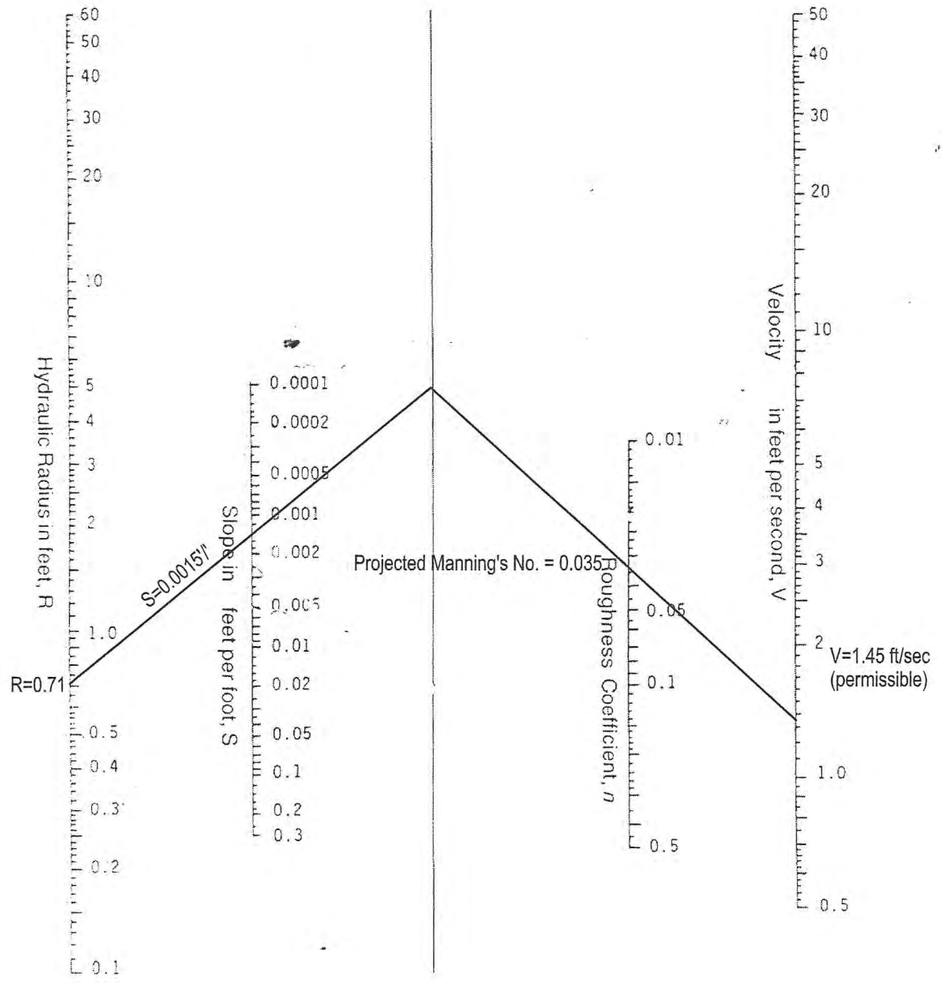


Figure 8.05a Nomograph for solution of Manning equation.

Velocity = 1.31 ft/sec < 1.45 ft/sec - ok

P432 - COROLLA BAY
RIGHT OF WAY GRASS SWALE (AREA #9)
V= 7.23 CFS OR 1.07 ft/sec (10 yr. storm event)

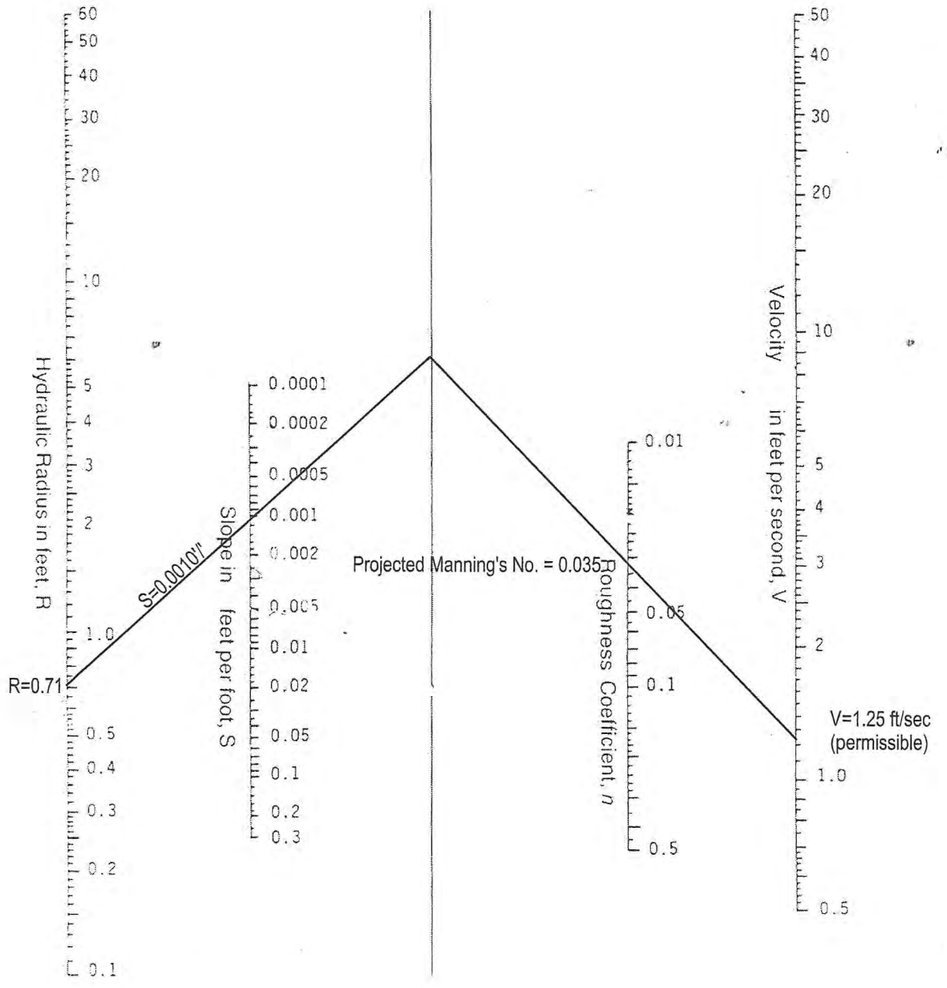


Figure 8.05a Nomograph for solution of Manning equation.

Velocity = 1.07 ft/sec < 1.25 ft/sec - ok

SOIL CHARACTERISTICS AND SOIL MAP

(Soil Survey of Dare County, North Carolina)

Prepared For

COROLLA BAY

(72 Lot Residential Development)

Located on

OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007

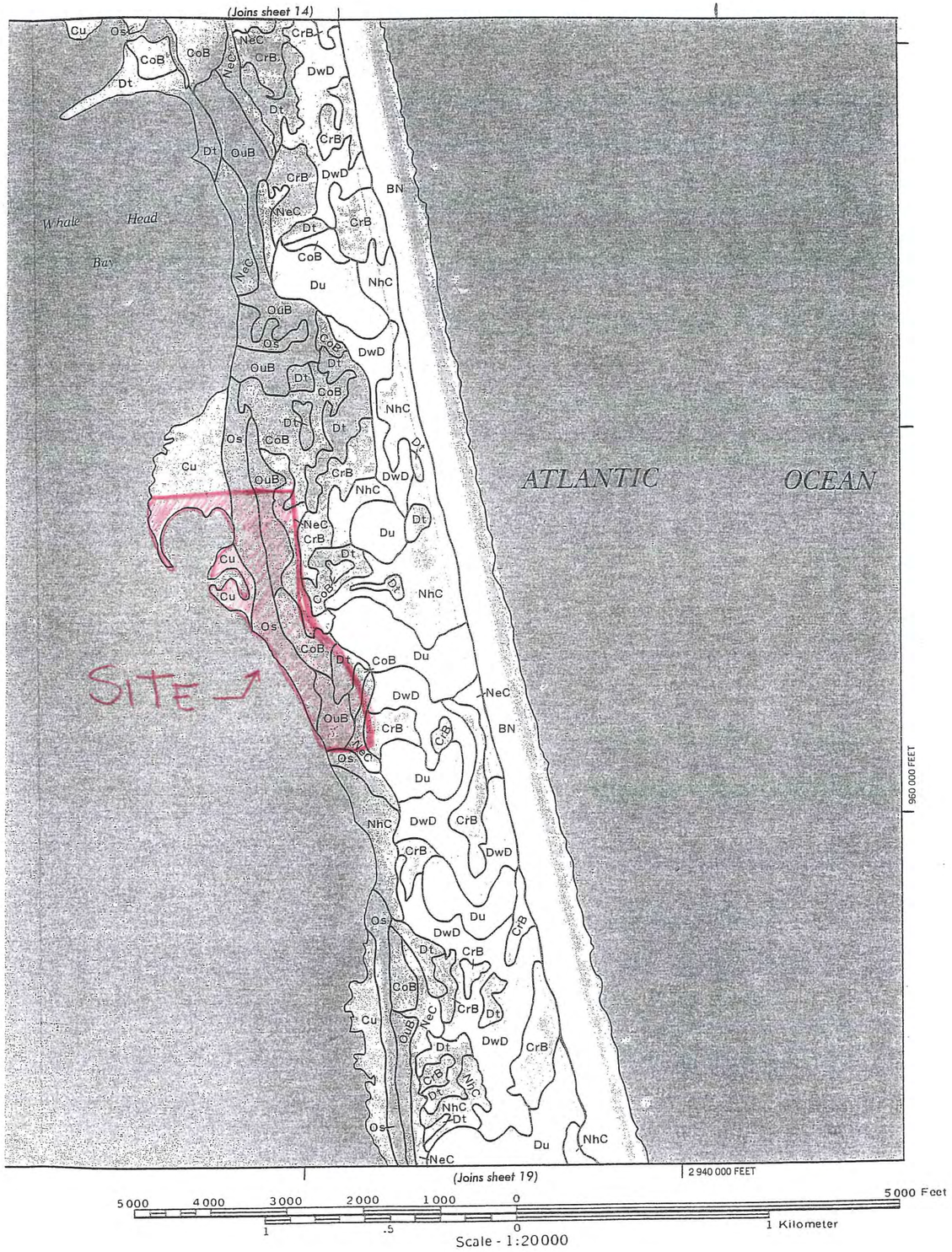

(Joins sheet 14)
Whale Head Bay
ATLANTIC OCEAN
SITE
960 000 FEET
2 940 000 FEET
(Joins sheet 19)
5000 4000 3000 2000 1000 0 5000 Feet
1 .5 0 1 Kilometer
Scale - 1:20000

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
						K	T	
	In	In/hr	In/in	pH				Pct
AaA---------- Altavista	0-15	2.0-6.0	0.12-0.20	4.5-6.0	Low----------	0.20	4	.5-3
	15-42	0.6-2.0	0.12-0.20	4.5-6.0	Low----------	0.24		
	42-80	---	---	4.5-6.0	Low----------	----		
At---------- Augusta	0-8	2.0-6.0	0.10-0.15	4.5-6.0	Low----------	0.15	4	.5-2
	8-48	0.6-2.0	0.12-0.18	4.5-6.0	Low----------	0.24		
	48-60	2.0-6.0	0.06-0.12	4.5-6.0	Low----------	0.24		
BN*: Beaches.								
Newhan----------	0-75	>20	<0.05	6.6-7.8	Low----------	0.10	5	---
BoA---------- Bojac	0-10	6.0-20	0.05-0.08	4.5-6.5	Low----------	0.28	3	.5-1
	10-34	2.0-6.0	0.08-0.17	4.5-6.5	Low----------	0.28		
	34-72	>6.0	0.02-0.08	4.5-6.0	Low----------	0.28		
Ca---------- Cape Fear	0-12	0.6-6.0	0.15-0.22	4.5-6.5	Low----------	0.15	5	5-15
	12-42	0.06-0.2	0.12-0.22	4.5-6.0	Moderate-------	0.32		
	42-60	6.0-20	0.02-0.06	4.5-6.0	Low----------	0.10		
Cb---------- Conaby	0-13	0.2-2.0	0.20-0.26	3.6-5.5	Low----------	----	---	20-60
	13-21	2.0-6.0	0.04-0.10	3.6-5.5	Low----------	0.10		
	21-33	2.0-6.0	0.10-0.14	3.6-5.5	Low----------	0.15		
	33-73	---	---	---	----------	----		
CnA---------- Conetoe	0-23	6.0-20	0.05-0.10	4.5-6.0	Low----------	0.15	5	.5-2
	23-43	2.0-6.0	0.10-0.15	4.5-6.0	Low----------	0.15		
	43-80	6.0-20	0.05-0.10	4.5-6.0	Low----------	0.10		
CoB---------- Corolla	0-72	>20	0.01-0.03	5.6-7.8	Low----------	0.10	5	<.5
CrB*: Corolla----------	0-72	>20	0.01-0.03	5.6-7.8	Low----------	0.10	5	<.5
Duckston--------	0-72	>20	0.02-0.05	5.6-8.4	Low----------	0.10	5	.5-1
Cu---------- Currituck	0-14	0.6-6.0	0.25-0.35	4.5-6.0	Low----------	----	---	20-60
	14-28	0.6-6.0	0.25-0.35	4.5-6.0	Low----------	----		
	28-60	6.0-20	0.04-0.09	3.6-6.0	Low----------	----		
Da---------- Dare	0-70	0.06-0.2	0.20-0.26	3.6-4.4	Low----------	----	---	20-95
	70-96	6.0-20	0.04-0.09	3.6-6.0	Low----------	0.15		
Do---------- Dorovan	0-10	0.6-2.0	0.25-0.50	3.6-4.4	----------	----	---	20-60
	10-84	0.6-2.0	0.25-0.50	3.6-4.4	----------	----		
	84-96	6.0-20	0.05-0.08	4.5-5.5	Low----------	----		
Ds---------- Dragston	0-8	>6.0	0.06-0.11	4.5-5.5	Low----------	0.17	4	.5-1
	8-42	2.0-6.0	0.08-0.16	4.5-5.5	Low----------	0.17		
	42-60	>6.0	0.04-0.08	4.5-5.5	Low----------	0.17		
Dt---------- Duckston	0-72	>20	0.02-0.05	5.6-8.4	Low----------	0.10	5	.5-1
Du*. Dune land								
DwD*: Dune land.								
Newhan----------	0-75	>20	<0.05	6.6-7.8	Low----------	0.10	5	---

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
						K	T	
	In	In/hr	In/in	pH				Pct
Mu----------	0-14	2.0-6.0	0.06-0.10	4.5-6.0	Low----------	0.20	4	.5-1
Munden	14-32	0.6-2.0	0.08-0.17	4.5-6.0	Low----------	0.17		
	32-60	>2.0	0.04-0.08	4.5-6.0	Low----------	0.17		
NeC----------	0-75	>20	<0.05	6.6-7.8	Low----------	0.10	5	---
Newhan								
NhC*:								
Newhan----------	0-75	>20	<0.05	6.6-7.8	Low----------	0.10	5	---
Corolla---------	0-72	>20	0.01-0.03	5.6-7.8	Low----------	0.10	5	<.5
No----------	0-9	2.0-6.0	0.06-0.10	3.6-5.5	Low----------	0.17	4	1-2
Nimmo	9-30	0.6-2.0	0.08-0.17	3.6-5.5	Low----------	0.17		
	30-60	>2.0	0.04-0.08	3.6-5.5	Low----------	0.17		
Os----------	0-5	6.0-20	0.03-0.10	4.5-6.0	Low----------	0.10	5	2-5
Osier	5-60	6.0-20	0.03-0.10	4.5-6.0	Low----------	0.10		
OuB----------	0-7	6.0-20	0.05-0.10	6.6-7.3	Low----------	0.15	5	<.5
Ousley	7-80	6.0-20	0.02-0.06	6.6-7.3	Low----------	0.15		
Pa----------	0-7	0.6-2.0	0.18-0.26	4.5-6.0	Low----------	0.43	5	2-5
Pasquotank	7-45	0.6-2.0	0.15-0.20	4.5-5.5	Low----------	0.43		
	45-60	2.0-6.0	0.05-0.10	4.5-5.5	Low----------	0.32		
Po----------	0-26	0.06-2.0	0.35-0.45	3.6-4.4	Low----------	----	---	25-60
Ponzer	26-60	0.06-2.0	0.10-0.24	3.6-6.5	Low----------	0.24		
Pt----------	0-16	0.6-6.0	0.12-0.18	3.6-5.5	Low----------	0.24	5	3-15
Portsmouth	16-32	0.6-2.0	0.14-0.20	3.6-5.5	Low----------	0.28		
	32-38	2.0-6.0	0.06-0.10	3.6-5.5	Low----------	0.17		
	38-80	6.0-20	0.02-0.05	3.6-6.0	Low----------	0.17		
Ro----------	0-8	0.6-2.0	0.14-0.20	4.5-5.5	Low----------	0.37	4	.5-3
Roanoke	8-45	0.06-0.2	0.10-0.19	4.5-5.5	Moderate-------	0.24		
	45-80	0.06-20	0.04-0.14	4.5-5.5	Moderate-------	0.24		
StA, StB----------	0-11	0.6-6.0	0.10-0.20	4.5-5.5	Low----------	0.28	4	<2
State	11-37	0.6-2.0	0.14-0.19	4.5-5.5	Low----------	0.28		
	37-65	>2.0	0.02-0.10	4.5-6.0	Low----------	0.17		
To----------	0-10	2.0-6.0	0.10-0.15	3.6-5.5	Low----------	0.20	5	1-6
Tomotley	10-50	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.20		
	50-60	0.2-2.0	0.12-0.18	3.6-6.0	Low----------	0.20		
Ud*.								
Udorthents								
Wa----------	0-7	0.6-2.0	0.10-0.15	4.5-6.0	Low----------	0.28	5	.5-5
Wahee	7-60	0.06-0.2	0.12-0.20	4.5-5.5	Moderate-------	0.28		
	60-99	0.2-0.6	0.12-0.20	4.5-5.5	Moderate-------	0.28		
WnB----------	0-3	6.0-20	0.05-0.08	5.6-7.3	Low----------	0.10	5	<1
Wando	3-99	6.0-20	0.03-0.07	5.6-7.3	Low----------	0.10		
Ws----------	0-12	0.2-0.6	0.20-0.25	3.6-5.5	----------	----	---	20-50
Wasda	12-40	0.6-2.0	0.12-0.18	4.5-5.5	Low----------	0.20		
	40-50	0.6-2.0	0.12-0.18	5.6-7.8	Low----------	0.24		
	50-60	6.0-20	0.02-0.06	5.6-7.8	Low----------	0.15		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," and "apparent" are explained in the text. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
AaA---- Altavista	C	None----	---	---	1.5-2.5	Apparent	Dec-Mar	Moderate	Moderate.
At---- Augusta	C	None----	---	---	1.0-2.0	Apparent	Jan-May	High----	Moderate.
BN*: Beaches.									
Newhan----	A	None----	---	---	>6.0	---	---	High----	Low.
BoA---- Bojac	B	None----	---	---	>4.0	Apparent	Sep-Jul	Low----	High.
Ca---- Cape Fear	D	Rare----	---	---	0-1.5	Apparent	Dec-Apr	High----	High.
Cb---- Conaby	B/D	Rare----	---	---	0-1.5	Apparent	Dec-May	High----	High.
CnA---- Conetoe	A	None----	---	---	>6.0	---	---	Low----	High.
CoB---- Corolla	D	Rare----	---	---	1.5-3.0	Apparent	Nov-May	Low----	Low.
CrB*: Corolla----	D	Rare----	---	---	1.5-3.0	Apparent	Nov-May	Low----	Low.
Duckston----	D	Frequent----	Brief----	Jan-Dec	1.0-2.0	Apparent	Jan-Dec	Low----	Low.
Cu---- Currituck	D	Frequent----	Long----	Jan-Dec	0-1.0	Apparent	Jan-Dec	High----	High.
Da---- Dare	D	Frequent----	Brief----	Nov-Apr	0-1.0	Apparent	Nov-May	High----	High.
Do---- Dorovan	D	Frequent----	Long----	Jan-Dec	0-0.5	Apparent	Jan-Dec	High----	High.
Ds---- Dragston	C	None----	---	---	1.0-2.5	Apparent	Nov-Apr	Low----	High.
Dt---- Duckston	D	Frequent----	Brief----	Jan-Dec	1.0-2.0	Apparent	Jan-Dec	Low----	Low.
Du*. Dune land									
DwD*: Dune land.									
Newhan----	A	None----	---	---	>6.0	---	---	High----	Low.
Mu---- Munden	B	None----	---	---	1.5-2.5	Apparent	Dec-Apr	Low----	High.
NeC---- Newhan	A	None----	---	---	>6.0	---	---	High----	Low.
NhC*: Newhan----	A	None----	---	---	>6.0	---	---	High----	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Uncoated steel	Concrete
					Ft				
NhC*: Corolla	D	Rare	---	---	1.5-3.0	Apparent	Nov-May	Low	Low.
No Nimmo	B/C	None	---	---	0-0.5	Apparent	Dec-Apr	Low	High.
Os Osier	D	Common	Brief	Jan-Dec	0-1.0	Apparent	Nov-Mar	High	High.
OuB Ousley	C	Common	Brief	Jan-Dec	1.5-3.0	Apparent	Dec-May	Low	High.
Pa Pasquotank	B/D	None	---	---	1.0-2.0	Apparent	Dec-Mar	High	Moderate.
Po Ponzer	D	Rare	---	---	0-1.0	Apparent	Dec-May	High	High.
Pt Portsmouth	D	Rare	---	---	0-1.0	Apparent	Dec-Apr	High	High.
Ro Roanoke	D	Frequent	Brief	Nov-Apr	0-1.0	Apparent	Nov-May	High	High.
StA, StB State	B	None	---	---	4.0-6.0	Apparent	Dec-Jun	Moderate	High.
To Tomotley	B/D	None	---	---	0-1.0	Apparent	Dec-Mar	High	High.
Ud*. Udorthents									
Wa Wahee	D	None	---	---	0.5-1.5	Apparent	Dec-Mar	High	High.
WnB Wando	A	None	---	---	>6.0	---	---	Low	Moderate.
Ws Wasda	B/D	Rare	---	---	0-1.0	Apparent	Dec-May	High	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

PRE-DEVELOPMENT STORMWATER CALCULATIONS

Prepared For

COROLLA BAY

(72 Lot Residential Development)

Located on

OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007

Subcatchment 1S: COROLLA BAY

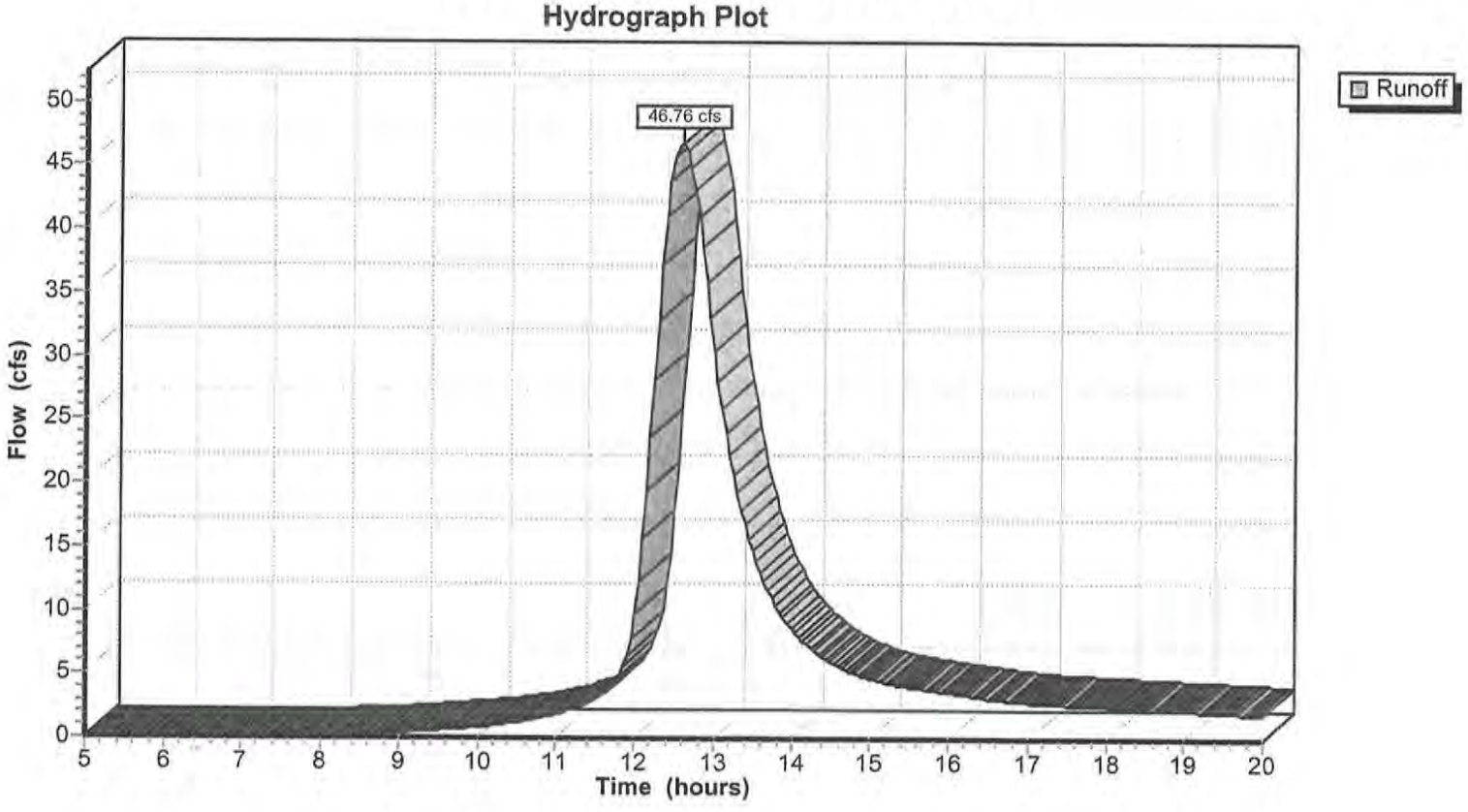
Runoff = 46.76 cfs @ 12.59 hrs, Volume= 6.422 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.20"

Area (sf)	CN	Description
1,498,585	83	Woods, Poor, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.4	125	0.0800	0.1		**Sheet Flow, through wood and brush** Woods: Dense underbrush n= 0.800 P2= 4.20"
13.4	160	0.0063	0.2		**Shallow Concentrated Flow, through woods and brush** Forest w/Heavy Litter Kv= 2.5 fps
14.9	293	0.0171	0.3		**Shallow Concentrated Flow, through woods and brush** Forest w/Heavy Litter Kv= 2.5 fps
6.5	98	0.0102	0.3		**Shallow Concentrated Flow, through tall weeds and gras** Forest w/Heavy Litter Kv= 2.5 fps
57.2	676	Total			

Subcatchment 1S: COROLLA BAY



Subcatchment 1S: COROLLA BAY

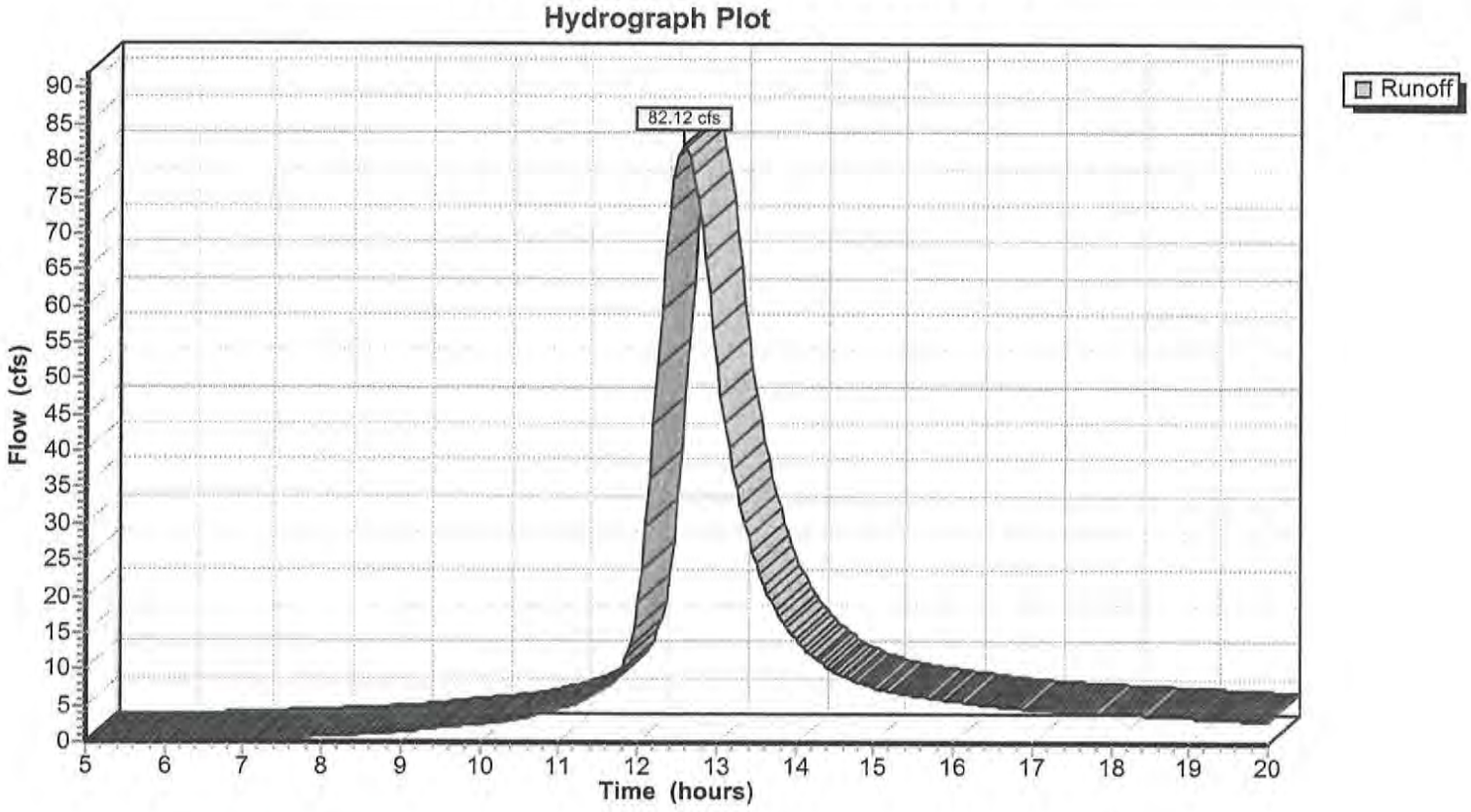
Runoff = 82.12 cfs @ 12.57 hrs, Volume= 11.392 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=6.25"

Area (sf)	CN	Description
1,498,585	83	Woods, Poor, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.4	125	0.0800	0.1		**Sheet Flow, through wood and brush** Woods: Dense underbrush n= 0.800 P2= 4.20"
13.4	160	0.0063	0.2		**Shallow Concentrated Flow, through woods and brush** Forest w/Heavy Litter Kv= 2.5 fps
14.9	293	0.0171	0.3		**Shallow Concentrated Flow, through woods and brush** Forest w/Heavy Litter Kv= 2.5 fps
6.5	98	0.0102	0.3		**Shallow Concentrated Flow, through tall weeds and gras** Forest w/Heavy Litter Kv= 2.5 fps
57.2	676	Total			

Subcatchment 1S: COROLLA BAY



Subcatchment 1S: COROLLA BAY

Runoff = 100.46 cfs @ 12.57 hrs, Volume= 14.035 af

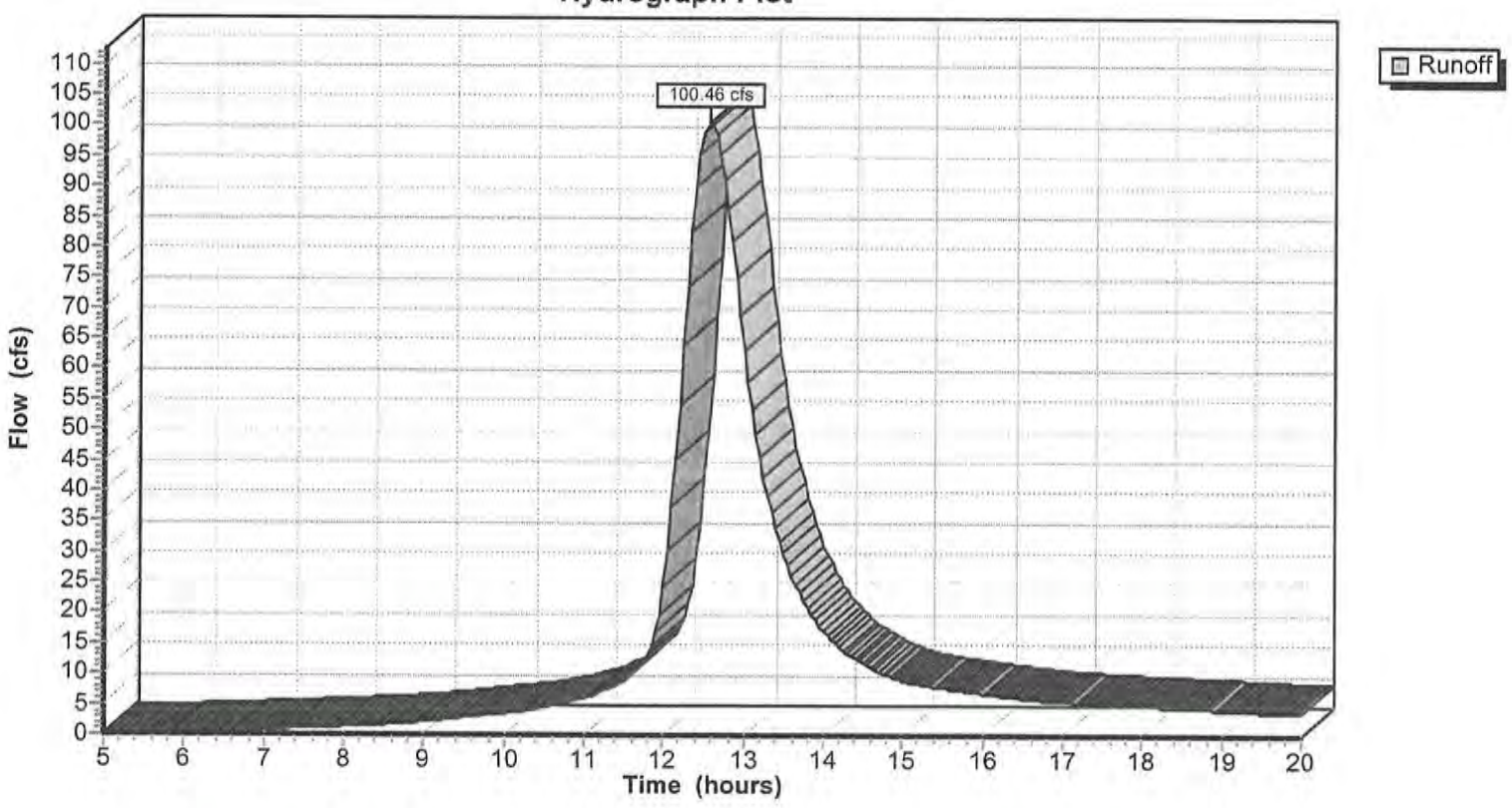
Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=7.30"

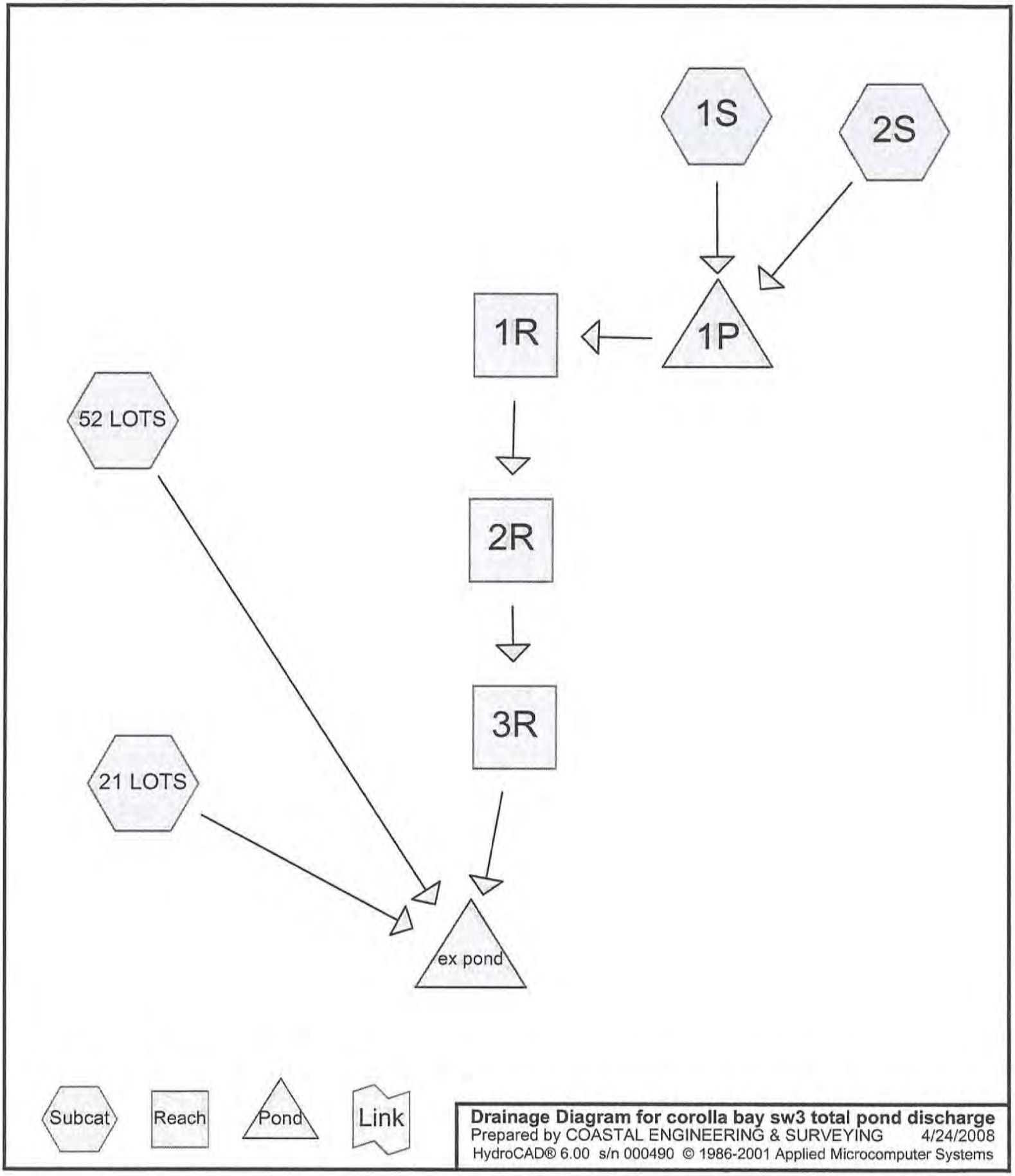
Area (sf)	CN	Description
1,498,585	83	Woods, Poor, HSG D

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.4	125	0.0800	0.1		**Sheet Flow, through wood and brush** Woods: Dense underbrush n= 0.800 P2= 4.20"
13.4	160	0.0063	0.2		**Shallow Concentrated Flow, through woods and brush** Forest w/Heavy Litter Kv= 2.5 fps
14.9	293	0.0171	0.3		**Shallow Concentrated Flow, through woods and brush** Forest w/Heavy Litter Kv= 2.5 fps
6.5	98	0.0102	0.3		**Shallow Concentrated Flow, through tall weeds and gras** Forest w/Heavy Litter Kv= 2.5 fps
57.2	676	Total			

Subcatchment 1S: COROLLA BAY

Hydrograph Plot




1S
2S
1P
1R
2R
3R
52 LOTS
21 LOTS
ex pond
Subcat
Reach
Pond
Link
Drainage Diagram for corolla bay sw3 total pond discharge
Prepared by COASTAL ENGINEERING & SURVEYING 4/24/2008
HydroCAD® 6.00 s/n 000490 © 1986-2001 Applied Microcomputer Systems

QUALITY MANAGEMENT STORMWATER CALCULATIONS
(1.0" Across Site)

Prepared For

COROLLA BAY
(72 Lot Residential Development)

Located on

OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007
Revised: 4/28/08

Subcatchment 1S: 57 PATIO HOMES - INTERIOR

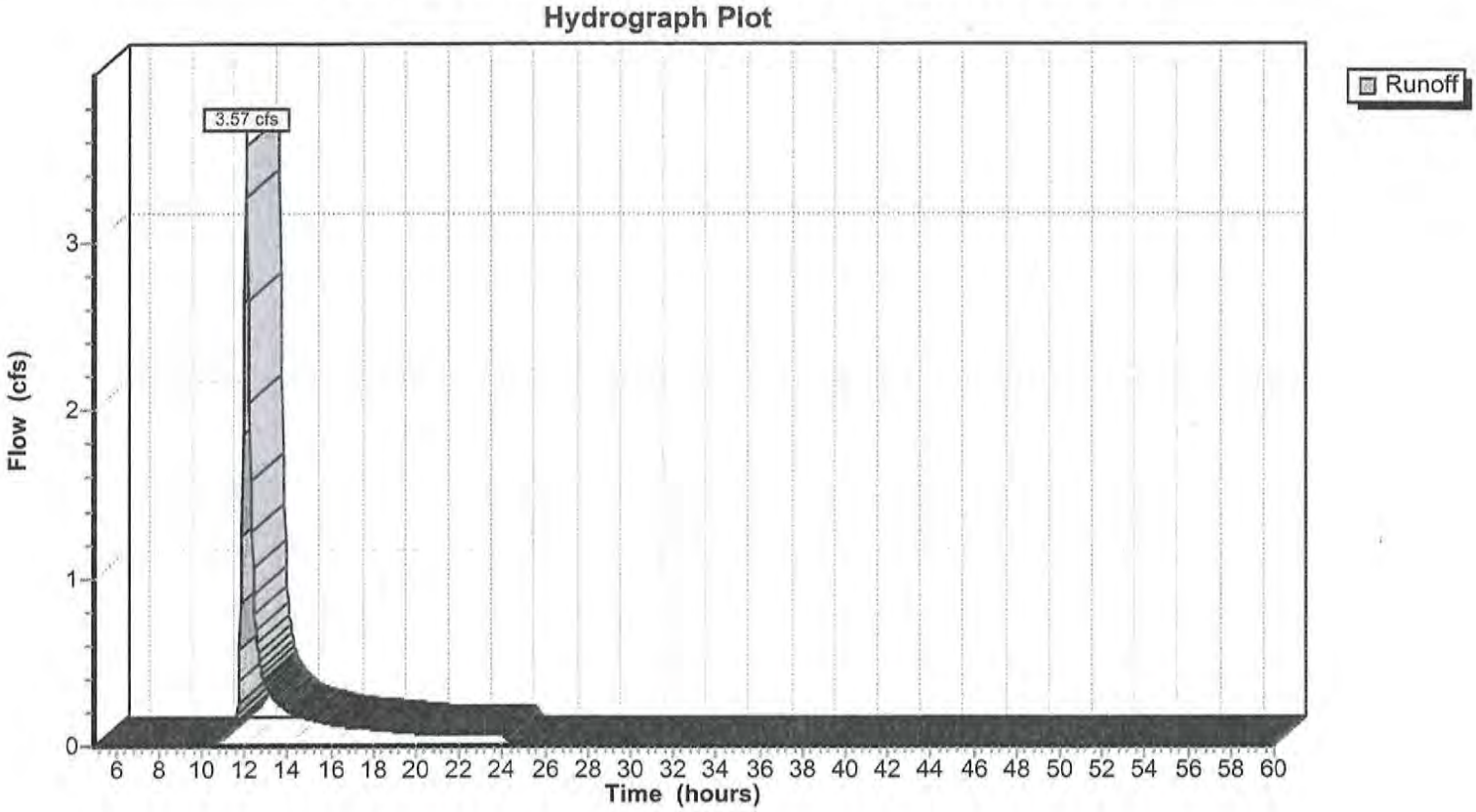
Runoff = 3.57 cfs @ 12.10 hrs, Volume= 0.246 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=1.00"

Area (sf)	CN	Description
55,825	98	ROOF TOPS
46,341	98	SIDE YARD PATIO AREA
26,310	98	DRIVEWAYS
7,361	98	INNER SIDEWALK AREA
55,920	98	ROADWAY & SIDEWALKS
16,272	98	REC. BLDG & POOL AREA
34,099	98	HERRING STREET AREA
77,856	74	>75% Grass cover, Good, HSG C
319,984	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	85	0.0141	0.2		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
8.1	1,163	0.0028	2.4	1.89	**Circular Channel (pipe), THRU STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
16.6	1,248	Total			

Subcatchment 1S: 57 PATIO HOMES - INTERIOR



Subcatchment 2S: 57 PATIO HOMES - EXTERIOR

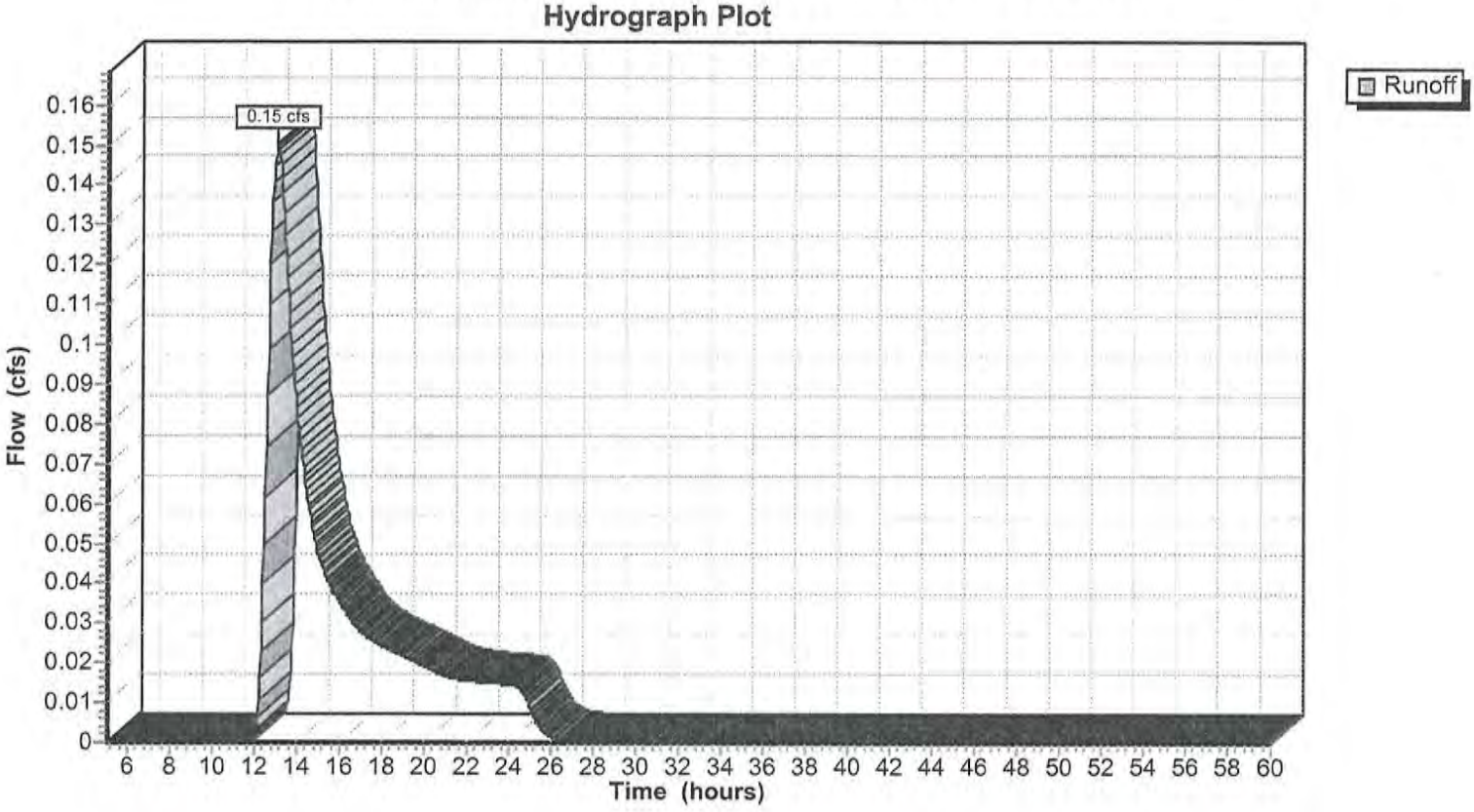
Runoff = 0.15 cfs @ 13.02 hrs, Volume= 0.039 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=1.00"

Area (sf)	CN	Description
26,825	98	ROOF TOPS
23,041	98	SIDEYARD PATIO AREAS
754	98	BATH HSE
1,372	98	SIDEWALK AREA
66,797	74	>75% Grass cover, Good, HSG C
118,789	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	40	0.0800	0.3		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
34.9	732	0.0025	0.4		**Shallow Concentrated Flow, THRU SWALE** Short Grass Pasture Kv= 7.0 fps
39.9	530	0.0010	0.2		**Shallow Concentrated Flow, THRU R/W SWALE** Short Grass Pasture Kv= 7.0 fps
2.4	342	0.0028	2.4	1.89	**Circular Channel (pipe), THUR STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
79.5	1,644	Total			

Subcatchment 2S: 57 PATIO HOMES - EXTERIOR



Subcatchment 21 LOTS: south end lots and r/w

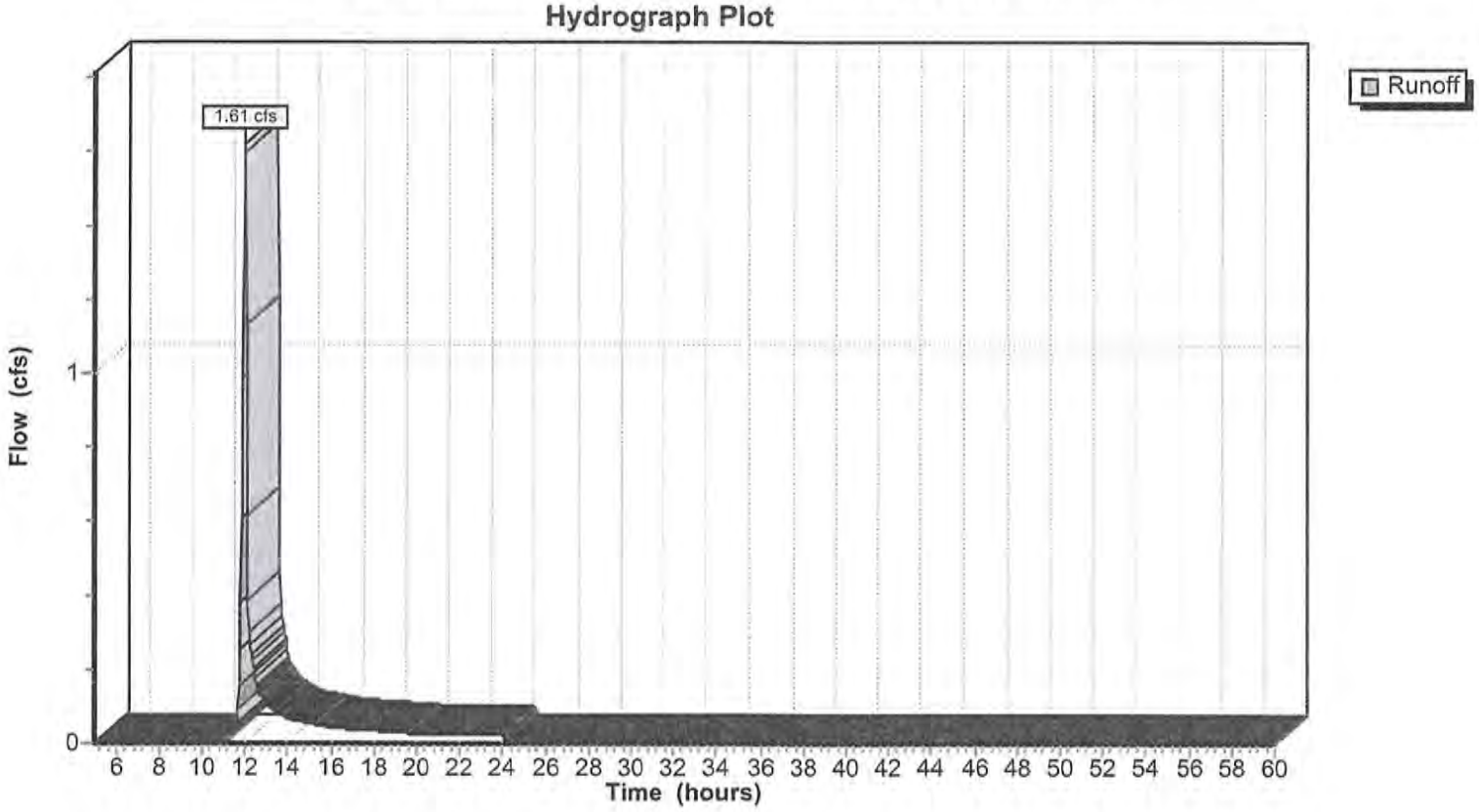
Runoff = 1.61 cfs @ 11.99 hrs, Volume= 0.079 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=1.00"

Area (sf)	CN	Description
29,949	98	conc. sidewalk and pavement
82,278	98	residential lot coverages
17,100	39	>75% Grass cover, Good, HSG A
129,327	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.0208	2.9		**Shallow Concentrated Flow, SHEET FLOW FROM ROADV** Paved Kv= 20.3 fps
6.1	576	0.0015	1.6	14.15	**Parabolic Channel, grass swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.3	78	0.0050	4.2	7.43	**Circular Channel (pipe), 18" rcp culvert** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
6.5	669	Total			

Subcatchment 21 LOTS: south end lots and r/w



Subcatchment 52 LOTS: north end lots & r.w. areas

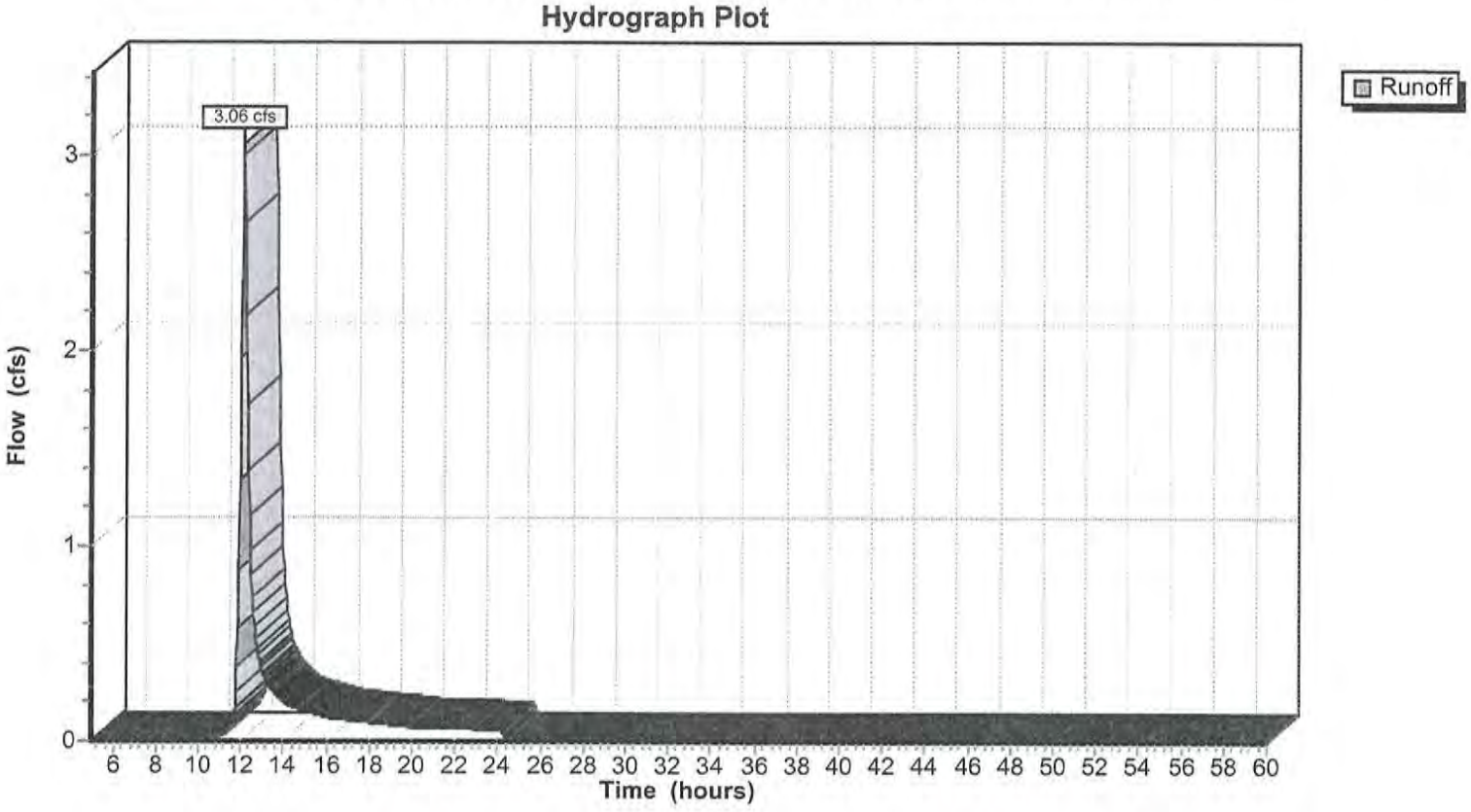
Runoff = 3.06 cfs @ 12.12 hrs, Volume= 0.230 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=1.00"

Area (sf)	CN	Description
84,636	98	conc. sidewalk & pavement
212,240	98	residential lot coverage
37,305	39	>75% Grass cover, Good, HSG A
334,181	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	48	0.0208	1.3		**Sheet Flow, over north cul-de-sac** Smooth surfaces n= 0.011 P2= 4.00"
8.9	871	0.0016	1.6	14.61	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.4	60	0.0016	2.4	4.20	**Circular Channel (pipe), 18 hdpe culvert under devils bay** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
7.8	600	0.0010	1.3	11.55	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.7	137	0.0023	3.5	10.85	**Circular Channel (pipe), 24" hdpe pipe from r/w to jb b-5** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.4	80	0.0010	3.0	21.09	**Circular Channel (pipe), 36" hdpe pipe from jb b-5 to fes** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
18.8	1,796	Total			

Subcatchment 52 LOTS: north end lots & r.w. areas



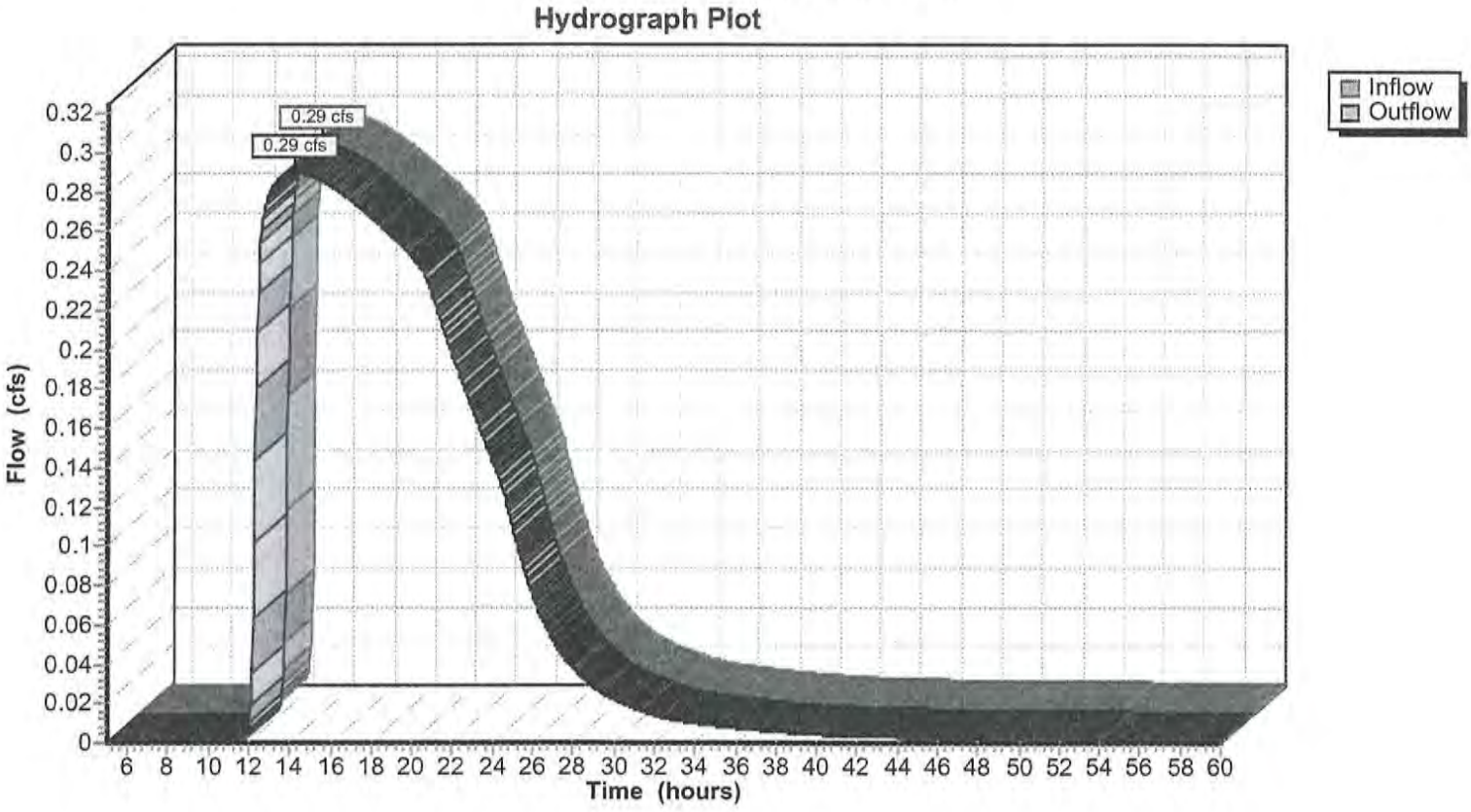
Reach 1R: 36" storm drain

Inflow = 0.29 cfs @ 14.00 hrs, Volume= 0.284 af
Outflow = 0.29 cfs @ 14.23 hrs, Volume= 0.284 af, Atten= 0%, Lag= 14.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.4 fps, Min. Travel Time= 8.3 min
Avg. Velocity = 0.2 fps, Avg. Travel Time= 17.6 min

Peak Depth= 0.51'
Capacity at bank full= 4.57 cfs
Inlet Invert= 5.18', Outlet Invert= 5.16'
36.0" Diameter Pipe n= 0.020 Length= 180.0' Slope= 0.0001 '/'

Reach 1R: 36" storm drain



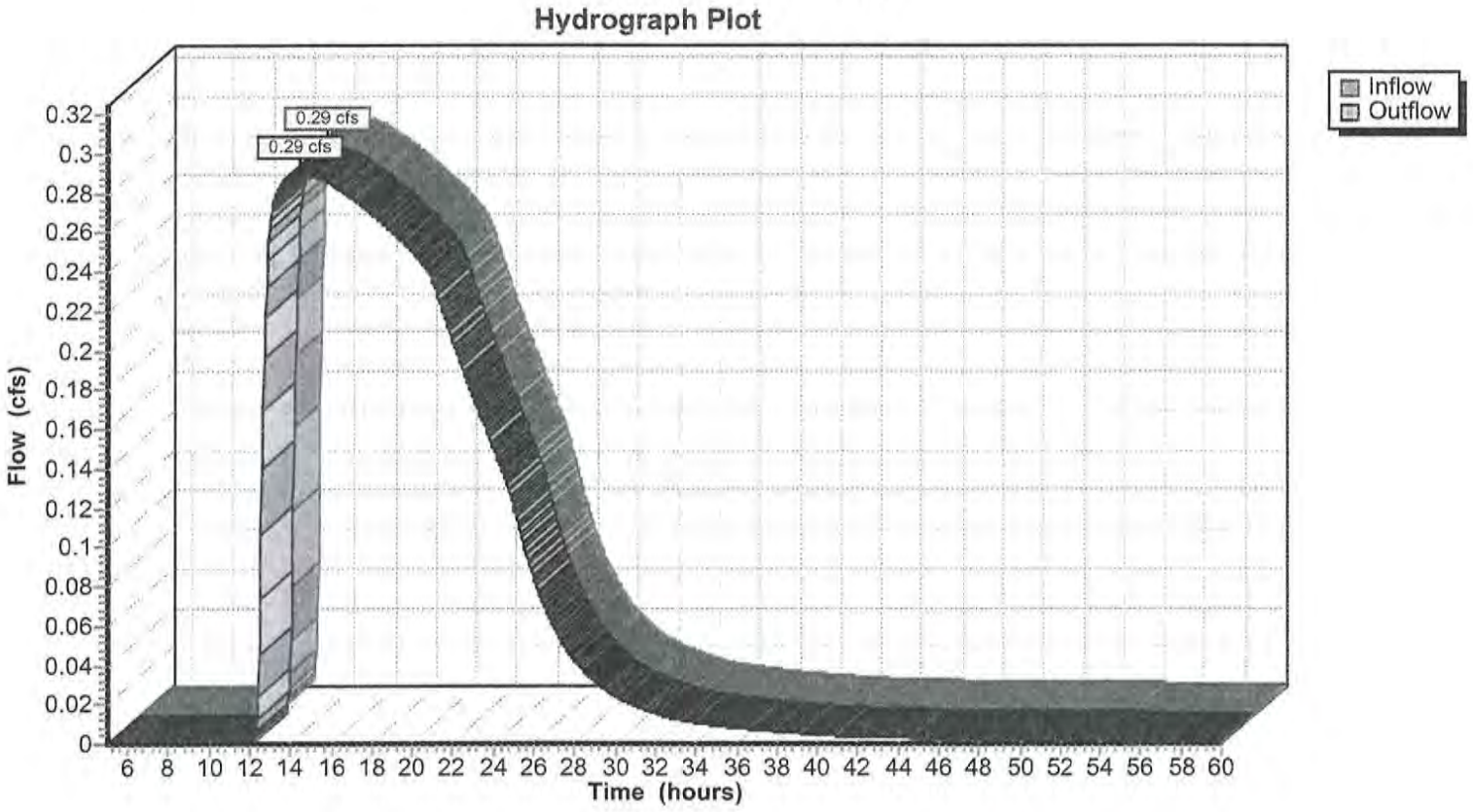
Reach 2R: 36" cmp

Inflow = 0.29 cfs @ 14.23 hrs, Volume= 0.284 af
Outflow = 0.29 cfs @ 14.50 hrs, Volume= 0.284 af, Atten= 0%, Lag= 15.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.8 fps, Min. Travel Time= 9.3 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 19.4 min

Peak Depth= 0.30'
Capacity at bank full= 13.42 cfs
Inlet Invert= 5.16', Outlet Invert= 4.75'
36.0" Diameter Pipe n= 0.020 Length= 428.0' Slope= 0.0010 '/'

Reach 2R: 36" cmp



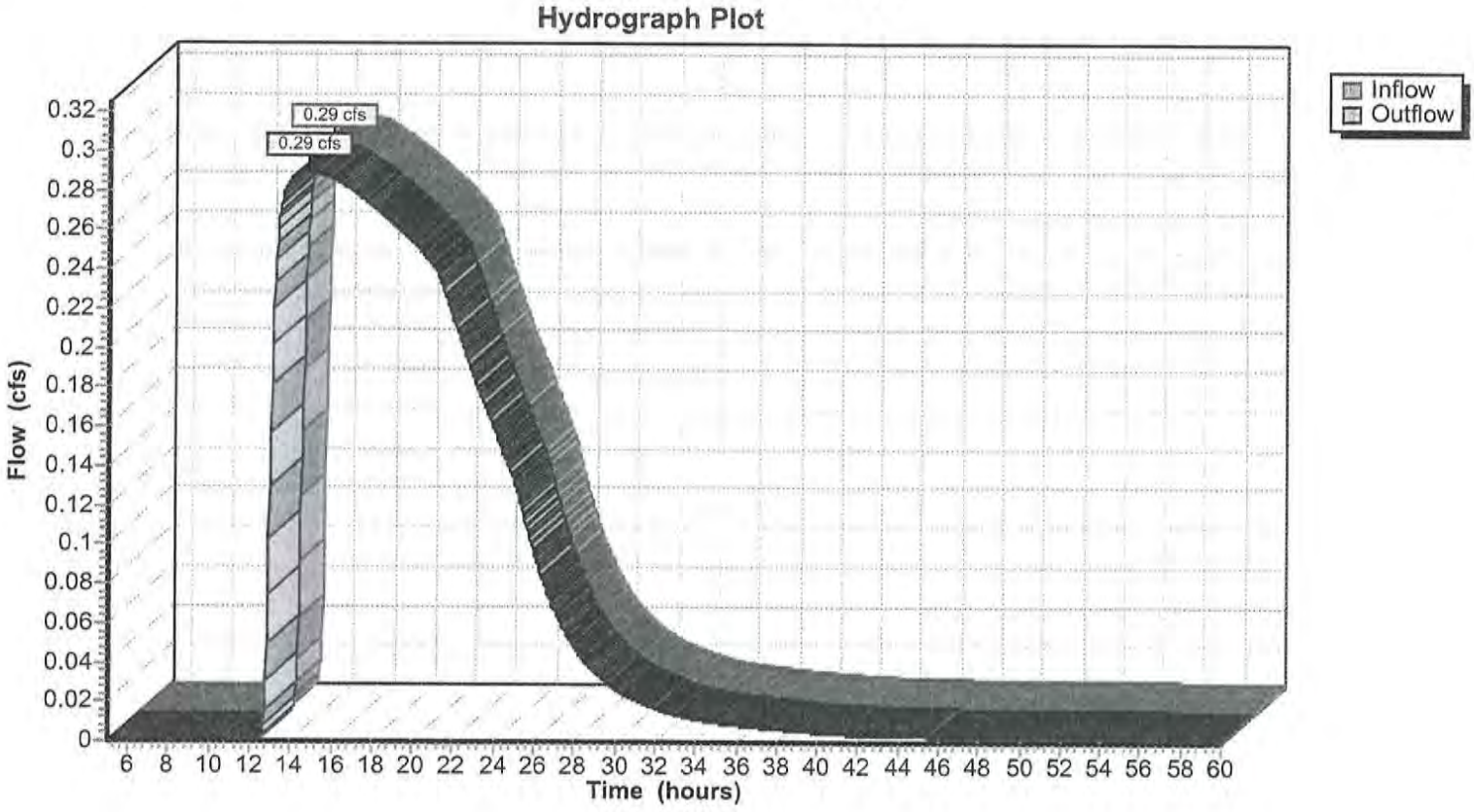
Reach 3R: 36" hdpe

Inflow = 0.29 cfs @ 14.50 hrs, Volume= 0.284 af
Outflow = 0.29 cfs @ 14.82 hrs, Volume= 0.284 af, Atten= 0%, Lag= 19.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.1 fps, Min. Travel Time= 11.0 min
Avg. Velocity = 0.6 fps, Avg. Travel Time= 22.3 min

Peak Depth= 0.24'
Capacity at bank full= 22.97 cfs
Inlet Invert= 4.75', Outlet Invert= 4.00'
36.0" Diameter Pipe n= 0.012 Length= 742.0' Slope= 0.0010 '/'

Reach 3R: 36" hdpe



Pond 1P: POND

Inflow	=	3.57 cfs @	12.10 hrs,	Volume=	0.286 af
Outflow	=	0.29 cfs @	14.00 hrs,	Volume=	0.284 af, Atten= 92%, Lag= 113.9 min
Primary	=	0.29 cfs @	14.00 hrs,	Volume=	0.284 af

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

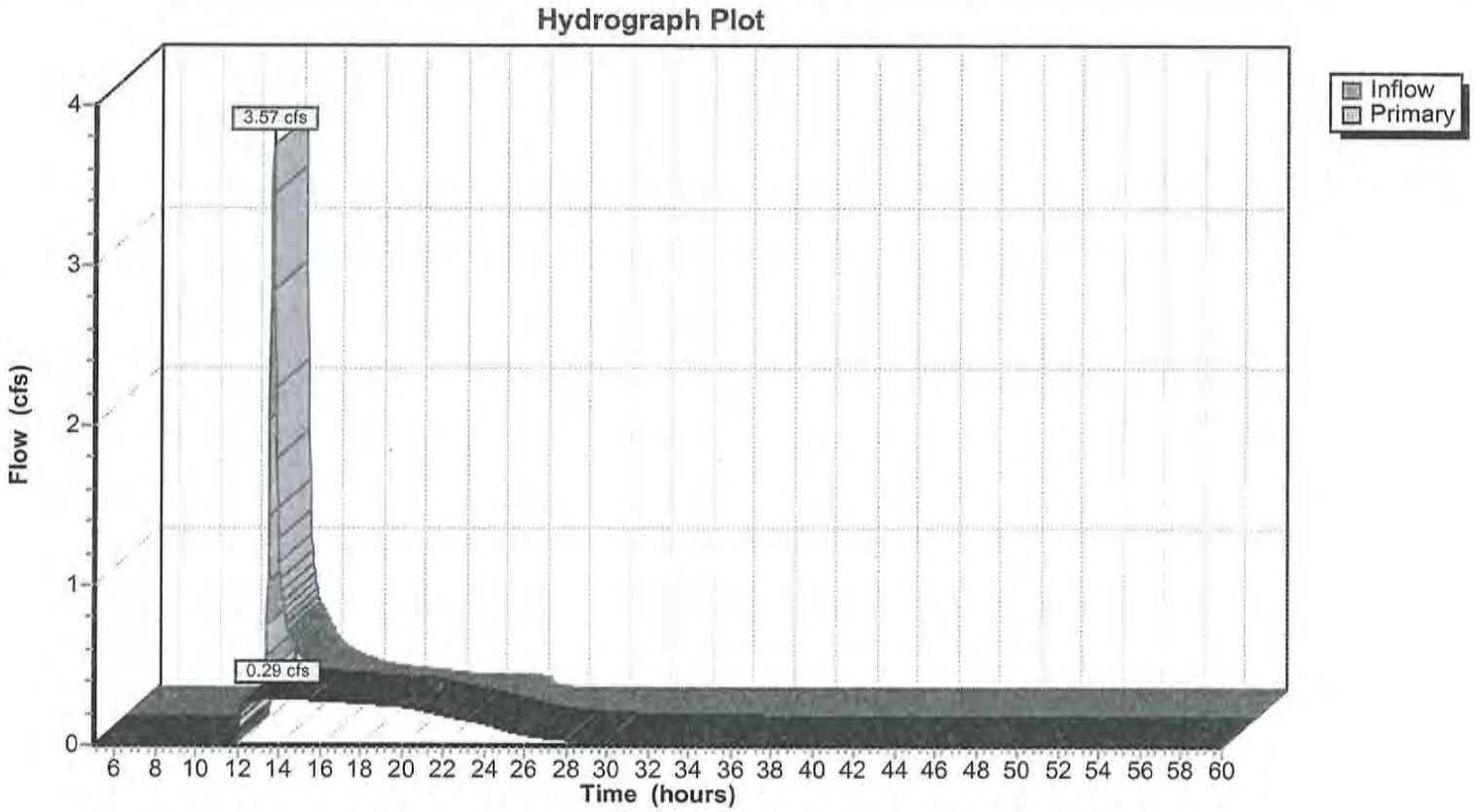
Peak Elev= 9.14' Storage= 5,848 cf
Plug-Flow detention time= 280.1 min calculated for 0.284 af (99% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
8.50	0	0.0	0	0	0
9.00	18,756	643.0	3,126	3,126	32,902
9.25	19,240	648.0	4,749	7,875	33,440
10.00	20,715	662.0	14,980	22,855	34,980
10.05	20,715	662.0	1,036	23,891	35,013
10.50	20,715	662.0	9,322	33,213	35,311
11.00	20,715	662.0	10,358	43,570	35,642
11.50	20,715	662.0	10,358	53,928	35,973
12.00	22,730	681.0	10,857	64,785	38,031

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
- 3=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	8.50'	**18.0" x 396.0' long Culvert** Ke= 0.500 Outlet Invert= 6.50' S= 0.0051 '/' n= 0.013 Cc= 0.900
2	Device 1	8.50'	**4.0" Vert. Orifice/Grate** C= 0.600
3	Primary	10.50'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond 1P: POND


Hydrograph Plot
Inflow
Primary
3.57 cfs
0.29 cfs
Flow (cfs)
0
1
2
3
4
6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60
Time (hours)

Pond ex pond: existing pond

Inflow	=	3.74 cfs @	12.06 hrs, Volume=	0.593 af	
Outflow	=	0.32 cfs @	21.49 hrs, Volume=	0.580 af,	Atten= 91%, Lag= 565.9 min
Primary	=	0.32 cfs @	21.49 hrs, Volume=	0.580 af	

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

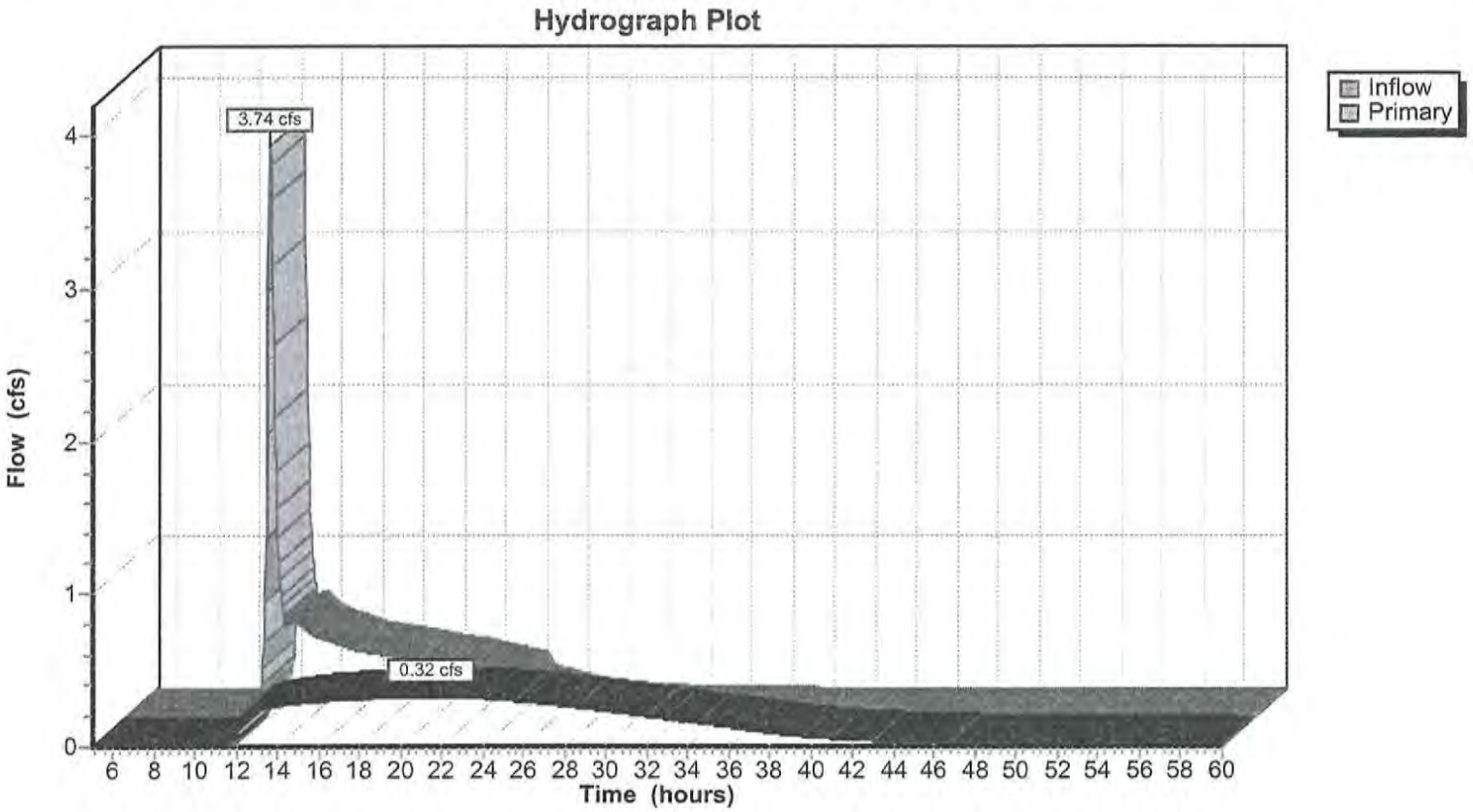
Peak Elev= 4.81' Storage= 11,114 cf
Plug-Flow detention time= 508.2 min calculated for 0.580 af (98% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
4.00	0	0.0	0	0	0
5.00	41,303	1,015.0	13,768	13,768	81,984
6.00	84,410	2,341.0	61,586	75,354	436,112
7.00	130,086	1,977.0	106,428	181,782	561,207

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
  - 3=Orifice/Grate
- 4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	4.00'	**18.0" x 300.0' long Culvert X 2.00** Ke= 0.500
			Outlet Invert= 3.24' S= 0.0025 '/' n= 0.012 Cc= 0.900
2	Device 1	4.00'	**2.7" Vert. Orifice/Grate X 2.00** C= 0.600
3	Device 1	4.85'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600
4	Primary	5.75'	**60.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ex pond: existing pond



POST-DEVELOPMENT STORMWATER CALCULATIONS
(1 YEAR STORM EVENT)

Prepared For

COROLLA BAY

(72 Lot Residential Development)

Located on

OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007
Revised: 4/28/08

Subcatchment 1S: 57 PATIO HOMES - INTERIOR

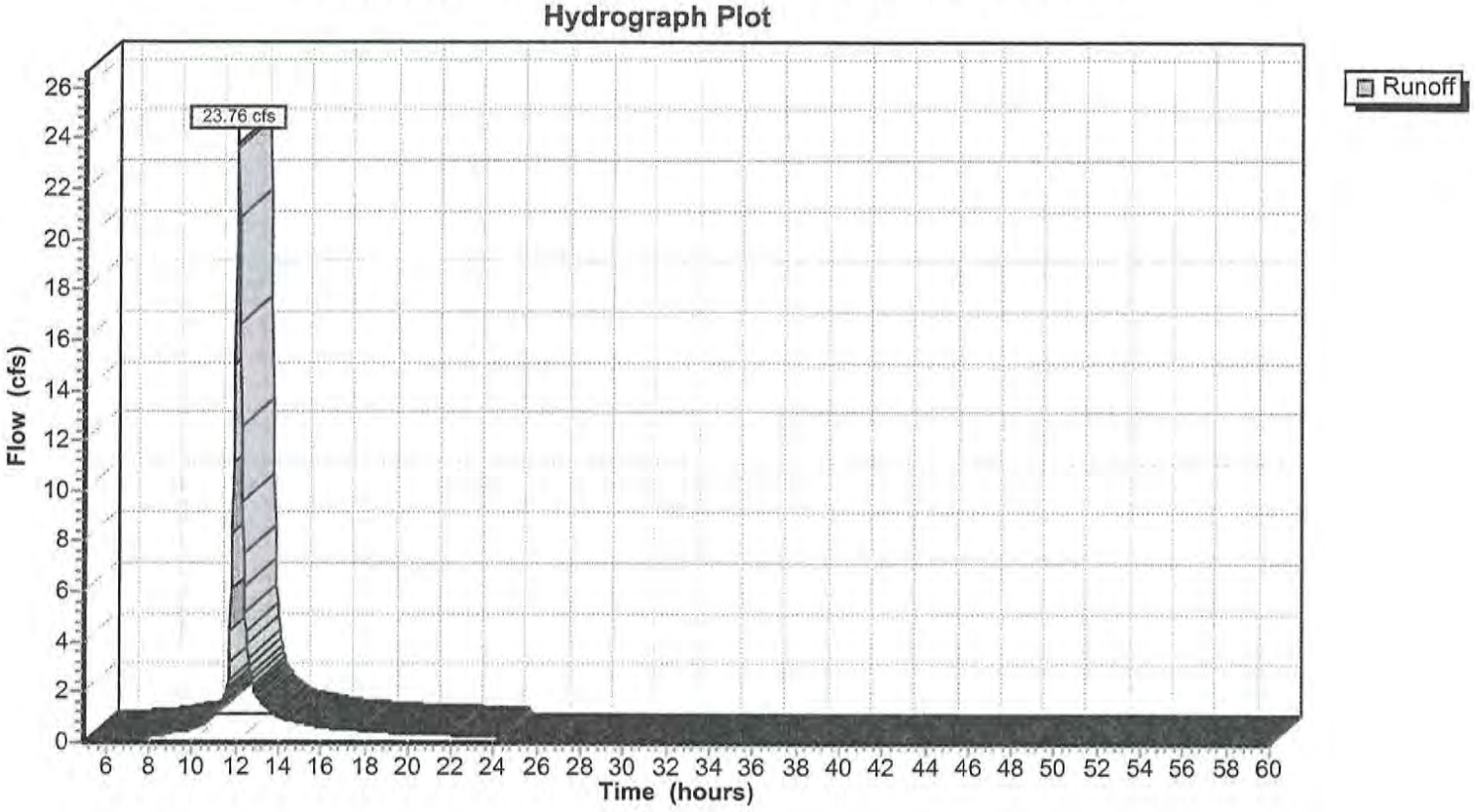
Runoff = 23.76 cfs @ 12.08 hrs, Volume= 1.672 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.60"

Area (sf)	CN	Description
55,825	98	ROOF TOPS
46,341	98	SIDE YARD PATIO AREA
26,310	98	DRIVEWAYS
7,361	98	INNER SIDEWALK AREA
55,920	98	ROADWAY & SIDEWALKS
16,272	98	REC. BLDG & POOL AREA
34,099	98	HERRING STREET AREA
77,856	74	>75% Grass cover, Good, HSG C
319,984	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	85	0.0141	0.2		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
8.1	1,163	0.0028	2.4	1.89	**Circular Channel (pipe), THRU STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
16.6	1,248	Total			

Subcatchment 1S: 57 PATIO HOMES - INTERIOR



Subcatchment 2S: 57 PATIO HOMES - EXTERIOR

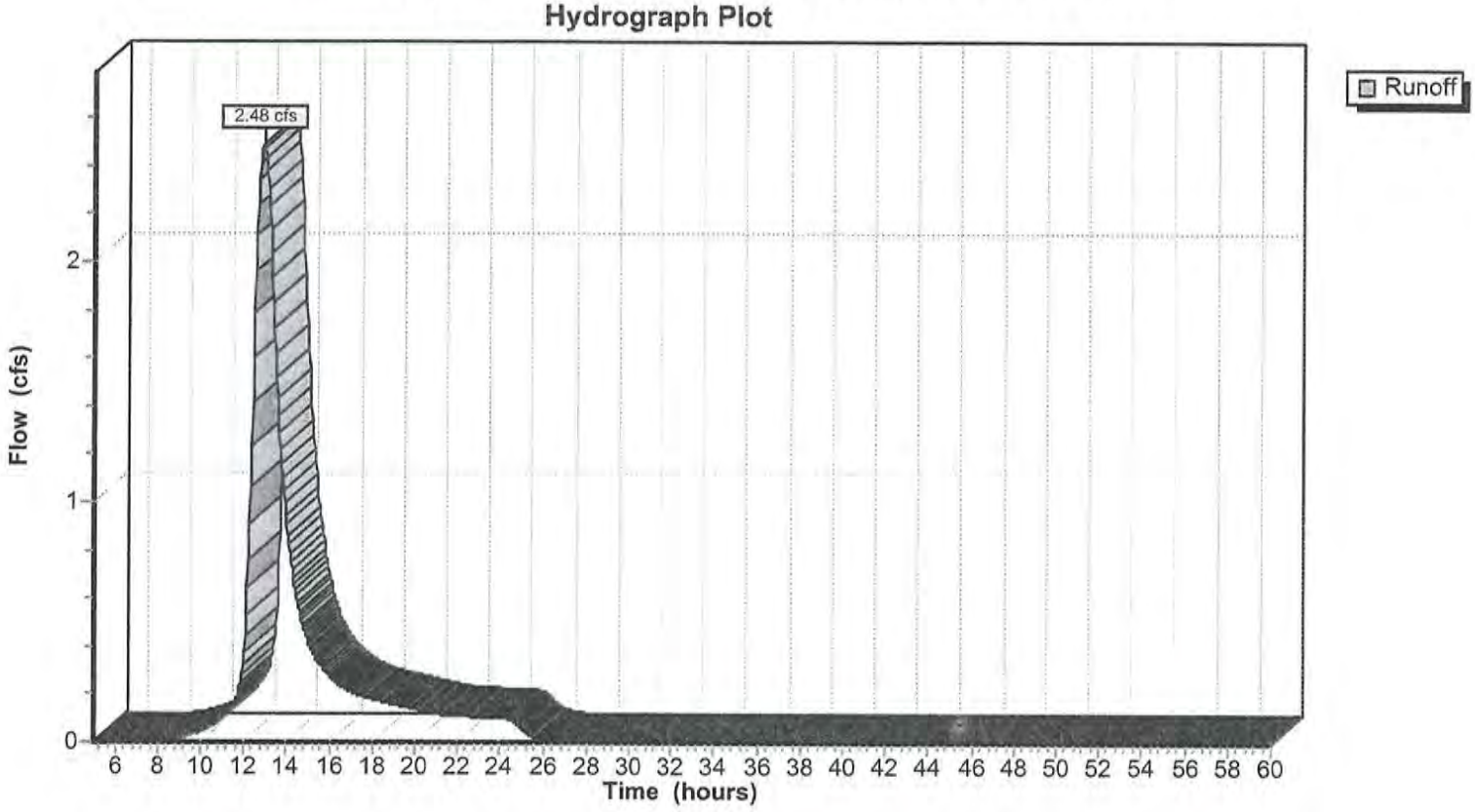
Runoff = 2.48 cfs @ 12.88 hrs, Volume= 0.478 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.60"

Area (sf)	CN	Description
26,825	98	ROOF TOPS
23,041	98	SIDEYARD PATIO AREAS
754	98	BATH HSE
1,372	98	SIDEWALK AREA
66,797	74	>75% Grass cover, Good, HSG C
118,789	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	40	0.0800	0.3		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
34.9	732	0.0025	0.4		**Shallow Concentrated Flow, THRU SWALE** Short Grass Pasture Kv= 7.0 fps
39.9	530	0.0010	0.2		**Shallow Concentrated Flow, THRU R/W SWALE** Short Grass Pasture Kv= 7.0 fps
2.4	342	0.0028	2.4	1.89	**Circular Channel (pipe), THUR STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
79.5	1,644	Total			

Subcatchment 2S: 57 PATIO HOMES - EXTERIOR



Subcatchment 21 LOTS: south end lots and r/w

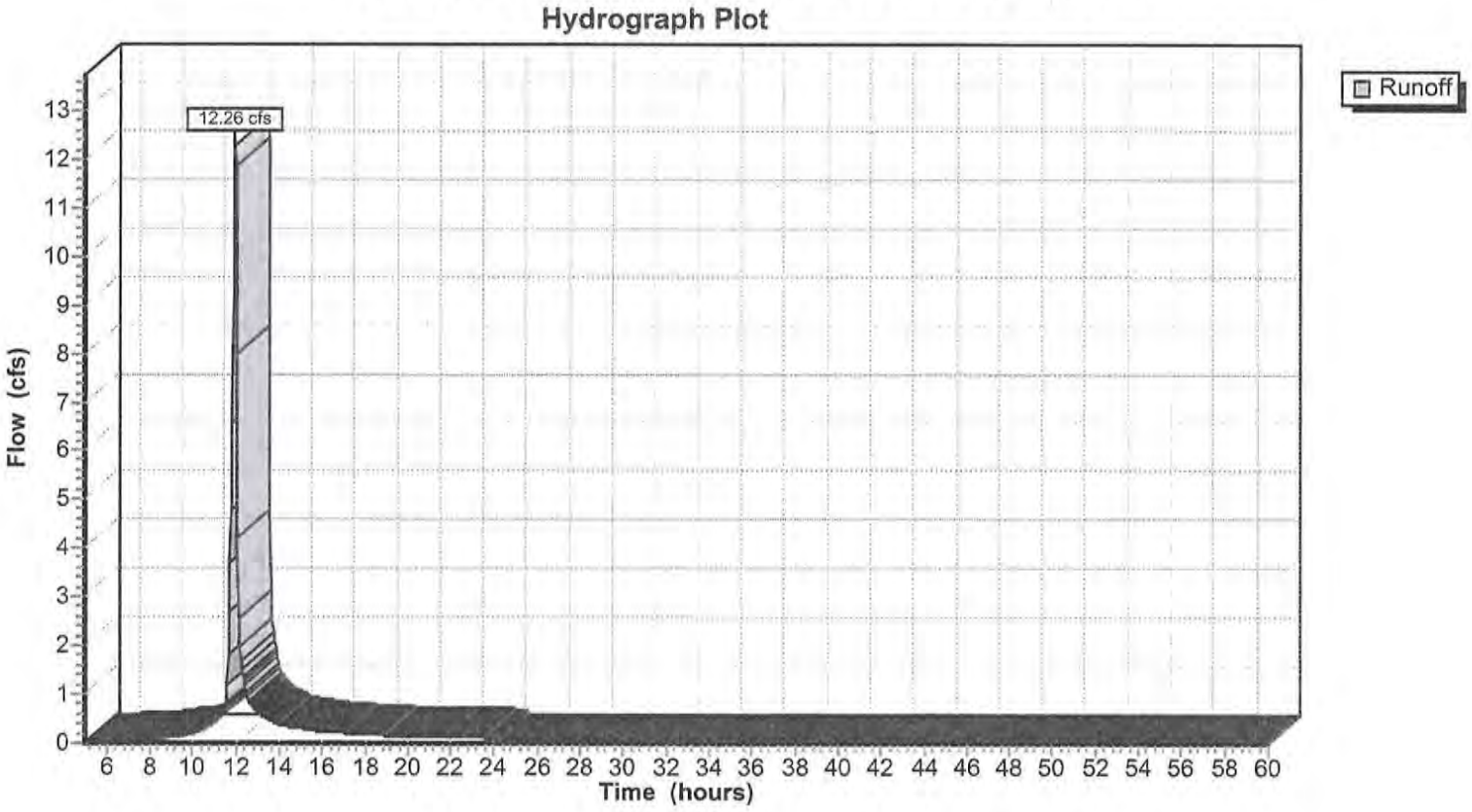
Runoff = 12.26 cfs @ 11.97 hrs, Volume= 0.629 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.60"

Area (sf)	CN	Description
29,949	98	conc. sidewalk and pavement
82,278	98	residential lot coverages
17,100	39	>75% Grass cover, Good, HSG A
129,327	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.0208	2.9		**Shallow Concentrated Flow, SHEET FLOW FROM ROADV** Paved Kv= 20.3 fps
6.1	576	0.0015	1.6	14.15	**Parabolic Channel, grass swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.3	78	0.0050	4.2	7.43	**Circular Channel (pipe), 18" rcp culvert** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
6.5	669	Total			

Subcatchment 21 LOTS: south end lots and r/w



Subcatchment 52 LOTS: north end lots & r.w. areas

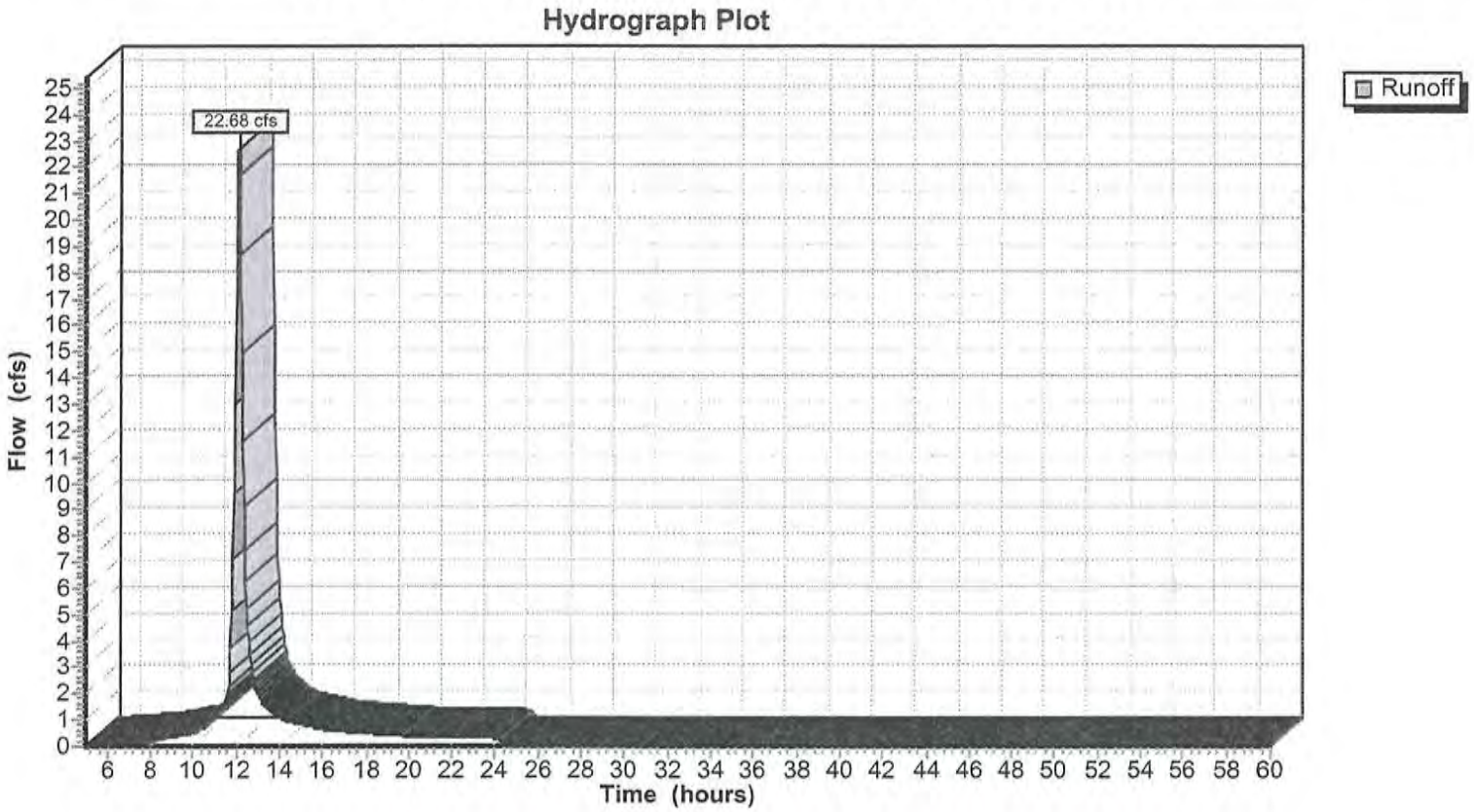
Runoff = 22.68 cfs @ 12.11 hrs, Volume= 1.685 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.60"

Area (sf)	CN	Description
84,636	98	conc. sidewalk & pavement
212,240	98	residential lot coverage
37,305	39	>75% Grass cover, Good, HSG A
334,181	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	48	0.0208	1.3		**Sheet Flow, over north cul-de-sac** Smooth surfaces n= 0.011 P2= 4.00"
8.9	871	0.0016	1.6	14.61	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.4	60	0.0016	2.4	4.20	**Circular Channel (pipe), 18 hdpe culvert under devils bay** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
7.8	600	0.0010	1.3	11.55	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.7	137	0.0023	3.5	10.85	**Circular Channel (pipe), 24" hdpe pipe from r/w to jb b-5** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.4	80	0.0010	3.0	21.09	**Circular Channel (pipe), 36" hdpe pipe from jb b-5 to fes** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
18.8	1,796	Total			

Subcatchment 52 LOTS: north end lots & r.w. areas



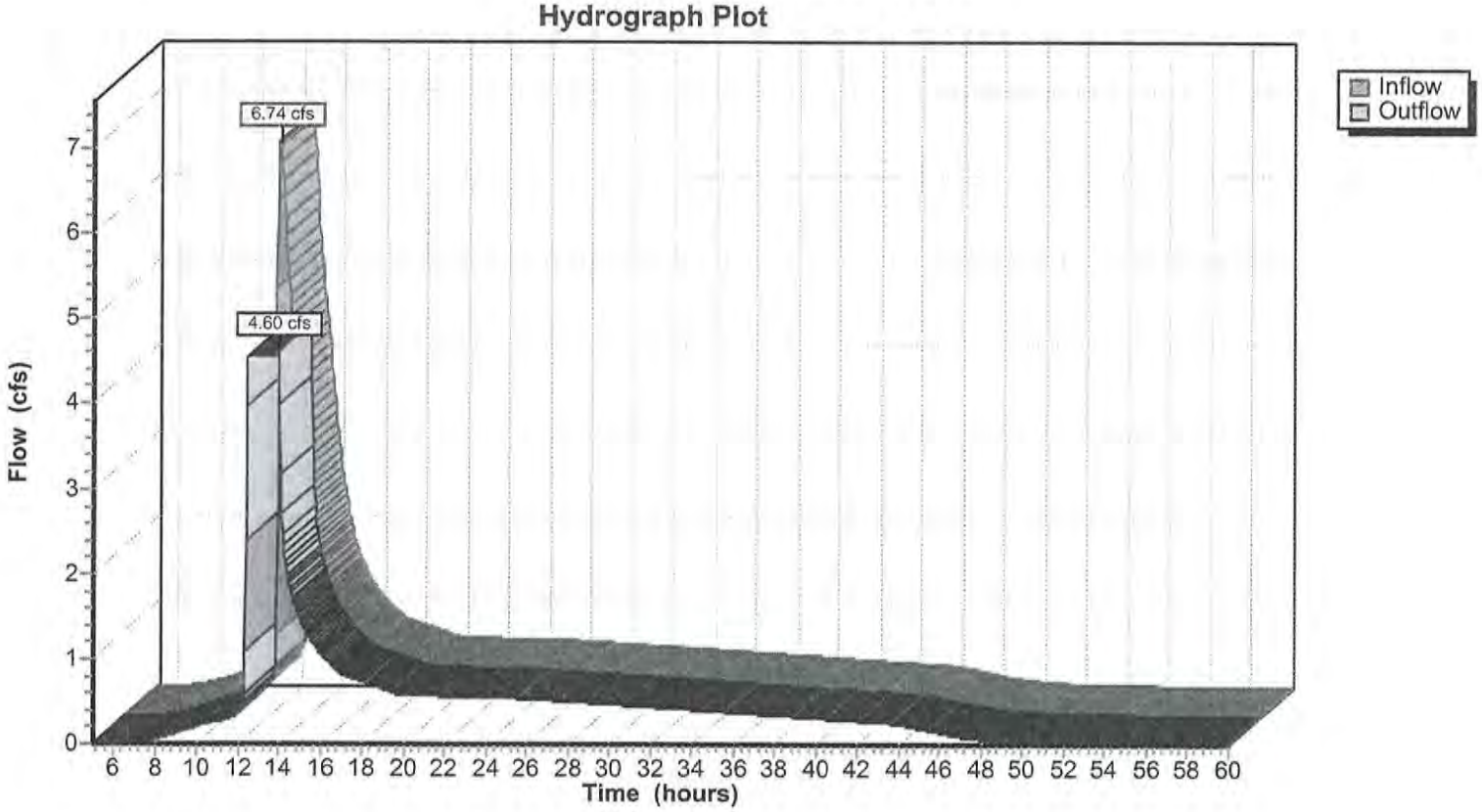
Reach 1R: 36" storm drain

Inflow = 6.74 cfs @ 12.46 hrs, Volume= 2.144 af
Outflow = 4.60 cfs @ 13.95 hrs, Volume= 2.144 af, Atten= 32%, Lag= 89.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.7 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.3 fps, Avg. Travel Time= 8.9 min

Peak Depth= 3.00'
Capacity at bank full= 4.57 cfs
Inlet Invert= 5.18', Outlet Invert= 5.16'
36.0" Diameter Pipe n= 0.020 Length= 180.0' Slope= 0.0001 '/'

Reach 1R: 36" storm drain



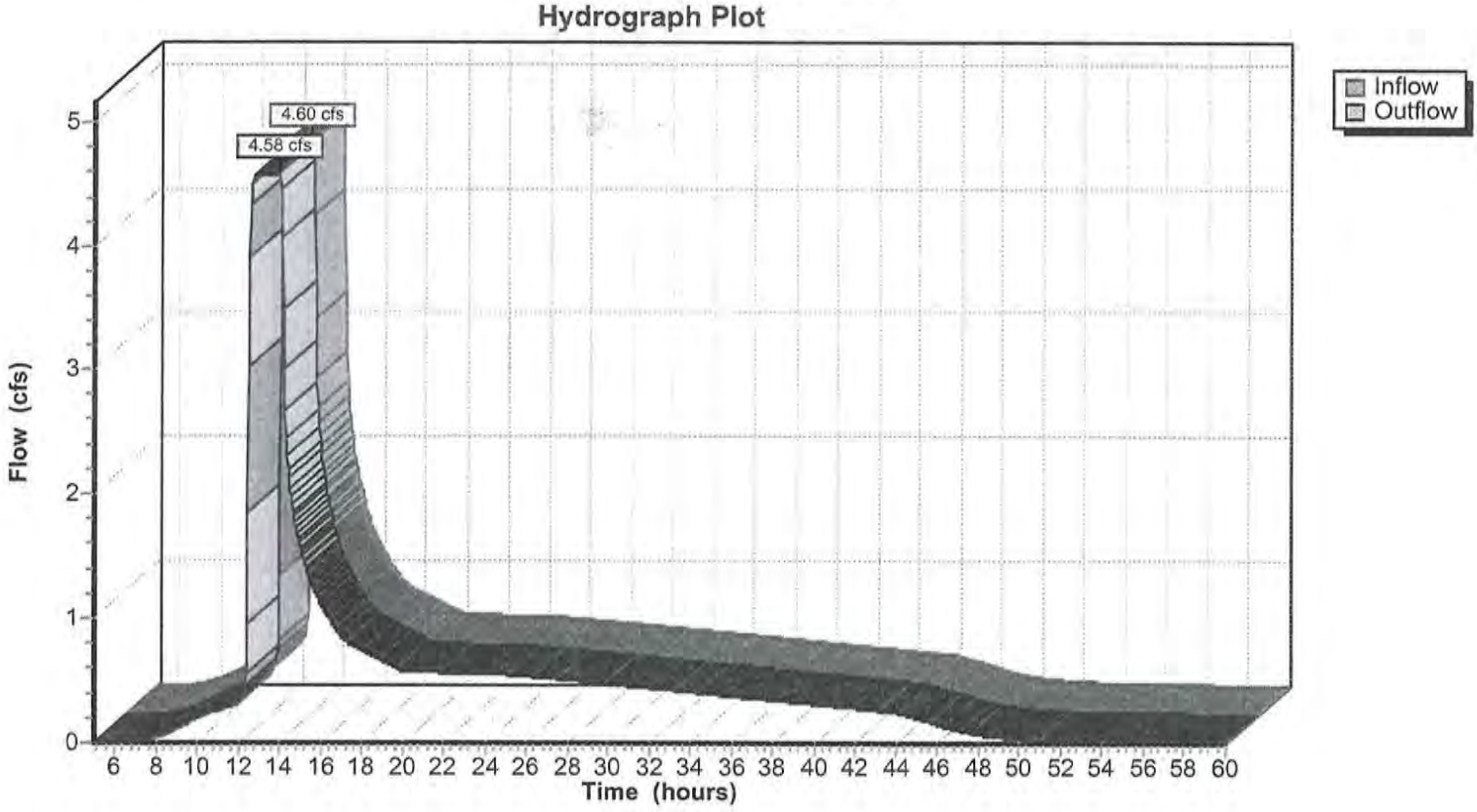
Reach 2R: 36" cmp

Inflow = 4.60 cfs @ 13.95 hrs, Volume= 2.144 af
Outflow = 4.58 cfs @ 14.00 hrs, Volume= 2.143 af, Atten= 1%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.7 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.7 fps, Avg. Travel Time= 9.7 min

Peak Depth= 1.21'
Capacity at bank full= 13.42 cfs
Inlet Invert= 5.16', Outlet Invert= 4.75'
36.0" Diameter Pipe n= 0.020 Length= 428.0' Slope= 0.0010 '/'

Reach 2R: 36" cmp



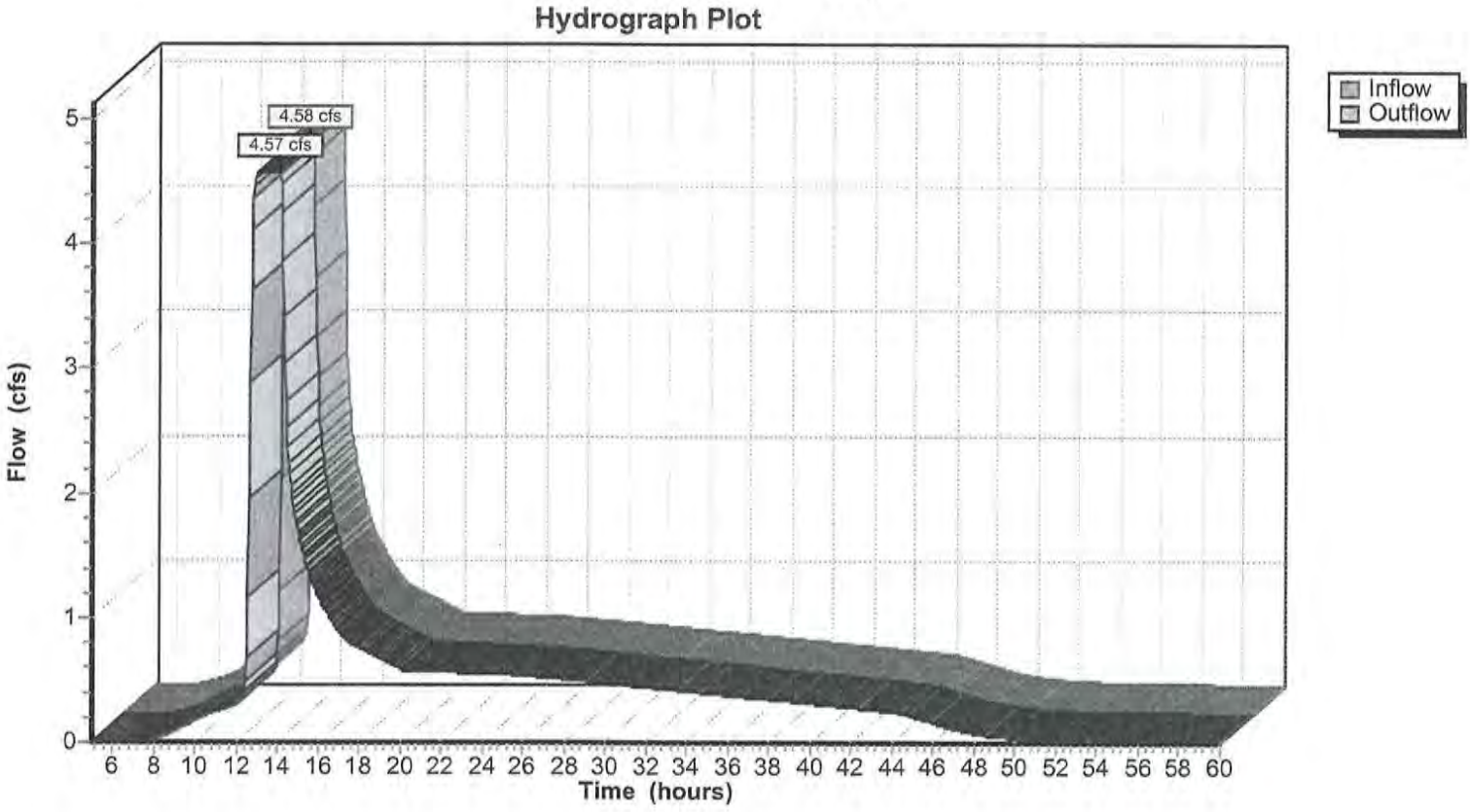
Reach 3R: 36" hdpe

Inflow = 4.58 cfs @ 14.00 hrs, Volume= 2.143 af
Outflow = 4.57 cfs @ 14.05 hrs, Volume= 2.143 af, Atten= 0%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.5 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 1.1 fps, Avg. Travel Time= 11.4 min

Peak Depth= 0.91'
Capacity at bank full= 22.97 cfs
Inlet Invert= 4.75', Outlet Invert= 4.00'
36.0" Diameter Pipe n= 0.012 Length= 742.0' Slope= 0.0010 '/'

Reach 3R: 36" hdpe



Pond 1P: POND

Inflow = 24.25 cfs @ 12.08 hrs, Volume= 2.150 af
Outflow = 6.74 cfs @ 12.46 hrs, Volume= 2.144 af, Atten= 72%, Lag= 22.5 min
Primary = 6.74 cfs @ 12.46 hrs, Volume= 2.144 af

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

Peak Elev= 10.78' Storage= 39,035 cf
Plug-Flow detention time= 472.9 min calculated for 2.144 af (100% of inflow)
Storage and wetted areas determined by Irregular sections

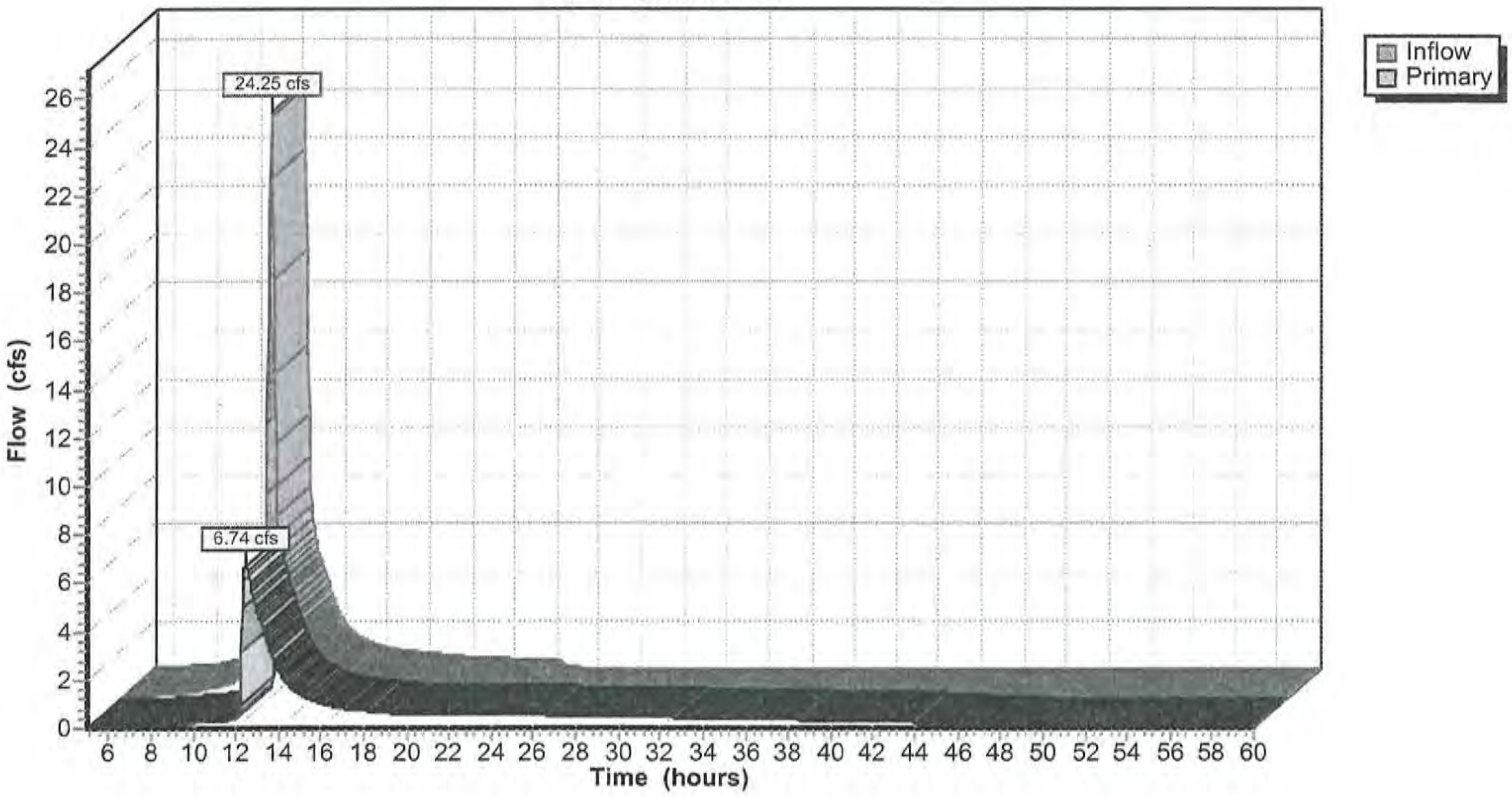
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
8.50	0	0.0	0	0	0
9.00	18,756	643.0	3,126	3,126	32,902
9.25	19,240	648.0	4,749	7,875	33,440
10.00	20,715	662.0	14,980	22,855	34,980
10.05	20,715	662.0	1,036	23,891	35,013
10.50	20,715	662.0	9,322	33,213	35,311
11.00	20,715	662.0	10,358	43,570	35,642
11.50	20,715	662.0	10,358	53,928	35,973
12.00	22,730	681.0	10,857	64,785	38,031

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
- 3=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	8.50'	**18.0" x 396.0' long Culvert** Ke= 0.500 Outlet Invert= 6.50' S= 0.0051 '/' n= 0.013 Cc= 0.900
2	Device 1	8.50'	**4.0" Vert. Orifice/Grate** C= 0.600
3	Primary	10.50'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond 1P: POND

Hydrograph Plot



Pond ex pond: existing pond

Inflow	=	29.75 cfs @	12.02 hrs, Volume=	4.457 af	
Outflow	=	5.93 cfs @	14.13 hrs, Volume=	4.407 af,	Atten= 80%, Lag= 126.1 min
Primary	=	5.93 cfs @	14.13 hrs, Volume=	4.407 af	

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

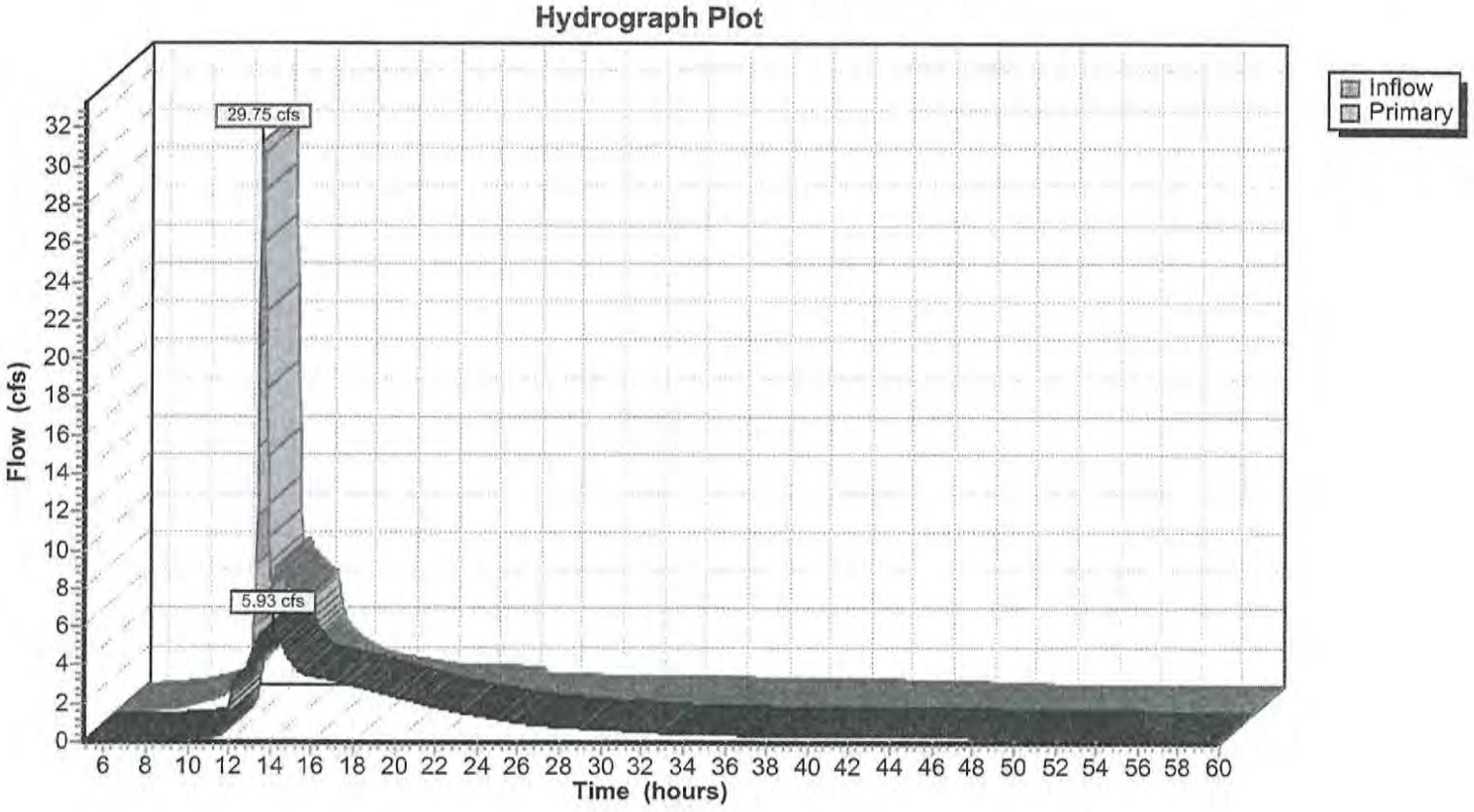
Peak Elev= 5.87' Storage= 67,259 cf
Plug-Flow detention time= 296.3 min calculated for 4.403 af (99% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
4.00	0	0.0	0	0	0
5.00	41,303	1,015.0	13,768	13,768	81,984
6.00	84,410	2,341.0	61,586	75,354	436,112
7.00	130,086	1,977.0	106,428	181,782	561,207

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
  - 3=Orifice/Grate
- 4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	4.00'	**18.0" x 300.0' long Culvert X 2.00** Ke= 0.500 Outlet Invert= 3.24' S= 0.0025 '/' n= 0.012 Cc= 0.900
2	Device 1	4.00'	**2.7" Vert. Orifice/Grate X 2.00** C= 0.600
3	Device 1	4.85'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600
4	Primary	5.75'	**60.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ex pond: existing pond



POST-DEVELOPMENT STORMWATER CALCULATIONS
(2 YEAR STORM EVENT)

Prepared For

COROLLA BAY

(72 Lot Residential Development)

Located on

OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007
Revised: 4/28/08

Subcatchment 1S: 57 PATIO HOMES - INTERIOR

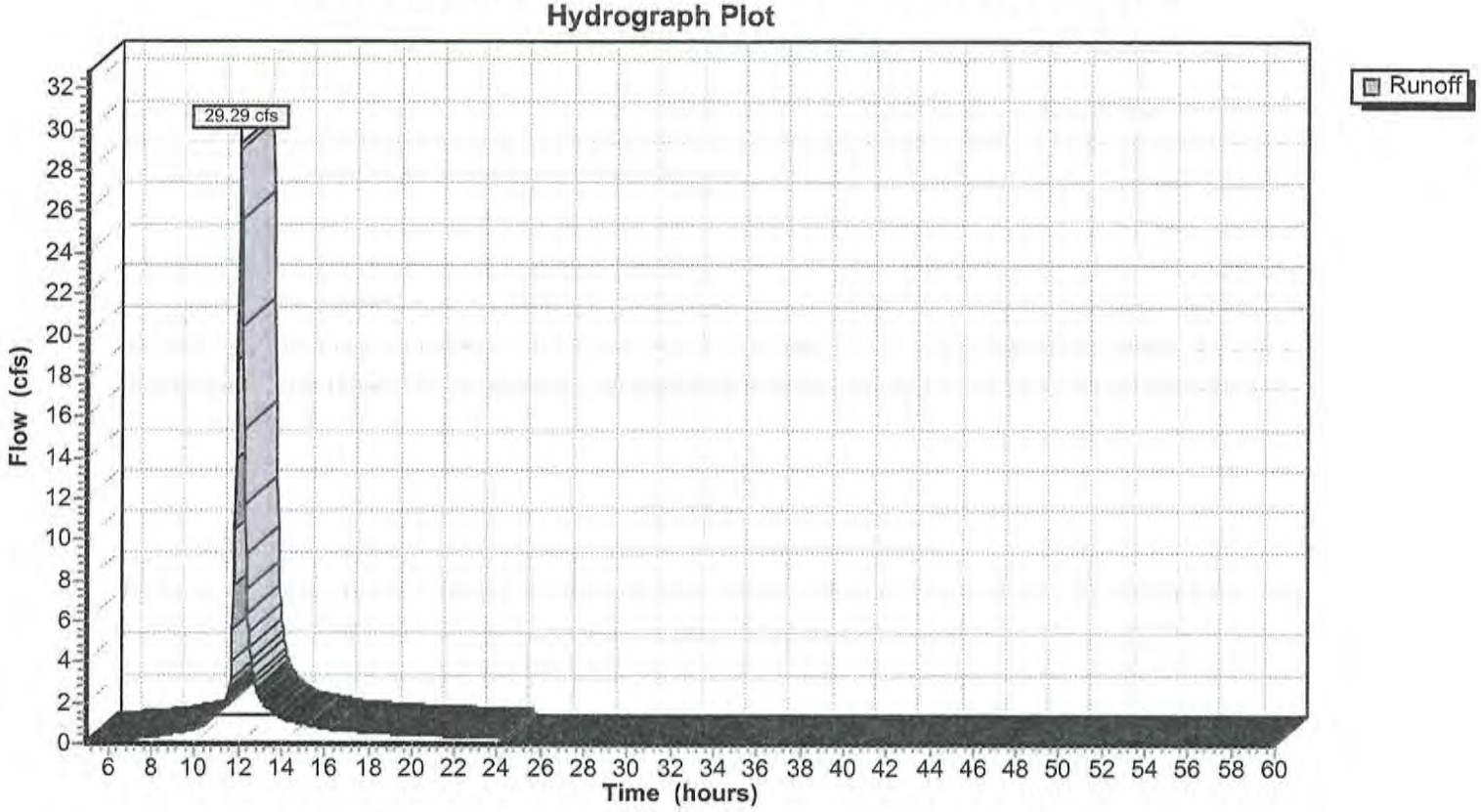
Runoff = 29.29 cfs @ 12.08 hrs, Volume= 2.082 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.30"

Area (sf)	CN	Description
55,825	98	ROOF TOPS
46,341	98	SIDE YARD PATIO AREA
26,310	98	DRIVEWAYS
7,361	98	INNER SIDEWALK AREA
55,920	98	ROADWAY & SIDEWALKS
16,272	98	REC. BLDG & POOL AREA
34,099	98	HERRING STREET AREA
77,856	74	>75% Grass cover, Good, HSG C
319,984	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	85	0.0141	0.2		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
8.1	1,163	0.0028	2.4	1.89	**Circular Channel (pipe), THRU STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
16.6	1,248	Total			

Subcatchment 1S: 57 PATIO HOMES - INTERIOR



Subcatchment 2S: 57 PATIO HOMES - EXTERIOR

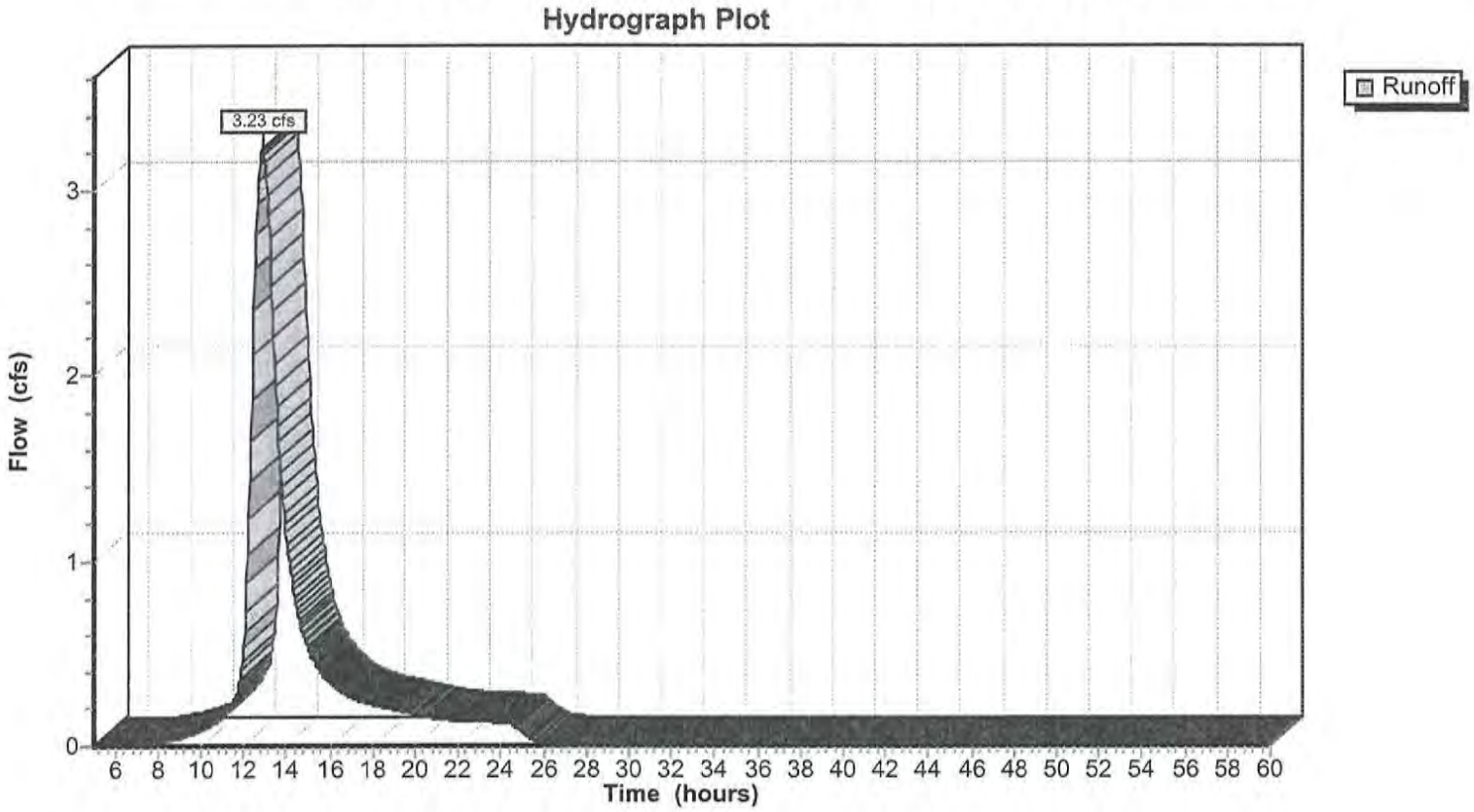
Runoff = 3.23 cfs @ 12.87 hrs, Volume= 0.620 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.30"

Area (sf)	CN	Description
26,825	98	ROOF TOPS
23,041	98	SIDEYARD PATIO AREAS
754	98	BATH HSE
1,372	98	SIDEWALK AREA
66,797	74	>75% Grass cover, Good, HSG C
118,789	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	40	0.0800	0.3		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
34.9	732	0.0025	0.4		**Shallow Concentrated Flow, THRU SWALE** Short Grass Pasture Kv= 7.0 fps
39.9	530	0.0010	0.2		**Shallow Concentrated Flow, THRU R/W SWALE** Short Grass Pasture Kv= 7.0 fps
2.4	342	0.0028	2.4	1.89	**Circular Channel (pipe), THUR STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
79.5	1,644	Total			

Subcatchment 2S: 57 PATIO HOMES - EXTERIOR



Subcatchment 21 LOTS: south end lots and r/w

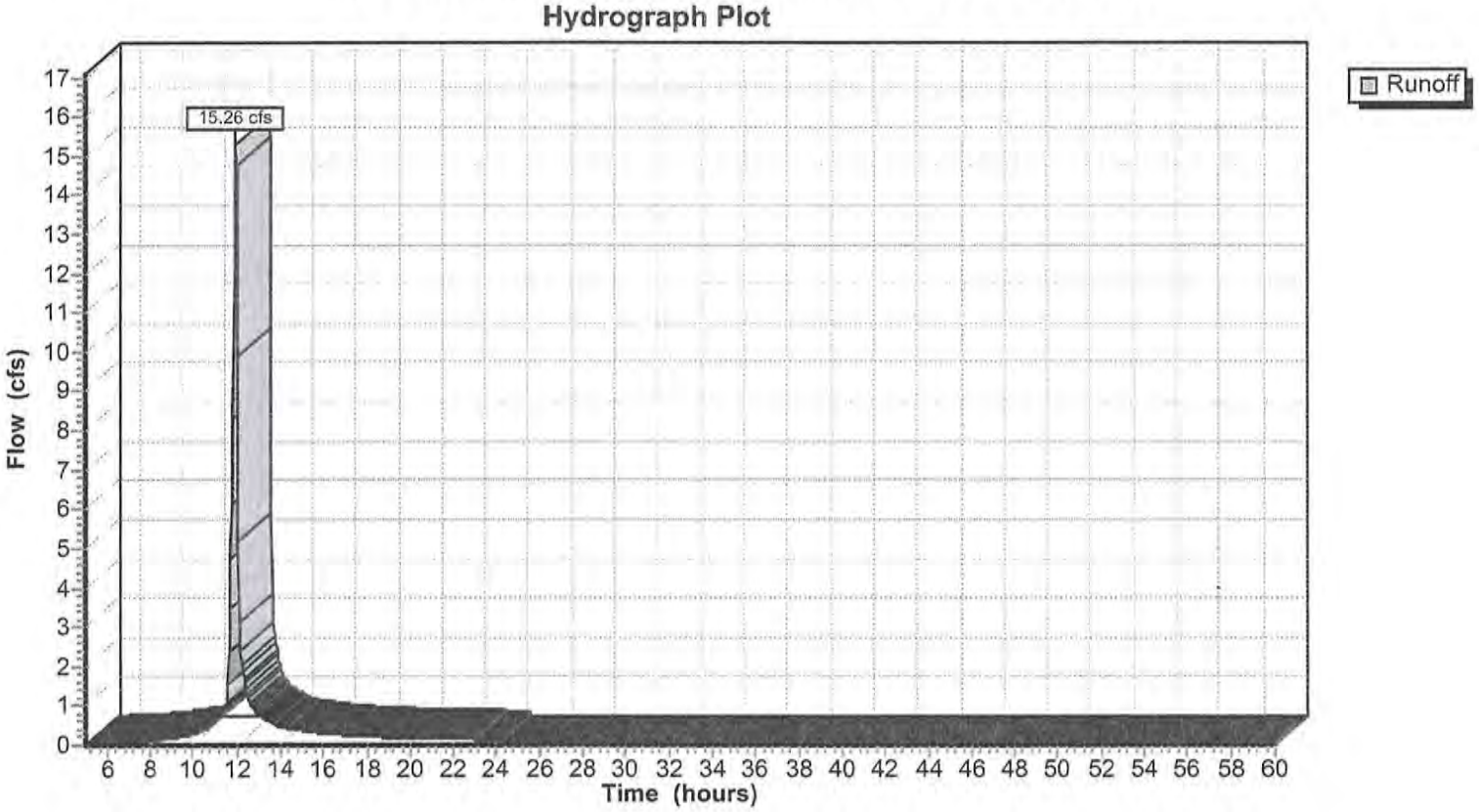
Runoff = 15.26 cfs @ 11.97 hrs, Volume= 0.793 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.30"

Area (sf)	CN	Description
29,949	98	conc. sidewalk and pavement
82,278	98	residential lot coverages
17,100	39	>75% Grass cover, Good, HSG A
129,327	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.0208	2.9		**Shallow Concentrated Flow, SHEET FLOW FROM ROADV** Paved Kv= 20.3 fps
6.1	576	0.0015	1.6	14.15	**Parabolic Channel, grass swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.3	78	0.0050	4.2	7.43	**Circular Channel (pipe), 18" rcp culvert** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
6.5	669	Total			

Subcatchment 21 LOTS: south end lots and r/w



Subcatchment 52 LOTS: north end lots & r.w. areas

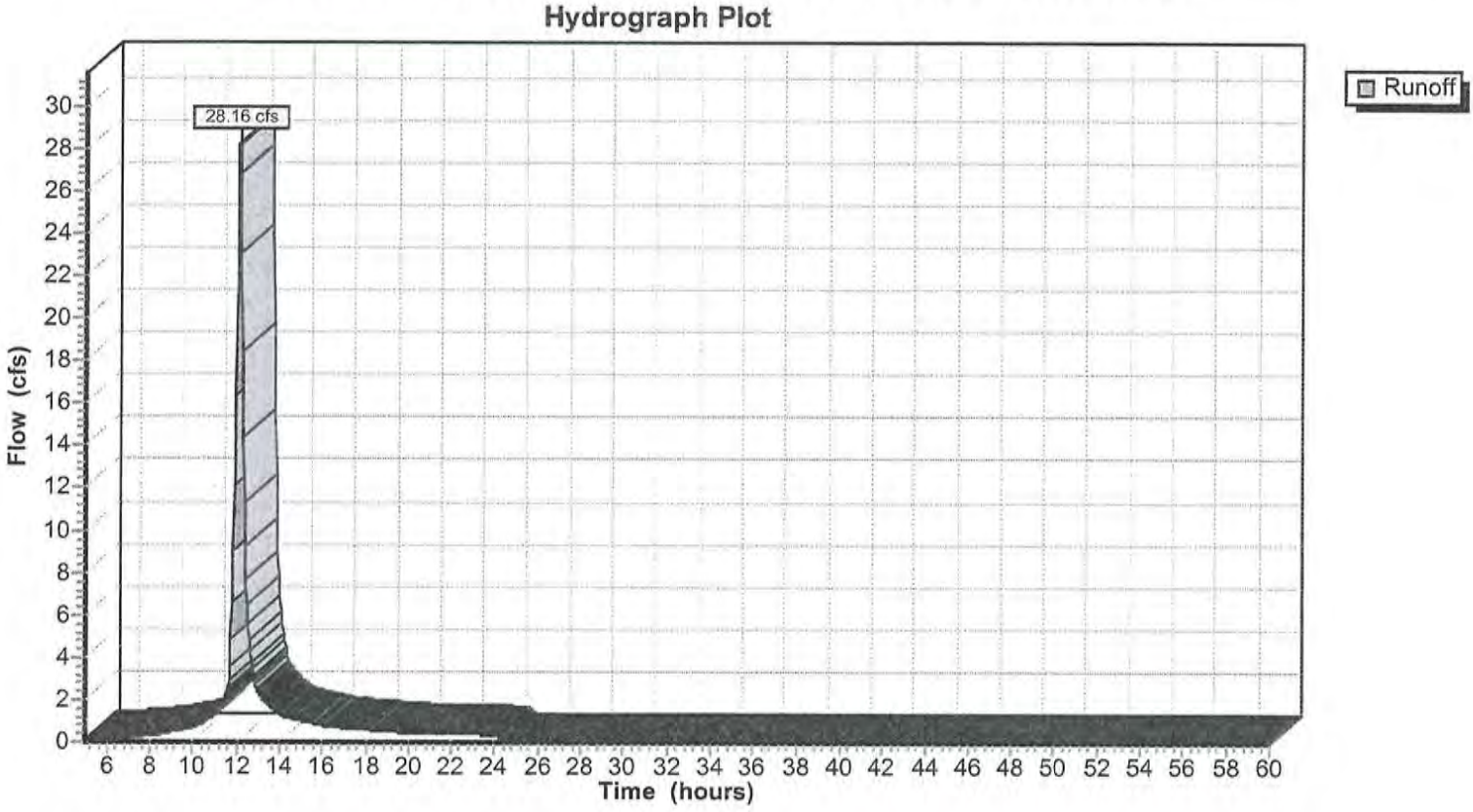
Runoff = 28.16 cfs @ 12.11 hrs, Volume= 2.111 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=4.30"

Area (sf)	CN	Description
84,636	98	conc. sidewalk & pavement
212,240	98	residential lot coverage
37,305	39	>75% Grass cover, Good, HSG A
334,181	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	48	0.0208	1.3		**Sheet Flow, over north cul-de-sac** Smooth surfaces n= 0.011 P2= 4.00"
8.9	871	0.0016	1.6	14.61	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.4	60	0.0016	2.4	4.20	**Circular Channel (pipe), 18 hdpe culvert under devils bay** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
7.8	600	0.0010	1.3	11.55	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.7	137	0.0023	3.5	10.85	**Circular Channel (pipe), 24" hdpe pipe from r/w to jb b-5** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.4	80	0.0010	3.0	21.09	**Circular Channel (pipe), 36" hdpe pipe from jb b-5 to fes** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
18.8	1,796	Total			

Subcatchment 52 LOTS: north end lots & r.w. areas



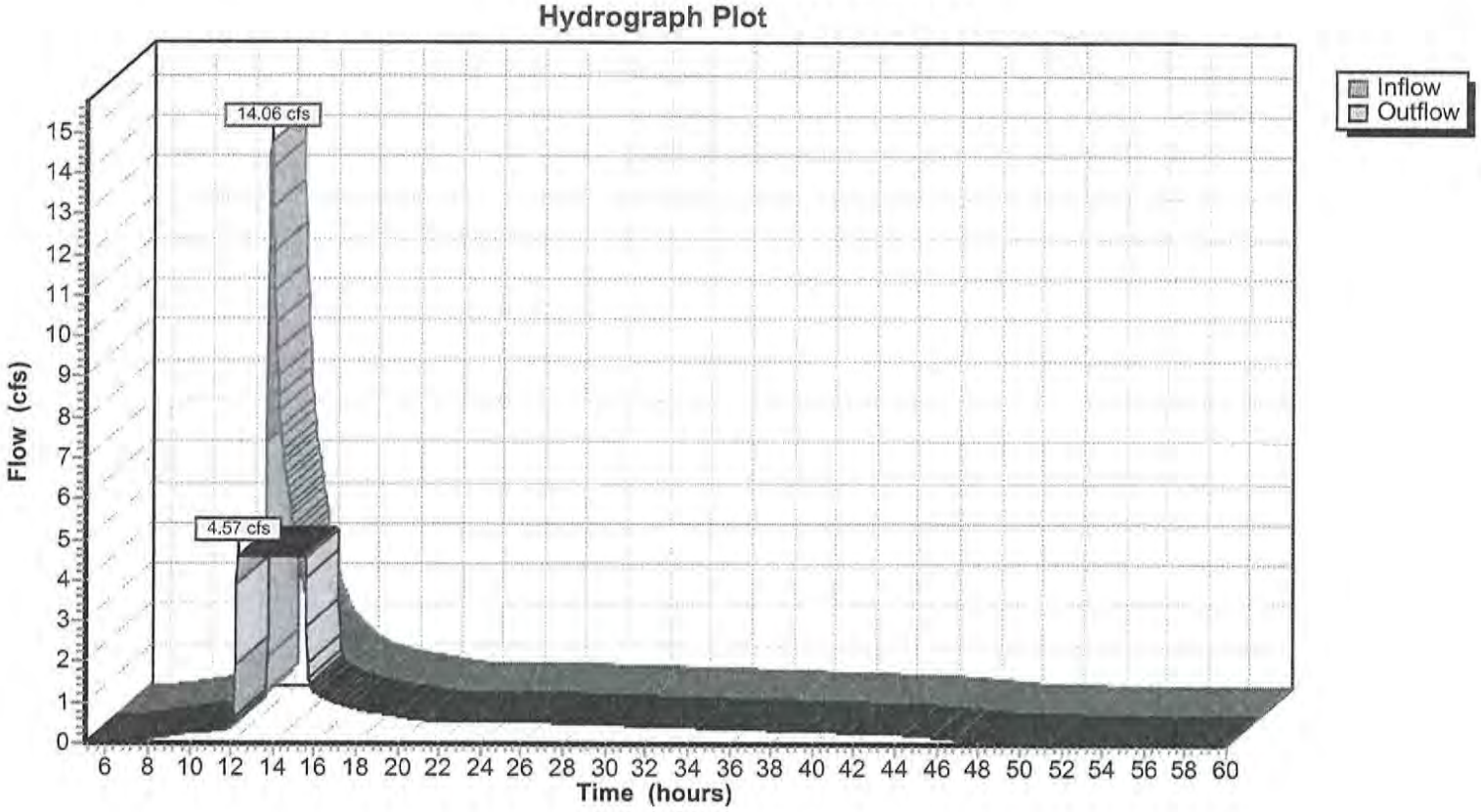
Reach 1R: 36" storm drain

Inflow = 14.06 cfs @ 12.29 hrs, Volume= 2.696 af
Outflow = 4.57 cfs @ 12.30 hrs, Volume= 2.695 af, Atten= 68%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.7 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 8.6 min

Peak Depth= 3.00'
Capacity at bank full= 4.57 cfs
Inlet Invert= 5.18', Outlet Invert= 5.16'
36.0" Diameter Pipe n= 0.020 Length= 180.0' Slope= 0.0001 '/'

Reach 1R: 36" storm drain



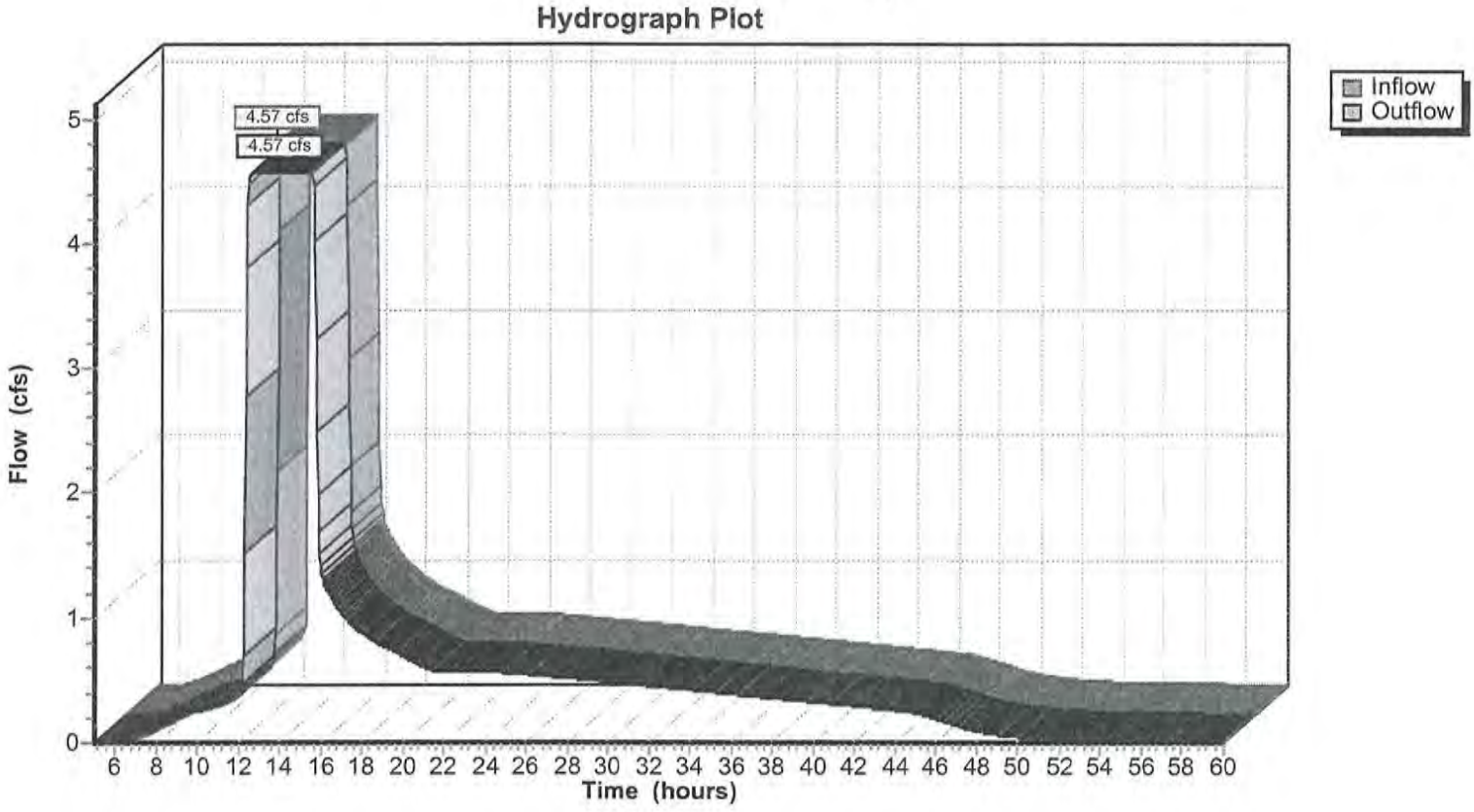
Reach 2R: 36" cmp

Inflow = 4.57 cfs @ 12.30 hrs, Volume= 2.695 af
Outflow = 4.57 cfs @ 14.00 hrs, Volume= 2.695 af, Atten= 0%, Lag= 102.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.7 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.8 fps, Avg. Travel Time= 9.2 min

Peak Depth= 1.21'
Capacity at bank full= 13.42 cfs
Inlet Invert= 5.16', Outlet Invert= 4.75'
36.0" Diameter Pipe n= 0.020 Length= 428.0' Slope= 0.0010 '/'

Reach 2R: 36" cmp



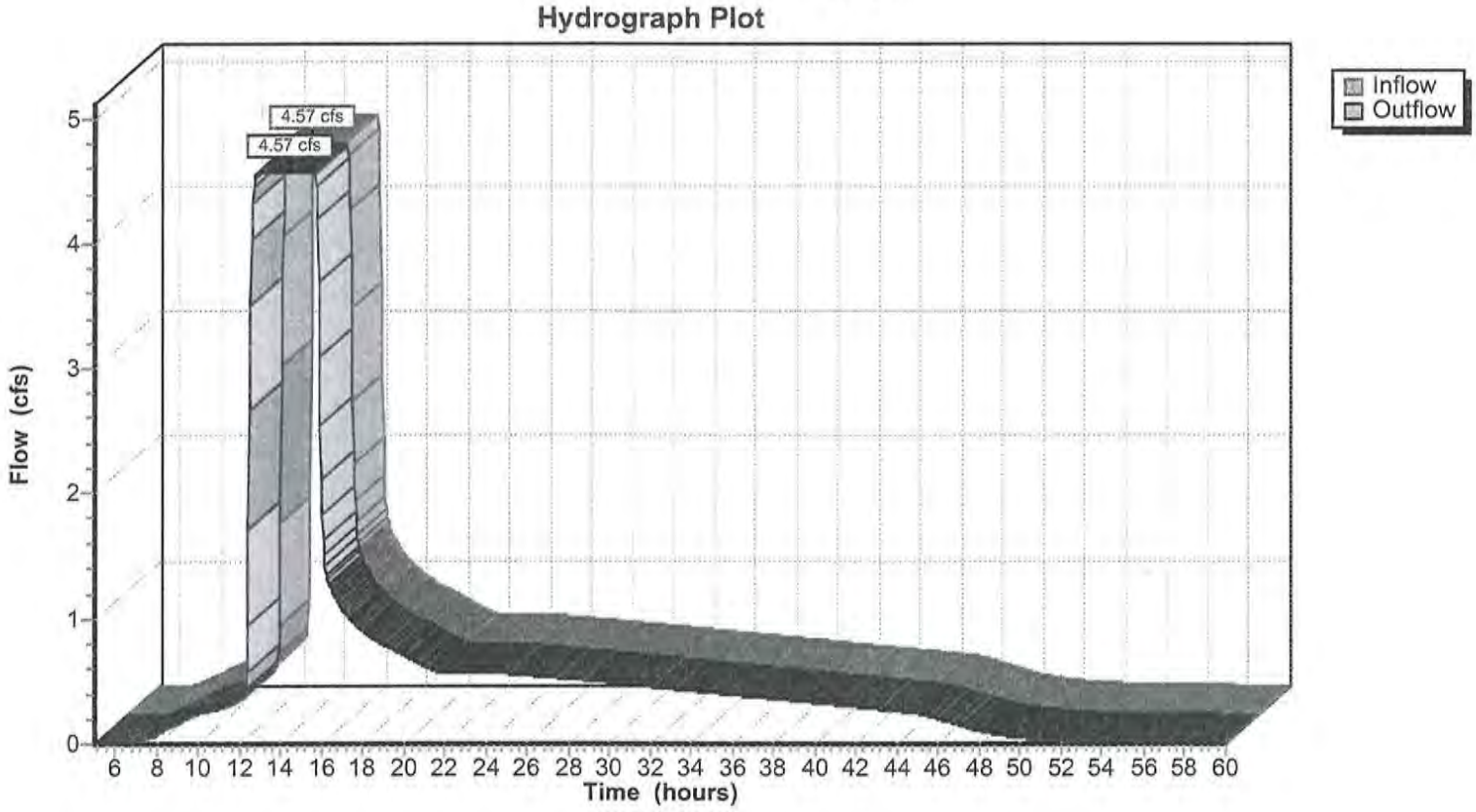
Reach 3R: 36" hdpe

Inflow = 4.57 cfs @ 14.00 hrs, Volume= 2.695 af
Outflow = 4.57 cfs @ 14.50 hrs, Volume= 2.695 af, Atten= 0%, Lag= 30.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.5 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 1.1 fps, Avg. Travel Time= 10.9 min

Peak Depth= 0.91'
Capacity at bank full= 22.97 cfs
Inlet Invert= 4.75', Outlet Invert= 4.00'
36.0" Diameter Pipe n= 0.012 Length= 742.0' Slope= 0.0010 '/'

Reach 3R: 36" hdpe



Pond 1P: POND

Inflow = 29.98 cfs @ 12.08 hrs, Volume= 2.702 af
Outflow = 14.06 cfs @ 12.29 hrs, Volume= 2.696 af, Atten= 53%, Lag= 12.6 min
Primary = 14.06 cfs @ 12.29 hrs, Volume= 2.696 af

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

Peak Elev= 10.97' Storage= 43,036 cf
Plug-Flow detention time= 396.9 min calculated for 2.696 af (100% of inflow)
Storage and wetted areas determined by Irregular sections

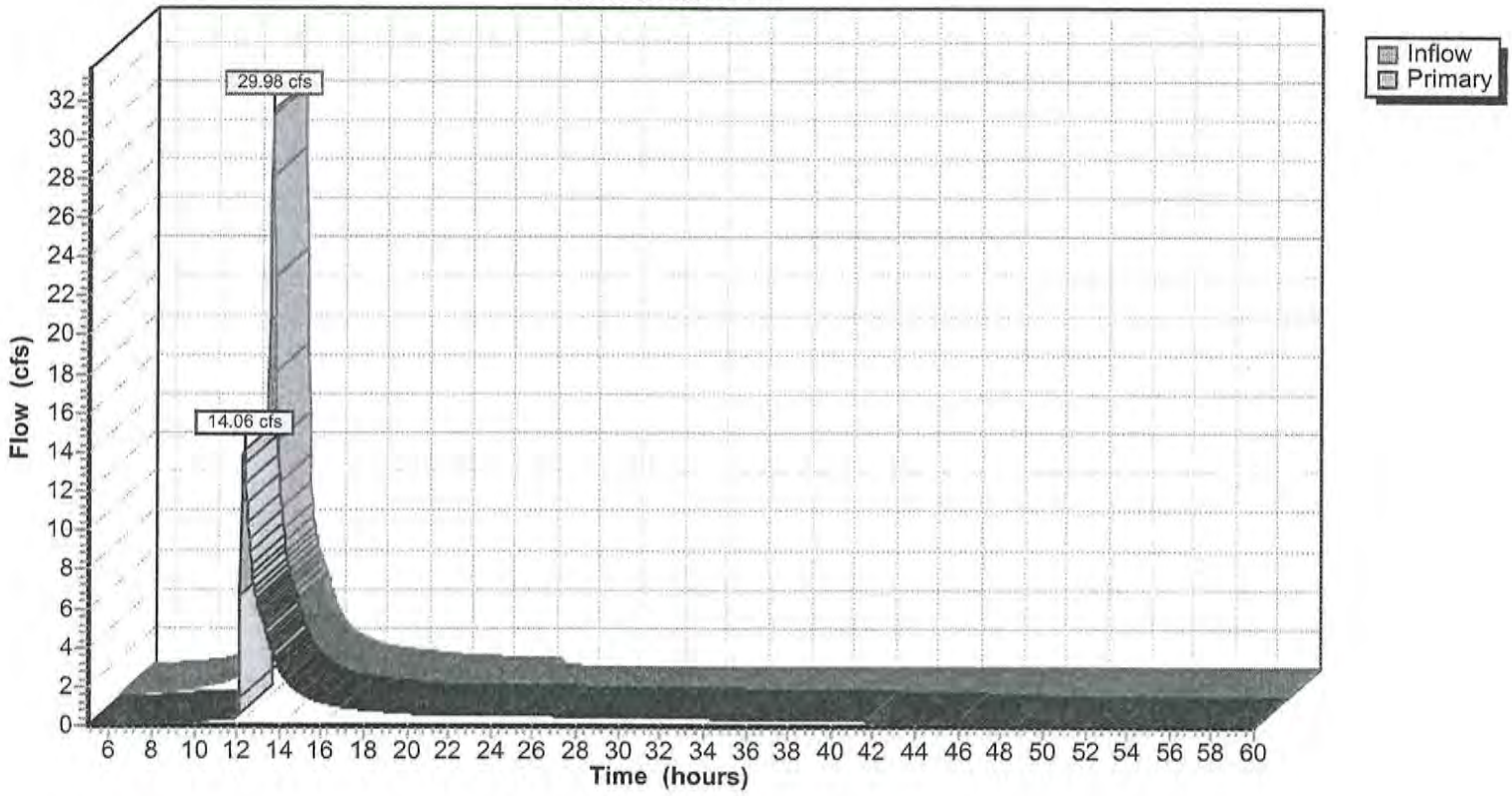
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
8.50	0	0.0	0	0	0
9.00	18,756	643.0	3,126	3,126	32,902
9.25	19,240	648.0	4,749	7,875	33,440
10.00	20,715	662.0	14,980	22,855	34,980
10.05	20,715	662.0	1,036	23,891	35,013
10.50	20,715	662.0	9,322	33,213	35,311
11.00	20,715	662.0	10,358	43,570	35,642
11.50	20,715	662.0	10,358	53,928	35,973
12.00	22,730	681.0	10,857	64,785	38,031

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
- 3=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	8.50'	**18.0" x 396.0' long Culvert** Ke= 0.500 Outlet Invert= 6.50' S= 0.0051 '/' n= 0.013 Cc= 0.900
2	Device 1	8.50'	**4.0" Vert. Orifice/Grate** C= 0.600
3	Primary	10.50'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond 1P: POND

Hydrograph Plot



Pond ex pond: existing pond

Inflow = 37.02 cfs @ 12.02 hrs, Volume= 5.599 af
Outflow = 8.30 cfs @ 12.86 hrs, Volume= 5.544 af, Atten= 78%, Lag= 50.4 min
Primary = 8.30 cfs @ 12.86 hrs, Volume= 5.544 af

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

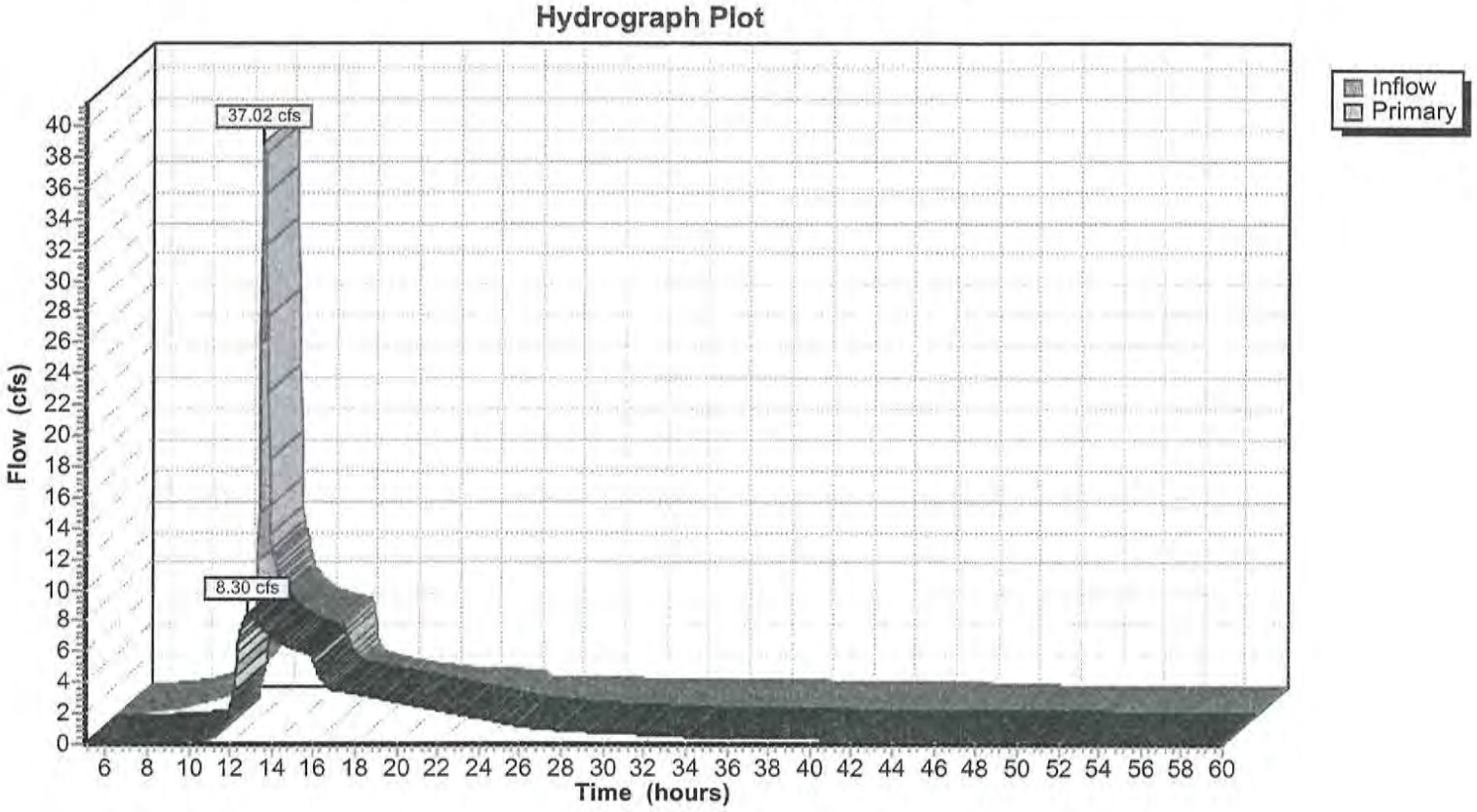
Peak Elev= 5.94' Storage= 71,748 cf
Plug-Flow detention time= 260.9 min calculated for 5.544 af (99% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
4.00	0	0.0	0	0	0
5.00	41,303	1,015.0	13,768	13,768	81,984
6.00	84,410	2,341.0	61,586	75,354	436,112
7.00	130,086	1,977.0	106,428	181,782	561,207

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
  - 3=Orifice/Grate
- 4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	4.00'	**18.0" x 300.0' long Culvert X 2.00** Ke= 0.500 Outlet Invert= 3.24' S= 0.0025 '/' n= 0.012 Cc= 0.900
2	Device 1	4.00'	**2.7" Vert. Orifice/Grate X 2.00** C= 0.600
3	Device 1	4.85'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600
4	Primary	5.75'	**60.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ex pond: existing pond



POST-DEVELOPMENT STORMWATER CALCULATIONS
(10 YEAR STORM EVENT)

Prepared For

COROLLA BAY

(72 Lot Residential Development)

Located on

OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007
Revised: 4/28/08

Subcatchment 1S: 57 PATIO HOMES - INTERIOR

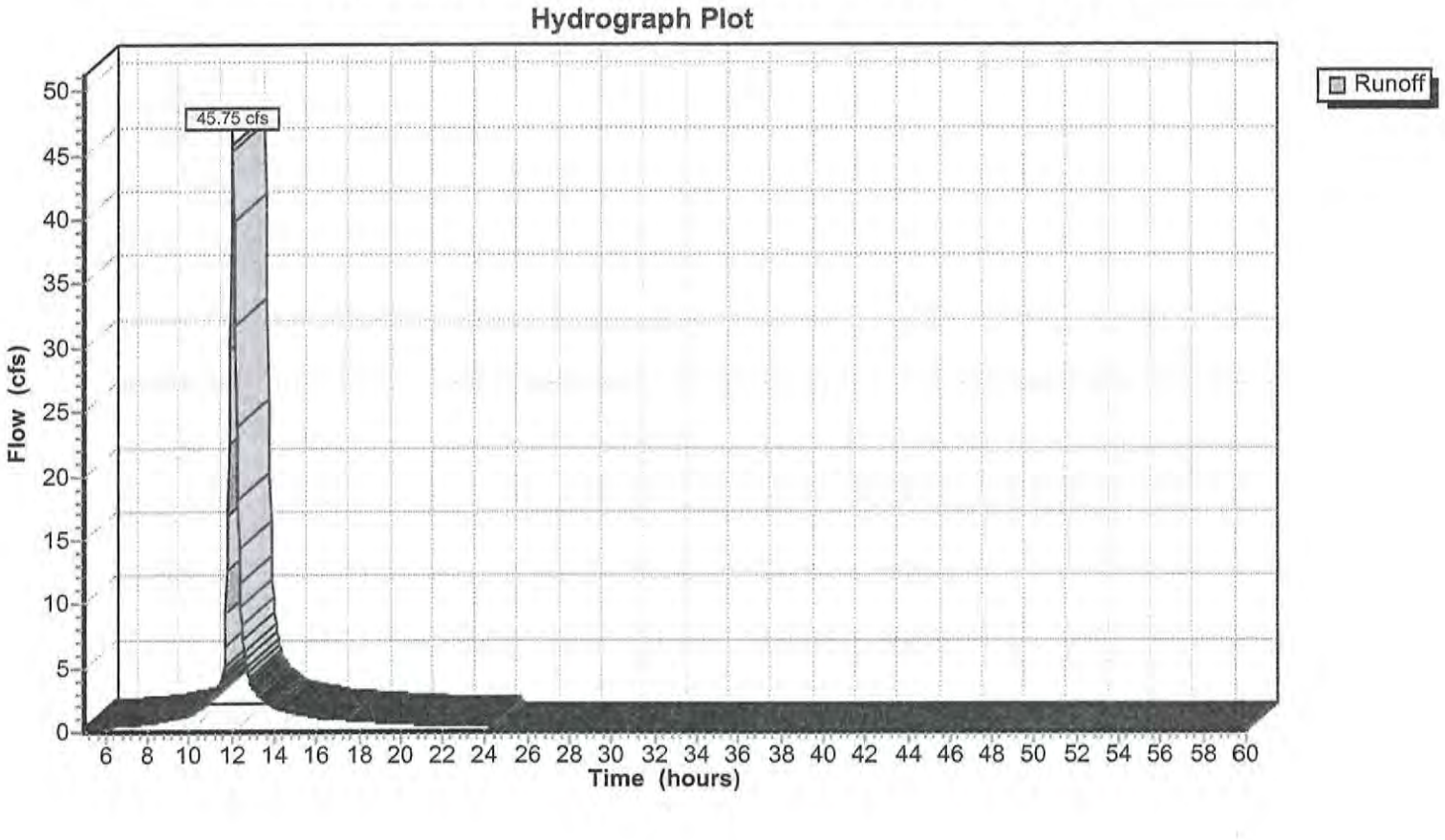
Runoff = 45.75 cfs @ 12.08 hrs, Volume= 3.321 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=6.40"

Area (sf)	CN	Description
55,825	98	ROOF TOPS
46,341	98	SIDE YARD PATIO AREA
26,310	98	DRIVEWAYS
7,361	98	INNER SIDEWALK AREA
55,920	98	ROADWAY & SIDEWALKS
16,272	98	REC. BLDG & POOL AREA
34,099	98	HERRING STREET AREA
77,856	74	>75% Grass cover, Good, HSG C
319,984	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	85	0.0141	0.2		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
8.1	1,163	0.0028	2.4	1.89	**Circular Channel (pipe), THRU STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
16.6	1,248	Total			

Subcatchment 1S: 57 PATIO HOMES - INTERIOR



Subcatchment 2S: 57 PATIO HOMES - EXTERIOR

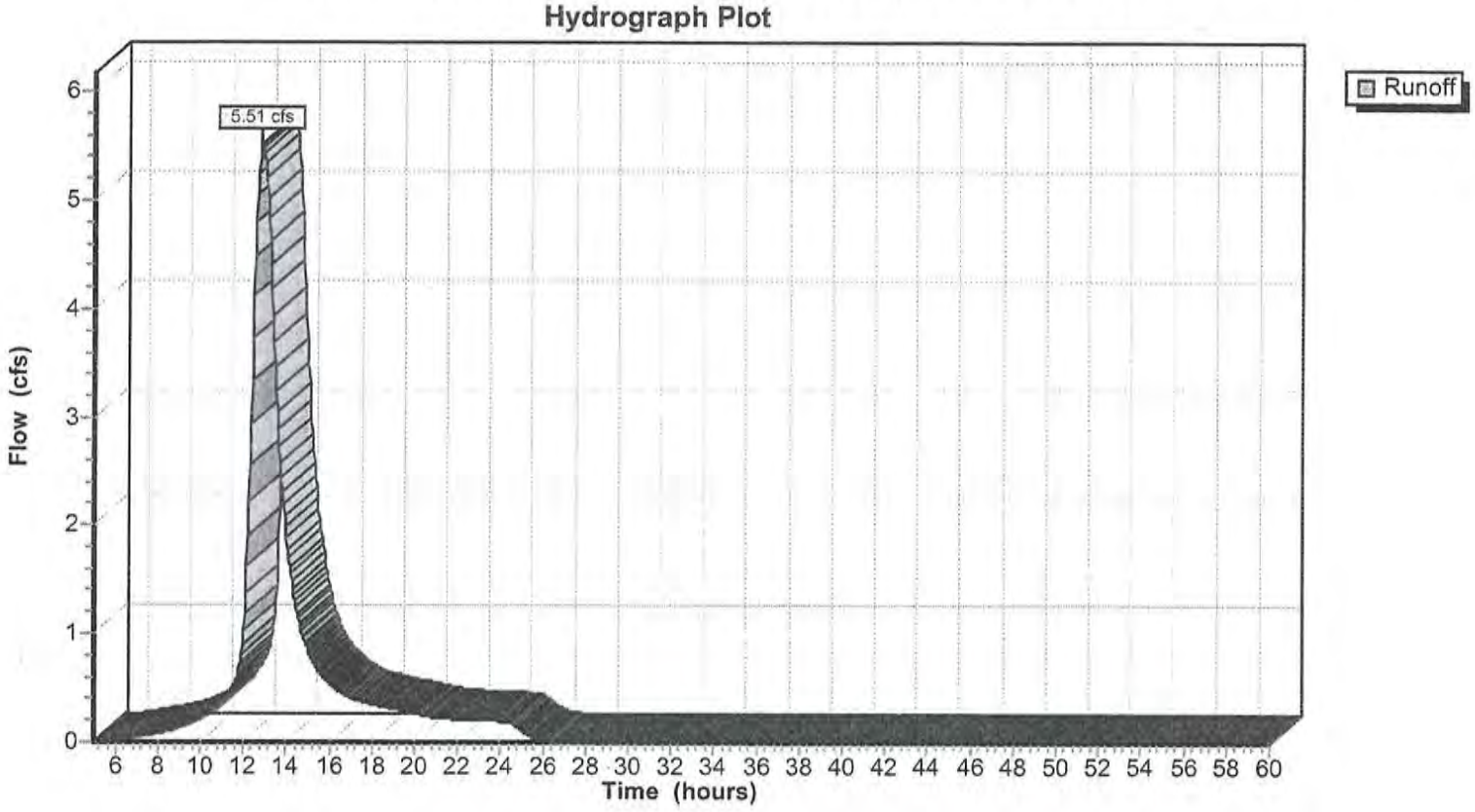
Runoff = 5.51 cfs @ 12.85 hrs, Volume= 1.064 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=6.40"

Area (sf)	CN	Description
26,825	98	ROOF TOPS
23,041	98	SIDEYARD PATIO AREAS
754	98	BATH HSE
1,372	98	SIDEWALK AREA
66,797	74	>75% Grass cover, Good, HSG C
118,789	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	40	0.0800	0.3		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
34.9	732	0.0025	0.4		**Shallow Concentrated Flow, THRU SWALE** Short Grass Pasture Kv= 7.0 fps
39.9	530	0.0010	0.2		**Shallow Concentrated Flow, THRU R/W SWALE** Short Grass Pasture Kv= 7.0 fps
2.4	342	0.0028	2.4	1.89	**Circular Channel (pipe), THUR STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
79.5	1,644	Total			

Subcatchment 2S: 57 PATIO HOMES - EXTERIOR



Subcatchment 21 LOTS: south end lots and r/w

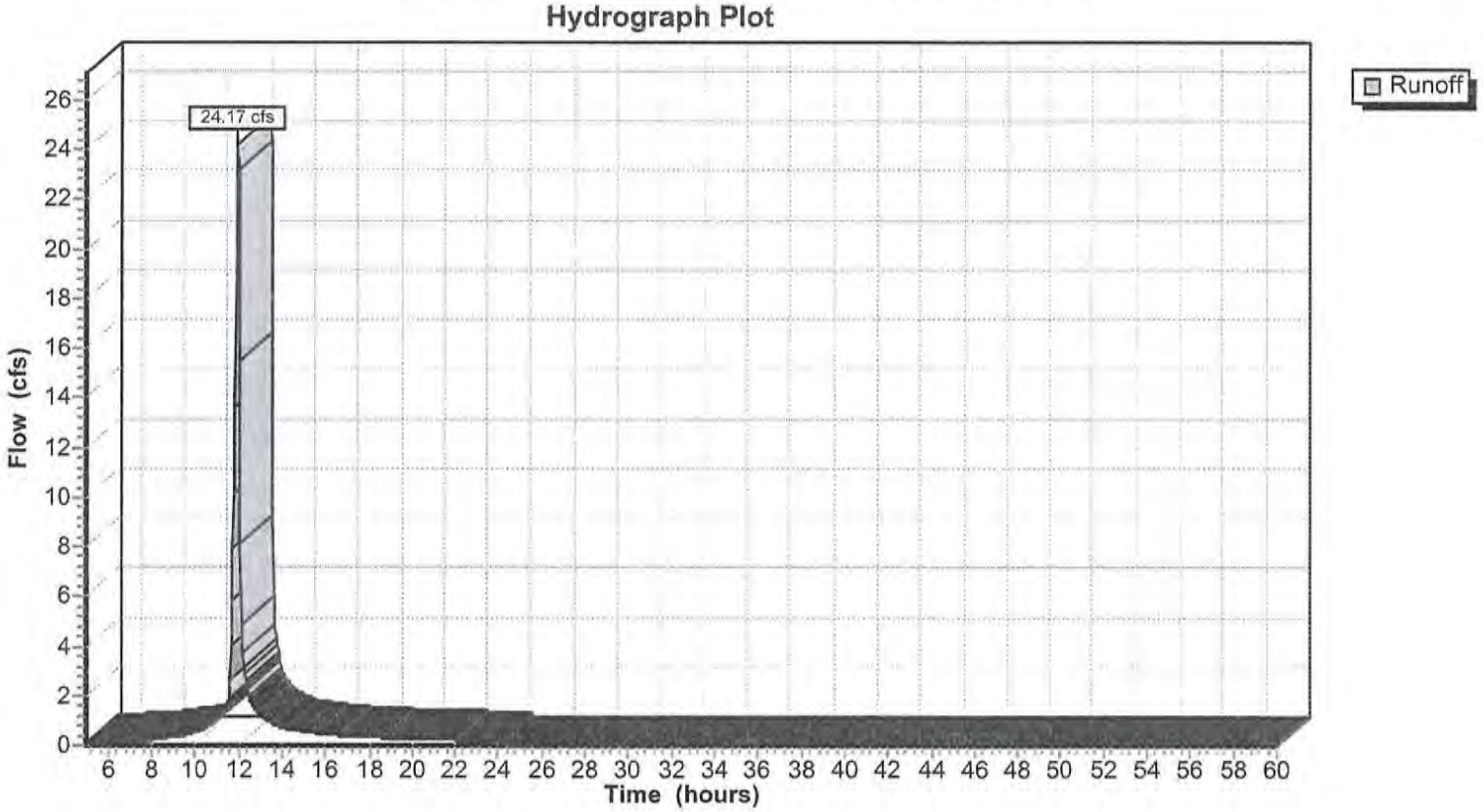
Runoff = 24.17 cfs @ 11.97 hrs, Volume= 1.290 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=6.40"

Area (sf)	CN	Description
29,949	98	conc. sidewalk and pavement
82,278	98	residential lot coverages
17,100	39	>75% Grass cover, Good, HSG A
129,327	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.0208	2.9		**Shallow Concentrated Flow, SHEET FLOW FROM ROADV** Paved Kv= 20.3 fps
6.1	576	0.0015	1.6	14.15	**Parabolic Channel, grass swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.3	78	0.0050	4.2	7.43	**Circular Channel (pipe), 18" rcp culvert** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
6.5	669	Total			

Subcatchment 21 LOTS: south end lots and r/w



Subcatchment 52 LOTS: north end lots & r.w. areas

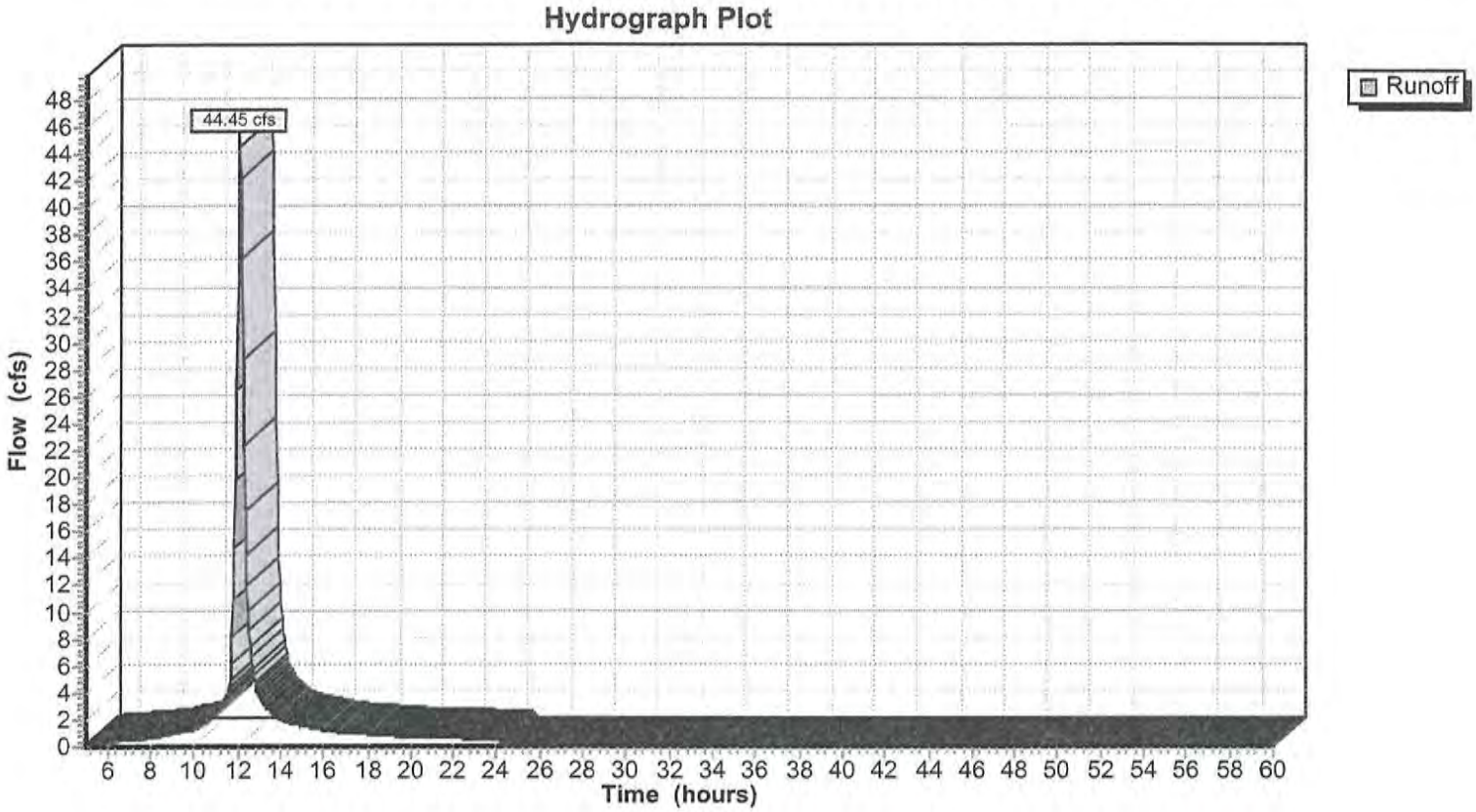
Runoff = 44.45 cfs @ 12.10 hrs, Volume= 3.403 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=6.40"

Area (sf)	CN	Description
84,636	98	conc. sidewalk & pavement
212,240	98	residential lot coverage
37,305	39	>75% Grass cover, Good, HSG A
334,181	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	48	0.0208	1.3		**Sheet Flow, over north cul-de-sac** Smooth surfaces n= 0.011 P2= 4.00"
8.9	871	0.0016	1.6	14.61	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.4	60	0.0016	2.4	4.20	**Circular Channel (pipe), 18 hdpe culvert under devils bay** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
7.8	600	0.0010	1.3	11.55	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.7	137	0.0023	3.5	10.85	**Circular Channel (pipe), 24" hdpe pipe from r/w to jb b-5** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.4	80	0.0010	3.0	21.09	**Circular Channel (pipe), 36" hdpe pipe from jb b-5 to fes** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
18.8	1,796	Total			

Subcatchment 52 LOTS: north end lots & r.w. areas



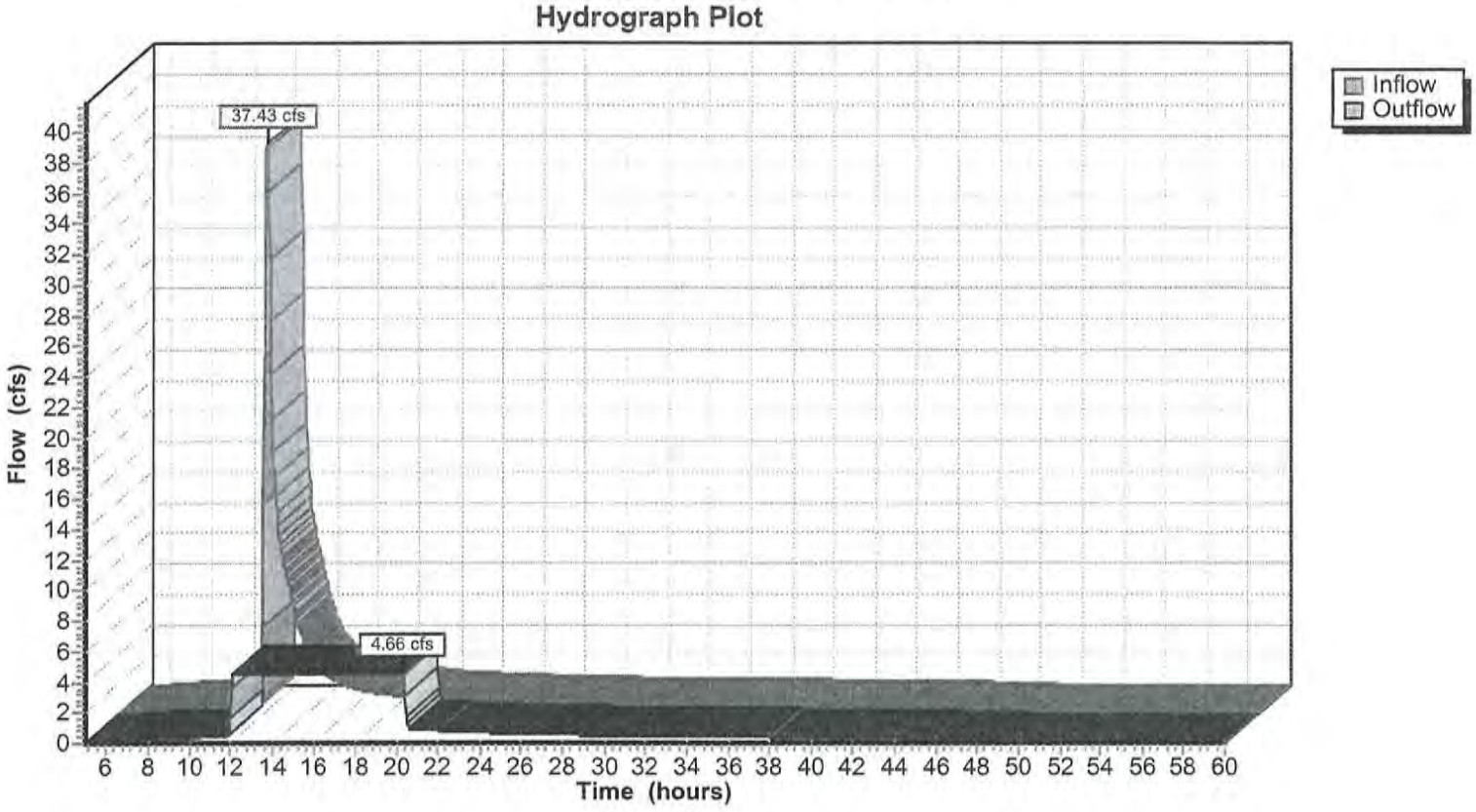
Reach 1R: 36" storm drain

Inflow = 37.43 cfs @ 12.18 hrs, Volume= 4.378 af
Outflow = 4.66 cfs @ 20.34 hrs, Volume= 4.377 af, Atten= 88%, Lag= 489.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.7 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 7.9 min

Peak Depth= 3.00'
Capacity at bank full= 4.57 cfs
Inlet Invert= 5.18', Outlet Invert= 5.16'
36.0" Diameter Pipe n= 0.020 Length= 180.0' Slope= 0.0001 '/'

Reach 1R: 36" storm drain



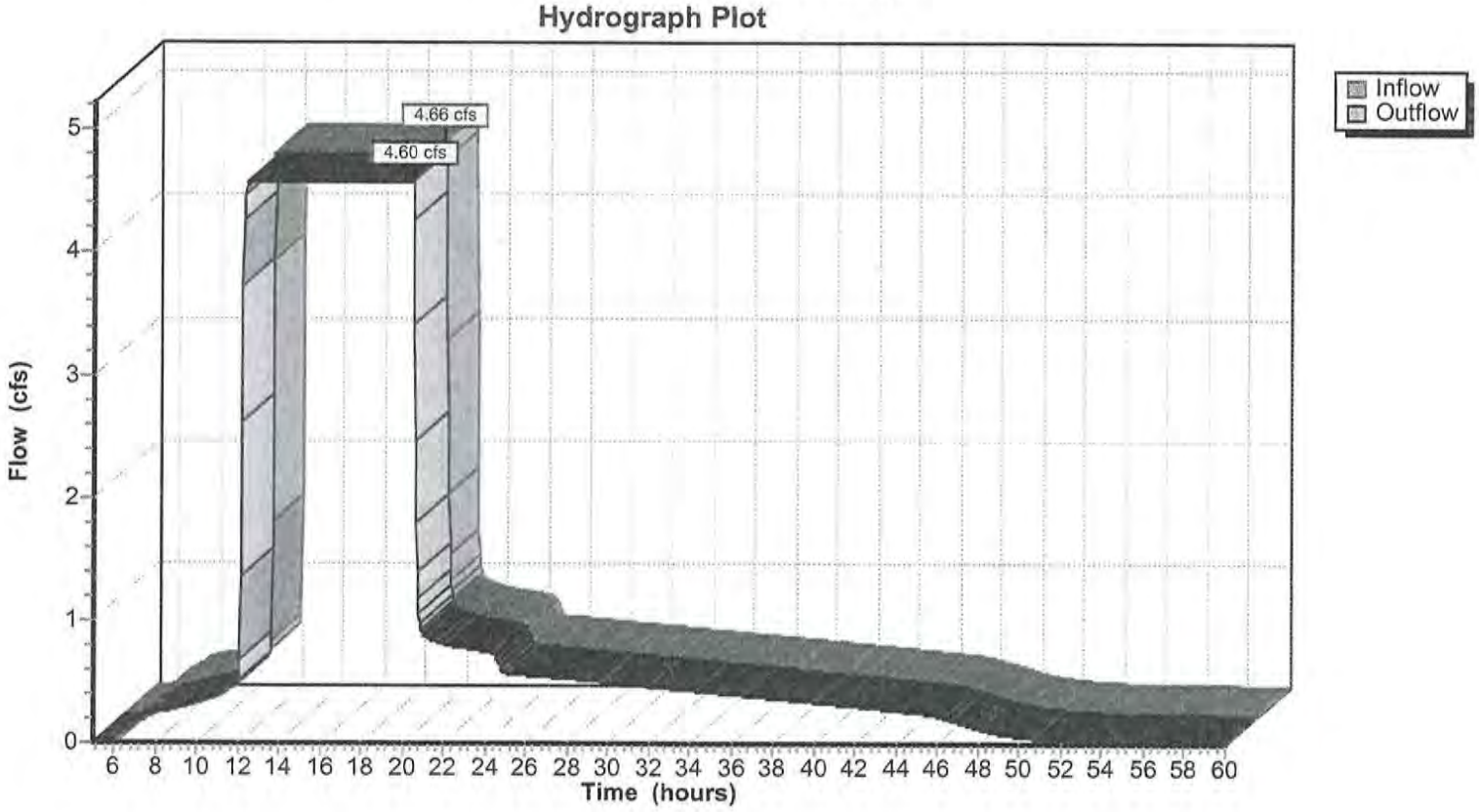
Reach 2R: 36" cmp

Inflow = 4.66 cfs @ 20.34 hrs, Volume= 4.377 af
Outflow = 4.60 cfs @ 20.45 hrs, Volume= 4.377 af, Atten= 1%, Lag= 6.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.7 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.9 fps, Avg. Travel Time= 8.3 min

Peak Depth= 1.21'
Capacity at bank full= 13.42 cfs
Inlet Invert= 5.16', Outlet Invert= 4.75'
36.0" Diameter Pipe n= 0.020 Length= 428.0' Slope= 0.0010 '/'

Reach 2R: 36" cmp



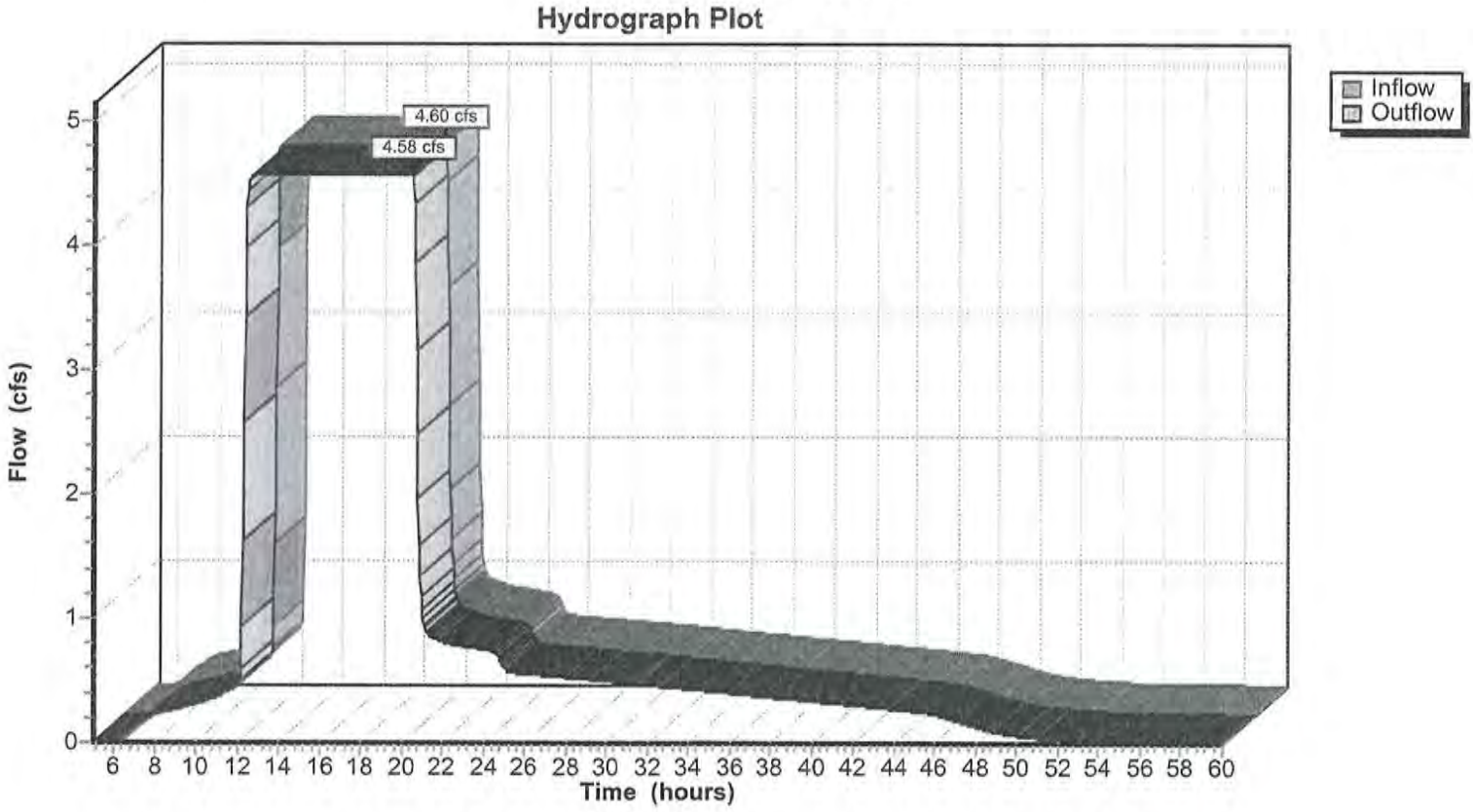
Reach 3R: 36" hdpe

Inflow = 4.60 cfs @ 20.45 hrs, Volume= 4.377 af
Outflow = 4.58 cfs @ 20.50 hrs, Volume= 4.377 af, Atten= 0%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.5 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 1.3 fps, Avg. Travel Time= 9.8 min

Peak Depth= 0.91'
Capacity at bank full= 22.97 cfs
Inlet Invert= 4.75', Outlet Invert= 4.00'
36.0" Diameter Pipe n= 0.012 Length= 742.0' Slope= 0.0010 '/'

Reach 3R: 36" hdpe



Pond 1P: POND

Inflow = 47.04 cfs @ 12.08 hrs, Volume= 4.385 af
Outflow = 37.43 cfs @ 12.18 hrs, Volume= 4.378 af, Atten= 20%, Lag= 5.8 min
Primary = 37.43 cfs @ 12.18 hrs, Volume= 4.378 af

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

Peak Elev= 11.43' Storage= 52,436 cf
Plug-Flow detention time= 265.4 min calculated for 4.378 af (100% of inflow)
Storage and wetted areas determined by Irregular sections

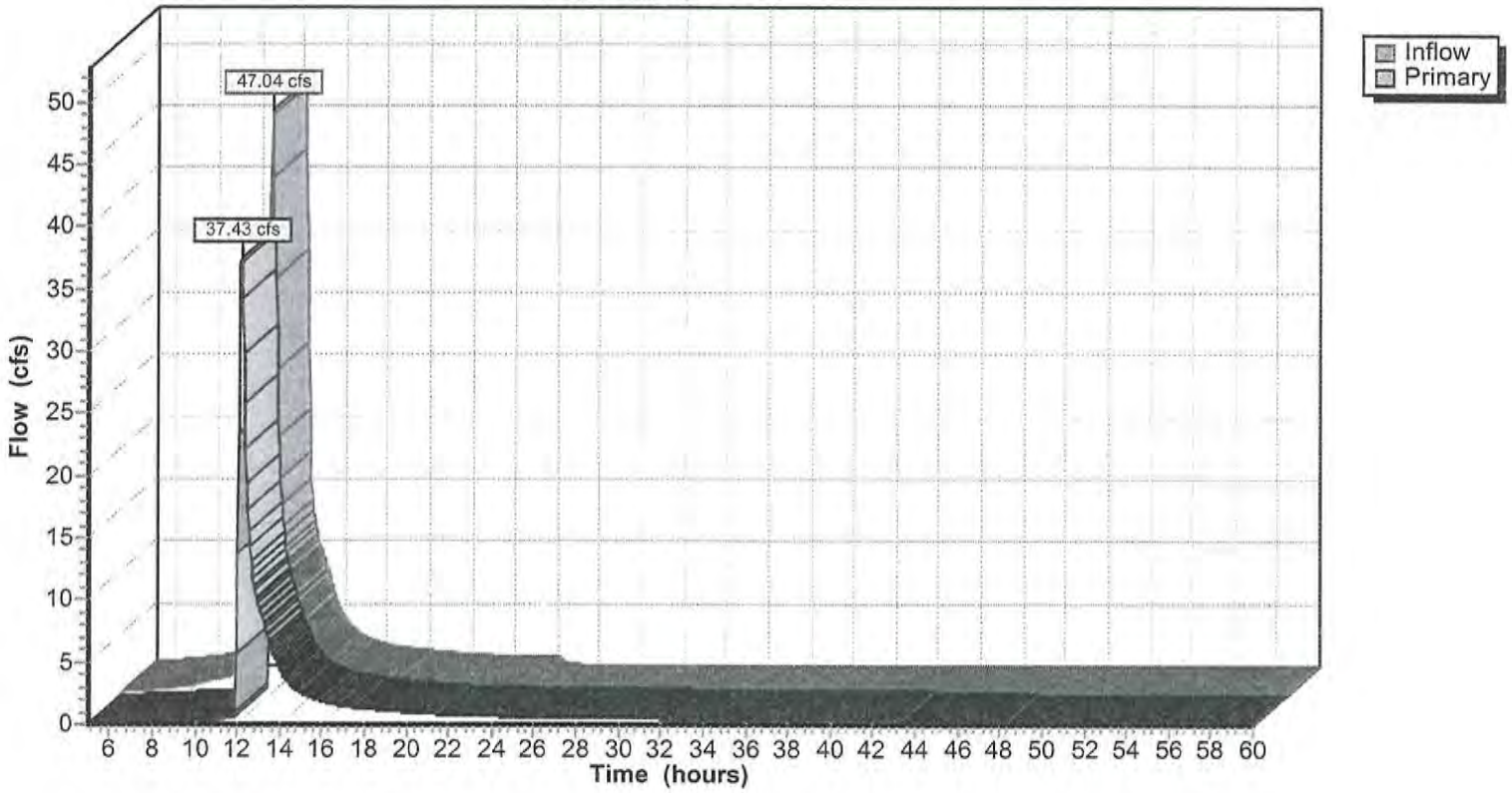
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
8.50	0	0.0	0	0	0
9.00	18,756	643.0	3,126	3,126	32,902
9.25	19,240	648.0	4,749	7,875	33,440
10.00	20,715	662.0	14,980	22,855	34,980
10.05	20,715	662.0	1,036	23,891	35,013
10.50	20,715	662.0	9,322	33,213	35,311
11.00	20,715	662.0	10,358	43,570	35,642
11.50	20,715	662.0	10,358	53,928	35,973
12.00	22,730	681.0	10,857	64,785	38,031

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
- 3=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	8.50'	**18.0" x 396.0' long Culvert** Ke= 0.500 Outlet Invert= 6.50' S= 0.0051 '/' n= 0.013 Cc= 0.900
2	Device 1	8.50'	**4.0" Vert. Orifice/Grate** C= 0.600
3	Primary	10.50'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond 1P: POND

Hydrograph Plot



Pond ex pond: existing pond

Inflow = 58.66 cfs @ 12.02 hrs, Volume= 9.070 af
Outflow = 20.95 cfs @ 12.40 hrs, Volume= 9.009 af, Atten= 64%, Lag= 22.7 min
Primary = 20.95 cfs @ 12.40 hrs, Volume= 9.009 af

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

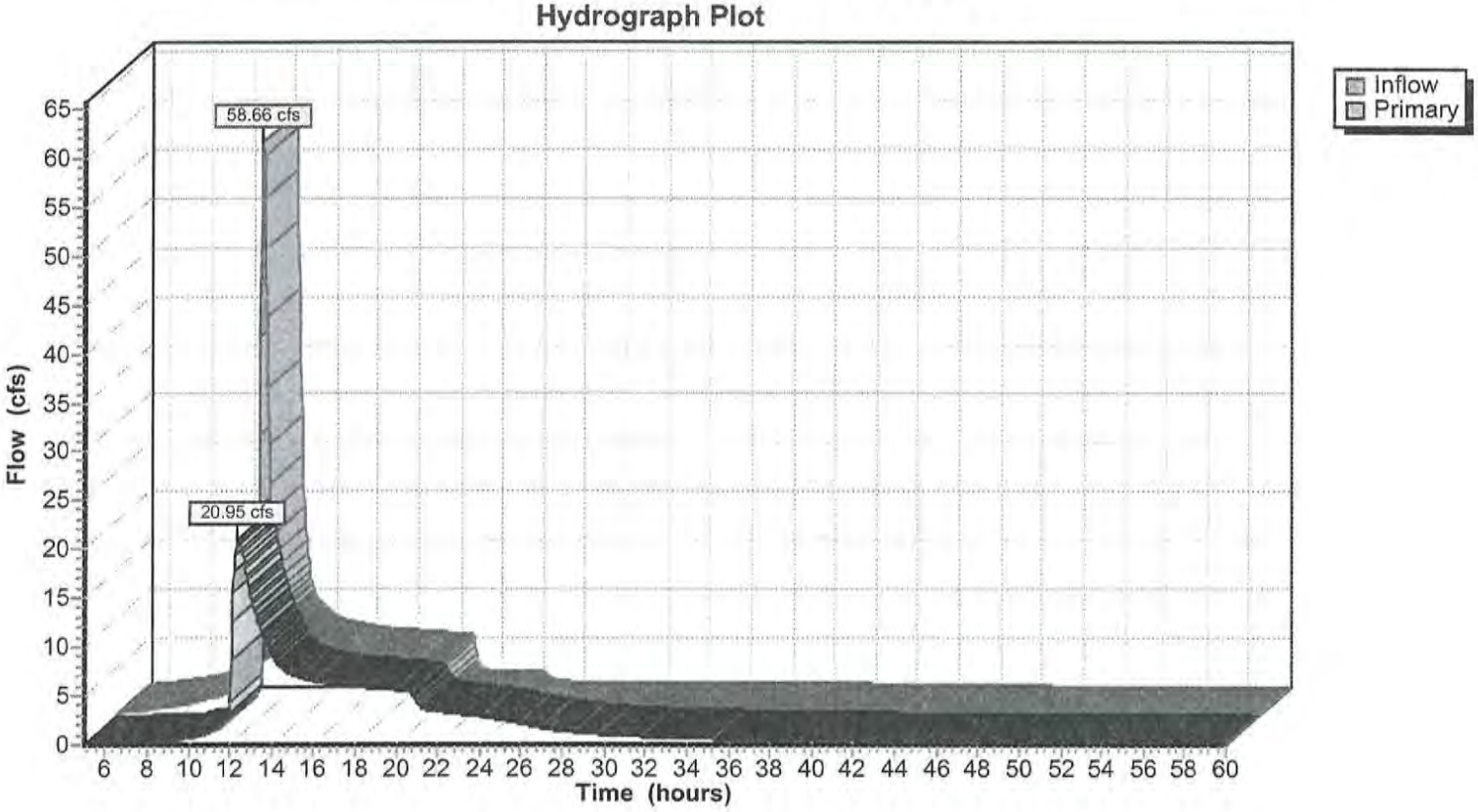
Peak Elev= 6.22' Storage= 98,451 cf
Plug-Flow detention time= 205.0 min calculated for 9.009 af (99% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
4.00	0	0.0	0	0	0
5.00	41,303	1,015.0	13,768	13,768	81,984
6.00	84,410	2,341.0	61,586	75,354	436,112
7.00	130,086	1,977.0	106,428	181,782	561,207

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
  - 3=Orifice/Grate
- 4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	4.00'	**18.0" x 300.0' long Culvert X 2.00** Ke= 0.500 Outlet Invert= 3.24' S= 0.0025 '/' n= 0.012 Cc= 0.900
2	Device 1	4.00'	**2.7" Vert. Orifice/Grate X 2.00** C= 0.600
3	Device 1	4.85'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600
4	Primary	5.75'	**60.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ex pond: existing pond



POST-DEVELOPMENT STORMWATER CALCULATIONS
(HYPOTHETHICAL 25 YEAR STORM EVENT)

Prepared For

COROLLA BAY

(72 Lot Residential Development)

Located on

OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007
Revised: 4/28/08

Subcatchment 1S: 57 PATIO HOMES - INTERIOR

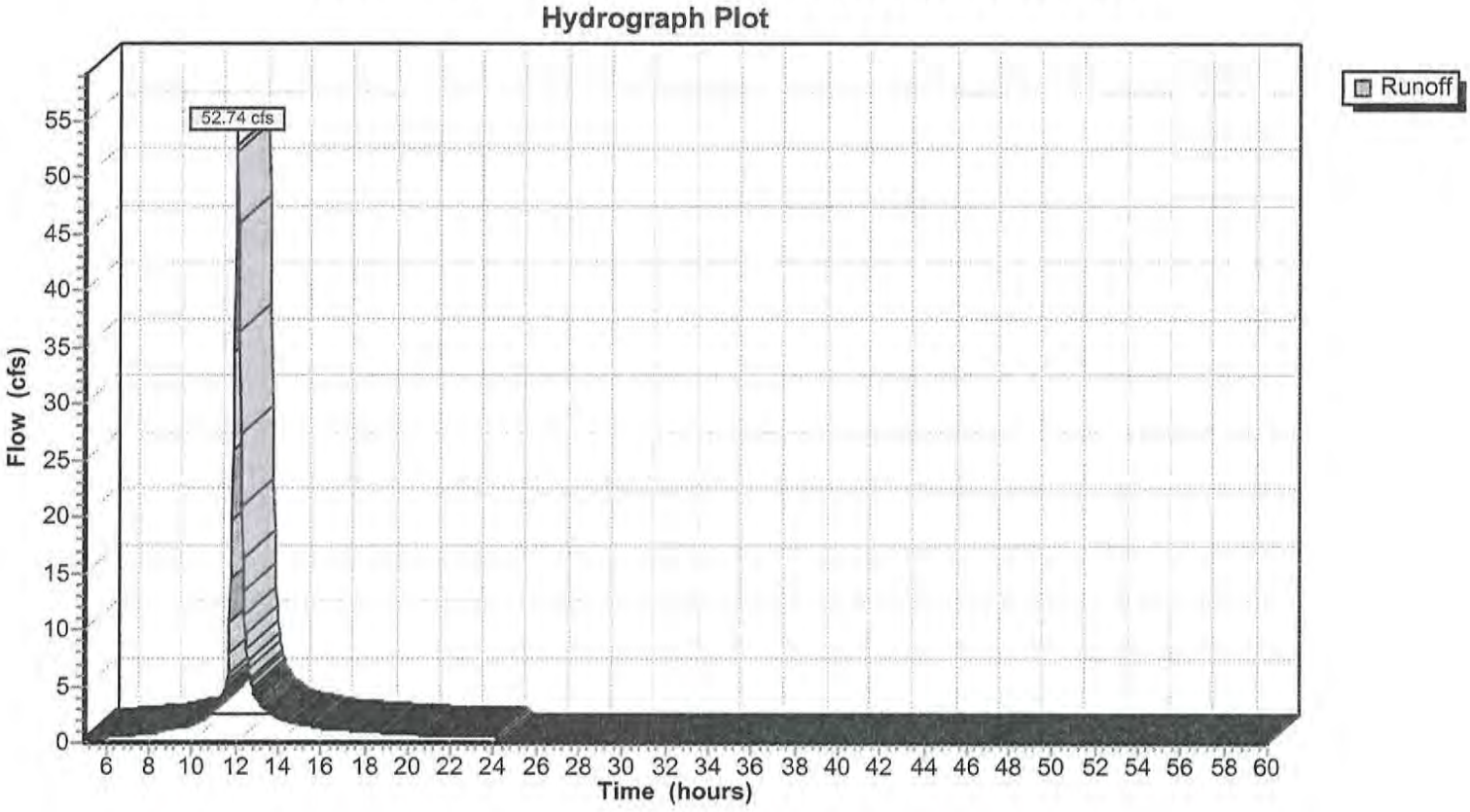
Runoff = 52.74 cfs @ 12.08 hrs, Volume= 3.853 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=7.30"

Area (sf)	CN	Description
55,825	98	ROOF TOPS
46,341	98	SIDE YARD PATIO AREA
26,310	98	DRIVEWAYS
7,361	98	INNER SIDEWALK AREA
55,920	98	ROADWAY & SIDEWALKS
16,272	98	REC. BLDG & POOL AREA
34,099	98	HERRING STREET AREA
77,856	74	>75% Grass cover, Good, HSG C
319,984	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	85	0.0141	0.2		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
8.1	1,163	0.0028	2.4	1.89	**Circular Channel (pipe), THRU STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
16.6	1,248	Total			

Subcatchment 1S: 57 PATIO HOMES - INTERIOR



Subcatchment 2S: 57 PATIO HOMES - EXTERIOR

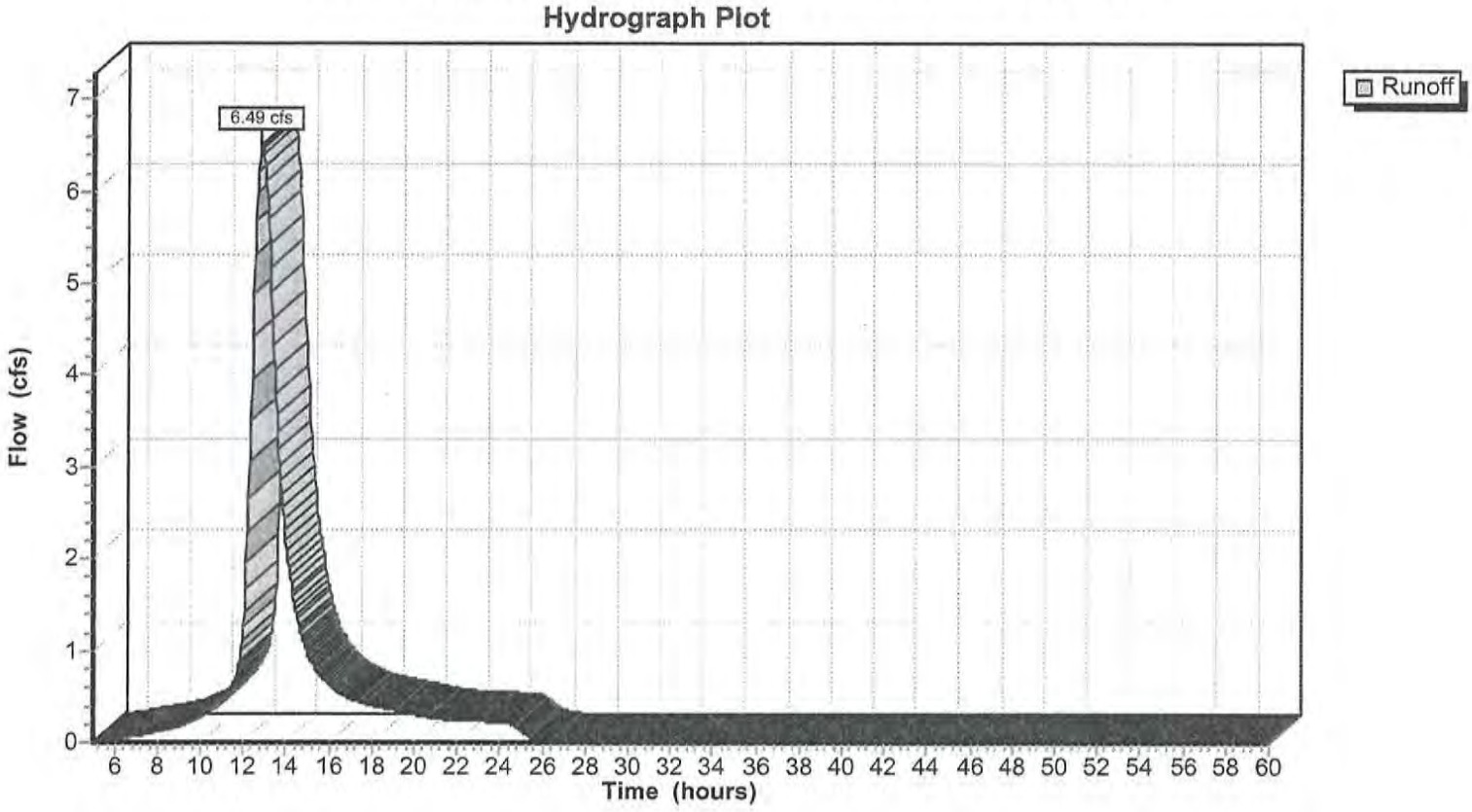
Runoff = 6.49 cfs @ 12.84 hrs, Volume= 1.259 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=7.30"

Area (sf)	CN	Description
26,825	98	ROOF TOPS
23,041	98	SIDEYARD PATIO AREAS
754	98	BATH HSE
1,372	98	SIDEWALK AREA
66,797	74	>75% Grass cover, Good, HSG C
118,789	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	40	0.0800	0.3		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
34.9	732	0.0025	0.4		**Shallow Concentrated Flow, THRU SWALE** Short Grass Pasture Kv= 7.0 fps
39.9	530	0.0010	0.2		**Shallow Concentrated Flow, THRU R/W SWALE** Short Grass Pasture Kv= 7.0 fps
2.4	342	0.0028	2.4	1.89	**Circular Channel (pipe), THUR STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
79.5	1,644	Total			

Subcatchment 2S: 57 PATIO HOMES - EXTERIOR



Subcatchment 21 LOTS: south end lots and r/w

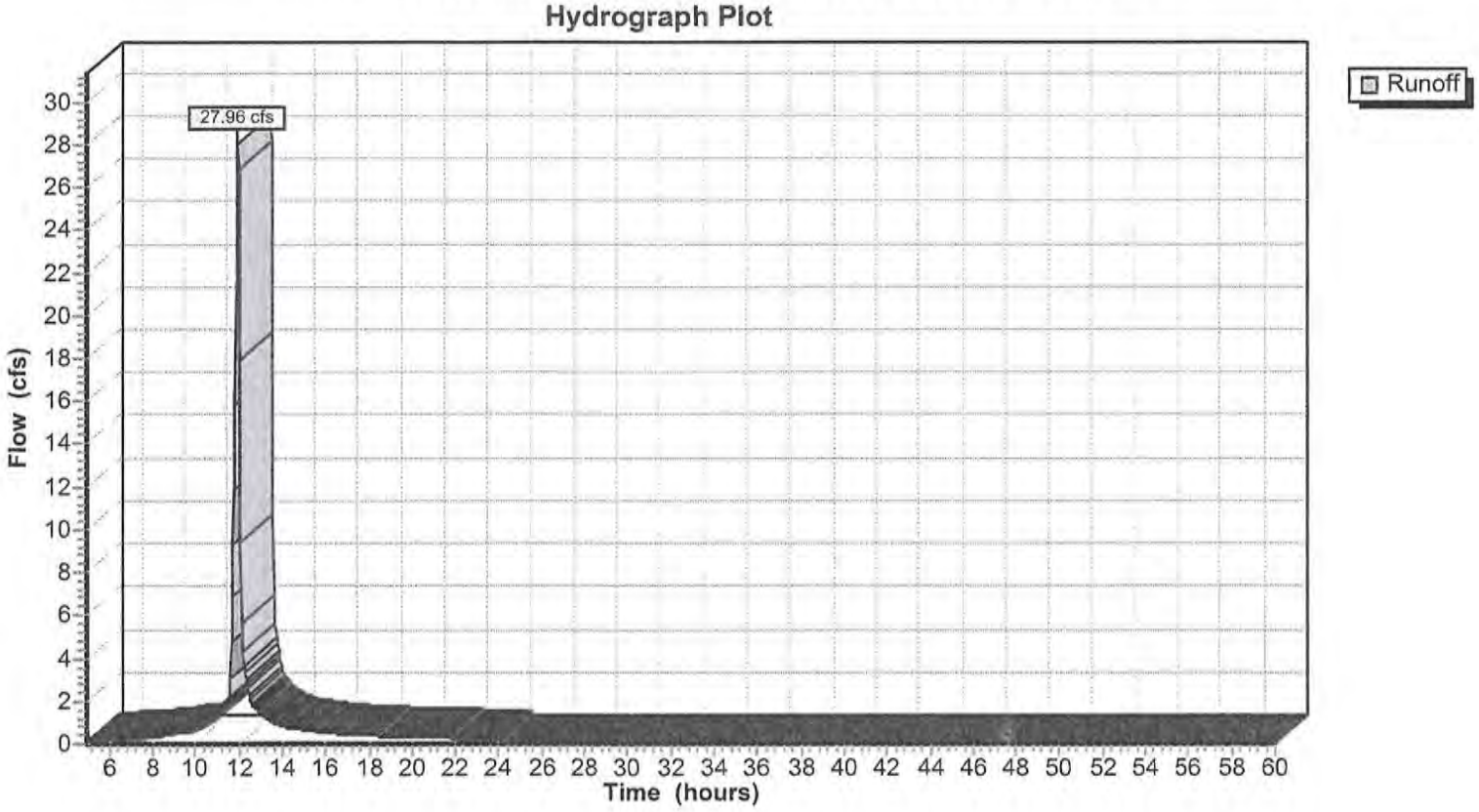
Runoff = 27.96 cfs @ 11.97 hrs, Volume= 1.504 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=7.30"

Area (sf)	CN	Description
29,949	98	conc. sidewalk and pavement
82,278	98	residential lot coverages
17,100	39	>75% Grass cover, Good, HSG A
129,327	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.0208	2.9		**Shallow Concentrated Flow, SHEET FLOW FROM ROAD** Paved Kv= 20.3 fps
6.1	576	0.0015	1.6	14.15	**Parabolic Channel, grass swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.3	78	0.0050	4.2	7.43	**Circular Channel (pipe), 18" rcp culvert** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
6.5	669	Total			

Subcatchment 21 LOTS: south end lots and r/w



Subcatchment 52 LOTS: north end lots & r.w. areas

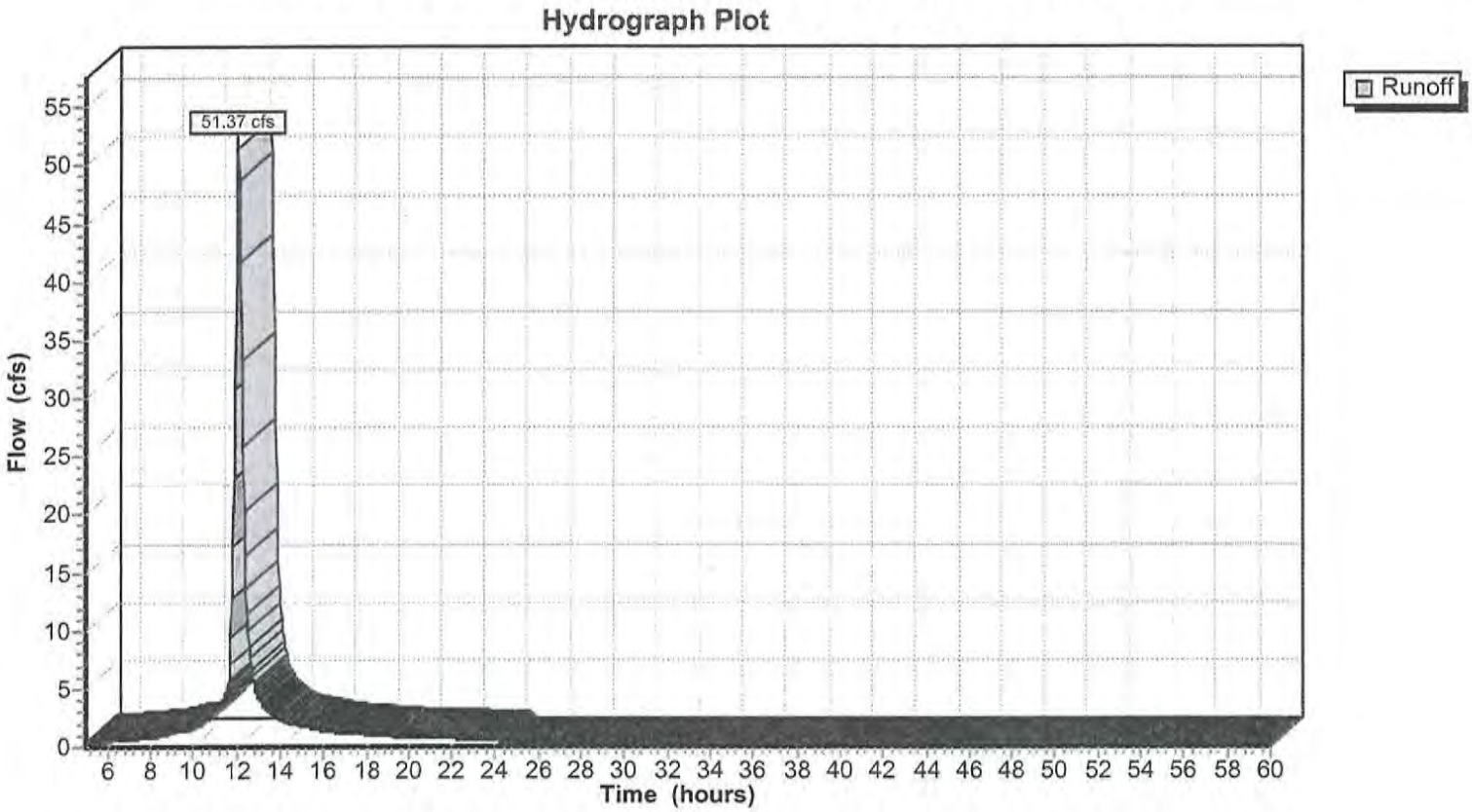
Runoff = 51.37 cfs @ 12.10 hrs, Volume= 3.959 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=7.30"

Area (sf)	CN	Description
84,636	98	conc. sidewalk & pavement
212,240	98	residential lot coverage
37,305	39	>75% Grass cover, Good, HSG A
334,181	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	48	0.0208	1.3		**Sheet Flow, over north cul-de-sac** Smooth surfaces n= 0.011 P2= 4.00"
8.9	871	0.0016	1.6	14.61	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.4	60	0.0016	2.4	4.20	**Circular Channel (pipe), 18 hdpe culvert under devils bay** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
7.8	600	0.0010	1.3	11.55	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.7	137	0.0023	3.5	10.85	**Circular Channel (pipe), 24" hdpe pipe from r/w to jb b-5** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.4	80	0.0010	3.0	21.09	**Circular Channel (pipe), 36" hdpe pipe from jb b-5 to fes** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
18.8	1,796	Total			

Subcatchment 52 LOTS: north end lots & r.w. areas



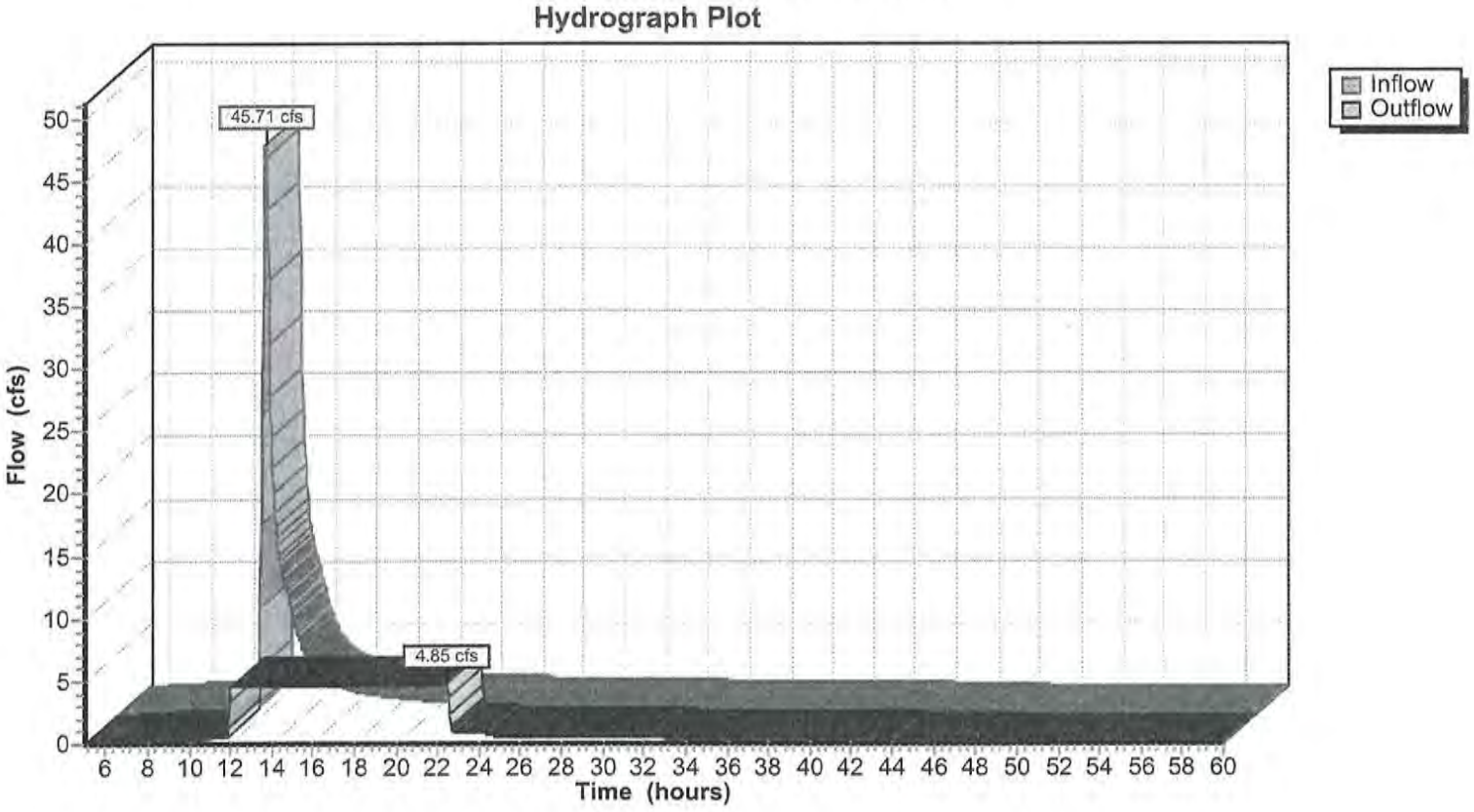
Reach 1R: 36" storm drain

Inflow = 45.71 cfs @ 12.17 hrs, Volume= 5.104 af
Outflow = 4.85 cfs @ 22.48 hrs, Volume= 5.104 af, Atten= 89%, Lag= 619.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.7 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 7.7 min

Peak Depth= 3.00'
Capacity at bank full= 4.57 cfs
Inlet Invert= 5.18', Outlet Invert= 5.16'
36.0" Diameter Pipe n= 0.020 Length= 180.0' Slope= 0.0001 '/'

Reach 1R: 36" storm drain



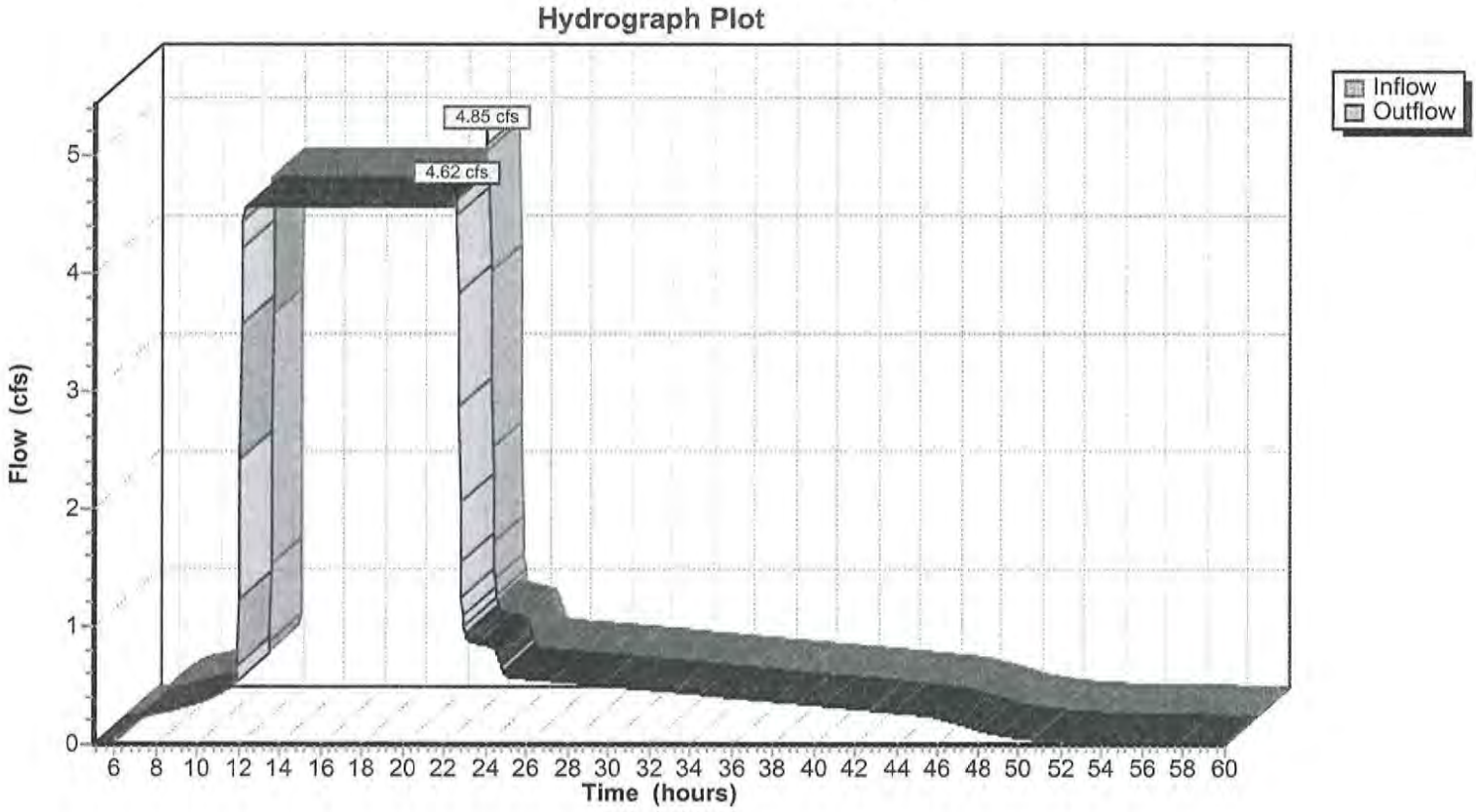
Reach 2R: 36" cmp

Inflow = 4.85 cfs @ 22.48 hrs, Volume= 5.104 af
Outflow = 4.62 cfs @ 22.54 hrs, Volume= 5.104 af, Atten= 5%, Lag= 3.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.7 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.9 fps, Avg. Travel Time= 8.0 min

Peak Depth= 1.22'
Capacity at bank full= 13.42 cfs
Inlet Invert= 5.16', Outlet Invert= 4.75'
36.0" Diameter Pipe n= 0.020 Length= 428.0' Slope= 0.0010 '/'

Reach 2R: 36" cmp



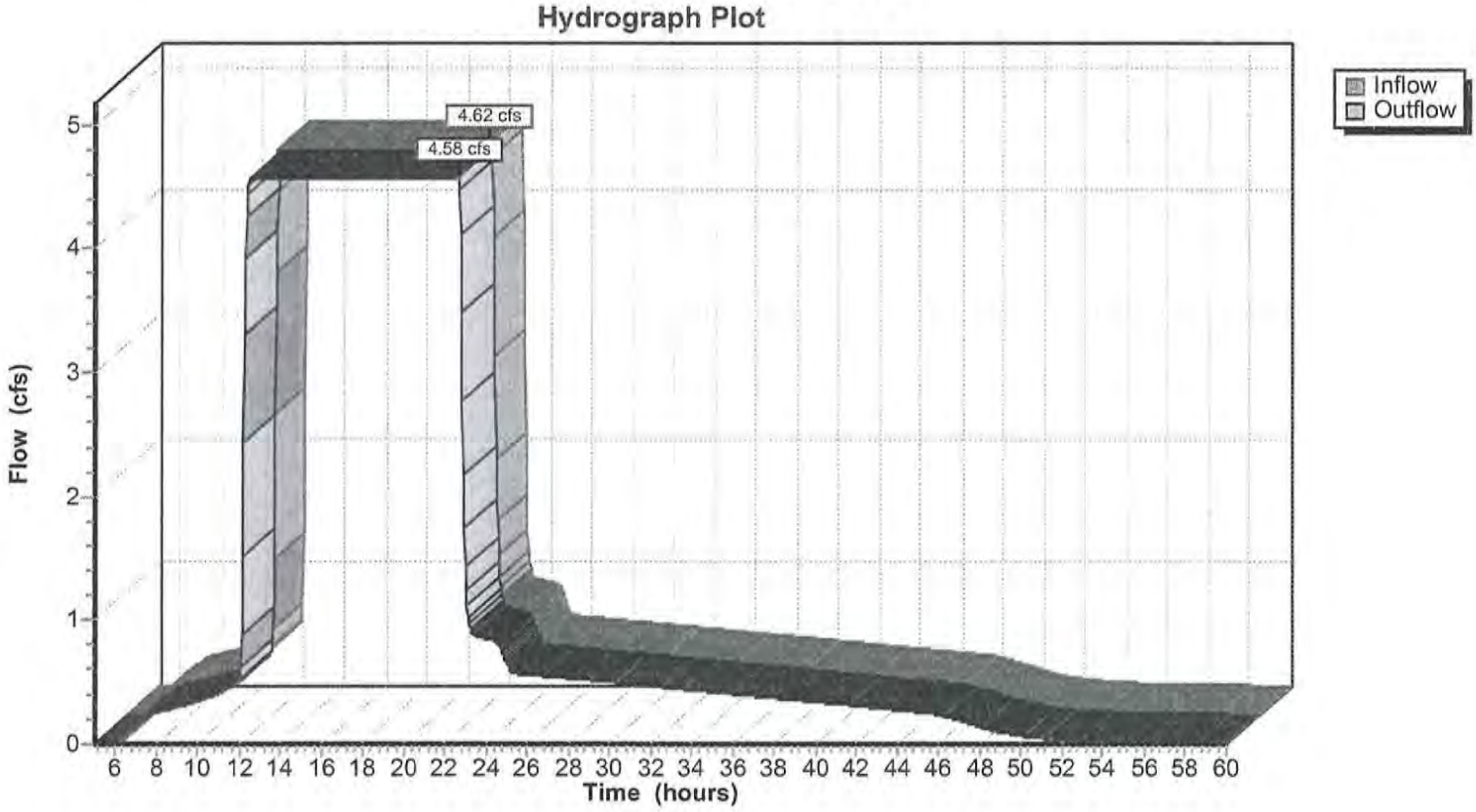
Reach 3R: 36" hdpe

Inflow = 4.62 cfs @ 22.54 hrs, Volume= 5.104 af
Outflow = 4.58 cfs @ 22.65 hrs, Volume= 5.103 af, Atten= 1%, Lag= 6.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.5 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 1.3 fps, Avg. Travel Time= 9.4 min

Peak Depth= 0.91'
Capacity at bank full= 22.97 cfs
Inlet Invert= 4.75', Outlet Invert= 4.00'
36.0" Diameter Pipe n= 0.012 Length= 742.0' Slope= 0.0010 '/'

Reach 3R: 36" hdpe



Pond 1P: POND

Inflow = 54.30 cfs @ 12.08 hrs, Volume= 5.112 af
Outflow = 45.71 cfs @ 12.17 hrs, Volume= 5.104 af, Atten= 16%, Lag= 5.0 min
Primary = 45.71 cfs @ 12.17 hrs, Volume= 5.104 af

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

Peak Elev= 11.56' Storage= 55,284 cf
Plug-Flow detention time= 232.2 min calculated for 5.099 af (100% of inflow)
Storage and wetted areas determined by Irregular sections

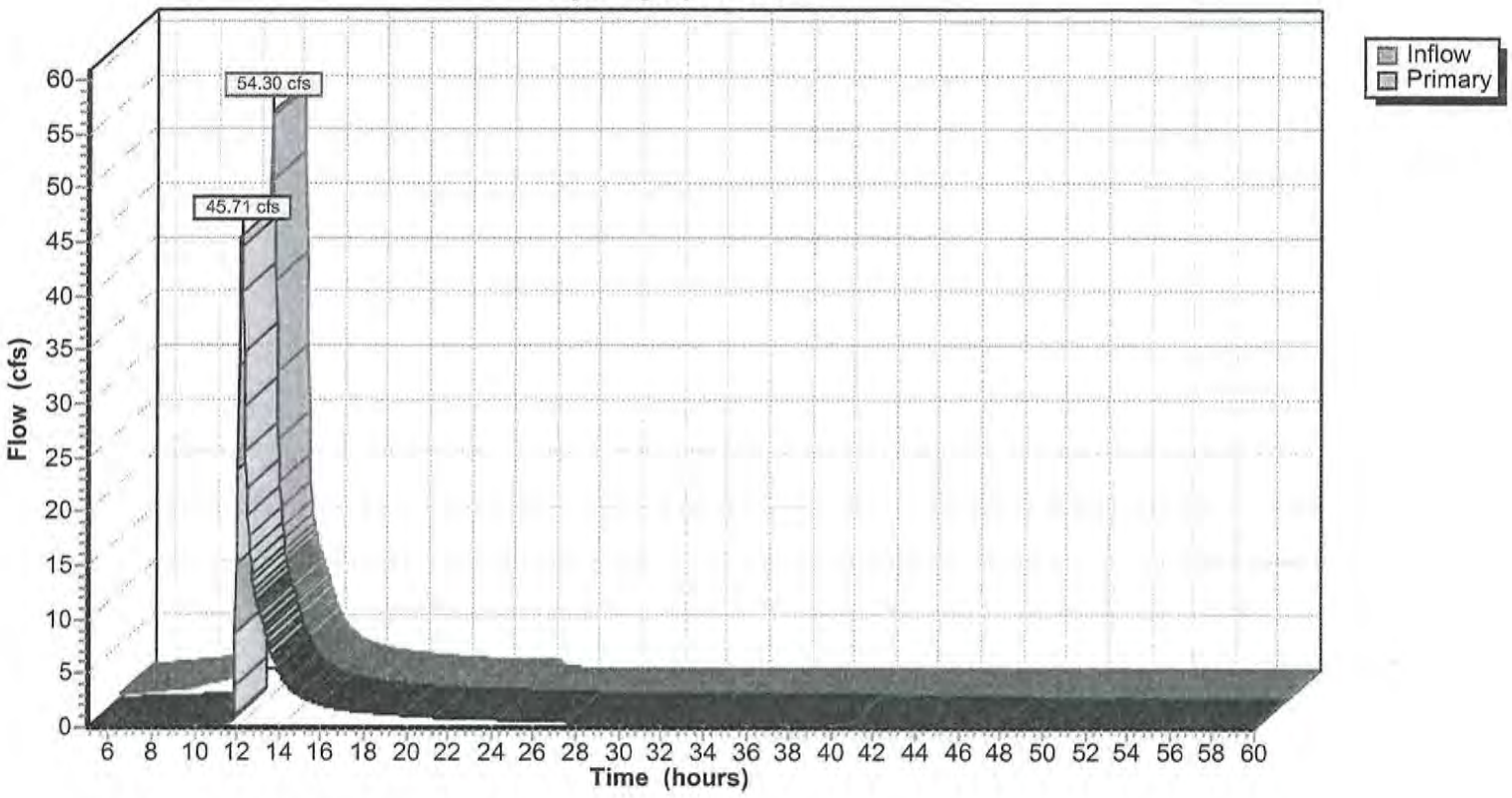
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
8.50	0	0.0	0	0	0
9.00	18,756	643.0	3,126	3,126	32,902
9.25	19,240	648.0	4,749	7,875	33,440
10.00	20,715	662.0	14,980	22,855	34,980
10.05	20,715	662.0	1,036	23,891	35,013
10.50	20,715	662.0	9,322	33,213	35,311
11.00	20,715	662.0	10,358	43,570	35,642
11.50	20,715	662.0	10,358	53,928	35,973
12.00	22,730	681.0	10,857	64,785	38,031

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
- 3=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	8.50'	**18.0" x 396.0' long Culvert** Ke= 0.500 Outlet Invert= 6.50' S= 0.0051 '/' n= 0.013 Cc= 0.900
2	Device 1	8.50'	**4.0" Vert. Orifice/Grate** C= 0.600
3	Primary	10.50'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond 1P: POND

Hydrograph Plot



Pond ex pond: existing pond

Inflow = 67.88 cfs @ 12.02 hrs, Volume= 10.566 af
Outflow = 27.31 cfs @ 12.36 hrs, Volume= 10.504 af, Atten= 60%, Lag= 20.3 min
Primary = 27.31 cfs @ 12.36 hrs, Volume= 10.504 af

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

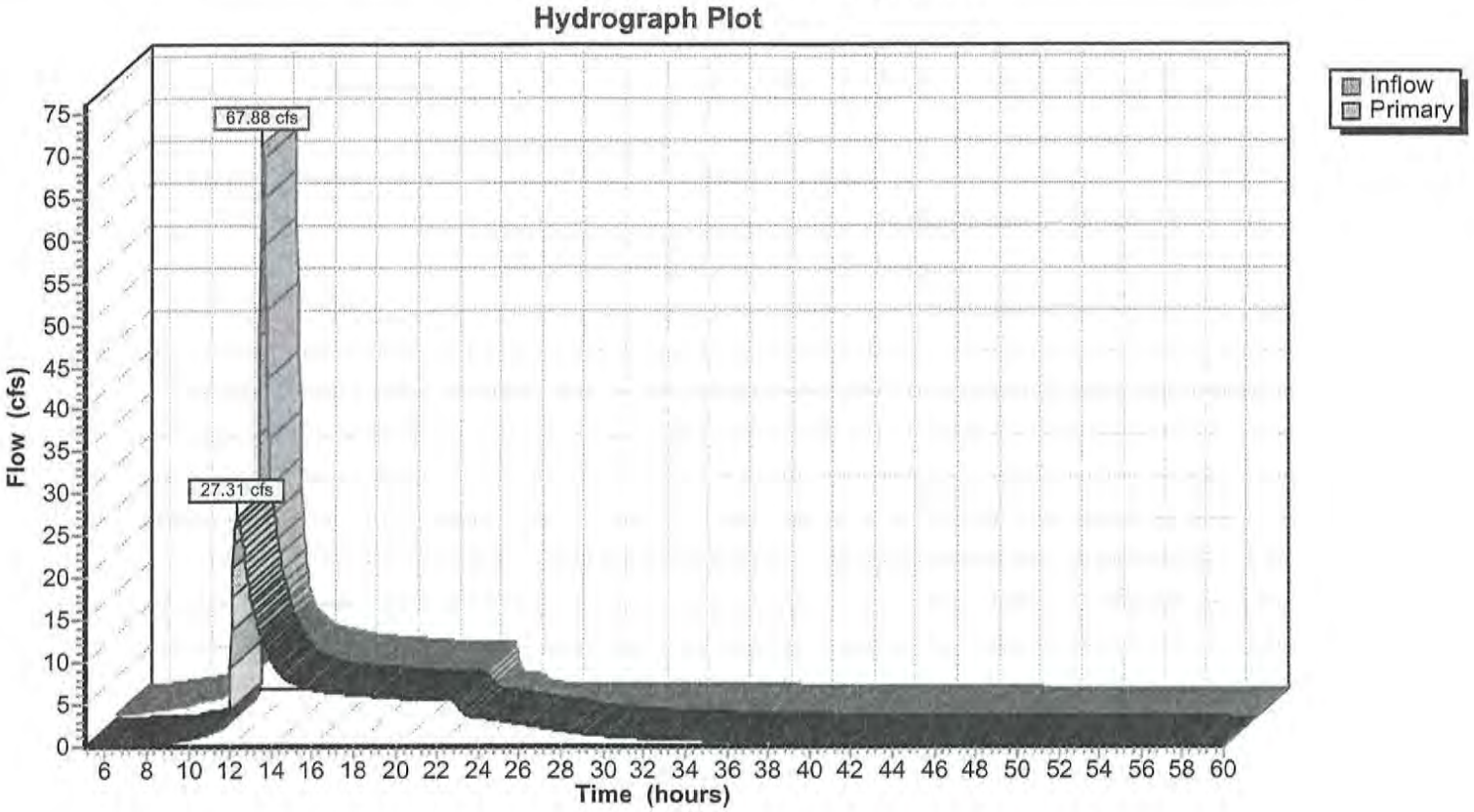
Peak Elev= 6.33' Storage= 110,209 cf
Plug-Flow detention time= 191.2 min calculated for 10.504 af (99% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
4.00	0	0.0	0	0	0
5.00	41,303	1,015.0	13,768	13,768	81,984
6.00	84,410	2,341.0	61,586	75,354	436,112
7.00	130,086	1,977.0	106,428	181,782	561,207

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
  - 3=Orifice/Grate
- 4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	4.00'	**18.0" x 300.0' long Culvert X 2.00** Ke= 0.500 Outlet Invert= 3.24' S= 0.0025 '/' n= 0.012 Cc= 0.900
2	Device 1	4.00'	**2.7" Vert. Orifice/Grate X 2.00** C= 0.600
3	Device 1	4.85'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600
4	Primary	5.75'	**60.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ex pond: existing pond



POST-DEVELOPMENT STORMWATER CALCULATIONS
(HYPOTHETHICAL 100 YEAR STORM EVENT)

Prepared For

COROLLA BAY

(72 Lot Residential Development)

Located on

OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007
Revised: 4/28/08

Subcatchment 1S: 57 PATIO HOMES - INTERIOR

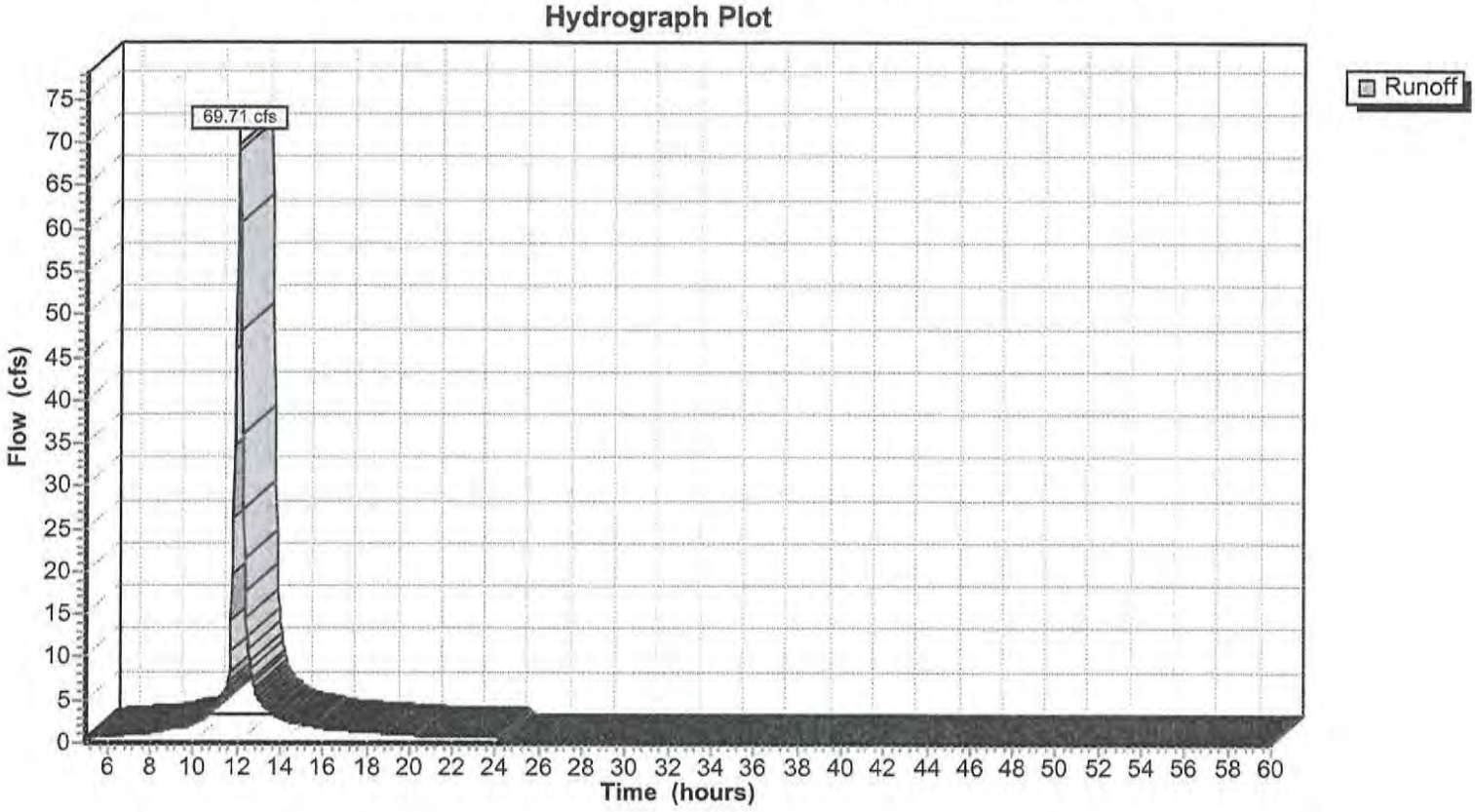
Runoff = 69.71 cfs @ 12.08 hrs, Volume= 5.150 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=9.50"

Area (sf)	CN	Description
55,825	98	ROOF TOPS
46,341	98	SIDE YARD PATIO AREA
26,310	98	DRIVEWAYS
7,361	98	INNER SIDEWALK AREA
55,920	98	ROADWAY & SIDEWALKS
16,272	98	REC. BLDG & POOL AREA
34,099	98	HERRING STREET AREA
77,856	74	>75% Grass cover, Good, HSG C
319,984	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	85	0.0141	0.2		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
8.1	1,163	0.0028	2.4	1.89	**Circular Channel (pipe), THRU STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
16.6	1,248	Total			

Subcatchment 1S: 57 PATIO HOMES - INTERIOR



Subcatchment 2S: 57 PATIO HOMES - EXTERIOR

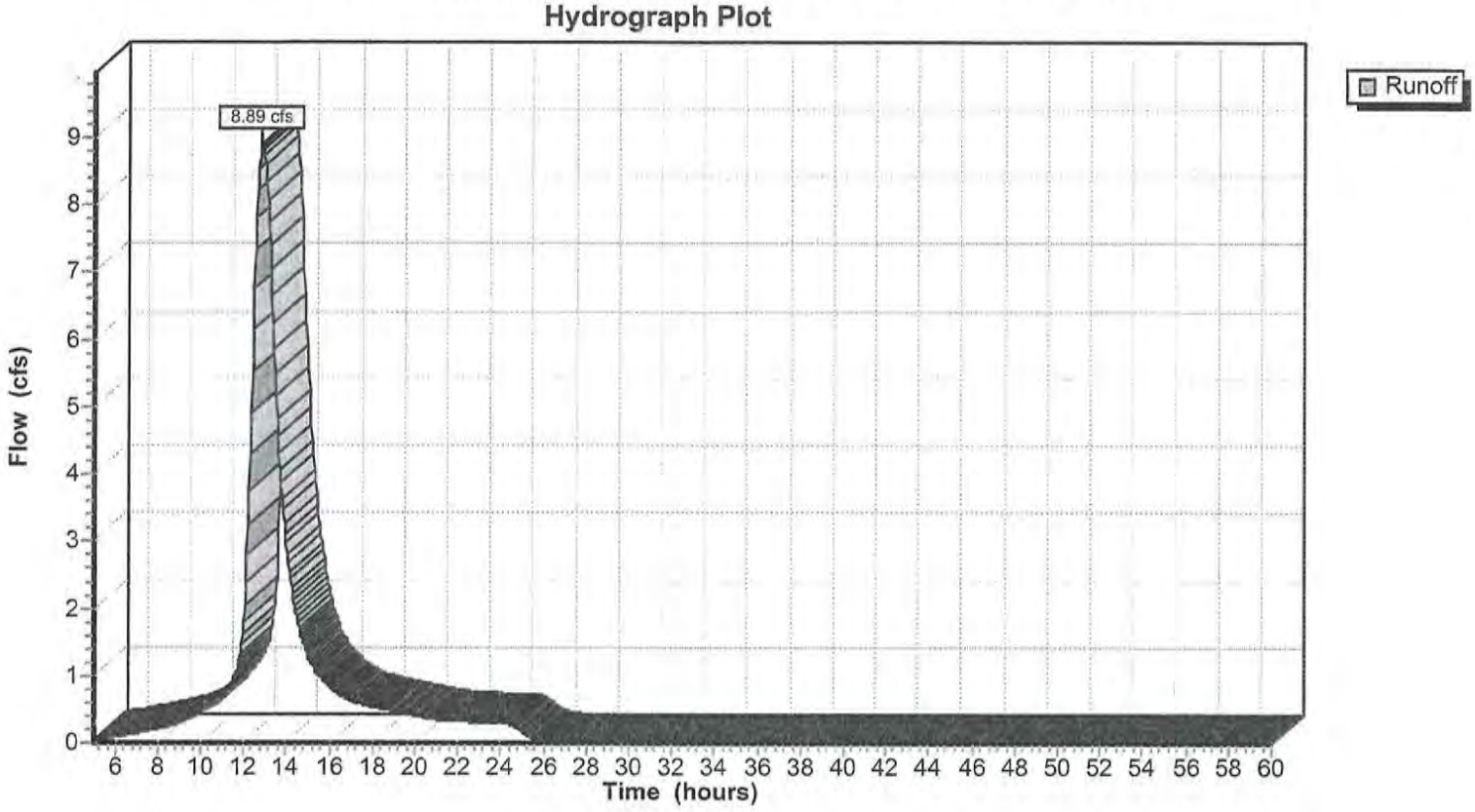
Runoff = 8.89 cfs @ 12.83 hrs, Volume= 1.741 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=9.50"

Area (sf)	CN	Description
26,825	98	ROOF TOPS
23,041	98	SIDEYARD PATIO AREAS
754	98	BATH HSE
1,372	98	SIDEWALK AREA
66,797	74	>75% Grass cover, Good, HSG C
118,789	85	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	40	0.0800	0.3		**Sheet Flow, OVER GRASS** Grass: Short n= 0.150 P2= 4.30"
34.9	732	0.0025	0.4		**Shallow Concentrated Flow, THRU SWALE** Short Grass Pasture Kv= 7.0 fps
39.9	530	0.0010	0.2		**Shallow Concentrated Flow, THRU R/W SWALE** Short Grass Pasture Kv= 7.0 fps
2.4	342	0.0028	2.4	1.89	**Circular Channel (pipe), THUR STORM DRAIN** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
79.5	1,644	Total			

Subcatchment 2S: 57 PATIO HOMES - EXTERIOR



Subcatchment 21 LOTS: south end lots and r/w

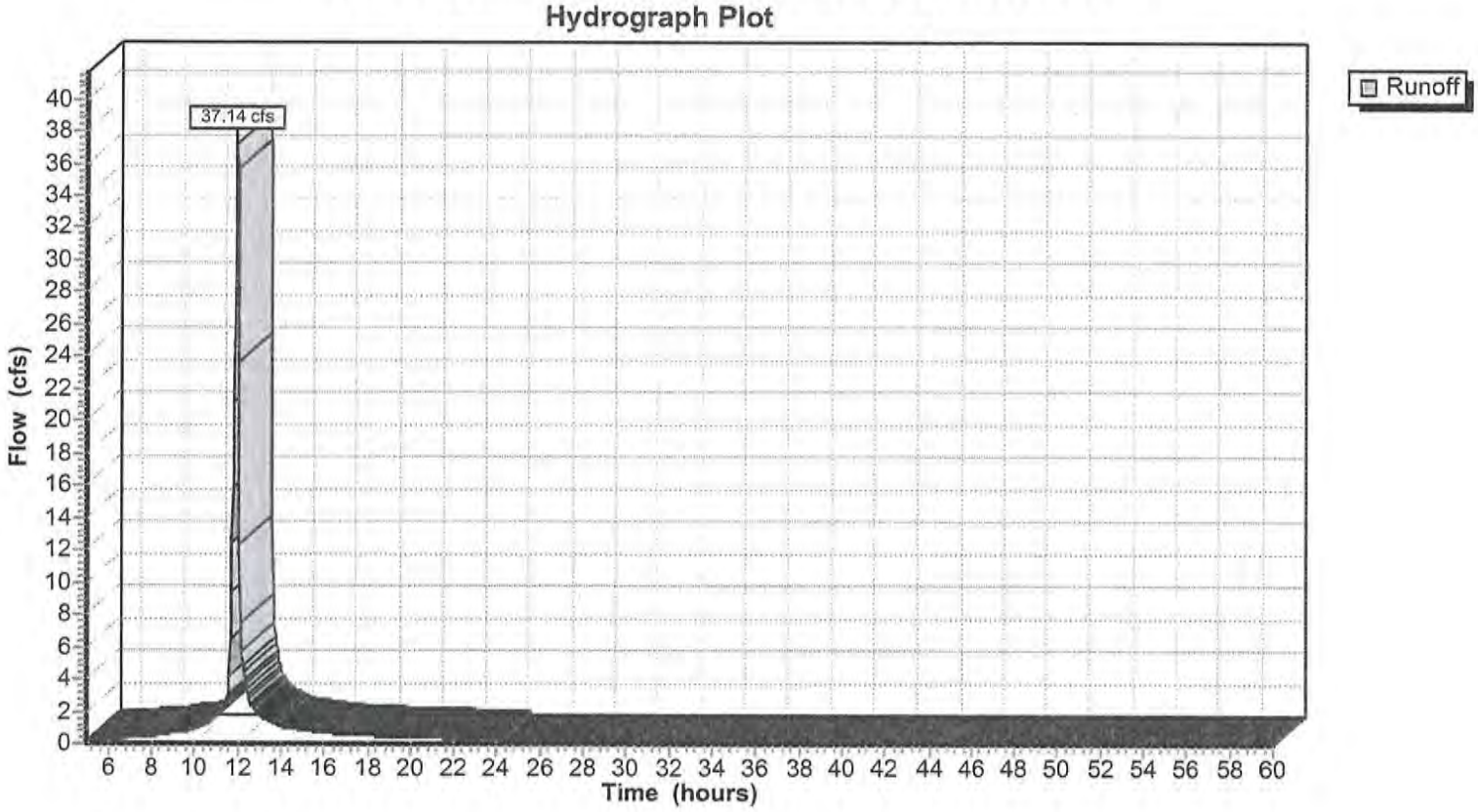
Runoff = 37.14 cfs @ 11.97 hrs, Volume= 2.028 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=9.50"

Area (sf)	CN	Description
29,949	98	conc. sidewalk and pavement
82,278	98	residential lot coverages
17,100	39	>75% Grass cover, Good, HSG A
129,327	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.0208	2.9		**Shallow Concentrated Flow, SHEET FLOW FROM ROADV** Paved Kv= 20.3 fps
6.1	576	0.0015	1.6	14.15	**Parabolic Channel, grass swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.3	78	0.0050	4.2	7.43	**Circular Channel (pipe), 18" rcp culvert** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
6.5	669	Total			

Subcatchment 21 LOTS: south end lots and r/w



Subcatchment 52 LOTS: north end lots & r.w. areas

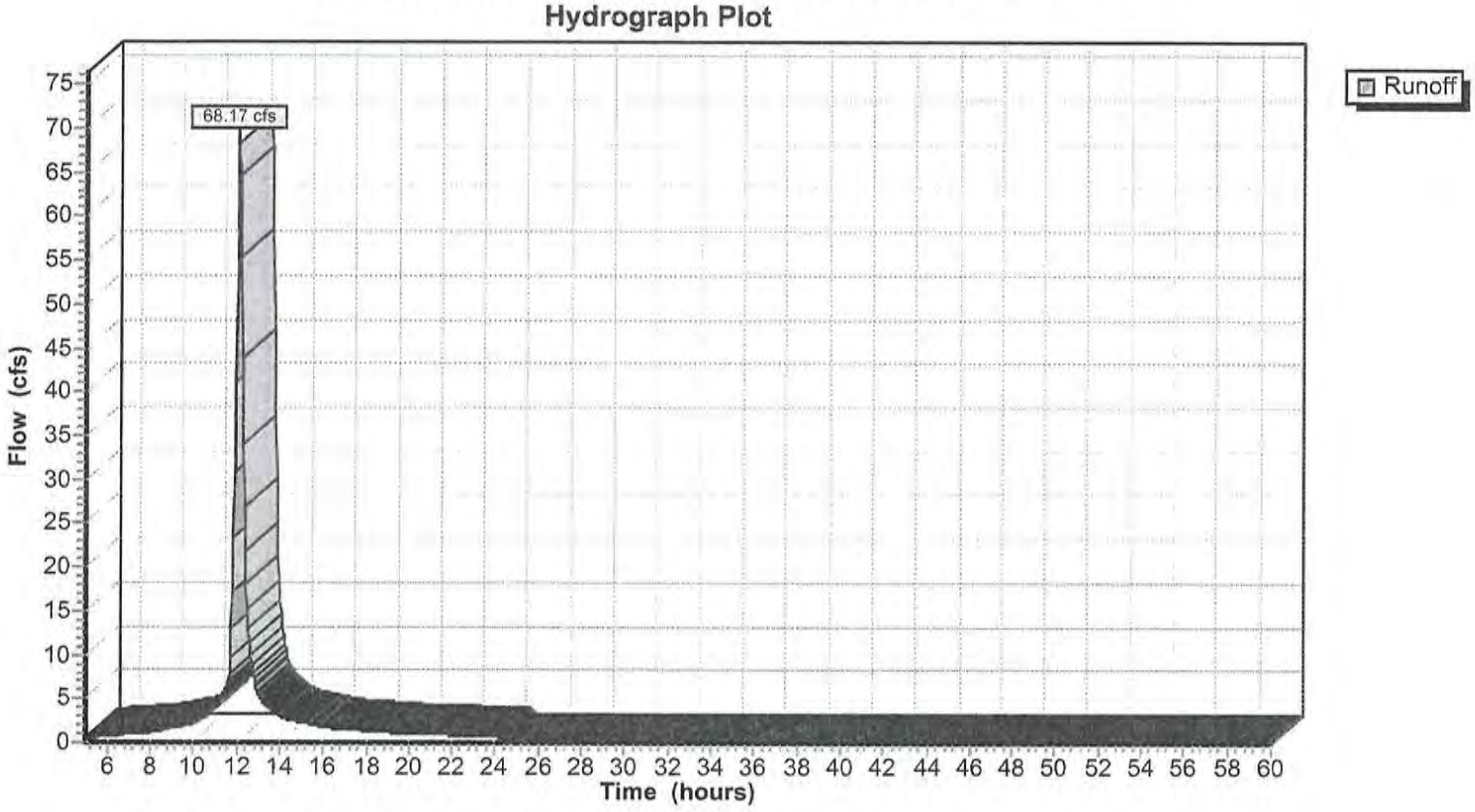
Runoff = 68.17 cfs @ 12.10 hrs, Volume= 5.316 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=9.50"

Area (sf)	CN	Description
84,636	98	conc. sidewalk & pavement
212,240	98	residential lot coverage
37,305	39	>75% Grass cover, Good, HSG A
334,181	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	48	0.0208	1.3		**Sheet Flow, over north cul-de-sac** Smooth surfaces n= 0.011 P2= 4.00"
8.9	871	0.0016	1.6	14.61	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.4	60	0.0016	2.4	4.20	**Circular Channel (pipe), 18 hdpe culvert under devils bay** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013
7.8	600	0.0010	1.3	11.55	**Parabolic Channel, thru right of way swale** W=9.00' D=1.50' Area=9.0 sf Perim=9.6' n= 0.035
0.7	137	0.0023	3.5	10.85	**Circular Channel (pipe), 24" hdpe pipe from r/w to jb b-5** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
0.4	80	0.0010	3.0	21.09	**Circular Channel (pipe), 36" hdpe pipe from jb b-5 to fes** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
18.8	1,796	Total			

Subcatchment 52 LOTS: north end lots & r.w. areas



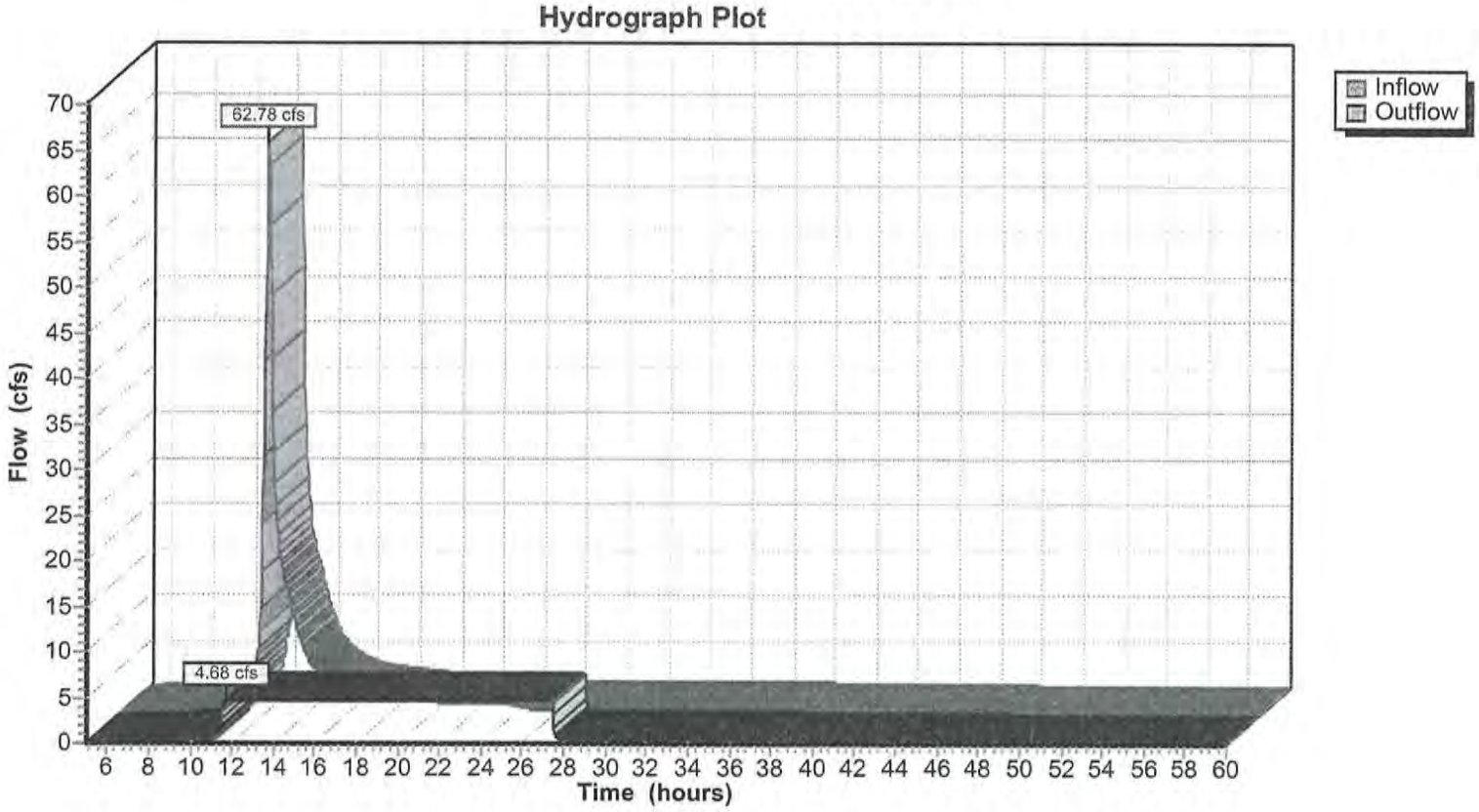
Reach 1R: 36" storm drain

Inflow = 62.78 cfs @ 12.16 hrs, Volume= 6.884 af
Outflow = 4.68 cfs @ 11.68 hrs, Volume= 6.883 af, Atten= 93%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.7 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 7.3 min

Peak Depth= 3.00'
Capacity at bank full= 4.57 cfs
Inlet Invert= 5.18', Outlet Invert= 5.16'
36.0" Diameter Pipe n= 0.020 Length= 180.0' Slope= 0.0001 '/'

Reach 1R: 36" storm drain



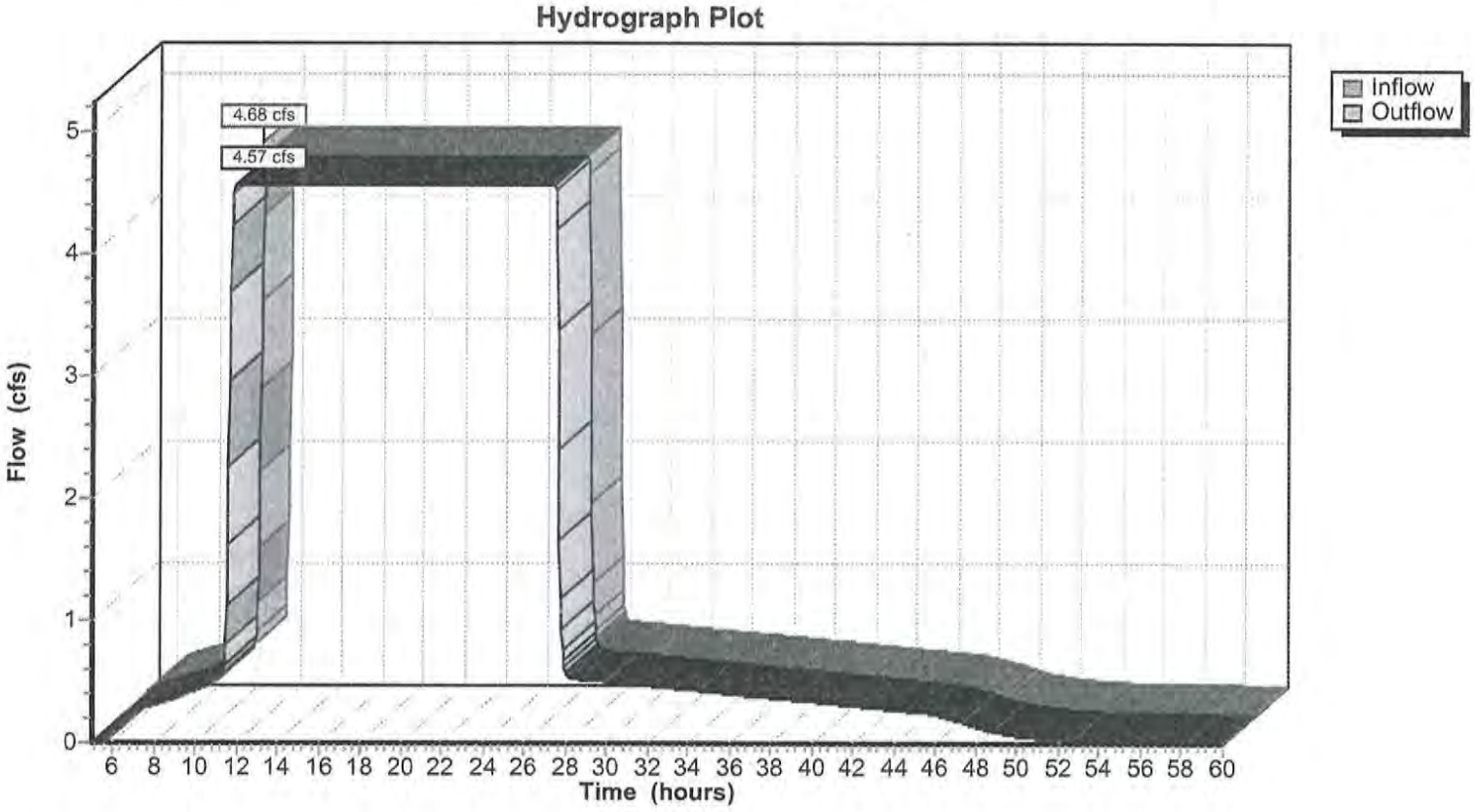
Reach 2R: 36" cmp

Inflow = 4.68 cfs @ 11.68 hrs, Volume= 6.883 af
Outflow = 4.57 cfs @ 13.25 hrs, Volume= 6.883 af, Atten= 2%, Lag= 94.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.7 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 1.0 fps, Avg. Travel Time= 7.3 min

Peak Depth= 1.21'
Capacity at bank full= 13.42 cfs
Inlet Invert= 5.16', Outlet Invert= 4.75'
36.0" Diameter Pipe n= 0.020 Length= 428.0' Slope= 0.0010 '/'

Reach 2R: 36" cmp



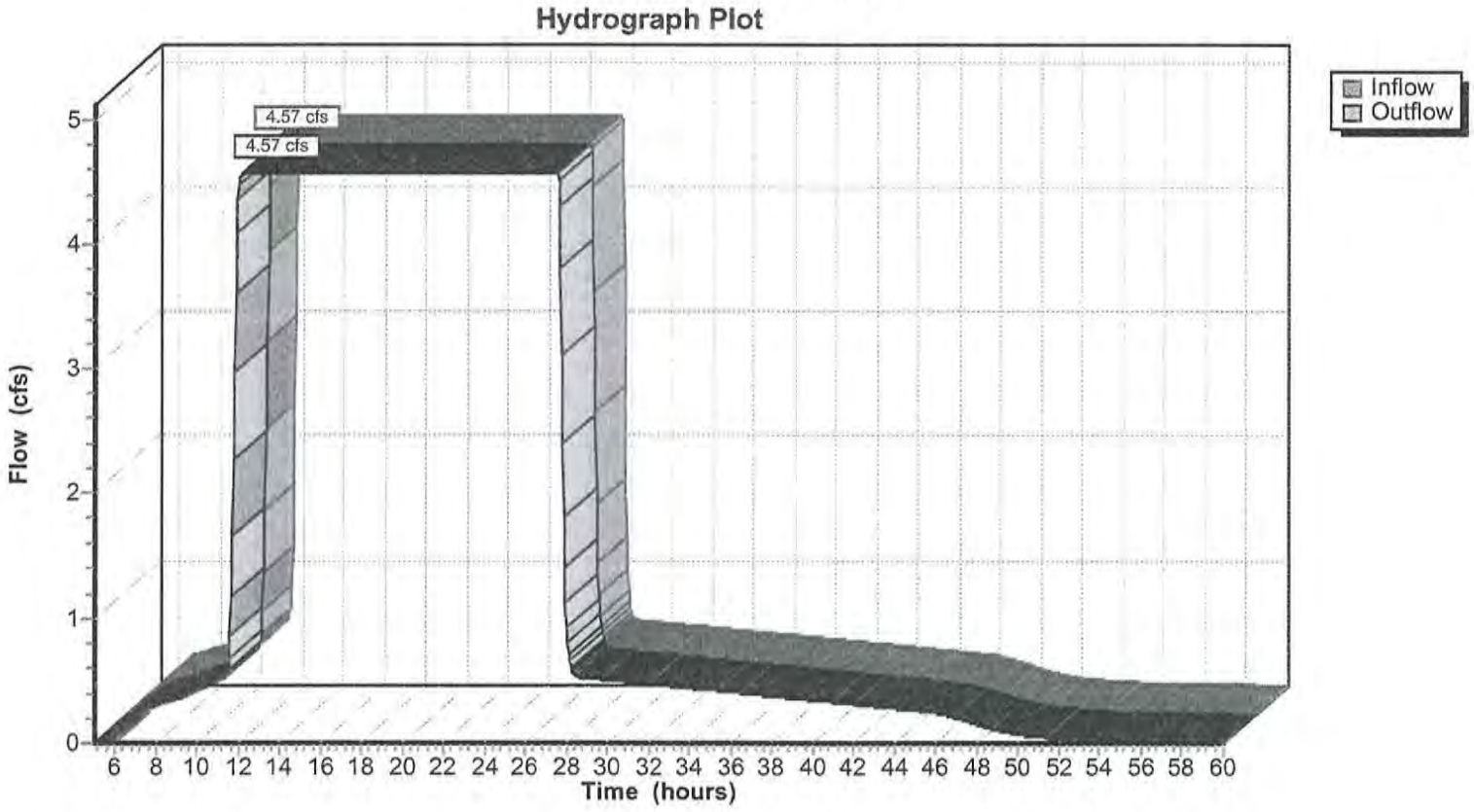
Reach 3R: 36" hdpe

Inflow = 4.57 cfs @ 13.25 hrs, Volume= 6.883 af
Outflow = 4.57 cfs @ 13.85 hrs, Volume= 6.883 af, Atten= 0%, Lag= 36.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.5 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 1.4 fps, Avg. Travel Time= 8.6 min

Peak Depth= 0.91'
Capacity at bank full= 22.97 cfs
Inlet Invert= 4.75', Outlet Invert= 4.00'
36.0" Diameter Pipe n= 0.012 Length= 742.0' Slope= 0.0010 '/'

Reach 3R: 36" hdpe



Pond 1P: POND

Inflow = 71.95 cfs @ 12.08 hrs, Volume= 6.892 af
Outflow = 62.78 cfs @ 12.16 hrs, Volume= 6.884 af, Atten= 13%, Lag= 4.4 min
Primary = 62.78 cfs @ 12.16 hrs, Volume= 6.884 af

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

Peak Elev= 11.82' Storage= 60,787 cf
Plug-Flow detention time= 181.9 min calculated for 6.877 af (100% of inflow)
Storage and wetted areas determined by Irregular sections

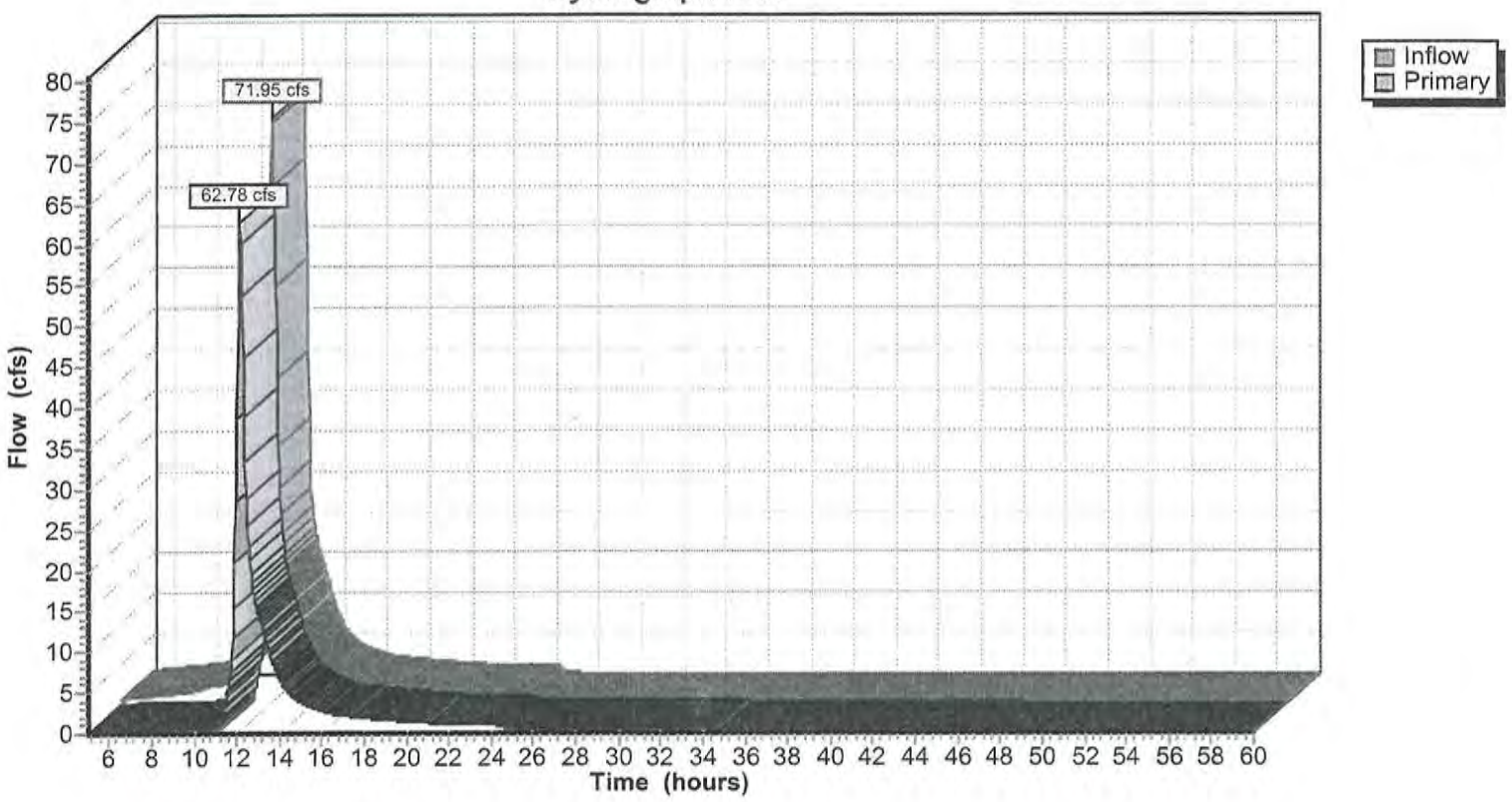
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
8.50	0	0.0	0	0	0
9.00	18,756	643.0	3,126	3,126	32,902
9.25	19,240	648.0	4,749	7,875	33,440
10.00	20,715	662.0	14,980	22,855	34,980
10.05	20,715	662.0	1,036	23,891	35,013
10.50	20,715	662.0	9,322	33,213	35,311
11.00	20,715	662.0	10,358	43,570	35,642
11.50	20,715	662.0	10,358	53,928	35,973
12.00	22,730	681.0	10,857	64,785	38,031

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
- 3=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	8.50'	**18.0" x 396.0' long Culvert** Ke= 0.500 Outlet Invert= 6.50' S= 0.0051 '/' n= 0.013 Cc= 0.900
2	Device 1	8.50'	**4.0" Vert. Orifice/Grate** C= 0.600
3	Primary	10.50'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond 1P: POND

Hydrograph Plot



Pond ex pond: existing pond

Inflow = 94.04 cfs @ 12.02 hrs, Volume= 14.227 af
Outflow = 44.80 cfs @ 12.30 hrs, Volume= 14.162 af, Atten= 52%, Lag= 16.5 min
Primary = 44.80 cfs @ 12.30 hrs, Volume= 14.162 af

Routing by Stor-Ind method, Time Span= 5.00-60.00 hrs, dt= 0.05 hrs

Peak Elev= 6.59' Storage= 138,198 cf
Plug-Flow detention time= 170.4 min calculated for 14.149 af (99% of inflow)
Storage and wetted areas determined by Irregular sections

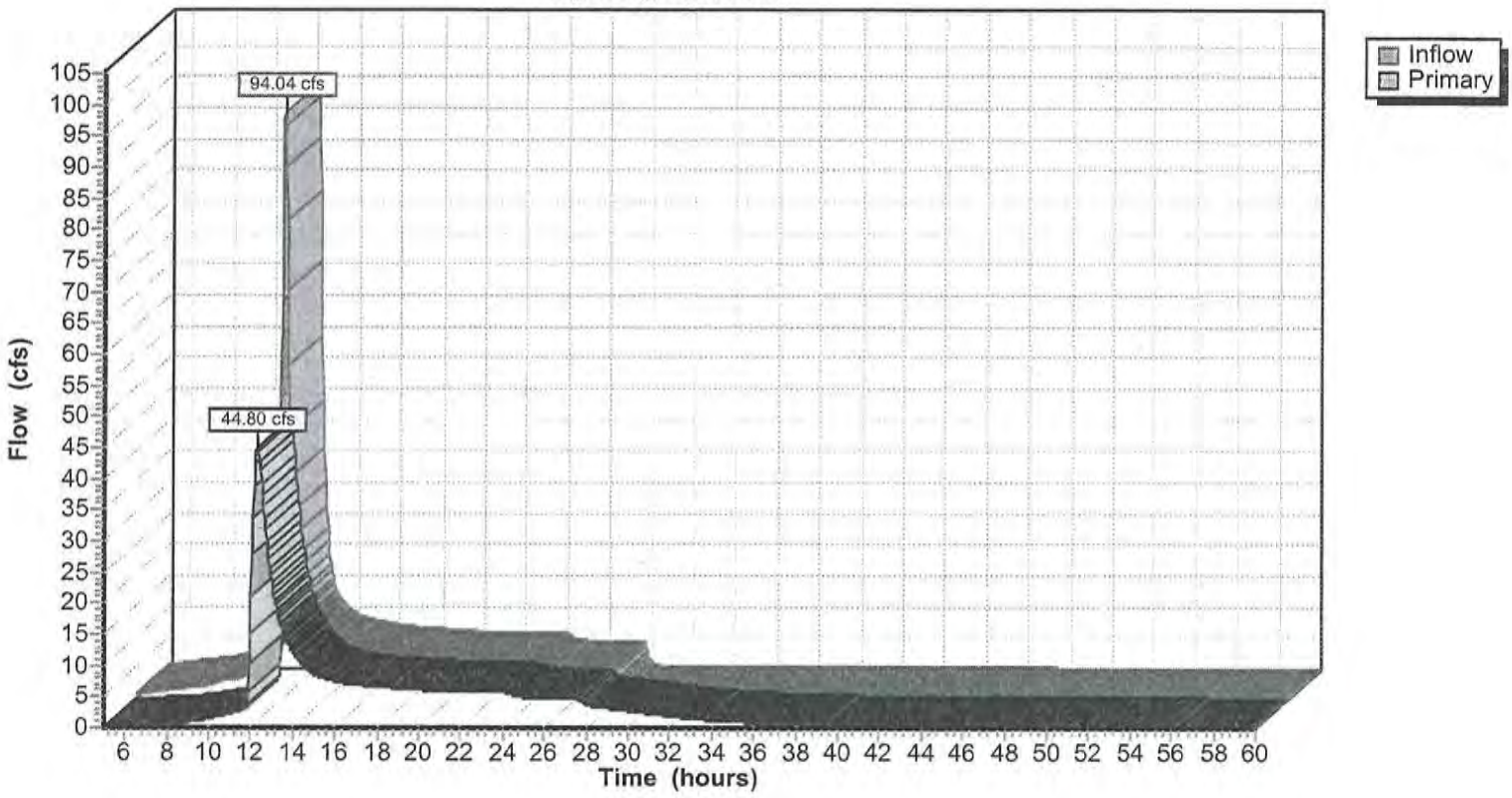
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
4.00	0	0.0	0	0	0
5.00	41,303	1,015.0	13,768	13,768	81,984
6.00	84,410	2,341.0	61,586	75,354	436,112
7.00	130,086	1,977.0	106,428	181,782	561,207

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
  - 3=Orifice/Grate
- 4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Primary	4.00'	**18.0" x 300.0' long Culvert X 2.00** Ke= 0.500
			Outlet Invert= 3.24' S= 0.0025 '/' n= 0.012 Cc= 0.900
2	Device 1	4.00'	**2.7" Vert. Orifice/Grate X 2.00** C= 0.600
3	Device 1	4.85'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600
4	Primary	5.75'	**60.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond ex pond: existing pond

Hydrograph Plot



POST-DEVELOPMENT DRAINAGE CALCULATIONS

(for propose swales)

Prepared For

COROLLA BAY

(72 Lot Residential Development)

Located on

OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007

Phase	Lot #	Area (sf)	Acres	% covg	Impvs. Covg.				
I	1	12,179	2.80	35%	4,263				
II	2	8,000	0.18	45%	3,600				
II	3	8,000	0.18	45%	3,600				
II	4	7,965	0.18	45%	3,584				
II	5	8,000	0.18	45%	3,600				
II	6	8,000	0.18	45%	3,600				
II	7	7,735	0.18	45%	3,481				
I	8	7,500	0.17	45%	3,375				
I	9	7,927	0.18	45%	3,567				
I	10	8,772	0.20	45%	3,947				
I	11	19,729	0.45	35%	6,905				
I	12	15,050	0.35	35%	5,268				
I	13	14,952	0.34	35%	5,233				
I	14	18,424	0.42	35%	6,448				
I	15	17,077	0.39	35%	5,977				
I	16	21,877	0.50	35%	7,657				
I	17	19,307	0.44	35%	6,757				
I	18	14,991	0.34	35%	5,247				
I	19	16,084	0.37	35%	5,629				
I	20	16,070	0.37	35%	5,625				
I	21	16,032	0.37	35%	5,611				
I	22	15,208	0.35	35%	5,323				
I	23	16,268	0.37	35%	5,694				
I	24	15,368	0.35	35%	5,379				
I	25	16,846	0.39	35%	5,896				
I	26	17,111	0.39	35%	5,989				
I	27	17,074	0.39	35%	5,976				
I	28	16,956	0.39	35%	5,935				
I	29	16,838	0.39	35%	5,893				
I	30	16,722	0.38	35%	5,853				
I	31	16,604	0.38	35%	5,811				
I	32	16,486	0.38	35%	5,770				
I	33	16,331	0.37	35%	5,716				
I	34	15,600	0.36	35%	5,460				
I	35	16,510	0.38	35%	5,779				
I	36	14,243	0.33	35%	4,985				
II	37	12,412	0.28	35%	4,344				
II	38	12,304	0.28	35%	4,306				
II	39	12,058	0.28	35%	4,220				
II	40	12,016	0.28	35%	4,206				
II	41	12,124	0.28	35%	4,243				
II	42	12,271	0.28	35%	4,295				
II	43	11,300	0.26	35%	3,955				
II	44	10,191	0.23	35%	3,567				
II	45	12,507	0.29	35%	4,377				
II	46	20,734	0.48	35%	7,257				
II	47	10,101	0.23	35%	3,535				
II	48	9,125	0.21	45%	4,106				
II	49	9,182	0.21	45%	4,132				

II	50	9,174	0.21	45%	4,128				
II	51	9,183	0.21	45%	4,132				
II	52	9,176	0.21	45%	4,129				
II	53	12,170	0.28	35%	4,260				
II	54	11,270	0.26	35%	3,945				
II	55	13,719	0.31	35%	4,802				
II	56	13,707	0.31	35%	4,797				
II	57	9,649	0.22	45%	4,342				
II	58	9,794	0.22	45%	4,407				
II	59	9,946	0.23	45%	4,476				
II	60	10,104	0.23	35%	3,536				
II	61	10,264	0.24	35%	3,592				
II	62	10,682	0.25	35%	3,739				
II	63	10,710	0.25	35%	3,749				
II	64	10,080	0.23	35%	3,528				
II	65	9,381	0.22	45%	4,221				
II	66	9,289	0.21	45%	4,180				
II	67	9,328	0.21	45%	4,198				
II	68	9,367	0.22	45%	4,215				
II	69	9,374	0.22	45%	4,218				
II	70	9,522	0.22	45%	4,285				
II	71	9,518	0.22	45%	4,283				
II	72	9,598	0.22	45%	4,319				
Total		909,166	SF		340,459	sf			
	TOTAL RESIDENTIAL LOT COVERAGE =				**37.45%**				
WEST SIDE NC12 COROLLA BAY ITEMIZED AREA RATIONALE:									
Section I Residential Lots					517,836				
Section II Residential Lots					391,330				
Right of way area West Side NC12					104,021				
Open Space #1					83,118				
Open Space #2 (pond)					90,186				
Open Space #6					305,575				
10 ft Cross Access Easements					6,519				
Total Area					1,498,585	sf			
COVERAGE:									
Section I & II Residential Lots					340,459				
Right of way (Roadway & Sidewalks)					100,841				
Total Area					441,300	sf			

CALCULATION:									
		(SAxDF)-RA-OA =		**BUA**					
		No. Lots		**Lot**					
	(	1,498,585	x	30%) -	100,841				
			=	348,735	sf	AVAILABLE FOR LOT COVERAGE			
		348,735	>	340,459	**OK**				

STORMWATER MANAGEMENT REPORT

For

Modifications to Low Density Permit (SW7050220)

Prepared For

COROLLA BAY

Section I & II

(72 Residential Lot Development)

Located on

OCEAN TRAIL (NC HWY 12) – POPLAR BRANCH TOWNSHIP
CURRITUCK COUNTY - COROLLA, NORTH CAROLINA

Prepared By:

COASTAL ENGINEERING & SURVEYING

16 November 2007

Revised: 4/28/08

REVISED 7/08

CONTENTS

*Approved*_____ *Date:*_____

Professional Engineer

NARRATIVE

OBJECTIVE

To present stormwater management analysis and calculations to modify existing NCDENR DWQ Stormwater Permit (SW7 050220) for the existing and proposed construction of Corolla Bay, Section I & II - a 72 residential lot subdivision site in Corolla, North Carolina. This report will illustrate stormwater management practices in accordance with The North Carolina Stormwater Best Management Practices for Low Density Application.

INTRODUCTION

Corolla Bay is also known as Phase III of the Monteray Shores PUD and is situated in Corolla, Currituck County, North Carolina. It is located along (N.C. 12) Ocean Trail approximately 1.75 miles north of Monteray Drive, 0.56 miles north of Ocean Forest Court and about 0.60 miles south of Hampton Street. The property is bordered to the north by lands of "Food Lion", which will be a future commercial development. Adjoining property to the northeast, between the proposed subdivision and the Ocean Trail right of way is vacant land of Currituck County, to the west is the Currituck Sound and adjoining property to the south is a residential development known as Monteray Shores, Phase I – Section 3.

Phase III of the Monteray ShoresPUD consists of approximately 89 acres of which 57.2 acres is the Corolla Bay mixed use development. The 57.2 acres is bisected by (N.C. 12) Ocean Trail amounting to approximately 22.8 acres on the east side of the roadway and 34.4 acres to the west.

The east side of Ocean Trail is planned for residential and commercial uses amounting to 57 patio homes on approximately 10 acres to the most southerly section of the 22.8 acres. The remaining 12.8 acres is intended for commercial development and will have condominiums and apartments mixed in among the commercial development amounting to about 127 residential units. The west side of Ocean Trail is planned for 72 residential lots.

Corolla Bay east side improvements are intended for future development and are not the subject of this Construction Activity and Stormwater Management Narrative. However, the residential development on the west side of Ocean Trail shall be the focus of the Construction Activity and Stormwater Management Narrative and will be referred to as the subject property here forth.

The subject property was found to be located in FEMA Flood Zones "AE" per Map Panel No. 37209923600J dated 16 December 2005.

Soil characteristics for the subject property in the vicinity of the proposed improvements are classified as "Cu" (Currituck Mucky Peat) and "Os" (Osier Fine Sand) per map panel #17, Soil Survey for Currituck County with a hydrologic soils group "D" classification, but for areas of proposed improvements, a "B" classification was used for post development stormwater analysis.

Soil characteristics show that the seasonal high water table varies in depth per the specified soils and on-site soil test bore's preformed by GET Solution, Inc. on 18 June 2003, G.E.T. found the seasonal

high water table varies in depth pending the existing ground grade at individual test bore locations. See the preliminary Subsurface Investigation and Geotechnical Engineering Report by GET Solutions, Inc., dated 24 July 2003.

The subject property has been examined by Environmental Professionals, Inc and on-site wetlands have been delineated and are classified as 404 as confirmed by Army Corps. of Engineers on 28 December 2005.

The subject property consists of dense trees, mostly that of the deciduous type and dense under brush and various grasses. The topography of the land varies across the 34.4 acre parcel with lands near the Currituck Sound being fairly flat with gentle sloping of 1 vertical foot in 50 horizontal feet. Steeper ground slopes occur toward the middle part of the site, 1 vertical foot in 15 horizontal feet with the steepest slopes closest to the (N.C. 12) Ocean Trail right of way being as steep as 1 vertical foot in 4 horizontal feet. As slopes and runs vary across the 34.4 acre parcel, stormwater drainage appears to just sheet flow to the Currituck Sound as no physical drainage ditches, channels or erosion trenches exist on site.

Two small ponds exist on the subject parcel and are located to the southerly most and northerly most points in the property. Both ponds are land locked and are non-tidal waters.

EXISTING CONDITIONS

The planning, permitting and development for the area of Corolla Bay, situated on the west side of (N.C. 12) Ocean Trail was already approved by Currituck County in 2005 for 76 residential lots and for a 1 acre commercial development. NCDENR issued a Soil Erosion & Sedimentation Control Permit and a Stormwater Permit (SW7 050220) for a Low Density application for the aforementioned development, Corolla Bay, Section I was approved for Preliminary Plat by Currituck County for 30 residential lots and in 2006, land development activities began.

Currently, all the infrastructure and utilities are installed on Corolla Bay – Section I. Corolla Bay – Section II, Preliminary Plat for 40 lots was pending approval but was delayed because of sewer capacity issues. Consequently, the Section II Preliminary Plat approval delay halted the construction commencement of Section II and left all Section I improvements terminated at the section line. Shortly thereafter, the Army Corps. of Engineers employed a moratorium on activity disturbance in 404 jurisdictional wetlands and at the time of the moratorium, it was uncertain as to how long the moratorium would last. The collaboration of aforementioned occurrences necessitated changes to the construction sequence in Section I which pertained to the tie in at Section II infrastructure construction, particularly stormwater drainage swales.

The objective of the stormwater drainage swales as permissible with NCDENR Low Density BMP is to convey stormwater via grass swale from the area of development to the point of discharge, the existing pond located at the southerly end of the subject property. Aforesaid events abandoned planned installation of Section II grass swales, creating a situation where the existing grass swales in Section I had no point of discharge. Consequently, the constructed grass swales were not functioning as a means of stormwater conveyance but as stormwater retention areas.

Stormwater alterations were designed and implemented to convey potential stormwater from the installed grass swales of Section I to the intended point of discharge, the existing pond located at the

southerly end of the subject property. Stormwater conveyance design alterations strived to continue the grass swale technique, but with the existing topographic features of the land and the existing grass swales as-built flow-line elevation, any projected swale locations were impractical. Other design criteria accounted for the potential design depth of the proposed grass swale continuation and the residual effects on the wetlands, as it would drain and lower the water elevations in the delineated wetland in the adjoining areas of the proposed grass swale. Ultimately, the installation of grass swales in the vicinity of the delineated wetlands would have an adverse impact on the wetlands, contradicting any attempts to employ any avoidance and minimization tactics to preserve wetlands.

As the grass swale continuation could not be designed in a location that would be feasible or complement adjoining delineated wetlands, a drain pipe was an alternate solution that allowed for the flexibility to maneuver near and around the adjoining delineated wetlands with no adverse effects to the wetlands. The drain pipe or storm drain was designed to provide stormwater conveyance from the grass swale locations to the existing pond located at the southerly end of the subject property.

From a single low point in the existing grass swale along Cruz Bay Lane, stormwater is conveyed easterly along the residential lot lines of proposed Section II lots 69 and 70 via a 24" cmp for approximately 140 linear feet to a junction box. Thence, the stormwater is conveyed southerly via 426 lienar feet of 36 inch cmp to another junction box where the storm drain would continue with a 36" cmp storm drain to the existing pond, but construction was terminated at the end to the installed 426 linear feet- 36 inch cmp because of the wetlands moratorium imposed by the Army Corps of Engineers.

As a result of the termination of the storm drain, a temporary stormwater basin was installed in attempts to provide a stormwater storage area for stormwater coming in from the Cruz Bay Lane road side swales. The temporary basin provides temporary quantity management area incorporating a controlled stormwater release from the basin via a control outlet structure, which discharges into 266 l.f. of vegetated conveyance swale to a level spreader, releasing stormwater across a 100 foot long filter strip then into the Currituck Sound.

The temporary stormwater basin and discharge area is situated in the proposed Section II area of development in the Corolla Bay Subdivision and is considered a temporary means to discharge stormwater in a controlled faction until the master plan can continue with stormwater conveyance to the existing pond.

At the point of termination on the 36" cmp, a junction box will be installed equipped with a 36 inch hdpe storm pipe, which will convey stormwater to the existing pond. The proposed 36 inch storm drain is intended to be placed outside the delineated wetlands areas in attempts to minimize wetlands disturbance.

Ultimately, Section I & part of Section II quality management for stormwater low density application is achieved prior to stormwater entering into the storm drain through approximately 4.145 linear feet of constructed road side grass swales along Cruz Bay Lane and will receive additional quality management in the existing pond via residence time in the pond before the stormwater is released. The pond stormwater release is via a control outlet structure, through 300 linear feet of two (2) 18 inch hdpe storm pipes, through 72 linear feet of grass swale and finally over approximately 75 linear feet of natural vegetation before reaching the Currituck Sound.

PROPOSED SITE CONDITIONS

The subject property is currently approved for 76 residential lots, for a 1 acre commercial development and access roadways amounting to about 9.28 acres in impervious coverage in Sections I & II. Section I has the infrastructure and utilities built and has final plat approval for 30 of the 36 lots. Section II preliminary plat approval is expected pending sewer capacity approval in Currituck County, but due to the Army Corps. of Engineers wetlands moratorium, the developer has decided to take the opportunity to avoid and minimize wetlands impact, becoming more conservative in the development of this residential section by reducing the lot density.

The Section II development was originally permitted for 40 residential lots and a 1 acre commercial development with access roadways amounting to about 5.04 acres of impervious coverage. The developer has decreased the lot yield in Section II to 36 residential lots and has eliminated the 1 acre commercial development, with the reduced impervious coverage amounting to about 4.65 acres or about a 7.7% reduction in impervious coverage.

Section II will have public water provided by Currituck County and sanitary sewer provided temporally by Carolina Water Waste Water Treatment Plant and eventually Monteray Shores Waste Water Treatment Plant once the proposed plant modifications are completed.

Construction activities proposed for Corolla Bay – Section II consist of first delineating the limits of disturbance per Soil Sedimentation & Erosion Control Plans prepared by Coastal Engineering & Surveying, Inc., dated 20 November 2007. Silt fence and the stabilized construction entrance will be installed in the locations as illustrated on the aforementioned plans followed by the construction of the proposed 1,135+/- linear foot subdivision roadway extension with roadway storm water grass conveyance swales, conveying stormwater to the existing pond located at the southerly end of the subject property.

An 18 inch r.c.p. stormwater culvert will be installed perpendicular to the grass swale to convey stormwater from the west side of Cruz Bay Lane to the grass swale on the east side of Cruz Bay Lane in front of lot 43 as shown on the construction plans prepared by Coastal Engineering & Surveying, Inc., dated 20 November 2007. A 24 inch c.m.p. stormwater culvert will also convey stormwater from the north side of Cruz Bay Lane near lot 53, to the south side of Cruz Bay Lane near lot 52, to a concrete head wall and through 257 linear feet of grass swale to the southerly pond as shown on the aforementioned construction plans.

The previously described activities will be the majority of the land disturbance actions required to accomplish Infrastructure, Stormwater and Utility improvements necessary to commence with individual lot (home-sites) development. All proposed impervious areas on individual home sites must drained to the subdivisions proposed stormwater management areas (swales) and shall not drain stormwater from such impervious improvements off-site onto adjoining properties. Land disturbance activities of individual home site development shall be per approved Currituck County site plan requirements and shall adhere to the approved subdivision Stormwater Management Regulations and Soil Sedimentation & Erosion Control Regulations issued by the State of North Carolina.

Stormwater is anticipated to sheet-flow from the proposed subdivision home sites, driveways and roadway into the proposed roadside grass conveyance swales, through culverts and storm drains and into the existing pond located at the southerly end of the subject property, ultimately to the Currituck Sound via a control overflow outlet. Stormwater Infiltration is expected to occur in the proposed

roadside grass swales based upon the seasonal high water table and ground water conditions and is not expected to seep up into the proposed swales during normal weather conditions.

The quality management of storm water will be by means of vegetated filtration through stormwater conveyance of approximately 6,045 linear feet of grass swales. Quality management is designed to manage 1.0 inch - (Type II 24-hr. rainfall) precipitation event across the proposed impervious areas.

The results of the calculations included in the Stormwater Management report prepared by Coastal Engineering and Surveying, Inc., demonstrates that the proposed post development off-site stormwater discharge is minimal and is much less than that of the pre-development off-site stormwater discharge in all storm events.
(See chart for pre/post storm water discharge analysis)

Pre-Development Off-Site Stormwater Discharge		**Post-Development Off-Site Stormwater Discharge**	
1-Year	**35.12** C.F.S.	1-Year	**4.29** C.F.S.
2-Year	**46.76** C.F.S.	2-Year	**6.90** C.F.S.
10-Year	**82.12** C.F.S.	10-Year	**19.82** C.F.S.
25-Year	**100.46** C.F.S.	25-Year	**25.60** C.F.S.

METHODOLOGY

The Storm Water calculations for this project were performed using Hydrocad, a computer aided design program for modeling stormwater runoff. This computer design program is based primarily on hydrology techniques developed by the Soil Conservation Service (SCS) for Urban Hydrology for Small Watersheds (TR-55) combined with standard hydraulic equations.

EROSION AND SEDIMENT CONTROL

In order to effectively control erosion and sediment deposition it is important to provide the necessary controls in the proper sequence of construction. Erosion and Sediment control practices and installation details are depicted on the Erosion and Sediment Plan prepared by Coastal Engineering, Inc. and consist of maintaining the perimeter controls throughout construction. Perimeter protection (as required) will be in the form of silt fencing.

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P432 COROLLA BAY

SWALE CALCULATIONS FOR AREAS DELINEATED AS FOLLOWS:

(Pg.2) #1 LOTS 11-29 WEST SIDE CRU3 BAY LANE NORTH OF ROADWAY CULVERT TO HIGH POINT

(Pg.4) #2 LOTS 30-39 WEST SIDE CRU3 BAY LANE SOUTH of ROADWAY CULVERT TO HIGH POINT

(Pg.6) #3 LOTS 1-10 EAST SIDE CRU3 BAY LANE NORTH OF DEVILS BAY CULVERT TO HIGH POINT ☆1 NORTH SIDE OF DEVILS BAY FROM NC 12 TO ROADWAY CULVERT AT CRU3 BAY LANE ☆1 DEVILS BAY INTERSECTION

(Pg. 8) #4 LOTS 70-72 EAST SIDE OF CRU3 BAY LANE SOUTH OF DEVILS BAY CULVERT TO DEEP INLET ACCROSS FROM ROADWAY CULVERT ☆1 SOUTH SIDE OF DEVILS BAY FROM NC 12 TO INTERSECTION OF CRU3 BAY.

(Pg.10) #5 LOTS 60-69 EAST SIDE OF CRU3 BAY LANE SOUTH OF DEEP INLETS TO HIGH POINT

(Pg.15) #6 LOTS 39-42 WEST SIDE OF CRU3 BAY LN. NORTH OF ROADWAY CULVERT (IN FRONT OF LOT 43) FROM HIGH POINT

(Pg.17) #7 LOTS 43-46 WEST SIDE OF CRU3 BAY LN. SOUTH OF ROADWAY CULVERT (IN FRONT OF LOT #43) FROM HIGH POINT.

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#8 LOTS 53-59 WEST/NORTH SIDE OF CRV3 BAY LANE FROM HIGH POINT (LOT 61) TO DROP INLET EAST OF LOT 53.

#9 LOTS 47-52 SOUTH SIDE OF CRV3 BAY LANE FROM HIGH POINT (LOT 47) TO DROP INLET EAST OF LOT 52.

SWALE CALC'S for AREA #1

TRIBUTARY COVERAGE TO SWALE:
1/2 OF ROADWAY: 14.5' x 1022' = 14,819 S.F. +
1/2 CUL DESAC AREA = 5017 S.F. = 19,836 S.F.
DRIVEWAYS IN R/W - N/A - SIDEWALKS ABUT R/W LINE ∴ AREA ARE PART OF ROADWAY CALCS
STORMWATER SWALES: 9' x 1219' = 10,971 S.F.
LOT COVERAGES 11-29 = 112,442 S.F. (ATTACHED)
(W/ 75% TO SWALE) = 84331.5 S.F.

TRIBUTARY FLOWS TO ROADSIDE SWALE $\overline{C} \cdot I \cdot EA$
TOTAL IMPERVIOUS COVERAGE $\overline{C} = A \cdot C$
19836 + 84,332 = 104,168 SF
TOTAL IMPERVIOUS COVERAGE $\overline{C}$ = 104168 X .95 = 98,960 S.F.
ROADSIDE SWALE = 10971 x 1.0 = 10971 S.F.
115,139 SF (2.64 ACS) 109,931 S.F.

$$\overline{C} = \frac{EC \cdot A}{EA} \quad \frac{115,139}{109,931} = .954$$

I: 2IN/hr. (10 yr - 2 hr Storm Event From NCDENR ESC Planning Design Manual)

EA = 2.64 ACS.

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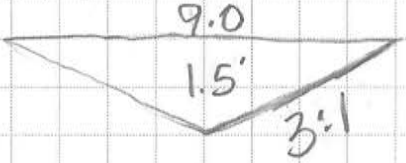
$Q = \overline{C} \cdot I \cdot EA = (.954)(2\,in/hr)(2.64)$ **5.03 CFS**

FOR A 2hr Storm Event, the Volume of StormWater Runoff Created:

$(5.03\ CFS)(7200\ sec/2\ hrs) = 36{,}216\ C.F.$

STORAGE VOLUME IN ROADSIDE SWALE:

A = 6.75 SF
P = 9.48'
HR = 0.71
S = 0.13%



$V = 2 \times 1/2 \times 4.5 \times 1.5 \times 1219 = 8{,}228\ C.F.$

INFILTRATION IN ROAD SIDE SWALE: (10"/hr)

SURFACE AREA = 9.48'
$9.48 \times 1219 = 11{,}556\ S.F.$

$I.V. = 11{,}556(.83'/hr.)(2\ hrs) = 19183\ C.F.$

SWALE IS CAPABLE OF HOLDING $(8228 + 19183) = 27{,}411\ C.F.$

PROPOSED SWALE VELOCITY CALC.

MANNINGS FORMULA: $Q = 1.49/N \times A \times HR^{2/3} \times \sqrt{S} =$

$\frac{1.49}{0.036} \times 6.75 \times .71^{.667} \times \sqrt{0.0013} =$

$42.57 \times 6.75 \times .795 \times .036 =$ **8.22 CFS**

8.22 CFS > **5.03 CFS** OK

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SWALE CALCS FOR AREA # 2

TRIBUTARY COVERAGE TO SWALE:
½ ROADWAY: 14.5 x 717' = 10,397 S.F.
DRIVEWAYS IN R/W = N/A SIDEWALKS ABUT R/W LINE AT AREA IS PART OF ROADWAY CALCS.
STORMWATER SWALES: 9' x 717' = 6453 S.F.
LOT COVERAGES 30-39 = 52,302 SF (ATTACHED)
(W/ 75% TO SWALE) = 39,227 S.F.

TRIBUTARY FLOWS TO ROADSIDE SWALE $\bar{C} \cdot I \cdot \Sigma A$
TOTAL IMPERVIOUS COVERAGE $\bar{C} = A \cdot C$

10397 + 39227 = 49624 SF

IMPERVIOUS COVERAGE = 49,624 (.95) = 47,143 S.F.
ROADSIDE SWALE = 6453 (1.0) = 6453 SF.
56,077 S.F. (1.287 ACS) 53,596 S.F.

$$\bar{C} = \frac{\Sigma C \cdot A}{\Sigma A} \quad \frac{56077}{53596} = .956$$

I: 2 in/hr (10 yr - 2 hr Storm Event From NCDENR ESC Planning Design Manual)

$$\Sigma A = 1.287 \text{ ACS.}$$

$$Q = \bar{C} \cdot I \cdot \Sigma A = .956 \times 2 \text{ in/hr.} \times 1.287 = \boxed{2.46 \text{ CFS}}$$

FOR A 2 HR STORM EVENT, THE VOLUME OF STORMWATER RUNOFF CREATED:

(2.46 CFS)(7200 SEC/2 hrs) = 17,712 C.F.

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STORAGE VOLUME IN ROADSIDE SWALE:

A= 6.75
P= 9.48
H/R= .71
S=0.11%

$V = 2 \times \frac{1}{2} \times 4.5 \times 1.5 \times 717 = 4,840$ C.F.

INFILTRATION IN ROADSIDE SWALE: (10"/hr)

SURFACE AREA = 9.48 × 717 = 6,797 SF

I.V. = 6,797 (.83)(2 hr) = 11,283 C.F.

SWALE IS CAPABLE OF HOLDING 4,840 + 11283 = 16,123 C.F.

PROPOSED SWALE VELOCITY CALCS:

MANNINGS FORMULA $Q = \frac{1.49}{N} \times A \times HR^{2/3} \sqrt{S}$

$Q = \frac{1.49}{.035} \times 6.75 \times .71^{.67} \sqrt{0.0011} =$

$42.57 \times 6.75 \times .795 \times .033 =$ **7.54 CFS**

7.54 > 2.46 GOOD

* POINT OF ANALYSIS AT WEST SIDE OF ROADWAY CULVERT (IN FRONT OF LOT 29) FOR AREA # 1 & # 2 CFS CALC'S =

5.03 CFS + 2.46 CFS = 7.49 CFS

SIZE ROADWAY CULVERT FOR 8.0 CFS +

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SWALE CALCS FOR AREA #3

TRIBUTARY COVERAGE TO SWALE:
1/2 of ROADWAY: 14.5' × 981 = 14224 +
1/2 of CUL DE SAC AREA 5017 = 19241 +
1/2 ENTRANCE DEVILS BAY @ NC12 = 980 SF = 20,221 S.F.
DRIVEWAY AREAS IN R/W ARE LOCATED IN SIDE-WALK AREA AND AREAS ARE PART OF ROADWAY CALC'S
STORMWATER SWALES = 9' × 867 = 7803 SF
(FOR Lots 1-10)
STORMWATER SWALES = 9' × 212 = 1908
DEVILS BAY NORTH SIDE
LOT COVERAGES (1-10) = 36,617 SF (ATTACHED)

TRIBUTARY FLOWS TO ROADSIDE SWALE: $\bar{C} \cdot I \cdot \Sigma A$
TOTAL IMPERVIOUS COVERAGE: $\bar{C} = A \cdot C$
20221 + 36617 = 56,838 S.F.

IMPERVIOUS COVERAGE	56,838 (.95) =	53,996 S.F.
ROADWAY SWALE	9711 (1.0)	9,711
	66,549	63,707
	(1.528 ACS.)	

$$\bar{C} = \frac{\Sigma C \cdot A}{\Sigma A} \quad \frac{66,549}{63,707} = .957$$

I: 2 IN/hr (10 yr - 2hr Storm Event From NCDENR ESC PLANNING DESIGN MANUAL

$\Sigma A = 1.528$ ACS.

$Q = \bar{C} \cdot I \cdot \Sigma A = .957 \times 2 \text{ in/hr} \times 1.528 =$ **2.92 CFS**

FOR A 2HR STORM EVENT THE VOLUME OF STORMWATER RUNOFF CREATED (2.92)(7200 SEC/2 hrs) = 21,024 C.F.

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STORAGE VOLUME IN ROADSIDE SWALES:

$V = 2 \times \frac{1}{2} \times 4.5 \times 1.5 \times 1079 = 7283$ L.F.

A = 6.75
P = 9.48
HR = .71
S = 1.39% @ 147 L.F.
0.62% @ 65 L.F.
0.10% @ 866 L.F.

INFILTRATION IN ROADSIDE SWALE: 10"/hr.

SURFACE AREA = 9.48(1079) = 10,228 S.F.

I.V. 10228(.83)(2 hr) = 16,980 C.F.

SWALE IS CAPABLE OF HOLDING
7,283 + 16,980 = 24,263 C.F.

PROPOSE SWALE VELOCITY CALCS:

MANNINGS FORMULA: $Q = 1.49/N \times A \times HR^{2/3} \times \sqrt{S}$

S = 1.39%: $1.49/.035 \times 6.75 \times .71^{.667} \times \sqrt{.0139} =$

$42.57 \times 6.75 \times .795 \times .118 = 26.93$ CFS

S = 0.62%: $42.57 \times 6.75 \times .795 \times 0.079 = 18.05$ CFS

S = 0.10%: $42.57 \times 6.75 \times .795 \times 0.032 = 7.22$ CFS
LOTS (1-10)

7.22 > 2.92 GOOD

★ POINT OF ANALYSIS AT NORTH SIDE OF ROADWAY CULVERT IN DEVILS BAY AT INTERSECTION OF DEVILS BAY & CRUZ BAY LANE.
AREA 3 CFS CALCS = 2.92 CFS

SIZE ROADWAY CULVERT FOR 3.0 CFS +

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SWALE CALCS FOR AREA #4

TRIBUTARY COVERAGE TO SWALE:
½ OF ROADWAY CRUZ BAY LANE: 14.5' x 265' = 3843 SF +
½ OF ROADWAY DEVILS BAY: 14.5 x 227' = 3,291 SF +
½ OF ENTRANCE DEVILS BAY @ NC12: 1905 SF
9,039 S.F.

DRIVEWAY AREAS IN R/W ARE LOCATED IN SIDEWALK AREA AND ARE PART OF ROADWAY CALCS.
STORMWATER SWALES = 9' x 423 = 3,807 S.F.
LOT COVERAGES (70-72) = 12,888 S.F. (ATTACHED)

TRIBUTARY FLOWS TO ROADSIDE SWALE: $\bar{C} \cdot I \cdot EA$
IMPERVIOUS COVERAGE: $\bar{C} = A_I C$
9039 + 12,888 = 21927 S.F.
TOTAL IMPERVIOUS COVERAGE $\bar{C}$ = 21,927 (.95) = 20,831 SF
ROADSIDE SWALE = 9,039 9039
309666 29,870
(0.71 AC.)

$$\bar{C} = \frac{\Sigma C \cdot A}{EA} = \frac{30,966}{29870} = 0.965$$

I: 2 IN/HR. (10 yr. - 2 hr - STORM EVENT FROM NCDENR ESC PLANNING & DESIGN MANUAL)

$EA = 0.71$ AC.

$$Q = \bar{C} \cdot I \cdot EA = (0.965)(2 \text{ IN/HR})(0.71) = \boxed{1.37 \text{ C.F.S}}$$

FOR A 2 HR STORM EVENT, THE VOLUME OF STORMWATER RUNOFF CREATED:

$$(1.37 \text{ CFS})(7200 \text{ SEC/2 HR}) = 9864 \text{ C.F.}$$

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STORAGE VOLUME IN ROADSIDE SWALE:

$V = 2 \times \frac{1}{2} \times 4.5 \times 1.5 \times 423 = 2855$ C.F.

A = 6.75
P = 9.48
HR = .71
S = 0.01%

INFILTRATION IN ROADSIDE SWALE (10"/hr)

SURFACE AREA = $9.48 \times 423 = 4{,}010$ S.F.

I.V. = $4010 (.83'/\text{HR})(2 \text{ hrs}) = 6{,}657$ C.F.

SWALE IS CAPABLE OF HOLDING $(2855 + 6657) = 9512$ C.F.

PROPOSE SWALE VELOCITY CALC'S.

MANNINGS FORMULA: $Q = \frac{1.49}{N} \times A \times HR^{2/3} \times \sqrt{S}$

$\frac{1.49}{0.035} \times 6.75 \times .71^{.667} \times \sqrt{0.0001}$

$42.57 \times 6.75 \times .795 \times .01 = 2.28$ C.F.S.

2.28 CFS > 1.37 C.F.S. - OK

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SWALE CALC'S FOR AREA #5

TRIBUTARY COVERAGE TO SWALE:
1/2 OF ROADWAY CRUZ BAY LANE 14.5' x 707' = 10,252 S.F.
DRIVEWAY AREAS IN R/W ARE LOCATED IN SIDEWALK AREA AND ARE PART OF ROADWAY CALC'S.
STORMWATER SWALES = 9' x 707 = 6363 S.F.
LOT COVERAGES (60-69) = 39,176 S.F. (ATTACHED)

TRIBUTARY FLOWS TO ROADSIDE SWALES: $\bar{C} \cdot I \cdot \Sigma A$
IMPERVIOUS COVERAGE: $\bar{C} = A \cdot C$

10252 + 39,176 = 49,428 S.F.

TOTAL IMPERVIOUS COVERAGE $\bar{C}$ = 49428 (.95) = 46957 S.F.
ROADSIDE SWALE 6363 (1.0) = 6363.
55,791 SF 53,320 SF
(1.28 ACS)

$$\bar{C} = \frac{\Sigma C \cdot A}{\Sigma A} \quad \frac{55,791}{53,320} = .955$$

I: 2IN/hr (10 yr - 2 hr - STORM EVENT FROM NCDENR ESC PLANNING DESIGN MANUAL)

ΣA = 1.46 ACS.

$Q = \bar{C} \cdot I \cdot \Sigma A = (.955)(2IN/hr)(1.28) =$ **2.45 CFS**

FOR A 2 HR STORM EVENT, THE VOLUME OF STORMWATER RUNOFF CREATED:

(2.45 CFS)(7200 Sec/2 hr) = 17,640. C.F.

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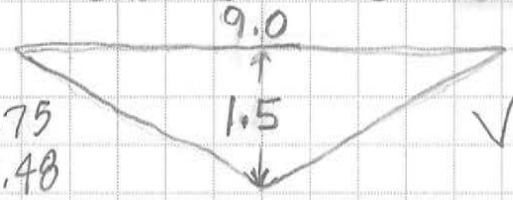
STORAGE VOLUME IN ROADSIDE SWALE:



A = 6.75
P = 9.48
HR = 0.71
S = 0.11%

$V = 2 \times 1/2 \times 4.5 \times 1.5 \times 707 = 6,999$ C.F.

INFILTRATION IN ROADSIDE SWALE (10"/hr)
SURFACE AREA = 9.48 X 707 = 6,702 S.F.

I.V. = 6,702 (.83'/hr)(2 hrs) = 11,125 C.F.

SWALE IS CAPABLE OF HOLDING (6,999 + 11,125) = 18,124 C.F.

PROPOSE SWALE VELOCITY CALCS
MANNINGS FORMULA: $Q = 1.49/N \times A \times HR^{2/3} \times \sqrt{S}$

$1.49/0.035 \times 6.75 \times .71^{.667} \times \sqrt{0.0011}$

$42.57 \times 6.75 \times .796 \times 0.034 =$ **7.78 CFS**

7.78 CFS > 2.45 CFS

* DROP INLET (STORM DRAIN) OUTLET EAST SIDE CRUZ BAY LANE IN FRONT OF LOT # 69 & 70

TRIBUTARY AREAS FOR STORM DRAIN DESIGN
AREA = AREA #1, #2 #3 #4 & #5

CFS = 5.03 + 2.46 + 2.92 + 1.37 + 2.45 = 14.23 CFS

14.23 CFS (7200 Sec/2hr) 102,456 C.F.

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QUANTITY MANAGEMENT (TEMPORARY S.W. BASIN)
VOLUME = 95,433 C.F. (10yr/2hr Event) 4" or 0.33'

PROVIDED SWALE INFILTRATION FOR AREA:

AREA #1 + AREA #2 + AREA #3 + AREA #4 + AREA #5 =
19,183 + 11,283 + 16,980 + 6,657 + 11,125 =
65,228 =

VOLUME YEILD = 102,456 CF - 65228 CF = 37,228 C.F.

VOLUME CONVEYED THROUGH STORM DRAIN TO TEMPORARY S.W. BASIN = 37,228 C.F. or 5.17 C.F.S.

QUALITY MANAGEMENT

VOLUME = 102,456 C.F. (10 yr/2hr EVENT) 4"

ESTIMATED VOLUME FOR (1.0") QUALITY MANAGEMENT

102,456/4 = 25,614 C.F. PER 1"

SO 25,614 C.F. PER 1.0"

PROVIDED SWALE INFILTRATION FOR AREA:

AREA #1 + AREA #2 + AREA #3 + AREA #4 + AREA #5
19,183 + 11,283 + 16,980 + 6,657 + 11,125 =

VOLUME = 65,228 CF (10yr/2hr EVENT) 4"

ESTIMATED VOLUME LOSS FROM INFILTRATION

65,228/4 = 16,307 C.F. PER 1"

* BASIN TO BE REMOVED ONCE STORM PIPE IS INSTALLED & CONNECTED TO EX. POND

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JOB COROLLA BAY
SHEET NO. 13 OF 22
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QUALITY MANAGEMENT

VOLUME = 25,614 C.F. PER 1.0" RAINFALL EVENT

INFILTRATION LOSS FROM SWALES:

= 16,307 C.F. PER 1.0" RAINFALL EVENT

VOLUME YEILD: 25,614 Cf - 16,307 C.F. = 9,307 C.F.

ESTIMATED VOLUME FOR (1.0") CONVEYED THROUGH STORMDRAIN TO SEDIMENTATION BASIN =
9,307 C.F. @ 1.29 CFS (2hr. EVENT)

SEDIMATATION BASIN STORAGE RATIONALE:

PERMENANT POOL ELEVATIONS

				Volume
BOTTOM =	2.0	A = 0	P = 0	– 0 C.F.
	3.0	A = 2074	P = 177	691 C.F.
PER. POOL =	4.0	A = 2687	P = 203	3,065 C.F.

STORAGE VOLUME BEFORE DISCHARGE

			Cum STORAGE
4.0	A = 0	P = 0	0 C.F.
5.0	A = 3,306	P = 219	1,102 C.F.
6.0	A = 4,648	P = 254	5,060 C.F.
7.0	A = 5431	P = 273	10,094 C.F.
8.0	A = 6507	P = 296	16,056 C.F.

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DESIGN OVERFLOW OUTLET STRUCTURE:
(2) 18" CMP BARREL OUT INV = 5.21
6" ORIFICE IN 48" CMP RISER INV = 6.0
TOP 48" CMP RISER = 7.0

ORIFICE: $0.60(A)\sqrt{2 \cdot 32.2 \cdot 0.75/3}$

$= 0.60(0.196)(4.01) = 0.47$ CFS DISCHARGE OUT

2 hr SCENARIO = 0.47×7200 (SEC/2 hr) = 3,398 C.F.

DISCHARGE FROM SED. BASIN THROUGH OVERFLOW (2) 18' CMP STORM DRAIN TO EXISTING POND. OVERFLOW OF EXISTING POND THROUGH (2) 18' CMP STORMPIPE TO DAYLIGHT OVER GRASS/NATIVE FILTER STRIP - 167 +/- L.F. TO SOUND.

CONTROL OUTLET STRUCTURE IN EXISTING POND DESIGNED FOR QUANTITY MANAGEMENT.

* BASIN TO BE REMOVED ONCE STORM PIPE IS INSTALLED & CONNECTED TO EX POND.

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SWALE CALCS FOR AREA #6

TRIBUTARY COVERAGE TO SWALE:
½ OF ROADWAY: 14.5 x 255 = 3,698 SF
DRIVEWAY IN R/W ARE LOCATED IN SIDEWALK AREA AND ARE PART OF ROADWAY CALCS.
STORMWATER SWALES = 9'X 255' = 2,295 S.F.
LOT COVERAGES = (39-42) = 16,964 S.F. (ATTACHED)
(W/ 75% TO SWALE) = 12,720 SF.
TRIBUTARY FLOWS TO ROADSIDE SWALE: $\bar{C} \cdot I \cdot \Sigma A$

IMPERVIOUS COVERAGE: $\bar{C} = A \cdot C$

3,698 + 12,720 = 16418 SF

TOTAL IMPERVIOUS COVERAGE ROADSIDE SWALE

$\bar{C} =$ 16418 (.95) = 15597
2295 (1.0) = 2295
18 713 (0.43 AC) 17,892

$$\bar{C} = \frac{\Sigma C \cdot A}{\Sigma A} = \frac{18.713}{17,892} = .956$$

I: 2IN/hr (10yr-2hr-STORM EVENT FROM NCDENR ESC PLANNING DESIGN MANUAL)

ΣA = 0.43 AC.

$Q = \bar{C} \cdot I \cdot \Sigma A = (.956)(2 in/hr)(0.43) =$ **0.82 CFS**

FOR A 2HR STORM EVENT, THE VOLUME OF STORMWATER RUNOFF CREATED:

(0.82 CFS)(7200 Sec/2hr) = 5,904 C.F.

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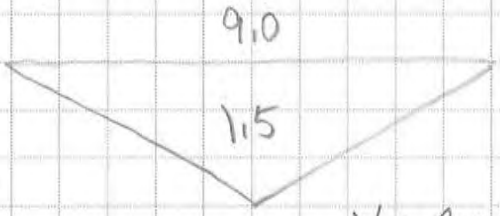
STORAGE VOLUME IN ROADSIDE SWALE :



A = 6.75
P = 9.48
HR = .71
S = 0.07%

$V = 2 \times 1/2 \times 4.5 \times 1.5 \times 255 = 1,721$ C.F.

INFILTRATION IN ROADSIDE SWALE : (10"/hr)

SURFACE AREA = $9.48 \times 255 = 2,417$ SF

I.V. = $2,417 (.83'/hr)(2 hrs) = 4,012$ CF

SWALE IS CAPABLE OF HOLDING (1721 + 4012) = 5,733
5,733 C.F.

PROPOSED SWALE VELOCITY CALC'S
MANNING'S FORMULA = $Q = 1.49/N \times A \times HR^{2/3} \times \sqrt{S}$

$1.49/0.035 \times 6.75 \times .71^{.667} \times \sqrt{0.0007} =$

$42.57 \times 6.75 \times .795 \times 0.026 =$ (6.04 CFS)

(6.04 CFS) > [0.82 CFS] GOOD

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SWALE CALCS FOR AREA #7

TRIBUTARY COVERAGE TO SWALE:
1/2 OF ROADWAY & 1/2 CUL-DE-SAC = 3,571 S.F.
DRIVEWAY IN R/W ARE LOCATED IN SIDEWALK AREA AND ARE PART OF ROADWAY CALC'S.
STORMWATER SWALES = 9' x 164' = 1,476 S.F.
LOT COVERAGES = (43-46) = 19,156 S.F.
W 75% COVERAGE TO SWALE = 14,367 S.F.

TRIBUTARY FLOWS TO ROADSIDE SWALE: $\bar{C} \cdot I \cdot \Sigma A$

IMPERVIOUS COVERAGE: $\bar{C} = A \cdot C$

3571 + 14,367 = 17,938 S.F.

TOTAL IMPERVIOUS COVERAGE	$\bar{C}$ =	17,938 (.95) =	17041 SF
ROADSIDE SWALE	=	1476 (1.0) =	1476
		19414	18,517
		(0.45 AC.)	

$$\bar{C} = \frac{\Sigma C \cdot A}{\Sigma A} = \frac{19414}{18517} = .954$$

I: 2IN/hr (10 yr - 2Hr - STORM EVENT FROM NCDENR ESC PLANNING DESIGN MANUAL)

$\Sigma A = 0.45$ AC.

$$Q = \bar{C} \cdot I \cdot \Sigma A = (.954)(2"/hr)(0.45) = \boxed{0.86 \text{ CFS}}$$

FOR A 2hr STORM EVENT, THE VOLUME OF STORMWATER RUNOFF CREATED:

(0.86 CFS)(7200 Sec/2hr) = 6,192 C.F.

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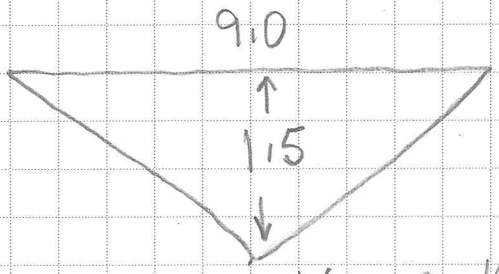
STORAGE VOLUME IN ROADSIDE SWALE:



A = 6.75
P = 9.48
HR = .71
S = 0.24%

$V = 2 \times \frac{1}{2} \times 4.5 \times 1.5 \times 164 = 1,107$ C.F.

INFILTRATION IN ROADSIDE SWALE = (10"/hr.)

SURFACE AREA = 9.48(164) = 1,555 S.F.

I.V. 1,555 (.83)(2 hrs) = 2,581 C.F.

SWALE IS CAPABLE OF HOLDING (1107 + 2,581) = 3,688 C.F.

PROPOSED SWALE VELOCITY CALC'S

MANNINGS FORMULA = $Q = 1.49/N \times A \times HR \times \sqrt{S}$

$Q = 1.49/0.035 \times 6.75 \times .71^{.667} \times \sqrt{0.0024}$

$42.57 \times 6.75 \times .795 \times 0.049 =$ (11.19 CFS)

(11.19 CFS) > [0.86 CFS] - Good

* POINT OF ANALYSIS AT WEST SIDE OF ROADWAY CULVERT (IN FRONT OF LOT # 43) FOR AREA # 6 & #7 CFS CALCS =

0.82 CFS + 0.86 CFS = 1.66 CFS

SIZE ROADWAY CULVERT FOR 2+ CFS (MIN.)

N=0.013 (15" RCP @ 0.0024 = 4.57 CFS)

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Swale Calcs for Area #8

Tributary Coverage to Swale:
1/2 of Roadway: 14.5 x 922' = 13,369 S.F.
Driveways in R/W are located in side walk area and areas are part of roadway calcs
Storm water swales = 9' x 965' = 8685
Lot (for Lots 53-59) Coverage = 31,029 S.F. (attached)

Tributary Flows to Roadside Swales $\bar{C} \cdot I \cdot \Sigma A$
Total Impervious Coverage $\bar{C} = A \cdot C$
13,369 + 31029 = 44,398 S.F.
Coverage $\bar{C}$ = 44,398 (.95) = 42,178
Roadside Swale = $\frac{8685 \times (10)}{53,083}$ = $\frac{8685}{50,863}$
1.219 Acres

$$\bar{C} = \frac{\Sigma C \cdot A}{\Sigma A} = \frac{53,083}{50863} = 0.958$$

I: 2in/hr (10yr - 2hr Storm Event From NCDENR ESC Planning Design Manual)

ΣA = 1.219 ACS.

$$Q = \bar{C} \cdot I \cdot \Sigma A = (.958)(2 in/hr)(1.219) = \boxed{2.336 \text{ CFS}}$$

For a 2 hr Storm event, the volume of stormwater runoff created:

(2.336)(7200 Sec/2 hr) = 16,819 C.F.

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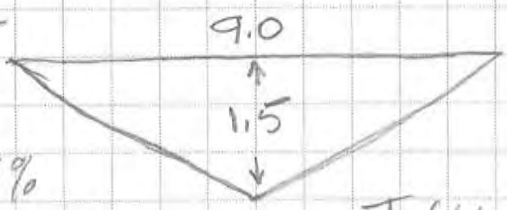
STORAGE VOLUME IN ROADSIDE SWALE:

A = 6.75
P = 9.48
HR = 0.71
S = 0.15%



$V = 2 \times \frac{1}{2} \times 4.5 \times 1.5 \times 965 = 6,514$ C.F.

INFILTRATION IN ROADSIDE SWALE (10"/hr)
SURFACE AREA = 9.48 × 965 = 9,119 S.F.

I.V. = 9119 (.83'/hr)(2 hrs) = 15,137.5 C.F.

SWALE IS CAPABLE OF HOLDING (6514 + 15137) = 21,651 C.F.

PROPOSE SWALE VELOCITY CALCS
MANNINGS FORMULA: $Q = \frac{1.49}{N} \times A \times HR^{2/3} \times \sqrt{S}$

$\frac{1.49}{0.1035} \times 6.75 \times .71^{.667} \times \sqrt{0.0015}$

$42.57 \times 6.75 \times .796 \times 0.0387 =$ **8.86 CFS**

8.86 > 2.336 CFS GOOD ✓

* POINT OF ANALYSIS AT NORTH SIDE OF CRUZ BAY LANE, WEST OF SOUTH INTERSECTION WITH NC 12 (EAST OF LOT 53) FOR ROADWAY CULVERT CFS CALC'S. AREA #6 + AREA #7 + AREA #8

0.82 CFS + 0.86 CFS + 2.336 = 4.016 C.F.S.

SIZE ROADWAY CULVERT FOR 5+ CFS (MIN)
N = 0.013 (18" RCP @ 0.005% = 7.43 CFS)

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SWALE CALCS FOR AREA #9
TRIBUTARY COVERAGE TO SWALE:
½ OF CUL-DE SAC AREA: 1,191 S.F.
½ OF ROADWAY: 14.5 X 560 L.F. = 8120 S.F. > 9,311 S.F.
DRIVEWAYS IN R/W ARE LOCATED IN SIDE WALK AREA AND AREAS ARE PART OF ROADWAY CALC'S.
STORMWATER SWALES = 9' × 516 = 4644
LOT COVERAGE (47-52) = 24,162 (ATTACHED)

TRIBUTARY FLOWS TO ROADSIDE SWALES $\bar{C} \cdot I \cdot \Sigma A$
TOTAL IMPERVIOUS COVERAGE $\bar{C} = A \cdot C$
9,311 + 24162 = 33473 S.F.

COVERAGE $\bar{C}$ =	33,473 (.95)	31,800
ROADSIDE SWALE	+ 4644 (1.0)	4644
	38,117	36,444

0.875 AC.

$$\bar{C} = \frac{\Sigma C \cdot A}{\Sigma A} = \frac{38,117}{36,444} = 0.956$$

I: 2IN/hr (10 yr-2hr Storm Event From NCDENR ESC Planning Design Manual)

ΣA = 0.875 AC.

$Q = \bar{C} \cdot I \cdot \Sigma A = (0.956)(2\text{IN/hr})(0.875) = \boxed{1.673 \text{ CFS}}$

FOR A 2 hr STORM EVENT, THE VOLUME OF STORM-WATER RUN OFF CREATED:

(1.673)(7200 SEC/2hr) = 12,046 C.F.

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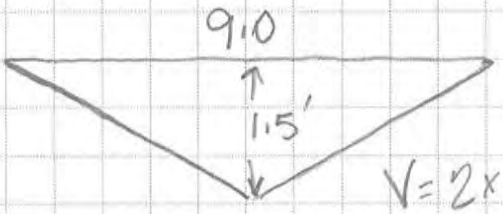
STORAGE VOLUME IN ROADSIDE SWALE:

A = 6.75
P = 9.48
HR = .71
S = 0.10%



$V = 2 \times \frac{1}{2} \times 4.5 \times 1.5 \times 516 = 3,483$ C.F.

INFILTRATION IN ROADSIDE SWALE (10"/hr) =
SURFACE AREA = $9.48 \times 516 = 4,892$ S.F.

I.V. = $4,892 (.83'/hr)(2 hrs) = 8,121$ C.F.

SWALE IS CAPABLE OF HOLDING (3483 + 8121) =
11,604 C.F.

PROPOSE SWALE VELOCITY CALC'S:
MANNINGS FORMULAR: $Q = 1.49/N \times A \times HR^{2/3} \times \sqrt{S}$

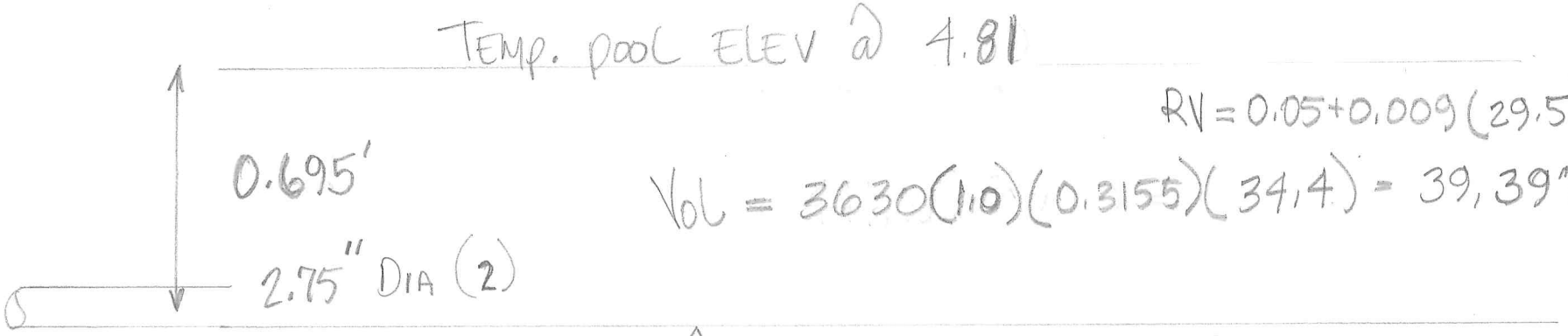
$1.49/0.035 \times 6.75 \times .71^{.667} \times \sqrt{0.0010} =$
$42.57 \times 6.75 \times .796 \times 0.0316 = 7.23$ C.F.S.

7.23 CFS > 1.673 CFS GOOD

P432 Corolla Bay Residential Development

Pond Draw Down Calc's

4/24/08



$RV = 0.05 + 0.009(29.5) = 0.3155$

$Vol = 3630(1.0)(0.3155)(34.4) = 39,397$ C.F.

$D = 2.75"$

$A = \pi R^2 = \pi(0.1146^2) = 0.0412$ Sf.

$Q = Co \cdot A \sqrt{2 \cdot g \cdot Ho/3}$

$Q = .6 \cdot 0.0412 \sqrt{2(32.2)(0.695/3)}$

$(0.0247)\ 3.86 = 0.095$ cfs $\times$ (2) orifices $= .191$ cfs

$VOL = 39397 / 0.191 = 206,267$ sec

3437 min

57.3 Hrs. $\rightarrow$ 2.39 days