CERTIFICATE OF AUTHENTICITY

THIS IS TO CERTIFY THAT THE FOLLOWING ELECTRONIC RECORDS ARE TRUE AND ACCURATE REPRODUCTIONS OF THE ORIGINAL RECORDS OF JAMES CITY COUNTY GENERAL SERVICES DEPARTMENT- STORMWATER DIVISION; WERE SCANNED IN THE REGULAR COURSE OF BUSINESS PURSUANT TO GUIDELINES ESTABLISHED BY THE LIBRARY OF VIRGINIA AND ARCHIVES; AND HAVE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.

BMP NUMBER: **PC195**

DATE VERIFIED: **June 28, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 13, 2010

TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services

FROM: Jo Anna Ripley, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: PC195

PIN: 3130100014

Subdivision, Tract, Business or Owner Name (if known): Longhill Grove

Property Description: Longhill Grove Apartments used to be known as Burton Woods Apartments

Site Address: 102 Burton Woods Drive

(For internal use only) **Box** 3 **Drawer:** 2

Agreements: (in file as of scan date) **Y** **Book or Doc#:** 030026590 **Page:**

Comments

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 19th day of August, 20 03, between Longhill Grove, L.P., and all successors in interest, ("COVENANTOR(S),") owner(s) of the following property: Tax Parcels (31-3)(1-12), (31-3)(1-13) and (31-3)(1-14), project name, Longhill Grove Apartments, Document No._____, Deed Book _____, Page No. _____; Instrument No. 03-7936 & 03-10239, and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

We, the COVENANTOR(S), with full authority to execute deeds, mortgages, other covenants, and all rights, titles and interests in the property described above, do hereby covenant with the COUNTY as follows:

1. The COVENANTOR(S) shall provide maintenance for the drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.

2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is properly maintained.

3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM for the COUNTY, its agent and its contractor.

4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the SYSTEM for the purpose of inspecting, operating, installing, constructing, reconstructing, maintaining or repairing the SYSTEM.

5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may assess the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

Instrument # 030026590

Recorded on Sept. 5, 2003.

6. The COVENANTOR(S) shall indemnify and save the COUNTY harmless from any and all claims for damages to persons or property arising from the installation, construction, maintenance, repair, operation or use of the SYSTEM.

7. The COVENANTOR(s) shall promptly notify the COUNTY when the COVENANTOR(S) legally transfers any of the COVENANTOR(S)' responsibilities for the SYSTEM. The COVENANTOR(S)' shall supply the COUNTY with a copy of any document of transfer, executed by both parties.

8. The covenants contained herein shall run with the land and shall bind the COVENANTOR(S) and the COVENANTOR(S)' heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of property served by the SYSTEM.

9. This COVENANT shall be recorded in the County Land Records.

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of the date first above written.

COVENANTOR(S)

_____

Print Name/Title Bryan E. Kornblau
Longhill Grove, L.P.

ATTEST:

_____

COVENANTOR(S)

_____

Print Name/Title _____

ATTEST:

_____

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF Henrico

I hereby certify that on this 19th day of August, 2003, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of Henrico, aforesaid personally appeared Bryan E. Kamblau and did acknowledge the aforegoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 19th day of August, 2003.

Joyce A. Wolfe
Notary Public
I was originally commissioned as
Joyce A. Hart, Notary Public

My Commission expires: 5/31/04

Approved as to form:

County Attorney

This Declaration of Covenants prepared by:

Joyce A. Wolfe
(Print Name)

Planning & Site Development
(Title)

4191 Innslake Drive, Suite 100
(Address)

Glen Allen, VA 23060
(City) (State) (Zip)

drainage.pre

Revised 01/02

James City County Environmental Division
Stormwater Management/BMP Record Drawing & Construction Certification Review
Tracking Form

Project Name: LONGHILL GROVE APARTMENTS
County Plan No.: SP-044-03
Stormwater Management Facility: WET EXTENDED DETENTION POND (TYPE A-3)
BMP Phase #: ☐ I ☐ II ☒ III
☐ Information Package Received. Date/By: JAN. 18, 2005
☐ Completeness Check:
- ☑ Record Drawing Date/By: 1-13-05 / TOWNES SITE ENG.
- ☑ Construction Certification Date/By: 1-14-05 / "
- ☑ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
- ☑ Insp/Maint Agreement # / Date: [redacted] # 030026590 9/05/03
- ☑ BMP Maintenance Plan Location: ON RECORD DRAWING
- ☐ Other:

☐ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
- ☑ Yes ☐ No Location: SHEET C-1 / comm #6 April 21, 2003

☑ Assign **County BMP ID Code #**: Code: PC-195
☑ Preliminary Input/Log into Division's "As-Built Tracking Log"
☑ Add Location to GIS Map. Obtain basic site information (GPIN, Owner, Address, etc.)
☑ Preliminary Log into Access Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
☑ Active Project File Review (correspondence, H&H, design computations, etc.).
☑ Initial As-Built File setup (File label, folder, copy plan/details/design information, etc.).
☑ Inspector Check of RD/CC (forward to Inspector using transmittal for cursory review).
☑ Pre-Inspection Drawing Review of Approved Plan (Quick look prior to Field Inspection).
☑ Final Inspection (FI) Performed Date: 1/4/07 JLB
☑ Record Drawing (RD) Review Date: 1/4/07
☑ Construction Certification (CC) Review Date: [redacted] 1/4/07
☐ Actions:
- ☐ No comments.
- ☑ Comments. Letter Forwarded. Date: 1/8/07 Letter
- ☐ Record Drawing (RD)
- ☐ Construction Certification (CC)
- ☐ Construction-Related (CR)
- ☐ Site Issues (SI)
- ☐ Other :

☐ Second Submission:
☑ Reinspection (if necessary): 4/17/07 JLB
☑ Acceptable for SWM Purposes (RD/CC/CR/Other). Ok to proceed with bond release.
☑ Complete "Surety Request Form".
☑ Check/Clean active file of any remaining material and finish "As-Built" file.
☑ Add to County BMP Inventory/Inspection schedule (Phase I, II or III).
☑ Copy Final Inspection Report into County BMP Inspection Program file.
☑ Obtain Digital Photographs of BMP and save into County BMP Inventory.
☑ Request mylar/reproducible from As-Built plan preparer.
☑ Complete "As-built Tracking Log".
☑ Last check of BMP Access Database (County BMP Inventory).
☐ ~~Add BMP to JCC Hydrology & Hydraulic database (optional).~~
☐ ~~Add BMP to Municipal BMP list (if a County-owned facility)~~
☑ Add BMP to PRIDE BMP ratings database.

Final Sign-Off

Plan Reviewer: [signature] Date: 4/17/07

*** See separate checklist, if needed.

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities Record Drawing and Construction Certification

Standard Forms & Instructions

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PC195

Issue Date
February 1, 2001

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

(Note: In accordance with the requirements of the Chesapeake Bay Preservation Ordinance, Chapter 23, Section 23-10(4), BMP's shall be designed and constructed in accordance with the manual entitled James City County Guidelines for Design and Construction of Stormwater Management BMP's. Erosion and sediment control policy and approved plans generally require that at the completion of the project and prior to release of surety, an "as-built" plan prepared by a registered Professional Engineer or Certified Land Surveyor must be provided for the drainage system for the project, including any Best Management Practice (BMP) facilities. In addition, for BMP facilities involving the construction of an impounding structure or dam embankment, certification is required by a Professional Engineer who has inspected the structure during its construction. Currently there are over 20 water quality type BMP's accepted by the County.)

Section 1 - Site Information:

Project Name: Longhill Grove
Structure/BMP Name: SWM/BMP Basin
Project Location: James City County at Intersection of Centerville Road & Longhill Road
BMP Location: Longhill Grove Apartments
County Plan No.: SP - 44 - 03

Project Type: ■ Residential ☐ Business ☐ Commercial ☐ Office ☐ Institutional ☐ Industrial ☐ Public ☐ Roadway ☐ Other _____

Tax Map/Parcel No.: (31-3) 1-12, (31-3) 1-13, (31-3) 1-14
BMP ID Code (if known): PC195
Zoning District:: R-5 w/ Proffers
Land Use: Apartments
Site Area (sf or acres): 15.82 Acres

Brief Description of Stormwater Management/BMP Facility: 10 Point, Wet Pond-Type Detention Facility, County Type A-3 BMP

Nearest Visible Landmark to SWM/BMP Facility: Building 4

Nearest Vertical Ground Control (if known):
■ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other
Station Number or Name: 309 Reset 1990
Datum or Reference Elevation: 101.76 Ft
Control Description: JCC Geodetic Ground Control Monument
Control Location from Subject Facility: N 3643181.517 E 11980267.633

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

I. Methods and Presentation: *(Required for all Stormwater Management / BMP facilities.)*

✓ 1. All constructed facilities meet approved design plans, unless otherwise shown. Record information or deviations from approved design plan shown in clearly annotated format and/or boxed beside design values.

✓ 2. Elevations to the nearest 0.1' unless higher accuracy is needed to show positive drainage.

✓ 3. All plan sheets labeled with "RECORD DRAWING" in large text in lower right hand corner (Approved County Plan Number and BMP ID Code can be included if known).

✓ 4. All plan sheet revision blocks modified to indicate date and record drawing status.

✓ 5. All plan sheets have certification statements and certifying professional's signature and seal.

II. Minimum Standards: *(Required for all Stormwater Management / BMP facilities, as applicable.)*

✓ 1. All requirements of Section I (Methods and Presentation) apply to this section.

✓ 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.

✓ 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.

✓ 4. Top widths, berm widths and embankment side slopes.

✓ 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.

✓ 6. Cross-section of the embankment through the principal spillway or outlet barrel. Must extend at least 100 ft. downstream of the pipe outlet or to recorded site property line, whichever is closer. Proper correlation is required between principal spillway (control structure) crest, emergency spillway crest, orifice and weirs and the top of the dam or facility. All elevations and dimensions must reasonably match the design plan or be sequentially relative to each other and the facility must reflect the required design storage volume(s) and/or design depth.

✓ 7. Profile or elevations along the entire centerline of the emergency spillway. Emergency spillway may be steeper, but no flatter or narrower than design.

✓ 8. Elevation of the principal spillway crest or outlet crest of the structure.

✓ 9. Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.

✓ 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

✓ 11. Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.

✓ 12. Type, location, size and number of anti-seep collars or documentation of other methods utilized for seepage control. **May need to obtain this information during construction.**

✓ 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**

✓ 14. Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.

✓ 15. Outlet barrel diameter, length, slope, type and thickness class of material and type of flared end sections, headwall or endwall.

✓ 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.

✓ 17. BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan.

✓ 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

✓ 19. Fencing location and type, if applicable to facility.

✓ 20. BMP vicinity properly cleaned of stockpiles and construction debris.

✓ 21. No visual signs of erosion or channel degradation immediately downstream of facility.

✓ 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

III. Group A - Wet Ponds *(Includes A-1 Small Wet Ponds; A-2 Wet Ponds; A-3 Wet Ext Det Ponds.)*

✓ A1. All requirements of Section II, Minimum Standards, apply to Group A facilities.

✓ A2. Principal spillway consists of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

✓ A3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

✓ A4. Access for maintenance and equipment is provided to the forebay(s). Access corridors are at least 12 ft. wide, have a maximum slope of 15 percent and are adequately stabilized to withstand heavy equipment or vehicle use.

✓ A5. Adequate fixed vertical sediment depth markers installed in the forebay(s) for future sediment monitoring purposes.

N/A A6. Pond liner (if required) provided. Either clay liners, polyliners, bentonite liners or use of chemical soil additives based on requirements of the approved plan.

✓ A7. Minimum 6 percent slope safety bench extending a minimum of 15 feet outward from normal pool edge and/or an aquatic bench extending a minimum of 10 feet inward from the normal shoreline with a maximum depth of 12 inches below the normal pool elevation, if applicable, per the approved design plans. (Note: Safety benches may be waived if pond side slopes are no steeper than 4H:1V).

✓ A8. No trees are present within a zone 15 feet around the embankment toe and 25 feet from the principal spillway structure.

✓ A9. Wet permanent pool, typically 3 to 6 feet deep, is provided and maintains level within facility.

✓ A10. Low flow orifice has a non-clogging mechanism.

✓ A11. A pond drain pipe with valve was provided.

✓ A12. Pond side slopes are not steeper than 3H:1V, unless approved plan allowed for steeper slope.

N/A A13. End walls above barrels (outlet pipe) greater than 48 inch in diameter are fenced to prevent a fall hazard.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

IV. Group B - Wetlands *(Includes B-1 Shallow Marsh; B-2 Ext Det Shallow Wetlands; B-3 Pond Wetland System and B-4 Pocket Wetland)*

N/A B1. Same requirements as Group A Wet Ponds.

N/A B2. Minimum 2:1 length to width flow path provided across the facility.

N/A B3. Micropool provided at or around outlet from BMP (generally 3 to 6 ft. deep).

N/A B4. Wetland type landscaping provided in accordance with approved plan. Includes correct pondscaping zones, plant species, planting arrangements, wetland beds, etc. Wetland plants include 5 to 7 emergent wetland species. Individual plants at 18 inches on center in clumps.

N/A B5. Adequate wetland buffer provided (Typically 25 ft. outward from maximum design water surface elevation and 15 ft. setback to structures).

N/A B6. No more than one-half (½) of the wetland surface area is planted.

N/A B7. Topsoil or wetland mulch provided to support vigorous growth of wetland plants.

N/A B8. Planting zones staked or flagged in field and locations subsequently established by appropriate field surveying methods for record drawing presentation.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

V. Group C - Infiltration Practices

(Includes C-1 Infiltration Trench; C-2 Infiltration Trench; C-3 Infiltration Basin; and C-4 Infiltration Basin)

N/A C1. All requirements of Section II, Minimum Standards, apply to Group C facilities as applicable.

N/A C2. Facility is not located on fill slopes or on natural ground in excess of six (6) percent.

N/A C3. Pretreatment devices provided prior to entry into the infiltration facility. Acceptable pretreatment devices include sediment forebays, sediment basins, sediment traps, sump pits or inlets, grass channels, plunge pools or other acceptable measures.

N/A C4. Three (3) or more of the following pretreatment devices provided to protect long term integrity of structure: grass channel; grass filter strip; bottom sand layer; upper filter fabric layer; use of washed bank run gravel aggregate.

N/A C5. Sides of infiltration practice lined with filter fabric.

N/A C6. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A C7. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

N/A C8. Minimum one hundred (100) foot separation horizontally from any known water supply well and minimum one hundred (100) foot separation upslope from any building.

N/A C9. Minimum twenty-five (25) foot separation down gradient from any structure.

N/A C10. Stormwater outfalls provided for overflow associated with larger design storms.

N/A C11. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A C12. Facility does not currently cause any apparent surface or subsurface water problems to downgrade properties.

N/A C13. Observation well provided.

N/A C14. Adequate, direct access provided to the facility for future maintenance, operation and inspection.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VI. Group D - Filtering Systems

(Includes D-1 Bioretention Cells; D-2 Surface Sand Filters; D-3 Underground Sand Filters; D-4 Perimeter Sand Filters; D-5 Organic Filters; and D-6 Pocket Sand Filters)

N/A D1. All requirements of Section II, Minimum Standards, apply to Group D facilities.

N/A D2. Sediment pretreatment devices provided.

N/A D3. For D-1 BMPs (Bioretention Cells), pretreatment consisting of a grass filter strip below level spreader (deflector); a gravel diaphragm; and mulch and planting soil layers were provided.

N/A D4. For D-1 BMPs (Bioretention Cells), plantings consist of native plant species; vegetation provided was based on zones of hydric tolerances; trees and understory of shrubs and herbaceous materials were provided; woody vegetation is absent from inflow locations; and trees are located around facility perimeter.

N/A D5. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A D6. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed .

N/A D7. Filtering system is off-line from storm drainage conveyance system.

N/A D8. Overflow outlet has adequate erosion protection.

N/A D9. Deflector, diversion, flow splitter or regulator structure provided to divert the water quality volume to the filtering structure.

N/A D10. Minimum four (4) inch perforated underdrain provided in a clean aggregate envelope layer beneath the facility.

N/A D11. Minimum fifty (50) foot separation from any slope fifteen (15) percent or greater. Minimum one hundred (100) foot separation horizontally from any known water supply well. Minimum one hundred (100) foot separation upslope and twenty-five (25) foot separation downslope from any building.

N/A D12. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

N/A D13. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A D14. Adequate, direct access provided to the pretreatment area and/or filter bed for future maintenance.

STORMWATER MANAGEMENT / BMP FACILITIES
AS-BUILT PLAN CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VII. Group E - Open Channel Systems

(Includes E-1 Wet Swales (Check Dams); E-2 Dry Swales;and E-3 Biofilters)

N/A E1. All requirements of Section II, Minimum Standards, apply to Group E facilities as applicable.

N/A E2. Open channel system has constructed longitudinal slope of less than four (4) percent.

N/A E3. No visual signs of erosion in the open channel system's soil and/or vegetative cover.

N/A E4. Open channel side slopes are no steeper than 2H:1V at any location. Preferred channel sideslope is 3H:1V or flatter.

N/A E5. No visual signs of ponding are present at any location in the open channel system, except at rock check dam locations for E-1 systems (Wet Swales).

N/A E6. For E-2 BMPs (Dry Swales), an underdrain system was provided.

N/A E7. Treated timber or rock check dams provided as pretreatment devices for the open channel system.

N/A E8. Gravel diaphragm provided in areas where lateral sheet flow from impervious surfaces are directly connected to the open channel system.

N/A E9. Grass cover/stabilization in the open channel system appears adaptable to the specific soils and hydric conditions for the site and along the channel system.

N/A E10. Open channel system areas with grass covers higher than four (4) to six (6) inches were properly mowed.

N/A E11. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A E12. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

N/A E13. For E-3 BMPs (Biofilters), the bottom width is six (6) feet maximum at any location.

N/A E14. For E-3 BMPs (Biofilters), sideslopes are 3H:1V maximum at any location.

N/A E15. For E-3 BMPs (Biofilters), the constructed channel slope is less than or equal to three (3) percent at any location.

N/A E16. For E-3 BMPs (Biofilters), the constructed grass channel is approximately equivalent to the constructed roadway length.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VIII. Group F - Extended Dry Detention

(Includes F-1 Timber Walls; and F-2 Dry Extended Detention with Forebay)

N/A F1. All requirements of Section II, Minimum Standards, apply to Group F facilities.

N/A F2. Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.

N/A F3. Timber wall BMP used in intermittent stream only. (ie. Prohibited in perennial streams.)

N/A F4. Forebay provided approximately 20 ft. upstream of the facility. Forebays generally 4 to 6 feet in depth.

N/A F5. A reverse slope pipe, vertical stand pipe or mini-barrel and riser was provided to prevent clogging.

N/A F6. Principal spillway and outlet barrel provided consisting of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

N/A F7. Mini-barrel and riser, if used, contains a removable trash rack to reduce clogging.

N/A F8. Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack.

N/A F9. Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.

N/A F10. Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.

N/A F11. Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.

N/A F12. Stilling basin or standard outlet protection provided at principal spillway outlet.

N/A F13. Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, slope is less than twenty (20) percent and appropriate stabilization provided for equipment and vehicle use. Access extends to forebay, standpipe and timber wall, as applicable.

N/A F14. No visual signs of undercutting of timber walls or clogging of the low orifice were present.

N/A F15. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A F16. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

IX. Group G - Open Spaces *(Includes All Open Space Types G-1; G-2; and G-3)*

N/A G1. All requirements of Section II, Minimum Standards, apply to Group G facilities as applicable.

N/A G2. Constructed impervious areas appear to conform with locations indicated on the approved plan and appear less than sixty (60) percent impervious in accordance with the requirements of the James City County Chesapeake Bay Preservation Ordinance.

N/A G3. Dedicated open space areas are in undisturbed common areas, conservation easements or are protected by other enforceable instruments that ensures perpetual protection.

N/A G4. Provisions included to clearly specify how the natural vegetated areas utilized as dedicated open space will be managed and field identified (marked).

N/A G5. Adequate protection measures were implemented during construction to protect the defined dedicated open space areas.

N/A G6. Dedicated open space areas were not disturbed during construction (ie. cleared, grubbed or graded).

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

X. Storm Drainage Systems (Associated with BMP's Only)

(Includes all incidental stormwater drainage conveyance systems associated with SWM/BMP facilities such as onsite or offsite storm drains, open channels, inlets, manholes, junctions, outlet protections, deflectors, etc. These facilities are external to the treatment function of, but are directly associated with drainage to and/or from a constructed SWM/BMP facility. The intent of this portion of the certification is to accurately identify the type and quantity of inflow or outflow points associated with the facility for future reference. The Professional may use his/her own discretion to determine inclusive facilities to meet the intent of this section. As a general rule, storm drainage systems would include incidental facilities to the nearest access structure upslope or downslope from the normal physical limits of the facility or 800 feet of storm drainage conveyance system length, whichever is less.)

N/A SD1. All requirements of Section II, Minimum Standards, apply to Storm Drainage Systems.

N/A SD2. Horizontal location of all pipe and structures relative to the SWM/BMP facility.

N/A SD3. Type, top elevation and invert elevation of all access type structures (inlets, manholes, etc.).

N/A SD4. Material type, size or diameter, class, invert elevations, lengths and slopes for all pipe segments.

N/A SD5. Class, length, width and depth of riprap and outlet protections or dimensions of special energy dissipation structures.

XII. Other Systems

(Includes any non-typical, specialty, manufactured or innovative stormwater management/BMP practices or systems generally accepted for use as or in conjunction with other acceptable stormwater management / BMP practices. Requires evidence of prior satisfactory industry use and prior Environmental Division approval, waiver or exception .)

N/A O1. All requirements of Section II, Minimum Standards, apply to this section.

N/A O2. Certification criteria to be determined on a case-by-case basis by the Environmental Division specific to the proposed SWM/BMP facility.

XIII. References

(The James City County Record Drawing and Construction Certification Forms and Checklists for Stormwater Management / BMP facilities were developed using the following sources and references.)

- ☐ Baltimore County, Maryland Soil Conservation District, As-Built Stormwater Management Pond Checklist.
- ☑ James City County, Virginia, Guidelines for Design and Construction of Stormwater Management BMP's (October 1999).
- ☑ James City County, Virginia, Stormwater Detention/Retention Basin Design Checklist and Erosion and Sediment Control and Stormwater Management Design Plan Checklists.
- ☐ James City County Stormwater Policy Framework, Final Report of the James City County BMP Policy Project, October 1998, The Center for Watershed Protection.
- ☐ Prince Georges County, Maryland, As-Built Requirements Retention or Detention Pond/Basin.
- ☐ Prince William County, Virginia, Stormwater Management Fact Sheet.
- ☐ Stafford County, Virginia, As-Built Plan Checklist.
- ☐ Stormwater Management Design Manual, NRCS Maryland Code No. 378, Pond Standards and Specifications.
- ☐ USEPA/Watershed Management Institute, Stormwater Management Inspection Forms.
- ☐ Virginia Impounding Structure Regulations (Dam Safety), Department of Conservation & Recreation, 1997.
- ☐ Virginia Erosion and Sediment Control Handbook, Third Edition 1992, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.
- ☐ Virginia Stormwater Management Handbook, 1999 edition, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.

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James City County, Virginia
Environmental Division

Erosion and Sediment Control and Stormwater Management Design Plan Checklists

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GENERAL INFORMATION

Project Name: LONGHILL GROVE
Owner / Applicant: EAGLE CONSTRUCTION OF VA
Plan Preparer: TOWNES SITE ENGINEERING Email: bmitchell@cctownes.com
Project Location: LONGHILL DRIVE / CENTERVILLE ROAD
Tax Map / Parcel: (31-3) 1-12, 31-3(1-13), 31-3(1-14)
County Plan No. (if known): SP-44-03
County BMP Type: A-3 WET POND EXTENDED DETENTION (A-3)
Other information submitted in addition to this checklist (Check all that apply):

- ☑ Design or Construction Drawings (Plans, Profiles, Details, etc.).
- ☑ Erosion & Sediment Control Plan (Plans, Details, etc.).
- ☑ Erosion & Sediment Control Plan Design Report.
- ☑ Stormwater Management Design Plan (Plans, Profiles, Details, etc.).
- ☑ Stormwater Management Design Report.
- ☐ Other, List: _____

Issue Date
March 1, 2001

JAMES CITY COUNTY, VIRGINIA
ENVIRONMENTAL DIVISION

EROSION AND SEDIMENT CONTROL PLAN CHECKLIST

I. *GENERAL:*

Yes	No	N/A	
☑	☐	☐	*FAMILIARITY* with current versions of Chapter 8, Erosion and Sedimentation Control and Chapter 23, Chesapeake Bay Preservation ordinances of the Code of James City County, Virginia and the Virginia Erosion and Sediment Control Handbook (VESCH).
☑	☐	☐	*LAND DISTURBING PERMIT AND SILTATION AGREEMENT* with surety are required for the project.
☐	☑	☐	*VARIANCE* if necessary, requested in writing, for the plan approving authority to waive or modify any of the minimum standards and specifications of the VESCH deemed inappropriate based on site conditions specific to this review case only. Variances which are approved shall be properly documented in the plan and become part of the approved erosion and sediment control plan for the site.

II. *SITE PLAN:*

Yes	No	N/A	
☑	☐	☐	*VICINITY MAP* locating the site in relation to the surrounding area. Include any major landmarks which might assist in physically locating the site.
☑	☐	☐	*INDICATE NORTH* direction in relation to the site.
☑	☐	☐	*LIMITS OF CLEARING AND GRADING* for the site including that required for implementation of erosion and sediment controls, stockpile areas and utilities.
☑	☐	☐	*DISTURBED AREA ESTIMATES* in acres or square feet for the project.
☑	☐	☐	*EXISTING TOPOGRAPHY* or contours for the site at no more than 5 foot contour interval.
☑	☐	☐	*FINAL TOPOGRAPHY*, contours or proposed site grading in accordance with the design plan which indicates changes to existing topography and drainage patterns at no more than 2 foot contour interval (or 1 foot contours where required).
☑	☐	☐	*EXISTING AND PROPOSED SPOT ELEVATIONS* to supplement existing and proposed contours, topography or site grading information. Spot elevations may replace final contours in some instances, especially if terrain is in a low lying area or relatively flat.
☑	☐	☐	*EXISTING VEGETATION* including existing tree lines, grassed or unique vegetation areas.

Yes	No	N/A	
☑	☐	☐	*EXISTING SITE FEATURES* including roads, buildings, homes, utilities, streams, fences, structures and other important surface features of the site.
☑	☐	☐	*SOILS MAP* with soil symbols, boundaries and legend in accordance with the current Soil Survey of James City and York Counties and the City of Williamsburg, Virginia.
☑	☐	☐	*ENVIRONMENTAL INVENTORY* in accordance with Section 23-10(2) of the Chesapeake Bay Preservation Ordinance of James City County. Inventory generally includes: tidal shores and wetlands, non-tidal wetlands, resource protection area, hydric soils and slopes steeper than 25 percent. For wetlands, provide a copy of issued permits or satisfactory evidence that appropriate permits are being pursued for the entire project.
☐	☐	☑	*100-YEAR FLOODPLAIN LIMITS* or any special flood hazard areas or flood zones based on appropriate Federal Management Agency Flood Insurance Rate Maps (FIRMs) or Flood Hazard Boundary Maps (FHBMs) of James City County, Virginia.
☑	☐	☐	*DRAINAGE AREAS* for offsite and onsite areas, existing or proposed as applicable. Include drainage divides and directional labels for all subareas at points of interest and size (in acres), weighted runoff coefficient or curve number and times of concentration for each subarea.
☑	☐	☐	*CRITICAL EROSION AREAS* which require special consideration or unique erosion and sediment control measures. Refer to the VESCH, Chapter 6 for criteria.
☑	☐	☐	*DEVELOPMENT PLAN* for the site showing all improvements such as buildings, structures, parking areas, access roadways, above and below ground utilities, stormwater management and drainage facilities, trails or sidewalks, proposed vegetation and landscaping, amenities, etc.
☑	☐	☐	*LOCATION OF PRACTICES* proposed for erosion and sediment control, tree protection and temporary stormwater management due to land disturbance activities at the site. Use standard abbreviations, labels and symbols consistent for plan views based on minimum standards and specifications in Chapter 3 of the VESCH.
☑	☐	☐	*TEMPORARY STOCKPILE AREAS* or staging and equipment storage areas as required for onsite or offsite construction activities or indicate that none are anticipated for this project.
☐	☐	☑	*OFFSITE LAND DISTURBING AREAS* including borrow sites, waste areas, utility extensions, etc. and required erosion and sediment controls. If none are anticipated for the project, then indicate on the plans by general or erosion and sediment control notes.
☑	☐	☐	*DETAILS* or alternately, appropriate reference to current minimum standards and specifications of the VESCH for each measure proposed for the project. Non-modified, standard duplicated details (silt fence, diversion dikes, etc.) may be referenced to the current version of the VESCH. Specific dimensional or modified standards (basins, traps, outlet protections, check dams, etc.) require presentation on detail sheets. Schedules or tables may be used for multiple site measures such as sediment traps, basins, channels, slope drains, etc. Any modification to standard details should be clearly defined, explained and illustrated.

Yes No N/A

☑ ☐ ☐ *MAINTENANCE PLAN* or alternately, appropriate reference to current minimum standards and specifications of the VESCH, outlining the inspection frequency and maintenance requirements for all erosion and sediment control measures proposed for the project.

☐ ☐ ☑ *TRENCH DEWATERING* methods and erosion and sediment controls, if anticipated for the project.

☑ ☐ ☐ *CONSTRUCTION SEQUENCE* outlining the anticipated sequence for installation of erosion and sediment controls and site, grading and utility work to be performed for the project by the site contractor.

☐ ☐ ☑ *PHASING PLAN* if required for larger project sites that are to be developed in stages or phases.

☑ ☐ ☐ *STANDARD COUNTY NOTES* are required to be placed on the erosion and sediment control plan. Refer to the standard James City County Erosion and Sediment Control Notes dated May 5, 1999.

☑ ☐ ☐ *PROFESSIONAL SEAL AND SIGNATURE* required on final and complete approved plans, drawings, technical reports and specifications.

III. ***NARRATIVE:***

Yes No N/A

☑ ☐ ☐ *PROJECT DESCRIPTION* briefly describing the nature and purpose of the land disturbing activity and the acreage to be disturbed.

☑ ☐ ☐ *EXISTING SITE CONDITIONS* description of existing topography, land use, cover and drainage patterns at the site.

☑ ☐ ☐ *ADJACENT AREA* descriptions of neighboring onsite or offsite areas such as streams, lakes, property, roads, etc. and potential impacts due to concentrated flow or runoff from the land disturbing activity.

☐ ☐ ☑ *OFFSITE DISTURBED AREA* descriptions of proposed borrow sites, waste or surplus areas, utility extensions and erosion and sediment controls to be implemented.

☑ ☐ ☐ *SOILS DESCRIPTION* briefly summarizing site, disturbed area and drainage basin soils including name, unit, hydrologic soil group (HSG) classification, surface runoff potential, erodibility, permeability, depth, texture, structure, erosion hazards, shrink-swell potential, limitations for use and anticipated depths to bedrock and the seasonal water table, as applicable.

☐ ☐ ☑ *CRITICAL AREAS* on the site which many have potentially serious erosion and sediment control problems and special considerations required (ie. steep slopes, hydric soils, channels, springs, sinkholes, water supply reservoirs, groundwater recharge areas, etc.)

Yes	No	N/A	
☑	☐	☐	*PROPOSED EROSION & SEDIMENT CONTROL MEASURES* inclusive to the specific erosion and sediment control plan as proposed for the land disturbing activity. Measures should be consistent with those proposed on the site drawings. Address general use, installation, limitations, sequencing and maintenance requirements for each control measure.
☑	☐	☐	*STABILIZATION MEASURES* required for the site, either temporary or permanent, and during and following construction including temporary and permanent seeding and mulching, paving, stone, soil stabilization blankets and matting, sodding, landscaping or special stabilization techniques to be utilized at the site.
☑	☐	☐	*STORMWATER MANAGEMENT CONSIDERATIONS* for the site, either of temporary or permanent nature, and strategies, sequences and measures required for control. May reference the stormwater management plan for the site, if prepared, for permanent stormwater management facilities and control of drainage once the site is stabilized.

IV. ***CALCULATIONS:***

Yes	No	N/A	
☑	☐	☐	*CALCULATIONS AND COMPUTATIONS* associated with hydrology, hydraulics and design of proposed temporary and permanent erosion and sediment control measures including: sediment traps and basins, diversions, stormwater conveyance channels, culverts, slope drains, outlet protections, etc. Computations are not required on the construction plan and may be attached in a supplemental erosion and sediment control plan design report, if presented in a clear and organized format.
☑	☐	☐	*TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET* submitted for each basin along with schematic or sketch cross-section showing applicable design and construction data, storage volumes (wet-dry), dimensions and elevations. Peak design runoff to be based on the 2- or 25-year design storm event based on maximum disturbed site conditions (existing, interim or proposed conditions) in accordance with Minimum Standard 3.14 of the VESCH.

JAMES CITY COUNTY, VIRGINIA
ENVIRONMENTAL DIVISION

STORMWATER MANAGEMENT DESIGN PLAN CHECKLIST

I. *GENERAL:*

Yes	No	N/A	
☑	☐	☐	*FAMILIARITY* with current versions of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual; Chapter 8, Erosion and Sediment Control and Chapter 23, Chesapeake Bay Preservation ordinances of the Code of James City County, Virginia; the Virginia Erosion and Sediment Control Handbook (VESCH); and the Virginia Stormwater Management Handbook (VSMH).
☐	☐	☑	*WAIVER OR EXCEPTION* if necessary, requested in writing, for the plan approving authority to waive or except the requirements of Chapter 23, Chesapeake Bay Preservation ordinance in accordance with procedure established in Sections 23-14 through 23-17 of the ordinance. Applies to this review case only.
☐	☐	☑	*VARIANCE REQUEST* if necessary, requested in writing for the plan approving authority to waive or modify any of the minimum standards and specifications of the VESCH deemed inappropriate based on site conditions specific to this review case only. Variances which are approved shall be properly documented in the plan and become part of the approved erosion and sediment control plan for the site.
☑	☐	☐	*PROFESSIONAL SEAL AND SIGNATURE* required on final and complete approved stormwater management plans, drawings, technical reports and specifications.
☑	☐	☐	*WORKSHEET FOR BMP POINT SYSTEM* to ensure the stormwater management plan for the project attains at least 10 BMP points (New Development) or traditional pollutant load reduction computations per the Chesapeake Bay Local Assistance Manual (Redevelopment Only).
☐	☐	☑	*PROPOSED CONSERVATION EASEMENT AREAS* for any natural open space points claimed in the BMP worksheet.
☐	☑	☐	*INSPECTION/MAINTENANCE AGREEMENT* is required to be prepared and executed with the County for the project. WILL BE SUBMITTED PRIOR TO C/O
☑	☐	☐	*FEMA FIRM PANEL* reference with designated special flood hazard areas or zone designations associated with the site, as applicable. SHOWN ON COVER PANEL 5102010035B
☑	☐	☐	*DRAINAGE AREA MAP* at a maximum scale of 1"=200' scale showing drainage area boundaries for pre- and postdevelopment conditions and associated time of concentration flow paths. Labels to include drainage area size, runoff coefficient or curve number and time of concentration for each subarea shown on the map.

Yes No N/A

☑ ☐ ☐ *SOILS MAP* with soil symbols, boundaries and legend in accordance with the current Soil Survey of James City and York Counties and the City of Williamsburg, Virginia with approximate locations of the project site, BMPs and applicable drainage basins.
ADDED SOILS MAPSHEET

☑ ☐ ☐ *STORMWATER MANAGEMENT NARRATIVE* in a brief and simple format which describes the project; location; site and drainage basin soil characteristics; receiving water or drainage facility; existing site and drainage basin conditions (topography, land use, cover, slopes, etc.); proposed site development; proposed stormwater management and drainage plan including County BMP type selected; summary of hydrology and hydraulics; maintenance program; and any special assumptions utilized for development of the stormwater management and drainage design plan or computations.
INCLUDED SUMMARY IN SUBMITTAL PACKET

☐ ☐ ☑ *TEMPORARY STORMWATER MANAGEMENT* (if applicable) for control of stormwater runoff encountered during construction activities in addition to measures provided in the erosion and sediment control plan or stormwater management/drainage plan for the site. Adequate protection measures or sequencing provided.

☑ ☐ ☐ *MODIFICATION PLAN* clearly defined for temporary sediment control structures which will be converted to permanent SWM/BMP structures. Includes appropriate hydrologic and hydraulic computations, conversions, sequencing and cleanout information or details. Normally related to primary control structures associated with dry detention or wet retention ponds. Normally not permitted for Group C or D categories such as bioretention, infiltration and filtering system facilities.

☑ ☐ ☐ *STORMWATER MANAGEMENT and DRAINAGE DESIGN REPORT* in a bound 8-1/2 x 11 inch size format. Report shall generally include a title sheet, date, project identification, owner and preparer information, table of contents, narrative, summaries and computations as required. Computations may include: backwater, closed conduit, headwater, hydraulic, hydraulic grade line, hydrology, inlet, open channel, storm sewer, water quality, extended detention or stream channel protection and muti-stage storm routing calculations, as applicable, for the project. Computation data may include hand or computer generated computations, maps or schematics. All information should be presented in a clear, easy to follow format and should closely match construction plan information.

☑ ☐ ☐ *PLAN VIEW* at 1 inch = 50 ft. scale or less (1" = 40', 1" = 30', etc.)

- ☑ ☐ ☐ North arrow and plan legend.
- ☑ ☐ ☐ Property lines.
- ☑ ☐ ☐ Adjacent property information.
- ☑ ☐ ☐ Existing site features and existing impervious cover areas.
- ☑ ☐ ☐ Impervious cover tabulations.
- ☑ ☐ ☐ Existing drainage facilities (natural or manmade).
- ☑ ☐ ☐ Existing environmentally sensitive areas (RPA, wetlands, floodplain, steep slopes, critical soils, buffers, etc.).
- ☑ ☐ ☐ Existing and proposed contours (1' or 2' contour interval) and spot elevations as necessary to define high and low topography.
- ☑ ☐ ☐ Existing and proposed easement locations.

Yes	No	N/A	
☑	☐	☐	Proposed site improvements and proposed impervious cover areas.
☑	☐	☐	Proposed stormwater conveyance, drainage and management facilities with appropriate labeled construction data and information.
☑	☐	☐	Proposed landscaping and seeding plans (disturbed areas, pond interior, etc.).
☑	☐	☐	Proposed slope stabilization areas (riprap, blankets, mattings, walls, etc.).
☑	☐	☐	Delineation of permanent pools and the 1-, 2-, 10- and 100-year Design Water Surface Elevations.
☑	☐	☐	Delineation of ponding, headwater, surcharge or backwater areas which may affect adjacent existing or proposed buildings, structures or upstream adjacent properties.
☐	☐	☑	Test boring locations with reference surface elevations (if known).
☑	☐	☐	Risers, barrels, underdrains, overflows and outlet protections.
☑	☐	☐	Emergency spillway level section and outlet channel.
☑	☐	☐	Existing and proposed site utilities and protection measures.
☑	☐	☐	Erosion and sediment control measures (for site or BMP).
☑	☐	☐	Maintenance or access corridors to permanent stormwater management, BMP or drainage facilities.

II. ***STORMWATER CONVEYANCE SYSTEMS:***

Yes	No	N/A	
☑	☐	☐	*PLAN VIEWS*
☑	☐	☐	Storm drain lengths, sizes, types, classes and slopes for all segments. Label directly on plan or use structure/pipe schedule.
☑	☐	☐	Access structure (inlets, manholes, junctions, etc.) rim elevations, inverts, type and required grate or top unit and lengths labeled.
☑	☐	☐	All structure numbers labeled.
☑	☐	☐	Adequate horizontal clearance from other site utilities or structures.
☑	☐	☐	*PROFILES* generally are not required but are encouraged to expedite review. If not provided, ensure all pipe segments have adequate minimum cover, do not exceed maximum depths of cover for the type/class of pipe specified and do not conflict with other site utilities or excavation areas.
☑	☐	☐	*DETAILS*
☑	☐	☐	Typical storm drain bedding details or reference note.
☑	☐	☐	Standard details or reference note for all proposed access structure types (inlets, manholes, junctions, etc.).
☑	☐	☐	Inlet shaping detail or applicable reference note.
☑	☐	☐	Step detail or applicable reference note (if depth 4 ft. or more).
☑	☐	☐	Typical open channel details with designation, location, shape, type, bottom width, top width, lining, slope, length, side slope, and installation depth required for construction. Channel design data as necessary may also be included.
☑	☐	☐	Outlet protections at all pipe outfalls.

Yes No N/A

☑ ☐ ☐ *STORMWATER CONVEYANCE SYSTEM COMPUTATIONS*

- ☑ ☐ ☐ Storm Sewer Design computations based on 10-year design event.
- ☑ ☐ ☐ Hydraulic Grade Line computations based on 10-year design event.
- ☑ ☐ ☐ Inlet computations based on current VDOT procedure for spread, ponding depth and grate size required.
- ☑ ☐ ☐ Culvert Headwater computations. Design based on 10-year design storm event and check only for 100-year storm event.
- ☑ ☐ ☐ Open Channel computations based on 2-year design event for velocity and 10-year design event for capacity.
- ☑ ☐ ☐ Standard outlet protection or special energy dissipators.
- ☑ ☐ ☐ Pipe thickness design computations, as required, for selected pipe type (live load, minimum cover, maximum height of cover, etc.).
- ☑ ☐ ☐ Adequate channel computations for receiving channels (based on field measured channel section data).

III. ***STORMWATER MANAGEMENT / BMP FACILITIES:***

Yes No N/A

☑ ☐ ☐ *HYDROLOGY* - An SCS based methodology is required for the design of stormwater management/BMP facilities with watersheds exceeding 20 acres. Under 20 acres, other generally accepted methodologies such as the modified rational, critical storm are allowable. Refer to Chapter 5 of the VESCH or Chapter 5 of the VSMH.

- ☑ ☐ ☐ Runoff Curve Number or Coefficient determinations: predeveloped and ultimate development land use scenarios.
- ☑ ☐ ☐ Time of concentration: predeveloped and ultimate development indicating overland, shallow concentrated, and channel flow components (200 ft. maximum length for overland flow).
- ☑ ☐ ☐ Hydrograph generation (tabular or graphical): pre- and postdevelopment conditions for the 1-, 2-, 10-, and 100-year design storm events.

☑ ☐ ☐ *FACILITY CONFIGURATION and MINIMUM SEPARATIONS*

- ☑ ☐ ☐ Screening and layout consistent with Section 24-98(d) of the Chapter 24 Zoning ordinance (landscaping, screening, visibility, etc.).
- ☑ ☐ ☐ Basic considerations for safety and unauthorized entry.
- ☑ ☐ ☐ Proper length to width ratio (Typically 2H:1V).
- ☑ ☐ ☐ Facilities with deep pools (4 feet or more in depth) provided with two benches. Fifteen (15) ft. safety bench outward from normal pool at maximum 6 percent slope and aquatic bench inward from normal shoreline below normal pool. Narrower widths may be considered on a case-by-case basis.
- ☑ ☐ ☐ Pond buffer minimum 25 feet outward from maximum design WSEL. Additional setbacks may be required to permanent structures.
- ☑ ☐ ☐ No trees, shrubs or woody plants within 15 feet of embankment toe or 25 feet from principal spillway structure.

Yes	No	N/A	
☐	☐	☐	Infiltration and filtering system facilities generally located at least 100 feet horizontally from any water supply well; 100 feet from any downslope building; and 25 feet from any upslope buildings, unless site specific investigation allows for reduced separation.

Yes	No	N/A	
☑	☐	☐	*HYDRAULIC COMPUTATIONS*
☑	☐	☐	Elevation- or Stage- Storage curve and/or tabular data.
☑	☐	☐	Weir / Orifice Control - Extended Detention.
☑	☐	☐	Weir / Orifice Control - riser 1-year control for channel protection.
☑	☐	☐	Weir / Orifice Control - riser 2-year control for quantity (if required).
☑	☐	☐	Weir / Orifice Control - riser 10-year control for quantity (if required).
☐	☑	☐	Inlet / Outlet (barrel) control - (All Storms).
☐	☑	☐	Check for barrel control prior to riser orifice flow to prevent slug flow-water hammer conditions.
☑	☐	☐	Emergency spillway capacity and depth of flow.
☑	☐	☐	Elevation - Discharge (Outlet Rating) curve and/or table. Provide all supporting calculations and/or design assumptions.
☐	☑	☐	Adequate channel computations for receiving channel. May be waived if facility is designed based on current Stream Channel Protection criteria.
☑	☐	☐	*POND or RESERVOIR ROUTING*
☑	☐	☐	Storage-Indication Routing of postdeveloped inflow hydrographs for the 1-, 2-, 10-, and 100-year design storms. Preference is for structure to discharge up to the 10-year storm through the principal spillway and pass the 100-year storm with a minimum 1 foot of freeboard through a combination principal and emergency spillways. If no emergency spillway is provided, riser must be large enough to pass the design high water flow and trash without overtopping the facility, have 3 square feet or more of cross-sectional area, contain a hood type inlet and have a minimum freeboard of 2 feet. Token spillways with minimum 8 ft. width are also recommended at or above the design 100-year storm elevation.
☐	☑	☐	Downstream hydrographs at established study points, if conditions warrant (ie. facility discharge combined with uncontrolled bypass).
☑	☐	☐	*MISCELLANEOUS COMPUTATIONS*
☑	☐	☐	Water quality volume for permanent pool based on selected BMP treatment volume (WQv).
☑	☐	☐	Water quality volume for extended detention based on selected BMP treatment volume (WQv) with drawdown computations.
☑	☐	☐	Drawdown computations for the 1-year, 24 hour detention for stream channel protection criteria.
☑	☐	☐	Pond drain computations (within 24 hours).
☑	☐	☐	Anti-seep collar design (concrete preferred) or match material type.
☐	☐	☑	Filter diaphragm design (or alternative method of controlling seepage).

Yes	No	N/A	
☐	☑	☐	Riser / base structure flotation analyses. FS = 1.25 minimum.
☐	☐	☑	Downstream danger reach study and/or emergency action plan (if conditions warrant).
☐	☐	☑	Upstream backwater analyses onto offsite adjacent property (if conditions warrant).
☐	☐	☑	100 year floodplain impacts (if conditions warrant).

Yes	No	N/A	
☑	☐	☐	*GEOTECHNICAL REQUIREMENTS*
☑	☐	☐	Geotechnical Report with recommendations specific to BMP facility type selected. Report prepared by a registered professional engineer. Requires submission, review and approval prior to issuance of Land Disturbance Permit.
☐	☐	☑	Initial Feasibility Testing requirements satisfied as per Appendix E of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual. (Infiltration, Bioretention and Filtering System BMP types only).
☐	☐	☑	Concept Design Testing requirements satisfied as per Appendix E of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual. (Infiltration, Bioretention and Filtering System BMP types only).
☑	☐	☐	Minimum Boring locations: borrow area, pool area, principal control structure, top of facility near one abutment and emergency spillway if provided.
☑	☐	☐	Boring logs with Unified Soil Classification (ASTM D2487), soils descriptions and depths to bedrock and the seasonal water table indicated.
☑	☐	☐	Standard County Record Drawing/Construction Certification note provided on plan. *Note: It is understood that preparation of record drawings and construction certifications as required for project facilities may not necessarily be performed by the plan preparer. These components may be performed by others.*
☑	☐	☐	*PRINCIPAL SPILLWAY PROFILE AND ASSOCIATED DETAILS*
☑	☐	☐	*EXISTING GROUND AND PROPOSED GRADE*
☑	☐	☐	Embankment or excavation side slopes labeled (3H:1V maximum).
☑	☐	☐	Minimum top width labeled (per VESCH or VSMH requirements).
☐	☐	☐	Removal of unsuitable material under proposed facility (per Geotechnical Report requirements).

Yes No N/A

☐ ☐ ☑ *CORE TRENCH*

- ☐ ☐ ☐ Material (per plan or Geotechnical Report).
- ☐ ☐ ☐ Bottom width (4' minimum or greater as dictated by Geotechnical Report recommendations).
- ☐ ☐ ☐ Side slopes (1:1 maximum steepness)
- ☐ ☐ ☐ Depth (4' minimum or greater as dictated by Geotechnical Report).

☑ ☐ ☐ *PRINCIPAL CONTROL STRUCTURE. RISER OR SIMILAR STRUCTURE (DETAILS REQUIRED FOR ALL ITEMS)*

- ☑ ☐ ☐ Durable, watertight, resistant material (concrete preferred).
- ☑ ☐ ☐ Riser diameter is at least 1.25 times larger than barrel diameter.
- ☑ ☐ ☐ All pertinent dimensions and elevations shown.
- ☑ ☐ ☐ Control orifice or weir dimensions and elevations shown.
- ☑ ☐ ☐ Trash rack - removable - for each release.
- ☑ ☐ ☐ Anti-vortex device, baffle or plate.
- ☑ ☐ ☐ Riser base structure with dimensions and embedment specifications (concrete preferred).
- ☑ ☐ ☐ Interior access (steps, ladders, etc.) for maintenance for structures over 4 feet in height. Excessively high risers may need some form of exterior access on top portion.
- ☑ ☐ ☐ Low flow orifice with trash rack device.

☑ ☐ ☐ *PRINCIPAL CONTROL STRUCTURE OUTLET BARREL*

- ☑ ☐ ☐ Material (ASTM C-361 reinforced concrete pipe) with watertight joints. Prior approval required for all other pipe material (other RCP types, CMP, CPP, PVC, etc.).
- ☐ ☑ ☐ Support and bedding requirements for barrel - concrete cradles, etc. or as recommended by the Geotechnical Report.
- ☑ ☐ ☐ Pipe inverts, length, size, class and slope shown.
- ☑ ☐ ☐ Flared end section or endwall provided on barrel outlet.

☑ ☐ ☐ *SEEPAGE CONTROL*

- ☑ ☐ ☐ Phreatic line shown (4:1 slope measured from the intersection of the embankment and the principal spillway design high water).
- ☑ ☐ ☐ *ANTI-SEEP COLLARS*
  - ☑ ☐ ☐ Anti-seep collar, concrete preferred.
  - ☑ ☐ ☐ Size - 15 percent increase in length of saturation using outside pipe diameter.
  - ☑ ☐ ☐ Spacing and location on barrel (located at least 2 feet from a pipe joint).

☐ ☑ ☐ *FILTER DIAPHRAGMS*

☐ ☐ ☐ Design based on latest NRCS design methods and certified by a professional engineer.

Yes No N/A

☑ ☐ ☐ *ELEVATION AND DIMENSIONAL DESIGN DATA*

☑ ☐ ☐ Top of facility - construction height and settled height (10 percent settlement).

☑ ☐ ☐ Crest of principal control structure spillway at least one (1) foot below crest of emergency spillway, if provided.

☑ ☐ ☐ Minimum freeboard of one (1) foot above the 100-year design high water elevation for facilities <u>with</u> an emergency spillway.

☐ ☐ ☑ Minimum freeboard of two (2) feet above the 100-year design high water elevation for facilities <u>without</u> an emergency spillway or in accordance with the SCS National Engineering Handbook (prior approval required).

☐ ☐ ☑ Basin Sediment Clean-Out elevation (permanent mode). Typically 10 to 25 percent of water quality volume.

☐ ☑ ☐ *CROSS SECTION THROUGH FACILITY*

☐ ☐ ☐ Existing Ground.

☐ ☐ ☐ Proposed grade.

☐ ☐ ☐ Top of facility - constructed and settled.

☐ ☐ ☐ Location of emergency spillway with side slopes labeled (emergency spillway in cut).

☐ ☐ ☐ Bottom of core trench (4' minimum).

☐ ☐ ☐ Location of each soil boring.

☐ ☐ ☐ Barrel location.

☐ ☐ ☐ Existing and proposed utility location/protection.

☐ ☑ ☐ *EMERGENCY SPILLWAY PROFILE*

☐ ☐ ☐ Existing ground.

☐ ☐ ☐ Inlet, level (control) and outlet sections per SCS.

☐ ☐ ☐ Spillway and crest elevations.

☐ ☐ ☑ *PRETREATMENT DEVICES* of adequate depth and properly designed using required pretreatment volumes for the selected County BMP facility type. Including, but not limited to: sediment forebays, sediment basins, sumps, grass channels, gravel diaphragms, plunge pools, chamber separators, manufactured systems or other acceptable methods.

Yes	No	N/A	
☑	☐	☐	*CONSTRUCTION SPECIFICATIONS and NOTES*
☑	☐	☐	Anticipated sequence of construction for BMP (consistent with erosion and sediment control plan).
☑	☐	☐	Provisions to control base stream or storm flow conditions encountered during construction.
☑	☐	☐	Site and subgrade preparation requirements.
☑	☐	☐	Embankment, fill and backfill material soil and placement (lift) thickness requirements.
☐	☑	☐	Compaction and soil moisture content requirements.
☐	☑	☐	Geosynthetics for drainage, filtration, moisture barrier, separation, and reinforcement purposes.
☐	☑	☐	Clay or synthetic (PVC or HDPE) pond liners.
☐	☑	☐	Storm drain, underdrain and pipe conduit requirements.
☐	☐	☐	Minimum depth of pipe cover for temporary (construction) and final cover conditions.
☐	☐	☐	Permanent shutoff valve and pond drain.
☐	☐	☐	Concrete requirements for structural components.
☐	☐	☐	Riprap and slope protection.
☐	☐	☐	Access or maintenance road surface, base, subbase.
☐	☐	☐	Temporary and permanent stabilization measures.
☐	☐	☐	Temporary or permanent safety fencing.
☐	☐	☐	BMP Landscaping (deep, shallow, fringe, perimeter,etc.)
☐	☐	☐	Dust and traffic control (if warranted).
☐	☐	☐	Construction monitoring and certification by professional.
☐	☐	☐	Other: _____
☐	☐	☐	Other: _____.
☐	☑	☐	*MAINTENANCE PROVISIONS*
☐	☐	☐	Entity responsible for maintenance identified..
☐	☐	☐	Maintenance Plan which outlines the long-term schedule for inspection/maintenance of the facility and forebays
☐	☐	☐	Maintenance access from public right-of-way or publicly traveled road.
☐	☐	☐	Maintenance easement provided encompassing high water pool and buffer, principal and emergency spillways, outlet structures, forebays, embankment area and possible sediment-removal stockpile areas.
☐	☐	☐	Minimum 6 foot wide public safety shelf (landing) or alternative fencing.

IV. *OUTLET PROTECTIONS:*

Yes	No	N/A	
☐	☐	☐	Sized for maximum design release (generally 10-year storm).
☐	☐	☐	Flared end section or endwall.
☐	☐	☐	Dimensions.
☐	☐	☐	Rock or riprap size, quantity and placement thickness.
☐	☐	☐	Slope at 0 percent (Level Grade).
☐	☐	☐	Geotextiles (nonwoven).
☐	☐	☐	Special energy dissipators are required for design discharge velocities that exceed eighteen (18) feet per second; or if use of standard outlet protection would result in velocities exceeding permissible channel velocities; or if space restricts or limits their use.

V. *ADDITIONAL COMMENTS OR INFORMATION SPECIFIC TO THE PLAN:*

Plan Preparer: TOWNES SITE ENGINEER

Date: 5/16/03

SWMProg/BMP/Checklist/ChkList

Insert as-built page here.

Townes
SITE ENGINEERING

LONGHILL GROVE APARTMENTS

JAMES CITY COUNTY

SWM/BMP ROUTING

SP-44-03
2ND SUB

ASK US HOW.

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
SWM/BMP ROUTING

REVISED MAY 15, 2003
REVISED April 28, 2003
MARCH 19, 2003

TOWNES SITE ENGINEERING
9850 LORI ROAD, SUITE 201
CHESTERFIELD, VIRGINIA 23832

PRE 15.54 AC CN 70 Tc = 0.18 hrs
Post DA = 15.85 AC. CN = 81 Tc = 0.10 hrs.

SUMMARY

Post INFLOW Post Dev

STORM	PRE Q	PEAK Q DISCHARGED	HOURS DETAINED	VOLUME	ELEV
1	10 CFS 28	0.64 CFS ✓	24+	48566 CF	82.89 ✓ ∠ 83.25
2	18 CFS 42	2.00 CFS ✓	24+	58893 CF	83.32 ✓
10	48 CFS 90	50.18 CFS ✓	24+	80597 CF	84.16 ✓
100	86 CFS 144	108.62 CFS	24+	97924 CF	84.79 DHW ✓

TOP OF CONTAINMENT SET AT 86.0

BMP VOLUME CALCULATION

WET ED POND REQUIRES 2.0 INCH/IMP ACRE A-3 BMP, 60% REMOVAL
½ PERM POOL
½ ED POOL

IMPERVIOUS ACREAGE-5.22

REQUIRED VOLUME= 5.22 ACRES X 43560 CF/ACRE X 1 INCH PER ACRE / 12 INCHES PER FOOT=18,948 CF IN WET POOL AND 18,948 CF IN DRY POOL.

AT THE OUTLET ELEVATION OF [redacted], 23545 ✓ CUBIC FEET OF STORAGE IS PROVIDED.

NP = 23545 CF
ED POOL = 51066 CF

Need County Worksheet Demonstrating Compliance

Sum DA's NOVZ Sac A-3 10pt × 16.12 / 15.82 =

Design Report A-3 10pt × 15.85 / 15.82 = 10.0196 pts ✓

Quick TR-55 Ver.5.46 S/N:
Executed: 18:21:23 05-15-2003 J:\PONDPACK\2003043\PRE.TCT

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
PRE DEVELOPED

Tc COMPUTATIONS FOR: SITE

SHEET FLOW (Applicable to Tc only)

Segment ID		surface	
Surface description		grass	
Manning's roughness coeff., n		0.0500	
Flow length, L (total < or = 300)	ft	200.0	
Two-yr 24-hr rainfall, P2	in	2.800	
Land slope, s	ft/ft	0.0200	

$$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$$ hrs 0.13 = 0.13

SHALLOW CONCENTRATED FLOW

Segment ID		swale	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	400.0	
Watercourse slope, s	ft/ft	0.0200	

$$Avg.V = Csf * (s)^{0.5}$$ ft/s 2.2818

where: Unpaved Csf = 16.1345
Paved Csf = 20.3282

T = L / (3600*V) hrs 0.05 = 0.05

CHANNEL FLOW

Segment ID		channel	
Cross Sectional Flow Area, a	sq.ft	9.00	
Wetted perimeter, Pw	ft	12.00	
Hydraulic radius, r = a/Pw	ft	0.750	
Channel slope, s	ft/ft	0.0100	
Manning's roughness coeff., n		0.0130	

$$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$$ ft/s 9.4613

Flow length, L ft 225

T = L / (3600*V) hrs 0.01 = 0.01

::

TOTAL TIME (hrs) 0.18

Quick TR-55 Ver.5.46 S/N:
Executed: 18:21:23 05-15-2003 J:\PONDPACK\2003043\PRE.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
PRE DEVELOPED

Subarea descr.	Tc or Tt	Time (hrs)
SITE	Tc	0.18

```
Quick TR-55 Ver.5.46   S/N:
Executed: 18:21:42   05-15-2003    J:\PONDPACK\2003043\POST.TCT

                                 LONGHILL GROVE APARTMENTS
                                     JAMES CITY COUNTY
                                      POST DEVELOPED

                             Tc COMPUTATIONS FOR: SITE

 SHEET FLOW (Applicable to Tc only)
     Segment ID                                      surface
     Surface description                        grass
     Manning's roughness coeff., n                    0.0500
     Flow length, L (total < or = 300)          ft      50.0
     Two-yr 24-hr rainfall, P2                  in     2.800
     Land slope, s                            ft/ft   0.0200
                        0.8
           .007 * (n*L)
     T =   --------------                      hrs      0.04               =  0.04
               0.5     0.4
            P2    *   s

 SHALLOW CONCENTRATED FLOW
     Segment ID                                      swale
     Surface (paved or unpaved)?                       Paved
     Flow length, L                              ft     500.0
     Watercourse slope, s                     ft/ft   0.0200

                          0.5
     Avg.V =  Csf *   (s)                      ft/s   2.8748
     where:   Unpaved Csf = 16.1345
              Paved   Csf = 20.3282

     T = L / (3600*V)                          hrs      0.05               =  0.05

 CHANNEL FLOW
     Segment ID                                      Channel
     Cross Sectional Flow Area, a             sq.ft      9.00
     Wetted perimeter, Pw                        ft     12.00
     Hydraulic radius, r = a/Pw                  ft     0.750
     Channel slope, s                         ft/ft    0.0100
     Manning's roughness coeff., n                     0.0130

                     2/3     1/2
          1.49  *  r   *  s
     V =  --------------------                 ft/s    9.4613
                   n

     Flow length, L                              ft       225

     T = L / (3600*V)                          hrs      0.01               =  0.01

    :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                               TOTAL TIME (hrs)        0.10
```

Quick TR-55 Ver.5.46 S/N:
Executed: 18:21:42 05-15-2003 J:\PONDPACK\2003043\POST.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED

Subarea descr.	Tc or Tt	Time (hrs)
SITE	Tc	0.10

Quick TR-55 Ver.5.46 S/N:
Executed: 18:24:39 05-15-2003

LONGHILL GROVE APTS
JAMES CITY COUNTY
PRE DEVELOPED

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
	15.54	70

Quick TR-55 Ver.5.46 S/N:
Executed: 18:24:39 05-15-2003

LONGHILL GROVE APTS
JAMES CITY COUNTY
PRE DEVELOPED

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
18B KEMPSVILLE FSL-B-brush	0.28	48	
14B/15D ONSITE EMPORIA-C-grass	2.28	65	
29B ONSITE/OFFSITE SLAGLE-C-gra	3.03	65	
11C ONSITE CRAVEN-C-grass/brush	5.96	65	
11C ONSITE CRAVEN-C-paved/bldg	2.12	98	
15D ONSITE EMPORIA-C-paved/bld	0.23	98	
14B OFFSITE EMPORIA-C-grass/bru	1.29	65	
14B OFFSITE EMPORIA-C-paved/bld	0.15	98	
11C OFFSITE CRAVEN-C-grass/brus	0.05	65	
11C OFFSITE CRAVEN-C-paved/bldg	0.15	98	
COMPOSITE AREA --->	15.54	70.3	(70)

::

Quick TR-55 Ver.5.46 S/N:
Executed: 18:25:22 05-15-2003

LONGHILL GROVE APTS
JAMES CITY COUNTY
POST DEVELOPED
bypass basin

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
	2.21	68

Quick TR-55 Ver.5.46 S/N:
Executed: 18:25:22 05-15-2003

LONGHILL GROVE APTS
JAMES CITY COUNTY
POST DEVELOPED
bypass basin

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
18B KEMPSVILLE FSL-B-brush	0.50	48	
14/15D EMPORIA-C-grass	1.05	74	
14B/15D EMPORIA-C-paved	0.20	98	
11C CRAVEN-D-grass	0.41	70	
COMPOSITE AREA --->	2.21	67.9	(68)

::

Quick TR-55 Ver.5.46 S/N:
Executed: 18:25:56 05-15-2003

LONGHILL GROVE APTS
JAMES CITY COUNTY
POST DEVELOPED

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
	15.85	81

Quick TR-55 Ver.5.46 S/N:
Executed: 18:25:56 05-15-2003

LONGHILL GROVE APTS
JAMES CITY COUNTY
POST DEVELOPED

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
18B KEMPSVILLE FSL-B-brush	0.16	48	
18B-KEMPSVILLE FSL-B-pved/bldg	0.18	98	
14B/15D ONSITE EMPORIA-C-grass	2.06	74	
14B/15D ONSITE EMPORIA-C-paved	0.45	98	
29B ONSITE/OFFSITE SLAGLE-C-gra	2.18	74	
29B ONSITE SLAGLE-C-paved/build	0.85	98	
11C ONSITE/OFFSITE CRAVEN-C-gra	4.72	70	
11C ONSITE/OFFSITE CRAVEN-C-pav	3.64	98	
14B OFFSITE EMPORIA-C-grass	1.42	74	EXXON SITE NOT DEVELOPED IN POSTDEV ROUTING
14B OFFSITE EMPORIA-C_paved	0.19	98	
COMPOSITE AREA --->	15.85	80.6	(81)

::

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.54	70.0	0.20	0.00	2.80	0.61	I.31 .31

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.54 acres or 0.02428 sq.mi
Peak discharge = 10 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.18	0.00	0.20	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	10	12.2
Composite Watershed	10	12.2

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	0	15.0	1
11.3	0	15.1	1
11.4	0	15.2	1
11.5	0	15.3	1
11.6	0	15.4	1
11.7	0	15.5	1
11.8	1	15.6	1
11.9	1	15.7	1
12.0	3	15.8	1
12.1	8	15.9	1
12.2	10	16.0	1
12.3	7	16.1	1
12.4	4	16.2	1
12.5	3	16.3	0
12.6	2	16.4	0
12.7	2	16.5	0
12.8	2	16.6	0
12.9	2	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0

14.3	1	18.1	0
14.4	1	18.2	0
14.5	1	18.3	0
14.6	1	18.4	0
14.7	1	18.5	0

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0

22.1	0	25.9	0
22.2	0		
22.3	0		

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.54	70.0	0.20	0.00	3.50	1.01	I.24 .24

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.54 acres or 0.02428 sq.mi
Peak discharge = 18 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.18	0.00	0.20	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	18	12.2
Composite Watershed	18	12.2

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	0	15.0	1
11.3	0	15.1	1
11.4	0	15.2	1
11.5	0	15.3	1
11.6	0	15.4	1
11.7	1	15.5	1
11.8	1	15.6	1
11.9	2	15.7	1
12.0	6	15.8	1
12.1	15	15.9	1
12.2	18	16.0	1
12.3	12	16.1	1
12.4	7	16.2	1
12.5	5	16.3	1
12.6	4	16.4	1
12.7	3	16.5	1
12.8	3	16.6	1
12.9	2	16.7	1
13.0	2	16.8	1
13.1	2	16.9	1
13.2	2	17.0	1
13.3	2	17.1	1
13.4	2	17.2	1
13.5	2	17.3	1
13.6	2	17.4	1
13.7	2	17.5	1
13.8	1	17.6	1
13.9	1	17.7	1
14.0	1	17.8	1
14.1	1	17.9	1
14.2	1	18.0	1

14.3	1	18.1	1
14.4	1	18.2	1
14.5	1	18.3	1
14.6	1	18.4	1
14.7	1	18.5	1

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	1	22.4	0
18.7	1	22.5	0
18.8	1	22.6	0
18.9	1	22.7	0
19.0	1	22.8	0
19.1	1	22.9	0
19.2	1	23.0	0
19.3	1	23.1	0
19.4	1	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0

22.1	0	25.9	0
22.2	0		
22.3	0		

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	15.54	70.0	0.20	0.00	5.70	2.57	I.15	.15

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.54 acres or 0.02428 sq.mi
Peak discharge = 48 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.18	0.00	0.20	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	48	12.2
Composite Watershed	48	12.2

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	2
11.1	1	14.9	2
11.2	1	15.0	2
11.3	1	15.1	2
11.4	1	15.2	2
11.5	2	15.3	2
11.6	2	15.4	2
11.7	5	15.5	2
11.8	7	15.6	2
11.9	10	15.7	2
12.0	22	15.8	2
12.1	43	15.9	2
12.2	48	16.0	2
12.3	30	16.1	2
12.4	16	16.2	2
12.5	11	16.3	1
12.6	8	16.4	1
12.7	7	16.5	1
12.8	6	16.6	1
12.9	6	16.7	1
13.0	5	16.8	1
13.1	4	16.9	1
13.2	4	17.0	1
13.3	4	17.1	1
13.4	4	17.2	1
13.5	4	17.3	1
13.6	3	17.4	1
13.7	3	17.5	1
13.8	3	17.6	1
13.9	3	17.7	1
14.0	3	17.8	1
14.1	3	17.9	1
14.2	2	18.0	1

14.3	2	18.1	1
14.4	2	18.2	1
14.5	2	18.3	1
14.6	2	18.4	1
14.7	2	18.5	1

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	1	22.4	1
18.7	1	22.5	1
18.8	1	22.6	1
18.9	1	22.7	1
19.0	1	22.8	1
19.1	1	22.9	1
19.2	1	23.0	1
19.3	1	23.1	1
19.4	1	23.2	1
19.5	1	23.3	1
19.6	1	23.4	1
19.7	1	23.5	1
19.8	1	23.6	1
19.9	1	23.7	1
20.0	1	23.8	1
20.1	1	23.9	1
20.2	1	24.0	0
20.3	1	24.1	0
20.4	1	24.2	0
20.5	1	24.3	0
20.6	1	24.4	0
20.7	1	24.5	0
20.8	1	24.6	0
20.9	1	24.7	0
21.0	1	24.8	0
21.1	1	24.9	0
21.2	1	25.0	0
21.3	1	25.1	0
21.4	1	25.2	0
21.5	1	25.3	0
21.6	1	25.4	0
21.7	1	25.5	0
21.8	1	25.6	0
21.9	1	25.7	0
22.0	1	25.8	0

22.1	1	25.9	0
22.2	1		
22.3	1		

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.54	70.0	0.20	0.00	8.00	4.46	I.11 .11

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.54 acres or 0.02428 sq.mi
Peak discharge = 86 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.18	0.00	0.20	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	86	12.2
Composite Watershed	86	12.2

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	2	14.8	4
11.1	2	14.9	3
11.2	3	15.0	3
11.3	3	15.1	3
11.4	4	15.2	3
11.5	4	15.3	3
11.6	5	15.4	3
11.7	11	15.5	3
11.8	16	15.6	3
11.9	22	15.7	3
12.0	42	15.8	3
12.1	79	15.9	3
12.2	86	16.0	3
12.3	52	16.1	3
12.4	27	16.2	3
12.5	18	16.3	2
12.6	14	16.4	2
12.7	11	16.5	2
12.8	9	16.6	2
12.9	8	16.7	2
13.0	8	16.8	2
13.1	8	16.9	2
13.2	7	17.0	2
13.3	6	17.1	2
13.4	6	17.2	2
13.5	6	17.3	2
13.6	5	17.4	2
13.7	5	17.5	2
13.8	5	17.6	2
13.9	4	17.7	2
14.0	4	17.8	2
14.1	4	17.9	2
14.2	4	18.0	2

14.3	4	18.1	2
14.4	4	18.2	2
14.5	4	18.3	2
14.6	4	18.4	2
14.7	4	18.5	2

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	2	22.4	1
18.7	2	22.5	1
18.8	2	22.6	1
18.9	2	22.7	1
19.0	2	22.8	1
19.1	2	22.9	1
19.2	2	23.0	1
19.3	2	23.1	1
19.4	2	23.2	1
19.5	2	23.3	1
19.6	1	23.4	1
19.7	1	23.5	1
19.8	1	23.6	1
19.9	1	23.7	1
20.0	1	23.8	1
20.1	1	23.9	1
20.2	1	24.0	0
20.3	1	24.1	0
20.4	1	24.2	0
20.5	1	24.3	0
20.6	1	24.4	0
20.7	1	24.5	0
20.8	1	24.6	0
20.9	1	24.7	0
21.0	1	24.8	0
21.1	1	24.9	0
21.2	1	25.0	0
21.3	1	25.1	0
21.4	1	25.2	0
21.5	1	25.3	0
21.6	1	25.4	0
21.7	1	25.5	0
21.8	1	25.6	0
21.9	1	25.7	0
22.0	1	25.8	0

22.1	1	25.9	0
22.2	1		
22.3	1		

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	2.21	68.0	0.10	0.00	2.80	0.53	I.34 .34

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 2.21 acres or 0.00345 sq.mi
Peak discharge = 2 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	2	12.1
Composite Watershed	2	12.1

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	0	15.6	0
11.9	0	15.7	0
12.0	1	15.8	0
12.1	2	15.9	0
12.2	1	16.0	0
12.3	0	16.1	0
12.4	0	16.2	0
12.5	0	16.3	0
12.6	0	16.4	0
12.7	0	16.5	0
12.8	0	16.6	0
12.9	0	16.7	0
13.0	0	16.8	0
13.1	0	16.9	0
13.2	0	17.0	0
13.3	0	17.1	0
13.4	0	17.2	0
13.5	0	17.3	0
13.6	0	17.4	0
13.7	0	17.5	0
13.8	0	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0

14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	2.21	68.0	0.10	0.00	3.50	0.90	I.27	.27

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 2.21 acres or 0.00345 sq.mi
Peak discharge = 3 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

22.1	0	25.9	0
22.2	0		
22.3	0		

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	3	12.1
Composite Watershed	3	12.1

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	1	15.6	0
11.9	1	15.7	0
12.0	2	15.8	0
12.1	3	15.9	0
12.2	2	16.0	0
12.3	1	16.1	0
12.4	1	16.2	0
12.5	0	16.3	0
12.6	0	16.4	0
12.7	0	16.5	0
12.8	0	16.6	0
12.9	0	16.7	0
13.0	0	16.8	0
13.1	0	16.9	0
13.2	0	17.0	0
13.3	0	17.1	0
13.4	0	17.2	0
13.5	0	17.3	0
13.6	0	17.4	0
13.7	0	17.5	0
13.8	0	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0

14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0

22.1	0	25.9	0
22.2	0		
22.3	0		

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	2.21	68.0	0.10	0.00	5.70	2.39	I.17	.17

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 2.21 acres or 0.00345 sq.mi
Peak discharge = 8 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	8	12.1
Composite Watershed	8	12.1

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	1	15.5	0
11.8	1	15.6	0
11.9	2	15.7	0
12.0	5	15.8	0
12.1	8	15.9	0
12.2	5	16.0	0
12.3	2	16.1	0
12.4	1	16.2	0
12.5	1	16.3	0
12.6	1	16.4	0
12.7	1	16.5	0
12.8	1	16.6	0
12.9	1	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	0	17.1	0
13.4	0	17.2	0
13.5	0	17.3	0
13.6	0	17.4	0
13.7	0	17.5	0
13.8	0	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0

14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0

22.1	0	25.9	0
22.2	0		
22.3	0		

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	2.21	68.0	0.10	0.00	8.00	4.24	I.12 .12

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 2.21 acres or 0.00345 sq.mi
Peak discharge = 15 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	15	12.1
Composite Watershed	15	12.1

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	1	15.3	0
11.6	1	15.4	0
11.7	2	15.5	0
11.8	4	15.6	0
11.9	5	15.7	0
12.0	9	15.8	0
12.1	15	15.9	0
12.2	9	16.0	0
12.3	3	16.1	0
12.4	2	16.2	0
12.5	2	16.3	0
12.6	2	16.4	0
12.7	1	16.5	0
12.8	1	16.6	0
12.9	1	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0

14.3	1	18.1	0
14.4	1	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	0	22.4	0
18.7	0	22.5	0
18.8	0	22.6	0
18.9	0	22.7	0
19.0	0	22.8	0
19.1	0	22.9	0
19.2	0	23.0	0
19.3	0	23.1	0
19.4	0	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0

22.1	0	25.9	0
22.2	0		
22.3	0		

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.85	81.0	0.10	0.00	2.80	1.16	I.17 .17

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.85 acres or 0.02477 sq.mi
Peak discharge = 28 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	28	12.1
Composite Watershed	28	12.1

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	0	1	1	8	18	28	17	6	4
Total (cfs)	0	1	1	8	18	28	17	6	4

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	4	3	3	2	2	2	2	1	1
Total (cfs)	4	3	3	2	2	2	2	1	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	1	1	1	1	1	1	1	1	1
Total (cfs)	1	1	1	1	1	1	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	1	1	0	0	0
Total (cfs)	1	1	0	0	0

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	1	15.0	1
11.3	1	15.1	1
11.4	1	15.2	1
11.5	1	15.3	1
11.6	1	15.4	1
11.7	3	15.5	1
11.8	6	15.6	1
11.9	8	15.7	1
12.0	18	15.8	1
12.1	28	15.9	1
12.2	17	16.0	1
12.3	6	16.1	1
12.4	4	16.2	1
12.5	4	16.3	1
12.6	3	16.4	1
12.7	3	16.5	1
12.8	2	16.6	1
12.9	2	16.7	1
13.0	2	16.8	1
13.1	2	16.9	1
13.2	2	17.0	1
13.3	2	17.1	1
13.4	2	17.2	1
13.5	2	17.3	1
13.6	1	17.4	1
13.7	1	17.5	1
13.8	1	17.6	1
13.9	1	17.7	1
14.0	1	17.8	1
14.1	1	17.9	1
14.2	1	18.0	1

14.3	1	18.1	1
14.4	1	18.2	1
14.5	1	18.3	1
14.6	1	18.4	1
14.7	1	18.5	1

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	1	22.4	0
18.7	1	22.5	0
18.8	1	22.6	0
18.9	1	22.7	0
19.0	1	22.8	0
19.1	1	22.9	0
19.2	1	23.0	0
19.3	1	23.1	0
19.4	1	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0

22.1	0	25.9	0
22.2	0		
22.3	0		

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.85	81.0	0.10	0.00	3.50	1.71	I.13 .13

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.85 acres or 0.02477 sq.mi
Peak discharge = 42 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	42	12.1
Composite Watershed	42	12.1

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	1	1	2	13	27	42	26	9	6
Total (cfs)	1	1	2	13	27	42	26	9	6

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	5	5	4	3	3	3	2	2	2
Total (cfs)	5	5	4	3	3	3	2	2	2

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	2	2	1	1	1	1	1	1	1
Total (cfs)	2	2	1	1	1	1	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	1	1	1	1	0
Total (cfs)	1	1	1	1	0

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	1
11.1	1	14.9	1
11.2	1	15.0	1
11.3	1	15.1	1
11.4	1	15.2	1
11.5	2	15.3	1
11.6	2	15.4	1
11.7	6	15.5	1
11.8	9	15.6	1
11.9	13	15.7	1
12.0	27	15.8	1
12.1	42	15.9	1
12.2	26	16.0	1
12.3	9	16.1	1
12.4	6	16.2	1
12.5	5	16.3	1
12.6	5	16.4	1
12.7	4	16.5	1
12.8	3	16.6	1
12.9	3	16.7	1
13.0	3	16.8	1
13.1	3	16.9	1
13.2	3	17.0	1
13.3	2	17.1	1
13.4	2	17.2	1
13.5	2	17.3	1
13.6	2	17.4	1
13.7	2	17.5	1
13.8	2	17.6	1
13.9	2	17.7	1
14.0	2	17.8	1
14.1	2	17.9	1
14.2	2	18.0	1

14.3	2	18.1	1
14.4	2	18.2	1
14.5	1	18.3	1
14.6	1	18.4	1
14.7	1	18.5	1

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	1	22.4	1
18.7	1	22.5	1
18.8	1	22.6	1
18.9	1	22.7	1
19.0	1	22.8	1
19.1	1	22.9	1
19.2	1	23.0	1
19.3	1	23.1	1
19.4	1	23.2	1
19.5	1	23.3	1
19.6	1	23.4	1
19.7	1	23.5	1
19.8	1	23.6	1
19.9	1	23.7	1
20.0	1	23.8	1
20.1	1	23.9	1
20.2	1	24.0	0
20.3	1	24.1	0
20.4	1	24.2	0
20.5	1	24.3	0
20.6	1	24.4	0
20.7	1	24.5	0
20.8	1	24.6	0
20.9	1	24.7	0
21.0	1	24.8	0
21.1	1	24.9	0
21.2	1	25.0	0
21.3	1	25.1	0
21.4	1	25.2	0
21.5	1	25.3	0
21.6	1	25.4	0
21.7	1	25.5	0
21.8	1	25.6	0
21.9	1	25.7	0
22.0	1	25.8	0

22.1	1	25.9	0
22.2	1		
22.3	1		

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.85	81.0	0.10	0.00	5.70	3.61	I.08 .10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.85 acres or 0.02477 sq.mi
Peak discharge = 90 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	90	12.1
Composite Watershed	90	12.1

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	2	3	5	30	58	90	56	19	13
Total (cfs)	2	3	5	30	58	90	56	19	13

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	11	9	8	7	6	5	5	4	4
Total (cfs)	11	9	8	7	6	5	5	4	4

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	3	3	3	3	2	2	2	2	2
Total (cfs)	3	3	3	3	2	2	2	2	2

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	2	1	1	1	0
Total (cfs)	2	1	1	1	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	2	14.8	3
11.1	2	14.9	3
11.2	3	15.0	3
11.3	3	15.1	3
11.4	4	15.2	3
11.5	4	15.3	2
11.6	5	15.4	2
11.7	13	15.5	2
11.8	22	15.6	2
11.9	30	15.7	2
12.0	58	15.8	2
12.1	90	15.9	2
12.2	56	16.0	2
12.3	19	16.1	2
12.4	13	16.2	2
12.5	11	16.3	2
12.6	9	16.4	2
12.7	8	16.5	2
12.8	7	16.6	2
12.9	6	16.7	2
13.0	6	16.8	2
13.1	6	16.9	2
13.2	5	17.0	2
13.3	5	17.1	2
13.4	5	17.2	2
13.5	5	17.3	2
13.6	4	17.4	2
13.7	4	17.5	2
13.8	4	17.6	2
13.9	4	17.7	2
14.0	3	17.8	2
14.1	3	17.9	2
14.2	3	18.0	2

14.3	3	18.1	2
14.4	3	18.2	2
14.5	3	18.3	2
14.6	3	18.4	2
14.7	3	18.5	2

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	1	22.4	1
18.7	1	22.5	1
18.8	1	22.6	1
18.9	1	22.7	1
19.0	1	22.8	1
19.1	1	22.9	1
19.2	1	23.0	1
19.3	1	23.1	1
19.4	1	23.2	1
19.5	1	23.3	1
19.6	1	23.4	1
19.7	1	23.5	1
19.8	1	23.6	1
19.9	1	23.7	1
20.0	1	23.8	1
20.1	1	23.9	1
20.2	1	24.0	0
20.3	1	24.1	0
20.4	1	24.2	0
20.5	1	24.3	0
20.6	1	24.4	0
20.7	1	24.5	0
20.8	1	24.6	0
20.9	1	24.7	0
21.0	1	24.8	0
21.1	1	24.9	0
21.2	1	25.0	0
21.3	1	25.1	0
21.4	1	25.2	0
21.5	1	25.3	0
21.6	1	25.4	0
21.7	1	25.5	0
21.8	1	25.6	0
21.9	1	25.7	0
22.0	1	25.8	0

22.1	1	25.9	0
22.2	1		
22.3	1		

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.85	81.0	0.10	0.00	8.00	5.74	I.06 .10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.85 acres or 0.02477 sq.mi
Peak discharge = 144 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	144	12.1
Composite Watershed	144	12.1

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	3	5	8	47	92	144	89	31	21
Total (cfs)	3	5	8	47	92	144	89	31	21

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	17	15	12	11	9	8	7	7	6
Total (cfs)	17	15	12	11	9	8	7	7	6

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	5	5	5	4	4	3	3	3	3
Total (cfs)	5	5	5	4	4	3	3	3	3

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	3	2	2	2	0
Total (cfs)	3	2	2	2	0

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	3	14.8	4
11.1	4	14.9	4
11.2	4	15.0	4
11.3	5	15.1	4
11.4	6	15.2	4
11.5	7	15.3	4
11.6	8	15.4	4
11.7	21	15.5	4
11.8	34	15.6	4
11.9	47	15.7	4
12.0	92	15.8	3
12.1	144	15.9	3
12.2	89	16.0	3
12.3	31	16.1	3
12.4	21	16.2	3
12.5	17	16.3	3
12.6	15	16.4	3
12.7	12	16.5	3
12.8	11	16.6	3
12.9	10	16.7	3
13.0	9	16.8	3
13.1	8	16.9	3
13.2	8	17.0	3
13.3	8	17.1	3
13.4	7	17.2	3
13.5	7	17.3	3
13.6	7	17.4	3
13.7	6	17.5	3
13.8	6	17.6	3
13.9	6	17.7	3
14.0	5	17.8	3
14.1	5	17.9	3
14.2	5	18.0	3

14.3	5	18.1	3
14.4	5	18.2	3
14.5	5	18.3	3
14.6	5	18.4	3
14.7	5	18.5	2

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:33:23
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	2	22.4	2
18.7	2	22.5	2
18.8	2	22.6	2
18.9	2	22.7	2
19.0	2	22.8	2
19.1	2	22.9	2
19.2	2	23.0	2
19.3	2	23.1	1
19.4	2	23.2	1
19.5	2	23.3	1
19.6	2	23.4	1
19.7	2	23.5	1
19.8	2	23.6	1
19.9	2	23.7	1
20.0	2	23.8	1
20.1	2	23.9	1
20.2	2	24.0	1
20.3	2	24.1	1
20.4	2	24.2	1
20.5	2	24.3	1
20.6	2	24.4	1
20.7	2	24.5	1
20.8	2	24.6	1
20.9	2	24.7	1
21.0	2	24.8	1
21.1	2	24.9	1
21.2	2	25.0	0
21.3	2	25.1	0
21.4	2	25.2	0
21.5	2	25.3	0
21.6	2	25.4	0
21.7	2	25.5	0
21.8	2	25.6	0
21.9	2	25.7	0
22.0	2	25.8	0

22.1	2	25.9	0
22.2	2		
22.3	2		

POND-2 Version: 5.20
S/N:

LONGHILL GROVE APTS
JAMES CITY COUNTY
WET ED POND
FOREBAY

CALCULATED 04-28-2003 07:43:07
DISK FILE: J:\PONDPACK\2003043\FOREBAY .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
76.00	846.00	846	0	0	0
77.00	1,314.00	1,314	3,214	1,071	1,071
78.00	1,882.00	1,882	4,769	1,590	2,661
79.00	2,550.00	2,550	6,623	2,208	4,869
80.00	3,318.00	3,318	8,777	2,926	7,794
81.00	4,185.00	4,185	11,229	3,743	11,537

* Incremental volume computed by the Conic Method for Reservoir Volumes.

0.1 inch + 5.22 AC. + 12 ft / 1 in + 43560 SF / 1 AC-FT

11,537 CF.

0.1 inch + 5.22 AC + 12 ft / 12 in +

= 0.522 AC-FT

22,738 CF

POND-2 Version: 5.20
S/N:

LONGHILL GROVE APTS
JAMES CITY COUNTY
WETPOOL VOLUME
WETPOOL VOLUME AT ELEV 80.3

CALCULATED 04-28-2003 07:44:03
DISK FILE: J:\PONDPACK\2003043\WETPOOL .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
77.00	3,530.00	3,530	0	0	0
78.00	4,982.00	4,982	12,706	4,235	4,235
79.00	6,556.00	6,556	17,253	5,751	9,986
79.50	7,389.00	7,389	20,905	3,484	13,470
79.55	12,017.00	12,017	28,829	481	13,951
80.00	12,962.00	12,962	37,460	5,619	19,570
80.30	*I*	13,538	39,747	3,975	23,545
81.00	14,931.00	14,931	41,805	13,935	33,505

I ---> Interpolated area from closest two planimeter readings.

* Incremental volume computed by the Conic Method for Reservoir Volumes.

23545 WQ Vol

POND-2 Version: 5.20
S/N:

LONGHILL GROVE APTS
JAMES CITY COUNTY
WET ED POND
ABOVE WET POOL ELEV OF 80.3

CALCULATED 04-28-2003 07:44:31
DISK FILE: J:\PONDPACK\2003043\WETPOND .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
80.30	13,538.00	13,538	0	0	0
81.00	14,931.00	14,931	42,686	9,960	9,960
82.00	21,731.00	21,731	54,675	18,225	28,185
83.00	24,051.00	24,051	68,644	22,881	51,066
84.00	26,479.00	26,479	75,766	25,255	76,322
85.00	29,014.00	29,014	83,211	27,737	104,058

* Incremental volume computed by the Conic Method for Reservoir Volumes.

ED Volume
51,066

Outlet Structure File: OUTSWM .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
OUTLET STRUCTURE STORMWATER VOLUME

****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
80.30	0.0	
80.55	0.0	
80.80	0.3	1
81.05	0.3	1
81.30	0.4	1
81.55	0.4	1
81.80	0.5	1
82.05	0.5	1
82.30	0.6	1
82.55	0.6	1
82.80	0.6	1
83.05	0.7	1
83.30	1.3	1 +2
83.55	10.0	1 +2
83.80	23.8	1 +2
84.05	41.2	1 +2
84.30	61.7	1 +2
84.55	84.7	1 +2
84.80	110.0	1 +2
85.00	131.8	1 +2

Outlet Structure File: OUTSWM .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
OUTLET STRUCTURE STORMWATER VOLUME

****

Outlet Structure File: j:\PONDPACK\2003043\OUTSWM .STR
Planimeter Input File: j:\PONDPACK\2003043\WETPOND .VOL
Rating Table Output File: j:\PONDPACK\2003043\PONDSWM .PND

Min. Elev.(ft) = 80.3 Max. Elev.(ft) = 85 Incr.(ft) = .25

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
ORIFICE-VC	1		->	1
STAND PIPE	2		->	2

Outflow rating table summary was stored in file:
j:\PONDPACK\2003043\PONDSWM .PND

Pond Barrel
30" would control not 72" RISER.

Outlet Structure File: OUTSWM .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

4" ORIF

****
LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
OUTLET STRUCTURE STORMWATER VOLUME
****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	80.6
E2 elev.(ft)?	85.001
Orifice coeff.?	.6 ✓
Invert elev.(ft)?	80.3 ✓
Datum elev.(ft)?	80.4
Diameter (ft)?	.33 4"

Outlet Structure File: OUTSWM .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
OUTLET STRUCTURE STORMWATER VOLUME

****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)?	83.25
E2 elev.(ft)?	85.001
Crest elev.(ft)?	83.25
Diameter (ft)?	6
Weir coefficient?	3
Orifice coefficient?	.6
Start transition elev.(ft) @ ?	
Transition height (ft)?	

Outlet Structure File: OUTSWM .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
OUTLET STRUCTURE STORMWATER VOLUME

****

Outflow Rating Table for Structure #1
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
80.30	0.0	E < E1=80.6
80.55	0.0	E < E1=80.6
80.80	0.3	H =.4
81.05	0.3	H =.65
81.30	0.4	H =.9
81.55	0.4	H =1.15
81.80	0.5	H =1.4
82.05	0.5	H =1.65
82.30	0.6	H =1.9
82.55	0.6	H =2.15
82.80	0.6	H =2.4
83.05	0.7	H =2.65
83.30	0.7	H =2.9
83.55	0.7	H =3.15
83.80	0.8	H =3.4
84.05	0.8	H =3.65
84.30	0.8	H =3.9
84.55	0.8	H =4.15
84.80	0.9	H =4.4
85.00	0.9	H =4.6

C = .6 A = 8.552988E-02 sq.ft.
H (ft) = Table elev. - Datum elev. (80.4 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: OUTSWM .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
OUTLET STRUCTURE STORMWATER VOLUME

****

Outflow Rating Table for Structure #2
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
80.30	0.0	E < Inv.El.= 83.25
80.55	0.0	E < El= 83.25
80.80	0.0	E < El= 83.25
81.05	0.0	E < El= 83.25
81.30	0.0	E < El= 83.25
81.55	0.0	E < El= 83.25
81.80	0.0	E < El= 83.25
82.05	0.0	E < El= 83.25
82.30	0.0	E < El= 83.25
82.55	0.0	E < El= 83.25
82.80	0.0	E < El= 83.25
83.05	0.0	E < El= 83.25
83.30	0.6	Weir: H =.05
83.55	9.3	Weir: H =.3
83.80	23.1	Weir: H =.55
84.05	40.5	Weir: H =.8
84.30	60.8	Weir: H =1.05
84.55	83.8	Weir: H =1.3
84.80	109.1	Weir: H =1.55
85.00	130.9	Weir: H =1.75

weir OK

Weir Cw = 3 Weir length = 18.84956 ft
Orifice Co = .6 Orifice area = 28.27434 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
No transition used, transition height = 0.0
Weir equation = Orifice equation @ elev.= 85.65749 ft

POND-2 Version: 5.20 S/N:
EXECUTED: 05-15-2003 18:36:25

Return Freq: 1 years

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*************************************************
*                                               *
*          LONGHILL GROVE APARTMENTS            *
*               JAMES CITY COUNTY               *
* ROUTING OF 1,2,10 AND 100 YEAR STORM EVENTS   *
*                                               *
*                                               *
*************************************************
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Inflow Hydrograph: j:\PONDPACK\2003043\PST1 .HYD
Rating Table file: j:\PONDPACK\2003043\PONDSWM .PND

----INITIAL CONDITIONS----
Elevation = 80.30 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
80.30	0.0	0
80.55	0.0	3,446
80.80	0.3	7,014
81.05	0.3	10,714
81.30	0.4	14,722
81.55	0.4	19,140
81.80	0.5	23,986
82.05	0.5	29,274
82.30	0.6	34,807
82.55	0.6	40,482
82.80	0.6	46,303
83.05	0.7	52,272
83.30	1.3	58,389
83.55	10.0	64,656
83.80	23.8	71,076
84.05	41.2	77,649
84.30	61.7	84,377
84.55	84.7	91,263
84.80	110.0	98,308
85.00	131.8	104,058

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
19.1	19.1
39.0	39.3
59.5	59.8
81.8	82.2
106.3	106.7
133.3	133.8
162.6	163.1
193.4	194.0
224.9	225.5
257.2	257.8
290.4	291.1
324.4	325.7
359.2	369.2
394.9	418.7
431.4	472.6
468.8	530.5
507.0	591.7
546.2	656.2
578.1	709.9

Time increment (t) = 0.100 hrs.

H = 2.95'
4" = 0.0873 SF
Q / 0.6√64.4(2.95) = 0.087
Q / 8.27 = 0.0873
Q = 0.7220 CFS
58389 CF / (d) 60·60 / 3600 d = 0.722 = 22.46 hrs.
83.25
80.30
2.95'
4" ORIF
58389 CF
22.46 hrs
12.1 hrs PEAK
24.0
36.1

POND-2 Version: 5.20 S/N:
EXECUTED: 05-15-2003 18:36:25

Return Freq: 1 years

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST1 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	0.00	-----	0.0	0.0	0.00	80.30
11.100	0.00	0.0	0.0	0.0	0.00	80.30
11.200	1.00	1.0	1.0	1.0	0.00	80.31
11.300	1.00	2.0	3.0	3.0	0.00	80.34
11.400	1.00	2.0	5.0	5.0	0.00	80.37
11.500	1.00	2.0	7.0	7.0	0.00	80.39
11.600	1.00	2.0	9.0	9.0	0.00	80.42
11.700	3.00	4.0	13.0	13.0	0.00	80.47
11.800	6.00	9.0	21.9	22.0	0.04	80.59
11.900	8.00	14.0	35.4	35.9	0.25	80.76
12.000	18.00	26.0	60.8	61.4	0.31	81.07
12.100	28.00 PEAK	46.0	106.0	106.8	0.40	81.55
12.200	17.00	45.0	150.0	151.0	0.50	81.95
12.300	6.00	23.0	171.9	173.0	0.53	82.13
12.400	4.00	10.0	180.8	181.9	0.56	82.20
12.500	4.00	8.0	187.6	188.8	0.58	82.26
12.600	3.00	7.0	193.4	194.6	0.60	82.31
12.700	3.00	6.0	198.2	199.4	0.60	82.34
12.800	2.00	5.0	202.0	203.2	0.60	82.37
12.900	2.00	4.0	204.8	206.0	0.60	82.40
13.000	2.00	4.0	207.6	208.8	0.60	82.42
13.100	2.00	4.0	210.4	211.6	0.60	82.44
13.200	2.00	4.0	213.2	214.4	0.60	82.46
13.300	2.00	4.0	216.0	217.2	0.60	82.48
13.400	2.00	4.0	218.8	220.0	0.60	82.51
13.500	2.00	4.0	221.6	222.8	0.60	82.53
13.600	1.00	3.0	223.4	224.6	0.60	82.54
13.700	1.00	2.0	224.2	225.4	0.60	82.55
13.800	1.00	2.0	225.0	226.2	0.60	82.56
13.900	1.00	2.0	225.8	227.0	0.60	82.56
14.000	1.00	2.0	226.6	227.8	0.60	82.57
14.100	1.00	2.0	227.4	228.6	0.60	82.57
14.200	1.00	2.0	228.2	229.4	0.60	82.58
14.300	1.00	2.0	229.0	230.2	0.60	82.59
14.400	1.00	2.0	229.8	231.0	0.60	82.59
14.500	1.00	2.0	230.6	231.8	0.60	82.60
14.600	1.00	2.0	231.4	232.6	0.60	82.61
14.700	1.00	2.0	232.2	233.4	0.60	82.61
14.800	1.00	2.0	233.0	234.2	0.60	82.62
14.900	1.00	2.0	233.8	235.0	0.60	82.62
15.000	1.00	2.0	234.6	235.8	0.60	82.63
15.100	1.00	2.0	235.4	236.6	0.60	82.64
15.200	1.00	2.0	236.2	237.4	0.60	82.64
15.300	1.00	2.0	237.0	238.2	0.60	82.65

15.400	1.00	2.0	237.8	239.0	0.60	82.65

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST1 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	1.00	2.0	238.6	239.8	0.60	82.66
15.600	1.00	2.0	239.4	240.6	0.60	82.67
15.700	1.00	2.0	240.2	241.4	0.60	82.67
15.800	1.00	2.0	241.0	242.2	0.60	82.68
15.900	1.00	2.0	241.8	243.0	0.60	82.69
16.000	1.00	2.0	242.6	243.8	0.60	82.69
16.100	1.00	2.0	243.4	244.6	0.60	82.70
16.200	1.00	2.0	244.2	245.4	0.60	82.70
16.300	1.00	2.0	245.0	246.2	0.60	82.71
16.400	1.00	2.0	245.8	247.0	0.60	82.72
16.500	1.00	2.0	246.6	247.8	0.60	82.72
16.600	1.00	2.0	247.4	248.6	0.60	82.73
16.700	1.00	2.0	248.2	249.4	0.60	82.74
16.800	1.00	2.0	249.0	250.2	0.60	82.74
16.900	1.00	2.0	249.8	251.0	0.60	82.75
17.000	1.00	2.0	250.6	251.8	0.60	82.75
17.100	1.00	2.0	251.4	252.6	0.60	82.76
17.200	1.00	2.0	252.2	253.4	0.60	82.77
17.300	1.00	2.0	253.0	254.2	0.60	82.77
17.400	1.00	2.0	253.8	255.0	0.60	82.78
17.500	1.00	2.0	254.6	255.8	0.60	82.78
17.600	1.00	2.0	255.4	256.6	0.60	82.79
17.700	1.00	2.0	256.2	257.4	0.60	82.80
17.800	1.00	2.0	257.0	258.2	0.60	82.80
17.900	1.00	2.0	257.8	259.0	0.60	82.81
18.000	1.00	2.0	258.6	259.8	0.61	82.82
18.100	1.00	2.0	259.4	260.6	0.61	82.82
18.200	1.00	2.0	260.2	261.4	0.61	82.83
18.300	1.00	2.0	261.0	262.2	0.61	82.83
18.400	1.00	2.0	261.7	263.0	0.62	82.84
18.500	1.00	2.0	262.5	263.7	0.62	82.84
18.600	1.00	2.0	263.3	264.5	0.62	82.85
18.700	1.00	2.0	264.0	265.3	0.62	82.86
18.800	1.00	2.0	264.8	266.0	0.62	82.86
18.900	1.00	2.0	265.5	266.8	0.63	82.87
19.000	1.00	2.0	266.3	267.5	0.63	82.87
19.100	1.00	2.0	267.0	268.3	0.63	82.88
19.200	1.00	2.0	267.7	269.0	0.63	82.88
19.300	1.00	2.0	268.4	269.7	0.64	82.89
19.400	1.00	2.0	269.2	270.4	0.64	82.89
19.500	0.00	1.0	268.9	270.2	0.64	82.89
19.600	0.00	0.0	267.6	268.9	0.63	82.88
19.700	0.00	0.0	266.4	267.6	0.63	82.87
19.800	0.00	0.0	265.1	266.4	0.63	82.86

PEAK ELEV.

19.900	0.00		0.0	263.9	265.1	0.62	82.85
20.000	0.00		0.0	262.6	263.9	0.62	82.85

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST1 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	261.4	262.6	0.61	82.84
20.200	0.00	0.0	260.2	261.4	0.61	82.83
20.300	0.00	0.0	259.0	260.2	0.61	82.82
20.400	0.00	0.0	257.8	259.0	0.60	82.81
20.500	0.00	0.0	256.6	257.8	0.60	82.80
20.600	0.00	0.0	255.4	256.6	0.60	82.79
20.700	0.00	0.0	254.2	255.4	0.60	82.78
20.800	0.00	0.0	253.0	254.2	0.60	82.77
20.900	0.00	0.0	251.8	253.0	0.60	82.76
21.000	0.00	0.0	250.6	251.8	0.60	82.75
21.100	0.00	0.0	249.4	250.6	0.60	82.74
21.200	0.00	0.0	248.2	249.4	0.60	82.73
21.300	0.00	0.0	247.0	248.2	0.60	82.73
21.400	0.00	0.0	245.8	247.0	0.60	82.72
21.500	0.00	0.0	244.6	245.8	0.60	82.71
21.600	0.00	0.0	243.4	244.6	0.60	82.70
21.700	0.00	0.0	242.2	243.4	0.60	82.69
21.800	0.00	0.0	241.0	242.2	0.60	82.68
21.900	0.00	0.0	239.8	241.0	0.60	82.67
22.000	0.00	0.0	238.6	239.8	0.60	82.66
22.100	0.00	0.0	237.4	238.6	0.60	82.65
22.200	0.00	0.0	236.2	237.4	0.60	82.64
22.300	0.00	0.0	235.0	236.2	0.60	82.63
22.400	0.00	0.0	233.8	235.0	0.60	82.62
22.500	0.00	0.0	232.6	233.8	0.60	82.61
22.600	0.00	0.0	231.4	232.6	0.60	82.60
22.700	0.00	0.0	230.2	231.4	0.60	82.60
22.800	0.00	0.0	229.0	230.2	0.60	82.59
22.900	0.00	0.0	227.8	229.0	0.60	82.58
23.000	0.00	0.0	226.6	227.8	0.60	82.57
23.100	0.00	0.0	225.4	226.6	0.60	82.56
23.200	0.00	0.0	224.2	225.4	0.60	82.55
23.300	0.00	0.0	223.0	224.2	0.60	82.54
23.400	0.00	0.0	221.8	223.0	0.60	82.53
23.500	0.00	0.0	220.6	221.8	0.60	82.52
23.600	0.00	0.0	219.4	220.6	0.60	82.51
23.700	0.00	0.0	218.2	219.4	0.60	82.50
23.800	0.00	0.0	217.0	218.2	0.60	82.49
23.900	0.00	0.0	215.8	217.0	0.60	82.48
24.000	0.00	0.0	214.6	215.8	0.60	82.47
24.100	0.00	0.0	213.4	214.6	0.60	82.46
24.200	0.00	0.0	212.2	213.4	0.60	82.45
24.300	0.00	0.0	211.0	212.2	0.60	82.44
24.400	0.00	0.0	209.8	211.0	0.60	82.43

24.500	0.00	0.0	208.6	209.8	0.60	82.43
24.600	0.00	0.0	207.4	208.6	0.60	82.42

POND-2 Version: 5.20 S/N:
EXECUTED: 05-15-2003 18:36:25

Return Freq: 1 years

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST1 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT1 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	206.2	207.4	0.60	82.41
24.800	0.00	0.0	205.0	206.2	0.60	82.40
24.900	0.00	0.0	203.8	205.0	0.60	82.39
25.000	0.00	0.0	202.6	203.8	0.60	82.38
25.100	0.00	0.0	201.4	202.6	0.60	82.37
25.200	0.00	0.0	200.2	201.4	0.60	82.36
25.300	0.00	0.0	199.0	200.2	0.60	82.35
25.400	0.00	0.0	197.8	199.0	0.60	82.34
25.500	0.00	0.0	196.6	197.8	0.60	82.33
25.600	0.00	0.0	195.4	196.6	0.60	82.32
25.700	0.00	0.0	194.2	195.4	0.60	82.31
25.800	0.00	0.0	193.0	194.2	0.60	82.30
25.900	0.00	0.0	191.8	193.0	0.60	82.29

Must go to 36.1 hrs with discharge to prove 24-hour discharge

58389 cf

25.9
12.1
13.8 hrs.

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST1 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT1 .HYD

Starting Pond W.S. Elevation = 80.30 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 28.00 cfs
Peak Outflow = 0.64 cfs
Peak Elevation = 82.89 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0 cu-ft
Peak Storage From Storm = 48,566 cu-ft

Total Storage in Pond = 48,566 cu-ft

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*                                               *
*          LONGHILL GROVE APARTMENTS            *
*               JAMES CITY COUNTY               *
* ROUTING OF 1,2,10 AND 100 YEAR STORM EVENTS   *
*                                               *
*                                               *
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Inflow Hydrograph: j:\PONDPACK\2003043\PST2 .HYD
Rating Table file: j:\PONDPACK\2003043\PONDSWM .PND

----INITIAL CONDITIONS----
Elevation = 80.30 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
80.30	0.0	0
80.55	0.0	3,446
80.80	0.3	7,014
81.05	0.3	10,714
81.30	0.4	14,722
81.55	0.4	19,140
81.80	0.5	23,986
82.05	0.5	29,274
82.30	0.6	34,807
82.55	0.6	40,482
82.80	0.6	46,303
83.05	0.7	52,272
83.30	1.3	58,389
83.55	10.0	64,656
83.80	23.8	71,076
84.05	41.2	77,649
84.30	61.7	84,377
84.55	84.7	91,263
84.80	110.0	98,308
85.00	131.8	104,058

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
19.1	19.1
39.0	39.3
59.5	59.8
81.8	82.2
106.3	106.7
133.3	133.8
162.6	163.1
193.4	194.0
224.9	225.5
257.2	257.8
290.4	291.1
324.4	325.7
359.2	369.2
394.9	418.7
431.4	472.6
468.8	530.5
507.0	591.7
546.2	656.2
578.1	709.9

Time increment (t) = 0.100 hrs.

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST2 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT2 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	1.00	-----	0.0	0.0	0.00	80.30
11.100	1.00	2.0	2.0	2.0	0.00	80.33
11.200	1.00	2.0	4.0	4.0	0.00	80.35
11.300	1.00	2.0	6.0	6.0	0.00	80.38
11.400	1.00	2.0	8.0	8.0	0.00	80.40
11.500	2.00	3.0	11.0	11.0	0.00	80.44
11.600	2.00	4.0	15.0	15.0	0.00	80.50
11.700	6.00	8.0	22.9	23.0	0.06	80.60
11.800	9.00	15.0	37.3	37.9	0.28	80.78
11.900	13.00	22.0	58.7	59.3	0.30	81.04
12.000	27.00	40.0	97.9	98.7	0.40	81.47
12.100	42.00	69.0	165.9	166.9	0.51	82.08
12.200	26.00	68.0	232.7	233.9	0.60	82.61
12.300	9.00	35.0	266.4	267.7	0.63	82.87
12.400	6.00	15.0	280.1	281.4	0.67	82.98
12.500	5.00	11.0	289.7	291.1	0.70	83.05
12.600	5.00	10.0	298.0	299.7	0.85	83.11
12.700	4.00	9.0	305.1	307.0	0.98	83.16
12.800	3.00	7.0	309.9	312.1	1.06	83.20
12.900	3.00	6.0	313.7	315.9	1.13	83.23
13.000	3.00	6.0	317.3	319.7	1.20	83.26
13.100	3.00	6.0	320.8	323.3	1.26	83.28
13.200	3.00	6.0	323.7	326.8	1.51	83.31
13.300	2.00	5.0	324.9	328.7	1.91	83.32
13.400	2.00	4.0	325.0	328.9	1.95	83.32
13.500	2.00	4.0	325.1	329.0	1.97	83.32
13.600	2.00	4.0	325.1	329.1	1.98	83.32
13.700	2.00	4.0	325.1	329.1	1.99	83.32
13.800	2.00	4.0	325.2	329.1	1.99	83.32
13.900	2.00	4.0	325.2	329.2	2.00	83.32
14.000	2.00	4.0	325.2	329.2	2.00	83.32
14.100	2.00	4.0	325.2	329.2	2.00	83.32
14.200	2.00	4.0	325.2	329.2	2.00	83.32
14.300	2.00	4.0	325.2	329.2	2.00	83.32
14.400	2.00	4.0	325.2	329.2	2.00	83.32
14.500	1.00	3.0	324.6	328.2	1.80	83.31
14.600	1.00	2.0	323.6	326.6	1.48	83.31
14.700	1.00	2.0	323.0	325.6	1.30	83.30
14.800	1.00	2.0	322.4	325.0	1.29	83.30
14.900	1.00	2.0	321.9	324.4	1.28	83.29
15.000	1.00	2.0	321.4	323.9	1.27	83.29
15.100	1.00	2.0	320.8	323.4	1.26	83.28
15.200	1.00	2.0	320.3	322.8	1.25	83.28
15.300	1.00	2.0	319.8	322.3	1.24	83.28

15.400	1.00	2.0	319.4	321.8	1.23	83.27

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST2 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT2 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	1.00	2.0	318.9	321.4	1.23	83.27
15.600	1.00	2.0	318.5	320.9	1.22	83.27
15.700	1.00	2.0	318.1	320.5	1.21	83.26
15.800	1.00	2.0	317.7	320.1	1.20	83.26
15.900	1.00	2.0	317.3	319.7	1.20	83.26
16.000	1.00	2.0	316.9	319.3	1.19	83.25
16.100	1.00	2.0	316.5	318.9	1.18	83.25
16.200	1.00	2.0	316.2	318.5	1.18	83.25
16.300	1.00	2.0	315.8	318.2	1.17	83.25
16.400	1.00	2.0	315.5	317.8	1.16	83.24
16.500	1.00	2.0	315.2	317.5	1.16	83.24
16.600	1.00	2.0	314.9	317.2	1.15	83.24
16.700	1.00	2.0	314.6	316.9	1.15	83.24
16.800	1.00	2.0	314.3	316.6	1.14	83.23
16.900	1.00	2.0	314.0	316.3	1.14	83.23
17.000	1.00	2.0	313.8	316.0	1.13	83.23
17.100	1.00	2.0	313.5	315.8	1.13	83.23
17.200	1.00	2.0	313.3	315.5	1.12	83.23
17.300	1.00	2.0	313.0	315.3	1.12	83.22
17.400	1.00	2.0	312.8	315.0	1.12	83.22
17.500	1.00	2.0	312.6	314.8	1.11	83.22
17.600	1.00	2.0	312.4	314.6	1.11	83.22
17.700	1.00	2.0	312.2	314.4	1.10	83.22
17.800	1.00	2.0	312.0	314.2	1.10	83.22
17.900	1.00	2.0	311.8	314.0	1.10	83.22
18.000	1.00	2.0	311.6	313.8	1.09	83.21
18.100	1.00	2.0	311.4	313.6	1.09	83.21
18.200	1.00	2.0	311.2	313.4	1.09	83.21
18.300	1.00	2.0	311.1	313.2	1.08	83.21
18.400	1.00	2.0	310.9	313.1	1.08	83.21
18.500	1.00	2.0	310.7	312.9	1.08	83.21
18.600	1.00	2.0	310.6	312.7	1.08	83.21
18.700	1.00	2.0	310.4	312.6	1.07	83.21
18.800	1.00	2.0	310.3	312.4	1.07	83.20
18.900	1.00	2.0	310.2	312.3	1.07	83.20
19.000	1.00	2.0	310.0	312.2	1.07	83.20
19.100	1.00	2.0	309.9	312.0	1.06	83.20
19.200	1.00	2.0	309.8	311.9	1.06	83.20
19.300	1.00	2.0	309.7	311.8	1.06	83.20
19.400	1.00	2.0	309.6	311.7	1.06	83.20
19.500	1.00	2.0	309.4	311.6	1.05	83.20
19.600	1.00	2.0	309.3	311.4	1.05	83.20
19.700	1.00	2.0	309.2	311.3	1.05	83.20
19.800	1.00	2.0	309.1	311.2	1.05	83.20

19.900	1.00	2.0	309.0	311.1	1.05	83.19
20.000	1.00	2.0	308.9	311.0	1.05	83.19

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST2 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT2 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	1.00	2.0	308.9	310.9	1.04	83.19
20.200	1.00	2.0	308.8	310.9	1.04	83.19
20.300	1.00	2.0	308.7	310.8	1.04	83.19
20.400	1.00	2.0	308.6	310.7	1.04	83.19
20.500	1.00	2.0	308.5	310.6	1.04	83.19
20.600	1.00	2.0	308.5	310.5	1.04	83.19
20.700	1.00	2.0	308.4	310.5	1.04	83.19
20.800	1.00	2.0	308.3	310.4	1.03	83.19
20.900	1.00	2.0	308.3	310.3	1.03	83.19
21.000	1.00	2.0	308.2	310.3	1.03	83.19
21.100	1.00	2.0	308.1	310.2	1.03	83.19
21.200	1.00	2.0	308.1	310.1	1.03	83.19
21.300	1.00	2.0	308.0	310.1	1.03	83.19
21.400	1.00	2.0	308.0	310.0	1.03	83.19
21.500	1.00	2.0	307.9	310.0	1.03	83.19
21.600	1.00	2.0	307.8	309.9	1.03	83.19
21.700	1.00	2.0	307.8	309.8	1.03	83.19
21.800	1.00	2.0	307.7	309.8	1.02	83.19
21.900	1.00	2.0	307.7	309.7	1.02	83.18
22.000	1.00	2.0	307.7	309.7	1.02	83.18
22.100	1.00	2.0	307.6	309.7	1.02	83.18
22.200	1.00	2.0	307.6	309.6	1.02	83.18
22.300	1.00	2.0	307.5	309.6	1.02	83.18
22.400	1.00	2.0	307.5	309.5	1.02	83.18
22.500	1.00	2.0	307.4	309.5	1.02	83.18
22.600	1.00	2.0	307.4	309.4	1.02	83.18
22.700	1.00	2.0	307.4	309.4	1.02	83.18
22.800	1.00	2.0	307.3	309.4	1.02	83.18
22.900	1.00	2.0	307.3	309.3	1.02	83.18
23.000	1.00	2.0	307.3	309.3	1.02	83.18
23.100	1.00	2.0	307.2	309.3	1.02	83.18
23.200	1.00	2.0	307.2	309.2	1.01	83.18
23.300	1.00	2.0	307.2	309.2	1.01	83.18
23.400	1.00	2.0	307.2	309.2	1.01	83.18
23.500	1.00	2.0	307.1	309.2	1.01	83.18
23.600	1.00	2.0	307.1	309.1	1.01	83.18
23.700	1.00	2.0	307.1	309.1	1.01	83.18
23.800	1.00	2.0	307.1	309.1	1.01	83.18
23.900	1.00	2.0	307.0	309.1	1.01	83.18
24.000	0.00	1.0	306.0	308.0	0.99	83.17
24.100	0.00	0.0	304.1	306.0	0.96	83.16
24.200	0.00	0.0	302.3	304.1	0.93	83.14
24.300	0.00	0.0	300.5	302.3	0.89	83.13
24.400	0.00	0.0	298.8	300.5	0.86	83.12

24.500	0.00	0.0	297.1	298.8	0.83	83.11
24.600	0.00	0.0	295.5	297.1	0.80	83.09

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST2 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT2 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	293.9	295.5	0.78	83.08
24.800	0.00	0.0	292.4	293.9	0.75	83.07
24.900	0.00	0.0	291.0	292.4	0.72	83.06
25.000	0.00	0.0	289.6	291.0	0.70	83.05
25.100	0.00	0.0	288.2	289.6	0.70	83.04
25.200	0.00	0.0	286.8	288.2	0.69	83.03
25.300	0.00	0.0	285.4	286.8	0.69	83.02
25.400	0.00	0.0	284.1	285.4	0.68	83.01
25.500	0.00	0.0	282.7	284.1	0.68	83.00
25.600	0.00	0.0	281.4	282.7	0.67	82.99
25.700	0.00	0.0	280.0	281.4	0.67	82.98
25.800	0.00	0.0	278.7	280.0	0.67	82.97
25.900	0.00	0.0	277.4	278.7	0.66	82.96

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST2 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT2 .HYD

Starting Pond W.S. Elevation = 80.30 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 42.00 cfs
Peak Outflow = 2.00 cfs
Peak Elevation = 83.32 ft

***** Summary of Approximate Peak Storage *****

2-yr

Initial Storage = 0 cu-ft
Peak Storage From Storm = 58,893 cu-ft

Total Storage in Pond = 58,893 cu-ft

Warning: Inflow hydrograph truncated on left side.

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*************************************************
*                                               *
*          LONGHILL GROVE APARTMENTS            *
*               JAMES CITY COUNTY               *
* ROUTING OF 1,2,10 AND 100 YEAR STORM EVENTS   *
*                                               *
*                                               *
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Inflow Hydrograph: j:\PONDPACK\2003043\PST10 .HYD
Rating Table file: j:\PONDPACK\2003043\PONDSWM .PND

----INITIAL CONDITIONS----
Elevation = 80.30 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
80.30	0.0	0
80.55	0.0	3,446
80.80	0.3	7,014
81.05	0.3	10,714
81.30	0.4	14,722
81.55	0.4	19,140
81.80	0.5	23,986
82.05	0.5	29,274
82.30	0.6	34,807
82.55	0.6	40,482
82.80	0.6	46,303
83.05	0.7	52,272
83.30	1.3	58,389
83.55	10.0	64,656
83.80	23.8	71,076
84.05	41.2	77,649
84.30	61.7	84,377
84.55	84.7	91,263
84.80	110.0	98,308
85.00	131.8	104,058

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
19.1	19.1
39.0	39.3
59.5	59.8
81.8	82.2
106.3	106.7
133.3	133.8
162.6	163.1
193.4	194.0
224.9	225.5
257.2	257.8
290.4	291.1
324.4	325.7
359.2	369.2
394.9	418.7
431.4	472.6
468.8	530.5
507.0	591.7
546.2	656.2
578.1	709.9

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.20 S/N:
EXECUTED: 05-15-2003 18:36:25

Return Freq: 10 years

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST10 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT10 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	2.00	-----	0.0	0.0	0.00	80.30
11.100	2.00	4.0	4.0	4.0	0.00	80.35
11.200	3.00	5.0	9.0	9.0	0.00	80.42
11.300	3.00	6.0	15.0	15.0	0.00	80.50
11.400	4.00	7.0	21.9	22.0	0.04	80.59
11.500	4.00	8.0	29.6	29.9	0.16	80.68
11.600	5.00	9.0	38.0	38.6	0.29	80.79
11.700	13.00	18.0	55.4	56.0	0.30	81.00
11.800	22.00	35.0	89.6	90.4	0.40	81.38
11.900	30.00	52.0	140.6	141.6	0.50	81.87
12.000	58.00	88.0	227.4	228.6	0.60	82.57
12.100	90.00	148.0	351.9	375.4	11.73	83.58
12.200	56.00	146.0	397.6	497.9	50.18	84.16
12.300	19.00	75.0	390.2	472.6	41.20	84.05
12.400	13.00	32.0	372.3	422.2	24.94	83.82
12.500	11.00	24.0	361.2	396.3	17.56	83.69
12.600	9.00	20.0	354.5	381.2	13.34	83.61
12.700	8.00	17.0	350.2	371.5	10.64	83.56
12.800	7.00	15.0	346.8	365.2	9.20	83.53
12.900	6.00	13.0	343.6	359.8	8.12	83.50
13.000	6.00	12.0	341.0	355.6	7.27	83.47
13.100	6.00	12.0	339.5	353.0	6.76	83.46
13.200	5.00	11.0	338.0	350.5	6.26	83.44
13.300	5.00	10.0	336.5	348.0	5.76	83.43
13.400	5.00	10.0	335.6	346.5	5.45	83.42
13.500	5.00	10.0	335.0	345.6	5.27	83.41
13.600	4.00	9.0	334.1	344.0	4.96	83.41
13.700	4.00	8.0	332.9	342.1	4.58	83.39
13.800	4.00	8.0	332.2	340.9	4.35	83.39
13.900	4.00	8.0	331.8	340.2	4.21	83.38
14.000	3.00	7.0	331.0	338.8	3.93	83.38
14.100	3.00	6.0	329.9	337.0	3.56	83.36
14.200	3.00	6.0	329.2	335.9	3.33	83.36
14.300	3.00	6.0	328.8	335.2	3.20	83.35
14.400	3.00	6.0	328.5	334.8	3.12	83.35
14.500	3.00	6.0	328.4	334.5	3.07	83.35
14.600	3.00	6.0	328.3	334.4	3.04	83.35
14.700	3.00	6.0	328.3	334.3	3.03	83.35
14.800	3.00	6.0	328.2	334.3	3.02	83.35
14.900	3.00	6.0	328.2	334.2	3.01	83.35
15.000	3.00	6.0	328.2	334.2	3.01	83.35
15.100	3.00	6.0	328.2	334.2	3.00	83.35
15.200	3.00	6.0	328.2	334.2	3.00	83.35
15.300	2.00	5.0	327.6	333.2	2.80	83.34

15.400	2.00		4.0	326.6	331.6	2.48	83.33

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST10 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT10 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	2.00	4.0	326.0	330.6	2.29	83.33
15.600	2.00	4.0	325.7	330.0	2.17	83.33
15.700	2.00	4.0	325.5	329.7	2.10	83.32
15.800	2.00	4.0	325.4	329.5	2.06	83.32
15.900	2.00	4.0	325.3	329.4	2.04	83.32
16.000	2.00	4.0	325.3	329.3	2.02	83.32
16.100	2.00	4.0	325.2	329.3	2.01	83.32
16.200	2.00	4.0	325.2	329.2	2.01	83.32
16.300	2.00	4.0	325.2	329.2	2.00	83.32
16.400	2.00	4.0	325.2	329.2	2.00	83.32
16.500	2.00	4.0	325.2	329.2	2.00	83.32
16.600	2.00	4.0	325.2	329.2	2.00	83.32
16.700	2.00	4.0	325.2	329.2	2.00	83.32
16.800	2.00	4.0	325.2	329.2	2.00	83.32
16.900	2.00	4.0	325.2	329.2	2.00	83.32
17.000	2.00	4.0	325.2	329.2	2.00	83.32
17.100	2.00	4.0	325.2	329.2	2.00	83.32
17.200	2.00	4.0	325.2	329.2	2.00	83.32
17.300	2.00	4.0	325.2	329.2	2.00	83.32
17.400	2.00	4.0	325.2	329.2	2.00	83.32
17.500	2.00	4.0	325.2	329.2	2.00	83.32
17.600	2.00	4.0	325.2	329.2	2.00	83.32
17.700	2.00	4.0	325.2	329.2	2.00	83.32
17.800	2.00	4.0	325.2	329.2	2.00	83.32
17.900	2.00	4.0	325.2	329.2	2.00	83.32
18.000	2.00	4.0	325.2	329.2	2.00	83.32
18.100	2.00	4.0	325.2	329.2	2.00	83.32
18.200	2.00	4.0	325.2	329.2	2.00	83.32
18.300	2.00	4.0	325.2	329.2	2.00	83.32
18.400	2.00	4.0	325.2	329.2	2.00	83.32
18.500	2.00	4.0	325.2	329.2	2.00	83.32
18.600	1.00	3.0	324.6	328.2	1.80	83.31
18.700	1.00	2.0	323.6	326.6	1.48	83.31
18.800	1.00	2.0	323.0	325.6	1.30	83.30
18.900	1.00	2.0	322.4	325.0	1.29	83.30
19.000	1.00	2.0	321.9	324.4	1.28	83.29
19.100	1.00	2.0	321.4	323.9	1.27	83.29
19.200	1.00	2.0	320.8	323.4	1.26	83.28
19.300	1.00	2.0	320.3	322.8	1.25	83.28
19.400	1.00	2.0	319.8	322.3	1.24	83.28
19.500	1.00	2.0	319.4	321.8	1.23	83.27
19.600	1.00	2.0	318.9	321.4	1.23	83.27
19.700	1.00	2.0	318.5	320.9	1.22	83.27
19.800	1.00	2.0	318.1	320.5	1.21	83.26

19.900	1.00	2.0	317.7	320.1	1.20	83.26
20.000	1.00	2.0	317.3	319.7	1.20	83.26

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST10 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT10 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	1.00	2.0	316.9	319.3	1.19	83.25
20.200	1.00	2.0	316.5	318.9	1.18	83.25
20.300	1.00	2.0	316.2	318.5	1.18	83.25
20.400	1.00	2.0	315.8	318.2	1.17	83.25
20.500	1.00	2.0	315.5	317.8	1.16	83.24
20.600	1.00	2.0	315.2	317.5	1.16	83.24
20.700	1.00	2.0	314.9	317.2	1.15	83.24
20.800	1.00	2.0	314.6	316.9	1.15	83.24
20.900	1.00	2.0	314.3	316.6	1.14	83.23
21.000	1.00	2.0	314.0	316.3	1.14	83.23
21.100	1.00	2.0	313.8	316.0	1.13	83.23
21.200	1.00	2.0	313.5	315.8	1.13	83.23
21.300	1.00	2.0	313.3	315.5	1.12	83.23
21.400	1.00	2.0	313.0	315.3	1.12	83.22
21.500	1.00	2.0	312.8	315.0	1.12	83.22
21.600	1.00	2.0	312.6	314.8	1.11	83.22
21.700	1.00	2.0	312.4	314.6	1.11	83.22
21.800	1.00	2.0	312.2	314.4	1.10	83.22
21.900	1.00	2.0	312.0	314.2	1.10	83.22
22.000	1.00	2.0	311.8	314.0	1.10	83.22
22.100	1.00	2.0	311.6	313.8	1.09	83.21
22.200	1.00	2.0	311.4	313.6	1.09	83.21
22.300	1.00	2.0	311.2	313.4	1.09	83.21
22.400	1.00	2.0	311.1	313.2	1.08	83.21
22.500	1.00	2.0	310.9	313.1	1.08	83.21
22.600	1.00	2.0	310.7	312.9	1.08	83.21
22.700	1.00	2.0	310.6	312.7	1.08	83.21
22.800	1.00	2.0	310.4	312.6	1.07	83.21
22.900	1.00	2.0	310.3	312.4	1.07	83.20
23.000	1.00	2.0	310.2	312.3	1.07	83.20
23.100	1.00	2.0	310.0	312.2	1.07	83.20
23.200	1.00	2.0	309.9	312.0	1.06	83.20
23.300	1.00	2.0	309.8	311.9	1.06	83.20
23.400	1.00	2.0	309.7	311.8	1.06	83.20
23.500	1.00	2.0	309.6	311.7	1.06	83.20
23.600	1.00	2.0	309.4	311.6	1.05	83.20
23.700	1.00	2.0	309.3	311.4	1.05	83.20
23.800	1.00	2.0	309.2	311.3	1.05	83.20
23.900	1.00	2.0	309.1	311.2	1.05	83.20
24.000	0.00	1.0	308.1	310.1	1.03	83.19
24.100	0.00	0.0	306.1	308.1	0.99	83.17
24.200	0.00	0.0	304.2	306.1	0.96	83.16
24.300	0.00	0.0	302.3	304.2	0.93	83.14
24.400	0.00	0.0	300.5	302.3	0.89	83.13

24.500	0.00	0.0	298.8	300.5	0.86	83.12
24.600	0.00	0.0	297.1	298.8	0.83	83.11

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST10 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT10 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	295.5	297.1	0.80	83.09
24.800	0.00	0.0	294.0	295.5	0.78	83.08
24.900	0.00	0.0	292.5	294.0	0.75	83.07
25.000	0.00	0.0	291.0	292.5	0.72	83.06
25.100	0.00	0.0	289.6	291.0	0.70	83.05
25.200	0.00	0.0	288.2	289.6	0.70	83.04
25.300	0.00	0.0	286.8	288.2	0.69	83.03
25.400	0.00	0.0	285.5	286.8	0.69	83.02
25.500	0.00	0.0	284.1	285.5	0.68	83.01
25.600	0.00	0.0	282.7	284.1	0.68	83.00
25.700	0.00	0.0	281.4	282.7	0.67	82.99
25.800	0.00	0.0	280.1	281.4	0.67	82.98
25.900	0.00	0.0	278.7	280.1	0.67	82.97

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST10 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT10 .HYD

Starting Pond W.S. Elevation = 80.30 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 90.00 cfs
Peak Outflow = 50.18 cfs
Peak Elevation = 84.16 ft

***** Summary of Approximate Peak Storage *****

Initial Storage = 0 cu-ft
Peak Storage From Storm = 80,597 cu-ft

Total Storage in Pond = 80,597 cu-ft

Warning: Inflow hydrograph truncated on left side.

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*************************************************
*                                               *
*          LONGHILL GROVE APARTMENTS            *
*              JAMES CITY COUNTY                *
* ROUTING OF 1,2,10 AND 100 YEAR STORM EVENTS   *
*                                               *
*                                               *
*************************************************
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Inflow Hydrograph: j:\PONDPACK\2003043\PST100 .HYD
Rating Table file: j:\PONDPACK\2003043\PONDSWM .PND

----INITIAL CONDITIONS----
Elevation = 80.30 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
80.30	0.0	0
80.55	0.0	3,446
80.80	0.3	7,014
81.05	0.3	10,714
81.30	0.4	14,722
81.55	0.4	19,140
81.80	0.5	23,986
82.05	0.5	29,274
82.30	0.6	34,807
82.55	0.6	40,482
82.80	0.6	46,303
83.05	0.7	52,272
83.30	1.3	58,389
83.55	10.0	64,656
83.80	23.8	71,076
84.05	41.2	77,649
84.30	61.7	84,377
84.55	84.7	91,263
84.80	110.0	98,308
85.00	131.8	104,058

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
19.1	19.1
39.0	39.3
59.5	59.8
81.8	82.2
106.3	106.7
133.3	133.8
162.6	163.1
193.4	194.0
224.9	225.5
257.2	257.8
290.4	291.1
324.4	325.7
359.2	369.2
394.9	418.7
431.4	472.6
468.8	530.5
507.0	591.7
546.2	656.2
578.1	709.9

Time increment (t) = 0.100 hrs.

POND-2 Version: 5.20 S/N:
EXECUTED: 05-15-2003 18:36:25

Return Freq: 100 years

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST100 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT100 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	3.00	-----	0.0	0.0	0.00	80.30
11.100	4.00	7.0	7.0	7.0	0.00	80.39
11.200	4.00	8.0	15.0	15.0	0.00	80.50
11.300	5.00	9.0	23.9	24.0	0.07	80.61
11.400	6.00	11.0	34.4	34.9	0.23	80.75
11.500	7.00	13.0	46.8	47.4	0.30	80.90
11.600	8.00	15.0	61.2	61.8	0.31	81.07
11.700	21.00	29.0	89.4	90.2	0.40	81.38
11.800	34.00	55.0	143.4	144.4	0.50	81.89
11.900	47.00	81.0	223.2	224.4	0.60	82.54
12.000	92.00	139.0	345.0	362.2	8.59	83.51
12.100	144.00	236.0	419.6	581.0	80.67	84.51
12.200	89.00	233.0	435.4	652.6	108.62	84.79
12.300	31.00	120.0	413.3	555.4	71.06	84.40
12.400	21.00	52.0	387.6	465.3	38.84	84.02
12.500	17.00	38.0	373.5	425.6	26.04	83.83
12.600	15.00	32.0	365.3	405.5	20.13	83.73
12.700	12.00	27.0	359.4	392.3	16.43	83.67
12.800	11.00	23.0	355.0	382.4	13.68	83.62
12.900	10.00	21.0	352.2	376.0	11.91	83.58
13.000	9.00	19.0	350.1	371.2	10.56	83.56
13.100	8.00	17.0	347.9	367.1	9.58	83.54
13.200	8.00	16.0	346.0	363.9	8.95	83.52
13.300	8.00	16.0	344.9	362.0	8.57	83.51
13.400	7.00	15.0	343.6	359.9	8.14	83.50
13.500	7.00	14.0	342.3	357.6	7.69	83.48
13.600	7.00	14.0	341.4	356.3	7.41	83.48
13.700	6.00	13.0	340.3	354.4	7.05	83.47
13.800	6.00	12.0	339.1	352.3	6.63	83.45
13.900	6.00	12.0	338.3	351.1	6.38	83.45
14.000	5.00	11.0	337.3	349.3	6.03	83.44
14.100	5.00	10.0	336.0	347.3	5.62	83.42
14.200	5.00	10.0	335.3	346.0	5.37	83.42
14.300	5.00	10.0	334.9	345.3	5.22	83.41
14.400	5.00	10.0	334.6	344.9	5.13	83.41
14.500	5.00	10.0	334.4	344.6	5.08	83.41
14.600	5.00	10.0	334.3	344.4	5.05	83.41
14.700	5.00	10.0	334.3	344.3	5.03	83.41
14.800	4.00	9.0	333.6	343.3	4.82	83.40
14.900	4.00	8.0	332.7	341.6	4.49	83.39
15.000	4.00	8.0	332.1	340.7	4.29	83.39
15.100	4.00	8.0	331.7	340.1	4.18	83.38
15.200	4.00	8.0	331.5	339.7	4.11	83.38
15.300	4.00	8.0	331.4	339.5	4.06	83.38

15.400	4.00	8.0	331.3	339.4	4.04	83.38	

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST100 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT100 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	4.00	8.0	331.3	339.3	4.02	83.38
15.600	4.00	8.0	331.2	339.3	4.01	83.38
15.700	4.00	8.0	331.2	339.2	4.01	83.38
15.800	3.00	7.0	330.6	338.2	3.81	83.37
15.900	3.00	6.0	329.6	336.6	3.48	83.36
16.000	3.00	6.0	329.1	335.6	3.29	83.36
16.100	3.00	6.0	328.7	335.1	3.17	83.35
16.200	3.00	6.0	328.5	334.7	3.10	83.35
16.300	3.00	6.0	328.4	334.5	3.06	83.35
16.400	3.00	6.0	328.3	334.4	3.04	83.35
16.500	3.00	6.0	328.3	334.3	3.02	83.35
16.600	3.00	6.0	328.2	334.3	3.01	83.35
16.700	3.00	6.0	328.2	334.2	3.01	83.35
16.800	3.00	6.0	328.2	334.2	3.00	83.35
16.900	3.00	6.0	328.2	334.2	3.00	83.35
17.000	3.00	6.0	328.2	334.2	3.00	83.35
17.100	3.00	6.0	328.2	334.2	3.00	83.35
17.200	3.00	6.0	328.2	334.2	3.00	83.35
17.300	3.00	6.0	328.2	334.2	3.00	83.35
17.400	3.00	6.0	328.2	334.2	3.00	83.35
17.500	3.00	6.0	328.2	334.2	3.00	83.35
17.600	3.00	6.0	328.2	334.2	3.00	83.35
17.700	3.00	6.0	328.2	334.2	3.00	83.35
17.800	3.00	6.0	328.2	334.2	3.00	83.35
17.900	3.00	6.0	328.2	334.2	3.00	83.35
18.000	3.00	6.0	328.2	334.2	3.00	83.35
18.100	3.00	6.0	328.2	334.2	3.00	83.35
18.200	3.00	6.0	328.2	334.2	3.00	83.35
18.300	3.00	6.0	328.2	334.2	3.00	83.35
18.400	3.00	6.0	328.2	334.2	3.00	83.35
18.500	2.00	5.0	327.6	333.2	2.80	83.34
18.600	2.00	4.0	326.6	331.6	2.48	83.33
18.700	2.00	4.0	326.0	330.6	2.29	83.33
18.800	2.00	4.0	325.7	330.0	2.17	83.33
18.900	2.00	4.0	325.5	329.7	2.10	83.32
19.000	2.00	4.0	325.4	329.5	2.06	83.32
19.100	2.00	4.0	325.3	329.4	2.04	83.32
19.200	2.00	4.0	325.3	329.3	2.02	83.32
19.300	2.00	4.0	325.2	329.3	2.01	83.32
19.400	2.00	4.0	325.2	329.2	2.01	83.32
19.500	2.00	4.0	325.2	329.2	2.00	83.32
19.600	2.00	4.0	325.2	329.2	2.00	83.32
19.700	2.00	4.0	325.2	329.2	2.00	83.32
19.800	2.00	4.0	325.2	329.2	2.00	83.32

19.900	2.00	4.0	325.2	329.2	2.00	83.32
20.000	2.00	4.0	325.2	329.2	2.00	83.32

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST100 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT100 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	2.00	4.0	325.2	329.2	2.00	83.32
20.200	2.00	4.0	325.2	329.2	2.00	83.32
20.300	2.00	4.0	325.2	329.2	2.00	83.32
20.400	2.00	4.0	325.2	329.2	2.00	83.32
20.500	2.00	4.0	325.2	329.2	2.00	83.32
20.600	2.00	4.0	325.2	329.2	2.00	83.32
20.700	2.00	4.0	325.2	329.2	2.00	83.32
20.800	2.00	4.0	325.2	329.2	2.00	83.32
20.900	2.00	4.0	325.2	329.2	2.00	83.32
21.000	2.00	4.0	325.2	329.2	2.00	83.32
21.100	2.00	4.0	325.2	329.2	2.00	83.32
21.200	2.00	4.0	325.2	329.2	2.00	83.32
21.300	2.00	4.0	325.2	329.2	2.00	83.32
21.400	2.00	4.0	325.2	329.2	2.00	83.32
21.500	2.00	4.0	325.2	329.2	2.00	83.32
21.600	2.00	4.0	325.2	329.2	2.00	83.32
21.700	2.00	4.0	325.2	329.2	2.00	83.32
21.800	2.00	4.0	325.2	329.2	2.00	83.32
21.900	2.00	4.0	325.2	329.2	2.00	83.32
22.000	2.00	4.0	325.2	329.2	2.00	83.32
22.100	2.00	4.0	325.2	329.2	2.00	83.32
22.200	2.00	4.0	325.2	329.2	2.00	83.32
22.300	2.00	4.0	325.2	329.2	2.00	83.32
22.400	2.00	4.0	325.2	329.2	2.00	83.32
22.500	2.00	4.0	325.2	329.2	2.00	83.32
22.600	2.00	4.0	325.2	329.2	2.00	83.32
22.700	2.00	4.0	325.2	329.2	2.00	83.32
22.800	2.00	4.0	325.2	329.2	2.00	83.32
22.900	2.00	4.0	325.2	329.2	2.00	83.32
23.000	2.00	4.0	325.2	329.2	2.00	83.32
23.100	1.00	3.0	324.6	328.2	1.80	83.31
23.200	1.00	2.0	323.6	326.6	1.48	83.31
23.300	1.00	2.0	323.0	325.6	1.30	83.30
23.400	1.00	2.0	322.4	325.0	1.29	83.30
23.500	1.00	2.0	321.9	324.4	1.28	83.29
23.600	1.00	2.0	321.4	323.9	1.27	83.29
23.700	1.00	2.0	320.8	323.4	1.26	83.28
23.800	1.00	2.0	320.3	322.8	1.25	83.28
23.900	1.00	2.0	319.8	322.3	1.24	83.28
24.000	1.00	2.0	319.4	321.8	1.23	83.27
24.100	1.00	2.0	318.9	321.4	1.23	83.27
24.200	1.00	2.0	318.5	320.9	1.22	83.27
24.300	1.00	2.0	318.1	320.5	1.21	83.26
24.400	1.00	2.0	317.7	320.1	1.20	83.26

24.500	1.00	2.0	317.3	319.7	1.20	83.26
24.600	1.00	2.0	316.9	319.3	1.19	83.25

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST100 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT100 .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	1.00	2.0	316.5	318.9	1.18	83.25
24.800	1.00	2.0	316.2	318.5	1.18	83.25
24.900	1.00	2.0	315.8	318.2	1.17	83.25
25.000	0.00	1.0	314.6	316.8	1.15	83.24
25.100	0.00	0.0	312.3	314.6	1.11	83.22
25.200	0.00	0.0	310.2	312.3	1.07	83.20
25.300	0.00	0.0	308.1	310.2	1.03	83.19
25.400	0.00	0.0	306.1	308.1	1.00	83.17
25.500	0.00	0.0	304.2	306.1	0.96	83.16
25.600	0.00	0.0	302.4	304.2	0.93	83.14
25.700	0.00	0.0	300.6	302.4	0.90	83.13
25.800	0.00	0.0	298.8	300.6	0.86	83.12
25.900	0.00	0.0	297.2	298.8	0.83	83.11

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: j:\PONDPACK\2003043\PONDSWM .PND
Inflow Hydrograph: j:\PONDPACK\2003043\PST100 .HYD
Outflow Hydrograph: j:\PONDPACK\2003043\OUT100 .HYD

Starting Pond W.S. Elevation = 80.30 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 144.00 cfs
Peak Outflow = 108.62 cfs
Peak Elevation = **84.79 ft** OKW

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	97,924 cu-ft
Total Storage in Pond	=	97,924 cu-ft

Warning: Inflow hydrograph truncated on left side.

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	2.21	68.0	0.10	0.00	8.00	4.24	I.12 .12

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 2.21 acres or 0.00345 sq.mi
Peak discharge = 15 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	15	12.1
Composite Watershed	15	12.1

HYDRAULIC GRADE LINE COMPUTATION
10 yr Event

PROJECT: Longhill Grove Apts
COUNTY: James City County
Date: March 17, 2003
DESCRIPTION: Apartment Complex
REVISED :
REVISED :
REVISED :

INLET/STATION Upstream Outflow 1	OUTLET WATER SURFACE ELEV. 2	Do 3	Qo 4	Lo 5	Sfo % 6	Hf 7	Vo 8	Ho 9	Qi 10	Vi 11	QiVi 12	Vi^2/2g	Hi 13	Angle 90-15 14	K	delta H 15	Ht 16	1.3 Ht 17	0.5 Ht 18	Final H 19	Inlet Water Surface Elev. 20	Rim Elev. 21
												JUNCTION LOSS										
15	82.00	36	51.53	24	0.60	0.14	7.3	0.21	49.02	6.9	340.10	0.75	0.26	15	0.19	0.14	0.61	0.79		0.94	82.94 ✓	85.33
38	82.94	15	2.45	111	0.14	0.16	2.0	0.02	-	-	-	-	-	-	-	-	0.02	0.02		0.18	83.12 ✓	87.75
13	82.94	36	49.02	52	0.54	0.28	6.9	0.19	40.24	5.7	229.15	0.50	0.18	15	0.19	0.10	0.46	0.60		0.88	83.81 ✓	84.25
34	83.81	15	6.77	156	1.10	1.72	5.5	0.12	4.36	3.6	15.47	0.20	0.07	70	0.61	0.12	0.31	0.40		2.12	85.93 ✓	90.33
36	85.93	15	1.16	147	0.03	0.05	0.9	0.00	-	-	-	-	-	-	-	-	0.00	0.00		0.05	85.98 ✓	92.33
32	85.93	15	4.36	66	0.46	0.30	3.6	0.05	2.31	1.9	4.34	0.05	0.02	15	0.19	0.01	0.08	0.10		0.40	86.34 ✓	88.75
30	86.34	15	2.31	134	0.13	0.17	1.9	0.01	-	-	-	-	-	-	-	-	0.01	0.02		0.19	86.53 ✓	90.00
11	83.81	36	40.24	239	0.36	0.87	5.7	0.13	39.79	5.6	224.12	0.49	0.17	15	0.19	0.09	0.39	0.51		1.38	85.19 ✓	87.50
9	85.19	36	39.79	57	0.36	0.20	5.6	0.12	11.91	5.0	59.05	0.38	0.13	70	0.61	0.23	0.49	0.64		0.84	86.03 ✓	88.00
28	86.03	15	4.38	68	0.46	0.31	3.6	0.05	-	-	-	-	-	-	-	-	0.05	0.06		0.38	86.41	-
26	86.03	15	5.47	147	0.72	1.06	4.5	0.08	4.51	3.7	16.57	0.21	0.07	15	0.19	0.04	0.19	0.25		1.30	87.34 ✓	92.00
24	87.34	15	4.51	64	0.49	0.31	3.7	0.05	-	-	-	-	-	-	-	-	0.05	0.07		0.38	87.72 ✓	90.50
22	87.72	24	17.18	134	0.58	0.77	5.5	0.12	-	-	-	-	-	-	-	-	0.12	0.15		0.93	88.64 ✓	94.00
20	90.46	18	7.85	72	0.56	0.40	4.4	0.08	2.49	2.0	5.06	0.06	0.02	15	0.19	0.01	0.11	0.14		0.55	91.01 ✓	95.50
18	91.01	15	2.49	188	0.15	0.28	2.0	0.02	-	-	-	-	-	-	-	-	0.02	0.02		0.30	91.31 ✓	99.33
7	86.03	21	11.91	138	0.57	0.78	5.0	0.10	8.76	5.0	43.43	0.38	0.13	30	0.28	0.11	0.34	0.44		1.22	87.25 ✓	95.33
5	91.32	18	8.76	279	0.70	1.94	5.0	0.10	6.05	4.9	29.86	0.38	0.13	90	0.70	0.26	0.49	0.64		2.58	93.90 ✓	99.00
3	93.90	15	6.05	72	0.88	0.63	4.9	0.09	3.08	2.5	7.74	0.10	0.03	0	0.19	0.02	0.15	0.19		0.82	94.72 ✓	99.50
1	94.72	15	3.08	206	0.23	0.47	2.5	0.02	0.79	0.6	0.51	0.01	0.00	30	0.28	0.00	0.02	0.03		0.50	95.22 ✓	102.33
1A	97.69	15	0.79	130	0.02	0.02	0.6	0.00	-	-	-	-	-	-	-	-	0.00	0.00		0.02	97.71 ✓	102.50

STORM SEWER DESIGN COMPUTATIONS
PIPE SIZING

PROJECT: Longhill Grove Apts COUNTY: James City County Date: March 17, 2003 REVISED :
DESCRIPTION: Apartment Complex REVISED :
REVISED :

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
FROM	TO	IDA	RUNOFF	"CA"		Tc	I10	Q10	INV.ELEV.		L	S	D	Qcap	V10	Time	Status
POINT	POINT	ACRES	"C"	INC.	ACC.	MIN.	IN/HR	CFS	UPPER	LOWER	FT	FT/FT	IN	CFS	FPS	MIN.	
1A	1B	0.3	0.4	0.12	0.12	7	**6.6**	**0.79**	97.08	96.69	130.00	0.0030	**15**	3.54	2.9	0.75	OK
1	3	0.60	0.60	0.36	0.48	7.8	**6.4**	**3.08**	96.59	93.50	206.01	0.0150	**15**	7.91	6.4	0.53	OK
3	5	0.80	0.60	0.48	0.96	8.3	**6.3**	**6.05**	93.40	92.32	71.61	0.0150	**15**	7.91	6.4	0.19	OK
5	7	0.73	0.60	0.44	1.40	8.5	**6.3**	**8.76**	92.07	90.12	279.11	0.0070	**18**	8.79	5.0	0.94	OK
7	9	0.94	0.60	0.56	1.96	9.4	**6.1**	**11.91**	89.87	83.65	138.25	0.0450	**21**	33.60	14.0	0.16	OK
18	20	0.63	0.60	0.38	0.38	7.0	**6.6**	**2.49**	92.77	89.95	187.96	0.0150	**15**	7.91	6.4	0.49	OK
20	22	1.39	0.60	0.83	1.21	7.5	**6.5**	**7.85**	89.70	89.26	72.26	0.0060	**18**	8.13	4.6	0.26	OK
22	9	2.09	0.70	1.46	2.68	7.7	**6.4**	**17.18**	88.76	83.40	134.17	0.0400	**24**	45.23	14.4	0.16	OK
24	26	1.14	0.60	0.68	0.68	7.0	**6.6**	**4.51**	86.36	85.72	63.79	0.0100	**15**	6.46	5.3	0.20	OK
26	9	0.19	0.80	0.15	0.84	7.2	**6.5**	**5.47**	85.62	84.15	147	0.0100	**15**	6.46	5.3	0.47	OK
28	9	1.47	0.50	0.74	0.74	10.0	**6.0**	**4.38**	86.87	84.15	68	0.0400	**15**	12.91	10.5	0.11	OK
9	11	0.76	0.50	0.38	6.59	9.5704	**6.0**	**39.79**	82.40	82.17	57.09	0.0040	**36**	42.18	6.0	0.16	OK
11	13	0.18	0.60	0.11	6.70	9.7	**6.0**	**40.24**	82.07	79.68	238.86	0.0100	**36**	66.69	9.4	0.42	OK
30	32	0.70	0.50	0.35	0.35	7.0	**6.6**	**2.31**	84.94	84.54	134.00	0.0030	**15**	3.54	2.9	0.77	OK
32	34	0.47	0.70	0.33	0.68	7.8	**6.4**	**4.36**	84.44	83.78	66.22	0.0100	**15**	6.46	5.3	0.21	OK
36	34	0.22	0.80	0.18	0.18	7.0	**6.6**	**1.16**	84.22	83.78	146.50	0.0030	**15**	3.54	2.9	0.85	OK
34	13	0.29	0.70	0.20	1.06	7.8	**6.4**	**6.77**	83.68	81.33	156.35	0.0150	**15**	7.91	6.4	0.40	OK
13	15	1.03	0.50	0.52	8.27	10.152	**5.9**	**49.02**	79.58	79.27	52.05	0.0060	**36**	51.66	7.3	0.12	OK
38	15	0.62	0.60	0.37	0.37	7.0	**6.6**	**2.45**	82.03	80.92	110.99	0.0100	**15**	6.46	5.3	0.35	OK
15	17	0.14	0.60	0.08	8.73	10.3	**5.9**	**51.53**	79.17	79.00	24.00	0.0070	**36**	55.80	7.9	0.05	OK

STORM SEWER INLET COMPUTATIONS and STRUCTURE SCHEDULE
(Spread and Inlets)

PROJECT: Longhill Grove Apts
DESCRIPTION: Apartment Complex

COUNTY: James City County

Date: March 17, 2003
REVISED :
REVISED :
REVISED :

Inlet NUMBER	TYPE	ON GRADE INLET	LENGTH	STATION	A - DRAINAGE	C	CA	CAw	I IN/HR	Q Increment CFS	Q Carry over CFS	Q Gutter Flow Left	Q Gutter Flow right	Qt Gutter Flow Total CFS	S Gutter Slope ft/ft	Sx Cross Slope ft/ft	T (spread) ft left	T (spread) ft right	T (spread) ft	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo(#10)	a=12W(Sw-Sx)	S'w = a/12W	Se(ft/ft)=Sx+S'wEo	Li(ft)	P effrct. Length FT	L/Lt	d(ft) #17	E(#16)	h(ft)	d/h	Q intercepted CFS	Q carryover CFS	T spread = d/Sx @ sag ft	REMARKS
1A	DI-7		2.5		0.30	0.40	0.12		6.6	0.8	0.00			0.8	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
1	DI-3A		2.5		0.38	0.60	0.23		6.4	1.5	0.00			1.5	0.0200	0.0208				2.00									6.10		0.25		0.50	0.50			12.02	OK
3	DI-3B		4		0.54	0.60	0.32		6.3	2.0	0.00			2.0	0.0200	0.0208				2.00									7.60		0.20		0.50	0.40			9.62	OK
5	DI-3A		2.5		0.42	0.60	0.25		6.3	1.6	0.00			1.6	0.0200	0.0208				2.00									6.10		0.25		0.50	0.50			12.02	OK
7	DI-3A		10		0.81	0.60	0.49		6.1	3.0	0.00			3.0	0.0200	0.0208				2.00									13.60		0.20		0.50	0.40			9.62	OK
18	DI-3A		2.5		0.40	0.60	0.24		6.6	1.6	0.00			1.6	0.0200	0.0208				2.00									6.10		0.25		0.50	0.50			12.02	OK
20	DI-3B		14		1.29	0.60	0.77		6.5	5.0	0.00			5.0	0.0200	0.0208				2.00									17.60		0.25		0.50	0.50			12.02	OK
22	DI-3C		20		2.09	0.70	1.46		6.4	9.4	0.00			9.4	0.0200	0.0208				2.00									23.60		0.30		0.50	0.60			14.42	OK
24	DI-7		2.5		1.10	0.60	0.66		6.6	4.4	0.00			4.4	0.0200	0.0208				2.00									6.10		0.50		0.50	1.00			24.04	OK
26	DI-3A		2.5		0.19	0.80	0.15		6.5	1.0	0.00			1.0	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
9	JB-1		2.5		0.76	0.50	0.38		6.0	2.3	0.00			2.3	0.0200	0.0208				2.00									6.10		0.40		0.50	0.80			19.23	OK
11	DI-7		2.5		0.18	0.60	0.11		6.0	0.6	0.00			0.6	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
30	DI-3A		4		0.60	0.50	0.30		6.6	2.0	0.00			2.0	0.0200	0.0208				2.00									7.60		0.20		0.50	0.40			9.62	OK
32	DI-3A		4		0.47	0.70	0.33		6.4	2.1	0.00			2.1	0.0200	0.0208				2.00									7.60		2.00		0.50	4.00			96.15	OOLT
36	DI-3A		2.5		0.12	0.80	0.10		6.6	0.6	0.00			0.6	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
34	DI-3A		2.5		0.29	0.70	0.20		6.4	1.3	0.00			1.3	0.0200	0.0208				2.00									6.10		0.20		0.50	0.40			9.62	OK
13	DI-3A		6		1.03	0.50	0.52		5.9	3.1	0.00			3.1	0.0200	0.0208				2.00									9.60		0.25		0.50	0.50			12.02	OK
38	DI-3A		4		0.52	0.60	0.31		6.6	2.1	0.00			2.1	0.0200	0.0208				2.00									7.60		0.20		0.50	0.40			9.62	OK
15	DI-3A		2.5		0.14	0.60	0.08		5.9	0.5	0.00			0.5	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
SWM/BMP ROUTING

REVISED JULY 30, 2003
REVISED JULY 15, 2003
REVISED MAY 15, 2003
REVISED April 28, 2003
MARCH 19, 2003

· A-3, 10 PT BMP w/ SCP

· PROVIDES WQv + SCPV FOR OFFSITE "EXXON PARCEL"

· D/W 85.28; ES 85.0
FB 1.22

TOWNES SITE ENGINEERING
9850 LORI ROAD, SUITE 201
CHESTERFIELD, VIRGINIA 23832

SUMMARY

STORM	PRE Q	PEAK Q DISCHARGED	HOURS DETAINED	VOLUME	ELEV
1	10 CFS	0.77 CFS	24+	55,531 CF	83.18
2	18 CFS	3.25 CFS		60,817 CF	83.40
10	48 CFS	44.93 CFS		86,056 CF	84.36
100	86 CFS	86.87 CFS		112,156CF	85.28

TOP OF CONTAINMENT SET AT 86.5

BMP VOLUME CALCULATION

WET ED POND REQUIRES **2.0 INCH/IMP ACRE**
ON-SITE IMPERVIOUS ACREAGE-5.97
OFF-SITE IMPERVIOUS ACREAGE - **0.94**
TOTAL IMPERVIOUS ACREAGE - 6.91 ✓
REQUIRED VOLUME= 6.91 ACRES X 43560 CF/ACRE X 1 INCH PER ACRE / 12 INCHES PER FOOT=**25,083 CF IN WET POOL AND 25,083 CF IN DRY POOL.**
REQUIRED VOLUME IN FOREBAY = 6.91 ACRES X 43560 CF/ACRE X 0.1 INCH PER ACRE / 12 INCHES PER FOOT= **2,508 CF IN FOREBAY.**
AT THE OUTLET ELEVATION OF 80.3 WITHIN THE MAIN BASIN, 23,545 CUBIC FEET OF WET POOL STORAGE IS PROVIDED
AT THE OUTLET ELEVATION OF 81.0 WITHIN THE FOREBAY, 11,537 CUBIC FEET OF WET POOL STORAGE IS PROVIDED
THIS PROVIDES A TOTAL WETPOOL STORAGE OF 35,082 CUBIC FEET WHICH IS WELL ABOVE THE 25,083 CF IN WET POOL REQUIRED VOLUME
AT THE RISER CREST OUTLET ELEVATION OF 83.25 THE DRY POOL VOLUME OF 57,153 IS PROVIDED WHICH IS WELL ABOVE THE 25,083 CF IN DRY POOL REQUIRED VOLUME

24 HOUR DRAWDOWN CALCULATION

Ap=total orifice area=0.0.0668 SF (3.5" diameter) ✓
Have=Average head on orifice=(83.25-(80.3+0.1458))*0.5=1.402 Ft.
Vd=Volume detained=**57153 CF**
Required average discharge Qave=Vd/(T*3600),
Where T=24 hours detention time
Qave=57153/86400=0.6615 required maximum average rate.
Actual Qd=Ap*(0.6*sqr(64.4*Have))=0.0668*(0.6*sqr(64.4*1.402)
Qd=0.381 cfs
Actual detention time= 57153/0.381/60/60=41.7 hours > 24 OK

BUOYANCY CALCULATION ON BMP OUTLET STRUCTURE

Weight of outlet pipe and outlet structure-68,000 lbs
Upward lift due to volume in same structures-47,000 lbs
System will not float. This calculation does not take into effect the additional weight of the dam on top of the pipes. Buoyancy is not a problem.

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Quick TR-55 Ver.5.46   S/N:
Executed: 18:21:23   05-15-2003    J:\PONDPACK\2003043\PRE.TCT
                        LONGHILL GROVE APARTMENTS
                            JAMES CITY COUNTY
                             PRE  DEVELOPED
                     Tc COMPUTATIONS FOR: SITE

 SHEET FLOW (Applicable to Tc only)
     Segment ID                                    surface
     Surface description                     grass
     Manning's roughness coeff., n                 0.0500
     Flow length, L (total < or = 300)     ft      200.0
     Two-yr 24-hr rainfall, P2             in      2.800
     Land slope, s                       ft/ft    0.0200
                      0.8
          .007 * (n*L)
     T =  --------------                   hrs      0.13              =  0.13
             0.5    0.4
           P2   *  s

 SHALLOW CONCENTRATED FLOW
     Segment ID                                   swale
     Surface (paved or unpaved)?                  Unpaved
     Flow length, L                        ft     400.0
     Watercourse slope, s                ft/ft    0.0200

                        0.5
     Avg.V =  Csf *  (s)                  ft/s    2.2818
     where:   Unpaved Csf = 16.1345
              Paved   Csf = 20.3282

     T = L / (3600*V)                      hrs      0.05              =  0.05


 CHANNEL FLOW
     Segment ID                                   channel
     Cross Sectional Flow Area, a        sq.ft      9.00
     Wetted perimeter, Pw                   ft     12.00
     Hydraulic radius, r = a/Pw             ft     0.750
     Channel slope, s                    ft/ft    0.0100
     Manning's roughness coeff., n                 0.0130

                   2/3    1/2
          1.49  *  r   *  s
     V =  --------------------            ft/s    9.4613
                  n

     Flow length, L                        ft       225

     T = L / (3600*V)                      hrs      0.01              =  0.01

    ::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                                TOTAL TIME (hrs)        0.18
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Quick TR-55 Ver.5.46   S/N:
Executed: 18:21:23   05-15-2003    J:\PONDPACK\2003043\PRE.TCT
                    SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
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LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
PRE DEVELOPED

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                        Tc COMPUTATIONS FOR: SITE

 SHEET FLOW (Applicable to Tc only)
     Segment ID                                        surface
     Surface description                         grass
     Manning's roughness coeff., n                      0.0500
     Flow length, L (total < or = 300)           ft      50.0
     Two-yr 24-hr rainfall, P2                   in      2.800
     Land slope, s                             ft/ft    0.0200
                               0.8
          .007 * (n*L)
     T =  --------------                         hrs      0.04            =  0.04
              0.5    0.4
            P2    *   s

 SHALLOW CONCENTRATED FLOW
     Segment ID                                        swale
     Surface (paved or unpaved)?                         Paved
     Flow length, L                              ft      500.0
     Watercourse slope, s                      ft/ft    0.0200

                                  0.5
     Avg.V =   Csf *   (s)                     ft/s     2.8748
     where:    Unpaved Csf = 16.1345
               Paved   Csf = 20.3282

     T = L / (3600*V)                            hrs      0.05            =  0.05


 CHANNEL FLOW
     Segment ID                                        Channel
     Cross Sectional Flow Area, a             sq.ft      9.00
     Wetted perimeter, Pw                        ft     12.00
     Hydraulic radius, r = a/Pw                  ft     0.750
     Channel slope, s                          ft/ft    0.0100
     Manning's roughness coeff., n                      0.0130

                          2/3     1/2
          1.49   *   r    *   s
     V =  --------------------                 ft/s     9.4613
                     n

     Flow length, L                              ft       225

     T = L / (3600*V)                            hrs      0.01            =  0.01

   :::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
                                                 TOTAL TIME (hrs)         0.10
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Quick TR-55 Ver.5.46 S/N:
Executed: 07:37:06 04-28-2003

LONGHILL GROVE APTS
JAMES CITY COUNTY
PRE DEVELOPED

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
	17.99	70

SURFACE DESCRIPTION	AREA (acres)	CN	
18B KEMPSVILLE FSL-B-brush	0.82	48	
14/15D EMPORIA-C-brush	4.63	65	
14B/15D EMPORIA-C-paved	0.67	98	
29B SLAGLE-C-brush	3.15	65	
29B-SLAGLE-C-paved	0.15	98	
11C CRAVEN-C-grass/brush	6.34	65	
11C-CRAVEN-C-paved/buildings	2.23	98	
COMPOSITE AREA --->	17.99	69.8	(70)

LONGHILL GROVE APTS
JAMES CITY COUNTY
POST DEVELOPED
bypass basin

RUNOFF CURVE NUMBER SUMMARY

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Subarea Description	Area (acres)	CN (weighted)
	2.21	68

RUNOFF CURVE NUMBER DATA

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Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
18B KEMPSVILLE FSL-B-brush	0.50	48	
14/15D EMPORIA-C-grass	1.05	74	
14B/15D EMPORIA-C-paved	0.20	98	
11C CRAVEN-D-grass	0.41	70	
COMPOSITE AREA --->	2.21	67.9	(68)

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LONGHILL GROVE APTS
JAMES CITY COUNTY
POST DEVELOPED

RUNOFF CURVE NUMBER SUMMARY

Subarea Description	Area (acres)	CN (weighted)
	15.85	83

RUNOFF CURVE NUMBER DATA

SURFACE DESCRIPTION	AREA (acres)	CN
18B KEMPSVILLE FSL-B-brush	0.13	48
18B-KEMPSVILLE FSL-B-pved/bldg	0.21	98
14B/15D ONSITE EMPORIA-C-grass	1.97	74
14B/15D ONSITE EMPORIA-C-paved	0.54	98
29B ONSITE/OFFSITE SLAGLE-C-gra	2.06	74
29B ONSITE SLAGLE-C-paved/build	0.97	98
11C ONSITE/OFFSITE CRAVEN-C-gra	4.21	70
11C ONSITE/OFFSITE CRAVEN-C-pav	4.15	98
14B OFFSITE EMPORIA-C-grass	0.92	74
14B OFFSITE EMPORIA-C_paved	0.69	98
COMPOSITE AREA --->	15.85	82.7 (83)

Quick TR-55 Version: 5.46 S/N

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
PRE DEVELOPED

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.54	70.0	0.20	0.00	2.80	0.61	I.31 .31

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.54 acres or 0.02428 sq.mi
Peak discharge = 10 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.18	0.00	0.20	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	10	12.2
Composite Watershed	10	12.2

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	0	15.0	1
11.3	0	15.1	1
11.4	0	15.2	1
11.5	0	15.3	1
11.6	0	15.4	1
11.7	0	15.5	1
11.8	1	15.6	1
11.9	1	15.7	1
12.0	3	15.8	1
12.1	8	15.9	1
12.2	10	16.0	1
12.3	7	16.1	1
12.4	4	16.2	1
12.5	3	16.3	0
12.6	2	16.4	0
12.7	2	16.5	0
12.8	2	16.6	0
12.9	2	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0
14.3	1	18.1	0
14.4	1	18.2	0
14.5	1	18.3	0
14.6	1	18.4	0
14.7	1	18.5	0

Time (hrs)	Flow (cfs)
18.6	0
18.7	0
18.8	0
18.9	0
19.0	0
19.1	0
19.2	0
19.3	0
19.4	0
19.5	0
19.6	0
19.7	0
19.8	0
19.9	0
20.0	0
20.1	0
20.2	0
20.3	0
20.4	0
20.5	0
20.6	0
20.7	0
20.8	0
20.9	0
21.0	0
21.1	0
21.2	0
21.3	0
21.4	0
21.5	0
21.6	0
21.7	0
21.8	0
21.9	0
22.0	0
22.1	0
22.2	0
22.3	0

Time (hrs)	Flow (cfs)
22.4	0
22.5	0
22.6	0
22.7	0
22.8	0
22.9	0
23.0	0
23.1	0
23.2	0
23.3	0
23.4	0
23.5	0
23.6	0
23.7	0
23.8	0
23.9	0
24.0	0
24.1	0
24.2	0
24.3	0
24.4	0
24.5	0
24.6	0
24.7	0
24.8	0
24.9	0
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
PRE DEVELOPED

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	15.54	70.0	0.20	0.00	3.50	1.01	I.24	.24

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.54 acres or 0.02428 sq.mi
Peak discharge = 18 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.18	0.00	0.20	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	18	12.2
Composite Watershed	18	12.2

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	1
11.1	0	14.9	1
11.2	0	15.0	1
11.3	0	15.1	1
11.4	0	15.2	1
11.5	0	15.3	1
11.6	0	15.4	1
11.7	1	15.5	1
11.8	1	15.6	1
11.9	2	15.7	1
12.0	6	15.8	1
12.1	15	15.9	1
12.2	18	16.0	1
12.3	12	16.1	1
12.4	7	16.2	1
12.5	5	16.3	1
12.6	4	16.4	1
12.7	3	16.5	1
12.8	3	16.6	1
12.9	2	16.7	1
13.0	2	16.8	1
13.1	2	16.9	1
13.2	2	17.0	1
13.3	2	17.1	1
13.4	2	17.2	1
13.5	2	17.3	1
13.6	2	17.4	1
13.7	2	17.5	1
13.8	1	17.6	1
13.9	1	17.7	1
14.0	1	17.8	1
14.1	1	17.9	1
14.2	1	18.0	1
14.3	1	18.1	1
14.4	1	18.2	1
14.5	1	18.3	1
14.6	1	18.4	1
14.7	1	18.5	1

Time (hrs)	Flow (cfs)
18.6	1
18.7	1
18.8	1
18.9	1
19.0	1
19.1	1
19.2	1
19.3	1
19.4	1
19.5	0
19.6	0
19.7	0
19.8	0
19.9	0
20.0	0
20.1	0
20.2	0
20.3	0
20.4	0
20.5	0
20.6	0
20.7	0
20.8	0
20.9	0
21.0	0
21.1	0
21.2	0
21.3	0
21.4	0
21.5	0
21.6	0
21.7	0
21.8	0
21.9	0
22.0	0
22.1	0
22.2	0
22.3	0

Time (hrs)	Flow (cfs)
22.4	0
22.5	0
22.6	0
22.7	0
22.8	0
22.9	0
23.0	0
23.1	0
23.2	0
23.3	0
23.4	0
23.5	0
23.6	0
23.7	0
23.8	0
23.9	0
24.0	0
24.1	0
24.2	0
24.3	0
24.4	0
24.5	0
24.6	0
24.7	0
24.8	0
24.9	0
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
PRE DEVELOPED

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	15.54	70.0	0.20	0.00	5.70	2.57	I.15	.15

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.54 acres or 0.02428 sq.mi
Peak discharge = 48 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.18	0.00	0.20	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	48	12.2
Composite Watershed	48	12.2

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	2
11.1	1	14.9	2
11.2	1	15.0	2
11.3	1	15.1	2
11.4	1	15.2	2
11.5	2	15.3	2
11.6	2	15.4	2
11.7	5	15.5	2
11.8	7	15.6	2
11.9	10	15.7	2
12.0	22	15.8	2
12.1	43	15.9	2
12.2	48	16.0	2
12.3	30	16.1	2
12.4	16	16.2	2
12.5	11	16.3	1
12.6	8	16.4	1
12.7	7	16.5	1
12.8	6	16.6	1
12.9	6	16.7	1
13.0	5	16.8	1
13.1	4	16.9	1
13.2	4	17.0	1
13.3	4	17.1	1
13.4	4	17.2	1
13.5	4	17.3	1
13.6	3	17.4	1
13.7	3	17.5	1
13.8	3	17.6	1
13.9	3	17.7	1
14.0	3	17.8	1
14.1	3	17.9	1
14.2	2	18.0	1
14.3	2	18.1	1
14.4	2	18.2	1
14.5	2	18.3	1
14.6	2	18.4	1
14.7	2	18.5	1

Time (hrs)	Flow (cfs)
18.6	1
18.7	1
18.8	1
18.9	1
19.0	1
19.1	1
19.2	1
19.3	1
19.4	1
19.5	1
19.6	1
19.7	1
19.8	1
19.9	1
20.0	1
20.1	1
20.2	1
20.3	1
20.4	1
20.5	1
20.6	1
20.7	1
20.8	1
20.9	1
21.0	1
21.1	1
21.2	1
21.3	1
21.4	1
21.5	1
21.6	1
21.7	1
21.8	1
21.9	1
22.0	1
22.1	1
22.2	1
22.3	1

Time (hrs)	Flow (cfs)
22.4	1
22.5	1
22.6	1
22.7	1
22.8	1
22.9	1
23.0	1
23.1	1
23.2	1
23.3	1
23.4	1
23.5	1
23.6	1
23.7	1
23.8	1
23.9	1
24.0	0
24.1	0
24.2	0
24.3	0
24.4	0
24.5	0
24.6	0
24.7	0
24.8	0
24.9	0
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:31:55
Watershed file: --> J:\PONDPACK\2003043\PRE .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PRE100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
PRE DEVELOPED

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	15.54	70.0	0.20	0.00	8.00	4.46	I.11	.11

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.54 acres or 0.02428 sq.mi
Peak discharge = 86 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.18	0.00	0.20	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	86	12.2
Composite Watershed	86	12.2

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	2	14.8	4
11.1	2	14.9	3
11.2	3	15.0	3
11.3	3	15.1	3
11.4	4	15.2	3
11.5	4	15.3	3
11.6	5	15.4	3
11.7	11	15.5	3
11.8	16	15.6	3
11.9	22	15.7	3
12.0	42	15.8	3
12.1	79	15.9	3
12.2	86	16.0	3
12.3	52	16.1	3
12.4	27	16.2	3
12.5	18	16.3	2
12.6	14	16.4	2
12.7	11	16.5	2
12.8	9	16.6	2
12.9	8	16.7	2
13.0	8	16.8	2
13.1	8	16.9	2
13.2	7	17.0	2
13.3	6	17.1	2
13.4	6	17.2	2
13.5	6	17.3	2
13.6	5	17.4	2
13.7	5	17.5	2
13.8	5	17.6	2
13.9	4	17.7	2
14.0	4	17.8	2
14.1	4	17.9	2
14.2	4	18.0	2
14.3	4	18.1	2
14.4	4	18.2	2
14.5	4	18.3	2
14.6	4	18.4	2
14.7	4	18.5	2

Time (hrs)	Flow (cfs)
18.6	2
18.7	2
18.8	2
18.9	2
19.0	2
19.1	2
19.2	2
19.3	2
19.4	2
19.5	2
19.6	1
19.7	1
19.8	1
19.9	1
20.0	1
20.1	1
20.2	1
20.3	1
20.4	1
20.5	1
20.6	1
20.7	1
20.8	1
20.9	1
21.0	1
21.1	1
21.2	1
21.3	1
21.4	1
21.5	1
21.6	1
21.7	1
21.8	1
21.9	1
22.0	1
22.1	1
22.2	1
22.3	1

Time (hrs)	Flow (cfs)
22.4	1
22.5	1
22.6	1
22.7	1
22.8	1
22.9	1
23.0	1
23.1	1
23.2	1
23.3	1
23.4	1
23.5	1
23.6	1
23.7	1
23.8	1
23.9	1
24.0	0
24.1	0
24.2	0
24.3	0
24.4	0
24.5	0
24.6	0
24.7	0
24.8	0
24.9	0
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	2.21	68.0	0.10	0.00	2.80	0.53	I.34 .34

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 2.21 acres or 0.00345 sq.mi
Peak discharge = 2 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	2	12.1
Composite Watershed	2	12.1

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	0	15.6	0
11.9	0	15.7	0
12.0	1	15.8	0
12.1	2	15.9	0
12.2	1	16.0	0
12.3	0	16.1	0
12.4	0	16.2	0
12.5	0	16.3	0
12.6	0	16.4	0
12.7	0	16.5	0
12.8	0	16.6	0
12.9	0	16.7	0
13.0	0	16.8	0
13.1	0	16.9	0
13.2	0	17.0	0
13.3	0	17.1	0
13.4	0	17.2	0
13.5	0	17.3	0
13.6	0	17.4	0
13.7	0	17.5	0
13.8	0	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

Time (hrs)	Flow (cfs)
18.6	0
18.7	0
18.8	0
18.9	0
19.0	0
19.1	0
19.2	0
19.3	0
19.4	0
19.5	0
19.6	0
19.7	0
19.8	0
19.9	0
20.0	0
20.1	0
20.2	0
20.3	0
20.4	0
20.5	0
20.6	0
20.7	0
20.8	0
20.9	0
21.0	0
21.1	0
21.2	0
21.3	0
21.4	0
21.5	0
21.6	0
21.7	0
21.8	0
21.9	0
22.0	0
22.1	0
22.2	0
22.3	0

Time (hrs)	Flow (cfs)
22.4	0
22.5	0
22.6	0
22.7	0
22.8	0
22.9	0
23.0	0
23.1	0
23.2	0
23.3	0
23.4	0
23.5	0
23.6	0
23.7	0
23.8	0
23.9	0
24.0	0
24.1	0
24.2	0
24.3	0
24.4	0
24.5	0
24.6	0
24.7	0
24.8	0
24.9	0
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	2.21	68.0	0.10	0.00	3.50	0.90	I.27 .27

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 2.21 acres or 0.00345 sq.mi
Peak discharge = 3 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.
bypass basin

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	3	12.1
Composite Watershed	3	12.1

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	0	15.3	0
11.6	0	15.4	0
11.7	0	15.5	0
11.8	1	15.6	0
11.9	1	15.7	0
12.0	2	15.8	0
12.1	3	15.9	0
12.2	2	16.0	0
12.3	1	16.1	0
12.4	1	16.2	0
12.5	0	16.3	0
12.6	0	16.4	0
12.7	0	16.5	0
12.8	0	16.6	0
12.9	0	16.7	0
13.0	0	16.8	0
13.1	0	16.9	0
13.2	0	17.0	0
13.3	0	17.1	0
13.4	0	17.2	0
13.5	0	17.3	0
13.6	0	17.4	0
13.7	0	17.5	0
13.8	0	17.6	0
13.9	0	17.7	0
14.0	0	17.8	0
14.1	0	17.9	0
14.2	0	18.0	0
14.3	0	18.1	0
14.4	0	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

Time (hrs)	Flow (cfs)
18.6	0
18.7	0
18.8	0
18.9	0
19.0	0
19.1	0
19.2	0
19.3	0
19.4	0
19.5	0
19.6	0
19.7	0
19.8	0
19.9	0
20.0	0
20.1	0
20.2	0
20.3	0
20.4	0
20.5	0
20.6	0
20.7	0
20.8	0
20.9	0
21.0	0
21.1	0
21.2	0
21.3	0
21.4	0
21.5	0
21.6	0
21.7	0
21.8	0
21.9	0
22.0	0
22.1	0
22.2	0
22.3	0

Time (hrs)	Flow (cfs)
22.4	0
22.5	0
22.6	0
22.7	0
22.8	0
22.9	0
23.0	0
23.1	0
23.2	0
23.3	0
23.4	0
23.5	0
23.6	0
23.7	0
23.8	0
23.9	0
24.0	0
24.1	0
24.2	0
24.3	0
24.4	0
24.5	0
24.6	0
24.7	0
24.8	0
24.9	0
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	2.21	68.0	0.10	0.00	5.70	2.39	I.17 .17

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 2.21 acres or 0.00345 sq.mi
Peak discharge = 8 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.
bypass basin

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	8	12.1
Composite Watershed	8	12.1

Time (hrs)	Flow (cfs)
11.0	0
11.1	0
11.2	0
11.3	0
11.4	0
11.5	0
11.6	0
11.7	1
11.8	1
11.9	2
12.0	5
12.1	8
12.2	5
12.3	2
12.4	1
12.5	1
12.6	1
12.7	1
12.8	1
12.9	1
13.0	1
13.1	1
13.2	1
13.3	0
13.4	0
13.5	0
13.6	0
13.7	0
13.8	0
13.9	0
14.0	0
14.1	0
14.2	0
14.3	0
14.4	0
14.5	0
14.6	0
14.7	0

Time (hrs)	Flow (cfs)
14.8	0
14.9	0
15.0	0
15.1	0
15.2	0
15.3	0
15.4	0
15.5	0
15.6	0
15.7	0
15.8	0
15.9	0
16.0	0
16.1	0
16.2	0
16.3	0
16.4	0
16.5	0
16.6	0
16.7	0
16.8	0
16.9	0
17.0	0
17.1	0
17.2	0
17.3	0
17.4	0
17.5	0
17.6	0
17.7	0
17.8	0
17.9	0
18.0	0
18.1	0
18.2	0
18.3	0
18.4	0
18.5	0

Time (hrs)	Flow (cfs)
18.6	0
18.7	0
18.8	0
18.9	0
19.0	0
19.1	0
19.2	0
19.3	0
19.4	0
19.5	0
19.6	0
19.7	0
19.8	0
19.9	0
20.0	0
20.1	0
20.2	0
20.3	0
20.4	0
20.5	0
20.6	0
20.7	0
20.8	0
20.9	0
21.0	0
21.1	0
21.2	0
21.3	0
21.4	0
21.5	0
21.6	0
21.7	0
21.8	0
21.9	0
22.0	0
22.1	0
22.2	0
22.3	0

Time (hrs)	Flow (cfs)
22.4	0
22.5	0
22.6	0
22.7	0
22.8	0
22.9	0
23.0	0
23.1	0
23.2	0
23.3	0
23.4	0
23.5	0
23.6	0
23.7	0
23.8	0
23.9	0
24.0	0
24.1	0
24.2	0
24.3	0
24.4	0
24.5	0
24.6	0
24.7	0
24.8	0
24.9	0
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 05-15-2003 18:32:47
Watershed file: --> J:\PONDPACK\2003043\POSTBY .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PSTBY100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
bypass basin

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	2.21	68.0	0.10	0.00	8.00	4.24	I.12 .12

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 2.21 acres or 0.00345 sq.mi
Peak discharge = 15 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.
bypass basin

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	15	12.1
Composite Watershed	15	12.1

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	0	14.8	0
11.1	0	14.9	0
11.2	0	15.0	0
11.3	0	15.1	0
11.4	0	15.2	0
11.5	1	15.3	0
11.6	1	15.4	0
11.7	2	15.5	0
11.8	4	15.6	0
11.9	5	15.7	0
12.0	9	15.8	0
12.1	15	15.9	0
12.2	9	16.0	0
12.3	3	16.1	0
12.4	2	16.2	0
12.5	2	16.3	0
12.6	2	16.4	0
12.7	1	16.5	0
12.8	1	16.6	0
12.9	1	16.7	0
13.0	1	16.8	0
13.1	1	16.9	0
13.2	1	17.0	0
13.3	1	17.1	0
13.4	1	17.2	0
13.5	1	17.3	0
13.6	1	17.4	0
13.7	1	17.5	0
13.8	1	17.6	0
13.9	1	17.7	0
14.0	1	17.8	0
14.1	1	17.9	0
14.2	1	18.0	0
14.3	1	18.1	0
14.4	1	18.2	0
14.5	0	18.3	0
14.6	0	18.4	0
14.7	0	18.5	0

Time (hrs)	Flow (cfs)
18.6	0
18.7	0
18.8	0
18.9	0
19.0	0
19.1	0
19.2	0
19.3	0
19.4	0
19.5	0
19.6	0
19.7	0
19.8	0
19.9	0
20.0	0
20.1	0
20.2	0
20.3	0
20.4	0
20.5	0
20.6	0
20.7	0
20.8	0
20.9	0
21.0	0
21.1	0
21.2	0
21.3	0
21.4	0
21.5	0
21.6	0
21.7	0
21.8	0
21.9	0
22.0	0
22.1	0
22.2	0
22.3	0
22.4	0
22.5	0
22.6	0
22.7	0
22.8	0
22.9	0
23.0	0
23.1	0
23.2	0
23.3	0
23.4	0
23.5	0
23.6	0
23.7	0
23.8	0
23.9	0
24.0	0
24.1	0
24.2	0
24.3	0
24.4	0
24.5	0
24.6	0
24.7	0
24.8	0
24.9	0
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

Return Frequency: 1 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-15-2003 19:56:16
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST1.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
ROUTED THROUGH BASIN

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.85	83.0	0.10	0.00	2.80	1.29	I.15 .15

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.85 acres or 0.02477 sq.mi
Peak discharge = 32 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	32	12.1
Composite Watershed	32	12.1

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	1	1	1	9	20	32	19	7	5
Total (cfs)	1	1	1	9	20	32	19	7	5

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	4	3	3	3	2	2	2	2	1
Total (cfs)	4	3	3	3	2	2	2	2	1

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	1	1	1	1	1	1	1	1	1
Total (cfs)	1	1	1	1	1	1	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	1	1	0	0	0
Total (cfs)	1	1	0	0	0

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	1
11.1	1	14.9	1
11.2	1	15.0	1
11.3	1	15.1	1
11.4	1	15.2	1
11.5	1	15.3	1
11.6	1	15.4	1
11.7	4	15.5	1
11.8	6	15.6	1
11.9	9	15.7	1
12.0	20	15.8	1
12.1	32	15.9	1
12.2	19	16.0	1
12.3	7	16.1	1
12.4	5	16.2	1
12.5	4	16.3	1
12.6	3	16.4	1
12.7	3	16.5	1
12.8	3	16.6	1
12.9	2	16.7	1
13.0	2	16.8	1
13.1	2	16.9	1
13.2	2	17.0	1
13.3	2	17.1	1
13.4	2	17.2	1
13.5	2	17.3	1
13.6	2	17.4	1
13.7	2	17.5	1
13.8	1	17.6	1
13.9	1	17.7	1
14.0	1	17.8	1
14.1	1	17.9	1
14.2	1	18.0	1
14.3	1	18.1	1
14.4	1	18.2	1
14.5	1	18.3	1
14.6	1	18.4	1
14.7	1	18.5	1

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
18.6	1	22.4	0
18.7	1	22.5	0
18.8	1	22.6	0
18.9	1	22.7	0
19.0	1	22.8	0
19.1	1	22.9	0
19.2	1	23.0	0
19.3	1	23.1	0
19.4	1	23.2	0
19.5	0	23.3	0
19.6	0	23.4	0
19.7	0	23.5	0
19.8	0	23.6	0
19.9	0	23.7	0
20.0	0	23.8	0
20.1	0	23.9	0
20.2	0	24.0	0
20.3	0	24.1	0
20.4	0	24.2	0
20.5	0	24.3	0
20.6	0	24.4	0
20.7	0	24.5	0
20.8	0	24.6	0
20.9	0	24.7	0
21.0	0	24.8	0
21.1	0	24.9	0
21.2	0	25.0	0
21.3	0	25.1	0
21.4	0	25.2	0
21.5	0	25.3	0
21.6	0	25.4	0
21.7	0	25.5	0
21.8	0	25.6	0
21.9	0	25.7	0
22.0	0	25.8	0
22.1	0	25.9	0
22.2	0		
22.3	0		

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-15-2003 19:56:16
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST2.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
ROUTED THROUGH BASIN

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.85	83.0	0.10	0.00	3.50	1.86	I.12 .12

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.85 acres or 0.02477 sq.mi
Peak discharge = 46 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	46	12.1
Composite Watershed	46	12.1

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	1	1	2	15	29	46	28	10	7
Total (cfs)	1	1	2	15	29	46	28	10	7

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	6	5	4	4	3	3	2	2	2
Total (cfs)	6	5	4	4	3	3	2	2	2

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	2	2	2	1	1	1	1	1	1
Total (cfs)	2	2	2	1	1	1	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	1	1	1	1	0
Total (cfs)	1	1	1	1	0

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	1	14.8	2
11.1	1	14.9	1
11.2	1	15.0	1
11.3	1	15.1	1
11.4	1	15.2	1
11.5	2	15.3	1
11.6	2	15.4	1
11.7	6	15.5	1
11.8	11	15.6	1
11.9	15	15.7	1
12.0	29	15.8	1
12.1	46	15.9	1
12.2	28	16.0	1
12.3	10	16.1	1
12.4	7	16.2	1
12.5	6	16.3	1
12.6	5	16.4	1
12.7	4	16.5	1
12.8	4	16.6	1
12.9	4	16.7	1
13.0	3	16.8	1
13.1	3	16.9	1
13.2	3	17.0	1
13.3	2	17.1	1
13.4	2	17.2	1
13.5	2	17.3	1
13.6	2	17.4	1
13.7	2	17.5	1
13.8	2	17.6	1
13.9	2	17.7	1
14.0	2	17.8	1
14.1	2	17.9	1
14.2	2	18.0	1
14.3	2	18.1	1
14.4	2	18.2	1
14.5	2	18.3	1
14.6	2	18.4	1
14.7	2	18.5	1

Time (hrs)	Flow (cfs)
18.6	1
18.7	1
18.8	1
18.9	1
19.0	1
19.1	1
19.2	1
19.3	1
19.4	1
19.5	1
19.6	1
19.7	1
19.8	1
19.9	1
20.0	1
20.1	1
20.2	1
20.3	1
20.4	1
20.5	1
20.6	1
20.7	1
20.8	1
20.9	1
21.0	1
21.1	1
21.2	1
21.3	1
21.4	1
21.5	1
21.6	1
21.7	1
21.8	1
21.9	1
22.0	1
22.1	1
22.2	1
22.3	1

Time (hrs)	Flow (cfs)
22.4	1
22.5	1
22.6	1
22.7	1
22.8	1
22.9	1
23.0	1
23.1	1
23.2	1
23.3	1
23.4	1
23.5	1
23.6	1
23.7	1
23.8	1
23.9	1
24.0	0
24.1	0
24.2	0
24.3	0
24.4	0
24.5	0
24.6	0
24.7	0
24.8	0
24.9	0
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-15-2003 19:56:16
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST10.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
ROUTED THROUGH BASIN

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.85	83.0	0.10	0.00	5.70	3.81	I.07 .10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.85 acres or 0.02477 sq.mi
Peak discharge = 95 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	95	12.1
Composite Watershed	95	12.1

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	2	3	5	32	61	95	59	20	14
Total (cfs)	2	3	5	32	61	95	59	20	14

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	12	10	8	7	6	5	5	4	4
Total (cfs)	12	10	8	7	6	5	5	4	4

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	4	3	3	3	2	2	2	2	2
Total (cfs)	4	3	3	3	2	2	2	2	2

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	2	1	1	1	0
Total (cfs)	2	1	1	1	0

Time (hrs)	Flow (cfs)	Time (hrs)	Flow (cfs)
11.0	2	14.8	3
11.1	2	14.9	3
11.2	3	15.0	3
11.3	3	15.1	3
11.4	4	15.2	3
11.5	4	15.3	2
11.6	5	15.4	2
11.7	14	15.5	2
11.8	23	15.6	2
11.9	32	15.7	2
12.0	61	15.8	2
12.1	95	15.9	2
12.2	59	16.0	2
12.3	20	16.1	2
12.4	14	16.2	2
12.5	12	16.3	2
12.6	10	16.4	2
12.7	8	16.5	2
12.8	7	16.6	2
12.9	6	16.7	2
13.0	6	16.8	2
13.1	6	16.9	2
13.2	5	17.0	2
13.3	5	17.1	2
13.4	5	17.2	2
13.5	5	17.3	2
13.6	4	17.4	2
13.7	4	17.5	2
13.8	4	17.6	2
13.9	4	17.7	2
14.0	4	17.8	2
14.1	4	17.9	2
14.2	3	18.0	2
14.3	3	18.1	2
14.4	3	18.2	2
14.5	3	18.3	2
14.6	3	18.4	2
14.7	3	18.5	2

Time (hrs)	Flow (cfs)
18.6	1
18.7	1
18.8	1
18.9	1
19.0	1
19.1	1
19.2	1
19.3	1
19.4	1
19.5	1
19.6	1
19.7	1
19.8	1
19.9	1
20.0	1
20.1	1
20.2	1
20.3	1
20.4	1
20.5	1
20.6	1
20.7	1
20.8	1
20.9	1
21.0	1
21.1	1
21.2	1
21.3	1
21.4	1
21.5	1
21.6	1
21.7	1
21.8	1
21.9	1
22.0	1
22.1	1
22.2	1
22.3	1

Time (hrs)	Flow (cfs)
22.4	1
22.5	1
22.6	1
22.7	1
22.8	1
22.9	1
23.0	1
23.1	1
23.2	1
23.3	1
23.4	1
23.5	1
23.6	1
23.7	1
23.8	1
23.9	1
24.0	0
24.1	0
24.2	0
24.3	0
24.4	0
24.5	0
24.6	0
24.7	0
24.8	0
24.9	0
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-15-2003 19:56:16
Watershed file: --> J:\PONDPACK\2003043\POST .MOP
Hydrograph file: --> J:\PONDPACK\2003043\PST100.HYD

LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
POST DEVELOPED HYDROGRAPHS
ROUTED THROUGH BASIN

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	15.85	83.0	0.10	0.00	8.00	5.98	I.05 .10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 15.85 acres or 0.02477 sq.mi
Peak discharge = 150 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
	0.10	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	150	12.1
Composite Watershed	150	12.1

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
	4	5	8	49	96	150	93	32	22
Total (cfs)	4	5	8	49	96	150	93	32	22

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
	18	15	13	11	10	8	8	7	6
Total (cfs)	18	15	13	11	10	8	8	7	6

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
	6	5	5	4	4	3	3	3	3
Total (cfs)	6	5	5	4	4	3	3	3	3

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	3	2	2	2	0
Total (cfs)	3	2	2	2	0

Time (hrs)	Flow (cfs)
11.0	4
11.1	4
11.2	5
11.3	5
11.4	6
11.5	7
11.6	8
11.7	22
11.8	35
11.9	49
12.0	96
12.1	150
12.2	93
12.3	32
12.4	22
12.5	18
12.6	15
12.7	13
12.8	11
12.9	10
13.0	10
13.1	9
13.2	8
13.3	8
13.4	8
13.5	8
13.6	7
13.7	6
13.8	6
13.9	6
14.0	6
14.1	6
14.2	5
14.3	5
14.4	5
14.5	5
14.6	5
14.7	5

Time (hrs)	Flow (cfs)
14.8	4
14.9	4
15.0	4
15.1	4
15.2	4
15.3	4
15.4	4
15.5	4
15.6	4
15.7	4
15.8	3
15.9	3
16.0	3
16.1	3
16.2	3
16.3	3
16.4	3
16.5	3
16.6	3
16.7	3
16.8	3
16.9	3
17.0	3
17.1	3
17.2	3
17.3	3
17.4	3
17.5	3
17.6	3
17.7	3
17.8	3
17.9	3
18.0	3
18.1	3
18.2	3
18.3	3
18.4	3
18.5	2

Time (hrs)	Flow (cfs)
18.6	2
18.7	2
18.8	2
18.9	2
19.0	2
19.1	2
19.2	2
19.3	2
19.4	2
19.5	2
19.6	2
19.7	2
19.8	2
19.9	2
20.0	2
20.1	2
20.2	2
20.3	2
20.4	2
20.5	2
20.6	2
20.7	2
20.8	2
20.9	2
21.0	2
21.1	2
21.2	2
21.3	2
21.4	2
21.5	2
21.6	2
21.7	2
21.8	2
21.9	2
22.0	2
22.1	2
22.2	2
22.3	2

Time (hrs)	Flow (cfs)
22.4	2
22.5	2
22.6	2
22.7	2
22.8	2
22.9	2
23.0	2
23.1	1
23.2	1
23.3	1
23.4	1
23.5	1
23.6	1
23.7	1
23.8	1
23.9	1
24.0	1
24.1	1
24.2	1
24.3	1
24.4	1
24.5	1
24.6	1
24.7	1
24.8	1
24.9	1
25.0	0
25.1	0
25.2	0
25.3	0
25.4	0
25.5	0
25.6	0
25.7	0
25.8	0
25.9	0

POND-2 Version: 5.20
S/N:

LONGHILL GROVE APTS
JAMES CITY COUNTY
WETPOOL VOLUME
WETPOOL VOLUME AT ELEV 80.3

CALCULATED 07-15-2003 20:02:07
DISK FILE: J:\pondpack\2003043\WETPOOL .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
77.00	3,530.00	3,530	0	0	0
78.00	4,982.00	4,982	12,706	4,235	4,235
79.00	6,556.00	6,556	17,253	5,751	9,986
79.50	7,389.00	7,389	20,905	3,484	13,470
79.55	12,017.00	12,017	28,829	481	13,951
80.00	12,962.00	12,962	37,460	5,619	19,570
80.30	-----	13,538	39,747	3,975	23,545
81.00	14,931.00	14,931	41,805	13,935	33,505

POND-2 Version: 5.20
S/N:

LONGHILL GROVE APTS
JAMES CITY COUNTY
WET ED POND
ABOVE WET POOL ELEV OF 80.3

CALCULATED 07-30-2003 14:27:03
DISK FILE: j:\pondpack\2003043\WETPOND .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
80.30	13,538.00	13,538	0	0	0
81.00	14,931.00	14,931	42,686	9,960	9,960
82.00	21,731.00	21,731	54,675	18,225	28,185
83.00	24,051.00	24,051	68,644	22,881	51,066
83.25	*I*	24,647	73,045	6,087	57,153
84.00	26,479.00	26,479	75,766	25,255	76,322
85.00	29,014.00	29,014	83,211	27,737	104,058
86.00	31,400.00	31,400	90,597	30,199	134,258

I ---> Interpolated area from closest two planimeter readings.

* Incremental volume computed by the Conic Method for Reservoir Volumes.

POND-2 Version: 5.20
S/N:

LONGHILL GROVE APTS
JAMES CITY COUNTY
WET ED POND
FOREBAY

CALCULATED 07-15-2003 20:03:31
DISK FILE: J:\pondpack\2003043\FOREBAY .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
76.00	846.00	846	0	0	0
77.00	1,314.00	1,314	3,214	1,071	1,071
78.00	1,882.00	1,882	4,769	1,590	2,661
79.00	2,550.00	2,550	6,623	2,208	4,869
80.00	3,318.00	3,318	8,777	2,926	7,794
81.00	4,185.00	4,185	11,229	3,743	11,537

****
LONGHILL GROVE APARTMENTS
JAMES CITY COUNTY
OUTLET STRUCTURE STORMWATER VOLUME

****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
80.30	0.0	1
80.55	0.2	1
80.80	0.2	1
81.05	0.3	1
81.30	0.3	1
81.55	0.4	1
81.80	0.4	1
82.05	0.4	1
82.30	0.5	1
82.55	0.5	1
82.80	0.5	1
83.05	0.5	1
83.30	1.0	1 +4
83.55	6.8	1 +4
83.80	16.0	1 +4
84.05	27.6	1 +4
84.30	41.2	1 +4
84.55	56.5	1 +4
84.80	73.4	1 +4
85.05	81.9	1 +4
85.30	87.4	1 +4
85.55	88.8	1 +2 +3
85.80	89.0	1 +2 +3
86.00	89.2	1 +2 +3

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
ORIFICE	1		->	1
CULVERT-CR	2		->	2
CULVERT-CR	3	+ 2	->	A
STAND PIPE	4	? A	->	4

Outflow rating table summary was stored in file:
j:\pondpack\2003043\PONDSWM .PND

```
>>>>>> Structure No. 1 <<<<<<
         (Input Data)

 ORIFICE
 Orifice - Based on Area and Datum Elevation


 E1 elev.(ft)?            80.3
 E2 elev.(ft)?            86.001
 Orifice coeff.?         .6
 Invert elev.(ft)?       80.3
 Datum elev.(ft) ?       80.3
 Orifice area (sq ft)?   0.0668

>>>>>> Structure No. 2 <<<<<<
         (Input Data)

 CULVERT-CR
 Circular Culvert (With Inlet Control)


 E1 elev.(ft)?           83.25
 E2 elev.(ft)?            86.001
 Diam. (ft)?             3.0
 Inv. el.(ft)?           78.6
 Slope (ft/ft)?          .0017
 T1 ratio?
 T2 ratio?
 K Coeff.?               .0098
 M Coeff.?               2
 c Coeff.?               .398
 Y Coeff.?               .67
 Form 1 or 2?            1
 Slope factor?           .5

>>>>>> Structure No. 3 <<<<<<
         (Input Data)

 CULVERT-CR
 Circular Culvert (With Inlet Control)


 E1 elev.(ft)?           83.25
 E2 elev.(ft)?            86.001
 Diam. (ft)?             3.0
 Inv. el.(ft)?           78.6
 Slope (ft/ft)?          .0017
 T1 ratio?
 T2 ratio?
 K Coeff.?               .0098
 M Coeff.?               2
 c Coeff.?               0.398
 Y Coeff.?               .67
 Form 1 or 2?            1
 Slope factor?           0.5
```

>>>>>> Structure No. 4 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)? 83.25
E2 elev.(ft)? 86.001
Crest elev.(ft)? 83.25
Diameter (ft)? 4
Weir coefficient? 3.0
Orifice coefficient? 0.6
Start transition elev.(ft) @ ?
Transition height (ft)?

Outflow Rating Table for Structure #1
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
80.30	0.0	H =0.0
80.55	0.2	H =.25
80.80	0.2	H =.5
81.05	0.3	H =.750
81.30	0.3	H =1.0
81.55	0.4	H =1.25
81.80	0.4	H =1.5
82.05	0.4	H =1.75
82.30	0.5	H =2.0
82.55	0.5	H =2.25
82.80	0.5	H =2.5
83.05	0.5	H =2.75
83.30	0.6	H =3.0
83.55	0.6	H =3.25
83.80	0.6	H =3.5
84.05	0.6	H =3.75
84.30	0.6	H =4.0
84.55	0.7	H =4.25
84.80	0.7	H =4.5
85.05	0.7	H =4.75
85.30	0.7	H =5.0
85.55	0.7	H =5.25
85.80	0.8	H =5.5
86.00	0.8	H =5.7

C = .6 A = .0668 sq.ft.
H (ft) = Table elev. - Datum elev. (80.3 ft)
Q (cfs) = C * A * sqr(2g * H)

Outflow Rating Table for Structure #2
CULVERT-CR Circular Culvert (With Inlet Control)
***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
80.30	0.0	E < E1=83.25
80.55	0.0	E < E1=83.25
80.80	0.0	E < E1=83.25
81.05	0.0	E < E1=83.25
81.30	0.0	E < E1=83.25
81.55	0.0	E < E1=83.25
81.80	0.0	E < E1=83.25
82.05	0.0	E < E1=83.25
82.30	0.0	E < E1=83.25
82.55	0.0	E < E1=83.25
82.80	0.0	E < E1=83.25
83.05	0.0	E < E1=83.25
83.30	43.3	Transition: HW =4.7
83.55	43.4	Transition: HW =4.95
83.80	43.4	Transition: HW =5.2
84.05	43.5	Transition: HW =5.45
84.30	43.6	Transition: HW =5.7
84.55	43.7	Transition: HW =5.95
84.80	43.8	Transition: HW =6.2
85.05	43.9	Transition: HW =6.45
85.30	44.0	Transition: HW =6.7
85.55	44.1	Transition: HW =6.95
85.80	44.1	Transition: HW =7.2
86.00	44.2	Transition: HW =7.400

Used Unsubmerged Equ. Form (1) for elev. less than 82.08 ft
Used Submerged Equation for elevations greater than 99.72 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=82.08 ft; Q1=42.85 cfs; Dc=2.13 ft; E2=99.72 ft; Q2=48.97 cfs

Outflow Rating Table for Structure #3
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
80.30	0.0	E < E1=83.25
80.55	0.0	E < E1=83.25
80.80	0.0	E < E1=83.25
81.05	0.0	E < E1=83.25
81.30	0.0	E < E1=83.25
81.55	0.0	E < E1=83.25
81.80	0.0	E < E1=83.25
82.05	0.0	E < E1=83.25
82.30	0.0	E < E1=83.25
82.55	0.0	E < E1=83.25
82.80	0.0	E < E1=83.25
83.05	0.0	E < E1=83.25
83.30	43.3	Transition: HW =4.7
83.55	43.4	Transition: HW =4.95
83.80	43.4	Transition: HW =5.2
84.05	43.5	Transition: HW =5.45
84.30	43.6	Transition: HW =5.7
84.55	43.7	Transition: HW =5.95
84.80	43.8	Transition: HW =6.2
85.05	43.9	Transition: HW =6.45
85.30	44.0	Transition: HW =6.7
85.55	44.1	Transition: HW =6.95
85.80	44.1	Transition: HW =7.2
86.00	44.2	Transition: HW =7.400

Used Unsubmerged Equ. Form (1) for elev. less than 82.08 ft
Used Submerged Equation for elevations greater than 99.72 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=82.08 ft; Q1=42.85 cfs; Dc=2.13 ft; E2=99.72 ft; Q2=48.97 cfs

Outflow Rating Table for Structure #4
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
80.30	0.0	E < Inv.El.= 83.25
80.55	0.0	E < El= 83.25
80.80	0.0	E < El= 83.25
81.05	0.0	E < El= 83.25
81.30	0.0	E < El= 83.25
81.55	0.0	E < El= 83.25
81.80	0.0	E < El= 83.25
82.05	0.0	E < El= 83.25
82.30	0.0	E < El= 83.25
82.55	0.0	E < El= 83.25
82.80	0.0	E < El= 83.25
83.05	0.0	E < El= 83.25
83.30	0.4	Weir: H =.05
83.55	6.2	Weir: H =.3
83.80	15.4	Weir: H =.55
84.05	27.0	Weir: H =.8
84.30	40.6	Weir: H =1.05
84.55	55.9	Weir: H =1.3
84.80	72.7	Weir: H =1.55
85.05	81.2	Orifice: H =1.8
85.30	86.6	Orifice: H =2.05
85.55	91.8	Orifice: H =2.3
85.80	96.6	Orifice: H =2.55
86.00	100.3	Orifice: H =2.75

Weir Cw = 3 Weir length = 12.56637 ft
Orifice Co = .6 Orifice area = 12.56637 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
No transition used, transition height = 0.0
Weir equation = Orifice equation @ elev.= 84.855 ft

Outflow Rating Table A
Table A = 2 + 3

Elevation (ft)	Q (cfs)	Contributing Structures
80.30	0.0	-
80.55	0.0	-
80.80	0.0	-
81.05	0.0	-
81.30	0.0	-
81.55	0.0	-
81.80	0.0	-
82.05	0.0	-
82.30	0.0	-
82.55	0.0	-
82.80	0.0	-
83.05	0.0	-
83.30	86.5	2 +3
83.55	86.7	2 +3
83.80	86.9	2 +3
84.05	87.1	2 +3
84.30	87.2	2 +3
84.55	87.4	2 +3
84.80	87.6	2 +3
85.05	87.8	2 +3
85.30	87.9	2 +3
85.55	88.1	2 +3
85.80	88.3	2 +3
86.00	88.4	2 +3

EXECUTED: 07-30-2003 16:36:06 **Return Freq: 1 years**

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*************************************************
*                                               *
*          LONGHILL GROVE APARTMENTS            *
*              JAMES CITY COUNTY                *
* ROUTING OF 1,2,10 AND 100 YEAR STORM EVENTS   *
*                                               *
*                                               *
*************************************************
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Inflow Hydrograph: j:\pondpack\2003043\PST1 .HYD
Rating Table file: j:\pondpack\2003043\PONDSWM .PND

----INITIAL CONDITIONS----
Elevation = 80.30 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
80.30	0.0	0	0.0	0.0
80.55	0.2	3,446	19.1	19.3
80.80	0.2	7,014	39.0	39.2
81.05	0.3	10,714	59.5	59.8
81.30	0.3	14,722	81.8	82.1
81.55	0.4	19,140	106.3	106.7
81.80	0.4	23,986	133.3	133.7
82.05	0.4	29,274	162.6	163.0
82.30	0.5	34,807	193.4	193.9
82.55	0.5	40,482	224.9	225.4
82.80	0.5	46,303	257.2	257.7
83.05	0.5	52,272	290.4	290.9
83.30	1.0	58,389	324.4	325.4
83.55	6.8	64,656	359.2	366.0
83.80	16.0	71,076	394.9	410.9
84.05	27.6	77,649	431.4	459.0
84.30	41.2	84,377	468.8	510.0
84.55	56.5	91,263	507.0	563.5
84.80	73.4	98,308	546.2	619.6
85.05	81.9	105,512	586.2	668.1
85.30	87.4	112,868	627.0	714.4
85.55	88.8	120,372	668.7	757.5
85.80	89.0	128,026	711.3	800.3
86.00	89.2	134,258	745.9	835.1

Time increment (t) = 0.100 hrs.

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	1.00	-----	0.0	0.0	0.00	80.30
11.100	1.00	2.0	2.0	2.0	0.02	80.33
11.200	1.00	2.0	3.9	4.0	0.04	80.35
11.300	1.00	2.0	5.8	5.9	0.06	80.38
11.400	1.00	2.0	7.6	7.8	0.08	80.40
11.500	1.00	2.0	9.4	9.6	0.10	80.42
11.600	1.00	2.0	11.2	11.4	0.12	80.45
11.700	4.00	5.0	15.8	16.2	0.17	80.51
11.800	6.00	10.0	25.4	25.8	0.20	80.63
11.900	9.00	15.0	40.0	40.4	0.21	80.82
12.000	20.00	29.0	68.4	69.0	0.30	81.15
12.100	32.00	52.0	119.6	120.4	0.40	81.68
12.200	19.00	51.0	169.8	170.6	0.42	82.11
12.300	7.00	26.0	194.8	195.8	0.50	82.32
12.400	5.00	12.0	205.8	206.8	0.50	82.40
12.500	4.00	9.0	213.8	214.8	0.50	82.47
12.600	3.00	7.0	219.8	220.8	0.50	82.51
12.700	3.00	6.0	224.8	225.8	0.50	82.55
12.800	3.00	6.0	229.8	230.8	0.50	82.59
12.900	2.00	5.0	233.8	234.8	0.50	82.62
13.000	2.00	4.0	236.8	237.8	0.50	82.65
13.100	2.00	4.0	239.8	240.8	0.50	82.67
13.200	2.00	4.0	242.8	243.8	0.50	82.69
13.300	2.00	4.0	245.8	246.8	0.50	82.72
13.400	2.00	4.0	248.8	249.8	0.50	82.74
13.500	2.00	4.0	251.8	252.8	0.50	82.76
13.600	2.00	4.0	254.8	255.8	0.50	82.78
13.700	2.00	4.0	257.8	258.8	0.50	82.81
13.800	1.00	3.0	259.8	260.8	0.50	82.82
13.900	1.00	2.0	260.8	261.8	0.50	82.83
14.000	1.00	2.0	261.8	262.8	0.50	82.84
14.100	1.00	2.0	262.8	263.8	0.50	82.85
14.200	1.00	2.0	263.8	264.8	0.50	82.85
14.300	1.00	2.0	264.8	265.8	0.50	82.86
14.400	1.00	2.0	265.8	266.8	0.50	82.87
14.500	1.00	2.0	266.8	267.8	0.50	82.88
14.600	1.00	2.0	267.8	268.8	0.50	82.88
14.700	1.00	2.0	268.8	269.8	0.50	82.89
14.800	1.00	2.0	269.8	270.8	0.50	82.90
14.900	1.00	2.0	270.8	271.8	0.50	82.91
15.000	1.00	2.0	271.8	272.8	0.50	82.91
15.100	1.00	2.0	272.8	273.8	0.50	82.92
15.200	1.00	2.0	273.8	274.8	0.50	82.93
15.300	1.00	2.0	274.8	275.8	0.50	82.94
15.400	1.00	2.0	275.8	276.8	0.50	82.94

POND INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
15.500	1.00
15.600	1.00
15.700	1.00
15.800	1.00
15.900	1.00
16.000	1.00
16.100	1.00
16.200	1.00
16.300	1.00
16.400	1.00
16.500	1.00
16.600	1.00
16.700	1.00
16.800	1.00
16.900	1.00
17.000	1.00
17.100	1.00
17.200	1.00
17.300	1.00
17.400	1.00
17.500	1.00
17.600	1.00
17.700	1.00
17.800	1.00
17.900	1.00
18.000	1.00
18.100	1.00
18.200	1.00
18.300	1.00
18.400	1.00
18.500	1.00
18.600	1.00
18.700	1.00
18.800	1.00
18.900	1.00
19.000	1.00
19.100	1.00
19.200	1.00
19.300	1.00
19.400	1.00
19.500	0.00
19.600	0.00
19.700	0.00
19.800	0.00
19.900	0.00
20.000	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
2.0	276.8	277.8	0.50	82.95
2.0	277.8	278.8	0.50	82.96
2.0	278.8	279.8	0.50	82.97
2.0	279.8	280.8	0.50	82.97
2.0	280.8	281.8	0.50	82.98
2.0	281.8	282.8	0.50	82.99
2.0	282.8	283.8	0.50	83.00
2.0	283.8	284.8	0.50	83.00
2.0	284.8	285.8	0.50	83.01
2.0	285.8	286.8	0.50	83.02
2.0	286.8	287.8	0.50	83.03
2.0	287.8	288.8	0.50	83.03
2.0	288.8	289.8	0.50	83.04
2.0	289.8	290.8	0.50	83.05
2.0	290.7	291.8	0.51	83.06
2.0	291.7	292.7	0.53	83.06
2.0	292.6	293.7	0.54	83.07
2.0	293.5	294.6	0.55	83.08
2.0	294.4	295.5	0.57	83.08
2.0	295.2	296.4	0.58	83.09
2.0	296.0	297.2	0.59	83.10
2.0	296.8	298.0	0.60	83.10
2.0	297.6	298.8	0.61	83.11
2.0	298.3	299.6	0.63	83.11
2.0	299.1	300.3	0.64	83.12
2.0	299.8	301.1	0.65	83.12
2.0	300.5	301.8	0.66	83.13
2.0	301.1	302.5	0.67	83.13
2.0	301.8	303.1	0.68	83.14
2.0	302.4	303.8	0.69	83.14
2.0	303.0	304.4	0.70	83.15
2.0	303.6	305.0	0.70	83.15
2.0	304.2	305.6	0.71	83.16
2.0	304.7	306.2	0.72	83.16
2.0	305.3	306.7	0.73	83.16
2.0	305.8	307.3	0.74	83.17
2.0	306.3	307.8	0.74	83.17
2.0	306.8	308.3	0.75	83.18
2.0	307.3	308.8	0.76	83.18
2.0	307.7	309.3	0.77	83.18
1.0	307.2	308.7	0.76	83.18
0.0	305.8	307.2	0.74	83.17
0.0	304.3	305.8	0.72	83.16
0.0	302.9	304.3	0.69	83.15
0.0	301.6	302.9	0.67	83.14
0.0	300.3	301.6	0.65	83.13

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	0.00	0.0	299.0	300.3	0.64	83.12
20.200	0.00	0.0	297.8	299.0	0.62	83.11
20.300	0.00	0.0	296.6	297.8	0.60	83.10
20.400	0.00	0.0	295.4	296.6	0.58	83.09
20.500	0.00	0.0	294.3	295.4	0.57	83.08
20.600	0.00	0.0	293.2	294.3	0.55	83.07
20.700	0.00	0.0	292.1	293.2	0.53	83.07
20.800	0.00	0.0	291.1	292.1	0.52	83.06
20.900	0.00	0.0	290.1	291.1	0.50	83.05
21.000	0.00	0.0	289.1	290.1	0.50	83.04
21.100	0.00	0.0	288.1	289.1	0.50	83.04
21.200	0.00	0.0	287.1	288.1	0.50	83.03
21.300	0.00	0.0	286.1	287.1	0.50	83.02
21.400	0.00	0.0	285.1	286.1	0.50	83.01
21.500	0.00	0.0	284.1	285.1	0.50	83.01
21.600	0.00	0.0	283.1	284.1	0.50	83.00
21.700	0.00	0.0	282.1	283.1	0.50	82.99
21.800	0.00	0.0	281.1	282.1	0.50	82.98
21.900	0.00	0.0	280.1	281.1	0.50	82.98
22.000	0.00	0.0	279.1	280.1	0.50	82.97
22.100	0.00	0.0	278.1	279.1	0.50	82.96
22.200	0.00	0.0	277.1	278.1	0.50	82.95
22.300	0.00	0.0	276.1	277.1	0.50	82.95
22.400	0.00	0.0	275.1	276.1	0.50	82.94
22.500	0.00	0.0	274.1	275.1	0.50	82.93
22.600	0.00	0.0	273.1	274.1	0.50	82.92
22.700	0.00	0.0	272.1	273.1	0.50	82.92
22.800	0.00	0.0	271.1	272.1	0.50	82.91
22.900	0.00	0.0	270.1	271.1	0.50	82.90
23.000	0.00	0.0	269.1	270.1	0.50	82.89
23.100	0.00	0.0	268.1	269.1	0.50	82.89
23.200	0.00	0.0	267.1	268.1	0.50	82.88
23.300	0.00	0.0	266.1	267.1	0.50	82.87
23.400	0.00	0.0	265.1	266.1	0.50	82.86
23.500	0.00	0.0	264.1	265.1	0.50	82.86
23.600	0.00	0.0	263.1	264.1	0.50	82.85
23.700	0.00	0.0	262.1	263.1	0.50	82.84
23.800	0.00	0.0	261.1	262.1	0.50	82.83
23.900	0.00	0.0	260.1	261.1	0.50	82.83
24.000	0.00	0.0	259.1	260.1	0.50	82.82
24.100	0.00	0.0	258.1	259.1	0.50	82.81
24.200	0.00	0.0	257.1	258.1	0.50	82.80
24.300	0.00	0.0	256.1	257.1	0.50	82.79
24.400	0.00	0.0	255.1	256.1	0.50	82.79
24.500	0.00	0.0	254.1	255.1	0.50	82.78
24.600	0.00	0.0	253.1	254.1	0.50	82.77

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
24.700	0.00
24.800	0.00
24.900	0.00
25.000	0.00
25.100	0.00
25.200	0.00
25.300	0.00
25.400	0.00
25.500	0.00
25.600	0.00
25.700	0.00
25.800	0.00
25.900	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	252.1	253.1	0.50	82.76
0.0	251.1	252.1	0.50	82.76
0.0	250.1	251.1	0.50	82.75
0.0	249.1	250.1	0.50	82.74
0.0	248.1	249.1	0.50	82.73
0.0	247.1	248.1	0.50	82.73
0.0	246.1	247.1	0.50	82.72
0.0	245.1	246.1	0.50	82.71
0.0	244.1	245.1	0.50	82.70
0.0	243.1	244.1	0.50	82.69
0.0	242.1	243.1	0.50	82.69
0.0	241.1	242.1	0.50	82.68
0.0	240.1	241.1	0.50	82.67

Starting Pond W.S. Elevation = 80.30 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	**=**	**32.00 cfs**
Peak Outflow	**=**	**0.77 cfs**
Peak Elevation	**=**	**83.18 ft**

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	55,531 cu-ft

Total Storage in Pond	=	55,531 cu-ft

Warning: Inflow hydrograph truncated on left side.

EXECUTED: 07-30-2003 16:36:06 Return Freq: **2 years**

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*                                               *
*          LONGHILL GROVE APARTMENTS            *
*              JAMES CITY COUNTY                *
* ROUTING OF 1,2,10 AND 100 YEAR STORM EVENTS   *
*                                               *
*                                               *
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Inflow Hydrograph: j:\pondpack\2003043\PST2 .HYD
Rating Table file: j:\pondpack\2003043\PONDSWM .PND

----INITIAL CONDITIONS----
Elevation = 80.30 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
80.30	0.0	0	0.0	0.0
80.55	0.2	3,446	19.1	19.3
80.80	0.2	7,014	39.0	39.2
81.05	0.3	10,714	59.5	59.8
81.30	0.3	14,722	81.8	82.1
81.55	0.4	19,140	106.3	106.7
81.80	0.4	23,986	133.3	133.7
82.05	0.4	29,274	162.6	163.0
82.30	0.5	34,807	193.4	193.9
82.55	0.5	40,482	224.9	225.4
82.80	0.5	46,303	257.2	257.7
83.05	0.5	52,272	290.4	290.9
83.30	1.0	58,389	324.4	325.4
83.55	6.8	64,656	359.2	366.0
83.80	16.0	71,076	394.9	410.9
84.05	27.6	77,649	431.4	459.0
84.30	41.2	84,377	468.8	510.0
84.55	56.5	91,263	507.0	563.5
84.80	73.4	98,308	546.2	619.6
85.05	81.9	105,512	586.2	668.1
85.30	87.4	112,868	627.0	714.4
85.55	88.8	120,372	668.7	757.5
85.80	89.0	128,026	711.3	800.3
86.00	89.2	134,258	745.9	835.1

Time increment (t) = 0.100 hrs.

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	1.00	-----	0.0	0.0	0.00	80.30
11.100	1.00	2.0	2.0	2.0	0.02	80.33
11.200	1.00	2.0	3.9	4.0	0.04	80.35
11.300	1.00	2.0	5.8	5.9	0.06	80.38
11.400	1.00	2.0	7.6	7.8	0.08	80.40
11.500	2.00	3.0	10.4	10.6	0.11	80.44
11.600	2.00	4.0	14.1	14.4	0.15	80.49
11.700	6.00	8.0	21.7	22.1	0.20	80.58
11.800	11.00	17.0	38.3	38.7	0.20	80.79
11.900	15.00	26.0	63.7	64.3	0.30	81.10
12.000	29.00	44.0	106.9	107.7	0.40	81.56
12.100	46.00	75.0	181.0	181.9	0.46	82.20
12.200	28.00	74.0	254.0	255.0	0.50	82.78
12.300	10.00	38.0	290.9	292.0	0.52	83.06
12.400	7.00	17.0	306.4	307.9	0.75	83.17
12.500	6.00	13.0	317.6	319.4	0.91	83.26
12.600	5.00	11.0	325.7	328.6	1.46	83.32
12.700	4.00	9.0	330.0	334.7	2.33	83.36
12.800	4.00	8.0	332.4	338.0	2.81	83.38
12.900	4.00	8.0	334.1	340.4	3.15	83.39
13.000	3.00	7.0	334.6	341.1	3.25	83.40
13.100	3.00	6.0	334.3	340.6	3.18	83.39
13.200	3.00	6.0	334.0	340.3	3.13	83.39
13.300	2.00	5.0	333.1	339.0	2.95	83.38
13.400	2.00	4.0	331.8	337.1	2.68	83.37
13.500	2.00	4.0	330.8	335.8	2.48	83.36
13.600	2.00	4.0	330.1	334.8	2.35	83.36
13.700	2.00	4.0	329.6	334.1	2.25	83.35
13.800	2.00	4.0	329.3	333.6	2.18	83.35
13.900	2.00	4.0	329.0	333.3	2.13	83.35
14.000	2.00	4.0	328.8	333.0	2.09	83.35
14.100	2.00	4.0	328.7	332.8	2.06	83.35
14.200	2.00	4.0	328.6	332.7	2.05	83.35
14.300	2.00	4.0	328.5	332.6	2.03	83.34
14.400	2.00	4.0	328.5	332.5	2.02	83.34
14.500	2.00	4.0	328.5	332.5	2.02	83.34
14.600	2.00	4.0	328.4	332.5	2.01	83.34
14.700	2.00	4.0	328.4	332.4	2.01	83.34
14.800	2.00	4.0	328.4	332.4	2.01	83.34
14.900	1.00	3.0	327.7	331.4	1.86	83.34
15.000	1.00	2.0	326.5	329.7	1.62	83.33
15.100	1.00	2.0	325.6	328.5	1.44	83.32
15.200	1.00	2.0	325.0	327.6	1.31	83.31
15.300	1.00	2.0	324.5	327.0	1.22	83.31
15.400	1.00	2.0	324.2	326.5	1.16	83.31

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	1.00	2.0	324.0	326.2	1.11	83.30
15.600	1.00	2.0	323.8	326.0	1.08	83.30
15.700	1.00	2.0	323.7	325.8	1.06	83.30
15.800	1.00	2.0	323.6	325.7	1.04	83.30
15.900	1.00	2.0	323.5	325.6	1.03	83.30
16.000	1.00	2.0	323.5	325.5	1.02	83.30
16.100	1.00	2.0	323.5	325.5	1.02	83.30
16.200	1.00	2.0	323.4	325.5	1.01	83.30
16.300	1.00	2.0	323.4	325.4	1.01	83.30
16.400	1.00	2.0	323.4	325.4	1.01	83.30
16.500	1.00	2.0	323.4	325.4	1.00	83.30
16.600	1.00	2.0	323.4	325.4	1.00	83.30
16.700	1.00	2.0	323.4	325.4	1.00	83.30
16.800	1.00	2.0	323.4	325.4	1.00	83.30
16.900	1.00	2.0	323.4	325.4	1.00	83.30
17.000	1.00	2.0	323.4	325.4	1.00	83.30
17.100	1.00	2.0	323.4	325.4	1.00	83.30
17.200	1.00	2.0	323.4	325.4	1.00	83.30
17.300	1.00	2.0	323.4	325.4	1.00	83.30
17.400	1.00	2.0	323.4	325.4	1.00	83.30
17.500	1.00	2.0	323.4	325.4	1.00	83.30
17.600	1.00	2.0	323.4	325.4	1.00	83.30
17.700	1.00	2.0	323.4	325.4	1.00	83.30
17.800	1.00	2.0	323.4	325.4	1.00	83.30
17.900	1.00	2.0	323.4	325.4	1.00	83.30
18.000	1.00	2.0	323.4	325.4	1.00	83.30
18.100	1.00	2.0	323.4	325.4	1.00	83.30
18.200	1.00	2.0	323.4	325.4	1.00	83.30
18.300	1.00	2.0	323.4	325.4	1.00	83.30
18.400	1.00	2.0	323.4	325.4	1.00	83.30
18.500	1.00	2.0	323.4	325.4	1.00	83.30
18.600	1.00	2.0	323.4	325.4	1.00	83.30
18.700	1.00	2.0	323.4	325.4	1.00	83.30
18.800	1.00	2.0	323.4	325.4	1.00	83.30
18.900	1.00	2.0	323.4	325.4	1.00	83.30
19.000	1.00	2.0	323.4	325.4	1.00	83.30
19.100	1.00	2.0	323.4	325.4	1.00	83.30
19.200	1.00	2.0	323.4	325.4	1.00	83.30
19.300	1.00	2.0	323.4	325.4	1.00	83.30
19.400	1.00	2.0	323.4	325.4	1.00	83.30
19.500	1.00	2.0	323.4	325.4	1.00	83.30
19.600	1.00	2.0	323.4	325.4	1.00	83.30
19.700	1.00	2.0	323.4	325.4	1.00	83.30
19.800	1.00	2.0	323.4	325.4	1.00	83.30
19.900	1.00	2.0	323.4	325.4	1.00	83.30
20.000	1.00	2.0	323.4	325.4	1.00	83.30

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	1.00	2.0	323.4	325.4	1.00	83.30
20.200	1.00	2.0	323.4	325.4	1.00	83.30
20.300	1.00	2.0	323.4	325.4	1.00	83.30
20.400	1.00	2.0	323.4	325.4	1.00	83.30
20.500	1.00	2.0	323.4	325.4	1.00	83.30
20.600	1.00	2.0	323.4	325.4	1.00	83.30
20.700	1.00	2.0	323.4	325.4	1.00	83.30
20.800	1.00	2.0	323.4	325.4	1.00	83.30
20.900	1.00	2.0	323.4	325.4	1.00	83.30
21.000	1.00	2.0	323.4	325.4	1.00	83.30
21.100	1.00	2.0	323.4	325.4	1.00	83.30
21.200	1.00	2.0	323.4	325.4	1.00	83.30
21.300	1.00	2.0	323.4	325.4	1.00	83.30
21.400	1.00	2.0	323.4	325.4	1.00	83.30
21.500	1.00	2.0	323.4	325.4	1.00	83.30
21.600	1.00	2.0	323.4	325.4	1.00	83.30
21.700	1.00	2.0	323.4	325.4	1.00	83.30
21.800	1.00	2.0	323.4	325.4	1.00	83.30
21.900	1.00	2.0	323.4	325.4	1.00	83.30
22.000	1.00	2.0	323.4	325.4	1.00	83.30
22.100	1.00	2.0	323.4	325.4	1.00	83.30
22.200	1.00	2.0	323.4	325.4	1.00	83.30
22.300	1.00	2.0	323.4	325.4	1.00	83.30
22.400	1.00	2.0	323.4	325.4	1.00	83.30
22.500	1.00	2.0	323.4	325.4	1.00	83.30
22.600	1.00	2.0	323.4	325.4	1.00	83.30
22.700	1.00	2.0	323.4	325.4	1.00	83.30
22.800	1.00	2.0	323.4	325.4	1.00	83.30
22.900	1.00	2.0	323.4	325.4	1.00	83.30
23.000	1.00	2.0	323.4	325.4	1.00	83.30
23.100	1.00	2.0	323.4	325.4	1.00	83.30
23.200	1.00	2.0	323.4	325.4	1.00	83.30
23.300	1.00	2.0	323.4	325.4	1.00	83.30
23.400	1.00	2.0	323.4	325.4	1.00	83.30
23.500	1.00	2.0	323.4	325.4	1.00	83.30
23.600	1.00	2.0	323.4	325.4	1.00	83.30
23.700	1.00	2.0	323.4	325.4	1.00	83.30
23.800	1.00	2.0	323.4	325.4	1.00	83.30
23.900	1.00	2.0	323.4	325.4	1.00	83.30
24.000	0.00	1.0	322.4	324.4	0.99	83.29
24.100	0.00	0.0	320.5	322.4	0.96	83.28
24.200	0.00	0.0	318.6	320.5	0.93	83.26
24.300	0.00	0.0	316.8	318.6	0.90	83.25
24.400	0.00	0.0	315.1	316.8	0.88	83.24
24.500	0.00	0.0	313.4	315.1	0.85	83.23
24.600	0.00	0.0	311.7	313.4	0.83	83.21

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	0.00	0.0	310.1	311.7	0.80	83.20
24.800	0.00	0.0	308.6	310.1	0.78	83.19
24.900	0.00	0.0	307.1	308.6	0.76	83.18
25.000	0.00	0.0	305.6	307.1	0.73	83.17
25.100	0.00	0.0	304.2	305.6	0.71	83.16
25.200	0.00	0.0	302.8	304.2	0.69	83.15
25.300	0.00	0.0	301.4	302.8	0.67	83.14
25.400	0.00	0.0	300.1	301.4	0.65	83.13
25.500	0.00	0.0	298.9	300.1	0.63	83.12
25.600	0.00	0.0	297.6	298.9	0.62	83.11
25.700	0.00	0.0	296.4	297.6	0.60	83.10
25.800	0.00	0.0	295.3	296.4	0.58	83.09
25.900	0.00	0.0	294.1	295.3	0.56	83.08

Starting Pond W.S. Elevation = 80.30 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 46.00 cfs
Peak Outflow = 3.25 cfs
Peak Elevation = 83.40 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	60,817 cu-ft

Total Storage in Pond	=	60,817 cu-ft

Warning: Inflow hydrograph truncated on left side.

EXECUTED: 07-30-2003 16:36:06 **Return Freq: 10 years**

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*************************************************
*                                               *
*          LONGHILL GROVE APARTMENTS            *
*               JAMES CITY COUNTY               *
* ROUTING OF 1,2,10 AND 100 YEAR STORM EVENTS   *
*                                               *
*                                               *
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Inflow Hydrograph: j:\pondpack\2003043\PST10 .HYD
Rating Table file: j:\pondpack\2003043\PONDSWM .PND

----INITIAL CONDITIONS----
Elevation = 80.30 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
80.30	0.0	0	0.0	0.0
80.55	0.2	3,446	19.1	19.3
80.80	0.2	7,014	39.0	39.2
81.05	0.3	10,714	59.5	59.8
81.30	0.3	14,722	81.8	82.1
81.55	0.4	19,140	106.3	106.7
81.80	0.4	23,986	133.3	133.7
82.05	0.4	29,274	162.6	163.0
82.30	0.5	34,807	193.4	193.9
82.55	0.5	40,482	224.9	225.4
82.80	0.5	46,303	257.2	257.7
83.05	0.5	52,272	290.4	290.9
83.30	1.0	58,389	324.4	325.4
83.55	6.8	64,656	359.2	366.0
83.80	16.0	71,076	394.9	410.9
84.05	27.6	77,649	431.4	459.0
84.30	41.2	84,377	468.8	510.0
84.55	56.5	91,263	507.0	563.5
84.80	73.4	98,308	546.2	619.6
85.05	81.9	105,512	586.2	668.1
85.30	87.4	112,868	627.0	714.4
85.55	88.8	120,372	668.7	757.5
85.80	89.0	128,026	711.3	800.3
86.00	89.2	134,258	745.9	835.1

Time increment (t) = 0.100 hrs.

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
11.000	2.00
11.100	2.00
11.200	3.00
11.300	3.00
11.400	4.00
11.500	4.00
11.600	5.00
11.700	14.00
11.800	23.00
11.900	32.00
12.000	61.00
12.100	95.00
12.200	59.00
12.300	20.00
12.400	14.00
12.500	12.00
12.600	10.00
12.700	8.00
12.800	7.00
12.900	6.00
13.000	6.00
13.100	6.00
13.200	5.00
13.300	5.00
13.400	5.00
13.500	5.00
13.600	4.00
13.700	4.00
13.800	4.00
13.900	4.00
14.000	4.00
14.100	4.00
14.200	3.00
14.300	3.00
14.400	3.00
14.500	3.00
14.600	3.00
14.700	3.00
14.800	3.00
14.900	3.00
15.000	3.00
15.100	3.00
15.200	3.00
15.300	2.00
15.400	2.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
-----	0.0	0.0	0.00	80.30
4.0	3.9	4.0	0.04	80.35
5.0	8.7	8.9	0.09	80.42
6.0	14.4	14.7	0.15	80.49
7.0	21.0	21.4	0.20	80.58
8.0	28.6	29.0	0.20	80.67
9.0	37.2	37.6	0.20	80.78
19.0	55.7	56.2	0.28	81.01
37.0	92.0	92.7	0.34	81.41
55.0	146.2	147.0	0.40	81.91
93.0	238.2	239.2	0.50	82.66
156.0	369.0	394.2	12.58	83.71
154.0	433.2	523.0	44.93	84.36
79.0	428.5	512.2	41.83	84.31
34.0	405.4	462.5	28.54	84.07
26.0	389.5	431.4	20.96	83.91
22.0	379.2	411.5	16.16	83.80
18.0	370.8	397.2	13.20	83.72
15.0	364.1	385.8	10.86	83.66
13.0	358.9	377.1	9.07	83.61
12.0	355.3	370.9	7.81	83.58
12.0	353.2	367.3	7.07	83.56
11.0	351.1	364.2	6.54	83.54
10.0	348.9	361.1	6.10	83.52
10.0	347.3	358.9	5.79	83.51
10.0	346.2	357.3	5.56	83.50
9.0	344.7	355.2	5.26	83.48
8.0	342.9	352.7	4.90	83.47
8.0	341.6	350.9	4.64	83.46
8.0	340.7	349.6	4.46	83.45
8.0	340.0	348.7	4.33	83.44
8.0	339.6	348.0	4.23	83.44
7.0	338.5	346.6	4.02	83.43
6.0	337.1	344.5	3.73	83.42
6.0	336.0	343.1	3.52	83.41
6.0	335.3	342.0	3.37	83.40
6.0	334.7	341.3	3.27	83.40
6.0	334.3	340.7	3.19	83.39
6.0	334.1	340.3	3.14	83.39
6.0	333.9	340.1	3.10	83.39
6.0	333.7	339.9	3.07	83.39
6.0	333.6	339.7	3.05	83.39
6.0	333.6	339.6	3.04	83.39
5.0	332.8	338.6	2.88	83.38
4.0	331.5	336.8	2.63	83.37

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	2.00	4.0	330.6	335.5	2.45	83.36
15.600	2.00	4.0	330.0	334.6	2.32	83.36
15.700	2.00	4.0	329.5	334.0	2.23	83.35
15.800	2.00	4.0	329.2	333.5	2.16	83.35
15.900	2.00	4.0	329.0	333.2	2.12	83.35
16.000	2.00	4.0	328.8	333.0	2.08	83.35
16.100	2.00	4.0	328.7	332.8	2.06	83.35
16.200	2.00	4.0	328.6	332.7	2.04	83.34
16.300	2.00	4.0	328.5	332.6	2.03	83.34
16.400	2.00	4.0	328.5	332.5	2.02	83.34
16.500	2.00	4.0	328.5	332.5	2.02	83.34
16.600	2.00	4.0	328.4	332.5	2.01	83.34
16.700	2.00	4.0	328.4	332.4	2.01	83.34
16.800	2.00	4.0	328.4	332.4	2.01	83.34
16.900	2.00	4.0	328.4	332.4	2.00	83.34
17.000	2.00	4.0	328.4	332.4	2.00	83.34
17.100	2.00	4.0	328.4	332.4	2.00	83.34
17.200	2.00	4.0	328.4	332.4	2.00	83.34
17.300	2.00	4.0	328.4	332.4	2.00	83.34
17.400	2.00	4.0	328.4	332.4	2.00	83.34
17.500	2.00	4.0	328.4	332.4	2.00	83.34
17.600	2.00	4.0	328.4	332.4	2.00	83.34
17.700	2.00	4.0	328.4	332.4	2.00	83.34
17.800	2.00	4.0	328.4	332.4	2.00	83.34
17.900	2.00	4.0	328.4	332.4	2.00	83.34
18.000	2.00	4.0	328.4	332.4	2.00	83.34
18.100	2.00	4.0	328.4	332.4	2.00	83.34
18.200	2.00	4.0	328.4	332.4	2.00	83.34
18.300	2.00	4.0	328.4	332.4	2.00	83.34
18.400	2.00	4.0	328.4	332.4	2.00	83.34
18.500	2.00	4.0	328.4	332.4	2.00	83.34
18.600	1.00	3.0	327.7	331.4	1.86	83.34
18.700	1.00	2.0	326.4	329.7	1.61	83.33
18.800	1.00	2.0	325.6	328.4	1.44	83.32
18.900	1.00	2.0	324.9	327.6	1.31	83.31
19.000	1.00	2.0	324.5	326.9	1.22	83.31
19.100	1.00	2.0	324.2	326.5	1.16	83.31
19.200	1.00	2.0	324.0	326.2	1.11	83.30
19.300	1.00	2.0	323.8	326.0	1.08	83.30
19.400	1.00	2.0	323.7	325.8	1.06	83.30
19.500	1.00	2.0	323.6	325.7	1.04	83.30
19.600	1.00	2.0	323.5	325.6	1.03	83.30
19.700	1.00	2.0	323.5	325.5	1.02	83.30
19.800	1.00	2.0	323.5	325.5	1.02	83.30
19.900	1.00	2.0	323.4	325.5	1.01	83.30
20.000	1.00	2.0	323.4	325.4	1.01	83.30

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	1.00	2.0	323.4	325.4	1.01	83.30
20.200	1.00	2.0	323.4	325.4	1.00	83.30
20.300	1.00	2.0	323.4	325.4	1.00	83.30
20.400	1.00	2.0	323.4	325.4	1.00	83.30
20.500	1.00	2.0	323.4	325.4	1.00	83.30
20.600	1.00	2.0	323.4	325.4	1.00	83.30
20.700	1.00	2.0	323.4	325.4	1.00	83.30
20.800	1.00	2.0	323.4	325.4	1.00	83.30
20.900	1.00	2.0	323.4	325.4	1.00	83.30
21.000	1.00	2.0	323.4	325.4	1.00	83.30
21.100	1.00	2.0	323.4	325.4	1.00	83.30
21.200	1.00	2.0	323.4	325.4	1.00	83.30
21.300	1.00	2.0	323.4	325.4	1.00	83.30
21.400	1.00	2.0	323.4	325.4	1.00	83.30
21.500	1.00	2.0	323.4	325.4	1.00	83.30
21.600	1.00	2.0	323.4	325.4	1.00	83.30
21.700	1.00	2.0	323.4	325.4	1.00	83.30
21.800	1.00	2.0	323.4	325.4	1.00	83.30
21.900	1.00	2.0	323.4	325.4	1.00	83.30
22.000	1.00	2.0	323.4	325.4	1.00	83.30
22.100	1.00	2.0	323.4	325.4	1.00	83.30
22.200	1.00	2.0	323.4	325.4	1.00	83.30
22.300	1.00	2.0	323.4	325.4	1.00	83.30
22.400	1.00	2.0	323.4	325.4	1.00	83.30
22.500	1.00	2.0	323.4	325.4	1.00	83.30
22.600	1.00	2.0	323.4	325.4	1.00	83.30
22.700	1.00	2.0	323.4	325.4	1.00	83.30
22.800	1.00	2.0	323.4	325.4	1.00	83.30
22.900	1.00	2.0	323.4	325.4	1.00	83.30
23.000	1.00	2.0	323.4	325.4	1.00	83.30
23.100	1.00	2.0	323.4	325.4	1.00	83.30
23.200	1.00	2.0	323.4	325.4	1.00	83.30
23.300	1.00	2.0	323.4	325.4	1.00	83.30
23.400	1.00	2.0	323.4	325.4	1.00	83.30
23.500	1.00	2.0	323.4	325.4	1.00	83.30
23.600	1.00	2.0	323.4	325.4	1.00	83.30
23.700	1.00	2.0	323.4	325.4	1.00	83.30
23.800	1.00	2.0	323.4	325.4	1.00	83.30
23.900	1.00	2.0	323.4	325.4	1.00	83.30
24.000	0.00	1.0	322.4	324.4	0.99	83.29
24.100	0.00	0.0	320.5	322.4	0.96	83.28
24.200	0.00	0.0	318.6	320.5	0.93	83.26
24.300	0.00	0.0	316.8	318.6	0.90	83.25
24.400	0.00	0.0	315.1	316.8	0.88	83.24
24.500	0.00	0.0	313.4	315.1	0.85	83.23
24.600	0.00	0.0	311.7	313.4	0.83	83.21

INFLOW HYDROGRAPH

TIME (hrs)	INFLOW (cfs)
24.700	0.00
24.800	0.00
24.900	0.00
25.000	0.00
25.100	0.00
25.200	0.00
25.300	0.00
25.400	0.00
25.500	0.00
25.600	0.00
25.700	0.00
25.800	0.00
25.900	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	310.1	311.7	0.80	83.20
0.0	308.6	310.1	0.78	83.19
0.0	307.1	308.6	0.76	83.18
0.0	305.6	307.1	0.73	83.17
0.0	304.2	305.6	0.71	83.16
0.0	302.8	304.2	0.69	83.15
0.0	301.4	302.8	0.67	83.14
0.0	300.1	301.4	0.65	83.13
0.0	298.9	300.1	0.63	83.12
0.0	297.6	298.9	0.62	83.11
0.0	296.4	297.6	0.60	83.10
0.0	295.3	296.4	0.58	83.09
0.0	294.1	295.3	0.56	83.08

Starting Pond W.S. Elevation = 80.30 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 95.00 cfs
Peak Outflow = 44.93 cfs
Peak Elevation = 84.36 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	86,056 cu-ft

Total Storage in Pond	=	86,056 cu-ft

Warning: Inflow hydrograph truncated on left side.

EXECUTED: 07-30-2003 16:36:06 **Return Freq: 100 years**

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*************************************************
*                                               *
*          LONGHILL GROVE APARTMENTS            *
*              JAMES CITY COUNTY                *
* ROUTING OF 1,2,10 AND 100 YEAR STORM EVENTS   *
*                                               *
*                                               *
*************************************************
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Inflow Hydrograph: j:\pondpack\2003043\PST100 .HYD
Rating Table file: j:\pondpack\2003043\PONDSWM .PND

----INITIAL CONDITIONS----
Elevation = 80.30 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
80.30	0.0	0	0.0	0.0
80.55	0.2	3,446	19.1	19.3
80.80	0.2	7,014	39.0	39.2
81.05	0.3	10,714	59.5	59.8
81.30	0.3	14,722	81.8	82.1
81.55	0.4	19,140	106.3	106.7
81.80	0.4	23,986	133.3	133.7
82.05	0.4	29,274	162.6	163.0
82.30	0.5	34,807	193.4	193.9
82.55	0.5	40,482	224.9	225.4
82.80	0.5	46,303	257.2	257.7
83.05	0.5	52,272	290.4	290.9
83.30	1.0	58,389	324.4	325.4
83.55	6.8	64,656	359.2	366.0
83.80	16.0	71,076	394.9	410.9
84.05	27.6	77,649	431.4	459.0
84.30	41.2	84,377	468.8	510.0
84.55	56.5	91,263	507.0	563.5
84.80	73.4	98,308	546.2	619.6
85.05	81.9	105,512	586.2	668.1
85.30	87.4	112,868	627.0	714.4
85.55	88.8	120,372	668.7	757.5
85.80	89.0	128,026	711.3	800.3
86.00	89.2	134,258	745.9	835.1

Time increment (t) = 0.100 hrs.

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
11.000	4.00	-----	0.0	0.0	0.00	80.30
11.100	4.00	8.0	7.8	8.0	0.08	80.40
11.200	5.00	9.0	16.5	16.8	0.17	80.52
11.300	5.00	10.0	26.1	26.5	0.20	80.64
11.400	6.00	11.0	36.7	37.1	0.20	80.77
11.500	7.00	13.0	49.2	49.7	0.25	80.93
11.600	8.00	15.0	63.6	64.2	0.30	81.10
11.700	22.00	30.0	92.9	93.6	0.35	81.42
11.800	35.00	57.0	149.1	149.9	0.40	81.94
11.900	49.00	84.0	232.1	233.1	0.50	82.61
12.000	96.00	145.0	358.9	377.1	9.07	83.61
12.100	150.00	246.0	467.0	604.9	68.99	84.73
12.200	93.00	243.0	536.2	710.0	86.87	85.28
12.300	32.00	125.0	499.8	661.2	80.70	85.01
12.400	22.00	54.0	446.4	553.8	53.73	84.50
12.500	18.00	40.0	416.6	486.4	34.90	84.18
12.600	15.00	33.0	398.9	449.6	25.33	84.00
12.700	13.00	28.0	387.2	426.9	19.87	83.88
12.800	11.00	24.0	379.0	411.2	16.07	83.80
12.900	10.00	21.0	372.5	400.0	13.78	83.74
13.000	10.00	20.0	368.0	392.5	12.23	83.70
13.100	9.00	19.0	364.8	387.0	11.11	83.67
13.200	8.00	17.0	361.7	381.8	10.04	83.64
13.300	8.00	16.0	359.3	377.7	9.20	83.62
13.400	8.00	16.0	357.9	375.3	8.71	83.60
13.500	8.00	16.0	357.1	373.9	8.42	83.59
13.600	7.00	15.0	356.0	372.1	8.04	83.58
13.700	6.00	13.0	354.2	369.0	7.41	83.57
13.800	6.00	12.0	352.5	366.2	6.83	83.55
13.900	6.00	12.0	351.3	364.5	6.58	83.54
14.000	6.00	12.0	350.5	363.3	6.42	83.53
14.100	6.00	12.0	349.9	362.5	6.30	83.53
14.200	5.00	11.0	348.7	360.9	6.07	83.52
14.300	5.00	10.0	347.2	358.7	5.76	83.51
14.400	5.00	10.0	346.1	357.2	5.55	83.50
14.500	5.00	10.0	345.3	356.1	5.39	83.49
14.600	5.00	10.0	344.8	355.3	5.28	83.48
14.700	5.00	10.0	344.4	354.8	5.20	83.48
14.800	4.00	9.0	343.4	353.4	5.00	83.47
14.900	4.00	8.0	342.0	351.4	4.71	83.46
15.000	4.00	8.0	340.9	350.0	4.51	83.45
15.100	4.00	8.0	340.2	348.9	4.36	83.45
15.200	4.00	8.0	339.7	348.2	4.26	83.44
15.300	4.00	8.0	339.3	347.7	4.19	83.44
15.400	4.00	8.0	339.1	347.3	4.13	83.44

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
15.500	4.00	8.0	338.9	347.1	4.09	83.43
15.600	4.00	8.0	338.7	346.9	4.07	83.43
15.700	4.00	8.0	338.6	346.7	4.05	83.43
15.800	3.00	7.0	337.9	345.6	3.89	83.42
15.900	3.00	6.0	336.6	343.9	3.64	83.41
16.000	3.00	6.0	335.7	342.6	3.46	83.41
16.100	3.00	6.0	335.0	341.7	3.33	83.40
16.200	3.00	6.0	334.6	341.0	3.23	83.40
16.300	3.00	6.0	334.2	340.6	3.17	83.39
16.400	3.00	6.0	334.0	340.2	3.12	83.39
16.500	3.00	6.0	333.8	340.0	3.08	83.39
16.600	3.00	6.0	333.7	339.8	3.06	83.39
16.700	3.00	6.0	333.6	339.7	3.04	83.39
16.800	3.00	6.0	333.5	339.6	3.03	83.39
16.900	3.00	6.0	333.5	339.5	3.02	83.39
17.000	3.00	6.0	333.5	339.5	3.02	83.39
17.100	3.00	6.0	333.4	339.5	3.01	83.39
17.200	3.00	6.0	333.4	339.4	3.01	83.39
17.300	3.00	6.0	333.4	339.4	3.01	83.39
17.400	3.00	6.0	333.4	339.4	3.00	83.39
17.500	3.00	6.0	333.4	339.4	3.00	83.39
17.600	3.00	6.0	333.4	339.4	3.00	83.39
17.700	3.00	6.0	333.4	339.4	3.00	83.39
17.800	3.00	6.0	333.4	339.4	3.00	83.39
17.900	3.00	6.0	333.4	339.4	3.00	83.39
18.000	3.00	6.0	333.4	339.4	3.00	83.39
18.100	3.00	6.0	333.4	339.4	3.00	83.39
18.200	3.00	6.0	333.4	339.4	3.00	83.39
18.300	3.00	6.0	333.4	339.4	3.00	83.39
18.400	3.00	6.0	333.4	339.4	3.00	83.39
18.500	2.00	5.0	332.7	338.4	2.86	83.38
18.600	2.00	4.0	331.4	336.7	2.61	83.37
18.700	2.00	4.0	330.6	335.4	2.44	83.36
18.800	2.00	4.0	329.9	334.6	2.31	83.36
18.900	2.00	4.0	329.5	333.9	2.22	83.35
19.000	2.00	4.0	329.2	333.5	2.16	83.35
19.100	2.00	4.0	329.0	333.2	2.11	83.35
19.200	2.00	4.0	328.8	333.0	2.08	83.35
19.300	2.00	4.0	328.7	332.8	2.06	83.35
19.400	2.00	4.0	328.6	332.7	2.04	83.34
19.500	2.00	4.0	328.5	332.6	2.03	83.34
19.600	2.00	4.0	328.5	332.5	2.02	83.34
19.700	2.00	4.0	328.5	332.5	2.02	83.34
19.800	2.00	4.0	328.4	332.5	2.01	83.34
19.900	2.00	4.0	328.4	332.4	2.01	83.34
20.000	2.00	4.0	328.4	332.4	2.01	83.34

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
20.100	2.00	4.0	328.4	332.4	2.00	83.34
20.200	2.00	4.0	328.4	332.4	2.00	83.34
20.300	2.00	4.0	328.4	332.4	2.00	83.34
20.400	2.00	4.0	328.4	332.4	2.00	83.34
20.500	2.00	4.0	328.4	332.4	2.00	83.34
20.600	2.00	4.0	328.4	332.4	2.00	83.34
20.700	2.00	4.0	328.4	332.4	2.00	83.34
20.800	2.00	4.0	328.4	332.4	2.00	83.34
20.900	2.00	4.0	328.4	332.4	2.00	83.34
21.000	2.00	4.0	328.4	332.4	2.00	83.34
21.100	2.00	4.0	328.4	332.4	2.00	83.34
21.200	2.00	4.0	328.4	332.4	2.00	83.34
21.300	2.00	4.0	328.4	332.4	2.00	83.34
21.400	2.00	4.0	328.4	332.4	2.00	83.34
21.500	2.00	4.0	328.4	332.4	2.00	83.34
21.600	2.00	4.0	328.4	332.4	2.00	83.34
21.700	2.00	4.0	328.4	332.4	2.00	83.34
21.800	2.00	4.0	328.4	332.4	2.00	83.34
21.900	2.00	4.0	328.4	332.4	2.00	83.34
22.000	2.00	4.0	328.4	332.4	2.00	83.34
22.100	2.00	4.0	328.4	332.4	2.00	83.34
22.200	2.00	4.0	328.4	332.4	2.00	83.34
22.300	2.00	4.0	328.4	332.4	2.00	83.34
22.400	2.00	4.0	328.4	332.4	2.00	83.34
22.500	2.00	4.0	328.4	332.4	2.00	83.34
22.600	2.00	4.0	328.4	332.4	2.00	83.34
22.700	2.00	4.0	328.4	332.4	2.00	83.34
22.800	2.00	4.0	328.4	332.4	2.00	83.34
22.900	2.00	4.0	328.4	332.4	2.00	83.34
23.000	2.00	4.0	328.4	332.4	2.00	83.34
23.100	1.00	3.0	327.7	331.4	1.86	83.34
23.200	1.00	2.0	326.4	329.7	1.61	83.33
23.300	1.00	2.0	325.6	328.4	1.44	83.32
23.400	1.00	2.0	324.9	327.6	1.31	83.31
23.500	1.00	2.0	324.5	326.9	1.22	83.31
23.600	1.00	2.0	324.2	326.5	1.16	83.31
23.700	1.00	2.0	324.0	326.2	1.11	83.30
23.800	1.00	2.0	323.8	326.0	1.08	83.30
23.900	1.00	2.0	323.7	325.8	1.06	83.30
24.000	1.00	2.0	323.6	325.7	1.04	83.30
24.100	1.00	2.0	323.5	325.6	1.03	83.30
24.200	1.00	2.0	323.5	325.5	1.02	83.30
24.300	1.00	2.0	323.5	325.5	1.02	83.30
24.400	1.00	2.0	323.4	325.5	1.01	83.30
24.500	1.00	2.0	323.4	325.4	1.01	83.30
24.600	1.00	2.0	323.4	325.4	1.01	83.30

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
24.700	1.00	2.0	323.4	325.4	1.00	83.30
24.800	1.00	2.0	323.4	325.4	1.00	83.30
24.900	1.00	2.0	323.4	325.4	1.00	83.30
25.000	0.00	1.0	322.4	324.4	0.99	83.29
25.100	0.00	0.0	320.5	322.4	0.96	83.28
25.200	0.00	0.0	318.6	320.5	0.93	83.26
25.300	0.00	0.0	316.8	318.6	0.90	83.25
25.400	0.00	0.0	315.1	316.8	0.88	83.24
25.500	0.00	0.0	313.4	315.1	0.85	83.23
25.600	0.00	0.0	311.7	313.4	0.83	83.21
25.700	0.00	0.0	310.1	311.7	0.80	83.20
25.800	0.00	0.0	308.6	310.1	0.78	83.19
25.900	0.00	0.0	307.1	308.6	0.76	83.18

Starting Pond W.S. Elevation = 80.30 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 150.00 cfs
Peak Outflow = 86.87 cfs
Peak Elevation = 85.28 ft D.H.W.

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	112,156 cu-ft
Total Storage in Pond	=	112,156 cu-ft

Warning: Inflow hydrograph truncated on left side.

HYDRAULIC GRADE LINE COMPUTATION
10 yr Event

PROJECT: Longhill Grove Apts
DESCRIPTION: Apartment Complex

COUNTY: James City County

Date: March 17, 2003
REVISED :
REVISED :
REVISED :

INLET/STATION Upstream Outflow 1	OUTLET WATER SURFACE ELEV. 2	Do 3	Qo 4	Lo 5	Sfo % 6	Hf 7	Vo 8	Ho 9	Qi 10	Vi 11	QiVi 12	Vi^2/2g	Hi 13	Angle 90-15 14	K	delta H 15	Ht 16	1.3 Ht 17	0.5 Ht 18	Final H 19	Inlet Water Surface Elev. 20	Rim Elev. 21
15	83.25	36	48.50	24	0.53	0.13	6.9	0.18	46.34	6.6	303.93	0.67	0.23	15	0.19	0.13	0.54	0.71		0.83	84.08	85.33
38	84.08	15	2.06	111	0.10	0.11	1.7	0.01	-	-	-	-	-	-	-	-	0.01	0.01		0.13	84.21	87.75
13	84.08	36	46.34	52	0.48	0.25	6.6	0.17	35.97	5.1	183.13	0.40	0.14	15	0.19	0.08	0.38	0.50		0.75	84.84	84.75
34	84.84	15	7.51	156	1.35	2.12	6.1	0.15	5.17	4.2	21.80	0.28	0.10	70	0.61	0.17	0.41	0.53		2.65	87.49	90.33
36	87.49	15	1.11	147	0.03	0.04	0.9	0.00	-	-	-	-	-	-	-	-	0.00	0.00		0.05	87.53	92.33
32	87.49	15	5.17	66	0.64	0.43	4.2	0.07	2.18	1.8	3.86	0.05	0.02	15	0.19	0.01	0.10	0.12		0.55	88.04	88.75
30	88.04	15	2.18	134	0.11	0.15	1.8	0.01	-	-	-	-	-	-	-	-	0.01	0.02		0.17	88.20	90.00
11	84.84	36	35.97	239	0.29	0.70	5.1	0.10	35.50	5.0	178.42	0.39	0.14	15	0.19	0.07	0.31	0.41		1.10	85.94	87.50
9	85.94	36	35.50	57	0.28	0.16	5.0	0.10	12.39	5.2	63.90	0.41	0.14	70	0.61	0.25	0.49	0.64		0.80	86.74	88.00
28	86.74	15	2.44	68	0.14	0.10	2.0	0.02	-	-	-	-	-	-	-	-	0.02	0.02		0.12	86.86	-
26	86.74	15	3.57	147	0.31	0.45	2.9	0.03	2.18	1.8	3.86	0.05	0.02	15	0.19	0.01	0.06	0.08		0.53	87.27	92.00
24	87.27	15	2.18	64	0.11	0.07	1.8	0.01	-	-	-	-	-	-	-	-	0.01	0.02		0.09	87.36	90.50
22	87.36	24	16.16	134	0.51	0.69	5.1	0.10	-	-	-	-	-	-	-	-	0.10	0.13		0.82	88.18	94.00
22A	88.18	15	7.79	84	1.46	1.22	6.4	0.16	-	-	-	-	-	-	-	-	0.16	0.20		1.43	89.60	95.00
20	90.46	18	7.28	72	0.48	0.35	4.1	0.07	2.31	1.9	4.34	0.05	0.02	15	0.19	0.01	0.10	0.12		0.47	90.94	95.50
18	90.95	15	2.31	188	0.13	0.24	1.9	0.01	-	-	-	-	-	-	-	-	0.01	0.02		0.26	91.21	99.33
7	86.74	21	12.39	138	0.61	0.85	5.2	0.10	8.31	4.7	39.13	0.34	0.12	30	0.28	0.10	0.32	0.42		1.26	88.00	95.33
5	91.32	18	8.31	279	0.63	1.75	4.7	0.09	3.95	2.2	8.86	0.08	0.03	90	0.70	0.05	0.17	0.22		1.97	93.29	99.00
5A	93.37	18	3.95	104	0.14	0.15	2.2	0.02	-	-	-	-	-	-	-	-	0.02	0.03		0.17	93.55	94.50
3	93.32	15	3.35	72	0.27	0.19	2.7	0.03	1.25	1.0	1.28	0.02	0.01	0	0.19	0.00	0.04	0.05		0.24	93.56	99.50
1	94.50	15	1.25	206	0.04	0.08	1.0	0.00	0.63	0.5	0.33	0.00	0.00	30	0.28	0.00	0.00	0.01		0.08	94.58	102.33
1A	97.69	15	0.63	130	0.01	0.01	0.5	0.00	-	-	-	-	-	-	-	-	0.00	0.00		0.01	97.70	102.50

STORM SEWER DESIGN COMPUTATIONS
PIPE SIZING

PROJECT: Longhill Grove Apts
DESCRIPTION: Apartment Complex

COUNTY: James City County

Date: March 17, 2003 REVISED :
REVISED :
REVISED :

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
FROM POINT	TO POINT	IDA ACRES	RUNOFF "C"	"CA" INC.	"CA" ACC.	Tc MIN.	I10 IN/HR	Q10 CFS	INV.ELEV. UPPER	INV.ELEV. LOWER	L FT	S FT/FT	D IN	Qcap CFS	V10 FPS	Time MIN.	Status
1A	1B	0.24	0.4	0.10	0.10	7	**6.6**	**0.63**	97.08	96.69	130.00	0.0030	**15**	3.54	2.9	0.75	OK
1	3	0.11	0.90	0.10	0.20	7.8	**6.4**	**1.25**	96.59	93.50	206.01	0.0150	**15**	7.91	6.4	0.53	OK
3	5	0.48	0.70	0.34	0.53	8.3	**6.3**	**3.35**	93.40	92.32	71.61	0.0150	**15**	7.91	6.4	0.19	OK
5A	5	1.20	0.50	0.60	0.60	7	**6.6**	**3.95**	92.48	92.17	104.00	0.0030	**18**	5.75	3.3	0.53	OK
5	7	0.28	0.70	0.20	1.33	8.5	**6.3**	**8.31**	92.07	90.12	279.11	0.0070	**18**	8.79	5.0	0.94	OK
7	9	1.19	0.60	0.71	2.04	9.4	**6.1**	**12.39**	89.87	83.65	138.25	0.0450	**21**	33.60	14.0	0.16	OK
18	20	0.50	0.70	0.35	0.35	7.0	**6.6**	**2.31**	92.77	89.95	187.96	0.0150	**15**	7.91	6.4	0.49	OK
20	22	1.29	0.60	0.77	1.12	7.5	**6.5**	**7.28**	89.70	89.26	72.26	0.0060	**18**	8.13	4.6	0.26	OK
22A	22	1.97	0.60	1.18	1.18	7	**6.6**	**7.79**	89.63	87.11	84.00	0.0300	**15**	11.18	9.1	0.15	OK
22	9	0.42	0.50	0.21	2.52	7.7	**6.4**	**16.16**	88.76	83.40	134.17	0.0400	**24**	45.23	14.4	0.16	OK
24	26	0.66	0.50	0.33	0.33	7.0	**6.6**	**2.18**	86.36	85.72	63.79	0.0100	**15**	6.46	5.3	0.20	OK
26	9	0.27	0.80	0.22	0.55	7.2	**6.5**	**3.57**	85.62	84.15	147	0.0100	**15**	6.46	5.3	0.47	OK
28	9	0.82	0.50	0.41	0.41	10.0	**6.0**	**2.44**	88.23	84.15	68	0.0600	**15**	15.82	12.9	0.09	OK
9	11	0.73	0.50	0.37	5.88	9.5704	**6.0**	**35.50**	82.40	82.17	57.09	0.0040	**36**	42.18	6.0	0.16	OK
11	13	0.18	0.60	0.11	5.99	9.7	**6.0**	**35.97**	82.07	79.68	238.86	0.0100	**36**	66.69	9.4	0.42	OK
30	32	0.66	0.50	0.33	0.33	7.0	**6.6**	**2.18**	84.94	84.54	134.00	0.0030	**15**	3.54	2.9	0.77	OK
32	34	0.68	0.70	0.48	0.81	7.8	**6.4**	**5.17**	84.44	83.78	66.22	0.0100	**15**	6.46	5.3	0.21	OK
Roofdrain 2	36	0.11	0.80	0.09	0.09	7.0	**6.6**	**0.58**	85.06	84.80	87.84	0.0030	**8**	0.66	1.9	0.77	OK
36	34	0.10	0.80	0.08	0.17	7.0	**6.6**	**1.11**	84.22	83.78	146.50	0.0030	**15**	3.54	2.9	0.85	OK
34	13	0.25	0.80	0.20	1.17	7.8	**6.4**	**7.51**	83.68	81.33	156.35	0.0150	**15**	7.91	6.4	0.40	OK
Roofdrain 3	13	0.13	0.90	0.12	0.12	7.0	**6.6**	**0.77**	82.08	81.91	33.53	0.0050	**8**	0.85	2.4	0.23	OK
13	15	1.08	0.50	0.54	7.82	10.152	**5.9**	**46.34**	79.58	79.27	52.05	0.0060	**36**	51.66	7.3	0.12	OK
Roofdrain 4	38	0.10	0.90	0.09	0.09	7.0	**6.6**	**0.59**	83.93	82.61	66.03	0.0200	**8**	1.71	4.9	0.22	OK
38	15	0.52	0.60	0.31	0.31	7.0	**6.6**	**2.06**	82.03	80.92	110.99	0.0100	**15**	6.46	5.3	0.35	OK
15	17	0.14	0.60	0.08	8.21	10.3	**5.9**	**48.50**	79.17	79.00	24.00	0.0070	**36**	55.80	7.9	0.05	OK

STORM SEWER INLET COMPUTATIONS and STRUCTURE SCHEDULE
(Spread and Inlets)

PROJECT: Longhill Grove Apts
DESCRIPTION: Apartment Complex

COUNTY: James City County

Date: March 17, 2003
REVISED :
REVISED :
REVISED :

Inlet NUMBER	TYPE	ON GRADE INLET	LENGTH	STATION	A - DRAINAGE	C	CA	CAw	I IN/HR	Q Increment CFS	Q Carry over CFS	Q Gutter Flow Left	Q Gutter Flow right	Qt Gutter Flow Total CFS	S Gutter Slope ft/ft	Sx Cross Slope ft/ft	T (spread) ft left	T (spread) ft right	T (spread) ft	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo(#10)	a = 12W(Sw-Sx)	S'w = a/12W	Se(ft/ft)=Sx+S'wEo	Lt(ft)	P effect. Length FT	L/Lt	d(ft) #17	E(#16)	h(ft)	d/h	Q intercepted CFS	Q carryover CFS	T spread = d/Sx @ sag ft	REMARKS
1A	DI-7		2.5		0.24	0.40	0.10		6.6	0.6	0.00			0.6	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
1	DI-3A		2.5		0.11	0.90	0.10		6.4	0.6	0.00			0.6	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
3	DI-3B		4		0.48	0.70	0.34		6.3	2.1	0.00			2.1	0.0200	0.0208				2.00									7.60		0.20		0.50	0.40			9.62	OK
5A	DI-7		2.5		1.20	0.50	0.60		6.6	4.0	0.00			4.0	0.0200	0.0208				2.00									6.10		0.35		0.50	0.70			16.83	OK
5	DI-3A		2.5		0.28	0.70	0.20		6.3	1.2	0.00			1.2	0.0200	0.0208				2.00									6.10		0.25		0.50	0.50			12.02	OK
7	DI-3A		10		1.19	0.60	0.71		6.1	4.3	0.00			4.3	0.0200	0.0208				2.00									13.60		0.20		0.50	0.40			9.62	OK
18	DI-3B		4		0.50	0.70	0.35		6.6	2.3	0.00			2.3	0.0200	0.0208				2.00									7.60		0.25		0.50	0.50			12.02	OK
20	DI-3B		14		1.29	0.60	0.77		6.5	5.0	0.00			5.0	0.0200	0.0208				2.00									17.60		0.25		0.50	0.50			12.02	OK
22A	DI-7		2.5		1.97	0.60	1.18		6.6	7.8	0.00			7.8	0.0200	0.0208				2.00									6.10		0.50		0.50	1.00			24.04	OK
22	DI-3C		6		0.42	0.50	0.21		6.4	1.3	0.00			1.3	0.0200	0.0208				2.00									9.60		0.20		0.50	0.40			9.62	OK
24	DI-7		2.5		0.66	0.50	0.33		6.6	2.2	0.00			2.2	0.0200	0.0208				2.00									6.10		0.25		0.50	0.50			12.02	OK
26	DI-3A		2.5		0.27	0.80	0.22		6.5	1.4	0.00			1.4	0.0200	0.0208				2.00									6.10		0.20		0.50	0.40			9.62	OK
9	JB-1		2.5		0.73	0.50	0.37		6.0	2.2	0.00			2.2	0.0200	0.0208				2.00									6.10		0.25		0.50	0.50			12.02	OK
11	DI-7		2.5		0.18	0.60	0.11		6.0	0.6	0.00			0.6	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
30	DI-3B		4		0.66	0.50	0.33		6.6	2.2	0.00			2.2	0.0200	0.0208				2.00									7.60		0.20		0.50	0.40			9.62	OK
32	DI-3B		6		0.68	0.70	0.48		6.4	3.1	0.00			3.1	0.0200	0.0208				2.00									9.60		0.25		0.50	0.50			12.02	OK
36	DI-3A		2.5		0.10	0.80	0.08		6.6	0.5	0.00			0.5	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
34	DI-3A		2.5		0.25	0.80	0.20		6.4	1.3	0.00			1.3	0.0200	0.0208				2.00									6.10		0.20		0.50	0.40			9.62	OK
13	DI-3B		6		1.08	0.50	0.54		5.9	3.2	0.00			3.2	0.0200	0.0208				2.00									9.60		0.25		0.50	0.50			12.02	OK
38	DI-3B		4		0.52	0.60	0.31		6.6	2.1	0.00			2.1	0.0200	0.0208				2.00									7.60		0.20		0.50	0.40			9.62	OK
15	DI-3A		2.5		0.14	0.60	0.08		5.9	0.5	0.00			0.5	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK

SP-44-03
PC 195
Longhill Grove
Apartments
Wet Pond

OFFSITE

DA-1	1.43AC.
DA-2	0.45AC.
DA-3	0.21AC.
DA-4	0.09AC.
DA-5	0.06AC.
	2.24AC.

ONSITE

DA-1	0.12 AC.
DA-2	0.10 AC.
DA-3	0.35AC.
DA-3A	0.27AC.
DA-4	0.13AC.
DA-5	0.13AC.
DA-6	0.54AC.
DA-7	0.13AC.
DA-8	0.18AC.
DA-9	0.42AC.
DA-10	0.13AC.
DA-11	0.81AC
DA-12	0.13AC.
DA-13	0.10AC
DA-14	0.40AC.
DA-15	0.10AC.
DA-16	1.29AC.
DA-17	1.06AC.
DA-18	0.04AC.
DA-19	0.65AC.
DA-20	0.19AC.
DA-21	1.47AC.
DA-22	0.76AC.
DA-23	0.18AC.
DA-24	0.10AC.
DA-25	0.60AC.
DA-26	0.10AC.
DA-27	0.10AC.
DA-28	0.12AC.
DA-29	0.29AC.
DA-30	0.47AC.
DA-31	0.13AC.
DA-32	1.03AC.
DA-33	0.52AC.
DA-34	0.14AC.
	13.88 AC.

DRAINAGE AREA TO POND

16.12 AC

DESIGN REPORT

15.85AC.

0.27AC (1.67% DIFF)

Table 2

Worksheet for BMP Point System

13.61
2.24
15.85 AC.

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
WET ED POND A-3	10	x	13.61 ONSITE / 2.24 OFFSITE > 15.85	=	10
		x		=	
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: _____

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
0	x	0 (0.1 per 1%)	=	0
	x	(0.15 per 1%)	=	

TOTAL NATURAL OPEN SPACE CREDIT: _____

C. TOTAL WEIGHTED POINTS

10	+	0	=	10
Structural BMP Points		Natural Open Space Points		Total

CREDIT TAKEN FOR OFFSITE PARCEL DA-OFFSITE1; HOWEVER CN = 74 & NO OFFSITE IMPERV AREA CONSIDERED.

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

Project: Longhill Grove Apts

Basin #: East

Total area draining to basin 15.71 acres

Basin Volume Design

Wet Storage:

1. Minimum required volume = 67 cu. Yds x Total Drainage Area (acres)

   67 cu. Yds x 15.71 acres = 1053 cu. Yds.
   28419 cu. Ft.

2. Available basin Volume = 1245 cu. Yds. At elevation 82
   (from storage-elevation curve) 33617 cu. Ft

3. Excavate 1245 cu. Yds. To obtain required volume*
   *Elevation corresponding to required volume = invert of the dewatering orifice.

4. Available volume before cleanout required.

   33 cu. Yds x 15.71 acres = 518 cu. Yds.
   13998 cu. Ft

5. Elevation corresponding to cleanout level= 80.5 PLAN SHOWS 80.5 ✓
   (From Storage-Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 1.5 ft
   (Minimum = 1.0 ft.)

Dry Storage:

7. Minimum required volume = 67 cu. Yds x Total Drainage Area (acres)

   67 cu. Yds x 15.71 acres = 1053 cu. yds
   28419 cu. Ft

8. Total available basin volume at crest of riser* = 2415 cu. Yds at elevation 84 .(From Storage - Elevation Curve)

* Minimum = 134 cu. Yds./acre of total drainage area.

9. Diameter of dewatering orifice = 10 in. NOT ON PLAN

10. Diameter of flexible tubing = 12 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 84.0 ✓

Top of Dam = 86.5 ✓

Design High Water = 85.5 ✓

Upstream Toe of Dam = 79.0

Basin Shape

12. Length of Flow L = 185 ft
Effective Width We 88 ft

If > 2, baffles are not required baffles not required

If < 2, baffles are required _____

Runoff

13. Q(2) = 29.8 cfs (From Chapter 5)

14. Q(25) = 47.1 cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity Qp = Q(2) = 29.8 cfs
(riser and barrel)

Without emergency spillway, required spillway capacity Qp = Q(25) = 47.1 cfs

16. With Emergency Spillway:

Assumed available head (h) = 0.7 ft. (Using Q(2)

h = Crest of Emergency Spillway Elevation - Crest of Riser Elevation

Without emergency spillway:

Assumed available head (h) = _____ ft. (Using Q(25)

h = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter (Dr) = 36 in. Actual Head (h) 0.7 ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel Length (l) = 70 ft.

Head (H) on barrel through embankment = 4.5 ft.

(From Plate 3.14-7).

19. Barrel diameter = 24 in.

(From Plate 3.14-B [concrete pipe] or Plate 3.14-A [corrugated pipe]).

20. Trash Rack and anti-vortex device

Diameter = 54 in. Thickness Gage 14

Height = 17 in.

(From Table 3.14-D).

21. Required spillway capacity Qe = Q(25) -Qp= 17.3 cfs.

22. Bottom width (b) = 24 ft; the slope of the exit channel (s) = 3.8 ft./foot; and the minimum length of the exit channel (x) = 33 ft.

(From Table 3.14-C).

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = _____ ft

Slope of upstream face of embankment (Z) = _____ :1

Slope of principal spillway barrel (Sb) = _____ %

Length of barrel in saturated zone (Ls) = _____ ft

24. Number of collars required = _____ dimensions = _____
(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 86.5

Design High Water = 85.5

Emergency Spillway Crest = 85.0

Principal Spillway Crest = 84.0

Dewatering Orifice Invert = 82.0

Cleanout Elevation = 80.5

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = 79.0

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

Project: Longhill Grove Apts

Basin #: West

Total area draining to basin 10.3 acres ✓ ok

Basin Volume Design

Wet Storage:

1. Minimum required volume = 67 cu. Yds x Total Drainage Area (acres)

   67 cu. Yds x 10.3 acres = 690 cu. Yds.
   18633 cu. Ft.

2. Available basin Volume = 700 cu. Yds. At elevation 90
   (from storage-elevation curve) 18887 cu. Ft ✓

3. Excavate 700 cu. Yds. To obtain required volume*
   *Elevation corresponding to required volume = invert of the dewatering orifice.

4. Available volume before cleanout required.

   33 cu. Yds x 10.3 acres = 340 cu. Yds.
   9177 cu. Ft

5. Elevation corresponding to cleanout level= 88.3 ✓
   (From Storage-Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 1.7 ft
   (Minimum = 1.0 ft.)

Dry Storage:

7. Minimum required volume = 67 cu. Yds x Total Drainage Area (acres)

   67 cu. Yds x 10.3 acres = 690 cu. yds
   18633 cu. Ft

8. Total available basin volume at crest of riser* = 1408 cu. Yds at elevation 92.5 .(From Storage - Elevation Curve) ✓

* Minimum = 134 cu. Yds./acre of total drainage area.

9. Diameter of dewatering orifice = 8 in.

10. Diameter of flexible tubing = 10 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 92.5

Top of Dam = 94.0 95 PER PLAN

Design High Water = 93.5 94.0 per PLAN

Upstream Toe of Dam = 86.0

Basin Shape

12. Length of Flow L = 110 ft
Effective Width We 55 ft

If > 2, baffles are not required _____

If < 2, baffles are required _____

Runoff

13. Q(2) = 19.6 cfs (From Chapter 5)

14. Q(25) = 30.9 cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity Qp = Q(2) = 19.6 cfs
(riser and barrel)

Without emergency spillway, required spillway capacity Qp = Q(25) = 30.9 cfs

16. With Emergency Spillway:

Assumed available head (h) = 1.0 ft. (Using Q(2)

h = Crest of Emergency Spillway Elevation - Crest of Riser Elevation

Without emergency spillway:

Assumed available head (h) = _____ ft. (Using Q(25)

h = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter (Dr) = 36 in. Actual Head (h) 1 ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel Length (l) = 45 ft.

Head (H) on barrel through embankment = 4.5 ft.

(From Plate 3.14-7).

19. Barrel diameter = 24 in.

(From Plate 3.14-B [concrete pipe] or Plate 3.14-A [corrugated pipe]).

20. Trash Rack and anti-vortex device

Diameter = 54 in. Thickness Gage 14

Height = 17 in.

(From Table 3.14-D).

21. Required spillway capacity Qe = Q(25) -Qp= 11.3 cfs.

22. Bottom width (b) = 16 ft; the slope of the exit channel (s) = 3.8 ft./foot; and the minimum length of the exit channel (x) = 33 ft.

(From Table 3.14-C).

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = _____ ft

Slope of upstream face of embankment (Z) = _____ :1

Slope of principal spillway barrel (Sb) = _____ %

Length of barrel in saturated zone (Ls) = _____ ft

24. Number of collars required = _____ dimensions = _____
(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 95.0 ✓

Design High Water = 94.0 ✓

Emergency Spillway Crest = 93.5 ✓

Principal Spillway Crest = 92.5 ✓

Dewatering Orifice Invert = 90.0 ✓

Cleanout Elevation = 88.5 ✓

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = 86.0

Culvert Calculator Report
BasinOutlet Pipes

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	0.00 ft	Headwater Depth/ Height	0.14
Computed Headwater Elevation	79.02 ft	Discharge	1.00 cfs
Inlet Control HW Elev	79.00 ft	Tailwater Elevation	79.00 ft
Outlet Control HW Elev	79.02 ft	Control Type	Outlet Control

Grades			
Upstream Invert	78.60 ft	Downstream Invert	78.50 ft
Length	34.50 ft	Constructed Slope	0.002899 ft/ft

Hydraulic Profile			
Profile	M1	Depth, Downstream	0.50 ft
Slope Type	Mild	Normal Depth	0.25 ft
Flow Regime	Subcritical	Critical Depth	0.22 ft
Velocity Downstream	0.65 ft/s	Critical Slope	0.004986 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	3.00 ft
Section Size	36 inch	Rise	3.00 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev	79.02 ft	Upstream Velocity Head	0.01 ft
Ke	0.50	Entrance Loss	0.01 ft

Inlet Control Properties			
Inlet Control HW Elev	79.00 ft	Flow Control	Unsubmerged
Inlet Type	Square edge w/headwall	Area Full	14.1 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Calculator Report
BasinOutlet Pipes

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	0.00	ft	Headwater Depth/ Height	0.24	
Computed Headwater Elevation	79.33	ft	Discharge	5.00	cfs
Inlet Control HW Elev	79.26	ft	Tailwater Elevation	79.00	ft
Outlet Control HW Elev	79.33	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	78.60	ft	Downstream Invert	78.50	ft
Length	34.50	ft	Constructed Slope	0.002899	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	0.50	ft
Slope Type	Mild		Normal Depth	0.54	ft
Flow Regime	Subcritical		Critical Depth	0.49	ft
Velocity Downstream	3.23	ft/s	Critical Slope	0.004131	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev	79.33	ft	Upstream Velocity Head	0.13	ft
Ke	0.50		Entrance Loss	0.07	ft

Inlet Control Properties					
Inlet Control HW Elev	79.26	ft	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	14.1	ft^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
BasinOutlet Pipes

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	0.00 ft	Headwater Depth/ Height	0.35
Computed Headwater Elevation	79.65 ft	Discharge	10.00 cfs
Inlet Control HW Elev	79.55 ft	Tailwater Elevation	79.00 ft
Outlet Control HW Elev	79.65 ft	Control Type	Outlet Control

Grades			
Upstream Invert	78.60 ft	Downstream Invert	78.50 ft
Length	34.50 ft	Constructed Slope	0.002899 ft/ft

Hydraulic Profile			
Profile	M2	Depth, Downstream	0.70 ft
Slope Type	Mild	Normal Depth	0.76 ft
Flow Regime	Subcritical	Critical Depth	0.70 ft
Velocity Downstream	3.99 ft/s	Critical Slope	0.003936 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	3.00 ft
Section Size	36 inch	Rise	3.00 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev	79.65 ft	Upstream Velocity Head	0.20 ft
Ke	0.50	Entrance Loss	0.10 ft

Inlet Control Properties			
Inlet Control HW Elev	79.55 ft	Flow Control	Unsubmerged
Inlet Type	Square edge w/headwall	Area Full	14.1 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Calculator Report
BasinOutlet Pipes

Solve For: Headwater Elevation

Culvert Summary				
Allowable HW Elevation	0.00 ft		Headwater Depth/ Height	0.44
Computed Headwater Elevation	79.91 ft		Discharge	15.00 cfs
Inlet Control HW Elev	79.78 ft		Tailwater Elevation	79.00 ft
Outlet Control HW Elev	79.91 ft		Control Type	Outlet Control

Grades				
Upstream Invert	78.60 ft		Downstream Invert	78.50 ft
Length	34.50 ft		Constructed Slope	0.002899 ft/ft

Hydraulic Profile				
Profile	M2		Depth, Downstream	0.86 ft
Slope Type	Mild		Normal Depth	0.93 ft
Flow Regime	Subcritical		Critical Depth	0.86 ft
Velocity Downstream	4.46 ft/s		Critical Slope	0.003894 ft/ft

Section				
Section Shape	Circular		Mannings Coefficient	0.013
Section Material	Concrete		Span	3.00 ft
Section Size	36 inch		Rise	3.00 ft
Number Sections	2			

Outlet Control Properties				
Outlet Control HW Elev	79.91 ft		Upstream Velocity Head	0.25 ft
Ke	0.50		Entrance Loss	0.13 ft

Inlet Control Properties				
Inlet Control HW Elev	79.78 ft		Flow Control	Unsubmerged
Inlet Type	Square edge w/headwall		Area Full	14.1 ft²
K	0.00980		HDS 5 Chart	1
M	2.00000		HDS 5 Scale	1
C	0.03980		Equation Form	1
Y	0.67000			

Culvert Calculator Report
BasinOutlet Pipes

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	0.00	ft	Headwater Depth/ Height	0.51	
Computed Headwater Elevation	80.12	ft	Discharge	20.00	cfs
Inlet Control HW Elev	79.98	ft	Tailwater Elevation	79.00	ft
Outlet Control HW Elev	80.12	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	78.60	ft	Downstream Invert	78.50	ft
Length	34.50	ft	Constructed Slope	0.002899	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.00	ft
Slope Type	Mild		Normal Depth	1.08	ft
Flow Regime	Subcritical		Critical Depth	1.00	ft
Velocity Downstream	4.84	ft/s	Critical Slope	0.003903	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev	80.12	ft	Upstream Velocity Head	0.30	ft
Ke	0.50		Entrance Loss	0.15	ft

Inlet Control Properties					
Inlet Control HW Elev	79.98	ft	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	14.1	ft^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

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Charles C. Townes & Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
BasinOutlet Pipes

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	0.00 ft	Headwater Depth/ Height	0.63
Computed Headwater Elevation	80.50 ft	Discharge	30.00 cfs
Inlet Control HW Elev	80.34 ft	Tailwater Elevation	79.00 ft
Outlet Control HW Elev	80.50 ft	Control Type	Outlet Control

Grades			
Upstream Invert	78.60 ft	Downstream Invert	78.50 ft
Length	34.50 ft	Constructed Slope	0.002899 ft/ft

Hydraulic Profile			
Profile	M2	Depth, Downstream	1.24 ft
Slope Type	Mild	Normal Depth	1.35 ft
Flow Regime	Subcritical	Critical Depth	1.24 ft
Velocity Downstream	5.47 ft/s	Critical Slope	0.004011 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	3.00 ft
Section Size	36 inch	Rise	3.00 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev	80.50 ft	Upstream Velocity Head	0.38 ft
Ke	0.50	Entrance Loss	0.19 ft

Inlet Control Properties			
Inlet Control HW Elev	80.34 ft	Flow Control	Unsubmerged
Inlet Type	Square edge w/headwall	Area Full	14.1 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Culvert Calculator Report
BasinOutlet Pipes

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	0.00	ft	Headwater Depth/ Height	0.75	
Computed Headwater Elevation	80.84	ft	Discharge	40.00	cfs
Inlet Control HW Elev	80.67	ft	Tailwater Elevation	79.00	ft
Outlet Control HW Elev	80.84	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	78.60	ft	Downstream Invert	78.50	ft
Length	34.50	ft	Constructed Slope	0.002899	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.44	ft
Slope Type	Mild		Normal Depth	1.60	ft
Flow Regime	Subcritical		Critical Depth	1.44	ft
Velocity Downstream	5.99	ft/s	Critical Slope	0.004183	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev	80.84	ft	Upstream Velocity Head	0.45	ft
Ke	0.50		Entrance Loss	0.23	ft

Inlet Control Properties					
Inlet Control HW Elev	80.67	ft	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	14.1	ft^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
BasinOutlet Pipes

Solve For: Headwater Elevation

Culvert Summary				
Allowable HW Elevation	0.00	ft	Headwater Depth/ Height	0.85
Computed Headwater Elevation	81.14	ft	Discharge	50.00 cfs
Inlet Control HW Elev	80.98	ft	Tailwater Elevation	79.00 ft
Outlet Control HW Elev	81.14	ft	Control Type	Outlet Control

Grades				
Upstream Invert	78.60	ft	Downstream Invert	78.50 ft
Length	34.50	ft	Constructed Slope	0.002899 ft/ft

Hydraulic Profile				
Profile	M2		Depth, Downstream	1.61 ft
Slope Type	Mild		Normal Depth	1.84 ft
Flow Regime	Subcritical		Critical Depth	1.61 ft
Velocity Downstream	6.45	ft/s	Critical Slope	0.004408 ft/ft

Section				
Section Shape	Circular		Mannings Coefficient	0.013
Section Material	Concrete		Span	3.00 ft
Section Size	36 inch		Rise	3.00 ft
Number Sections	2			

Outlet Control Properties				
Outlet Control HW Elev	81.14	ft	Upstream Velocity Head	0.52 ft
Ke	0.50		Entrance Loss	0.26 ft

Inlet Control Properties				
Inlet Control HW Elev	80.98	ft	Flow Control	Unsubmerged
Inlet Type	Square edge w/headwall		Area Full	14.1 ft²
K	0.00980		HDS 5 Chart	1
M	2.00000		HDS 5 Scale	1
C	0.03980		Equation Form	1
Y	0.67000			

Culvert Calculator Report
BasinOutlet Pipes

Solve For: Headwater Elevation

Culvert Summary				
Allowable HW Elevation	0.00 ft		Headwater Depth/ Height	0.95
Computed Headwater Elevation	81.44 ft		Discharge	60.00 cfs
Inlet Control HW Elev	81.28 ft		Tailwater Elevation	79.00 ft
Outlet Control HW Elev	81.44 ft		Control Type	Outlet Control

Grades				
Upstream Invert	78.60 ft		Downstream Invert	78.50 ft
Length	34.50 ft		Constructed Slope	0.002899 ft/ft

Hydraulic Profile				
Profile	M2		Depth, Downstream	1.77 ft
Slope Type	Mild		Normal Depth	2.10 ft
Flow Regime	Subcritical		Critical Depth	1.77 ft
Velocity Downstream	6.89 ft/s		Critical Slope	0.004683 ft/ft

Section				
Section Shape	Circular		Mannings Coefficient	0.013
Section Material	Concrete		Span	3.00 ft
Section Size	36 inch		Rise	3.00 ft
Number Sections	2			

Outlet Control Properties				
Outlet Control HW Elev	81.44 ft		Upstream Velocity Head	0.58 ft
Ke	0.50		Entrance Loss	0.29 ft

Inlet Control Properties				
Inlet Control HW Elev	81.28 ft		Flow Control	Unsubmerged
Inlet Type	Square edge w/headwall		Area Full	14.1 ft²
K	0.00980		HDS 5 Chart	1
M	2.00000		HDS 5 Scale	1
C	0.03980		Equation Form	1
Y	0.67000			

Culvert Calculator Report
BasinOutlet Pipes

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	0.00	ft	Headwater Depth/ Height	1.04	
Computed Headwater Elevation	81.72	ft	Discharge	70.00	cfs
Inlet Control HW Elev	81.59	ft	Tailwater Elevation	79.00	ft
Outlet Control HW Elev	81.72	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	78.60	ft	Downstream Invert	78.50	ft
Length	34.50	ft	Constructed Slope	0.002899	ft/ft

Hydraulic Profile					
Profile	M2		Depth, Downstream	1.92	ft
Slope Type	Mild		Normal Depth	2.39	ft
Flow Regime	Subcritical		Critical Depth	1.92	ft
Velocity Downstream	7.31	ft/s	Critical Slope	0.005013	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev	81.72	ft	Upstream Velocity Head	0.65	ft
Ke	0.50		Entrance Loss	0.33	ft

Inlet Control Properties					
Inlet Control HW Elev	81.59	ft	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	14.1	ft^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

ROADSIDE DITCH ANALYSIS

PROJECT: Longhill Grove
DESCRIPTION: Apartment Complex
15-Jul-03

COUNTY: James City

Sta. FROM	Sta. TO	Length (ft)	0.30 Area	0.90 Area	CA Incr.	Acc.	Tc min	I2 in/hr	Q2 cfs	Slope ft/ft	Allow. Vel.	2.6 fps Earth n=0.03 Vel.	4 fps Jute-Mesh n =0.05 Vel.	I10	Q10	D (ft)	D (in)	Material Type
Start (SW corner of BLDG 9)	SE corner of BLDG 7	405	0.62	0.18	0.35	0.35	7	5.05	**1.76**	0.0136	2.60	2.00	1.39	6.59	**2.29**	0.32	4	Earth
SE corner of BLDG 7	STR 5A	150	0.30	0.10	0.18	0.53	10	4.5	**2.37**	0.0133	2.60	2.16	1.49	5.96	**3.15**	0.38	5	Earth
STR 5A	NE corner of BLDG 6	125	0.26	0.06	0.13	0.13	7	5.05	**0.67**	0.0120	2.60	1.44	1.01	6.59	**0.87**	0.20	2	Earth
NE corner of BLDG 6	STR 28	200	0.44	0.06	0.19	0.32	10	4.5	**1.43**	0.0238	2.60	2.29	1.60	5.96	**1.89**	0.25	3	Earth

STORM SEWER INLET COMPUTATIONS and STRUCTURE SCHEDULE
(Spread and Inlets)

PROJECT: Longhill Grove Apts
DESCRIPTION: Apartment Complex

COUNTY: James City County

Date: March 17, 2003
REVISED :
REVISED :
REVISED :

Inlet

NUMBER	TYPE	ON GRADE INLET	LENGTH	STATION	A - DRAINAGE	C	CA	CAw	I IN/HR	Q Increment CFS	Q Carry over CFS	Q Gutter Flow Left	Q Gutter Flow right	Qt Gutter Flow Total CFS	S Gutter Slope ft/ft	Sx Cross Slope ft/ft	T (spread) ft left	T (spread) ft right	T (spread) ft	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo(#10)	a = 12W(Sw-Sx)	S'w = a/12W	Se(ft/ft)=Sx+S'wEo	Lt(ft)	P effect. Length FT	L/Lt	d(ft) #17	E(#16)	h(ft)	d/h	Q intercepted CFS	Q carryover CFS	T spread = d/Sx @ sag ft	REMARKS
1A	DI-7		2.5		0.30	0.40	0.12		6.6	0.8	0.00			0.8	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
1	DI-3A		2.5		0.38	0.60	0.23		6.4	1.5	0.00			1.5	0.0200	0.0208				2.00									6.10		0.25		0.50	0.50			12.02	OK
3	DI-3B		4		0.54	0.60	0.32		6.3	2.0	0.00			2.0	0.0200	0.0208				2.00									7.60		0.20		0.50	0.40			9.62	OK
5	DI-3A		2.5		0.42	0.60	0.25		6.3	1.6	0.00			1.6	0.0200	0.0208				2.00									6.10		0.25		0.50	0.50			12.02	OK
7	DI-3A		10		0.81	0.60	0.49		6.1	3.0	0.00			3.0	0.0200	0.0208				2.00									13.60		0.20		0.50	0.40			9.62	OK
18	DI-3A		2.5		0.40	0.60	0.24		6.6	1.6	0.00			1.6	0.0200	0.0208				2.00									6.10		0.25		0.50	0.50			12.02	OK
20	DI-3B		14		1.29	0.60	0.77		6.5	5.0	0.00			5.0	0.0200	0.0208				2.00									17.60		0.25		0.50	0.50			12.02	OK
22	DI-3C		20		2.09	0.70	1.46		6.4	9.4	0.00			9.4	0.0200	0.0208				2.00									23.60		0.30		0.50	0.60			14.42	OK
24	DI-7		2.5		1.10	0.60	0.66		6.6	4.4	0.00			4.4	0.0200	0.0208				2.00									6.10		0.50		0.50	1.00			24.04	OK
26	DI-3A		2.5		0.19	0.80	0.15		6.5	1.0	0.00			1.0	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
9	JB-1		2.5		0.76	0.50	0.38		6.0	2.3	0.00			2.3	0.0200	0.0208				2.00									6.10		0.40		0.50	0.80			19.23	OK
11	DI-7		2.5		0.18	0.60	0.11		6.0	0.6	0.00			0.6	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
30	DI-3A		4		0.60	0.50	0.30		6.6	2.0	0.00			2.0	0.0200	0.0208				2.00									7.60		0.20		0.50	0.40			9.62	OK
32	DI-3A		4		0.47	0.70	0.33		6.4	2.1	0.00			2.1	0.0200	0.0208				2.00									7.60		2.00		0.50	4.00			96.15	DOLT
36	DI-3A		2.5		0.12	0.80	0.10		6.6	0.6	0.00			0.6	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK
34	DI-3A		2.5		0.29	0.70	0.20		6.4	1.3	0.00			1.3	0.0200	0.0208				2.00									6.10		0.20		0.50	0.40			9.62	OK
13	DI-3A		6		1.03	0.50	0.52		5.9	3.1	0.00			3.1	0.0200	0.0208				2.00									9.60		0.25		0.50	0.50			12.02	OK
38	DI-3A		4		0.52	0.60	0.31		6.6	2.1	0.00			2.1	0.0200	0.0208				2.00									7.60		0.20		0.50	0.40			9.62	OK
15	DI-3A		2.5		0.14	0.60	0.08		5.9	0.5	0.00			0.5	0.0200	0.0208				2.00									6.10		0.10		0.50	0.20			4.81	OK

NEED HGL.

STORM SEWER DESIGN COMPUTATIONS
PIPE SIZING

PROJECT: Longhill Grove Apts COUNTY: James City County Date: March 17, 2003 REVISED :
DESCRIPTION: Apartment Complex REVISED :
REVISED :

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
FROM	TO	IDA	RUNOFF	"CA"		Tc	I10	Q10	INV.ELEV.		L	S	D	Qcap	V10	Time	Status
POINT	POINT	ACRES	"C"	INC.	ACC.	MIN.	IN/HR	CFS	UPPER	LOWER	FT	FT/FT	IN	CFS	FPS	MIN.	
1A	1B	0.3	0.4	0.12	0.12	7	**6.6**	**0.79**	97.08	96.69	130.00	0.0030	**15**	3.54	2.9	0.75	OK
1	3	0.60	0.60	0.36	0.48	7.8	**6.4**	**3.08**	96.59	93.50	206.01	0.0150	**15**	7.91	6.4	0.53	OK
3	5	0.80	0.60	0.48	0.96	8.3	**6.3**	**6.05**	93.40	92.32	71.61	0.0150	**15**	7.91	6.4	0.19	OK
5	7	0.73	0.60	0.44	1.40	8.5	**6.3**	**8.76**	92.07	90.12	279.11	0.0070	**18**	8.79	5.0	0.94	OK
7	9	0.94	0.60	0.56	1.96	9.4	**6.1**	**11.91**	89.87	83.65	138.25	0.0450	**21**	33.60	14.0	0.16	OK
18	20	0.63	0.60	0.38	0.38	7.0	**6.6**	**2.49**	92.77	89.95	187.96	0.0150	**15**	7.91	6.4	0.49	OK
20	22	1.39	0.60	0.83	1.21	7.5	**6.5**	**7.85**	89.70	89.26	72.26	0.0060	**18**	8.13	4.6	0.26	OK
22	9	2.09	0.70	1.46	2.68	7.7	**6.4**	**17.18**	88.76	83.40	134.17	0.0400	**24**	45.23	14.4	0.16	OK
24	26	1.14	0.60	0.68	0.68	7.0	**6.6**	**4.51**	86.36	85.72	63.79	0.0100	**15**	6.46	5.3	0.20	OK
26	9	0.19	0.80	0.15	0.84	7.2	**6.5**	**5.47**	85.62	84.15	147	0.0100	**15**	6.46	5.3	0.47	OK
28	9	1.47	0.50	0.74	0.74	10.0	**6.0**	**4.38**	86.87	84.15	68	0.0400	**15**	12.91	10.5	0.11	OK
9	11	0.76	0.50	0.38	6.59	9.5704	**6.0**	**39.79**	82.40	82.17	57.09	0.0040	**36**	42.18	6.0	0.16	OK
11	13	0.18	0.60	0.11	6.70	9.7	**6.0**	**40.24**	82.07	79.68	238.86	0.0100	**36**	66.69	9.4	0.42	OK
30	32	0.70	0.50	0.35	0.35	7.0	**6.6**	**2.31**	84.94	84.54	134.00	0.0030	**15**	3.54	2.9	0.77	OK
32	34	0.47	0.70	0.33	0.68	7.8	**6.4**	**4.36**	84.44	83.78	66.22	0.0100	**15**	6.46	5.3	0.21	OK
36	34	0.22	0.80	0.18	0.18	7.0	**6.6**	**1.16**	84.22	83.78	146.50	0.0030	**15**	3.54	2.9	0.85	OK
34	13	0.29	0.70	0.20	1.06	7.8	**6.4**	**6.77**	83.68	81.33	156.35	0.0150	**15**	7.91	6.4	0.40	OK
13	15	1.03	0.50	0.52	8.27	10.152	**5.9**	**49.02**	79.58	79.27	52.05	0.0060	**36**	51.66	7.3	0.12	OK
38	15	0.62	0.60	0.37	0.37	7.0	**6.6**	**2.45**	82.03	80.92	110.99	0.0100	**15**	6.46	5.3	0.35	OK
15	17	0.14	0.60	0.08	8.73	10.3	**5.9**	**51.53**	79.17	79.00	24.00	0.0070	**36**	55.80	7.9	0.05	OK

· ENSURE CLEANSING VELOCITY

DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6671 Fax: (757) 253-6850 E-MAIL: devtman@james-city.va.us

CODE COMPLIANCE
(757) 253-6626
codecomp@james-city.va.us

ENVIRONMENTAL DIVISION
(757) 253-6670
environ@james-city.va.us

PLANNING
(757) 253-6685
planning@james-city.va.us

COUNTY ENGINEER
(757) 253-6678

INTEGRATED PEST MANAGEMENT
(757) 253-2620

OFFSITE

DA-1	1.43
DA-2	0.45
DA-3	0.21
DA-4	0.09
DA-5	0.06
	2.24

ONSITE

DA-1	0.12	DA-18	0.04
DA-2	0.10	DA-19	0.65
DA-3	0.35	DA-20	0.19
DA-3A	0.20	DA-21	0.13
DA-4	0.13	DA-22	0.76
DA-5	0.13	DA-23	0.18
DA-6	0.54	DA-24	0.10
DA-7	0.13	DA-25	0.60
DA-8	0.18	DA-26	0.10
DA-9	0.42	DA-27	0.10
DA-10	0.13	DA-28	0.12
DA-11	0.81	DA-29	0.29
DA-12	0.13	DA-30	0.47
DA-13	0.10	DA-31	0.13
DA-14	0.40	DA-32	1.03
DA-15	0.10	DA-33	0.52
DA-16	1.29	DA-34	0.14
DA-17	0.66	DA-POND	0.54
	5.92		12.01 AC.

2.24 + 12.01 = 14.25 AC. NOT 14.09 AC.

Townes
SITE ENGINEERING

2ND RPV

REPORT OF FINDINGS
PRELIMINARY GEOTECHNICAL INVESTIGATION
LONGHILL GROVE APARTMENT SITE
JAMES CITY COUNTY, VIRGINIA

SP-44-03

ASK US HOW.

REPORT OF FINDINGS
PRELIMINARY GEOTECHNICAL INVESTIGATION
LONGHILL GROVE APARTMENT SITE
James City County, Virginia

Prepared for:
EAGLE CONSTRUCTION OF VIRGINIA INC.
Richmond, Virginia

Prepared by:
TOWNES SITE ENGINEERING
Chesterfield, Virginia

April 2003

BASIN
EXIST 80-84
BOTTOM 77.0
3' - 7' DEEP
CUT IN BASIN.

BORING 16
AT BASIN
Perched GW @ 4.5
AT BORING 16

Townes
SITE ENGINEERING

April 23, 2003

Eagle Construction of Virginia, Inc.
Attn: Mr. Buzz Harris
4191 Innslake Drive, Suite 100
Glen Allen, Virginia 23060

Re: Preliminary Geotechnical Study
Longhill Grove Apartments Site
James City County, Virginia
Townes Project No. 2003043

Dear Mr. Harris,

TOWNES SITE ENGINEERING is pleased to submit this report addressing the subsurface exploration and geotechnical analysis for the above referenced site. These services were performed to aid in the design and construction of foundations, pavement and other soil related aspects of construction.

TOWNES SITE ENGINEERING greatly appreciates the opportunity to serve as your geotechnical engineering consultant on this project, and we look forward to continuing our cordial working relationship on this and future efforts. Please do not hesitate to call if you have any questions concerning any aspects of this report.

Sincerely,

Brent E. Johnson
Senior Environmental Geologist

Charles E. Townes P.E.
President

COMMONWEALTH OF VIRGINIA
CHARLES E. TOWNES
CERTIFICATE No.
10478
PROFESSIONAL ENGINEER

ASK US HOW.
9850 Lori Road, Suite 201 Chesterfield, VA 23832
804-748-9011 Fax 804-748-2590 www.cctownes.com

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1.0 SCOPE OF SERVICES

Our scope of services for this project included preliminary subsurface exploration and geotechnical analysis for the subject site. The investigation consisted of evaluating test borings and geological data to develop general construction and building recommendations for land use as a multifamily apartment complex. Laboratory tests were performed on selected samples to confirm field classification and to clarify any potential shrink/swell concerns as well as additional construction considerations.

Drilling services provided by Houff Drilling included drilling 16 borings to a depth of 15 feet. These borings were field surveyed based upon the preliminary layout provided by Townes Site Engineering. The test borings were located approximately at the center of each proposed building envelope. The boring locations are illustrated on the Boring Location Plan (Figure 2, Appendix 1).

This report completes our services for this phase of the project. Included herein are our conclusions and foundation recommendations.

2.0 DESCRIPTION OF PROJECT

The subject site is located on a 15.82-acre parcel at the intersection of Centerville Road and Longhill Road in James City County, Virginia (See Appendix 1, Figure 1). A portion of the site is currently undeveloped. The remaining area of the site contains five existing abandoned apartment buildings. Based upon the current layout, these building are to be completely removed prior to development of the site.

3.0 SUBSURFACE EXPLORATION AND SOIL CLASSIFICATION

3.1 Description of Subsurface Exploration

Sixteen (16) soil test borings (B-1 through B-16) were advanced to depths of 15 feet below existing grade (Figure 2, Appendix 1). These borings were field located by survey personnel from **TOWNES SITE ENGINEERING** in accordance with the preliminary plan. The soil borings were completed with an ATV-mounted Central Mine Equipment drilling rig. A description of the methods and procedures used to perform soil sampling and classification are presented below.

3.1.1 Soil Sampling/Classification

A six (6) inch hollow stem auger was used to advance each drilled borehole. Representative soil samples were obtained by means of the split-barrel sampling procedure in general accordance with ASTM Specification D-1586. In this procedure, a 2 inch OD, 1 3/8 inch ID, split-barrel sampler is driven into the soil a distance of 18 inches by means of a 140 pound hammer falling 30 inches. The Standard Penetration Resistance (SPR) Value is the number of blows per foot of

Townes
SITE ENGINEERING
9850 LORI ROAD SUITE 201
CHESTERFIELD, VIRGINIA 23832

PHONE (804) 748-9011
FAX (804) 748-2590

LETTER OF TRANSMITTAL

DATE 1/14/05
JOB NO. 2003 2167 ~~3004043~~
ATTENTION SCOTT THOMAS, P.E.
RE: LONGHILL GROVE BMP FACILITY

TO PUBLIC WORKS ENGINEERING
101 MOUNTS BAY RD
WILLIAMSBURG, VA 23187-8784

RECEIVED
JAN 18 2005
ENVIRONMENTAL DIVISION

WE ARE SENDING YOU ☐ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☑ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1	1/14		MYLAR PLANS
1	1/14		BOND PLANS
1	1/14		FORM

PC195
SP-44-03

THESE ARE TRANSMITTED as checked below:

☑ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
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☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment ☐ _____
☐ FOR BIDS DUE _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS _____

COPY TO _____

SIGNED: B Mitchell (CHAV)

If enclosures are not as noted, kindly notify us at once.

penetration for the final 12 inches of driving. This value can be used to provide a qualitative indication of the in-place relative density of cohesionless soils. This indication is qualitative, since many factors can significantly affect the Standard Penetration Resistance Value and prevent direct correlation between samples obtained by various drill crews, drill rigs, drilling procedures, and hammer-rod-spoon assemblies.

A field log of the soils encountered in the borings was prepared by the geotechnical engineer. All soil samples obtained from the drilling operations were sealed immediately in the field and brought to our office for additional examination.

An experienced geotechnical engineer classified each soil sample on the basis of texture and plasticity in accordance with the Unified Soil Classification System, and ASTM D-2488. The group symbols for each soil type are indicated in the parentheses following the soil descriptions on the boring logs. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs are approximate. The actual contact between material types may be transitional.

3.1.2 Regional Geology

The site is located in the in the Coastal Plain Physiographic Province of Virginia. The Coastal Plain consists of eastward dipping bands of sediment, which generally parallel the coast. The sediments were deposited during transgressive and regressive shallow seas, which occurred during Miocene and Pliocene times. These sediments overlie crystalline bedrock formed over 200 million years ago that are now buried between 40 and 100 feet below the existing surface. Regressive deposits of sands, gravels and fluvial clay known as the Bacons Castle Formation in particular dominate the site. These Tertiary sediments were deposited during the last ocean regression where it is established that the James Rivers assumed its modern course. The subject site exists at a topographic elevation between 85 and 105 feet above sea level according to the Norge Virginia U.S.G.S. quadrangle map. The property gently slopes to the east and southeast toward an unnamed tributary to Powhatan Creek.

3.1.3 Soil Conditions

Topsoil and a layer of organically rich material were encountered within the top 12 inches of each boring. The areas of the site currently in agricultural use have increased thickness between 12 and 15 inches due to tilling operations. These materials are unsuitable for construction and will need to be removed. Uncontrolled Fill material was encountered within test borings B3, B15, & B16. Uncontrolled fill material located within the limits of construction should be removed at the direction of a geotechnical engineer. **Perched groundwater was encountered in borings B-13 and B-16 at depths of 4.5 feet below the surface.** At these depths, groundwater could pose a problem to excavation in these areas. The areas appeared to be isolated and groundwater should not be a severe concern to the development of the entire site. However, it should be noted that, depending on time of year, precipitation, and surface moisture,

BASIN
82
- 4.5
77.5
NO 80.3 ok.

groundwater could influence the bearing capacity of natural soil. An effective drainage system should be implemented to control surface moisture and provide positive drainage from the construction area.

Soil encountered below the surface materials and identified fills appeared to be undisturbed. The typical soil profile is described below. For soil descriptions at a particular boring location, the respective boring log should be reviewed. Logs of the exploratory borings are included in APPENDIX 2.

Based on visual observation and the split-spoon samples, the subsurface soil profile appears to consist of loose to medium dense silty sands and clayey sands and stiff to very stiff lean clays and silts.

STRATUM 1

Composition: light brown, yellowish brown, reddish brown, strong brown, and gray, very fine to coarse, friable, moist to wet, light mottling, silty sand, clayey sand, and small lenses of well graded sand, (SM, SC, & SW)

Distribution: Stratum 1 was observed in all test borings from immediately beneath the surface materials to contact with stratum 2 or boring termination at an average depth of 10.0 feet below grade.

Blow counts (N-values) within this stratum ranged from 1 blow per foot to 18 blows per foot, with an average value of 10.0 blows per foot. These values indicate a " loose to medium dense" relative density for the soils in Stratum 1.

STRATUM 2

Composition: gray, reddish brown, yellowish brown, and strong brown, very fine to medium, moist to wet, friable to subangular blocky, mottled, Lean Clay and Silt with interbedded lenses of Clayey Sand (CL, ML).

Distribution: Stratum 2 was encountered in test borings B4, B6-B11, B13, B14, & B16. The stratum was found to be interbedded with stratum 1 or below stratum 1 to boring termination.

Blow counts (N-values) within this stratum ranged from 3 blows per foot to 20 blows per foot, with an average value of 11.0 blows per foot. These values indicate a "stiff to very stiff" relative density for the soils in Stratum 2.

3.2 General Groundwater Conditions

Water level observations were made after the completion of drilling operations. In power auger operations used at the site, water was not introduced into the boreholes during drilling. Groundwater elevations can often be ascertained by observing water seepage into the boreholes during and after drilling and the moisture content of recovered samples. The water observations are noted on the respective boring logs. It should be noted that, dependent on the permeability of the in-place soils, it could take several hours for the groundwater levels to stabilize within each borehole. Fluctuations in the location of the long-term water table may occur seasonally and are dependent upon variations in precipitation, evaporation, and surface run-off. Groundwater was encountered in borings B-13 and B-16 at a depth of 4.5 feet below the surface. At this depth, groundwater could pose a problem to excavation of footings and basins within these areas. These areas of near surface groundwater appear to be isolated and should not pose a severe problem to development of the entire site. However, it should be noted that, depending on time of year, precipitation, and surface moisture, groundwater could influence the bearing capacity of natural soil. An effective drainage system should be implemented to control surface moisture and provide positive drainage from the construction area.

3.3 Laboratory Tests

Laboratory testing was performed to confirm field classification and to determine plasticity and clay fraction of the soils. Two separate composite samples obtained from drill clippings and submitted to the laboratory for testing. These samples were tested for Atterberg Limits, natural moisture content, sieve analysis, and Standard Proctor testing (See Appendix 3, Laboratory Results). A brief description of the methods and procedures used to perform the various laboratory tests are presented below.

3.3.1 Natural Moisture Content

Moisture content measurement was made to determine the natural in-place soil moisture. The moisture content of the soil is the ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the dry soil particles. The test was performed in general accordance with ASTM D-2216.

3.3.2 Grain Size

The percent by weight passing the No. 200 sieve was determined by washing. This test indicates the amount of sand present and was performed for classification purposes. The test was performed in general accordance with ASTM D-1140.

3.3.3 Soil Plasticity/Atterberg Limits

In order to determine the plasticity characteristics of the soils and their behavior with changes in moisture content, tests to determine the Plastic Limit (PL) and Liquid Limit (LL) of the soils were performed. The Liquid Limit is the moisture content at which the soil will flow as a heavy viscous liquid, while the Plastic Limit is the moisture content at which the soil begins to lose its plasticity. The soil's Plasticity Index (PI = LL - PL) indicates the range of water contents in which the soil will behave plastically, or deform without cracking. These tests were performed in general accordance with ASTM D-4318.

3.3.4 Laboratory Compaction – Standard Effort

Three standard proctors were performed on bulk samples submitted to the soil laboratory. This testing method is used to determine the relationship between water content and dry unit weight of soils to produce compaction in accordance with ASTM D-698 (See Appendix 3, Proctor results Figures 3, 4 & 5)

4.0 RECOMMENDATIONS AND CONCLUSIONS

4.1 Proposed Construction

This preliminary geotechnical study has been conducted based upon potential land used as an apartment complex. The proposed development will consist of fourteen three-story apartment buildings and a two-story clubhouse. The apartment buildings are anticipated to be wood frame with vinyl siding.

4.2 Construction Considerations

Topsoil and organic surface material was noted at an average depth of 12 inches. Areas that have been in use as agricultural fields have increased topsoil to near 15 inches due to tilling operations. With clearing and grubbing of the wooded areas it should be anticipated that stripping would include approximately twelve inches of unsuitable material. **Uncontrolled fill material was encountered in test borings B-3, B-15, and B-16 to depths of 1.0-3.0 feet.** These areas are associated with backfill, retaining wall and grading of the existing apartment complex. Based upon other observations of the site, additional isolated areas of uncontrolled fill material will likely be encountered during construction around existing apartment buildings. The fill amounts appear to be minor and should not pose a significant threat to development. All uncontrolled and organic laden soils are unsuitable for construction and should be removed.

Groundwater was encountered in borings B-13 and B-16 at a depth of 4.5 feet below the surface. At this depth, groundwater could pose a problem to excavation of footings and basins within these areas. These areas of near surface groundwater appear to be isolated and should not pose a severe problem to development of the entire site. However, it should be noted that, depending on

time of year, precipitation, and surface moisture, groundwater could influence the bearing capacity of natural soil. An effective drainage system should be implemented to control surface moisture and provide positive drainage from the construction area.

Soil classification from bulk samples obtained during drilling operations indicates A-2-4 to A-4 soils according to the AASHTO system of classification, which indicate a good to fair subgrade rating. Maximum dry density values range from 107.3 to 112.4 pounds per cubic foot. (See Appendix 3, Standard Proctor results). With the exception of soils previously identified as unsuitable, all soils identified, as stratum 1 should be suitable for use as structural fill material. Soils identified as stratum 2 are fair to poor sources of structural fill material and should be verified by a qualified geotechnical engineer prior to use. Maximum dry density values above 100 pounds per cubic foot are generally considered good engineered fill material. Soil classification and physical properties tested indicated soils adequate for typical construction use.

4.3 Foundation Recommendations

The soils identified in stratums 1 and 2 encountered onsite are capable of supporting typical frame and masonry structures. Site observation and laboratory analyses indicate that subsurface soils within these stratums exhibit low plasticity.

Based on the conditions encountered and our experience with similar sites, we recommend that the proposed building be supported on conventional spread footing foundations. These would bear within the suitable undisturbed natural soil, or on a pad of engineered fill provided that the fills are selected and suitably compacted as described below. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. These bearing capacities are based on a maximum settlement of 1 inch with a differential settlement of 3/4 inch.

For ease of construction and to avoid a local shear or "punching" failure of the footings, minimum column and continuous wall footing widths of 36 inches and 24 inches, respectively, should be used. In order to provide adequate frost cover protection and to avoid questionable soils, we recommend that all exterior footings be excavated to a minimum of 24 inches below the final exterior ground elevation. The depth of interior column footing excavations should also be a minimum of 18 inches below the slab on grade.

Seismic Considerations

Based on our subsurface exploration and referencing Table 1610.3.1 BOCA National Building Code, the site soils appear to fit profile Type *S1*. The seismic coefficient for this soil is 1.0.

The following is a more detailed examination of each of the fifteen buildings that has been incorporated with the overall analysis of the site.

BUILDING #1

Building #1 is a type "B" structure consisting of a twelve unit, three-story frame structure. One boring (B-1) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 93.5'. Grading indicates the cut and fill of between 1.0 to 2.0 feet of material to achieve subgrade elevations for the building pad. The building pad will therefore be placed within both undisturbed natural soil and on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. Areas of unsuitable materials and uncontrolled fill from the demolition of the existing structure may be encountered during site work. A qualified geotechnical engineer should verify the suitability of subgrade materials and identify materials to be removed. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. Site observation and laboratory analysis indicate that the existing subsurface soils at the proposed footing depth relate to Stratum 1 soils, which exhibit **low** plasticity. Therefore we conclude that there is **low** threat of structural damage due to shrink/swell action of these soils (See Appendix 3 for Laboratory Results).

BUILDING #2

Building #2 is a type "B" structure consisting of a twelve unit, three-story frame structure. One boring (B-2) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 96.5'. The building pad will therefore be placed within both undisturbed natural soil and on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. Areas of unsuitable materials and uncontrolled fill from the demolition of the existing structure may be encountered during site work. A qualified geotechnical engineer should verify the suitability of subgrade materials and identify materials to be removed. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings. Site observation and laboratory analysis indicate that the existing subsurface soils at the proposed footing depth relate to Stratum 1 soils, which exhibit **low** plasticity. Therefore we conclude that there is **low** threat of structural damage due to shrink/swell action of these soils (See Appendix 3 for Laboratory Results).

BUILDING #3

Building #3 is a type "B" structure consisting of a twelve unit, three-story frame structure. One boring (B-3) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 88.5'. This will require the cut and fill of between 1 and 3 feet throughout the entire building pad. The building pad will therefore be placed within both undisturbed natural soil and on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. Areas of unsuitable materials and uncontrolled fill from the demolition of the existing structure may be encountered during site work. A qualified geotechnical engineer should verify the suitability of subgrade materials and identify materials to be removed. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. Site observation and laboratory analysis indicate that the existing subsurface soils at the proposed footing depth relate to Stratum 1 soils, which exhibit **low** plasticity. Therefore we conclude that there is **low** threat of structural damage due to shrink/swell action of these soils (See Appendix 3 for Laboratory Results).

BUILDING #4

Building #4 is a type "A" structure consisting of a twelve unit, three-story frame structure. One boring (B-4) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 84.0'. This will require the placement of approximately 1.0 foot or less of material throughout the building pad. The building pad will therefore be placed within both undisturbed natural soil and on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. Areas of unsuitable materials and uncontrolled fill from the demolition of the existing structure may be encountered during site work. A qualified geotechnical engineer should verify the suitability of subgrade materials and identify materials to be removed. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings. Site observation and laboratory analysis indicate that the existing subsurface soils at the proposed footing depth relate to Stratum 1 soils, which exhibit **low** plasticity. Therefore we conclude that there is **low** threat of structural damage due to shrink/swell action of these soils (See Appendix 3 for Laboratory Results).

BUILDING #5

Building #5 is a type "A" structure consisting of a twelve unit, three-story frame structure. One boring (B-5) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 96.5. This will require the placement of approximately 2.0 to 3.0 feet of material throughout the building pad. The building pad will therefore be placed entirely on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings.

BUILDING #6

Building #6 is a type "B" structure consisting of a twelve unit, three-story frame structure. One boring (B-6) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 98.5. This will require the placement of approximately 1.0 to 3.0 feet of material throughout the building pad. The building pad will therefore be placed entirely on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings.

BUILDING #7

Building #7 is a type "C" structure consisting of a fourteen unit, three-story frame structure. One boring (B-7) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 100.5'. This will require the removal of approximately 1.0 foot of material from within the limits of the building pad. The building pad will therefore be placed within suitable undisturbed natural soil. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Site observation and laboratory analysis indicate that the existing subsurface soils at the proposed footing depth relate to Stratum 1 soils, which exhibit **low** plasticity. Therefore we conclude that there is **low** threat of structural damage due to shrink/swell action of these soils (See Appendix 3 for Laboratory Results).

BUILDING #8

Building #8 is a type "A" structure consisting of a twelve unit, three-story frame structure. One boring (B-8) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 102.5'. This will require the placement of 1.0 to 3.0 feet of controlled fill material within the building pad. The building pad will therefore be placed entirely on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings.

BUILDING #9

Building #9 is a type "B" structure consisting of a twelve unit, three-story frame structure. One boring (B-9) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 103.5'. This will require the removal of approximately 1.0 foot of material from the western end of the building and the placement of approximately 1.0 foot of material at the eastern end of the pad. The building pad will therefore be placed within both undisturbed natural soil and on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings. Site observation and laboratory analysis indicate that the existing subsurface soils at the proposed footing depth relate to Stratum 1 soils, which exhibit **low** plasticity. Therefore we conclude that there is **low** threat of structural damage due to shrink/swell action of these soils (See Appendix 3 for Laboratory Results).

BUILDING #10

Building #10 is a type "A" structure consisting of a twelve unit, three-story frame structure. One boring (B-10) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 102.5'. This will require the placement of approximately 1.0 to 3.0 feet of controlled fill material within the building pad. The building pad will therefore be placed entirely on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A

qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings.

BUILDING #11

Building #11 is a type "B" structure consisting of a twelve unit, three-story frame structure. One boring (B-11) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 100.5'. This will require the cut and fill of less than 1.0 foot of material throughout the building pad. The building pad will therefore be placed within both undisturbed natural soil and on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings. Site observation and laboratory analysis indicate that the existing subsurface soils at the proposed footing depth relate to Stratum 1 soils, which exhibit **low** plasticity. Therefore we conclude that there is **low** threat of structural damage due to shrink/swell action of these soils (See Appendix 3 for Laboratory Results).

BUILDING #12

Building #12 is a type "B" structure consisting of a twelve unit, three-story frame structure. One boring (B-12) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 97.5'. This will require the placement of approximately 1.0 to 3.0 feet of controlled fill material within the building pad. The building pad will therefore be placed entirely on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings.

BUILDING #13

Building #13 is a type "A" structure consisting of a twelve unit, three-story frame structure. One boring (B-13) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 99.5'. This will require the placement of approximately 1.0 to 3.0 feet of controlled fill material within the building pad. The building pad will therefore be placed entirely on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in

control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings. Perched groundwater was encountered within the near surface soils of this area. It should be noted, that depending on the time of year the footing is excavated, groundwater could influence the bearing capacity of the in-place natural soils.

BUILDING #14

Building #14 is a type "A" structure consisting of a twelve unit, three-story frame structure. One boring (B-14) was advanced within the limits of the proposed building pad. According to the grading plan the finished floor is at an elevation of 101.0'. This will require the placement of approximately 3.0 to 4.0 feet of controlled fill material throughout the building pad. The building pad will therefore be placed entirely on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings.

CLUB HOUSE

The Club House structure consists of a 1852 square foot, two-story frame structure and associated pool area. One boring (B-15) was advanced within the limits of the proposed building envelope. According to the grading plan the finished floor is at an elevation of 95.5'. This will require the placement of approximately 1.0 to 3.0 feet of material within the building pad. The building pad will therefore be placed entirely on a pad of engineered fill provided that the fills are selected and suitably compacted as described in this report. The spread footings for the proposed building may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot, subject to field inspection and verification as detailed below. Provided the footings are placed in control fill material as specified by this report the material should exhibit low plasticity. A qualified geotechnical engineer should verify the material and its potential for shrink/swell concerns prior to placement of footings. Small amounts of uncontrolled fill material were encountered in this area during drilling operations. The fill material should be completely removed prior to placement of engineered fill.

STORMWATER BASIN

One boring (B-16) was advanced within the limits of the proposed stormwater basin. According to the grading plan the bottom elevation of the basin is at contour 78.0'. Groundwater was encountered at or just above this elevation. Uncontrolled, highly organic and wet material was also encountered in the top four feet of this boring. This material is unsuitable for use as structural fill or an impermeable layer of an embankment and will need to be removed if in areas

of such use. The location of the groundwater should be helpful for aquatic growth required for a wet pool design.

4.4 Floor Slab Design

The floor slab is to be constructed on previously undisturbed suitable natural soils, or suitably compacted structural fill. The floor slab should be designed for the anticipated loading conditions and a suitable number of crack control joints should be installed. The slab should be nominally reinforced to maintain integrity should minor differential movement occur. Before the placement of any fill, the floor slab subgrade should be proof rolled using a loaded tandem axle dump truck. Refer to sections 5.6 and 5.7 respectively for details on proof rolling and engineered fills.

To protect the slab against the effects of capillary rise, we recommend that it be constructed on a layer (typically between 4 and 8 inches) of clean sand or gravel with a maximum nominal size of 1.5 inches (if gravel), and with a maximum fines content (passing #200 sieve) of 5%. A vapor barrier placed should be utilized for additional moisture protection.

4.5 Paved Parking Area Preparation

Upon completion of site earthwork, the subgrade material within the proposed paved areas should be field inspected and proofrolled as described below prior to the placement of stone. Based upon field observation and laboratory testing the subsurface materials are considered adequate base material and should support the typical pavement section as shown on the construction plans.

4.6 Field Inspection and Verification

The suitability of near-surface soils in foundation areas between borings should be verified by visual observation and proof rolling, as discussed in detail below. In addition, we suggest that the opened footing excavations be explored for uniformity of soil properties and tested utilizing a pocket Penetrometer, or suitable substitute, to verify design pressures. The inspection is intended to locate any unexpected soft spots which may require undercutting and backfilling with crushed stone or other suitable structural fill material to provide uniform bearing. This inspection should be performed before any reinforcing steel or concrete is placed.

The prepared foundation bearing soils should not be left exposed during inclement weather (rain or freezing). Saturation and subsequent disturbance of these soils can result in loss of strength and bearing capacity, leading to increased settlement.

4.7 Proof Rolling

After removal of the demolition debris, existing vegetation, topsoil, and other unsuitable materials, the building sites, driveways, and parking areas should be proof rolled using a loaded

tandem axle dump truck. The proof rolling should be performed in order to aid in locating any soft areas within the subsurface. Proof rolling of the exposed surface should consist of an adequate number of passes, evenly distributed in perpendicular directions, to characterize the entire surface. All proof rolling should be observed by an experienced geotechnical engineer. Any areas which pump or rut should be undercut to firm soil and replaced with engineered fill.

4.8 Selection and Placement of Engineering Fill

Before placing engineered fill, we recommend that the exposed surface be inspected by an experienced geotechnical engineer. At that time, the construction area should be proof rolled as described in section 5.6 above. Any fill to be utilized at the site, except clean sand or gravel to be placed immediately beneath the floor slab for protection against capillary rise, should be selected on the basis of its plasticity characteristics and laboratory compaction tests. On-site soils, which are found to contain deleterious material, including organic material and topsoil, should not be used as engineered fill for support of structures. In addition, soils having a Plasticity Index (PI) in excess of 20 and/or a Standard Proctor (ASTM D-698) maximum dry density of less than 85 pounds per cubic foot should not be used, without prior engineering evaluation and approval.

Fill placed within the proposed construction area should be compacted to a minimum of 95% of the maximum dry density obtained in accordance with ASTM Specification D-698 (Standard Proctor). All fill should be placed and mechanically compacted in uniform lifts not exceeding 9 inches in loose thickness. The moisture content of all fill at the time of placement should be within plus or minus 3% of the optimum moisture content established by the laboratory compaction test.

Fills placed against sloping surfaces should be "knit" or benched into the existing slope in horizontal layers in such a manner to provide satisfactory bond and to avoid planar surfaces of potential sliding. Materials should not be placed when either the fill material or the foundation surface is excessively wet, frozen, improperly compacted, or otherwise unsuitable.

We recommend that the fill be carefully observed during placement to determine if proper compaction is being achieved within the building and parking areas. A minimum of one in-place density test should be performed in general accordance with ASTM Specification D-1556 for each 2500 square feet of lift area with a minimum of two tests per lift. Improper compaction may result in premature deterioration of pavement and differential settlement of foundations.

Test pits were excavated within the limits of proposed sediment basins. These areas are anticipated to be significant sources of controlled fill material for this project. Soils encountered within test pit #1 exhibit characteristics of "excellent to good" structural fill material. Soils encountered within test pit #2 exhibit characteristics of "fair to poor" structural fill material. Stratum 1 soils encountered within test pit #3 exhibit characteristics of "excellent to good" structural fill material. Soils encountered below stratum 1 can be classified as "fair to poor" structural fill material (See Appendix 2, Boring Logs).

5.0 LIMITATIONS

This report has been prepared for the purpose of evaluating the existing subsurface conditions, identifying possible construction concerns and determining general structural design criteria for multi-family housing use. The information and recommendations reported herein are presented to assist in the preliminary design of this project. In the event there are any significant changes in the size, design, or location of the project structures, changes in the planned construction from the concepts previously outlined, or changes of the design parameters stated in this report, the conclusions and recommendations contained in this report shall not be considered valid unless these changes have been reviewed and our conclusions and recommendations reaffirmed or appropriately modified, in writing.

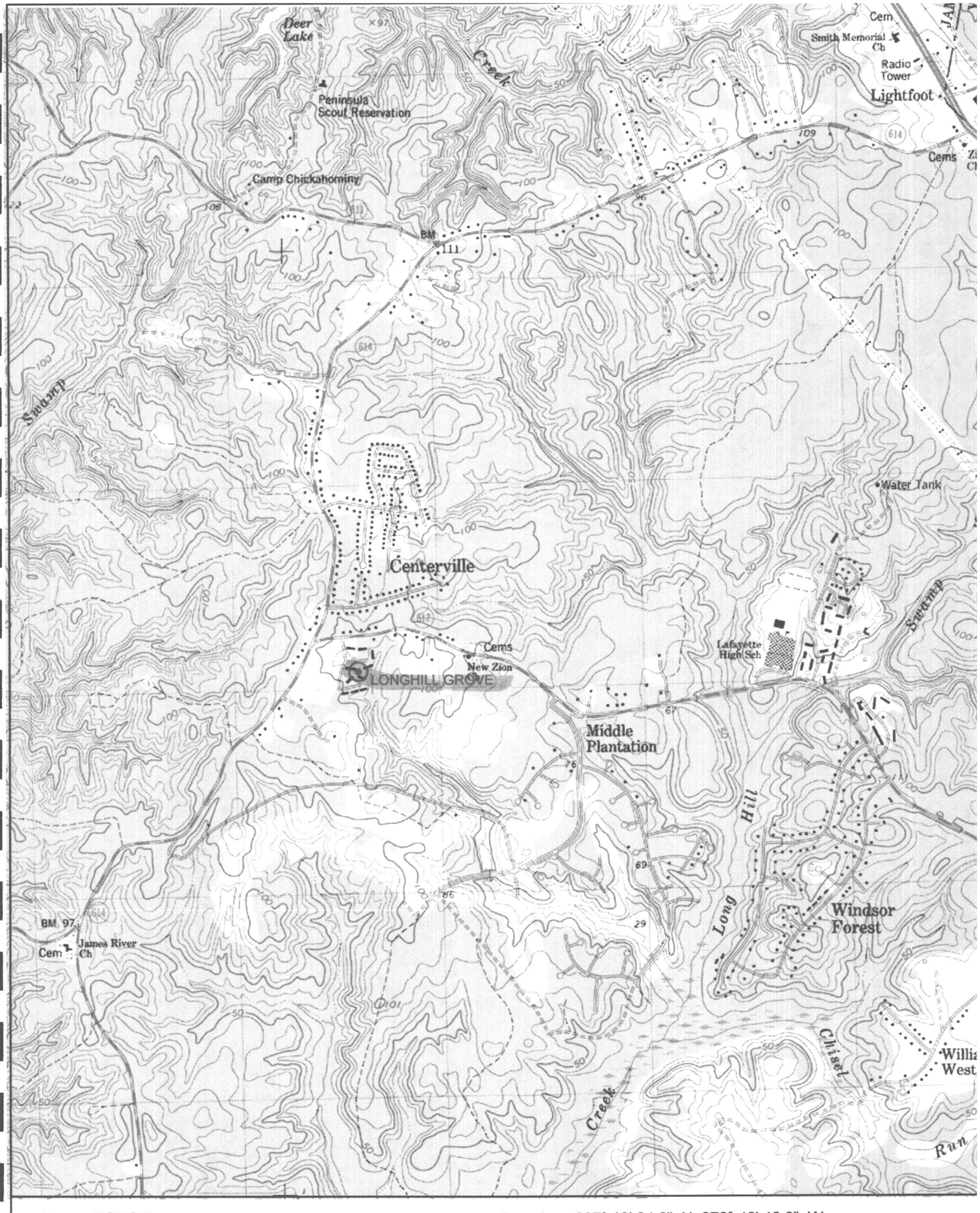
There is a possibility that variations in soil conditions will be encountered during construction. In order to permit correlation between the preliminary data and the actual soil conditions encountered during construction and to insure conformance with plans and specifications as originally contemplated, it is recommended that this firm be retained to perform full time on-site construction review during the foundation phase of this project.

This report was prepared in accordance with generally accepted standards of practice for geotechnical engineering services. No other warranty, either expressed or implied, is made. This report is not to be reproduced, either in whole or in part, without written consent from **TOWNES SITE ENGINEERING.** Our conclusions and recommendations are based upon information provided to us by others, our site observations, and professional judgment. To the best of our knowledge, information provided by others is true and correct, unless otherwise noted; however, **TOWNES SITE ENGINEERING** is not responsible for the accuracy of information provided by others. Our on-site observations pertain only to specific locations at specific times on specific dates. Our observations and conclusions do not reflect variations in subsurface conditions that may exist between sampling locations, in unexplored areas of the site, or at times other than those represented by our observations.

The soil samples will be retained in our laboratory for a period of sixty (60) days after the date of this report, after which they will be discarded unless instructions as to their disposition are received.

APPENDIX 1

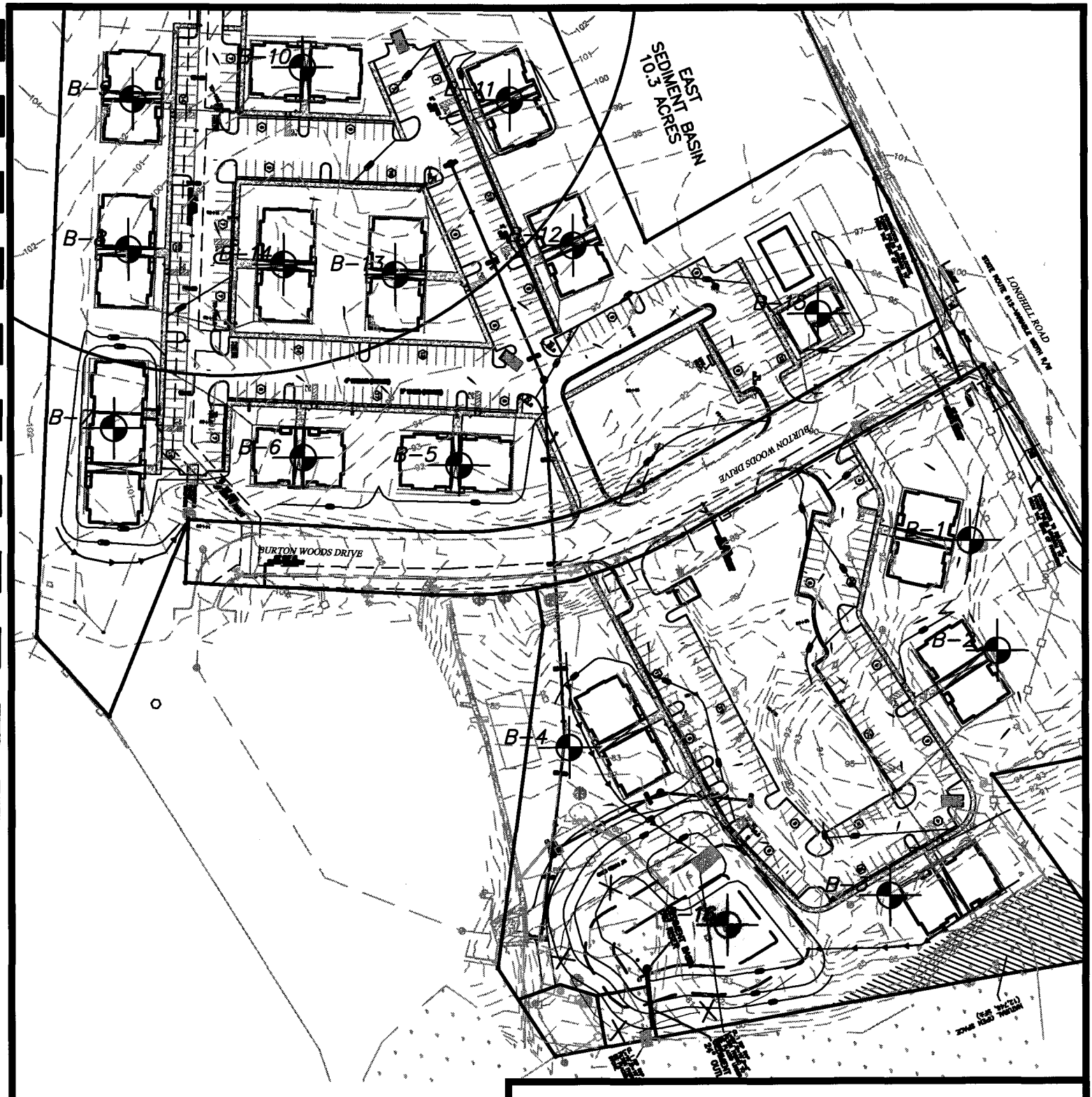
FIGURES



Name: NORGE
Date: 3/20/2003
Scale: 1 inch equals 2000 feet

Location: 037° 19' 04.6" N 076° 46' 46.0" W
Caption: FIGURE 1 - SITE LOCATION

Copyright (C) 1997, Maptech, Inc.



B-1 BORING LOCATION

LONGHILL GROVE APARTMENTS
BORING LOCATION PLAN

FIGURE 2	SITE PLAN	
PROJECT #:03043	DATE: 4/23/03	SCALE: N.T.S.
DESIGNED BY:	DRAWN BY: T.A.H.	APPROVED BY:

TOWNES
SITE ENGINEERING
9850 Lori Road, Suite 201
Chesterfield, Virginia 23832
Phone:(804) 748-9011 Fax: (804) 748-2590
Email: townes@cctownes.com

ASK US HOW

APPENDIX 2

BORING LOGS

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-1**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HS**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 9, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1			6" Topsoil	
3 4	7	2'	yellowish brown, fine to coarse, friable, silty sand (SM)	moist
4 5 7	12	4'	yellowish brown, fine to coarse, friable, silty sand (SM)	moist
4 3 7	10	6'	light brown and yellowish brown, fine to coarse, friable, silty sand (SM)	very moist
3 4 8	12	8'	light brown and yellowish brown, fine to coarse, friable, silty sand (SM)	moist
4 5 6	11	10' 12'	light brown and strong brown, fine to coarse, friable, silty sand (SM)	moist
4 6 5	11	14'	strong brown, fine to very coarse, friable, silty sand with concretions (SM)	moist
		16' 18' 20'	Boring terminateed at 15.0 feet.	

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-2**

		Project Number:	**2003043**
Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HS**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 9, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
W			6" Topsoil and backfill material	
3 4	7	2'	yellowish brown and reddish brown, very fine to medium, friable, clayey sand (SC)	moist
5 6 11	17	4'	yellowish brown and reddish brown, very fine to medium, friable, clayey sand (SC)	moist
5 6 12	18	6'	yellowish brown, strong brown, and gray, very fine to medium, friable, mottled, clayey sand (SC)	moist
4 5 5	10	8'	light brown and yellowish brown, fine to coarse, friable, silty sand (SM)	moist
3 3 4	7	10' 12'	yellowish brown and gray, fine to coarse, friable, mottled, silty sand (SM)	moist
3 4 4	8	14' 16' 18' 20'	yellowish brown and gray, fine to coarse, friable, mottled, silty sand (SM)	moist
			Boring terminated at 15.0 feet.	

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-3**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method:	**6" HSA** Total Depth: **15.0 Feet**	Completion Date:	**Apr. 9, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1 1 1	2	2'	Uncontrolled FILL material	moist
3 6 7	13	4'	yellowish brown, very fine to coarse, friable, clayey sand (SC)	moist
3 3 5	8	6'	yellowish brown and gray, very fine to coarse, friable, mottled, clayey sand (SC)	moist
1 2 4	6	8'	yellowish brown and gray, very fine to coarse, friable, mottled, clayey sand (SC)	moist
2 5 5	10	10' 12'	light brown and yellowish brown, fine to coarse, friable, silty sand (SM)	very moist
2 3 5	8	14'	light brown and gray, fine to coarse, friable, well graded sand (SW)	wet
		16' 18' 20'	Boring terminated at 15.0 feet.	

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-4**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HSA**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 9, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1 1 2	3	2'	strong brown, fine to coarse, friable, silty sand (SM)	moist
4 5 7	12	4'	strong brown and light brown, fine to coarse, friable, silty sand (SM)	moist
4 6 4	10	6'	light gray and yellowish brown, fine to coarse, friable, silty sand (SM)	moist
1 2 2	4	8'	gray and yellowish brown, very fine to medium, subangular blocky, mottled, sandy Lean Clay (CL)	wet
1 2 1	3	10' 12'	gray and yellowish brown, very fine to medium, subangular blocky, mottled, sandy Lean Clay (CL)	wet
2 2 2	4	14'	yellowish brown and gray, very fine to medium, friable, mottled, clayey sand (SC)	moist
		16' 18' 20'	Boring terminated at 15.0 feet.	

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-5**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HS**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1 2 2	4		8" Tosoil and forest litter	moist
		2'	brown, fine to coarse, friable, silty sand (SM)	
1 1 w	1		brown, fine to coarse, friable to loose, silty sand (SM)	very moist
		4'		
w 1 1	2	6'	light brown, fine to coarse, friable, silty sand (SM)	moist
1 2 2	4	8'	strong brown, fine to coarse, friable, silty sand (SM)	moist
1 2 4	6	10'	strong brown and reddish brown, fine to coarse, friable, silty sand (SM)	moist
		12'		
3 5 5	10	14'	yellowish brown, fine to coarse, friable, silty sand (SM)	moist
		16'	Boring terminateed at 15.0 feet.	
		18'		
		20'		

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-6**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HS**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1			6" Topsoil and forest litter	
1 3	4	2'	light brown and strong brown, fine to coarse, friable, silty sand (SM)	moist
3 7 9	16	4'	reddish brown, very fine to coarse, friable, sandy Silt (ML)	moist
4 8 12	20	6'	yellowish brown, strong brown, and gray, very fine to medium, friable, mottled, sandy Silt (ML)	moist
3 3 5	8	8'	gray and yellowish brown, very fine to medium, friable, mottled, interbedded silty sand and sandy silt (SM-ML)	moist
3 7 10	17	10' 12'	yellowish brown, reddish brown, and gray, very fine to coarse, friable, interbedded, clayey sand and well graded sand (SC-SW)	moist
5 5 9	14	14'	reddish brown and gray, fine to medium, friable, well graded sand (SW)	moist
		16' 18' 20'	Boring terminated at 15.0 feet.	

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-7**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HSA**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1 2 2	4		12" Topsoil and tilled material	moist
		2'	brown, fine to coarse, friable, silty sand (SM)	
1 1 1	2	4'	strong brown, fine to coarse, friable, silty sand (SM)	moist
1 1 2	3	6'	strong brown, fine to coarse, friable, silty sand (SM)	moist
14 10 7	17	8'	red and strong brown, very fine to very coarse, friable, silty sand with large concretions (SM)	moist
3 3 7	10	10' 12'	yellowish brown and gray, very fine to medium, friable, mottled, clayey sand (SC)	moist
2 3 4	7	14'	yellowish brown and gray, very fine to medium, mottled, subangular blocky, interbedded clayey sand and sandy Lean Clay (CL)	moist
		16' 18' 20'	Boring terminated at 15.0 feet.	

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-8**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method:	**6" HSA** Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1 1 1	2		12" Topsoil and tilled material	moist
		2'		
w 1 1	2		strong brown, fine to coarse, friable, silty sand (SM)	moist
		4'		
2 3 6	9	6'	strong brown and reddish brown, very fine to coarse, friable, silty sand (SM)	moist
4 7 4	11	8'	reddish brown, yellowish brown, and gray, very fine to coarse, friable, silty sand (SM)	moist
6 4 6	10	10'	red brown, yellowish brown, and gray, very fine to medium, subangular blocky, mottled, sandy Lean Clay (CL)	moist
		12'		
2 4 4	8	14'	yellowish brown and gray, very fine to medium, subangular blocky, mottled, interbedded clayey sand and sandy Lean Clay (SC-CL)	moist
			Boring terminated at 15.0 feet.	
		16'		
		18'		
		20'		

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-9**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HS**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1 1 1	2		12 Topsoil and tilled material	moist
		2'	brown, fine to coarse, friable, silty sand (SM)	
4 2 3	5	4'	strong brown, fine to coarse, friable, silty sand (SM)	very moist
2 2 3	5	6'	reddish brown and strong brown, very fine to coarse, friable, silty sand (SM)	moist
4 6 6	12	8'	reddish brown, very fine to coarse, friable, silty sand (SM)	moist
4 4 5	9	10' 12'	red brown, yellowish brown, and gray, very fine to medium, subangular blocky, mottled, sandy Lean Clay (CL)	moist
4 6 8	14	14'	yellowish brown and reddish brown, fine to medium, friable, silty sand (SM)	moist
		16' 18' 20'	Boring terminateed at 15.0 feet.	

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-10**

(10 of 16)

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HS**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1 2			12" Topsoil and tilled material	moist
1	3	2'	strong brown, fine to coarse, friable, silty sand (SM)	moist
1 1	2	4'		
2 2			reddish brown and dark red, very fine to coarse, friable, silty sand (SM)	moist
5	7	6'		
3 3		8'	reddish brown, yellowish brown, and gray, very fine to medium, subangular blocky, mottled, sandy Lean Clay (CL)	moist
4	7			
4 3		10'	reddish brown and yellowish brown, very fine to coarse, friable, clayey sand (SC)	very moist
4	7	12'		
2 2		14'	yellowish brown, reddish brown, and gray, very fine to medium, mottled, sandy Lean Clay (CL)	moist
3	5			
		16'	Boring terminated at 15.0 feet.	
		18'		
		20'		

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-11**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method:	**6" HSA** Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
W W			12" Topsoil and tilled material	moist
1	1	2'		
2 5 6	11	4'	red brown and yellowish brown, very fine to coarse, friable, clayey sand (SC)	moist
4 6 9	15	6'	reddish brown and yellowish brown, very fine to medium, friable, silty sand (SM)	moist
6 7 11	18	8'	gray, yellowish brown, and reddish brown, very fine to medium, friable, mottled, sandy Silt (ML)	moist
6 7 7	14	10' 12'	light brown, yellowish brown, and gray, fine to medium, friable, well graded sand (SW)	moist
3 5 5	10	14'	reddish brown and yellowish brown, fine to coarse, friable to loose, well graded sand (SW)	moist
		16' 18' 20'	Boring terminated at 15.0 feet.	

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-12**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HSA**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
2 4 4	8		Uncontrolled FILL material	moist
		2'		
3 2 2	4		light brown, very fine to coarse, friable, clayey sand (SC)	moist
		4'		
3 7 9	16	6'	strong brown and light brown, fine to coarse, friable, silty sand (SM)	moist
4 6 7	13	8'	yellowish brown and reddish brown, fine to coarse, friable, silty sand (SM)	moist
5 4 4	8	10'	reddish brown, fine to coarse, friable, well graded sand (SW)	moist
		12'		
3 4 4	8	14'	yellowish brown and red brown, fine to coarse, friable, silty sand (SM)	moist
		16'	Boring terminated at 15.0 feet.	
		18'		
		20'		

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-13**

(13 of 16)

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HS**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1 2			8" Topsoil and forest litter	wet
1	3	2'	light brown, fine to coarse, loose, silty sand (SM)	
2 1 1	2		brown, fine to coarse, loose, silty sand (SM)	wet
		4'	Perched groundwater @ 4.0'	
1 3 5	8	6'	yellowish brown, very fine to coarse, friable, silty sand (SM)	moist
3 4 8	12	8'	yellowish brown and strong brown, very fine to coarse, friable, silty sand (SM)	moist
2 4 3	7	10' 12'	red brown, yellowish brown, and gray, very fine to medium, friable, interbedded clayey sand and sandy Lean Clay (SC-CL)	moist
7 5 9	14	14'	light brown and yellowish brown, fine to medium, friable, silty sand (SM)	moist
		16' 18' 20'	Boring terminateed at 15.0 feet.	

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-14**

(14 of 16)

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method:	**6" HS** Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1 2			12" Topsoil and tilled material	moist
1	3	2'	strong brown, very fine to medium, subangular blocky, sandy Lean Clay (CL)	moist
1 2 4	6	4'		
2 4 5	9	6'	strong brown, fine to coarse, friable, clayey sand (SC)	moist
3 4 5	9	8'	light brown and strong brown, fine to coarse, friable, silty sand (SM)	moist
2 4 6	10	10' 12'	yellowish brown and gray, fine to medium, friable, silty sand (SM)	very moist
3 3 6	9	14'	light gray and yellowish brown, fine to medium, friable, silty sand (SM)	moist
		16' 18' 20'	Boring terminated at 15.0 feet.	

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-15**

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HSA**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
2 3 3	6		Uncontrolled FILL material	moist
		2'	light brown, fine to coarse, friable, silty sand (SM)	moist
4 6 3	9	4'		
2 5 8	13	6'	red brown, yellowish brown, and gray, very fine to medium, friable, mottled, clayey sand (SC)	moist
5 7 10	17	8'	red brown, yellowish brown, and gray, very fine to medium, friable, mottled, clayey sand (SC)	moist
6 8 5	13	10'	gray with red, very fine to medium, friable, clayey sand (SC)	moist
		12'		
4 4 4	8	14'	gray and strong brown, fine to coarse, friable, silty sand (SM)	moist
		16'	Boring terminated at 15.0 feet.	
		18'		
		20'		

BASIN

TOWNES SITE ENGINEERING
Consulting Engineers

LOG OF: **B-16**

(16 of 16)

Project Number: **2003043**

Client:	**EAGLE CONSTRUCTION INC.**	Drilling Company:	**Houff Drilling**
Project:	**LONGHILL GROVE SITE**	Driller:	**Mervin**
Location:	**James City, Virginia**	Logged by:	**BEJ**
Boring Method: **6" HSA**	Total Depth: **15.0 Feet**	Completion Date:	**Apr. 8, 2003**

Blow Count	N	Scale	SOIL DESCRIPTION (USCS)	REMARKS
1 2 1	3		Uncontrolled FILL material	moist
		2'		
1 3 8	11		Uncontrolled FILL material	moist
		4'	groundwater @4.0'	
5 2 2	4	6'	gray, fine to medium, friable, silty sand (SM)	wet
			BASIN EXCAV BOTTOM	
4 5 6	11	8'	yellowish brown and light brown, fine to coarse, friable, well graded sand (SW)	wet
8 6 9	15	10'	light brown and yellowish brown, fine to coarse, friable, well graded sand (SW)	wet
		12'		
1 4 5	9	14'	gray and yellowish brown, very fine to medium, subangular blocky, mottled, sandy Lean Clay (CL)	wet
		16'	Boring terminated at 15.0 feet.	
			10' below basin	
		18'		
		20'		

82
77
5.0

APPENDIX 3

LABORATORY TESTING & STANDARD PROCTOR RESULTS

TABLE I
SUMMARY OF LABORATORY TESTS
LONGHILL GROVE APARTMENTS SITE
JAMES CITY COUNTY, VIRGINIA

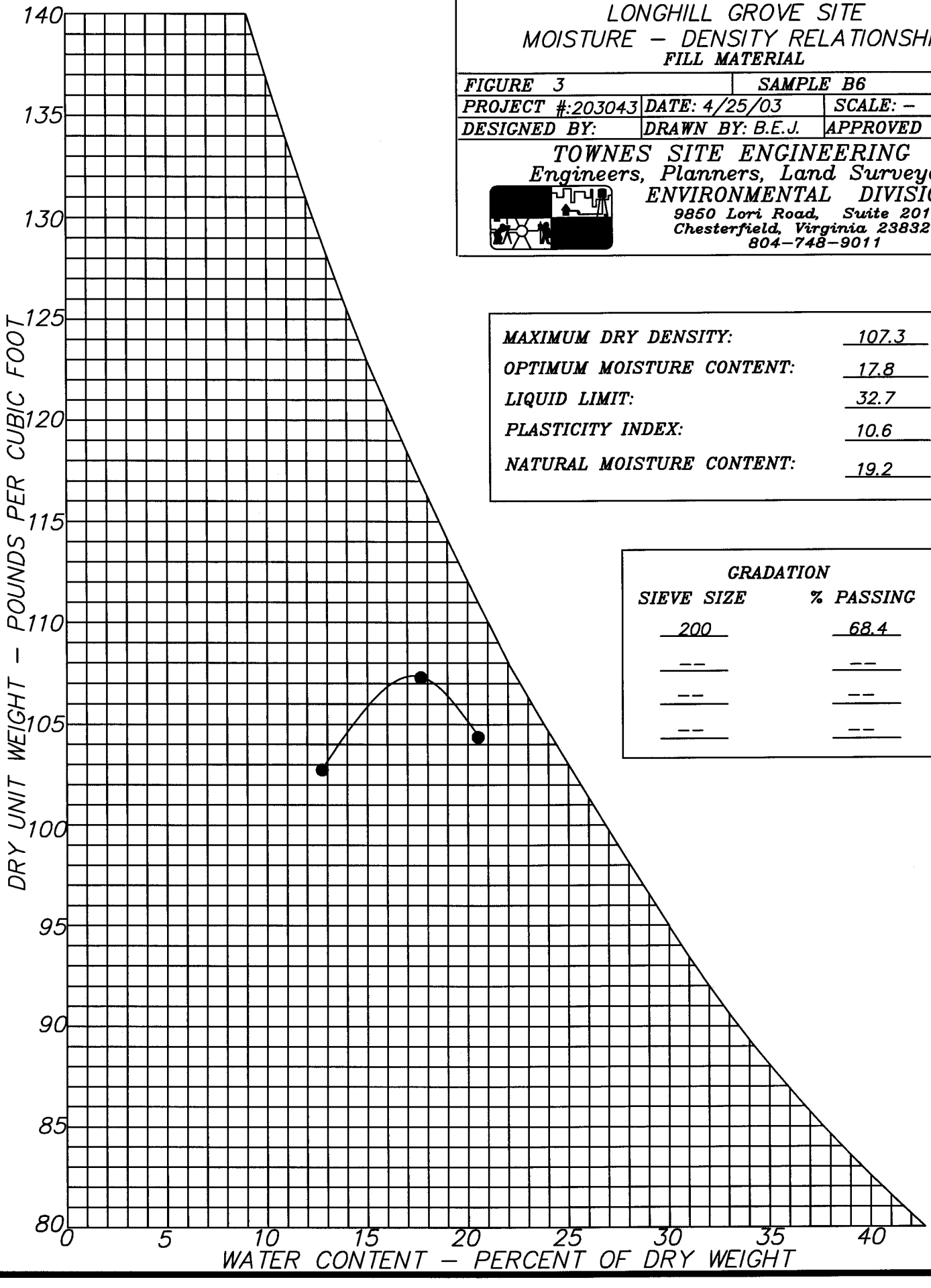
TEST	SAMPLE			
	B-6 4.5-6.0 ft	B-9 4.5-8.5 ft	B-12 4.5-6.0 ft	
NATURAL MOISTURE	18.5	17.7	16.2	
LIQUID LIMIT	32.7	29.5	28.1	
PLASTIC LIMIT	22.1	19.5	23.7	
PLASTICITY INDEX	10.6	10.0	4.4	
% PASSING #200 SIEVE	68.4	27.6	31.5	
UNIFIED SOIL CLASSIFICATION	CL	SC	SM	

NOTES: **Testing performed as per ASTM.**
Soils with a plasticity index exceeding 35 to 40 are typically shrink/swell prone.
NP = Non Plastic

LONGHILL GROVE SITE
MOISTURE – DENSITY RELATIONSHIP
FILL MATERIAL

FIGURE 3	SAMPLE B6	
PROJECT #:203043	DATE: 4/25/03	SCALE: –
DESIGNED BY:	DRAWN BY: B.E.J.	APPROVED BY:

TOWNES SITE ENGINEERING
Engineers, Planners, Land Surveyors
ENVIRONMENTAL DIVISION
9850 Lori Road, Suite 201
Chesterfield, Virginia 23832
804-748-9011



MAXIMUM DRY DENSITY:	107.3
OPTIMUM MOISTURE CONTENT:	17.8
LIQUID LIMIT:	32.7
PLASTICITY INDEX:	10.6
NATURAL MOISTURE CONTENT:	19.2

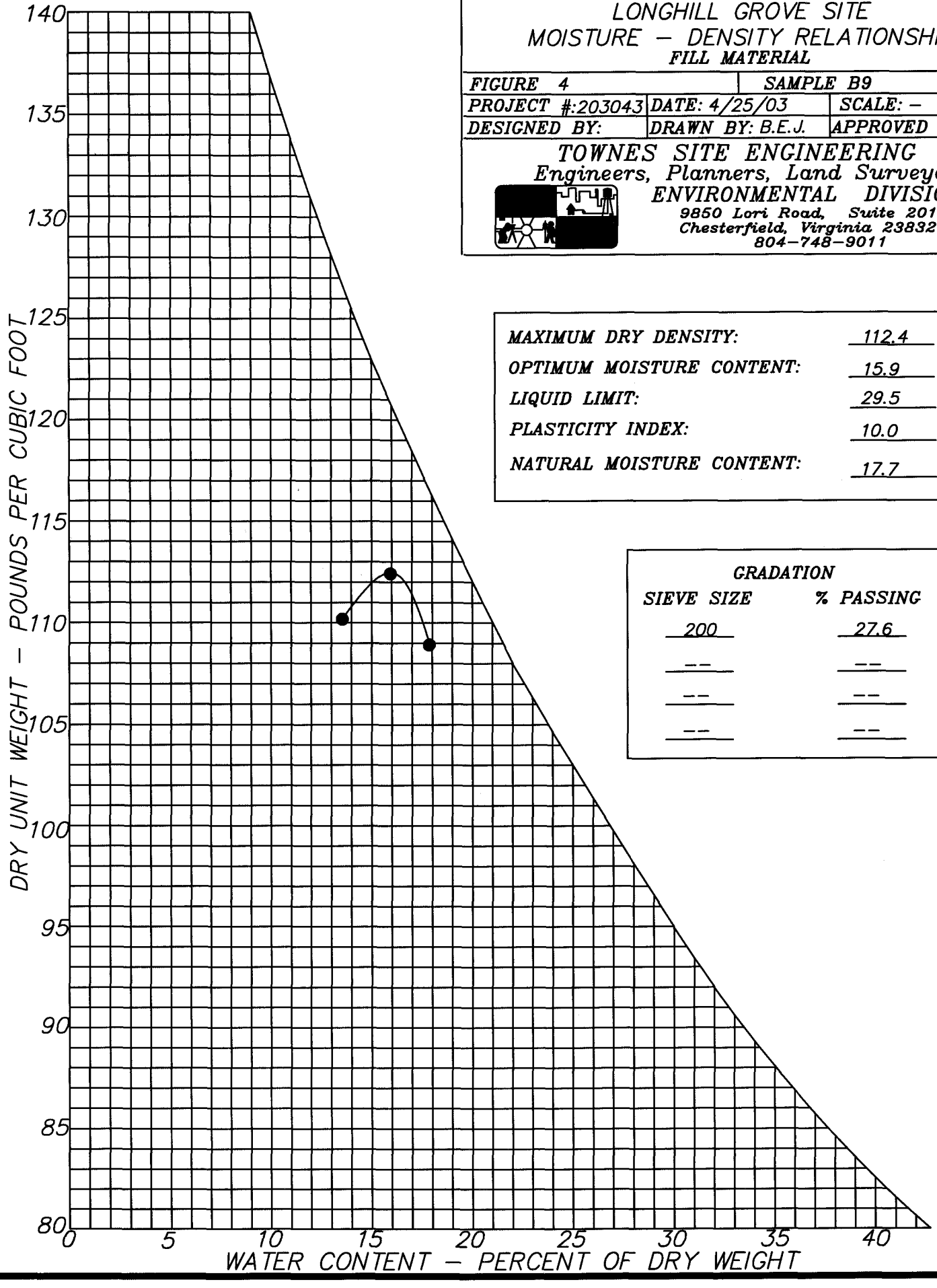
GRADATION

SIEVE SIZE	% PASSING
200	68.4
--	--
--	--
--	--

LONGHILL GROVE SITE
MOISTURE – DENSITY RELATIONSHIP
FILL MATERIAL

FIGURE 4	SAMPLE B9	
PROJECT #:203043	DATE: 4/25/03	SCALE: –
DESIGNED BY:	DRAWN BY: B.E.J.	APPROVED BY:

TOWNES SITE ENGINEERING
Engineers, Planners, Land Surveyors
ENVIRONMENTAL DIVISION
9850 Lori Road, Suite 201
Chesterfield, Virginia 23832
804-748-9011



MAXIMUM DRY DENSITY:	112.4
OPTIMUM MOISTURE CONTENT:	15.9
LIQUID LIMIT:	29.5
PLASTICITY INDEX:	10.0
NATURAL MOISTURE CONTENT:	17.7

GRADATION

SIEVE SIZE	% PASSING
200	27.6
--	--
--	--
--	--

DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6671 Fax: (757) 259-4032 E-MAIL: devtman@james-city.va.us

ENVIRONMENTAL DIVISION (757) 253-6670 environ@james-city.va.us
PLANNING (757) 253-6685 planning@james-city.va.us
COUNTY ENGINEER (757) 253-6678
MOSQUITO CONTROL (757) 259-4116

January 8, 2007

Eagle Construction of Virginia, Inc.
Attn: Joyce Wolfe
4191 Innslake Drive
Glen Allen, VA 23060

Re: Longhill Grove Apartments
County Plan No. SP-044-03
County BMP ID Code: PC-195

Dear Ms. Wolfe:

The Environmental Divisions has received a record drawing (asbuilt) and construction certification for the stormwater management facility for the above referenced project. The record drawing provides as-built information for a retention basin situated in the Southeast corner of the site.

Based on our review of the project and a concurrent field inspection as performed on January 4, 2007, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility at the site and to proceed with closing out the project:

Construction - Related Items:

1. The chain link fence around the perimeter of the facility is across and blocking the grass line emergency spillway. During high flow conditions, the fence will tend to trap debris which could raise the water surface elevation of the pond above that intended which could result in overtopping. Based on design information, depth of flow in the emergency spillway for the 100-year event would be at least 0.70 feet deep in the spillway; therefore, the fence should be cut about 1 foot.

2. Need to fill, compact and stabilize hole on the right slope of the emergency spillway.

3. Need to fill, compact, and stabilize sinkhole approximately 10ft behind the riser and above the dual 36 inch barrel. Upon inspection of the dual barrel pipes it appears the sinkhole was caused by settling and not pipe failure.

4. Provide an extra set of keys or combination for the fence lock to the Environmental Division office.

Once this work is satisfactorily completed, contact our office appropriately for a re-inspection. We can then proceed with final release of the surety and/or closing out the project.

Please contact me at 757-259-4026 or Chief Engineer, Scott Thomas, at 757-253-6639 if you have any further comments or questions.

Sincerely,

Jason Beck

Jason L. Beck
Environmental Inspector, II
Environmental Division

cc: Longhill Grove Apartments
Scott Thomas, Chief Engineer - Storm Water

G:\AsBuilts\reviews\final\SP04403.pc195

Scott Thomas

From: Scott Thomas
Sent: Thursday, January 27, 2005 10:49 AM
To: 'bmitchell@cctownes.com'
Cc: Darryl Cook
Subject: Longhill Grove Asbuilts

Brian

I received the asbuilts and construction certification for the BMP at the Longhill Grove project. I would just like to complement you and Townes on the presented asbuilt. I am impressed with the quality and completeness of the package. It is exactly what we look for on asbuilt submittals and have difficulty in getting a lot of the plan preparer's to do. I'm especially impressed with the .jpeg photos directly on the asbuilt and feel that it is a direction I would like to see all asbuilts go.

This does not mean the asbuilt is approved (I have not reviewed it yet), just some feedback on the initial presentation and completeness of the submission package.

We will continue with processing the package. I need to review the as-builts against the design plan and perform a final inspection of the BMP. The assigned Environmental Division inspector is responsible for looking at site issues. If there are any comments on the asbuilt or field-related items, I would issue a letter to Eagle and cc: Townes. Also, usually we don't require the mylar on the first submission, only one or two blueprints because if there are any changes to the asbuilt we would need a second reproducible.

Scott J. Thomas, P.E.
James City County
Environmental Division

Visit:
http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html
and
www.protectedwithpride.org

Townes
SITE ENGINEERING

January 14, 2005

Scott Thomas, P.E.
Public Works Engineering
101 Mounts Bay Road
P.O. Box 8784
Williamsburg, VA 23187-8784

Re: Longhill Grove Apartments

Dear Scott,

Please find 1 bond and mylar copy of the SWM/BMP Certification sheet and certification form for the Longhill Grove Apartment Complex.

If you have any questions please feel free to give me a call or e-mail (bmitchell@cctownes.com) in our Chesterfield office.

Sincerely,

Brian C. Mitchell, P.E.
Project Engineer

cc: Buzz Harris/Chris Harris- Eagle Construction (1 copy of form, 1 copy of plans, letter)
Liston Laine – JH Martin (1 copy of letter)
File

Scott Thomas

From: Scott Thomas
Sent: Tuesday, July 12, 2005 1:58 PM
To: 'Joyce Wolfe'
Subject: RE: Longhill Grove BMP

Joyce

I'm working the BMP certification documents and final inspection. Sorry but we have quite a backlog. I had hoped to get to it by now but have not. I am going to make it top priority in my asbuilt reviews.

Review of the BMP is tied to the E&S bond release. The way it works is that the assigned site inspector handles the site end of things (stabilization, erosion issues) and I handle the BMP end (certification, final inspection). Both sign-offs are required before the bond is released or reduced. I believe Jordan Anglin is the assigned inspector for the project. I will forward this to him as a notification to look at the project.

On another matter, I would like to express my concern over the fact that you are not allowing the College of William & Mary to install the flow monitoring device on the BMP until the bonds are released. That effort is not at all tied to our regulatory program, but is an academic program to benefit the students at the college and also give us helpful insight into how effective our stormwater program is. I am sure that you would be quite displeased if we had said that we would not release bond until you let the College install the monitoring equipment.

I would hope that you rethink this policy and allow the College to move forward concurrently with closing of the project.

Scott J. Thomas, P.E.
James City County
Environmental Division

Visit:
http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html
and
www.protectedwithpride.org

-----Original Message-----
From: Joyce Wolfe [mailto:jwolfe@eagleofva.com]
Sent: Monday, July 11, 2005 2:46 PM
To: Scott Thomas
Subject: RE: Longhill Grove BMP

Scott-
Could you send me an update when you get a chance? Also - would your review include the E&S bond and it's release as well? If not - to whom do I send a letter requesting the release?

Thanks,
Joyce

Joyce A. Wolfe
Planning and Site Development
Eagle Construction of VA, LLC
4191 Innslake Drive, Suite 100
Glen Allen, VA 23060
ph. 741-4663 ext. 227

fax 741-0553
jwolfe@eagleofva.com

From: Scott Thomas [mailto:SCOTTT@james-city.va.us]
Sent: Thursday, June 02, 2005 4:17 PM
To: Joyce Wolfe
Subject: RE: Longhill Grove BMP

I've gotten the certification information; however, I haven't reviewed it or performed a final inspection of the BMP. I will get on it right away.

Scott J. Thomas, P.E.
James City County
Environmental Division

Visit:
http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html
and
www.protectedwithpride.org

-----Original Message-----
From: Joyce Wolfe [mailto:jwolfe@eagleofva.com]
Sent: Thursday, June 02, 2005 1:34 PM
To: Scott Thomas
Subject: Longhill Grove BMP

I'm following up on the BMP certification and bond release for the Longhill Grove apartments. I haven't received any correspondence that there were deficiencies, but I don't believe I've gotten any that says the bond has been released either. Our engineer is out of town this week - could you update me please?

Thanks,
Joyce

James City County Environmental Division
Stormwater Management / BMP Inspection Report
Detention and Retention Pond Facilities

County BMP ID Code (if known): PC-195 SP-44-03

Name of Facility: Longhill Grove Apts BMP BMP No.: 1 of 1 Date: 1/4/07

Location: Northeast Corner of Site Tax ID: 3130100002 5500 Centerville Road

Name of Owner: Longhill Grove, LP

Name of Inspector: Jason Beck

Type of Facility: Wet Pond

Weather Conditions: Partly Cloudy Type: ☒ Final Inspection ☐ County BMP Inspection Program ☐ Owner Inspection

If an inspection item is not applicable, mark NA, otherwise mark the appropriate column.

O.K. - The item checked is in adequate condition and the maintenance program is currently satisfactory. No action required.
Routine - The item checked requires attention, but does not present an immediate threat to the function/integrity of the BMP.
Urgent - The item checked requires immediate attention to keep the BMP operational and to prevent damage to the facility.

Provide an explanation and details in the comment column, if routine or urgent are marked.

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:				
Grass Height	✓			
Vegetation Condition	✓			
Tree Growth	✓			shown on plan
Erosion	✓			
Trash & Debris	✓			
Seepage	✓			
Fencing or Benches	✓			
Interior Landscaping/Planted Areas: ☐ None ☐ Constructed Wetland/Shallow Marsh ☐ Naturally Established Vegetation				
Vegetated Conditions	✓			
Trash & Debris	✓			
Floating Material	✓			
Erosion	✓			
Sediment	✓			
Dead Plant	✓			
Aesthetics	✓			
Other	✓			
Notes:				
Water Pools: ☒ Permanent Pool (Retention Basin) ☐ Shallow Marsh (Detention Basin) ☐ None, Dry (Detention Basin)				
Shoreline Erosion	✓			
Algae	✓			very little

Facility Item	O.K.	Routine	Urgent	Comments
Trash & Debris	✓			
Sediment	✓			
Aesthetics	✓			
Other				
Inflows (Describe Types/Locations):				8" PVC
Condition of Structure	✓			RCP 36" Pipe size not shown on asbuilt
Erosion	✓			
Trash and Debris	✓			
Sediment	✓			
Outlet Protection	✓			
Other				
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type):				
Condition of Structure	✓			
Corrosion	✓			
Trash and Debris	✓			
Sediment	✓			
Vegetation	✓			
Other				
Principal Outlet Structure - Barrel, Conduit, etc. :				
Condition of Structure	✓			two 36" RCP
Settlement	✓			
Trash & Debris	x	✓		minor
Erosion/Sediment			X	Sinkhole behind riser
Outlet Protection	✓			
Other				
Emergency Spillway (Overflow):				
Vegetation	✓			
Lining	✓			grass
Erosion		✓		scoured rightside of slope 1'x1'
Trash & Debris	✓			
Other				
Notes:				
Nuisance Type Conditions:				
Mosquito Breeding	✓			
Animal Burrows	✓			

Facility Item	O.K.	Routine	Urgent	Comments
Graffiti				
Other				
Surrounding Perimeter Conditions:				West
Land Uses	✓			North, NW, Multi Family
Vegetation	✓			SW, S, SE - Woods
Trash & Debris	✓			
Aesthetics	✓			
Access /Maintenance Roads or Paths	✓			
Other				

Remarks:

4/12/07 Reinspected everything is OK.

Jean Bell

Overall Environmental Division Internal Rating: 3

Signature: Jean Bell **Date:** 1/4/07

Title:

SWMProg\BMP\CoInspProg\DetRet.wpd

Date Record Created:

Created By:

WS_BMPNO: PC195

WATERSHED	PC
BMP ID NO	195
PLAN NO	SP-44-03
TAX PARCEL	(31-3)(1-14)
PIN NO	3130100014
CONSTRUCTION DATE	1/12/2005
PROJECT NAME	Longhill Grove Apartments
FACILITY LOCATION	3800 Hill Grove Lane
CITY-STATE	Williamsburg, VA 23188
CURRENT OWNER	Eagle Construction of Virginia, Inc.
OWNER ADDRESS	4191 Innslake Drive
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	Glen Allen, VA 23832
OWNER PHONE	804-741-4663
MAINT AGREEMENT	Yes
EMERG ACTION PLAN	No

Thursday, March 04
11:01:25 AM

Get Last BMP No | Return to Menu | Print Record

MAINTENANCE PLAN	Yes
SITE AREA acre	15.82
LAND USE	R-5 Residential
old BMP TYP	Wet Pond
JCC BMP CODE	A3 Wet ED Pond
POINT VALUE	10
SVC DRAIN AREA acres	15.85
SERVICE AREA DESCRI	Buildings & Parking lot
IMPERV AREA acres	6.91
RECV STREAM	Powhatan Creek
EXT DET-WQ-CTRL	Yes
WTR QUAL VOL acre-ft	1.15
CHAN PROT CTRL	Yes
CHAN PROT VOL acre-ft	1.31
SW/FLOOD CONTROL	Yes
GEOTECH REPORT	Yes

CTRL STRUC DESC	RCP Riser
CTRL STRUC SIZE inches	48
OTLT BARRL DESC	Dual RCP
OTLT BARRL SIZE inch	36
EMERG SPILLWAY	Yes
DESIGN HW ELEV	85.28
PERM POOL ELEV	80.3
2-YR OUTFLOW cfs	3.25
10-YR OUTFLOW cfs	44.93
REC DRAWING	Yes
CONSTR CERTIF	Yes

LAST INSP DATE 1/4/2007 Inspected by:

INTERNAL RATING

MISC/COMMENTS

Serves 13.61 onsite & 2.24 offsite. Dual 36-inch barrels.

Additional Comments:

James City County, Virginia
Environmental Division
Stormwater Management Program

Stormwater Management Design Plan
Staff "Quick" Review

Plan No. SP - 44 - 03 Date/Time: 4/17/03 4:00pm
Project Name: LONGHILL GROVE APARTMENTS
Rough Location: INT. OF LONGHILL ROAD + Centerville ROAD
ADC Map: Sheet 2 Grid: A - 13 ☒ First Review
Flood Map / Zone: 510201- 00 35 B Zone: X ☐ ___ Review
Description: OUTSIDE SOU-YEAR

Drainage Area: ☒ Onsite ☒ Offsite

Submitted:

Y	N		
☑	☐	Demolition Plan (if applicable)	Sheets: C2
☑	☐	Site, Geometric or Layout Plan	Sheets: C6, C7, C8
☑	☐	Grading Plan	Sheets: C9, C10, C11
☑	☐	Storm Drainage Plan	Sheets: C9, C10, C11
☑	☐	E&SC Plan	Sheets: C4
☑	☐	Profiles (Storm)	Sheets: C14, C15
☐	☐	Environmental Inventory	Sheets: None
☐	☐	Note & Detail Sheets	Sheets:
☑	☐	Drainage Map(s)	C3
☐	☐	Soils Map/Narrative	
☐	☐	E&SC/SWM Design Plan Checklist (Required).	
☑	☐	E&SC/Stormwater Management / Drainage Narratives.	
☑	☐	E&SC/Stormwater Management Design Report with Calculations (Attachment).	
☐	☑	Geotechnical Report (Attachment).	
☐	☐	Waivers, Variances, or Exceptions (Attachments in Writing).	
		☐ VESCH ☐ CBP Ord (RPA, Steep Slope Policy) ☐ JCC BMP Manual	
☐	☐	Other (List):	

SUBMIT 104

JCC GIS Database: Zoning: B - 5 Tax Parcel/GPIN: (31-3)(1-12, 13 + 14)
Receiving Water: UT of Pow CREEK Site Acreage: _____ acres / s.f.

Other Approvals (SUP, etc.): Z-5-02

Site Plan Information: Owner: EAGLE CONSTRUCTION OF VA (Heritage Builders + Burton Woods Assoc)
Zoning: B - 5 Description:
Site Area: 15.82 acres / s.f
Disturbed Area: ?? acres / s.f. (. %)
☒ Disturbance ≥ 1 acre, VPDES Notice of Intent required.
Impervious Cover: ?? acres / s.f. (. %)
☐ Less than or equal to 60 percent. Meets CBPO requirements.
☐ More than 60 percent. Does Not Meet CBPO requirements.
Open / Green Space: _____ acres / s.f. (. %)

LB zoned (WEST)
R5 zoned (EAST)

Site Development Plan:

☑ Residential, Lots, etc.	☐ Commercial (B / O / R)	☑ Govern./Institutional	☐ Industrial
☑ Roadways or Entrances	☑ Parking or Loading	☑ Water	☑ Sanitary Sewer
☑ Landscaping	☑ SWM/BMP facilities	☑ Manmade Drainage	☐ Parks, Amenities
☑ Pump/Lift Station	☐ Dams (regulated)	☐ Other,	

Description: 3 floor Apartment building, 14 Clubhouse + Pool.

PC195_LONGHILL_GROVE_APARTMENTS_WET_ POND - 336

"Not Provide!"

Soils Information: Site: 14B, 29B, 11C, 15D Hydric: ☐ Yes ☒ No
Soil Survey Sheet DA: SAME HSG: C-ALL
BMP: 11C? Hydric: ☐ Yes ☐ No
Description of Soils at BMP: Craven-Vihec 6-10%; SANDY CLAY LOAM SEASONAL HW TABLE;

BMP Control: ☐ None ☒ Onsite ☐ Offsite ☐ Previously Approved ☐ Manufactured BMP
BMP Types: 1- Name: ED SHALLOW WETLAND (JCC BMP Type B - 2), Points _____
2- Name: _____ (JCC BMP Type _____ - _____), Points _____
3- Name: _____ (JCC BMP Type _____ - _____), Points _____
Onsite Drainage: ☒ Reinforced Concrete Pipe ☐ Corrugated Metal Pipe ☐ Aluminum Type Pipe
☐ Corrugated Polyethylene Pipe ☐ PVC Type Pipe ☒ Open Channel Type
☒ Storm Drain ☐ Culverts Type: _____
☒ Inlets ☐ Other (Specify): _____

1. VDOT Standards & Specifications Referenced for work **within** R/W: ☒ Yes ☐ No
2. VDOT Standards & Specifications Referenced for work **outside** R/W: ☒ Yes ☐ No

Site Limitations: ☐ RPA ☐ RMA ☐ Steep Slopes ☒ Delineated Wetlands
☐ Hydric Soils ☐ Critical Soils ☒ Vegetated ☐ Buffers: _____
☒ Defined Natural Drainage Features onsite ☐ Downstream Storm/Culv.
☐ Downstream Channel Erosion ☐ Floodplain ☐ Problem Drainage Area
☐ Stormwater Hotspot ☐ Other, _____
☐ Site Activities may warrant a General VPDES Permit for Discharge of Stormwater Associated with Industrial Activities (ie. process water, batch plants, etc.).

Site Stormwater Management / BMP Control (Add sheets if necessary for Multiple Onsite Facilities):

☐ Yes ☐ No	# BMP 1 B-2 ED SHALLOW WETLAND			
Predev (Present) INCLUDES EX. BURTON WOODS	DA = ~~29~~ 14.09 ac.	C/CN = 79	Tc = 0.18	min / hrs.
2-year	27	cfs		
10-year	60	cfs		
100-year	?	cfs		
PostDev w/o Detention (Inflow)	DA = 14.09 ac.	C/CN = 90	Tc = 0.10	min / hrs
1-year	40 cfs			
2-year	54 cfs	cfs		
10-year	101 cfs	cfs		
100-year	?	cfs		
PostDev with Detention (Routed)	DA = ac.	C/CN =	Tc =	min / hrs.
2-year	24.02	cfs	at El. 82.74	
10-year	36.31	cfs	at El. 84.75	
100-year (DHW)		cfs	at El.	

1-YR. 17 CFS

Downstream Tailwater Assumption for Pond Routing: Need.
Routed Peak Discharges (Outflows) from BMP meet Predevelopment Allowables: ☐ Yes ☐ No
Appears to Meet VESCH / E&SC Ordinance / CBP Ordinance Requirements: ☐ Yes ☐ No

No 1-YR STORM COMPS?

Pond / BMP Design Data (Add Sheet If Necessary for Multiple Onsite Facilities):

❒ Check if None ❒ Provided: BMP # _____ Type: _____

Y N * See Below for Pertinent WQv /Stream CPv Design Information.

❒ ❒ Top of Facility (Dam Crest) El. _____

❒ ❒ Design High Water (100-year) El. _____

❒ ❒ Emergency Spillway (ES) Crest El. _____ BW:_____ SS: _____

❒ ❒ FreeBoard _____ 1 ft. or > with Emerg. Spillway.

❒ Acceptable ❒ Not Acceptable. _____ 2 ft. or > w/o Emerg. Spillway.

❒ ❒ Principal Spillway (Riser) Crest El. _____ Size/Type: _____

❒ ❒ Principal Spillway Crest 1 ft. below Crest of Emergency Spillway. ❒ Yes ❒ No ❒ N/A

❒ ❒ Stage-Storage Curve or Data

❒ ❒ Outlet Rating Curve or Table (Composite Structure)

❒ ❒ Extended Detention for WQ Provided (Min. 24 hours) ❒ Yes ❒ No ❒ N/A

❒ ❒ 1-year, 24 hour detention criteria for Stream Channel Protection. ❒ Yes ❒ No ❒ N/A

❒ ❒ 1-year design storm El. _____ or Volume _____

❒ ❒ Normal/Permanent Pool El. _____ ❒ N/A

❒ ❒ Orifice/Weir #1 (Highest El.) El. _____ Type: _____

❒ ❒ Orifice/Weir #2 El. _____ Type: _____

❒ ❒ Orifice/Weir #3 El. _____ Type: _____

❒ ❒ Orifice/Weir #4 El. _____ Type: _____

❒ ❒ Orifice/Weir #5 (Lowest El.) El. _____ Type: _____

❒ ❒ Low Flow Orifice (ExDet, CPv) El. _____ Type: _____

❒ ❒ Pond Drain w/ Valve (24 hr.) El. _____ Type: _____

❒ ❒ Pond Bottom (Positive Drain) El. _____ Riser Height: _____

❒ ❒ Steps or Access Provided (for over 4 ft. depth) ❒ N/A

❒ ❒ Riser Base Bottom El. _____ Type: _____

❒ ❒ Core Trench ❒ N/A

❒ ❒ Anti-Seep Collars or other Acceptable Seepage Control Method. ❒ N/A

❒ ❒ Principal Spillway Anti-Vortex/Trash Rack Device Type: _____

❒ ❒ Low Flow Orifice Trash Rack. Type: _____

❒ ❒ Outlet Barrel: Type/Class: _____ Size: _____

Inv. U/S: _____ Inv D/S: _____

Slope: _____ Length: _____ (ft.)

❒ ❒ Flared End Section/Wingwalls. Matches Outlet Barrel material type, over 48 inch with fence.

❒ ❒ Outlet Protection.

❒ Standard Riprap Outlet Protection (OP) Type: _____

❒ Special Dissipator Structure (SDS) Type: _____

❒ ❒ BMP Cleanout Elevation El. _____ or Depth _____

❒ ❒ Adequate Channel Downstream of BMP: ❒ 1-year, 24-hour; or ❒ MS # 19 criteria.

Sketch or Notes, If Necessary:

<u>* WQv / Stream CPv Design Summary</u>

Imperv. Area	_____
WQTV (Per JCC Man)	_____
WQ Vol. Required	_____
WQ Vol. Provided	_____
1-yr SCPv Required	_____
1-yr SCPv Provided	_____
Ext Det Orifice Size	_____

Sediment Trap & Basins

❒ Temporary Sediment Trap # 1 _____ DA = _____ < 3 acres

❒ Temporary Sediment Trap # 2 _____ DA = _____ < 3 acres

❒ Temporary Sediment Basin # 1 _____ DA = _____ ❒ BMP # ____ convert.

❒ Temporary Sediment Basin # 2 _____ DA = _____ ❒ BMP # ____ convert.

E&SC Plan Comments: _____

Plan Review Steps & Components:

Y	N	
❒	❒	Watershed, Subwatershed, Catchment correctly shown on site information portion of plan.
❒	❒	First "Look-Thru". Quick look through plan for familiarity and completeness.
❒	❒	Existing Utilities - Miss Utility (1-800-552-7001) or other methods.
❒	❒	Responsible Land-Disturber Certification; Disturbed Area Estimate.
❒	❒	Worksheet for BMP Point System. 10 point (New Dev) or Pollutant Load method (Redevelopment).
❒	❒	FEMA Special Flood Hazard Areas. Check location relative to property site and/or development area.
❒	❒	Check JCC Tax Parcel Maps for RPA / RMA locations and Tax Parcel number.
❒	❒	Stormwater hotspot, general layout and/or BMP separation distances (if any) are satisfactory.
❒	❒	Environmental Inventory - Chesapeake Bay Ordinance requirements satisfactory.
❒	❒	Highlight/check impacts to any Environmental Sensitive Areas (wetlands, RPA, floodplain, steep slopes, etc.).
❒	❒	Offsite borrow, waste areas and onsite stockpiles areas addressed.
❒	❒	Review existing topography to determine adequacy of perimeter E&SC plan (Phase I).
❒	❒	Soils Erodibility and Erosion Hazard-Land-Disturbing area..
❒	❒	Current version of Standard JCC Erosion & Sediment Control Notes on plan.
❒	❒	Virginia E&SC Regulations. Minimum Standards # 1 thru # 19 appear satisfied.
❒	❒	Check for Offsite Work; Grading Plan conflicts such as excessive cut-fill slopes, deep excavations, etc.
❒	❒	Review adequacy of onsite E&SC plan (Phase II).
❒	❒	Review layout to check for conflicts (utilities, buildings, parking, buffers, etc.).
❒	❒	Storm Drainage - culverts, inlets, channels, storm drains. (pipe data, cover, conflicts, specs or reference to VDOT).
❒	❒	Proper Outlet Protection or Energy Dissipator information, details and computations.
❒	❒	Review Sequence of Construction (for E&SC and SWM/BMP installation).
❒	❒	Review E&SC Narrative (preferred to be on plan); SWM Narrative (Report).
❒	❒	Review for any Lot-to-Lot or adjacent property uncontrolled drainage problems.
❒	❒	Review plan based on Chapter 19 Subdivision ordinance as it relates to SWM/BMP control.
❒	❒	Review plan based on Chapter 24 Zoning as it relates to SWM/BMP control.
❒	❒	Review plan based on Chapter 23 Chesapeake Bay ordinance requirements.
❒	❒	Review plan based on JCC E&SC/SWM Design Plan Checklist.
❒	❒	Review plan based on Virginia Erosion and Sediment Control Handbook (VESCH).
❒	❒	Review E&SC Plan Design Report and computations (Attached report).
❒	❒	Review plan based on JCC BMP manual for BMP type selected for project.
❒	❒	Review plan based on Virginia Stormwater Management Handbook (VSMH) for BMP type.
❒	❒	Review SWM Design Report and computations (Attached Report).
❒	❒	Review for potential mosquito-vector issues with BMP type and location.
❒	❒	Review plan based on JCC Stormwater Conveyance System Design/Construction Guidelines.
❒	❒	Review plan based on General Knowledge and Experience for Design/Construction.
❒	❒	Review plan based on other BMP design/construction references. List:
❒	❒	Review BMP for Buffer/Setback Requirements (Min 25 ft. from DHW) and Access.
❒	❒	Review BMP Benching (aquatic, safety) & Pondscape Plan (deep pool, shallow water, shoreline fringes, etc.).
❒	❒	Review Maintenance Plan for SWM / BMP facility. Detailed and specific guidance for long-term maintenance.
❒	❒	Well-defined, adequate channels downstream of uncontrolled or SWM/BMP areas. (MS # 19 or 1-year criteria).
❒	❒	Adequate conversion plan for TSB to use as permanent BMP.
❒	❒	Geotechnical. Information per Appendix E (infiltration) or to substantiate use of other BMPs (soils-wet pond, etc).
❒	❒	Provisions on plan requiring Record Drawing and Construction Certification of SWM facilities.
❒	❒	Drainage, Maintenance and Open Space Easements (if provided) appear satisfactory.
❒	❒	Wetland Permit required prior to issuance of a Land-Disturbance Permit or Final Approval.
❒	❒	Inclusion of H&H and SWM / BMP data into any JCC databases.
❒	❒	Other: _____

Prepared Environmental Division comments for the following categories based on above review areas:

❒	❒	***General Comments:***	❒	❒	***Erosion & Sediment Control Plan:***
❒	❒	***Floodplain:***	❒	❒	***Chesapeake Bay Preservation:***
❒	❒	***Stormwater Management / Drainage:***	❒	❒	***Other:***

Additional Notes & Comments: _____

(Note: THIS FORM FOR COUNTY USE ONLY.)

❒ 1st Rev ❒ 2nd Rev

Signature _____ Date _____

Signature _____ Date _____

Comment History

ENVIRONMENTAL DIVISION REVIEW COMMENTS
LONGHILL GROVE APARTMENTS
COUNTY PLAN NO. SP - 44 - 03
June 13, 2003

General Comments:

1. Wetlands. Previous comment # 4 was not adequately addressed. Firstly, there is some confusion about the extent (area) of wetland impact, mainly due to pond construction and secondly, whether wetland permits will be necessary for the project. Quantify the exact amount of non-tidal wetland to be impacted due to land-disturbing activity associated with this project in the Environmental Inventory and provide evidence that any necessary wetlands permits have been obtained, have not expired or are not necessary for this project.

2. Presentation. Darken the wetland delineation line work or provide a denser hatching pattern on Sheets C4, C8 and C11. It is difficult to read, interpret and distinguish between the wetland delineation line and other features and line work on the plan. Also, show proposed building unit numbers on erosion and sediment control plan Sheet C4.

3. Site Tabulation. Information as provided on the cover sheet of the plan and in the design report shows 5.22 acres of impervious cover for this site. Based on rough computational methods, for building, parking and sidewalk area it would appear that impervious cover for the site is closer to 6.5 acres or about 20 percent more than indicated. As this is a substantial difference that could have significant impact on the design and size of the stormwater management facility, provide additional information or tabulations to justify or support the impervious cover estimate.

4. Existing Road. Sheets C2, C3, C4, C14 and C15 show the existing road through the middle of the project as "Burton Woods Drive"; however, Sheets C6 through C11 show the roadway as Longhill Grove Drive.

Chesapeake Bay Preservation:

5. Steep Slope Areas. Response to previous comment # 16 indicated that due to flat terrain of the site, no slopes in excess of 25 percent exist or will be disturbed on the site. Based on existing topographic information as shown on the demolition and grading and erosion and sediment control plans, there appears to be existing areas of 25 percent slope within the limit of work. These areas are situated near Building Unit 4 and the central parking area on the eastern portion of the project. Therefore, a waiver request, in writing, is required.

Erosion and Sediment Control Plan:

6. E&SC Plan. Provide diversion dikes and/or right-of-way diversions along the entire western edge of the existing Longhill Grove Drive (Burton Woods Drive) to direct all disturbed area drainage from the west part of the site. This will intercept and divert disturbed area drainage to the basin prior to grading and installation of the storm piping system. Include appropriate outlet protection or slope stabilization along the interior of the basin to safely convey drainage from the ends of the diversions into the basin.

7. Sediment Trap Information. Based on the response to previous comment # 29, it is our understanding that all sediment traps were removed from the plan configuration. Therefore, remove the sediment trap detail from Sheet C5 of the plan set as well as references to Sediment Trap # 10 at Building Unit 7 on Sheet C4.

8. Grading Plan. Show proposed grading/spot elevation as necessary due to improvements proposed at the intersection of Longhill Grove Drive (Burton Woods Drive) and Longhill Road.

9. Grading Plan. Based on the current grading plan, Building Units 5 and 6 will have no backyard area. Provide a backyard behind these units and/or attempt to grade to a less steep slope. Also refer to comment # 24 below, as there are serious concerns about the drainage channel arrangement at this location.

10. Grading. Show all necessary grading in the common area between Buildings Units 2, 3 and 4. Either a limit of work needs to be shown to not disturb existing area in the common area or proposed contours have not been shown to reflect grading in this area.

11. Grading. Label the proposed contour around Building Unit 8. Also, channel grading between Building Units 7 and 8 will convey concentrated drainage directly to the southwest corner of Building Unit 7. Also, a proposed contour El. 102 should be shown south of Building Unit 7.

12. Drainage. Explain how VDOT roadside drainage will work at the proposed intersection of Grove Gate Land and Centerville Road. Currently, design and construction information is vague.

13. West Sediment Basin. Show the western sediment basin on Sheet C10, as it is integral with the plan of development. It should be half-toned so as to not be confused with final proposed grading of the site. Ensure the basin can be constructed per design data sheets on existing, not proposed topography.

14. Limits of Work. Previous comment # 24 was not fully addressed. Show and label a distinct limit of work (clearing and grading) around the site periphery on Sheets C9, C10 and C11. Be sure to include work associated with installation of perimeter erosion and sediment controls and utility connections. Ensure the limit of work is outside proposed limits of grading and disturbed area estimates match the designated limit of work.

15. Plan. Previous comment # 25 was not addressed. Provide additional proposed spot elevations and drainage flow arrows, as applicable, around and between each of the building units to clarify localized grading and drainage patterns. Show and label spot elevations on building corners and between buildings, including the pool area, and along onsite drainage channels and yard inlets.

16. Demolition Plan. Provide a large boxed note on demolition plan Sheet C2 to refer to the sequence of construction on Sheet C4 for placement of erosion and sediment control measures prior to start of demolition activities. Interim erosion and sediment control measures need to be in place and functional prior to commencing demolition activities as shown on Sheet C2 in accordance with the provisions of the sequence of construction (Step 6) and the erosion and sediment plan.

17. Sediment Basins. Show sizes required for the temporary dewatering orifices on the east and west temporary sediment basin details on Sheet C5.

18. East Sediment Basin. The primary BMP for the site will now serve as the east temporary sediment basin for control during construction activity. The east temporary sediment basin detail on Sheet C5 shows the need for a 36-inch CMP riser and a 24-inch CMP barrel. The final BMP detail shows the need for a 72-inch RCP riser and 30-inch RCP barrel. During initial construction of the basin, it is unclear if the final permanent riser/barrel will be constructed and the temporary riser/barrel constructed as two separate structures; or if the final riser/barrel will be modified by adding an extension riser/barrel to serve during sediment basin mode; or if construction of the permanent riser/barrel structure will be delayed until the temporary basin is removed from service. Provide clarification as to how the temporary riser/barrel system will be installed relative to final BMP design.

19. Trail. Remove the exercise and fitness trail from the bottom of all drainage swales, especially around Building Units 6, 7 and 12.

20. Sequence of Construction. The following issues remain with the sequence of construction as presented on Sheet C4:

20a. Step 3 of the sequence should state that prior to mass clearing and grading of the site, rather than prior to land-disturbance. Ensure basin grading as shown on the plans can be performed under existing topography conditions as most of the grading shown appears to be once the entire site is as final grade per grading plan Sheets C9, C10 and C11. Clarify if proposed grading of the basins can be performed as shown under existing topography of the site. *(Note: The temporary sediment basins must have volumes as outlined in the Sediment Basin Design Data Sheets. An interim basin grading plan may be necessary.)*

20b. There may be a conflict with Step 12 of the sequence. Due to grading and the location of the west temporary sediment basin, it appears that some of the onsite storm drainage piping system will not able to be constructed until the basin is removed, especially pipe segments 23 and 27. Temporary pipes may need to be installed from storm inlets # 7, # 22 and # 26 into the western sediment basin. Once the basin is removed and the area regraded, storm pipe segments # 8, # 23 and # 27 can then be installed.

20c. If temporary pipes are used for the west sediment basin, then installation of pipe segments # 8, # 23 and # 27 should be added to Step 20 of the sequence of construction as they will not be constructed until after the western sediment basin is removed.

20d. Step 20 of the sequence should also be specific that only the west temporary sediment basin is to be removed. The east basin gets converted to a permanent BMP once the site is stabilized.

20e. It is unclear how the discharge from the western sediment basin will initially occur once the temporary riser and barrel is installed, but before the downstream connecting storm drainage system is in place and functional. The sequence may need to be clear and specific about early installation of inlets # 9, # 10, # 13 and # 15 and storm piping segments # 10, # 12, # # 14 as well as outlet protection at the east sediment basin.

21. Safety Fence. Adjust safety fence to stay outside (around) the playground area for Powhatan Village apartments.

22. Plan Information. Previous comment # 44 was not fully addressed. Show and label the riprap channel recently installed at Powhatan Village under approved County Plan No. SP-78-01.

Stormwater Management / Drainage:

23. General. In order to achieve 10 BMP points for the stormwater management plan for this site, credit was taken for treatment of offsite drainage from the parcel at the corner of Centerville Road and Longhill Road (n/f Exxon, GPIN 3130100011). However, based on a review of the design report, it appears that the runoff coefficient for DA-Offsite 1 was determined to be 74, which would not reflect a developed condition on that offsite parcel. Also based on the water quality volume computation, only onsite impervious area (5.22 acres) was considered in the design of the BMP (normal pool and extended detention volume). Therefore, based on current design, the BMP for this site does not provide water quality or quantity control for the offsite parcel. Although for channel protection (quantity) purposes, offsite areas can be modeled under present conditions for the 1-year storm event, if BMP point credit is taken for offsite areas, then offsite impervious cover must also be considered in water quality computations and design of the BMP. Also, some basic consideration should be given to the ramifications of future development that may occur on that particular parcel as it pertains to the proposed onsite storm drainage system for this site. Particularly, connection from the offsite parcel to the onsite storm drainage system (ie. near proposed Building 12 and Hill Grove Lane). Secondly, proposed storm pipe segment # 10 (across Longhill Grove Drive) may not have adequate capacity to accept drainage from the offsite parcel under a developed condition.

(Refer to Item 2.8 of the James City County, Environmental Division, Stormwater Drainage Conveyance Systems, General Design and Construction Guidelines. This provision would appear to apply to offsite development which may occur and connect to this onsite drainage system.)

24. Drainage Plan. Currently the stormwater conveyance channel along the back of Building Units 9, 8 and 7 wraps around Building Unit 7 and is then conveyed in a north direction along Longhill Grove Drive. Based on the grading plan Sheet C9 and C10, it appears drainage from this channel would either be conveyed directly onto Longhill Grove Drive or to pipe segment # 29 which is a 15-inch culvert across Grovewood Way. A 15-inch culvert pipe appears substantially undersized for this amount of drainage. In order to address grading/yard issues behind Building Units 5 and 6 (See comment # 9 above) and to not create a drainage problem area along Longhill Grove Drive, it is recommended that an additional DI-7, pedestrian safe inlet be placed in the drainage channel southeast corner of Building 6 with an adequately sized storm drain pipe directed back to proposed Inlet # 5 (Hillgrove Lane). Based on the storm system data, DI-3A Inlet # 5 is approximately 7 ft. deep. *(Note: This may result in a substantial change in the drainage area to Inlet # 5 and verification of hydraulic adequacy or redesign of the downstream storm drain pipe system from Inlet 5 to the BMP.)*

25. Stream Channel Protection. Previous comment # 42 was not fully addressed. The computations in the design report do not adequately show 24-hour detention (drawdown) of the postdevelopment 1-year, 24 hour storm event through the BMP. Please substantiate how 24-hour drawdown was achieved. *(Note: Peak inflow is at time 12.1 hours and the last value in the peak outflow hydrograph is at time 25.9 hours; therefore, the routing only shows 13.8 hours of detention. Outflow must continue to time 36.1 hours to achieve 24 hour detention. Also by rough computation, using the brim full method between top of riser and the 4-inch orifice, only about 22.5 hours is calculated. Please examine.)*

26. Pond Hydraulics. Outlet structure data in the design report does not appear to reflect the 30-inch diameter pond barrel and the effects the barrel could have on the hydraulics of the pond. Configuration of the PondPack model only shows system configuration (connectivity) with a 4-inch low flow orifice and a 6 ft. diameter riser standpipe (weir length = 18.84 feet). The 30-inch pipe may control flow through the system; therefore, the barrel must be added to and considered in the pond's hydraulic model.

27. Pond Tailwater. Previous comment # 52 was not addressed. There is no evidence in the design report that downstream tailwater in the wetland was considered in the hydraulic model for the BMP. A tailwater condition may have a significant effect on outlet discharges and design water surface elevations of the BMP.

28. Riser. As currently shown, the riser device for the BMP is situated on the dam slope, rather than out in the basin pool. As such, the riser cap will be flush with the dam embankment and may cause easily trap debris on the back side and may be easily accessed by authorized individuals. For these types of situations, we prefer the vertical riser to be recessed into the dam embankment with a bar grate structure level with the pond slope, in this case 4H:1V. The bar grate should be a DI-7 type or similar type grate with trash rack bars set perpendicular to the level pool. The 4-inch diameter low flow orifice should also have an EW-11 or other similar trash rack device set into the embankment soils. *(Note: This type of configuration also provides for better aesthetics and screening of the principal spillway device.)*

29. Stormwater Channels. Previous comment # 46 was not fully addressed. Provide construction information (slope, lining, depth, side slope, etc.) or typical channel details and computations for the onsite stormwater conveyance channel situated around Building Units 6 through 9. This channel is approximately 550 ft. in length. Channels shall be designed for erosion resistance for the 2-year storm and for capacity for the 10-year storm.

30. Forebay. Computations in the design report show that 11,537 c.f. of storage volume is available in the pretreatment sediment forebay. No calculations were provided to show volume required based on impervious area for the site (at 0.1 inch per impervious acre). Provide an erosion resistant overflow device between the forebay and the main wet pond cell. *(Note: Maintain sufficient depth in the forebay to minimize mosquito habitat, perhaps 3 or 4 ft. depth.)*

31. Emergency Spillway. More information is necessary to address previous comment # 53. Plans or details should specify lining requirements and minimum side slope for the token emergency spillway section.

32. Flotation Computations. Previous comment # 56 was not addressed. Provide flotation (buoyancy) computations for the riser and base structure. A minimum factor of safety of 1.25 is recommended.

33. Anti-Seep Collars. Show dimensions for the anti-seep collars as shown on the BMP detail on Sheet C5. Provide design information as appropriate for sizing of the collars.

34. Pond Construction. Previous comment # 60 was not addressed. Provide notes or details showing specific construction requirements for the pond (fill) embankment and outlet barrel. Include requirements for sub-grade preparation, fill material type and placement, soil compaction, concrete anti-seep collars (or toe drain), pipe bedding/backfill or cradle and core trench, as applicable for a wet extended detention BMP.

35. Adequate Outflow. There was no response to previous comment # 61. It is unclear if discharge directly to the delineated wetland is adequate. Outflows from SWM/BMP facilities must be discharged to an adequate and well-defined channel. Refer to VSMH page 5 - 61.

36. Maintenance Plan. Previous comment # 62 was not addressed properly. To be provided by others is not an adequate response to this comment. BMP maintenance plans are required as part of the stormwater management plan for the project. Maintenance plans should be prepared by qualified professionals experienced with dam and BMP design, operation and maintenance. Provide a maintenance plan specific for a wet extended detention basin. *(Note: A base electronic version is available from the Environmental Division upon request.)*

37. Slope Labels. Label all graded cut and fill slopes on Sheet C11 with slope indicators to match grading as intended for the interior and exterior slopes of the BMP basin and forebay (ie.4H:1V, 3H:1V, etc.).

38. Pipe Data. Pipe structure number 1A should be 1B on the Drainage Structure Summary on Sheet C9. Also, as previously requested, for clarity purposes it is also recommended that the "Drainage Structure Summary" table as shown on Sheet C9 also be shown on Sheets C10 and C11.

39. Utilities. Show all water line and sanitary sewer crossings on storm profile Sheet C-13.

40. Roof Drains. Provide additional information for construction of the roof drains around all Building Units as shown on SheetsC 6 through C11. Include storm pipe type, size, slope, invert elevations, etc.

ENVIRONMENTAL DIVISION REVIEW COMMENTS
LONGHILL GROVE APARTMENTS
COUNTY PLAN NO. SP - 44 - 03
April 21, 2003

General Comments:

1. A Land-Disturbing Permit and Siltation Agreement, with surety, are required for this project.

2. Water and sewer inspection fees, as applicable, must be paid in full prior to issuance of a Land-Disturbing Permit.

3. A Standard Inspection / Maintenance agreement is required to be executed with the County due to the proposed stormwater conveyance systems and Stormwater Management/BMP facility as proposed for this project.

4. Wetlands. Prior to initiating grading or other on-site activities on any portion of a lot or parcel, all wetland permits required by federal, state and county laws and regulations shall be obtained and evidence of such submitted to the Environmental Division. Refer to Section 23-9(b)(8) and 23-10(7)(d) of the Chapter 23 Chesapeake Bay Preservation ordinance. *(Note: This includes securing necessary wetland permits through the U.S. Army Corps of Engineers Norfolk District and the Virginia Department of Environmental Quality.)*

5. Responsible Land-Disturber Notification. Provide the name of an individual who will be in charge of and responsible for carrying out the land-disturbing activity. Permits or plans without this information are deemed incomplete and not approved until proper notification is received.

6. Record Drawing and Construction Certification. The stormwater management/BMP facility as proposed for this project will require submission, review and approval of a record drawing (as-built) <u>and</u> construction certification prior to release of the posted bond/surety. Provide notes on the plan accordingly to ensure this activity is adequately coordinated and performed before, during and following construction in accordance with current County guidelines.

7. VPDES. It appears land disturbance for the project may exceed one (1) acre. Therefore, it is the owners responsibility to register for a General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from <u>Construction</u> Activities, in accordance with current requirements of the Virginia Department of Environmental Quality and 9 VAC 25-180-10 et seq. Contact the Tidewater Regional Office of the DEQ at (757) 518-2000 or the Central Office at (804) 698-4000 for further information.

8. Watershed. Provide a note on the cover sheet of the plans indicating which County watershed, subwatershed and/or catchment, as applicable, in which the project is situated. *(Note: It appears this project is situated in Subwatershed 204, Catchment 204-101-1 of the Powhatan Creek Watershed.)*

9. Powhatan Creek. This project is situated within the Powhatan Creek watershed. Please note the James City County Board of Supervisors, by resolution dated February 26th 2002, adopted ***in concept*** eight goals and 21 priorities associated with the Powhatan Creek Watershed Management Plan. This project is subject to the contents of that plan. The owner, applicant, developer and plan preparer should be advised of and completely review the goals, priorities (tools) and entire contents of this study, including subwatershed maps, as layout and design of the proposed project could be affected by and should remain consistent with these items. Refer to the draft watershed management plan and it's associated subwatershed maps for environmental sensitive areas, features and/or recommendations that may apply to the subwatershed in which the project area is situated. Specific items that may apply this subwatershed include: RPA buffer extensions; stream buffering; a

potential site for a regional stormwater facility; and a watershed education target area. *(Note: During previous review of the rezoning application Z-5-02, Environmental Division staff generally found that the concept and master plan as presented was generally consistent with the provisions of the Powhatan Creek Watershed Management Plan.)*

10. Site Tabulation. Provide proposed impervious cover and disturbed area estimates in the site statistic portion of the cover sheet . Section 23-9(b)(1)(b) of the Chesapeake Bay Preservation Ordinance states that impervious cover shall not exceed 60 percent of the site.

11. Plan Notes. The following comments are in reference to the "Required Site Plan Notes" as provided on the cover sheet.

    11a. Correct all language in the notes which refer to the "engineering department" or "County inspector" to the James City County Environmental Division or Environmental Division inspector, respectively. This comment also applies to the sequence of construction Sheet C4.
    11b. The County does not own any streets at this location, therefore, all traffic control must be coordinated with VDOT.
    11c. The County does not inspect or certify storm drain installations nor does the County own any of the storm drainage systems at this location.
    11d. The County does not own any public right-of-way at this location, therefore coordinate with VDOT for any inspections to public (or future public) roads.
    11e. Methods and materials do not require approval from the Environmental Division; however, design and construction shall be in accordance with the *James City County Environmental Division, Stormwater Drainage Conveyance Systems (Non-BMP related) General Design and Construction Guidelines.*
    11f. Embankment material and compaction tests are not performed by the County for BMP facilities. The owner/contractor is responsible to ensure inspections and testing are performed to adequately provide construction certifications for BMPs as required. Refer to the *James City County Environmental Division, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions.*
    11g. Drainage Easements. Provide a note on the plan indicating that all drainage easements designated on the plan shall remain private.
    11h. Coordinate with the JCSA for the proper notes for their specific requirements related to public water and sewer facilities.

12. Existing Contours. It is difficult to interpret existing contour information on the plan sheets; therefore, provide labels for existing contours on all sheets.

13. Lift Station. Provide for the replatting of the JCSA lift station parcel. Coordinate with the JCSA.

Floodplain:

14. Provide a note referencing the correct FEMA FIRM panel and any designated special flood hazard areas or zone designations associated with this site, as applicable.

Chesapeake Bay Preservation:

15. Environmental Inventory. Please provide an Environmental Inventory in accordance with Section 23-10(2) of the Chesapeake Bay Preservation ordinance. Components include tidal wetlands, tidal shores, non-tidal wetlands in RPA, resource protection areas, non-tidal wetlands in RMA, hydric soils and slopes 25 percent or greater.

16. Delineate Steep Slope Areas. Section 23-10(2) of the Chesapeake Bay Preservation Ordinance requires delineation of areas with slopes 25 percent or greater. If steep slope areas are present and impacted, a request for a waiver or exception is required, in writing.

17. Wetlands. The concept plan under rezoning application Z-05-02 showed a wetland area in the northeast corner of the site. The final plan set does not show any wetland area situated within this area which coincides with the proposed natural open space east of Building Unit 3. If wetlands are present at this location, it must be shown on the Environmental Inventory for the site.

Erosion and Sediment Control Plan:

18. Design Checklist. Please provide a completed standard *James City County Erosion and Sediment Control and Stormwater Management Design Plan Checklist*, specific to this project. The intent of the checklist is to ensure the plan preparer has provided all items necessary for a complete and expeditious review.

19. Standard E&SC Notes. Replace the Erosion Control Notes on the cover sheet with revised James City County Erosion Control Notes dated 7/06/01. Refer to the Environmental Division portion of the County website or contact the Environmental Division at 757-253-6639 if you need a hard or electronic copy of the standard notes.

20. Temporary Stockpile Areas. Show any temporary soil stockpile, staging and equipment storage areas (with required erosion and sediment controls) or indicate on the plans that none are anticipated for the project site.

21. Offsite Land Disturbing Areas. Based on information on plan Sheet C2, there is a considerable amount of demolition activity to occur on the site. Identify any offsite land disturbing areas including borrow, waste, or disposal sites (with required erosion and sediment controls) or indicate on the plans that none are anticipated for this project.

22. E&SC Narrative. Provide a brief erosion and sediment control plan narrative in accordance with VESCH requirements. The narrative should include important site, adjacent parcel, soil and development information as well as specific control and stabilization measures as proposed.

23. Soils Data. Provide a map and brief descriptions of all soil types associated with the project based on the James City and York Counties and the City of Williamsburg Soil Survey (issued 1985). List erodibility and erosion factors for identified soil mapping units within the limits of construction.

24. Limits of Work. Show and label a distinct limit of work (clearing and grading) around the site periphery on Sheets C4, C9, C10 and C11. Be sure to include work associated with installation of perimeter erosion and sediment controls and utility connections. Ensure disturbed area estimates match the limit of work.

25. Plan. Provide additional proposed spot elevations, and drainage flow arrows as applicable, around and between each of the building units to clarify localized grading and drainage pattern.

26. Construction Entrance. The construction entrance as shown on C4 will need to be in place for the eastern side of the project for disturbances associated with demolition activities on Sheet C2.

27. Access. It is recommended that access for land-disturbing and construction be limited to Longhill Road rather than Centerville Road to limit the transportation of sediment onto public roadways. VDOT approval will be necessary for temporary construction access. If Longhill Road is the primary access location, provide for temporary barriers at the Grove Gate entrance off of Centerville Road during the land-disturbing phase of the project.

28. BMP. Step # 3 of the sequence of construction on Sheet C4 indicates that disturbed area runoff will be directed to the BMP once the onsite storm drainage piping system is in place and functional. No computations were provided for the design of the BMP as a temporary sediment basin consistent with Minimum Standard & Spec. 3.14 of the VESCH.

29. Sediment Traps. The following comments pertain to the layout and design of all onsite temporary sediment traps:

29a. Based on the plans and utility profiles, it appears that most of the proposed locations of all site Temporary Sediment Traps (# 1 through # 10) will directly conflict with either site grading (cut/fill) operations, storm drainage piping installations and existing or proposed water/sewer installations. This is especially true for Sediment Traps # 1, # 2, # 5, # 6, # 7, # 8, # 9 and # 10. Ensure there are no conflicts with existing utilities and explain how the traps will remain functional during grading of the site and installation of piping as proposed. For existing utilities which cross the trap locations, ensure adequate cover will be provided under interim conditions.

29b. The minimum length on the stone outlet shall be 6 feet, regardless of drainage area.

29c. Based on design drainage area sizes as indicated on Sheet C4, Sediment Traps # 6 and # 8 are required to be temporary sediment basins in accordance with Minimum Standard & Spec. 3.13 and 3.14 of the VESCH. The total contributing drainage area to a sediment trap must be less than 3 acres.

29d. Ensure proposed grading for each of the traps can adequately tie to existing ground elevations (when first constructed) and can remain in place and functional as site work progresses to grades shown on Sheets C4 and C9, C10 and C11. Properly show where the stone outlet (discharge) is to be located for each trap.

29e. Sediment traps are to be designed for the total contributing drainage area. Some of the traps for this site are placed such that they will discharge downstream to another trap in series until the site storm drainage piping system is in place and functional. Usually sediment trapping measures are not to be placed in a series configuration. Therefore, Sediment Traps # 9 and # 10 are redundant, making the drainage area for Sediment Trap # 8 at least 4.5 acres. Similarly, Sediment Traps # 1 and # 2 are redundant, making the drainage area for Sediment Trap # 4 approximately 3.5 acres or more if discharges from Sediment Traps # 6, # 7, # 8 and # 9 are intercepted by perimeter diversion dike and directed to Sediment Trap # 4. This issue must be resolved to provide for proper sediment control on the site.

29f. Provide for proper slope or outlet protection at the end of all diversion dikes which enter into sediment traps consistent with Minimum Standard # 7 and # 8.

30. Sediment Traps. Given the number of sediment traps used for the E&SC plan, conflicts as previously mentioned and the need for redesign of at least three of the traps into sediment basins, it is suggested that the E&SC plan be reconfigured for proper control of land-disturbing activities. A suggestion is to utilize two larger sediment trapping basins, one on the west side of the project and one on the east side of the project. The proposed BMP may be utilized as a temporary sediment basin during construction and converted to it's function as a permanent BMP once the land-disturbing phase of construction is over.

31. Diversion Dike. If Temporary Sediment Trap # 3 is to be utilized, another temporary diversion dike is necessary along the limit of work to the west of the trap. This diversion would be a perimeter control device to intercept and direct disturbed area drainage from between Building Units 2 and 3 to the trap.

32. Sequence of Construction. The following comments refer to the sequence of construction as presented on Sheet C4:

32a. Installation of perimeter erosion and sediment control plan measures in the southeast corner of the site (silt fence, diversions, sediment traps, etc.) must precede demolition activities as indicated in Step # 2 of the sequence; or alternatively, interim erosion and sediment control plan measures specific to demolition activities (ie. prior to full site work operations) must be shown on Sheet C2.

32b. The sequence does not address when existing storm sewers are to be removed.

32c. Refer to the record drawing and construction certification requirements and adjust language in Step # 20 of the sequence accordingly or remove language completely.

33. Outlet Protections. Provide riprap outlet protection for all pipe, culvert and storm drain outfalls. This includes storm pipes leading into and out of the BMP. Specify riprap class and thickness, pad dimensions and amount of stone to be used in accordance with requirements of the VESCH, Minimum Standards 3.18 and 3.19.

34. Safety Fence. Provide orange colored safety fence in accordance with VESCH Minimum Standard 3.01 along the south border of the site common with the existing Powhatan Village apartments. This temporary fencing needs to be installed prior to the demolition phase of work. *(Note: It is recommended that this fencing be shown on both demolition plan Sheet C2 and the erosion and sediment control plan sheets.)*

35. Dust Control. Add dust control measures in accordance with Minimum Standard 3.39 of the VESCH to the erosion and sediment control plan for the site. Dust control may be warranted due to the proximity of work to Longhill and Centerville Roads.

Stormwater Management / Drainage:

36. Drainage Map. Based on information in the design report, the drainage area to the BMP is the same for both pre-development and postdevelopment conditions (14.09 acres). Provide a drainage map showing the pre-development drainage area to the proposed basin location.

37. Site Hydrology. Provide additional computations to support the weighted runoff curve number coefficients as used for the pre-development and postdevelopment conditions analyses for the BMP. Also, provide hydrologic computations for the 100-year design storm event under postdevelopment conditions. *(Note: Further substantiate the CN of 79 and 90 as used in the runoff analyses for pre- and postdevelopment conditions. Further breakdowns are necessary for the weighted composite.)*

38. BMP/Water Quality Points. The standard Worksheet for BMP Point System as provided in the design report shows the site stormwater management plan achieves over 10 points based on use of County type B-2 extended detention shallow marsh BMP in combination with dedicated open space. There are several major discrepancies associated with the BMP point computations.

    38a. Firstly, for the structural BMP computation, the total site area is 15.82 acres. Total drainage area for the BMP in the postdeveloped condition is 14.09 acres of which approximately 2.24 acres is offsite and just over 12 acres is onsite. Therefore, the fraction of site served by the BMP is not 100 percent as indicated in the worksheet, but rather 14.09/15.82 = 89.1%. Therefore, structural BMP points are 5.34 points, not 12 as indicated.

    38b. Natural Open Space areas as claimed in the standard BMP worksheet shall be placed in undisturbed common areas or conservation easements. Any areas located within private lots, private property and within maintained landscaping and active recreational areas are not eligible for open space credit. Therefore, the only credit allowed under the natural open space credit portion of the BMP worksheet is the proposed 12,746 sf (0.29 acre) area situated to the east of Building Unit 3. The other 1.5 acres as indicated in the worksheet in not applicable unless placed in conservation easement. Therefore, based on a site area of 15.82 acres, natural open space credit is 0.29/15.82 = 1.83%. Using 0.15 points per 1 percent of the site, this results in 0.27 points for natural open space.

    38c. Extra BMP point credit of 0.15 points per 1 percent site area only applies to natural open space conservation easements which accept and treat stormwater runoff per design specifications or those which directly border, buffer and are adjacent to wetland, mature forests or Resource Protection Area. In order to receive 0.15 points, rather than 0.10 points for each 1 percent of natural open space, it must be shown that the proposed natural open space next to Building Unit 3 is adjacent to a wetland, mature forest or Resource Protection Area. Refer to page 56 of the County BMP manual.

38d. Generally, natural open space credit is not given for open spaces which are less than 35 feet in width. The south portion of the triangular-shaped open space east of Building Unit 3 (12,746 sf) would not meet this requirement.

Therefore, by adding structural and natural open space points would result in 5.34 + 0.27 = 5.61 points, rather than the 13.22 points shown on the worksheet. It does not appear that the site obtains 10 BMP points per County requirements. Suggestions to achieve 10 BMP points for the site include: adding additional natural open space to the site; using a higher point value BMP for the primary onsite BMP; or treating additional offsite area. Submit a BMP calculation worksheet that demonstrates that this project meets the County's water quality criteria.

39. BMP Points. Assigned BMP point values indicated in Table 1 of the County BMP manual assume all features consistent with the manual are provided such as pretreatment forebays, aquatic shelves, stream channel protection volume, pond buffers, etc. As full point credit value is being taken for the BMP in the calculation worksheet, all applicable design features must be present. Many are not.

40. Open Space Credit. Provide a conservation easement plat for all Natural Open Space areas as claimed in the BMP worksheet and as shown on the plan of development.

41. General. Evaluate the potential or feasibility of directing drainage from the uncontrolled area in back (south) of proposed Building Unit 4 to the proposed BMP for this site. Also, drainage from the existing Powhatan Village Apartments site (to the south) is of an uncontrolled nature and is directed to the existing paved and riprap channel which also services a portion of this site. Evaluate the potential or feasibility of directing drainage from the paved channel into the proposed BMP. Offsite point credit can be taken for control of this area in order to achieve 10 BMP points for this plan of development.

42. Stream Channel Protection. There were no computations in the design report to show the BMP design complies with current stream channel protection criteria. Current stream channel protection criteria for James City County requires 24-hour extended detention of the runoff from the 1-year frequency storm (post-developed) instead of reduction of the 2-year peak rate as previously required by MS-19 of the Virginia Erosion and Sediment Control regulations. The traditional SCS Type II, 24-hour storm duration rainfall depth for the 1-year storm event in James City County is 2.8 inches.

43. Site Drainage. Ensure there are no existing culverts or storm drainage piping system which convey unanticipated offsite drainage to areas shown on drainage map Sheet C3. Currently, drainage divides are shown ending at Centerville and Longhill Roads. Additional drainage as such may drastically affect design of the onsite storm drainage system and the BMP. Field reconnaissance may be necessary to confirm.

44. Drainage. A private drainage easement of adequate width is necessary to ensure offsite drainage can be maintained through this site, specifically for the existing offsite paved channel, culvert and riprap channel situated in the southeast corner of the site in the vicinity of the JCSA pump station. Also, show and label the riprap channel which was recently installed at this location under approved County Plan No. SP-78-01 (Powhatan Village).

45. BMP. Provide contour labels or additional proposed spot elevations in the BMP for either the low points or high points. It is unclear if these are high marshes or micropools.

46. Stormwater Channels. Provide construction information (slope, lining, depth, side slope, etc.) or typical channel details and computations for all onsite stormwater conveyance channels. Channels shall be designed for erosion resistance for the 2-year storm and for capacity for the 10-year storm. Also, the onsite stormwater conveyance channels situated to the north and south of Building Unit 4 end abruptly. A designed channel section must continue on to an adequate receiving channel or be directed to the BMP.

47. Channel Adequacy. There are two areas associated with this development plan which discharge runoff into existing natural drainage channels in an uncontrolled manner (ie. without SWM/BMP control). These areas are behind Building Unit 3 and Building Unit 4. Submit adequacy analyses for all receiving natural drainage facilities (swales, channels, etc.) in accordance with VESCH, MS-19 procedure to verify that the natural channels are adequate for velocity and capacity using the 2-year design storm event and man-made channels are adequate for velocity based on the 2-year event and for capacity based on the 10-year event.

48. Pond Hydraulics. Provide computations in the design report for the 100-year water surface elevation in the BMP. Pond buffer and freeboard requirements (ie. minimum top of dam elevation) are based on the 100-year water surface elevation in the BMP.

49. Pond Buffers. A pond buffer should be provided that extends 25 feet outward (landward or upland) from the 100-year design high water surface elevation of the pond.

50. Pond WSEL's. Show the design 1-, 2-, 10- and 100-year design water surface elevations on pond plan Sheet C11 and detail Sheet C5.

51. BMP Pretreatment. Address BMP pretreatment requirements by use of a sediment forebay or other equivalent measure. Sediment forebays are generally sized to contain 0.1 inch per impervious area and can be counted toward the total water quality volume requirement. A reasonable location for a pretreatment forebay is within the northwest corner of the basin where the 36-inch storm pipe outfall is situated.

52. Pond Tailwater. Tailwater conditions directly downstream of the SWM/BMP facility were not considered in the hydraulic routing for the BMP. Please evaluate the potential for tailwater conditions at the outlet of the barrel and subsequent effects a tailwater condition may have to the outlet discharges and design water surface elevations for the BMP.

53. Emergency Spillway. No emergency spillway was provided. For detention/retention facilities, the County recommends use of a combined principal and emergency spillway to achieve a minimum of 1 foot of freeboard from the 100-year design water surface elevation to top of dam (settled). If the principal spillway mechanism (riser/barrel) is intended to pass the design 100-year event, it is common policy to require a token emergency spillway as a secondary release mechanism. The token spillway can be set at or above the design 100-year WSEL as to not impact BMP hydraulics and can be simple in nature such as minimum 8 ft. width, 2H:1V side slopes and grassed or matted lining. Use of a token spillway, as such, can reduce the freeboard requirement to 1 foot, if necessary, for design of the BMP.

54. Riser and Barrel. Specify watertight reinforced concrete pipe meeting the requirements of ASTM C361 or ASTM C76 for the reinforced concrete pipe riser and outlet barrel. Indicate class of pipe required. Provide dimensions and specifications for embedment of the riser into the concrete base. Include provisions for an access lid and steps in the riser for maintenance purposes and consider recessing the riser structure into the pond embankment if feasible.

55. Outlet Barrel. The detail on Sheet C6 show a 27-inch diameter outlet barrel; however, the "Drainage Structure Summary" on Sheet C9 shows an 8-inch pipe. Specify watertight reinforced concrete pipe meeting the requirements of ASTM C361or ASTM C76 for the pond outlet barrel. Indicate all proper construction information including size, class, length, slope, invert elevations and joint type as required.

56. Flotation Computations. Provide flotation (buoyancy) computations for the riser and base structure. A minimum factor of safety of 1.25 is recommended.

57. Anti-Vortex/Trash Rack Device. A concrete anti-vortex top unit is preferred instead of the CMP unit as proposed. Use of materials similar to the riser and barrel material type will deter corrosion. In addition, a concrete unit will be more durable, provide for a longer service life and deter vandalism. Provide details as necessary.

58. Anti-Seep Collars. Provide anti-seep collars along the pond barrel and show appropriate details. Use of concrete collars is recommended per the VSMH.

59. Flared End Section. Provide a flared end section or endwall at the principal spillway barrel outlet.

60. Pond Construction. Provide notes or details showing specific construction requirements for the pond (fill) embankment and outlet barrel. Include requirements for sub-grade preparation, fill material type and placement, soil compaction, concrete anti-seep collars (or toe drain), pipe bedding/backfill or cradle and core trench, as applicable for a extended detention shallow marsh BMP.

61. Adequate Outflow. Outflows from SWM/BMP facilities must be discharged to an adequate and well-defined channel. Facilities discharging onto flat areas with no defined channel usually require a onsite channel to be provided which can adequately convey design flows (discharges). Refer to VSMH page 5 - 61.

62. Maintenance Plan. Provide a maintenance plan for the stormwater management/BMP facility. Section 23-10(4) of the Chesapeake Bay Preservation Ordinance requires stormwater management plans to include a long-term schedule for inspection and maintenance of stormwater management/BMP facilities. The plan should be specific for the selected BMP type.

63. Inlets. Inlet structure # 1A should be designated as a DI-7 on the "Drainage Structure Summary" on Sheet C9.

64. Storm Drains. There are several discrepancies between the storm sewer design computations and construction information shown on the "Drainage Structure Summary" on Sheet C9.

    64a. Computations show that a 21-inch diameter pipe is needed for pipe segment 8 (inlet 7 to 9); however, construction information on the plans shows a 15-inch size.
    64b. Computations show that a 36-inch diameter pipe is needed for pipe segment 10 (inlet 9 to 11); however, construction information on the plans shows a 15-inch size.
    64c. Computations show that a 36-inch diameter pipe is needed for pipe segment 12 (inlet 11 to 13); however, construction information on the plans shows an 18-inch size.
    64d. Computations show that a 36-inch diameter pipe is needed for pipe segment 14 (inlet 13 to 15); however, construction information on the plans shows a 15-inch size.
    64e. Computations show that a 36-inch diameter pipe is needed for pipe segment 16 (inlet 15 to 17); however, construction information on the plans shows a 15-inch size.
    64f. Computations show that an 18-inch diameter pipe is needed for pipe segment 21 (inlet 20 to 22); however, construction information on the plans shows a 15-inch size.
    64g. Computations show that a 24-inch diameter pipe is needed for pipe segment 23 (inlet 22 to 9); however, construction information on the plans shows a 15-inch size.
    64h. Computations show that 15-inch diameter pipe is needed for pipe segments 27, 37 and 35; however, construction information on the plans shows 18-inch size. Ensure the plans and computations match correct pipe sizes for these segments.
    64i. For clarity purposes for design review and construction, it is also recommended that the "Drainage Structure Summary" table as shown on Sheet C9 also be shown on Sheets C10 and C11.

65. Inlets Computations. Inlet spread computations were provided in the design report. Please provide hydraulic grade line computations for the storm system or show the hydraulic grade line for the 10-year design storm on storm sewer profile Sheet C15.

66. Onsite Channels. Provide calculations to support the design of all stormwater conveyance channels and swales. Include drainage areas, times of concentration, runoff coefficients or curve numbers, and intensities for the 2- and 10-year design events and channel design assumptions (slopes, lining, sideslopes, etc.). Provide construction information or typical sections for all onsite stormwater conveyance (open) channels as applicable.

67. IS-1 Shaping. Inlet shaping is recommended for all storm drain structures. Inlet shaping will help to minimize and prevent debris buildups due to changes in pipe alignment. Use notes or details to specify inlet shaping at all structures in accordance with VDOT Standard.

68. Shallow Marsh Design. If a County type B-2 extended detention shallow marsh design is selected for the primary onsite BMP, certain design requirements must be addressed. Provide a water balance to show the wetland can withstand a 30 day drought at summer evaporation rates without completely drawing down and a landscaping or planting plan to show the intended shallow marsh creation at the lower stage of the dry detention pond BMP along with stabilization recommendations for buffer areas. Refer to pages 42 through 44 of the County BMP manual.

69. Geotechnical. Provide information (preliminary soil evaluations, logs, test results, reports, etc.) as necessary to substantiate that existing soils beneath the extended detention shallow marsh (County type B-2) are adequate to sustain a permanent pool as intended for water quality purposes.

70. Meeting. Due to the extensive nature of these comments and incompleteness of the plans, it is suggested that further discussions or a meeting be held between Environmental Division staff and the plan preparer prior to the next submission. Contact the Environmental Division at 757-253-6639.

Section 2 - Stormwater Management / BMP Facility Construction Information:

PreConstruction Meeting Held for Construction of SWM/BMP Facility: ■ Yes ☐ No ☐ Unknown
Approx. Construction Start Date for SWM/BMP Facility: July 16, 2003
Facility Monitored by County Representative during Construction: ■ Yes ☐ No ☐ Unknown
Name of Site Work Contractor Who Constructed Facility: J. H. Martin & Sons Contractors
Name of Professional Firm Who Routinely Monitored Construction: Townes Site Engineering
Date of Completion for SWM/BMP Facility: January 12, 2005
Date of Record Drawing/Construction Certification Submittal: January 20, 2005

(Note: Record Drawing and Construction Certifications are required within thirty (30) days of the completion of Stormwater Management and/or BMP facility construction. Record Drawings and Construction Certifications must be reviewed and approved by the James City County Environmental Division prior to final inspection, acceptance and bond or surety release.)

Section 3 - Owner / Designer / Contractor Information:

Owner/Developer: *(Note: Site Owner or Applicant responsible for development of the project.)*

Name: Eagle Construction of Virginia, Inc.
Mailing Address: 4191 Innslake Drive
Glen Allen, Virginia 23060
Business Phone: (804) 741-4663 Fax: (804) 741-0553
Contact Person: Joyce Wolfe Title:

Design Professional: *(Note: Professional Engineer or Certified Land Surveyor responsible for the design and preparation of plans and specifications for the Stormwater Management / BMP facility.)*

Firm Name: Townes Site Engineering
Mailing Address: 9850 Lori Road, Suite 201
Chesterfield, Virginia 23832
Business Phone: (804) 748-9011
Fax: (804) 748-2590
Responsible Plan Preparer: Brian C. Mitchell, P.E.
Title: Project Manager
Plan Name: Longhill Grove
Firm's Project No. 2003043
Plan Date: March 24, 2003 Latest Revised July 16, 2003
Sheet No.'s Applicable to SWM/BMP Facility: C3 / C4 / C8 / C11 /

BMP Contractor: *(Note: Site Work Contractor directly responsible for construction of the Stormwater Management / BMP facility.)*

Name: J. H. Martin & Sons
Mailing Address: 6550 Ironbridge Road
Richmond, Virginia 23234
Business Phone: (804) 275-1670
Fax: (804) 271-4129
Contact Person: Liston Laine
Site Foreman/Supervisor: Tony Silva
Specialty Subcontractors & Purpose (for BMP Construction Only):

Section 4 - Professional Certifications:

Certifying Professionals: *(Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional Engineer is responsible for the inspection, monitoring and certification of Stormwater Management / BMP facilities during its construction.)*

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: Townes Site Engineering
Mailing Address: 9850 Lori Road, Suite 201
Chesterfield, Virginia 23832
Business Phone: (804) 748-9011
Fax: (804) 748-2590

Name: Brian C. Mitchell, P.E.
Title: Principal

Signature:
Date: 1/14/08

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
BRIAN C. MITCHELL
No. 35724
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: Townes Site Engineering
Mailing Address: 9850 Lori Road, Suite 201
Chesterfield, Virginia 23832
Business Phone: (804) 748-9011
Fax: (804) 748-2590

Name: Brian C. Mitchell, P.E.
Title: Principal

Signature:
Date: 1/14/08

I hereby certify to the best of my knowledge and belief that this Stormwater Management/BMP facility was monitored and constructed in accordance with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
BRIAN C. MITCHELL
No. 35724
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer

Section 5 - Record Drawing and Construction Certification Requirements and Instructions:

☒ PreConstruction Meeting - Provides an opportunity to review SWM / BMP facility construction, maintenance and operation plans and address any questions regarding construction and/or monitoring of the structure. The design engineer, certifying professionals (if different), Owner/Applicant, Contractor and County representative(s) are encouraged to attend the preconstruction meeting. Advanced notice to the Environmental Division is requested. Usually, this requirement can be met simultaneously with Erosion and Sediment Control preconstruction meetings held for the project.

☒ A fully completed ***STORMWATER MANAGEMENT / BMP FACILITIES, RECORD DRAWING and CONSTRUCTION CERTIFICATION FORM*** and ***RECORD DRAWING CHECKLIST***. All applicable sections shall be completed in their entirety and certification statements signed and sealed by the registered professional responsible for individual record drawing and/or construction certification.

☒ The Record Drawing shall be prepared by a Registered Professional Engineer or Certified Land Surveyor for the drainage system of the project including any Best Management Practices.

☒ Construction Certification. Construction of Stormwater Management / BMP facilities which contain impoundments, embankments and related engineered appurtenances including subgrade preparation, compacted soils, structural fills, liners, geosynthetics, filters, seepage controls, cutoffs, toe drains, hydraulic flow control structures, etc. shall be visually observed and monitored by a Registered Professional Engineer or his/her authorized representative. The Engineer must certify that the structure, embankment and associated appurtenances were built in accordance with the approved design plan, specifications and stormwater management plan and standard accepted construction practice and shall submit a written certification and/or drawings to the Environmental Division as required. Soil and compaction test reports, concrete test reports, inspection reports, logs and other required construction material or installation documentation may be required by the Environmental Division to substantiate the certification, if specifically requested. The Engineer shall have the authority and responsibility to make minor changes to the approved plan, in coordination with the assigned County inspector, in order to compensate for unsafe or unusual conditions encountered during construction such as those related to bedrock, soils, groundwater, topography, etc. as long as changes do not adversely affect the integrity of the structure(s). Major changes to the approved design plan or structure must be reviewed and approved by the original design professional and the James City County Environmental Division.

☒ Record Drawing and Construction Certifications are required within **thirty (30) days** of the completion of Stormwater Management / BMP facility construction. Submittals must be reviewed and accepted by James City County Environmental Division prior to final inspection, acceptance and bond/surety release.

Dual Purpose Facilities - Completion of construction also includes an interim stage for Stormwater Management / BMP facilities which serve dual purpose as temporary sediment basins during construction and as permanent stormwater management / BMP facilities following construction, once development and stabilization are substantially complete. For these dual purpose facilities, construction certification is required once the temporary sediment basin phase of construction is complete. Final record drawing and construction certification of additional permanent components is required once permanent facility construction is complete.

Interim Construction Certification is required for those dual purpose embankment-type facilities that are generally ten (10) feet or greater in dam height (*) and may not be converted, modified or begin function as a permanent SWM / BMP structure for a period generally ranging from six (6) to eighteen (18) months or more from issuance of a Land Disturbance permit for construction.

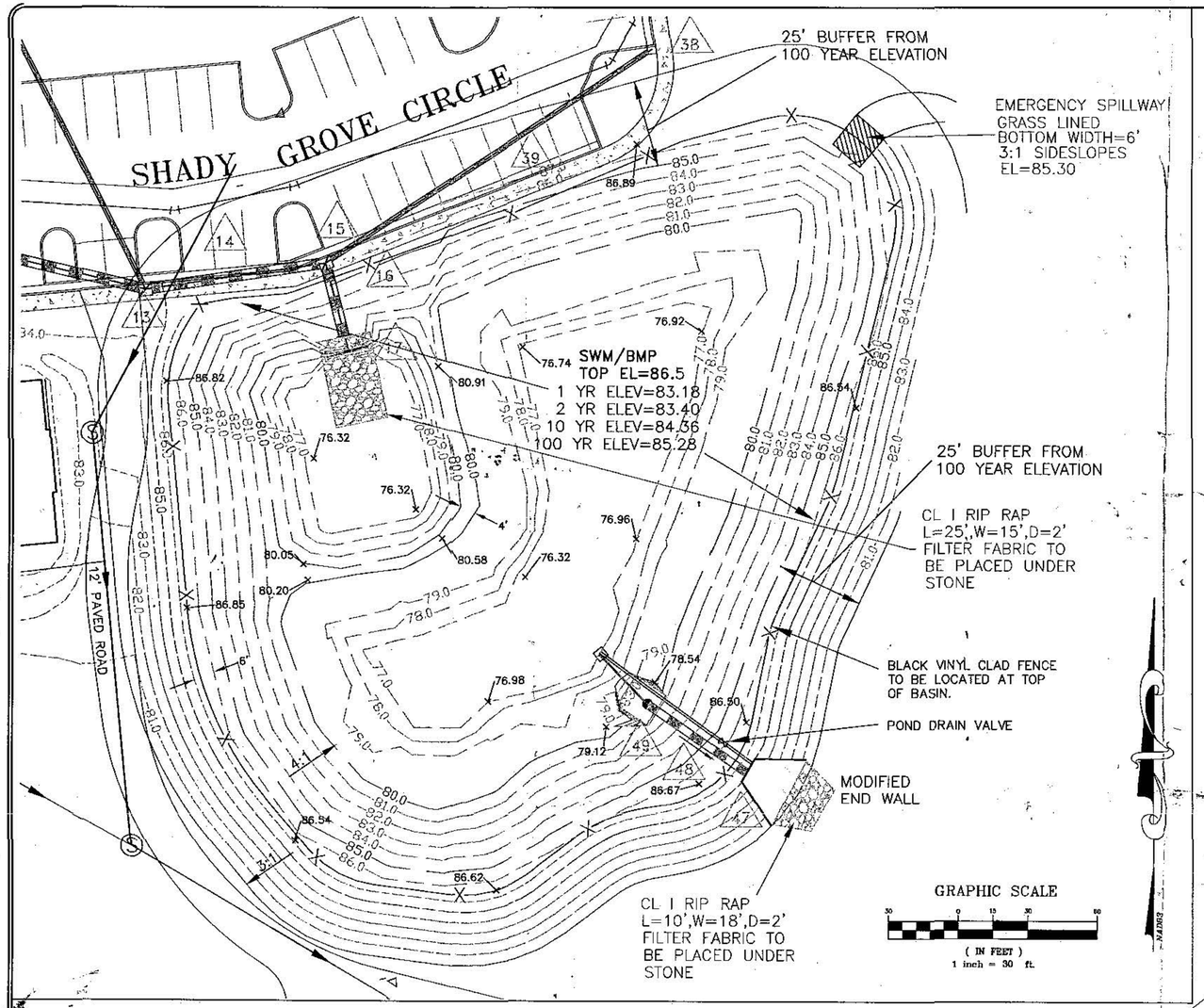
Interim or final record drawing and construction certifications are not required for temporary sediment basins which are designed and constructed in accordance with current minimum standards and specifications for temporary sediment basins per the Virginia Erosion and Sediment Control Handbook (VESCH); have a temporary service life of less than eighteen (18) months; and will be removed completely once associated disturbed areas are stabilized, unless a distinct hazard to the public's health, safety and welfare is determined by the Environmental Division due to the size or presence of the structure or due to evidence of improper construction.

(*Note: Dam Height as referenced above is generally defined as the vertical distance from the natural bed of the stream or waterway at the downstream toe of the embankment to the top of the embankment structure in accordance with 4VAC50-20-30, Virginia Impoundment Structure Regulations and the Virginia Dam Safety Program.)

☒ Record Drawings shall provide, at a minimum, all information as shown within these requirements and the attached **RECORD DRAWING CHECKLIST** specific to the type of SWM/BMP facility being constructed. Other additional record data may be formally requested by the James City County Environmental Division. *(Note: Refer to the current edition of the James City County Guidelines for Design and Construction of Stormwater Management BMP's manual for a complete list of acceptable BMP's. Currently there are over 20 acceptable water quality type BMP's accepted by the County.)*

☒ Record Drawings shall consist of blue/black line prints and a reproducible (mylar, sepia, diazo, etc.) set of the approved stormwater management plan including applicable plan views, profiles, sections, details, maintenance plans, etc. as related to the subject SWM / BMP facility. The set shall indicate **"RECORD DRAWING "** in large text in the lower right hand corner of each sheet with record elevations, dimensions and data drawn in a clearly annotated format and/or boxed beside design values. Approved design plan values, dimensions and data shall not be removed or erased. Drawing sheet revision blocks shall be modified as required to indicate record drawing status. Elevations to the nearest 0.1' are sufficiently accurate except where higher accuracy is needed to show positive drainage. Certification statements as shown in Section 4 of the Record Drawing and Construction Certification Form, ***or similar forms thereof***, and professional signatures and seals, with dates matching that of the record drawing status in the revision or title block, are also required on all associated record drawing plans, prints or reproducibles.

☒ Submission Requirements. Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system, it is requested that the record drawings also be submitted to the Environmental Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Environmental Division staff at the time of final submission.



Maintenance Plan (Wet Extended Detention Pond / BMP)

A maintenance program is required to ensure the Stormwater Management (SWM) / Best Management Practice (BMP) facility functions as designed and to provide for reasonable aesthetic conditions. Proper maintenance is encouraged to prevent the introduction of debris and sediment at inflow locations, pretreatment areas, the BMP itself, its principal control structures and downstream waterways. Following installation and establishment of vegetation in disturbed site areas, inspections for sediment buildups will be performed at least quarterly. It is anticipated that under normal conditions, sediment removal will be required once every 5 to 10 years. If other construction or related land-disturbing activities are performed upslope of the BMP, adequate protection measures should be implemented with inspections performed at least once weekly.

The Owner or its designated representative will inspect the SWM/BMP structure after each significant rainfall event or the following working day if a weekend or holiday occurs. A significant rainfall for this structure is defined as one (1) inch or more of gauged rainfall within a 24 hour period. Once per year (more or less) a representative of the County may jointly inspect the structure. Appropriate action, performed at the cost of the owner will be taken to ensure appropriate maintenance. Keys to locked access points or structures shall be made available to the County upon request.

BMP Description: The BMP serves a drainage area of 15.85 acres. The facility is a 10 point, wet pond-type detention facility, County Type A-3 BMP. A wet extended detention pond stores runoff and is normally wet during non-rainfall periods. The principal structures associated with the BMP consist of a 3-1/2" orifice outfall pipe which sets the elevation of the normal pool. A 48 inch vertical RCP riser with double 36 inch RCP outlet barrels act as the primary outlet control device and an 8 ft. wide, grass-lined emergency overflow channel is provided for safety purposes. There is one opening in the riser to provide for water quality drawdown and to offer control for the 1 year design storm event. During the 100-year storm, the maximum water level should rise to about 2.0 feet above the top of the riser and within 1.25 feet below the top of dam. If functioning properly, normal storm events should reach an elevation just below the top of the riser and the pond should draw down in about 24 hours

Inspection and maintenance of the facility will consist of the following additional measures:

1. Inspect for sediment buildup by visual observation and a physical determination of sediment depth within pond storage areas. If the depth of sediment reaches the depth of 0' - 8" above the bottom of pond (or Cleanout Elevation of 77.67), removal is required. At the same time, or at least once per year, clean pretreatment devices, the riser bottom and outlet pipes of accumulated sediments. Dispose of sediments removed from the facility at an acceptable disposal area. (Note: Cleanout Elevation corresponds to 10 percent of the Water Quality Volume).

2. Perform maintenance mowing of pond grasses at least twice each year. Grasses such as tall fescue should be mowed in early summer after emergence of the heads on cool season grasses and in late fall to prevent seeds of annual weeds from maturing. Mowing of legumes can be less frequent. Trees, shrubs and woody vegetation are not be permitted to grow along or on any part of the embankment embankment that was constructed using engineered (compacted) fills.

3. Perform soil sampling on stabilized pond soil areas at least once every 4 years. Soil sampling and testing should be performed by qualified independent soil testing laboratory such as VPI&SU. Apply additional lime and fertilizer in accordance with test recommendations.

4. In stabilized pond areas, if vegetation covers less than 40 % of soil surfaces, lime, fertilize and seed in accordance with recommendations for new seedings. If vegetation covers more than 40 % but less than 70 % of soil surfaces, lime, fertilize and over seed in accordance with current seeding recommendations or requirements of the Virginia Erosion and Sediment Control Handbook (VESCH).

5. Perform quarterly inspections of the riser section and crest spillway for the observance of collected trash and debris. Immediately remove any trash or debris that prevents the movement of water. Remove any trash and litter downstream and at storm drain or channel inflow locations to maintain the integrity of the structure and provide an attractive appearance.

6. Perform yearly structural inspections of the facility for damage. Structural inspection shall be performed on the concrete riser, anti-vortex device, trash rack, orifices/weirs, outlet barrel and pond embankment. Exposed metal surfaces shall be re-painted or re-galvanized to minimize rust damage or replaced if rust damage is irreversible. If damage is evident, further investigation by a professional engineer may be required to assess the integrity of the structure.

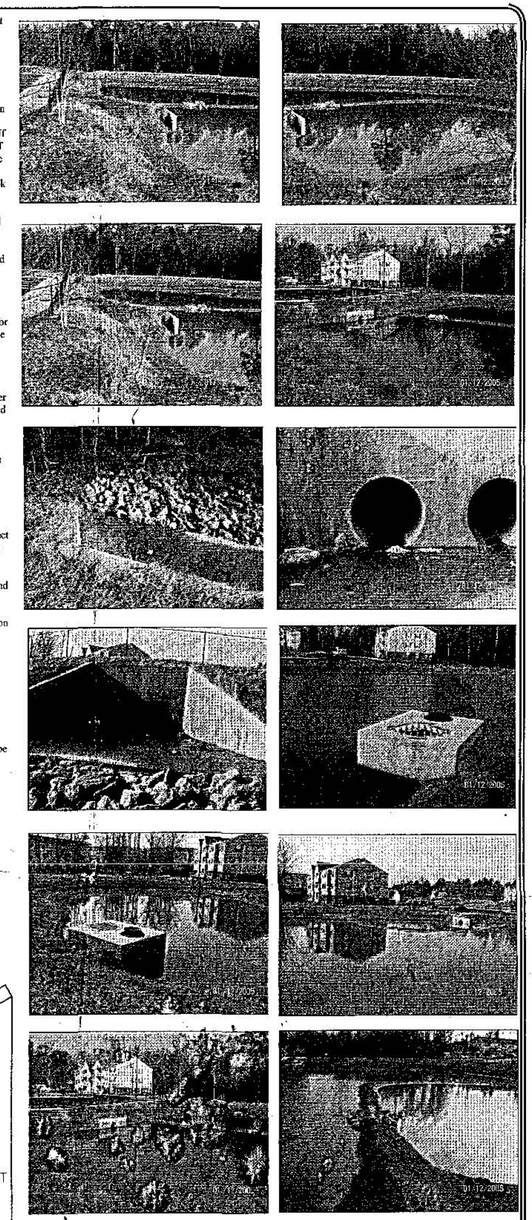
7. Perform quarterly inspections of the graded side slopes of the facility for signs of animal/rodent borrows or slope erosion. Immediately perform necessary repairs, refilling or reseeding.

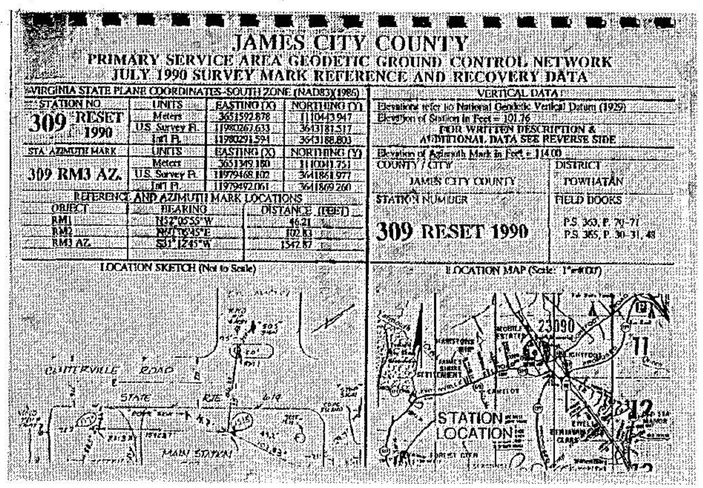
8. Perform yearly observations of perimeter areas surrounding the facility to ensure changes in land use, topography or access have not occurred and do not affect the operation, maintenance, access or safety features as provided. Appropriate action is required to ensure adequacy and to provide a clear, safe passage for maintenance vehicles to the engineered embankment and principal flow control structures.

9. Inspect and exercise pond drain valves, if provided, on a regular basis.

10. Record Keeping. The owner or designated representative shall keep reasonable, accurate written records of inspections performed for the structure. Records shall document routine maintenance and/or repairs performed. Copies shall be provided to the County upon request.

11. The facility shall not accept additional drainage or be modified in any way without prior consent or approval by the Environmental Division of James City County.





JAMES CITY COUNTY
PRIMARY SERVICE AREA GEODETIC GROUND CONTROL NETWORK
JULY 1990 SURVEY MARK REFERENCE AND RECOVERY DATA

VIRGINIA STATE PLANE COORDINATES-SOUTH ZONE (NAD83)(1985)

STATION NO	UNITS	EASTING (X)	NORTHING (Y)
309 RESET 1990	Meters	365192.878	1110443.947
	U.S. Survey Ft.	1198026.633	3643181.517
	Intl Ft.	1198029.594	3643188.803
STA AZIMUTH MARK	UNITS	EASTING (X)	NORTHING (Y)
309 RM3 AZ.	Meters	365139.180	1110341.751
	U.S. Survey Ft.	1197948.102	3641861.977
	Intl Ft.	1197952.061	3641869.260

VERTICAL DATA
Elevations refer to National Geodetic Vertical Datum (1929)
Elevation of Station in Feet = 101.76
FOR WRITTEN DESCRIPTION & ADDITIONAL DATA SEE REVERSE SIDE
Elevation of Azimuth Mark in Feet = 114.00

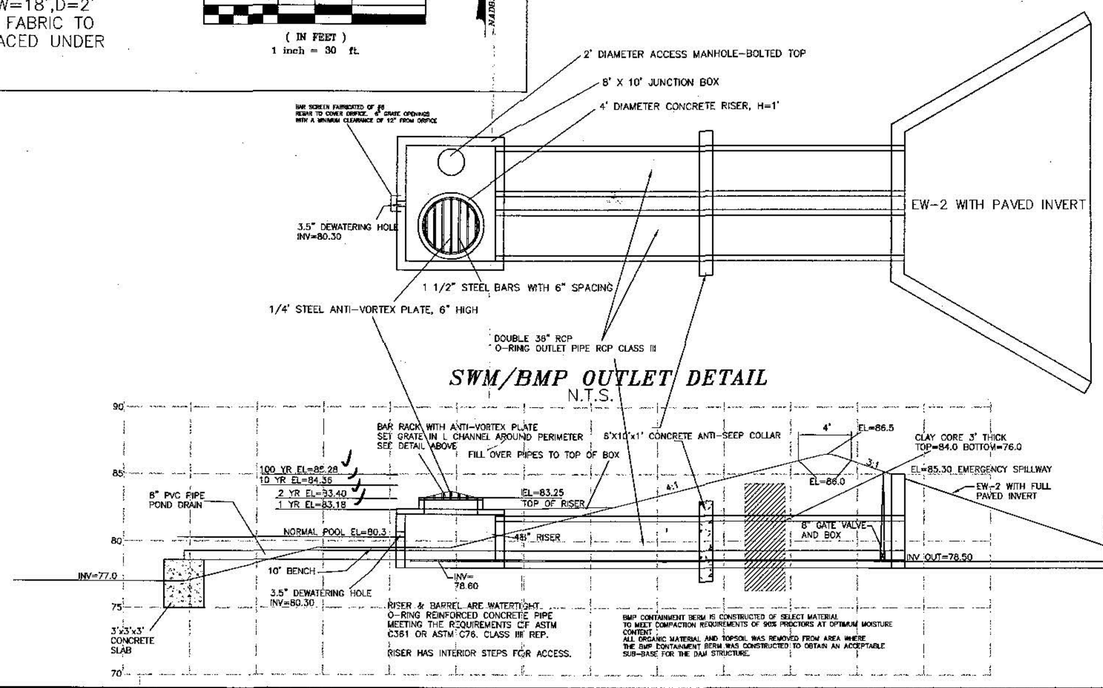
COUNTY / CITY	DISTRICT
JAMES CITY COUNTY	TOWNHATAN
STATION NUMBER	FIELD BOOKS
309 RESET 1990	P.S. 363, P. 70-71 P.S. 365, P. 30-31, 48

REFERENCE AND AZIMUTH MARK LOCATIONS

OBJECT	BEARING	DISTANCE (FEET)
RM1	N32°05'55"W	46.21
RM2	N67°19'45"E	102.83
RM3 AZ.	S31°12'45"W	1542.87

LOCATION SKETCH (Not to Scale)

LOCATION MAP (Scale: 1"=400')



I HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE ACTUAL CONDITION OF THE STORMWATER MANAGEMENT/BMP FACILITY. THE FACILITY APPEARS TO CONFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN, EXCEPT AS SPECIFICALLY NOTED.

RECEIVED
JAN 18 2005
ENVIRONMENTAL DIVISION

RECORD DRAWING
SP-44-03

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Townes Site Engineering

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ASK US HOW

COMMONWEALTH OF VIRGINIA
BRIAN C. MITCHELL
No.035724
JAN 14 2005
PROFESSIONAL ENGINEER

LONGHILL GROVE
BMP FACILITY
POWHATAN DISTRICT
JAMES CITY COUNTY, VIRGINIA

AS-BUILT PLAN

REVISIONS	
DATE	ITEM

DATE 1/13/05
SCALE AS SHOWN
PROJECT MANAGER BRIAN C. MITCHELL, P.E.
CHECKED BY
PROJ.# 2004043
SHEET #