

Stormwater Division

MEMORANDUM

DATE: March 11, 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: CC035

PIN: 4820100003

Subdivision, Tract, Business or Owner

Name (if known):

Williamsburg Landing

Property Description:

Senior Care/Retirement Facility

Site Address:

5560 Williamsburg Landing Drive

(For internal use only)

Box 18

Drawer: N/A

Agreements: (in file as of scan date)

Y

Book or Doc#:

020026036

Page:

809

797

Comments

COPY

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 25 day of October, 2002, between Williamsburg Landing, Inc. and all successors in interest, hereinafter referred to as the "COVENANTORS (S)," owner(s) of the following property: James City County Tax Parcels 4820100003 and 4810100033, project name, Williamsburg Landing, Deed Book 809, Page No. 797; Instrument No. 020013717 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 facility 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 FACILITY for the purpose of inspecting, operating, installing, construction, reconstruction, 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 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 # 020026036

Recorded on Nov. 5, 2002

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 first above written.

COVENANTOR(S)

William A. Doig

ATTEST:

Print Name/Title: William Doig, Executive Director

A
WMS

COMMONWEALTH OF VIRGINIA

~~CITY~~/COUNTY OF James City

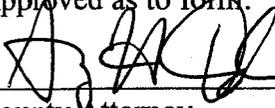
I hereby certify that on this 25th day of October, 2002, before the subscribed, a Notary Public of the State of Virginia, and for the ~~City~~/County of James City, aforesaid personally appeared William A. Doig and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 25 day of October, 2002

Jonas R. Symon
Notary Public

My Commission expires: August 31, 2004

Approved as to form:


Asst. County Attorney

This Declaration of Covenants prepared by:

Charles. J. Bodnar, P.E.
(Print Name)

Associate, The LandMark Design Group, Inc.
(Title)

4029 Ironbound Road, Suite 100
(Address)

Williamsburg, VA 23188
(City) (State) (Zip)

COPY

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 25 day of October, 2002, between Williamsburg Landing, Inc. and all successors in interest, hereinafter referred to as the "COVENANTORS (S)," owner(s) of the following property: James City County Tax Parcels 4820100003 and 4810100033, project name, Williamsburg Landing, Deed Book 809, Page No. 797; Instrument No. 020013717 and the County of James City, Virginia ("COUNTY.")

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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 FACILITY for the purpose of inspecting, operating, installing, construction, reconstruction, 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 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 asses the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

*Instrument # 020026036
Recorded on Nov. 5, 2002*

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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 first above written.

COVENANTOR(S)

William A. Doig

ATTEST:

Print Name/Title: William Doig, Executive Director

A
WKS

COMMONWEALTH OF VIRGINIA

CITY/COUNTY OF James City

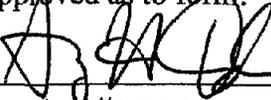
I hereby certify that on this 25th day of October, 2002, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of James City, aforesaid personally appeared William A. Doig and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 25 day of October, 2002

Jonni R. Symon
Notary Public

My Commission expires: August 31, 2004

Approved as to form:


Asst. County Attorney

This Declaration of Covenants prepared by:

Charles J. Bodnar, P.E.
(Print Name)

Associate, The LandMark Design Group, Inc.
(Title)

4029 Ironbound Road, Suite 100
(Address)

Williamsburg, VA 23188
(City) (State) (Zip)



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: WILLIAMSBURG LANDING
Structure/BMP Name: BMP-3 / BASIN #3
Project Location: BERKELEY MAGISTERIAL DISTRICT - OFF LAKE POWELL ROAD NEAR INTERSECTION OF BROOKWOOD DR.
BMP Location: BETWEEN DOW LANE AND DOWNING STREET ON THE NE SIDE OF THE MALL
County Plan No.: SP - 017 - 02

Project Type: Residential Business Tax Map/Parcel No.: (49-2)(01-03), (49-2)(01-33)
 Commercial Office BMP ID Code (if known): _____
 Institutional Industrial Zoning District: R-5
 Public Roadway Land Use: RESIDENTIAL-RETIREMENT LIVING
 Other Site Area (sf or acres): 50.35 AC

Brief Description of Stormwater Management/BMP Facility: BASIN #3 IS A 4-POINT SERIES OF RETAINING WALL STRUCTURES. STRUCTURES INCLUDE ONE SEGMENTAL BLOCK RETAINING WALL W/ ORIFICE AND FOUR METAL SHEET PILE WALLS W/ ORIFICES AND WEIRS. THE TOP OF THE WALLS SERVE AS THE EMERGENCY SPILLWAY. BASIN #3 SERVES A DRAINAGE AREA OF 14.62 ACRES.

Nearest Visible Landmark to SWM/BMP Facility: WILLIAMSBURG LANDING - EARL'S COURT APARTMENTS

Nearest Vertical Ground Control (if known):

JCC Geodetic Ground Control USGS Temporary Arbitrary Other

Station Number or Name: 333

Datum or Reference Elevation: 28.29

Control Description: CONTROL IS A 3 3/4" OEA. DISC IN CONCRETE

Control Location from Subject Facility: CONTROL IS LOCATED 0.6 MI. SOUTH OF RT. 618 (LAKE POWELL RD), 17.0' WEST OF THE E OF RT 617 PAVEMENT (TREASURE ISLAND ROAD)

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: _____
Facility Monitored by County Representative during Construction: Yes No Unknown
Name of Site Work Contractor Who Constructed Facility: JACK L. MASSIE CONTRACTOR, INC.
Name of Professional Firm Who Routinely Monitored Construction: MCKENNEY AND CO.
Date of Completion for SWM/BMP Facility: _____
Date of Record Drawing/Construction Certification Submittal: _____

(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: WILLIAMSBURG LANDING, INC.
Mailing Address: 5700 WILLIAMSBURG LANDING DRIVE
WILLIAMSBURG, VA 23185
Business Phone: 757-253-8801 Fax: _____
Contact Person: BEN TUCKETT 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: LANDMARK DESIGN GROUP
Mailing Address: 4029 IRONBOUND RD., SUITE 100
WILLIAMSBURG, VA 23188
Business Phone: 757-253-2975
Fax: 757-229-0049
Responsible Plan Preparer: CHARLES J. BODNAR
Title: PROF. ENGINEER
Plan Name: WILLIAMSBURG LANDING
Firm's Project No. 2000312-000.07
Plan Date: FEBRUARY 20, 2002
Sheet No.'s Applicable to SWM/BMP Facility: C-10 / C-14 / C-16 / C-17 / C-18 / C-19

BMP Contractor: *(Note: Site Work Contractor directly responsible for construction of the Stormwater Management / BMP facility.)*

Name: JACK L. MASSIE CONTRACTOR, INC.
Mailing Address: 3900 LOKES LANE
WILLIAMSBURG, VA 23188
Business Phone: 757-566-8643
Fax: 757-566-8566
Contact Person: BRENT WELLEN
Site Foreman/Supervisor: MIKE WARREN
Specialty Subcontractors & Purpose (for BMP Construction Only):
BRYANT CONTRACTING, INC. - SHEET PILE WALLS
LANDSCAPE SOLUTIONS - SEGMENTAL BLOCK RETAINING WALL

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

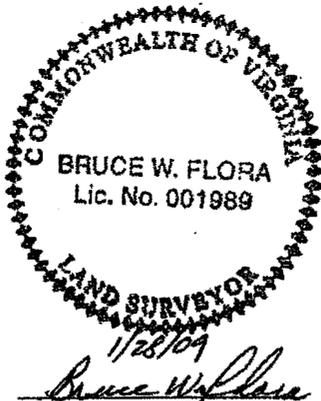
Firm Name: FLORA SURVEYING ASSOC.
Mailing Address: 17863 George Washington
MEM. HWY (RTE 17)
Business Phone: 804-694-4578
Fax: " " 8625
Name: Bruce W. Flora ^{BRUCE} _{FLORA}
Title: PARTNER
Signature: Bruce W. Flora
Date: 1/28/09

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.

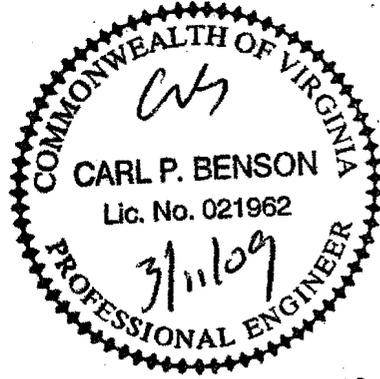
Construction Certification

Firm Name: McKinney & Co.
Mailing Address: 100 S. Railroad Ave.
Ashland, VA 23001
Business Phone: 804-798-1451
Fax: 804-459-0024
Name: Carl P. Benson
Title: MANAGER & GEOTECHNICAL
Signature: Carl P. Benson
Date: 3/11/09

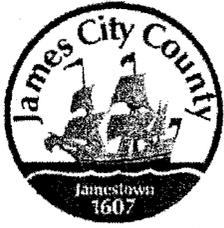
I hereby certify to the best of my knowledge and belief that this Stormwater Management/BMP facility was monitored and constructed in accordance with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.



(Seal)
Virginia Registered Professional Engineer
or Certified Land Surveyor



(Seal)
Virginia Registered
Professional Engineer



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

Project Name: Williamsburg Landing Bmp #3
County Plan No.: SP-017-02
Stormwater Management Facility: _____
BMP Phase #: I II III
 Information Package Received. Date/By: UNKNOWN
 Completeness Check:
 Record Drawing Date/By: 5/14/2008 Bruce Flora
 Construction Certification Date/By: 3/11/2009 Carl Benson
 RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001 Only)
 Insp/Maint Agreement # / Date: 020026036 Nov 5, 2002
 BMP Maintenance Plan Location: _____
 Other: _____
 Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
 Yes No Location: _____
 Assign County BMP ID Code #: Code: CC035
 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: _____
 Record Drawing (RD) Review Date: _____
 Construction Certification (CC) Review Date: _____
 Actions
 No comments.
 Comments. Letter Forwarded. Date: _____
 Record Drawing (RD)
 Construction Certification (CC)
 Construction-Related (CR)
 Site Issues (SI)
 Other: _____
 Second Submission: _____
 Reinspection (if necessary): _____
 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

Inspector: _____

Date: _____

Chief Engineer: _____

Date: _____

*** See separate checklist, if needed.

**STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST**

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

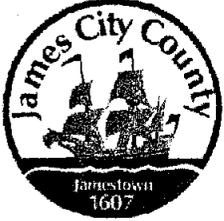
I. Methods and Presentation: (Required for all Stormwater Management / BMP facilities.)

- 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.
- X 2. Elevations to the nearest 0.1' unless higher accuracy is needed to show positive drainage.
- X 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).
- X 4. All plan sheet revision blocks modified to indicate date and record drawing status.
- X 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.)

- X 1. All requirements of Section I (Methods and Presentation) apply to this section.
- X 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.
- X 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.
- X 4. Top widths, berm widths and embankment side slopes.
- X 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.



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

- Project Name: Williamsburg Landing BMP #3
County Plan No.: SP-017-02
Stormwater Management Facility: _____
BMP Phase #: I II III
 Information Package Received. Date/By: UNKNOWN
 Completeness Check:
 Record Drawing Date/By: 5/14/2008 Bruce Flory
 Construction Certification Date/By: 3/11/2009 Carl Benson
 RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001 Only)
 Insp/Maint Agreement # / Date: 020026036 Nov 5, 2002
 BMP Maintenance Plan Location: _____
 Other: _____
 Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
 Yes No Location: _____
 Assign County BMP ID Code #: Code: 22035
 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).
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 Final Inspection (FI) Performed Date: _____
 Record Drawing (RD) Review Date: _____
 Construction Certification (CC) Review Date: _____
 Actions:
 No comments.
 Comments. Letter Forwarded. Date: _____
 Record Drawing (RD)
 Construction Certification (CC)
 Construction-Related (CR)
 Site Issues (SI)
 Other : _____
 Second Submission: _____
 Reinspection (if necessary): _____
 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

Inspector: _____ Date: _____

Chief Engineer: _____ Date: _____

*** See separate checklist, if needed.



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: WILLIAMSBURG LANDING
Structure/BMP Name: BMP-3 / BASIN #3
Project Location: BERKELEY MAGISTRIAL DISTRICT - OFF LAKE POWELL ROAD NEAR INTERSECTION OF BROOKWOOD DR. BETWEEN BOW LANE AND DOWNING STREET ON THE NE SIDE OF THE MALL
BMP Location: BETWEEN BOW LANE AND DOWNING STREET ON THE NE SIDE OF THE MALL
County Plan No.: SP - 017 - 02

Project Type: Residential Business Tax Map/Parcel No.: (49-2)(01-03), (49-2)(01-33)
 Commercial Office BMP ID Code (if known): _____
 Institutional Industrial Zoning District: R-5
 Public Roadway Land Use: RESIDENTIAL-RETIREMENT LIVING
 Other Site Area (sf or acres): 30.35 AC

Brief Description of Stormwater Management/BMP Facility: BASIN #3 IS A 4-POINT SERIES OF RETAINING WALL STRUCTURES. STRUCTURES INCLUDE ONE SEGMENTAL BLOCK RETAINING WALL W/ ORIFICE AND FOUR METAL SHEET PILE WALLS W/ ORIFICES AND WEIRS. THE TOP OF THE WALLS SERVE AS THE EMERGENCY SPILLWAY. BASIN #3 SERVES A DRAINAGE AREA OF 14.62 ACRES.

Nearest Visible Landmark to SWM/BMP Facility: WILLIAMSBURG LANDING - EARL'S COURT APARTMENTS

Nearest Vertical Ground Control (if known):
 ICC Geodetic Ground Control USGS Temporary Arbitrary Other
Station Number or Name: 333
Datum or Reference Elevation: 29.29
Control Description: CONTROL IS A 3 1/4" DIA. DISC IN CONCRETE
Control Location from Subject Facility: CONTROL IS LOCATED 0.6 MI. SOUTH OF RT. 618 (LAKE POWELL RD), 17.0' WEST OF THE E OF RT 617 PAVEMENT (TREASURE ISLAND ROAD)

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: _____
Facility Monitored by County Representative during Construction: Yes No Unknown
Name of Site Work Contractor Who Constructed Facility: JACK L. MASSIE CONTRACTOR, INC.
Name of Professional Firm Who Routinely Monitored Construction: MCKENNEY AND CO.
Date of Completion for SWM/BMP Facility: _____
Date of Record Drawing/Construction Certification Submittal: _____

(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: WILLIAMSBURG LANDING, INC.
Mailing Address: 5700 WILLIAMSBURG LANDING DRIVE
WILLIAMSBURG, VA 23185
Business Phone: 757-253-8801 Fax: _____
Contact Person: BEN TUCKETT 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: LANDMARK DESIGN GROUP
Mailing Address: 4029 IRONBOUND RD., SUITE 100
WILLIAMSBURG, VA 23188
Business Phone: 757-253-2975
Fax: 757-229-0049
Responsible Plan Preparer: CHARLES J. BODNAR
Title: PROF. ENGINEER
Plan Name: WILLIAMSBURG LANDING
Firm's Project No. 2000312-000.07
Plan Date: FEBRUARY 20, 2002
Sheet No.'s Applicable to SWM/BMP Facility: C-10 / C-14 / C-16 / C-17 / C-18 / C-19

BMP Contractor: *(Note: Site Work Contractor directly responsible for construction of the Stormwater Management / BMP facility.)*
Name: JACK L. MASSIE CONTRACTOR, INC.
Mailing Address: 3900 LOKES LANE
WILLIAMSBURG, VA 23188
Business Phone: 757-566-8643
Fax: 757-566-8566
Contact Person: BRENT WILLIAMS
Site Foreman/Supervisor: MIKE WARREN
Specialty Subcontractors & Purpose (for BMP Construction Only):
BRYANT CONTRACTING, INC - SHEET PILE WALLS
LANDSCAPE SOLUTIONS - SEGMENTAL BLOCK RETAINING WALL

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

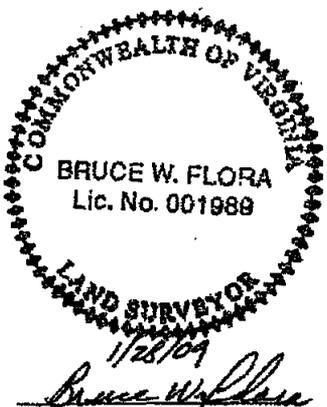
Firm Name: FLORA Surveying Assoc.
 Mailing Address: 12263 George Washington
Mem. Hwy (Rte 17)
 Business Phone: 804-194-4578
 Fax: " " 8625
 Name: Bruce W. Flora ^{BRUCE FLORA}
 Title: PRESIDENT
 Signature: Bruce W. Flora
 Date: 1/28/09

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.

Construction Certification

Firm Name: McKinney & Co.
 Mailing Address: 100 S. Railroad Ave.
Ashland, VA 23001
 Business Phone: 804-798-1451
 Fax: 804-459-0024
 Name: Carl P. Benson
 Title: Manager Geot Services
 Signature: Carl P. Benson
 Date: 3/1/09

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.



Virginia Registered Professional Engineer or Certified Land Surveyor



Virginia Registered Professional Engineer

**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.



WILLIAMSBURG LANDING
WILLIAMSBURG, VIRGINIA



Architect: Cadden, Stephenson & Associates, Inc.
Civil Engineer: Brian W. Bost, No. 029501
Landscape Architect: James P. Bost, No. 029501
Structural Engineer: Michael J. Condit, No. 029501
Professional Engineer: James P. Bost, No. 029501

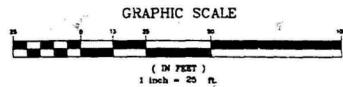
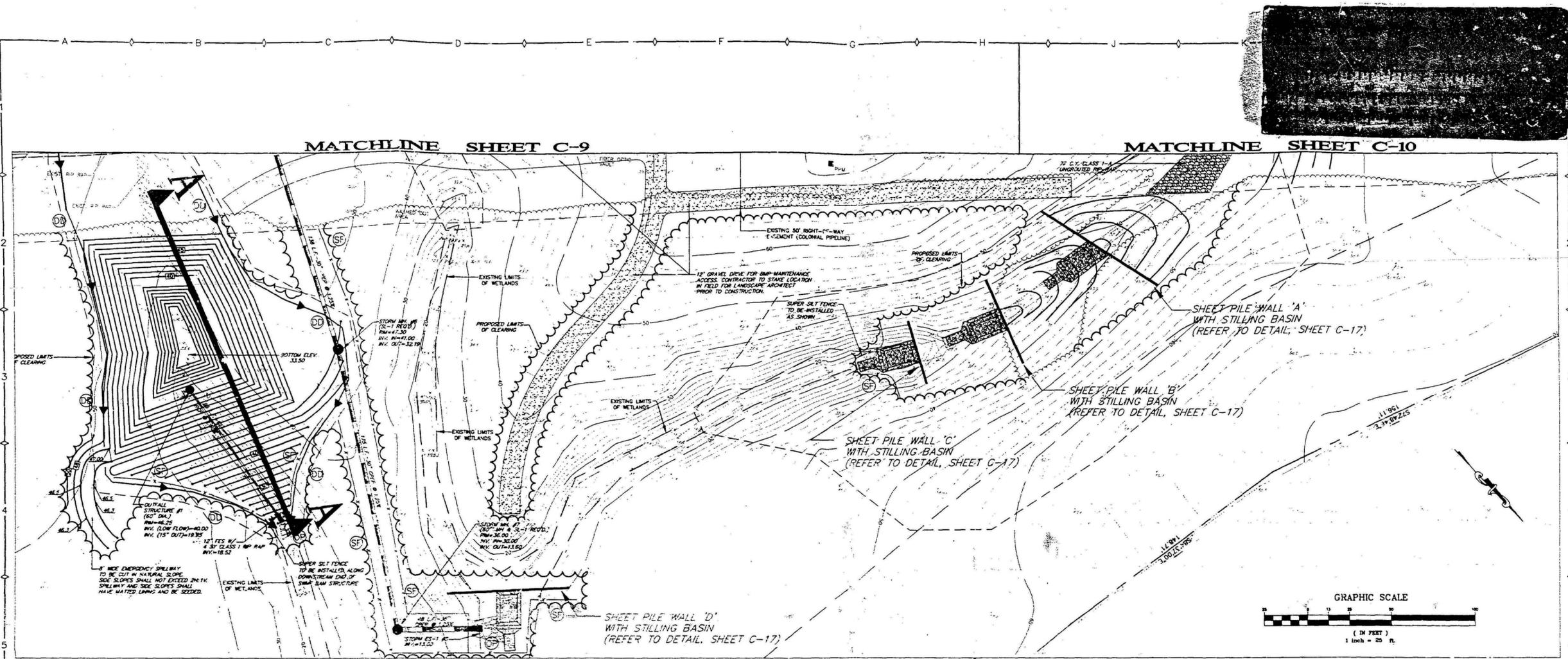
No.	Date	Revisions
1	5/23/02	PER JCC COMMENTS
2	8/5/02	PER JCC COMMENTS
3	10/9/02	PER JCC COMMENTS

Project No: 2000312-000.07
Date: FEBRUARY 20, 2002

Scale: 1"=25'
Sheet Title: BMP PLAN, NOTES AND DETAILS

Sheet No: C-14

SHEET # OF #
SITE
DESIGN DEVELOPMENT
LADD DWG NO. 000774



GEO TECHNICAL ENGINEERING FOR BMP 2

SEEPAGE CONTROL SHALL BE HANDLED VIA A GROUT OR CONCRETE GRADE FOR THE UPPER 2/3 THE DISCHARGE PIPE LENGTH WITH COMPACTED EMBANKMENT FILL PLACED ABOVE THE CONCRETE GRADE... FOR THE LOWER 1/3 OF THE DISCHARGE PIPE LENGTH, A PIPE DRAIN SHALL BE PROVIDED

AN INTERNAL CORE IS NOT NECESSARY FOR THIS EMBANKMENT DAM. THE AVAILABLE SOILS DISPLAY FAVORABLE HYDRAULIC CONDUCTIVITY. ADDITIONAL, IN THE ABSENCE OF VARIATION IN THE NATIVE SOIL MATERIAL, SELECTIVE WATERAL USE IS NOT PRACTICAL. THE FOLLOWING CONSTRUCTION CRITERIA SHALL BE USED FOR THE EMBANKMENT DAM

1. TOPSOIL, ORGANIC MATTER AND DISTURBED SOILS SHOULD BE REMOVED FROM ALL SUBSTRATES TO RECEIVE COMPACTED EMBANKMENT FILL. THE RESULTING SUBSTRATE SHOULD BE PROFFERED WITH A FULLY LOADED TANDEM AXLE DUMP TRUCK UNDER THE DIRECT VISUAL OBSERVATION OF THE GEO TECHNICAL ENGINEER. AREAS THAT "FL" HEAVE OR BECOME OTHERWISE DISTURBED SHOULD BE UNDERLIFT AND RETURNED TO GRADE USING COMPACTED EMBANKMENT FILL.
2. COMPACTED EMBANKMENT FILL SHOULD CONSIST OF NON-ORGANIC SOILS CONTAINING BETWEEN 30 AND 70 PERCENT SAND, A PLASTICITY INDEX OF AT LEAST 15 AND A RECOMPACTED HYDRAULIC CONDUCTIVITY OF NO GREATER THAN 0.00001 CM/SEC. CLASSIFICATION ALLOWS FOR THE REUSE OF ON-SITE SOILS, WITH THE EXCEPTION OF NON-PLASTIC SILTY SAND AND OTHER PERVIOUS SANDY SOILS. SANDY SOILS NOT SUITABLE FOR EMBANKMENT FILL CONSTRUCTION CAN BE USED IN OTHER AREAS OF THE OVERALL SITE DEVELOPMENT.
3. COMPACTED EMBANKMENT FILL SHALL BE PLACED IN HORIZONTALY-PLACED LOOSE LIFTS NOT EXCEEDING 8-INCHES THICK, WHICH ARE COMPACTED TO AT LEAST 95 PERCENT OF THE MAXIMUM DRY DENSITY AS DETERMINED IN THE LABORATORY USING ASTM D-698. STANDARD PROCTOR. WHERE EMBANKMENT FILL IS PLACED ADJACENT TO EXISTING OR PREVIOUSLY-PLACED GRADES IN EXCESS OF 5% IN, THE NEW SOIL LIFT SHOULD BE BENCHED INTO THE EXISTING GRADE.
4. THE PERFORMANCE OF THE NET POND AND EMBANKMENT DAM IS CONTINGENT ON COMPLIANCE TO JCC'S DESIGN PERMEABILITY REQUIREMENT OF 0.00001 CM/SEC. DURING CONSTRUCTION, WE RECOMMEND AT LEAST 3 RECOMPACTED PERMEABILITY AND CLASSIFICATION TESTS ON THE SOILS USED IN EMBANKMENT CONSTRUCTION.
5. PORTIONS OF THE BMP BELOW THE NORMAL POOL ELEVATION WILL BE CONSTRUCTED IN EXCAVATED SOILS. IN EXCAVATION AREAS, THE SUBGRADE SHOULD BE SCARFED, MOISTURE CONDITIONED AND RECOMPACTED TO CONFORM TO THE REQUIREMENTS OF EMBANKMENT FILL.
6. FOR THE CASE THAT I.E. RECOMPACTED PERMEABILITY TESTS DO NOT DEMONSTRATE CONFORMANCE TO JCC REQUIREMENTS, WE RECOMMEND THE DESIGN BE MODIFIED TO INCLUDE AN ENGINEERED LINER BELOW THE NORMAL POOL ELEVATION AND ON THE UPSTREAM FACE OF THE EMBANKMENT.

THE FOLLOWING QUALITY CONTROL ASSURANCE (QCA) PROGRAM SHALL BE UTILIZED DURING THE CONSTRUCTION OF THE PROJECT

1. DOCUMENTATION BY A GEO TECHNICAL ENGINEER (OR EXPERIENCED GEO TECHNICAL TECHNICIAN) OF SITE PREPARATION ACTIVITIES TO INCLUDE CONTRACTOR'S STRIPPING ACTIVITIES, PROFFERING AND UNDERCUTTING AS WARRANTED
2. STANDARD PROCTOR MOISTURE RELATIONS (ASTM D-698) AND SOIL CLASSIFICATION (ASTM D-2487) FOR REPRESENTATIVE SOILS USED IN THE EMBANKMENT CONSTRUCTION. SAMPLE EACH VARYING SOIL MATERIAL OR AT LEAST ONCE PER WEEK, WHICHEVER IS GREATER
3. RECOMPACTED HYDRAULIC CONDUCTIVITY TESTING OF REVOLVED SURFACES (ASTM D-5084). PREPARE SAMPLES TO AT LEAST 95 PERCENT RELATIVE COMPACTION (ASTM D-698), CONDENSATE TO 10 PSI AND CONDUCT THE TEST WITH A HYDRAULIC GRADIENT OF 4.50 INCHES PER INCH
4. FIELD DENSITY (ASTM D-1556) AND COMPACTION MOISTURE CONTENT TESTING (ASTM D-5223) ON EACH 8-INCH THICK LIFT OF EMBANKMENT FILL AT A FREQUENCY OF AT LEAST 1 TEST PER 5,000 SQUARE FEET (I.E. EVERY 250 CUBIC YARDS OF EMBANKMENT)
5. DOCUMENTATION ON THE INSTALLATION OF THE OUTLET PIPE CONCRETE BEDDING AND PIPE DRAIN AS SPECIFIED

BMP MAINTENANCE REQUIREMENTS

THE OWNER OR HIS DESIGNATED REPRESENTATIVE WILL INSPECT THE BMP STRUCTURES 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. A REPRESENTATIVE OF THE COUNTY MAY JOINTLY INSPECT THE STRUCTURE

BASIN #2 SERVES A DRAINAGE AREA OF 7.90 ACRES ASSOCIATED WITH PHASES 1 AND 2 OF THE WILLIAMSBURG LANDING DEVELOPMENT. THIS FACILITY IS A 4-POINT, EXTENDED DETENTION FACILITY. THE NORMAL WATER ELEVATION IS 40.00 WITH THE NORMAL DEPTH OF WATER BEING 5 FEET. TYPICAL DRAINAGE FOR THIS BASIN RANGES FROM 24 TO 72 HOURS AFTER A STORM EVENT. PRINCIPAL STRUCTURES ASSOCIATED WITH THIS BMP CONSIST OF ONE 3-INCH LOW FLOW ORIFICE, A 60-INCH VERTICAL RISER AND A 12-INCH OUTLET BARREL. THERE IS NO EMERGENCY SPILLWAY ASSOCIATED WITH THIS BASIN. DURING THE 100-YEAR STORM EVENT, THE MAXIMUM WATER LEVEL SHOULD RISE TO ABOUT 2.0 FEET ABOVE THE TOP OF THE RISER AND WITHIN 1.10 FEET OF THE TOP OF THE DAM. IF FUNCTIONING PROPERLY, NORMAL STORM EVENTS SHOULD REACH AN ELEVATION 12-INCHES ABOVE THE TOP OF THE RISER

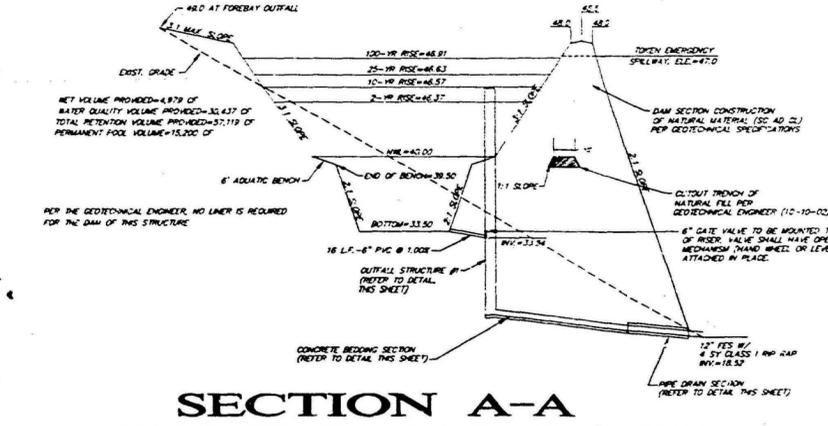
BASIN #3 SERVES A DRAINAGE AREA OF 14.62 ACRES ASSOCIATED WITH PHASE 2 OF THE WILLIAMSBURG LANDING DEVELOPMENT. THIS FACILITY IS A 4-POINT, SERIES OF RETAINING WALL STRUCTURES. PRINCIPAL STRUCTURES ASSOCIATED WITH THIS BMP CONSIST OF 1 SEGMENT BLOCK RETAINING WALL WITH ORIFICE AND 4 METAL SHEET PILE RETAINING WALLS WITH ORIFICES AND WEIRS. THE TOP OF THE WALLS SERVE AS THE EMERGENCY SPILLWAY FOR THIS FACILITY. DURING THE 100-YEAR STORM EVENT, THE MAXIMUM WATER LEVEL SHOULD RISE TO ABOUT 12 INCHES BELOW THE TOP OF THE RETAINING WALLS. IF FUNCTIONING PROPERLY, NORMAL STORM EVENTS WILL RISE TO 2-5 FEET BELOW THE TOP OF THE RETAINING WALLS

INSPECTION AND MAINTENANCE OF THE FACILITY WILL CONSIST OF THE FOLLOWING ADDITIONAL MEASURES:

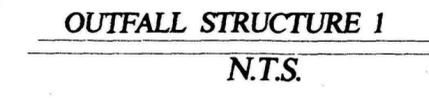
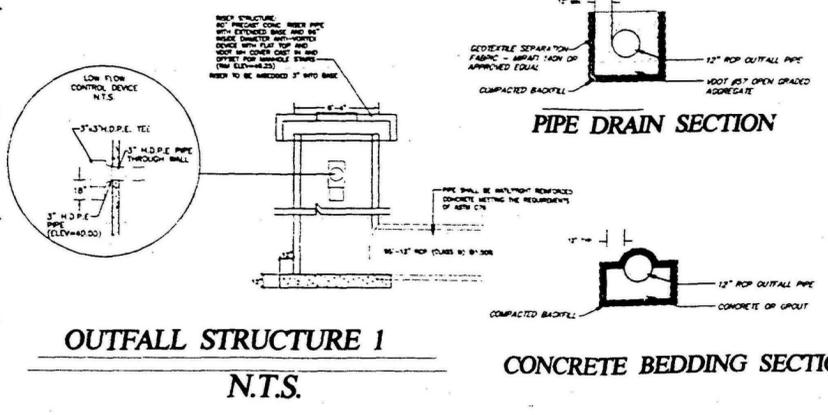
- INSPECT FOR SEDIMENT BUILDUP BY VISUAL OBSERVATION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN THE POND STORAGE AREAS. IF THE DEPTH OF THE SEDIMENT REACHES THE DEPTH OF 2'-6" ABOVE THE BOTTOM OF THE POND, REMOVAL IS REQUIRED. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, CLEAN THE FOREBAYS, THE RISER BOTTOMS AND OUTLET PIPES OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA.
- PERFORM MAINTENANCE MOWING OF POND GRASSES AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWN IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS OF 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 PERMITTED TO GROW ALONG OR ON ANY PART OF THE EMBANKMENT THAT WAS CONSTRUCTED USING ENGINEERED (COMPACTED) FILLS
- PERFORM SOIL SAMPLING ON STABILIZED POND SOIL AREAS AT LEAST ONCE EVERY 4 YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY A QUALIFIED SOIL TESTING LABORATORY SUCH AS VPK&S. CONTACT THE LOCAL OFFICE OF THE VIRGINIA COOPERATIVE EXTENSION FOR FURTHER INFORMATION. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.
- IN STABILIZED POND AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME, FERTILIZER AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDINGS IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACES, LIME, FERTILIZER AND OVER SEED IN ACCORDANCE WITH CURRENT SEEDING RECOMMENDATIONS OR REQUIREMENTS OF THE VESDH.
- PERFORM QUARTERLY INSPECTIONS OF THE RISER SECTION AND RETAINING WALLS FOR THE OBSERVATION 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.
- PERFORM YEARLY INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICES/WEIRS, OUTLET BARREL, RETAINING WALLS AND POND EMBANKMENT. EXPOSED METAL SURFACES SHALL BE RE-PAINTED OR RE-DANDED 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.
- PERFORM QUARTERLY INSPECTIONS OF THE GRADED SIDE SLOPES OF THE FACILITY FOR SIGNS OF ANNUAL/PERIODIC BORROWS OR SLOPE EROSION. IMMEDIATELY PERFORM NECESSARY REPAIRS, RETILING OR RESEEDING.
- 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.

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.

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.



N.T.S.



N.T.S.



WILLIAMSBURG LANDING
WILLIAMSBURG, VIRGINIA



ARCHITECT: O&D Engineering Associates, Inc.
10000 Williamsburg Blvd., Suite 400
Williamsburg, VA 23185
703.745.1400
www.oandd.com

GENERAL CONTRACTOR: Williamsburg Landing, Inc.
10000 Williamsburg Blvd., Suite 400
Williamsburg, VA 23185
703.745.1400
www.williamsburglanding.com

STRUCTURAL ENGINEER: O&D Engineering Associates, Inc.
10000 Williamsburg Blvd., Suite 400
Williamsburg, VA 23185
703.745.1400
www.oandd.com

No.	Date	Revisions
1	5/21/02	PER ACC COMMENTS
2	8/19/02	PER ACC COMMENTS
3	10/19/02	PER ACC COMMENTS

Project No: 2000312-000-07

Date: FEBRUARY 20, 2002

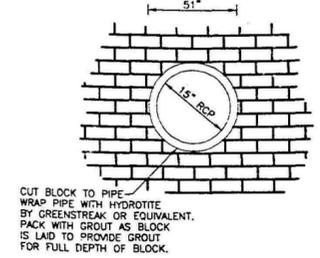
Scale: AS NOTED

Sheet Title: RETAINING WALL DETAILS AND SECTIONS

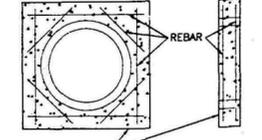
Sheet No: C-16

SITE DESIGN DEVELOPMENT

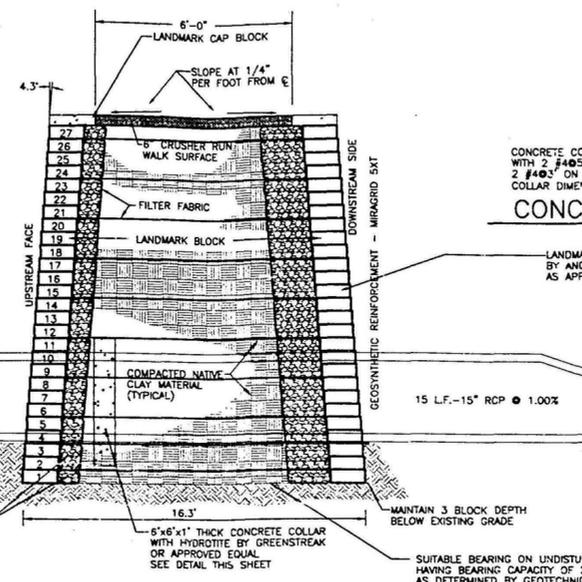
LINDA DAVIS P. 0200404



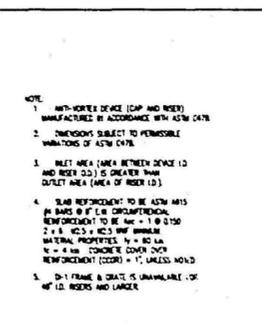
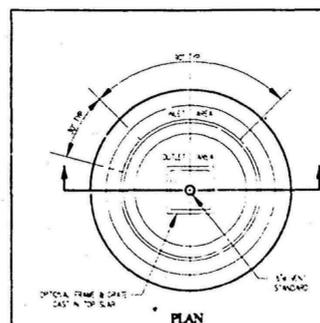
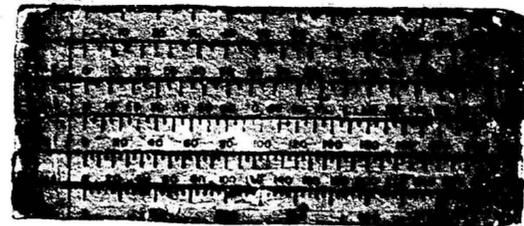
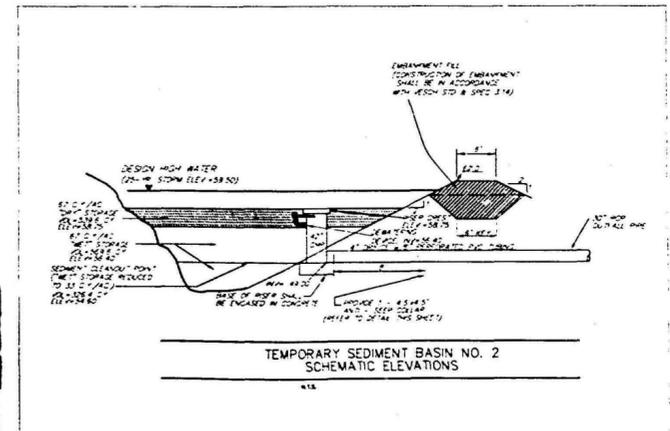
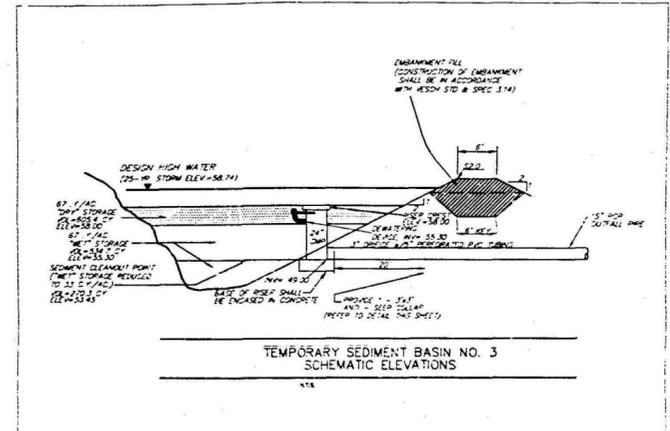
ELEVATION AT BARREL
TYPICAL BOTH FACES



CONCRETE COLLAR
DETAIL

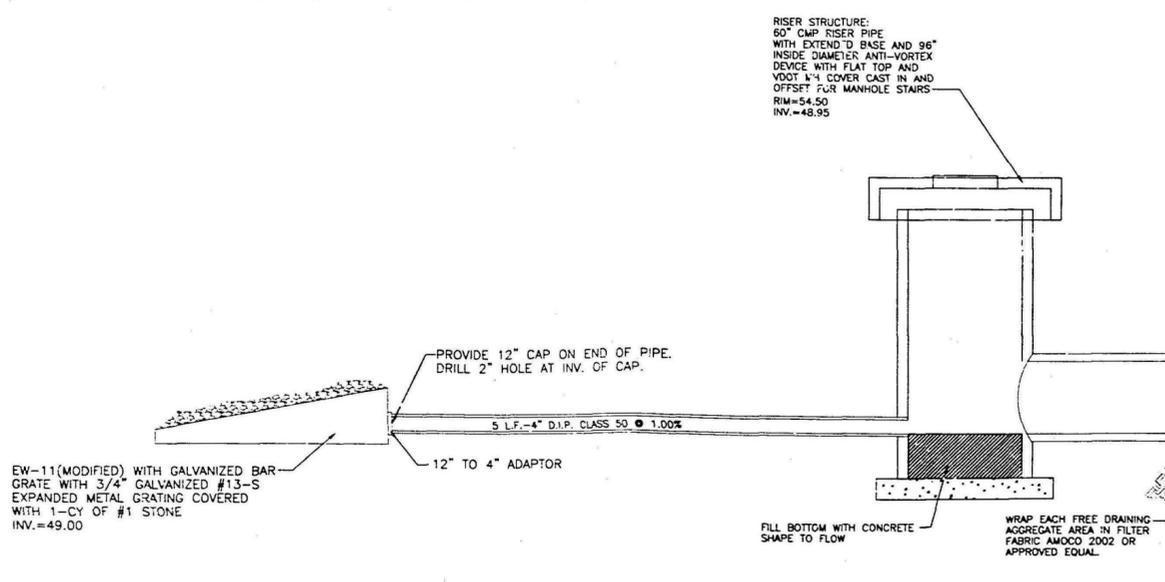


DAM SECTION A-A



ANTI-VORTEX DEVICE DETAIL

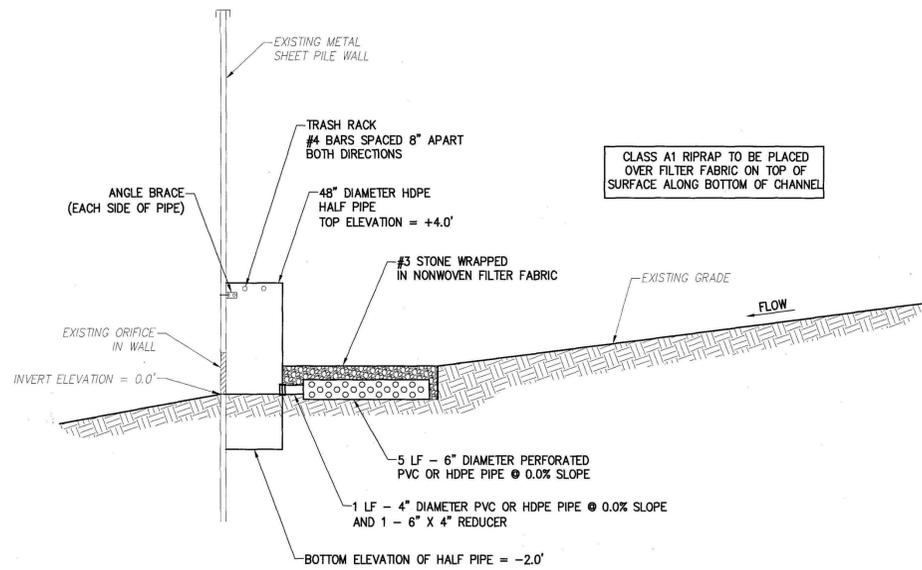
WATER	ANTI-VORTEX CAP	WATER	APPROX
DEPTH	DIAMETER	DEPTH	CAP HEIGHT
12"	0.0	10"	0.2
24"	0.0	20"	0.4
36"	0.0	30"	0.6
48"	0.0	40"	0.8
60"	0.0	50"	1.0
72"	0.0	60"	1.2
84"	0.0	70"	1.4
96"	0.0	80"	1.6
108"	0.0	90"	1.8
120"	0.0	100"	2.0
132"	0.0	110"	2.2
144"	0.0	120"	2.4
156"	0.0	130"	2.6
168"	0.0	140"	2.8
180"	0.0	150"	3.0
192"	0.0	160"	3.2
204"	0.0	170"	3.4
216"	0.0	180"	3.6
228"	0.0	190"	3.8
240"	0.0	200"	4.0
252"	0.0	210"	4.2
264"	0.0	220"	4.4
276"	0.0	230"	4.6
288"	0.0	240"	4.8
300"	0.0	250"	5.0



NOTES:
THIS DESIGN IS BASED ON THE ASSUMPTION THAT THE FOUNDATION SOILS SUPPORTING THE WALLS ARE COMPETENT WITH RESPECT TO BEARING CAPACITY AND SETTLEMENT. TO ASSIST IN EVALUATING THE FOUNDATION SOILS, A GEOTECHNICAL ENGINEER MUST OBSERVE AND TEST THE FOUNDATION SOILS PRIOR TO PLACEMENT OF THE GRAVEL LEVING PAD, BLOCK, FILL OR GEOSYNTHETIC REINFORCEMENT. DENSITY TESTS MUST BE TAKEN IN THE BACKFILL PLACED BEHIND THE WALLS. ADDITIONAL INFORMATION REGARDING REUSE OF THE ON-SITE SOILS FOR FILL, COMPACTION TESTING INTERVALS, SPECIFICATIONS, BACKFILLING TECHNIQUES, SITE DRAINAGE, ETC., SHOULD ALSO BE PROVIDED BY THE PROJECT GEOTECHNICAL OR CIVIL ENGINEER.
CONTRACTOR TO PROVIDE SEALED SHOP DRAWINGS AND CALCULATIONS FROM THE SEGMENTED CONCRETE MASONRY WALL SYSTEM SUPPLIER.

APARTMENT ROOF DRAINAGE SCHEDULE

1. 6" ADD. BASIN INV.=75.20	2. 6" ADD. BASIN INV.=75.20	3. 6" ADD. BASIN INV.=75.20	4. 6" ADD. BASIN INV.=75.20	5. 6" ADD. BASIN INV.=75.20	6. 6" ADD. BASIN INV.=75.20	7. 6" ADD. BASIN INV.=75.20	8. 6" ADD. BASIN INV.=75.20	9. 6" ADD. BASIN INV.=75.20	10. 6" ADD. BASIN INV.=75.20	11. 6" ADD. BASIN INV.=75.20	12. 6" ADD. BASIN INV.=75.20	13. 6" ADD. BASIN INV.=75.20	14. 6" ADD. BASIN INV.=75.20	15. 6" ADD. BASIN INV.=75.20	16. 6" ADD. BASIN INV.=75.20	17. 6" ADD. BASIN INV.=75.20	18. 6" ADD. BASIN INV.=75.20	19. 6" ADD. BASIN INV.=75.20	20. 6" ADD. BASIN INV.=75.20	21. 6" ADD. BASIN INV.=75.20	22. 6" ADD. BASIN INV.=75.20	23. 6" ADD. BASIN INV.=75.20	24. 6" ADD. BASIN INV.=75.20	25. 6" ADD. BASIN INV.=75.20	26. 6" ADD. BASIN INV.=75.20	27. 6" ADD. BASIN INV.=75.20	28. 6" ADD. BASIN INV.=75.20	29. 6" ADD. BASIN INV.=75.20	30. 6" ADD. BASIN INV.=75.20	31. 6" ADD. BASIN INV.=75.20	32. 6" ADD. BASIN INV.=75.20	33. 6" ADD. BASIN INV.=75.20	34. 6" ADD. BASIN INV.=75.20	35. 6" ADD. BASIN INV.=75.20	36. 6" ADD. BASIN INV.=75.20	37. 6" ADD. BASIN INV.=75.20	38. 6" ADD. BASIN INV.=75.20	39. 6" ADD. BASIN INV.=75.20	40. 6" ADD. BASIN INV.=75.20	41. 6" ADD. BASIN INV.=75.20	42. 6" ADD. BASIN INV.=75.20	43. 6" ADD. BASIN INV.=75.20	44. 6" ADD. BASIN INV.=75.20	45. 6" ADD. BASIN INV.=75.20	46. 6" ADD. BASIN INV.=75.20	47. 6" ADD. BASIN INV.=75.20	48. 6" ADD. BASIN INV.=75.20	49. 6" ADD. BASIN INV.=75.20	50. 6" ADD. BASIN INV.=75.20	51. 6" ADD. BASIN INV.=75.20	52. 6" ADD. BASIN INV.=75.20	53. 6" ADD. BASIN INV.=75.20	54. 6" ADD. BASIN INV.=75.20	55. 6" ADD. BASIN INV.=75.20	56. 6" ADD. BASIN INV.=75.20	57. 6" ADD. BASIN INV.=75.20	58. 6" ADD. BASIN INV.=75.20	59. 6" ADD. BASIN INV.=75.20	60. 6" ADD. BASIN INV.=75.20	61. 6" ADD. BASIN INV.=75.20	62. 6" ADD. BASIN INV.=75.20	63. 6" ADD. BASIN INV.=75.20	64. 6" ADD. BASIN INV.=75.20	65. 6" ADD. BASIN INV.=75.20	66. 6" ADD. BASIN INV.=75.20	67. 6" ADD. BASIN INV.=75.20	68. 6" ADD. BASIN INV.=75.20	69. 6" ADD. BASIN INV.=75.20	70. 6" ADD. BASIN INV.=75.20	71. 6" ADD. BASIN INV.=75.20	72. 6" ADD. BASIN INV.=75.20	73. 6" ADD. BASIN INV.=75.20	74. 6" ADD. BASIN INV.=75.20	75. 6" ADD. BASIN INV.=75.20	76. 6" ADD. BASIN INV.=75.20	77. 6" ADD. BASIN INV.=75.20	78. 6" ADD. BASIN INV.=75.20	79. 6" ADD. BASIN INV.=75.20	80. 6" ADD. BASIN INV.=75.20	81. 6" ADD. BASIN INV.=75.20	82. 6" ADD. BASIN INV.=75.20	83. 6" ADD. BASIN INV.=75.20	84. 6" ADD. BASIN INV.=75.20	85. 6" ADD. BASIN INV.=75.20	86. 6" ADD. BASIN INV.=75.20	87. 6" ADD. BASIN INV.=75.20	88. 6" ADD. BASIN INV.=75.20	89. 6" ADD. BASIN INV.=75.20	90. 6" ADD. BASIN INV.=75.20	91. 6" ADD. BASIN INV.=75.20	92. 6" ADD. BASIN INV.=75.20	93. 6" ADD. BASIN INV.=75.20	94. 6" ADD. BASIN INV.=75.20	95. 6" ADD. BASIN INV.=75.20	96. 6" ADD. BASIN INV.=75.20	97. 6" ADD. BASIN INV.=75.20	98. 6" ADD. BASIN INV.=75.20	99. 6" ADD. BASIN INV.=75.20	100. 6" ADD. BASIN INV.=75.20
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SIDE VIEW A-A

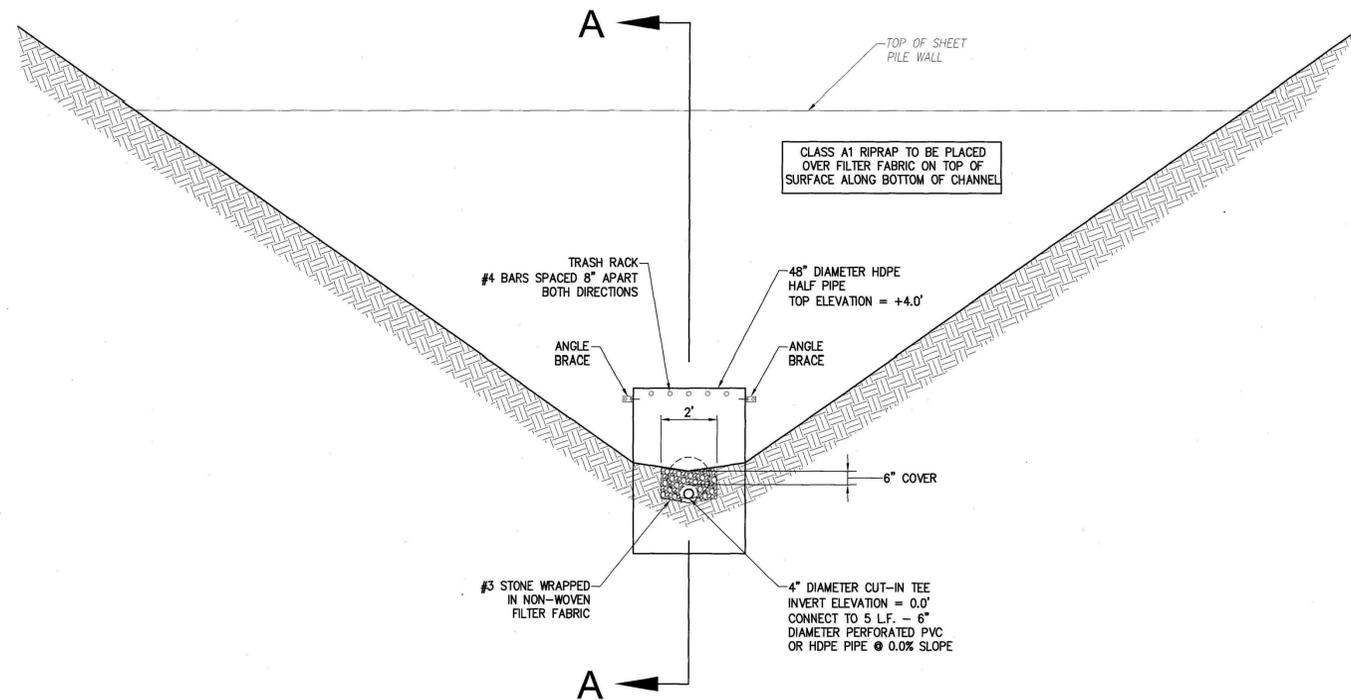
N.T.S.

OWNER / DEVELOPER INFORMATION:

OWNER/DEVELOPER: WILLIAMSBURG LANDING, INC.
 5700 WILLIAMSBURG LANDING DRIVE
 WILLIAMSBURG, VIRGINIA 23185
 TELEPHONE: (757) 258-2163
 FAX: (757) 258-2167
 CONTACT: STEVE MONTGOMERY

GENERAL NOTES

1. SITE ADDRESS: 5560 WILLIAMSBURG LANDING DRIVE
2. TAX MAP PARCEL ID.: 4820100003
3. THE CONTRACTOR SHALL REMOVE THE EXISTING WOOD STRUCTURES AT THE FOUR EXISTING SHEET PILE WALLS AND REPLACE THEM WITH THE DESIGN SHOWN ON THIS PLAN.
4. THE CONTRACTOR SHALL REMOVE ANY EXCESS MATERIAL THAT MAY EXIST AROUND THE LOW FLOW STRUCTURE TO ENSURE PROPER DRAINAGE.
5. THE CONTRACTOR SHALL PLACE SUITABLE FILL MATERIAL, FILTER FABRIC, AND CLASS A1 RIP RAP IN ERODED AREAS ALONG BOTTOM OF CHANNEL IN THE AREA OF THE SHEET PILE WALLS TO ENSURE PROPER DRAINAGE.
6. THE CONTRACTOR IS RESPONSIBLE FOR USING THE APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES AS OUTLINED IN THE LATEST EDITION OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH) INCLUDING PERMANENT SEEDING AS NECESSARY.



FRONT VIEW

N.T.S.



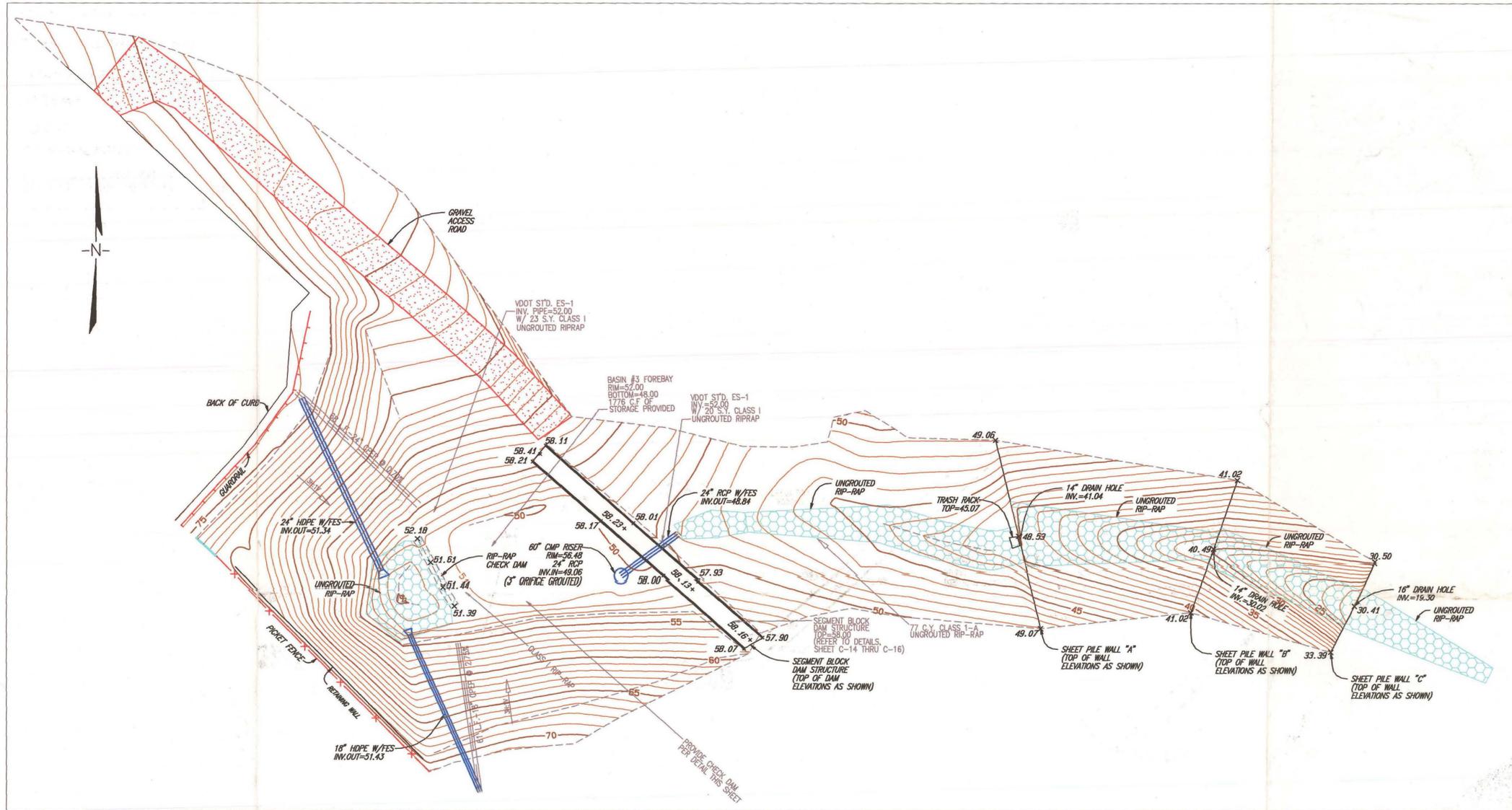
6548 Oak Trace Road, Suite 1
 Williamsburg, Virginia 23185
 Phone: (757) 253-0040
 Fax: (757) 253-8884
 www.aies.com

AIES
 CONSULTING ENGINEERS

Hampton Roads | Central Virginia | Middle Peninsula

LOW FLOW STRUCTURE DETAIL FOR
 SHEET PILE WALLS
WILLIAMSBURG LANDING, INC.
 JAMES CITY COUNTY, JAMESTOWN DISTRICT, VIRGINIA

Project Contact:	NB
Project Number:	8162-14
Scale:	Date:
AS NOTED	04/26/11
Sheet Title:	
LOW FLOW STRUCTURE DETAIL	
Sheet Number	1



LEGEND

- AS-BUILT TOPOGRAPHY 4/15/08 (1' CONTOUR INTERVAL)
- GRADE BREAKLINES
- FENCE
- GUARDRAIL
- PROPOSED STORMWATER PIPES
- AS-BUILT STORMWATER PIPE
- AS-BUILT ELEVATION
- RIP-RAP

NOTE: PROPOSED DESIGN INFORMATION IS SHOWN IN LIGHT GREY TEXT
AS-BUILT INFORMATION IS SHOWN IN BOLD TEXT



RECORD DRAWING CERTIFICATION:

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.

FLORA SURVEYING ASSOCIATES, P.C.
12683 GEORGE WASHINGTON MEMORIAL HIGHWAY
GLENNES, VA 23149
PHONE - 804-694-4578
FAX - 804-694-8265
BRUCE W. FLORA, LS#001989
PRESIDENT

Bruce W. Flora 1/28/09

JCC SP-17-02

FLORA
SURVEYING ASSOCIATES
12683 GEORGE WASHINGTON MEMORIAL HIGHWAY
GLENNES, VIRGINIA 23149
(800) 474-5052 (804) 694-4578



REV.	DATE	DESCRIPTION	DR BY	APP BY	REV BY	
PROJECT No.	06-0301	SCALE:	1"=30'	APP BY		
PROJECT:	WILLIAMSBURG LANDING BERKELEY DISTRICT, JAMES CITY COUNTY, VIRGINIA				DATE:	05/12/08
SHEET TITLE:	WILLIAMSBURG LANDING STORMWATER BASIN #3 RECORD DRAWING				SHEET	1 OF 1
					DRAWING No.	RD-01

Insert plan page here

**WATER QUALITY VOLUME CALCULATION
FOR
BASIN 3, WILLIAMSBURG LANDING**

LMDG File No. 2000312-000.15

- Per the *James City County Guidelines for Design and Construction of Stormwater Management BMP's*, a timber wall extended detention system is required to have a water quality volume equal to 1-inch (0.08 feet) times the impervious area draining to the basin.
- The impervious area from Basin 3's drainage area is 4.2076 acres, or 183,283 square feet.
- The water quality volume required is 14,663 cubic feet ($0.08 * 183283$).

File: Universal Pre.xls
PROJECT: WILLIAMSBURG LANDING
 Description: **Pre-development to BMP #3**
 Date: 7-Feb-02
 Revised

LandMark Design Group
 4029 Ironbound Road, Suite 100
 Williamsburg, VA 23188

UNIVERSAL RATIONAL METHOD FOR HYDROGRAPH GENERATION

Drainage Area = 6.88 Acres
 Runoff Coefficient = 0.32
 Time of Concentration = 37.32 Min

1 Yr computed peak discharge = 4.06 cfs
 2 Yr computed peak discharge = 4.94 cfs
 10 Yr computed peak discharge = 7.05 cfs
 25 Yr computed peak discharge = 8.20 cfs
 100 Yr computed peak discharge = 10.05 cfs

COMPUTED HYDROGRAPH VERTEX POINTS

1 Yr Frequency		2 Yr Frequency		10 Yr Frequency		25 Yr Frequency		100 Yr Frequency	
Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)
0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
37.3	0.85	37.3	1.04	37.3	1.48	37.3	1.72	37.3	2.11
74.6	1.22	74.6	1.48	74.6	2.11	74.6	2.46	74.6	3.02
112.0	4.06	112.0	4.94	112.0	7.05	112.0	8.20	112.0	10.05
149.3	2.19	149.3	2.67	149.3	3.81	149.3	4.43	149.3	5.43
186.6	1.58	186.6	1.93	186.6	2.75	186.6	3.20	186.6	3.92
223.9	1.02	223.9	1.24	223.9	1.76	223.9	2.05	223.9	2.51
261.2	0.73	261.2	0.89	261.2	1.27	261.2	1.48	261.2	1.81
298.6	0.61	298.6	0.74	298.6	1.06	298.6	1.23	298.6	1.51
335.9	0.57	335.9	0.69	335.9	0.99	335.9	1.15	335.9	1.41
373.2	0.53	373.2	0.64	373.2	0.92	373.2	1.07	373.2	1.31
410.5	0.00	410.5	0.00	410.5	0.00	410.5	0.00	410.5	0.00

EQUATIONS

$I = B / (tc + D)^E$

$tp = 3 * tc$

$tb = 11 * tc$

$Qp = C * I * A$

B, D, E constants based on NWS Hydro 35

File: Universal Post.xls
PROJECT: WILLIAMSBURG LANDING
 Description: **Postdevelopment to BMP #3**

LandMark Design Group
 4029 Ironbound Road, Suite 100
 Williamsburg, VA 23188

Date: 21-Mar-02
 Revised:

UNIVERSAL RATIONAL METHOD FOR HYDROGRAPH GENERATION

Drainage Area = 13.15 Acres
 Runoff Coefficient = 0.49
 Time of Concentration = 18.50 Min

1Yr computed peak discharge = 18.32 cfs
 2 Yr computed peak discharge = 21.89 cfs
 10 Yr computed peak discharge = 30.21 cfs
 25 Yr computed peak discharge = 34.58 cfs
 100 Yr computed peak discharge = 41.56 cfs

COMPUTED HYDROGRAPH VERTEX POINTS

1 Yr Frequency		2 Yr Frequency		10 Yr Frequency		25 Yr Frequency		100 Yr Frequency	
Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)
0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
18.5	3.85	18.5	4.60	18.5	6.34	18.5	7.26	18.5	8.73
37.0	5.49	37.0	6.57	37.0	9.06	37.0	10.37	37.0	12.47
55.5	18.32	55.5	21.89	55.5	30.21	55.5	34.58	55.5	41.56
74.0	9.89	74.0	11.82	74.0	16.31	74.0	18.67	74.0	22.44
92.5	7.14	92.5	8.54	92.5	11.78	92.5	13.49	92.5	16.21
111.0	4.58	111.0	5.47	111.0	7.55	111.0	8.65	111.0	10.39
129.5	3.30	129.5	3.94	129.5	5.44	129.5	6.22	129.5	7.48
148.0	2.75	148.0	3.28	148.0	4.53	148.0	5.19	148.0	6.23
166.5	2.56	166.5	3.06	166.5	4.23	166.5	4.84	166.5	5.82
185.0	2.38	185.0	2.85	185.0	3.93	185.0	4.50	185.0	5.40
203.5	0.00	203.5	0.00	203.5	0.00	203.5	0.00	203.5	0.00

EQUATIONS

$I = B / (tc + D)^E$

B, D, E constants based on NWS Hydro 35

$tp = 3 * tc$

$tb = 11 * tc$

$Qp = C * I * A$

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Manual	4.06	37	111	29,659	1	---	---	---	1-Yr. Predev.
2	Manual	18.32	18	54	65,081	1	---	---	---	1-Yr. Postdev.
3	Manual	4.94	37	111	36,097	2	---	---	---	2-Yr. Predev.
4	Manual	21.89	18	54	77,782	2	---	---	---	2-Yr. Postdev.
5	Manual	7.05	37	111	51,504	10	---	---	---	10-Yr. Predev.
6	Manual	30.21	18	54	107,330	10	---	---	---	10-Yr. Postdev.
7	Manual	8.20	37	111	59,918	25	---	---	---	25-Yr. Predev.
8	Manual	34.58	18	54	122,872	25	---	---	---	25-Yr. Postdev.
9	Manual	10.05	37	111	73,438	100	---	---	---	100-Yr. Predev.
10	Manual	41.56	18	54	147,668	100	---	---	---	100-Yr. Postdev.
11	Reservoir	2.71	18	144	65,081	1	2	41.86	43,579	1-Yr. Routing
12	Reservoir	3.30	18	144	77,781	2	4	42.35	52,470	2-Yr. Routing
13	Reservoir	6.75	18	108	107,330	10	6	43.18	68,545	10-Yr. Routing
14	Reservoir	8.86	18	108	122,872	25	8	43.46	74,285	25-Yr. Routing
15	Reservoir	11.03	18	108	147,668	100	10	43.95	84,553	100-Yr Routing
Proj. file: Basin3.GPW				IDF file: Norfolk.IDF				Run date: 03-22-2002		

CHANNEL PROTECTION VOLUME CALCULATION

Project Name : Williamsburg Landing, Phase 2
Basin 3

Project # : 2000312-000.15

One Year Precipitation : P= 2.8 Inches

PRE-DEVELOPMENT CONDITIONS :

Drainage Area : $DA_{PRE} = 6.88$ Acres
SCS Curve Number : $CN_{PRE} = 33$ Unitless
Time of Concentration : $T_{C_{PRE}} = 0.62$ Hours

I_a/P	C_0	C_1	C_2
0.10	2.55323	-0.61512	-0.16403
0.30	2.46532	-0.62257	-0.11657
0.35	2.41896	-0.61594	-0.08820
0.40	2.36409	-0.59857	-0.05621
0.45	2.29238	-0.57005	-0.02281
0.50	2.20282	-0.51599	-0.01259

Initial abstraction ; $I_a = 0.2 \times (1000/CN - 10) = 4.061$ Inches
 $I_a/P = 1.45$

Accumulated direct runoff : $Q_u = (P - I_a)^2 / (P + 4I_a) = 0.08$ Inches

Unit Peak Discharge : $q_u = 204$ cfs/sq.mile/in.
 $\log(q_u) = C_0 + C_1 \log(T_c) + C_2 [\log(T_c)]^2$
 C_0, C_1, C_2 Coefficients from TABLE F1 above

Pre-development peak discharge : $q_p = q_u \times DA \times Q_u / 640 = 0.18$ c.f.s.

POST DEVELOPMENT CONDITIONS :

Drainage Area : $DA_{POST} = 13.15$ Acres
SCS Curve Number : $CN_{POST} = 50$ Unitless
Time of Concentration : $T_{C_{POST}} = 0.31$ Hours

Initial abstraction ; $I_a = 2.000$ Inches
 $I_a/P = 0.71$

Accumulated direct runoff : $Q_u = 0.06$ Inches

Unit Peak Discharge : $q_u = 290$ cfs/sq.mile/in.

Post development peak discharge rate : $q_i = q_p = 0.35$ c.f.s.

Ration of outflow to inflow : * $q_o/q_i = 11.98 \times q_u^{0.937} = 0.0591$

* Direct calculation using equation for T=24hr. developed by Stewart Comstock, P.E., MDE

Peak outflow discharge : $q_o = 0.0208$ c.f.s.

Ratio of storage volume to runoff volume : $V_s/V_r = 0.60$
 $V_s/V_r = 0.683 - 1.43(q_o/q_i) + 1.64(q_o/q_i)^2 - 8.04(q_o/q_i)^3 =$

Required Storage Volume : $V_s = V_s/V_r \times Q_u \times A / 12 \times 43560 = 1709$ cubic feet

ESTIMATED POND FULL DRAWDOWN

$H_{TRIAL} = 1.5$ Feet

$A_o = 0.003539$ sq. ft.

$d_o = 0.8055154$ inches

BMP BASIN 2

$D_{ORIFICE} = 1.75$ inches

W.S.E. (feet)	AREA s.f.	INC. VOL c.f.	STORAGE c.f.	H _{AVG} ft.	Q _{AVG} cfs	dT hours
45.00	7052	6542	23641	4.50		
44.00	6032	5560	17099	3.50		
43.00	5088	4653	11539	2.50	0.1253	10.3
42.00	4218	3821	6886	1.00	0.0774	13.7
WQVSE 41.45	3781.3	1621	4686	0.73	0.0649	6.9
41.00	3424	3065	3065	0.50	0.0526	16.2
40.00	2706	0	0	0.00		

DRAW DOWN TIME = 24.0

**FOREBAY SIZING CALCULATIONS
FOR
WILLIAMSBURG LANDING**

LMDG File No. 2000312-000.07

- James City County requires a forebay to be sized to contain 0.1 inches per impervious area of contributing drainage. 0.1-inch is 0.0083 feet. The forebay must be 4 to 6 feet deep.

Basin 2

- The impervious area from Basin 2's drainage area within the project limits is 3.052 acres, or 132,945 square feet. The impervious area from Woodhaven (Phase 1) that drains into Basin 2 is 1.186 acres, or 51,665 square feet. Total impervious area within Basin 2 is 4.238 acres, or 184,610 square feet.
- The forebay volume required is 1532.3 cubic feet (0.0083 * 184610).
- Calculate the volume provided per the design on the plans:

ELEVATION	SURFACE AREA (square feet)	INCREMENTAL VOLUME (cubic feet)	TOTAL VOLUME (cubic feet)
46.0	154	0	0
47.0	392	273	273
48.0	720	556	829
49.0	1139	929.5	1,758.5

- As the total volume provided (1,758.5 cubic feet) is greater than the total volume required (1,532.3 cubic feet), the forebay, as designed, is acceptable.

CHANNEL PROTECTION VOLUME CALCULATION

Project Name : Williamsburg Landing, Phase 2
Basin 2

Project # : 2000312-000.15

One Year Precipitation : P = 2.8 Inches

PRE-DEVELOPMENT CONDITIONS :

Drainage Area : $DA_{PRE} = 4.84$ Acres
SCS Curve Number : $CN_{PRE} = 50$ Unitless
Time of Concentration : $T_{C_{PRE}} = 0.6$ Hours

I_a/P	C_0	C_1	C_2
0.10	2.55323	-0.61512	-0.16403
0.30	2.46532	-0.62257	-0.11657
0.35	2.41896	-0.61594	-0.08820
0.40	2.36409	-0.59857	-0.05621
0.45	2.29238	-0.57005	-0.02281
0.50	2.20282	-0.51599	-0.01259

Initial abstraction ; $I_a = 0.2 \times (1000/CN - 10) = 2.000$ Inches
 $I_a/P = 0.71$

Accumulated direct runoff : $Q_U = (P - I_a)^2 / (P + 4I_a) = 0.06$ Inches

Unit Peak Discharge : $q_u = 207$ cfs/sq.mile/in.
 $\log(q_u) = C_0 + C_1 \log(T_c) + C_2 [\log(T_c)]^2$
 C_0, C_1, C_2 : Coefficients from TABLE F1 above

Pre-development peak discharge : $q_p = q_u \times DA \times Q_U / 640 = 0.09$ c.f.s.

POST DEVELOPMENT CONDITIONS :

Drainage Area : $DA_{POST} = 7.85$ Acres
SCS Curve Number : $CN_{POST} = 65$ Unitless
Time of Concentration : $T_{C_{POST}} = 0.31$ Hours

Initial abstraction ; $I_a = 1.077$ Inches
 $I_a/P = 0.38$

Accumulated direct runoff : $Q_U = 0.42$ Inches

Unit Peak Discharge : $q_u = 512$ cfs/sq.mile/in.

Post development peak discharge rate : $q_i = q_p = 2.62$ c.f.s.

Ration of outflow to inflow : * $q_o/q_i = 11.98 \times q_u^{0.937} = 0.0347$

* Direct calculation using equation for T=24hr. developed by Stewart Comstock, P.E., MDE

Peak outflow discharge : $q_o = 0.0909$ c.f.s.

Ratio of storage volume to runoff volume : $V_s/V_r = 0.64$
 $V_s/V_r = 0.683 - 1.43(q_o/q_i) + 1.64(q_o/q_i)^2 - 8.04(q_o/q_i)^3$

Required Storage Volume : $V_s = V_s/V_r \times Q_U \times A / 12 \times 43560 = 7563$ cubic feet

ESTIMATED POND FULL DRAWDOWN

$H_{TRIAL} = 1.5$ Feet

$A_o = 0.0154359$ sq. ft.

$d_o = 1.6822931$ inches

BMP BASIN 2

$D_{ORIFICE} = 1.75$ inches

	W.S.E. (feet)	AREA s.f.	INC. VOL c.f.	STORAGE c.f.	H _{AVG} ft.	Q _{AVG} cfs	dT hours
	45.00	7052	6542	23641	4.50		
	44.00	6032	5560	17099	3.50		
	43.00	5088	4653	11539	2.50	0.1253	10.3
	42.00	4218	3821	6886	1.00	0.0774	13.7
WQVSE	41.45	3781.3	1621	4686	0.73	0.0649	6.9
	41.00	3424	3065	3065	0.50	0.0526	16.2
	40.00	2706	0	0	0.00		

DRAW DOWN TIME = 24.0

**BMP POINT CALCULATIONS
FOR
WILLIAMSBURG LANDING DEVELOPMENT**

LMDG File No. 2000312-000.07

- Per phase 1, site area to the east of the Colonial Pipeline easement is 33.26 acres. A total of 11.20 acres on the west side of the Colonial Pipeline easement is developable as a 3rd phase.
- The total site area for BMP Point Calculations is 44.46 acres (33.26 on east plus 11.20 on west).
- Per phase 1 calculations, 23.05 acres of natural open space is located on the north and west side of the existing facility.
- Dry Basin 1 (Part of Phase 1) is an extended detention basin to the north side of the existing facility. This basin serves a drainage area of 6.20 acres.

$$\text{BMP Points} = \frac{6.20}{44.46} \times 4 = \underline{\underline{0.56 \text{ BMP points}}}$$

- Dry Basin 2 (Part of Phase 1) was designed as an extended detention system with a timber wall. As part of Phase 2, the extended detention system will become the forebay for a small wet pond to be constructed on the west side of the Colonial Pipeline easement. The wet pond and forebay will be designed to serve a drainage area of 4.20 acres.

$$\text{BMP Points} = \frac{4.40}{44.46} \times 6 = \underline{\underline{0.59 \text{ BMP points}}}$$

- Basin 3, to be constructed as part of Phase 2, will be an extended detention wet pond. This basin will be constructed on the west side of the Colonial Pipeline easement, with the forebay construction on the east side of the easement. The basin will be designed to handle 16.90 acres.

$$\text{BMP Points} = \frac{16.90}{44.46} \times 10 = \underline{\underline{3.80 \text{ BMP points}}}$$

- A total of 3 acres of the open space from Phase 1 will be utilized for the construction of BMPs as part of Phase 2. However, 2.88 acres of open space will remain in place in Phase 2. Thus, 22.93 acres of open space will exist on the site.

$$\text{BMP Points} = \frac{22.93}{67.51} \times 100 \times 0.15 = \underline{\underline{5.09 \text{ BMP points}}}$$

- Total BMP Points for Site = 0.56 + 0.59 + 3.80 + 5.09 = **10.04 BMP points**
- NOTE: As the 11.20 acres to the west is included in these calculations, no BMP is required for Phase 3 of this development.

**BMP POINT CALCULATIONS
FOR
WILLIAMSBURG LANDING DEVELOPMENT**

LMDG File No. 2000312-000.07

- Per phase 1, site area to the east of the Colonial Pipeline easement is 33.26 acres. A total of 11.20 acres on the west side of the Colonial Pipeline easement is developable as a 3rd phase.
- The total site area for BMP Point Calculations is 44.46 acres (33.26 on east plus 11.20 on west).
- Per phase 1 calculations, 23.05 acres of natural open space is located on the north and west side of the existing facility.
- Dry Basin 1 (Part of Phase 1) is an extended detention basin to the north side of the existing facility. This basin serves a drainage area of 6.20 acres.

$$\text{BMP Points} = \frac{6.20}{44.46} \times 4 = \underline{\underline{0.56 \text{ BMP points}}}$$

- Dry Basin 2 (Part of Phase 1) was designed as an extended detention system with a timber wall. As part of Phase 2, the extended detention system will become the forebay for a small wet pond to be constructed on the west side of the Colonial Pipeline easement. The wet pond and forebay will be designed to serve a drainage area of 4.20 acres.

$$\text{BMP Points} = \frac{4.40}{44.46} \times 6 = \underline{\underline{0.59 \text{ BMP points}}}$$

- Basin 3, to be constructed as part of Phase 2, will be an extended detention wet pond. This basin will be constructed on the west side of the Colonial Pipeline easement, with the forebay construction on the east side of the easement. The basin will be designed to handle 16.90 acres.

$$\text{BMP Points} = \frac{16.90}{44.46} \times 10 = \underline{\underline{3.80 \text{ BMP points}}}$$

- A total of 3 acres of the open space from Phase 1 will be utilized for the construction of BMPs as part of Phase 2. However, 2.88 acres of open space will remain in place in Phase 2. Thus, 22.93 acres of open space will exist on the site.

$$\text{BMP Points} = \frac{22.93}{67.51} \times 100 \times 0.15 = \underline{\underline{5.09 \text{ BMP points}}}$$

- Total BMP Points for Site = 0.56 + 0.59 + 3.80 + 5.09 = **10.04 BMP points**
- NOTE: As the 11.20 acres to the west is included in these calculations, no BMP is required for Phase 3 of this development.

LANDMARK DESIGN GROUP



May 12, 2004

Ms. Ellen Cook
Planner
James City County
101 E Mounts Bay Road
Williamsburg, VA 23187-8784

Re: SP-023-04, Williamsburg Landing Site Plan Amendment

Dear Ms. Cook:

Attached are 10 sets of the above referenced plan, revised according to comments in your March 26, 2004 and April 2, 2004 letters. In response to those comments, we offer the following.

Planning

1. The plans have been revised to reflect the original road names.
2. See Item #1.
3. See Item #1.

Environmental (March 19, 2004)

1. The BMP/Stormwater Management access road has been relocated as recommended and a curb wipe down has been added.
2. The sediment basin has been relocated.
3. Acknowledged.

Environmental (April 6, 2004)

1. This is inconsistent with what has been approved for other projects with similar soils. A properly prepared 1:1 slope should perform adequately for this temporary function and we are confident that the sitework contractor working this project is accordingly consistent.
2. Retaining Wall Detail.
 - a. Acknowledged.
 - b. The concrete collars have been revised.
 - c. Note has been added to plan sheet C-14.
 - d. The concrete collars are not to function as anti-steep collars. Rather, they are to provide hard edges to lay the segmental block to.
 - e. Specifications sheet C-17 has been added to the plan set.

3. No elevation changes are proposed for the final stage of the project and only temporary grading changes are proposed for the temporary sediment basin stage of construction.
4. The plans include a professional engineers seal, and this is sufficient documentation of the proper application of the design.
4. A baffle has been added to plan sheet C-2.
5. Upon approval of this amendment, the plan sheets can be re-indexed into the full set. No additional work is needed.

Fire

1. The plans have been revised to reflect the original road names.
2. The original site plan has been approved with the current waterline layout. We have not revised any of the water system as part of this site plan amendment.

Please call if you have any questions or need further information.

Best regards,

The LandMark Design Group, Inc.



Stephen A. Romeo, L.S.
Principal

SAR/tmp

Enclosure

Larry S. Barry, P.E., President
Norman H. Mason, L.S., VP
Vaughn B. Rinner, C.L.A.
Elizabeth J. Anderson, P.E.
Kenneth A. Dierks
Robert P. Kerr, R.E.P., P.W.S.
Clayton E. Massey, P.E.



Charles R. Orsborne, L.S.
Stephen A. Romeo, L.S.
Kenneth E. Rodman, Jr., P.E.
Mark W. Strickland, P.E.
William R. Turner, Jr., A.I.C.P.
A. Gary Webb, P.E.

December 4, 2002

Mr. Christopher Johnson
Senior Planner
James City County
P.O. Box 8784
Williamsburg, VA 23187-8784

Re: S-91-02. Williamsburg Landing, Inc., Boundary Line Adjustment Plat

Dear Chris:

We are pleased to submit, for approval, ten copies of the revised boundary line adjustment plat for the above referenced project. In regards to the comments of your letter dated November 8, 2002, we offer the following:

County Engineer:

1. The Deed for the proposed conservation easement is forthcoming from Paul W. Gerhardt, Esq., Kaufman and Canoles, P.C. Copies of the proposed plat will be forwarded to Wayland Bass.

Environmental:

1. Based on a telephone conversation between C.J. Bodnar and Darryl Cook on Tuesday, Dec. 3rd, 2002, the revised BMP Point calculations are attached. These calculations correspond with the open space area on the plat. The acreage is shown on the attached "Plat of Conservation Easement", dated December 2, 2002.

Please contact me if you have any questions or wish to further discuss this.

Best regards,
The LandMark Design Group Inc.

A handwritten signature in black ink that reads "Stephen Romeo".

Stephen A. Romeo, L.S.
Principal

SAR/tmp

Copy: Wayland Bass, County Engineer, w/encl.
Darryl Cook, P.E., Director, Environmental Division, w/encl.
Paul W. Gerhardt, Esq., Kaufman & Canoles, P.C., w/encl.
William A. Doig, Williamsburg Landing, w/encl.
File 2000312

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

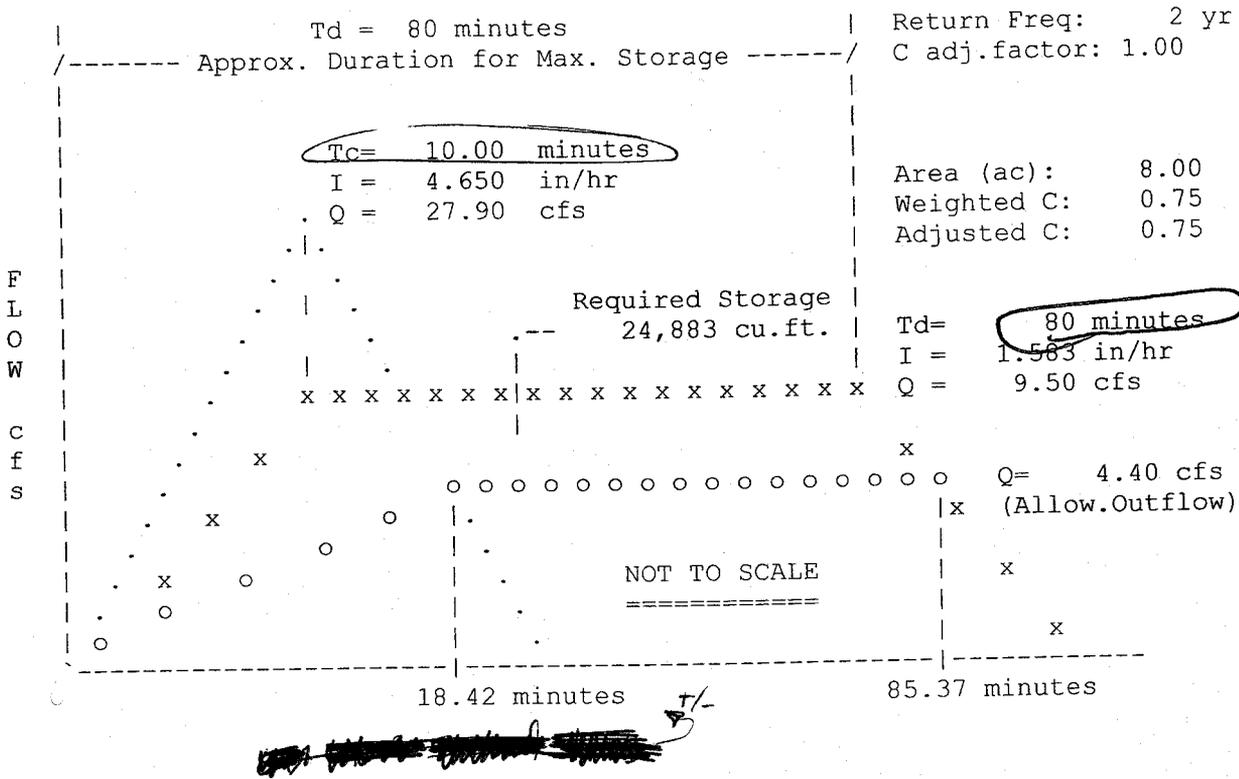
MODIFIED RATIONAL METHOD
 ---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

 * RETURN FREQUENCY: 2 yr | Allowable Outflow: 4.40 cfs *
 * 'C' Adjustment: 1.000 | Required Storage: 24,883 cu.ft. *

 * Peak Inflow: 9.50 cfs | Inflow .HYD stored: L3-2IN .HYD *



NEW SEDIMENT BASIN #3

24 APR 23 11:41 AM
 RAINFALLING

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

**** Modified Rational Hydrograph ****

Weighted C = 0.750 Area= 8.000 acres Tc = 10.00 minutes

Adjusted C = 0.750 Td= 80.00 min. I= 1.58 in/hr Qp= 9.50 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00

Output file: L3-2IN .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
 For the 2 Year Storm

Time increment = 1.00 Minutes
 Time on left represents time for first Q in each row.

Time Minutes	0.00	0.95	1.90	2.85	3.80	4.75	5.70
0.00	0.00	0.95	1.90	2.85	3.80	4.75	5.70
7.00	6.65	7.60	8.55	9.50	9.50	9.50	9.50
14.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
21.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
28.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
35.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
42.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
49.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
56.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
63.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
70.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
77.00	9.50	9.50	9.50	9.50	8.55	7.60	6.65
84.00	5.70	4.75	3.80	2.85	1.90	0.95	0.00

9.5 CFS FOR 78 HOURS
THIS GREATLY EXCEEDS PRE-DEVELOPMENT COMPS

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
const. phase	0.750	8.00						
			10.00	0.750	0.750	4.650	8.00	27.90

NEW SEDIMENT BASIN #3

STRUCTURE

24 AND 25 YEAR
 ROLLINGS

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

MODIFIED RATIONAL METHOD
 ---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

RETURN FREQUENCY: 2 yr 'C' Adjustment = 1.000 Allowable Q = 4.40 cfs

Hydrograph file duration= 80.00 minutes
 Hydrograph file: L3-2IN .HYD Tc = 10.00 minutes
 ::

VOLUMES							
Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	Inflow (cu.ft.)	Storage (cu.ft.)
0.750	0.750	10	4.650	8.00	27.90	16,740	14,100
0.750	0.750	15	3.950	8.00	23.70	21,330	17,407
0.750	0.750	20	3.500	8.00	21.00	25,200	19,988
0.750	0.750	30	2.800	8.00	16.80	30,240	22,458
0.750	0.750	40	2.300	8.00	13.80	33,120	22,773
0.750	0.750	50	2.000	8.00	12.00	36,000	23,076
0.750	0.750	60	1.800	8.00	10.80	38,880	23,370

***** Storage Maximum
 0.750 0.750 80 1.583 8.00 9.50 | 45,600 24,883

0.750	0.750	120	1.150	8.00	6.90	49,680	18,634
0.750	0.750	180	0.750	8.00	4.50	48,600	2,162
0.750	0.750	240	0.600	8.00	3.60	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

MODIFIED RATIONAL METHOD
 ---- Graphical Summary for Maximum Required Storage ----

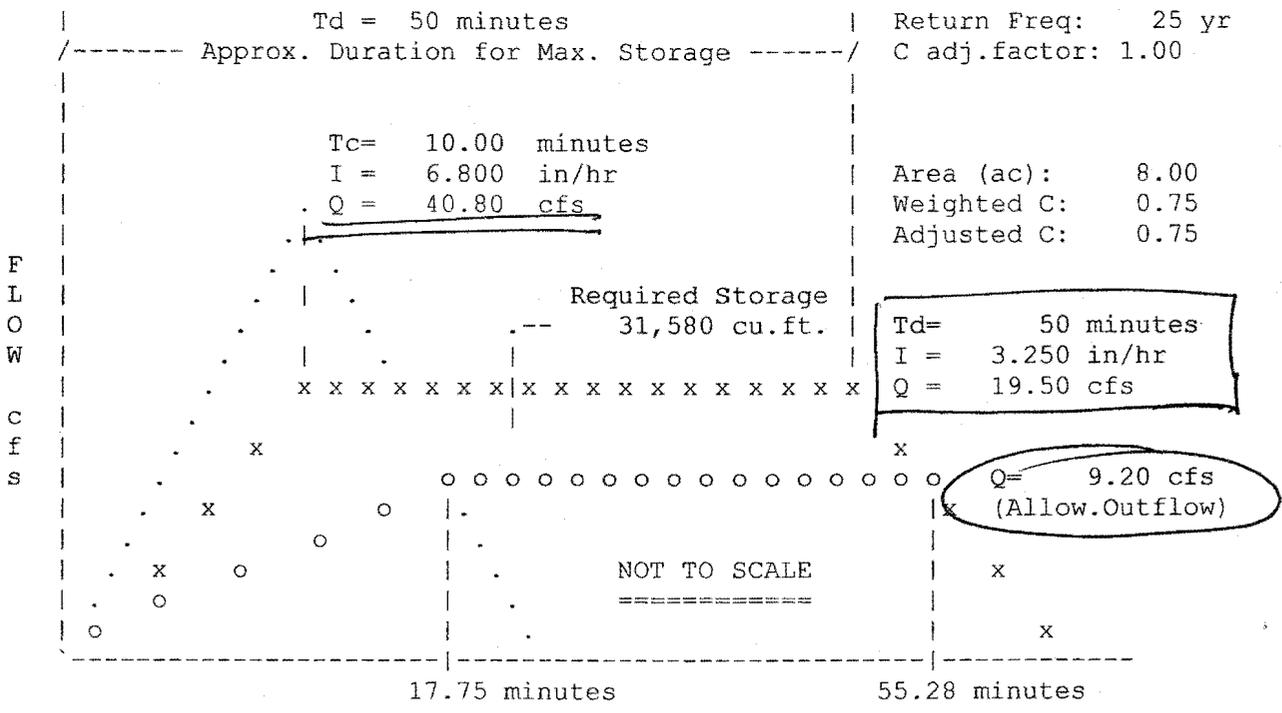
First peak outflow point assumed to occur at Tc hydrograph recession leg.

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

NEW SEDIMENT BASIN #3

 * RETURN FREQUENCY: 25 yr | Allowable Outflow: 9.20 cfs *
 * 'C' Adjustment: 1.000 | Required Storage: 31,580 cu.ft. *

 * Peak Inflow: 19.50 cfs Inflow .HYD stored: L3-25IN .HYD *



24 AND 25 YEAR
 RAINFALLS

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

**** Modified Rational Hydrograph ****

Weighted C = 0.750 Area= 8.000 acres Tc = 10.00 minutes

Adjusted C = 0.750 Td= 50.00 min. I= 3.25 in/hr Qp= 19.50 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.00

Output file: L3-25IN .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
 For the 25 Year Storm

Time increment = 1.00 Minutes
 Time on left represents time for first Q in each row.

Time Minutes	0.00	1.95	3.90	5.85	7.80	9.75	11.70
0.00	0.00	1.95	3.90	5.85	7.80	9.75	11.70
7.00	13.65	15.60	17.55	19.50	19.50	19.50	19.50
14.00	19.50	19.50	19.50	19.50	19.50	19.50	19.50
21.00	19.50	19.50	19.50	19.50	19.50	19.50	19.50
28.00	19.50	19.50	19.50	19.50	19.50	19.50	19.50
35.00	19.50	19.50	19.50	19.50	19.50	19.50	19.50
42.00	19.50	19.50	19.50	19.50	19.50	19.50	19.50
49.00	19.50	19.50	17.55	15.60	13.65	11.70	9.75
56.00	7.80	5.85	3.90	1.95	0.00		

19.50 CFS FOR 41 HOURS?

NEW SEDIMENT BASIN #3

24 AND 25 YEAR
 ROUTINGS

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
const. phase	0.750	8.00						
			10.00	0.750	0.750	6.800	8.00	40.80

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20
Date Executed:

S/N:
Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

Outflow Rating Table for Structure #3
CULVERT-CR Circular Culvert (With Inlet Control)

BARREL CONTROL
 $Q = CA \left(\frac{64.4 \cdot H_p}{Y_2} \right)^{3/2}$

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

Elevation (ft)	Q (cfs)	Computation Messages
49.00	0.0	E < E1=55.51
49.50	0.0	E < E1=55.51
50.00	0.0	E < E1=55.51
50.50	0.0	E < E1=55.51
51.00	0.0	E < E1=55.51
51.50	0.0	E < E1=55.51
52.00	0.0	E < E1=55.51
52.50	0.0	E < E1=55.51
53.00	0.0	E < E1=55.51
53.50	0.0	E < E1=55.51
54.00	0.0	E < E1=55.51
54.50	0.0	E < E1=55.51
55.00	0.0	E < E1=55.51
55.50	0.0	E < E1=55.51
56.00	15.3	Submerged: HW =7.0
56.50	15.9	Submerged: HW =7.5
57.00	16.5	Submerged: HW =8.0
57.50	17.0	Submerged: HW =8.5
58.00	17.6	Submerged: HW =9.0

4" ORIFICE w/ 1' HEAD
 $Q = 0.38 \text{ cfs}$

Used Unsubmerged Equ. Form (1) for elev. less than 50.44 ft
Used Submerged Equation for elevations greater than 50.63 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=50.44 ft; Q1=4.8 cfs; Dc=.89 ft; E2=50.63 ft; Q2=5.49 cfs

POND-2 Version: 5.20
S/N:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

CALCULATED 03-16-2004 13:04:01
DISK FILE: a:LANDING3.VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sq ² (A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
49.00	4,700.00	4,700	0	0	0
50.50	*I*	5,052	14,624	7,312	7,312
52.00	*I*	5,416	15,161	15,161	15,161
55.50	*I*	6,315	16,463	35,671	35,671
58.00	7,000.00	7,000	17,436	52,308	52,308

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

$$IA = (\text{sq. rt}(\text{Areal}) + ((E_i - E_1) / (E_2 - E_1)) * (\text{sq. rt}(\text{Area}_2) - \text{sq. rt}(\text{Areal})))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Areal, Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

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

$$\text{Volume} = (1/3) * (EL2 - EL1) * (\text{Areal} + \text{Area}_2 + \text{sq. rt.}(\text{Areal} * \text{Area}_2))$$

where: EL1, EL2 = Lower and upper elevations of the increment
Areal, Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20
Date Executed:

S/N:
Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

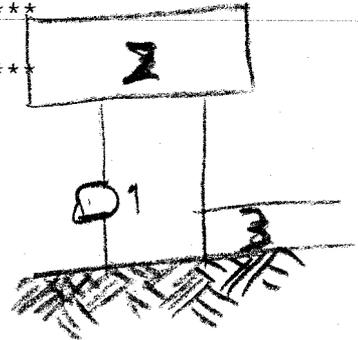
Outlet Structure File: a:LANDING3.STR
Planimeter Input File: a:LANDING3.VOL
Rating Table Output File: a:LANDING3.PND

Min. Elev.(ft) = 49 Max. Elev.(ft) = 58 Incr.(ft) = .5

Additional elevations (ft) to be included in table:

SYSTEM CONNECTIVITY

Structure	No.	Q Table	Q Table
ORIFICE-VC	1	->	1
STAND PIPE	2	->	2
CULVERT-CR	3	->	3



Outflow rating table summary was stored in file:
a:LANDING3.PND

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20
Date Executed:

S/N:
Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

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

Elevation (ft)	Q (cfs)	Contributing Structures
49.00	0.0	
49.50	0.0	
50.00	0.0	
50.50	0.0	
51.00	0.0	
51.50	0.0	
52.00	0.0	
52.50	3.0	1
53.00	3.0	1
53.50	3.0	1
54.00	3.0	1
54.50	3.0	1
55.00	3.1	1
55.50	3.1	1 +2
56.00	35.0	1 +2 +3
56.50	66.1	1 +2 +3
57.00	106.2	1 +2 +3
57.50	153.4	1 +2 +3
58.00	170.2	1 +2 +3

15" DEP @ 1% (AS PROPOSED)
HAS CAPACITY OF 6.46 CFS DURING
FREE FLOW. AT ELEV. 51.42, FLOW
GOES TO 6.75. AT 52.42, Q=9.54
53.42, Q=11.68
54.42, Q=13.52
55.42, Q=

OTHER PS OR LFO

SYSTEM IS UNDER BARREL CONTROL

106.2
153.4
170.2

OVERFLOW?
NO ES!

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20
Date Executed:

S/N:
Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

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

ORIFICE-VC
Orifice - Vertical Circular

E1 elev. (ft)?	52.00001
E2 elev. (ft)?	58.001
Orifice coeff.?	.6
Invert elev. (ft)?	52.00001
Datum elev. (ft)?	0
Diameter (ft)?	.33

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20
Date Executed:

S/N:
Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

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

Elevation (ft)	Q (cfs)	Computation Messages
49.00	0.0	E < E1= 52.00001
49.50	0.0	E < E1= 52.00001
50.00	0.0	E < E1= 52.00001
50.50	0.0	E < E1= 52.00001
51.00	0.0	E < E1= 52.00001
51.50	0.0	E < E1= 52.00001
52.00	0.0	E < E1= 52.00001
52.50	3.0	H =52.5
53.00	3.0	H =53.0
53.50	3.0	H =53.5
54.00	3.0	H =54.0
54.50	3.0	H =54.5
55.00	3.1	H =55.0
55.50	3.1	H =55.5
56.00	3.1	H =56.0
56.50	3.1	H =56.5
57.00	3.1	H =57.0
57.50	3.1	H =57.5
58.00	3.1	H =58.0

C = .6 A = 8.552988E-02 sq.ft.
H (ft) = Table elev. - Datum elev. (0 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20
Date Executed:

S/N:
Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

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

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)? 55.5
E2 elev.(ft)? 58.001
Crest elev.(ft)? 55.5
Diameter (ft)? 5
Weir coefficient? 3
Orifice coefficient? .6
Start transition elev.(ft) @ ?
Transition height (ft)?

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20
Date Executed:

S/N:
Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

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

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

Elevation (ft)	Q (cfs)	Computation	Messages
49.00	0.0	E < Inv.El.=	55.5
49.50	0.0	E < E1=	55.5
50.00	0.0	E < E1=	55.5
50.50	0.0	E < E1=	55.5
51.00	0.0	E < E1=	55.5
51.50	0.0	E < E1=	55.5
52.00	0.0	E < E1=	55.5
52.50	0.0	E < E1=	55.5
53.00	0.0	E < E1=	55.5
53.50	0.0	E < E1=	55.5
54.00	0.0	E < E1=	55.5
54.50	0.0	E < E1=	55.5
55.00	0.0	E < E1=	55.5
55.50	0.0	Weir:	H =0.0
56.00	16.7	Weir:	H =.5
56.50	47.1	Weir:	H =1.0
57.00	86.6	Weir:	H =1.5
57.50	133.3	Weir:	H =2.0
58.00	149.5	Orifice:	H =2.5

BARRIER CONTROL

Weir Cw = 3 Weir length = 15.70796 ft
Orifice Co = .6 Orifice area = 19.63496 sq.ft.
 $Q \text{ (cfs)} = (Cw * L * H^{1.5}) \text{ or } (Co * A * \text{sqr}(2 * g * H))$
No transition used, transition height = 0.0
Weir equation = Orifice equation @ elev.= 57.50624 ft

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20
Date Executed:

S/N:
Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

>>>>> Structure No. 3 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	55.51
E2 elev.(ft)?	58.001
Diam. (ft)?	1.25
Inv. el.(ft)?	49
Slope (ft/ft)?	.01
T1 ratio?	
T2 ratio?	
K Coeff.?	.0098
M Coeff.?	2
c Coeff.?	.0398
Y Coeff.?	.67
Form 1 or 2?	1
Slope factor?	-.5

**BMP POINT CALCULATIONS
FOR
WILLIAMSBURG LANDING DEVELOPMENT, PHASE 2**

LMDG File No. 2000312-000.15

- Per boundary of site, the site area is 50.22 acres. Of this acreage, 14.93 is on the west side of the Colonial Pipeline Easement as part of a future phase and will not be included in this calculation. Thus, the total site area for these calculations is 35.29 acres.
- Per recorded conservation easements for Phase 1, 25.01 acres of natural open space is located on the north and west side of the existing facility. Of this 25.01 acres, 0.41 acres is on this parcel. Thus, the total area for credit calculation is 59.89 acres (35.29 + 25.01 – 0.41).

$$\text{BMP Points} = \frac{25.01}{59.89} \times 100 \times 0.10 = \underline{\underline{4.18 \text{ BMP points}}}$$

- Dry Basin 1 (Part of Phase 1) is an extended detention basin to the north side of the existing facility. This basin serves a drainage area of 5.19 acres, per the Phase 1 as-builts.

$$\text{BMP Points} = \frac{5.19}{35.29} \times 4 = \underline{\underline{0.59 \text{ BMP points}}}$$

- Dry Basin 2 (Part of Phase 1) was designed as an extended detention system with a timber wall. As part of Phase 2, the extended detention system will become the forebay for an extended detention wet pond to be constructed on the west side of the Colonial Pipeline easement. The wet pond and forebay will be designed to serve a drainage area of 7.85 acres.

$$\text{BMP Points} = \frac{7.85}{35.29} \times 10 = \underline{\underline{2.22 \text{ BMP points}}}$$

- Basin 3, to be constructed as part of Phase 2, will be a series of timber walls designed to provide water quality and flow attenuation. This basin will be constructed within the existing ravine on the west side of the Colonial Pipeline easement and the area between Cottage 6 and the Colonial Pipeline easement. The basin will be designed to handle 13.15 acres.

$$\text{BMP Points} = \frac{13.15}{35.29} \times 4 = \underline{\underline{1.49 \text{ BMP points}}}$$

- A total of 9.19 acres of open space will be recorded as part of a conservation easement in Phase 2.

$$\text{BMP Points} = \frac{9.19}{35.29} \times 100 \times 0.15 = \underline{\underline{3.91 \text{ BMP points}}}$$

- Total BMP Points for Site = $4.18 + 0.59 + 2.22 + 1.49 + 3.91 = \underline{\underline{12.39 \text{ BMP points}}}$

**BMP POINT CALCULATIONS
FOR
WILLIAMSBURG LANDING DEVELOPMENT, PHASE 2**

LMDG File No. 2000312-000.15

- Per the boundary of the site, the site area is 50.22 acres.
- Per recorded conservation easements for Phase 1, 25.01 acres of natural open space is located on the north and west side of the existing facility. Of this 25.01 acres, 0.41 acres is on this parcel. Thus, the total area for credit calculation is 74.82 (50.22 + 25.01 – 0.41).

$$\text{BMP Points} = \frac{25.01}{74.82} \times 100 \times 0.10 = \underline{\underline{3.34 \text{ BMP points}}}$$

- Dry Basin 1 (Part of Phase 1) is an extended detention basin to the north side of the existing facility. This basin serves a drainage area of 5.19 acres, per the Phase 1 as-builts.

$$\text{BMP Points} = \frac{5.19}{50.22} \times 4 = \underline{\underline{0.41 \text{ BMP points}}}$$

- Dry Basin 2 (Part of Phase 1) was designed as an extended detention system with a timber wall. As part of Phase 2, the extended detention system will become the forebay for an extended detention wet pond to be constructed on the west side of the Colonial Pipeline easement. The wet pond and forebay will be designed to serve a drainage area of 7.85 acres.

$$\text{BMP Points} = \frac{7.85}{50.22} \times 10 = \underline{\underline{1.56 \text{ BMP points}}}$$

- Basin 3, to be constructed as part of Phase 2, will be a series of timber walls designed to provide water quality and flow attenuation. This basin will be constructed within the existing ravine on the west side of the Colonial Pipeline easement and the area between Cottage 6 and the Colonial Pipeline easement. The basin will be designed to handle 13.15 acres.

$$\text{BMP Points} = \frac{13.15}{50.22} \times 4 = \underline{\underline{1.05 \text{ BMP points}}}$$

- A total of 9.10 acres of open space will be recorded as part of a conservation easement in Phase 2.

$$\text{BMP Points} = \frac{9.19}{50.22} \times 100 \times 0.15 = \underline{\underline{2.74 \text{ BMP points}}}$$

- Total BMP Points for Site = 3.34 + 0.41 + 1.56 + 1.05 + 2.74 = 9.10 BMP points

- As the 14.93 acres to the west of the Colonial Pipeline easement is included in this calculation, a Phase 3 of development would be required to provide 0.90 BMP points as part of its development.

Larry S. Barry, P.E., President
Norman H. Mason, L.S., VP
Vaughn B. Rinner, C.L.A.
Elizabeth J. Anderson, P.E.
Kenneth A. Dierks
Robert P. Kerr, R.E.P. P.W.S.
Clayton E. Massey, P.E.



Charles R. Orsborne, L.S.
Stephen A. Romeo, L.S.
Kenneth E. Rodman, Jr., P.E.
Mark W. Strickland, P.E.
William R. Turner, Jr., A.I.C.P.
A. Gary Webb, P.E.

December 4, 2002

Mr. Christopher Johnson
Senior Planner
James City County
P.O. Box 8784
Williamsburg, VA 23187-8784

Re: S-91-02. Williamsburg Landing, Inc., Boundary Line Adjustment Plat

Dear Chris:

We are pleased to submit, for approval, ten copies of the revised boundary line adjustment plat for the above referenced project. In regards to the comments of your letter dated November 8, 2002, we offer the following:

County Engineer:

1. The Deed for the proposed conservation easement is forthcoming from Paul W. Gerhardt, Esq., Kaufman and Canoles, P.C. Copies of the proposed plat will be forwarded to Wayland Bass.

Environmental:

1. Based on a telephone conversation between C.J. Bodnar and Darryl Cook on Tuesday, Dec. 3rd, 2002, the revised BMP Point calculations are attached. These calculations correspond with the open space area on the plat. The acreage is shown on the attached "Plat of Conservation Easement", dated December 2, 2002.

Please contact me if you have any questions or wish to further discuss this.

Best regards,
The LandMark Design Group Inc.

A handwritten signature in cursive script that reads "Stephen Romeo".

Stephen A. Romeo, L.S.
Principal

SAR/tmp

Copy: Wayland Bass, County Engineer, w/encl.
Darryl Cook, P.E., Director, Environmental Division, w/encl.
Paul W. Gerhardt, Esq., Kaufman & Canoles, P.C., w/encl.
William A. Doig, Williamsburg Landing, w/encl.
File 2000312

- Total BMP Points for Site = $4.18 + 0.59 + 2.22 + 1.49 + 3.91 = \underline{\underline{12.39 \text{ BMP points}}}$

**BMP POINT CALCULATIONS
FOR
WILLIAMSBURG LANDING DEVELOPMENT, PHASE 2**

LMDG File No. 2000312-000.15

- Per the boundary of the site, the site area is 50.22 acres.
- Per recorded conservation easements for Phase 1, 25.01 acres of natural open space is located on the north and west side of the existing facility. Of this 25.01 acres, 0.41 acres is on this parcel. Thus, the total area for credit calculation is 74.82 (50.22 + 25.01 - 0.41).

$$\text{BMP Points} = \frac{25.01}{74.82} \times 100 \times 0.10 = \underline{\underline{3.34 \text{ BMP points}}}$$

- Dry Basin 1 (Part of Phase 1) is an extended detention basin to the north side of the existing facility. This basin serves a drainage area of 5.19 acres, per the Phase 1 as-builts.

$$\text{BMP Points} = \frac{5.19}{50.22} \times 4 = \underline{\underline{0.41 \text{ BMP points}}}$$

- Dry Basin 2 (Part of Phase 1) was designed as an extended detention system with a timber wall. As part of Phase 2, the extended detention system will become the forebay for an extended detention wet pond to be constructed on the west side of the Colonial Pipeline easement. The wet pond and forebay will be designed to serve a drainage area of 7.85 acres.

$$\text{BMP Points} = \frac{7.85}{50.22} \times 10 = \underline{\underline{1.56 \text{ BMP points}}}$$

- Basin 3, to be constructed as part of Phase 2, will be a series of timber walls designed to provide water quality and flow attenuation. This basin will be constructed within the existing ravine on the west side of the Colonial Pipeline easement and the area between Cottage 6 and the Colonial Pipeline easement. The basin will be designed to handle 13.15 acres.

$$\text{BMP Points} = \frac{13.15}{50.22} \times 4 = \underline{\underline{1.05 \text{ BMP points}}}$$

- A total of 9.10 acres of open space will be recorded as part of a conservation easement in Phase 2.

$$\text{BMP Points} = \frac{9.19}{50.22} \times 100 \times 0.15 = \underline{\underline{2.74 \text{ BMP points}}}$$

- Total BMP Points for Site = 3.34 + 0.41 + 1.56 + 1.05 + 2.74 = 9.10 BMP points

- As the 14.93 acres to the west of the Colonial Pipeline easement is included in this calculation, a Phase 3 of development would be required to provide 0.90 BMP points as part of its development.

**WATER QUALITY VOLUME CALCULATION
FOR
BASIN 3, WILLIAMSBURG LANDING**

LMDG File No. 2000312-000.15

- Per the *James City County Guidelines for Design and Construction of Stormwater Management BMP's*, a timber wall extended detention system is required to have a water quality volume equal to 1-inch (0.08 feet) times the impervious area draining to the basin.
 - The impervious area from Basin 3's drainage area is 4.2076 acres, or 183,283 square feet.
 - The water quality volume required is 14,663 cubic feet (0.08 * 183283).
-

File: Universal Pre.xls
PROJECT: WILLIAMSBURG LANDING
 Description: **Pre-development to BMP #3**
 Date: 7-Feb-02
 Revised

LandMark Design Group
 4029 Ironbound Road, Suite 100
 Williamsburg, VA 23188

UNIVERSAL RATIONAL METHOD FOR HYDROGRAPH GENERATION

Drainage Area = 6.88 Acres
 Runoff Coefficient = 0.32
 Time of Concentration = 37.32 Min

1 Yr computed peak discharge = 4.06 cfs
 2 Yr computed peak discharge = 4.94 cfs
 10 Yr computed peak discharge = 7.05 cfs
 25 Yr computed peak discharge = 8.20 cfs
 100 Yr computed peak discharge = 10.05 cfs

COMPUTED HYDROGRAPH VERTEX POINTS

1 Yr Frequency		2 Yr Frequency		10 Yr Frequency		25 Yr Frequency		100 Yr Frequency	
Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)
0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
37.3	0.85	37.3	1.04	37.3	1.48	37.3	1.72	37.3	2.11
74.6	1.22	74.6	1.48	74.6	2.11	74.6	2.46	74.6	3.02
112.0	4.06	112.0	4.94	112.0	7.05	112.0	8.20	112.0	10.05
149.3	2.19	149.3	2.67	149.3	3.81	149.3	4.43	149.3	5.43
186.6	1.58	186.6	1.93	186.6	2.75	186.6	3.20	186.6	3.92
223.9	1.02	223.9	1.24	223.9	1.76	223.9	2.05	223.9	2.51
261.2	0.73	261.2	0.89	261.2	1.27	261.2	1.48	261.2	1.81
298.6	0.61	298.6	0.74	298.6	1.06	298.6	1.23	298.6	1.51
335.9	0.57	335.9	0.69	335.9	0.99	335.9	1.15	335.9	1.41
373.2	0.53	373.2	0.64	373.2	0.92	373.2	1.07	373.2	1.31
410.5	0.00	410.5	0.00	410.5	0.00	410.5	0.00	410.5	0.00

EQUATIONS

$I = B / (tc + D)^E$
 $tp = 3 * tc$
 $tb = 11 * tc$
 $Qp = C * I^A$

B, D, E constants based on NWS Hydro 35

File: Universal Post.xls
PROJECT: WILLIAMSBURG LANDING
 Description: Postdevelopment to BMP #3

LandMark Design Group
 4029 Ironbound Road, Suite 100
 Williamsburg, VA 23188

Date: 21-Mar-02
 Revised:

UNIVERSAL RATIONAL METHOD FOR HYDROGRAPH GENERATION

Drainage Area = 13.15 Acres
 Runoff Coefficient = 0.49
 Time of Concentration = 18.50 Min

1Yr computed peak discharge = 18.32 cfs
 2 Yr computed peak discharge = 21.89 cfs
 10 Yr computed peak discharge = 30.21 cfs
 25 Yr computed peak discharge = 34.58 cfs
 100 Yr computed peak discharge = 41.56 cfs

COMPUTED HYDROGRAPH VERTEX POINTS

1 Yr Frequency		2 Yr Frequency		10 Yr Frequency		25 Yr Frequency		100 Yr Frequency	
Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)	Time (min)	Q (cfs)
0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
18.5	3.85	18.5	4.60	18.5	6.34	18.5	7.26	18.5	8.73
37.0	5.49	37.0	6.57	37.0	9.06	37.0	10.37	37.0	12.47
55.5	18.32	55.5	21.89	55.5	30.21	55.5	34.58	55.5	41.56
74.0	9.89	74.0	11.82	74.0	16.31	74.0	18.67	74.0	22.44
92.5	7.14	92.5	8.54	92.5	11.78	92.5	13.49	92.5	16.21
111.0	4.58	111.0	5.47	111.0	7.55	111.0	8.65	111.0	10.39
129.5	3.30	129.5	3.94	129.5	5.44	129.5	6.22	129.5	7.48
148.0	2.75	148.0	3.28	148.0	4.53	148.0	5.19	148.0	6.23
166.5	2.56	166.5	3.06	166.5	4.23	166.5	4.84	166.5	5.82
185.0	2.38	185.0	2.85	185.0	3.93	185.0	4.50	185.0	5.40
203.5	0.00	203.5	0.00	203.5	0.00	203.5	0.00	203.5	0.00

EQUATIONS

$I = B / (tc + D)^E$
 $tp = 3 * tc$
 $tb = 11 * tc$
 $Qp = C * I * A$

B, D, E constants based on NWS Hydro 35

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Return period (yrs)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	Manual	4.06	37	111	29,659	1	---	---	---	1-Yr. Predev.
2	Manual	18.32	18	54	65,081	1	---	---	---	1-Yr. Postdev.
3	Manual	4.94	37	111	36,097	2	---	---	---	2-Yr. Predev.
4	Manual	21.89	18	54	77,782	2	---	---	---	2-Yr. Postdev.
5	Manual	7.05	37	111	51,504	10	---	---	---	10-Yr. Predev.
6	Manual	30.21	18	54	107,330	10	---	---	---	10-Yr. Postdev.
7	Manual	8.20	37	111	59,918	25	---	---	---	25-Yr. Predev.
8	Manual	34.58	18	54	122,872	25	---	---	---	25-Yr. Postdev.
9	Manual	10.05	37	111	73,438	100	---	---	---	100-Yr. Predev.
10	Manual	41.56	18	54	147,668	100	---	---	---	100-Yr. Postdev.
11	Reservoir	2.71	18	144	65,081	1	2	41.86	43,579	1-Yr. Routing
12	Reservoir	3.30	18	144	77,781	2	4	42.35	52,470	2-Yr. Routing
13	Reservoir	6.75	18	108	107,330	10	6	43.18	68,545	10-Yr. Routing
14	Reservoir	8.86	18	108	122,872	25	8	43.46	74,285	25-Yr. Routing
15	Reservoir	11.03	18	108	147,668	100	10	43.95	84,553	100-Yr Routing
Proj. file: Basin3.GPW			IDF file: Norfolk.IDF			Run date: 03-22-2002				

CHANNEL PROTECTION VOLUME CALCULATION

Project Name : Williamsburg Landing, Phase 2

Project # : 2000312-000.15

Basin 3

One Year Precipitation : P = 2.8 Inches

PRE-DEVELOPMENT CONDITIONS :

Drainage Area : $DA_{PRE} = 6.88$ Acres
 SCS Curve Number : $CN_{PRE} = 33$ Unitless
 Time of Concentration : $T_{C_{PRE}} = 0.62$ Hours

I_a/P	C_0	C_1	C_2
0.10	2.55323	-0.61512	-0.16403
0.30	2.46532	-0.62257	-0.11657
0.35	2.41896	-0.61594	-0.08820
0.40	2.36409	-0.59857	-0.05621
0.45	2.29238	-0.57005	-0.02281
0.50	2.20282	-0.51599	-0.01259

Initial abstraction ; $I_a = 0.2 \times (1000/CN - 10) = 4.061$ Inches
 $I_a/P = 1.45$

Accumulated direct runoff : $Q_U = (P - I_a)^2 / (P + 4I_a) = 0.08$ Inches

Unit Peak Discharge : $q_u = 204$ cfs/sq.mile/in.
 $\log(q_u) = C_0 + C_1 \log(T_c) + C_2 [\log(T_c)]^2$
 C_0, C_1, C_2 : Coefficients from TABLE F1 above

Pre-development peak discharge : $q_p = q_u \times DA \times Q_U / 640 = 0.18$ c.f.s.

POST DEVELOPMENT CONDITIONS :

Drainage Area : $DA_{POST} = 13.15$ Acres
 SCS Curve Number : $CN_{POST} = 50$ Unitless
 Time of Concentration : $T_{C_{POST}} = 0.31$ Hours

Initial abstraction ; $I_a = 2.000$ Inches
 $I_a/P = 0.71$

Accumulated direct runoff : $Q_U = 0.06$ Inches

Unit Peak Discharge : $q_u = 290$ cfs/sq.mile/in.

Post development peak discharge rate : $q_i = q_p = 0.35$ c.f.s.

Ration of outflow to inflow : * $q_o/q_i = 11.98 \times q_u^{0.937} = 0.0591$

* Direct calculation using equation for T=24hr. developed by Stewart Comstock, P.E., MDE

Peak outflow discharge : $q_o = 0.0208$ c.f.s.

Ratio of storage volume to runoff volume : $V_s/V_r = 0.60$
 $V_s/V_r = 0.683 - 1.43(q_o/q_i) + 1.64(q_o/q_i)^2 - 8.04(q_o/q_i)^3 =$

Required Storage Volume : $V_s = V_s/V_r \times Q_U \times A / 12 \times 43560 = 1709$ cubic feet

ESTIMATED POND FULL DRAWDOWN

$H_{TRIAL} = 1.5$ Feet

$A_o = 0.003539$ sq. ft.

$d_o = 0.8055154$ inches

BMP BASIN 2

$D_{ORIFICE} = 1.75$ inches

W.S.E. (feet)	AREA s.f.	INC. VOL c.f.	STORAGE c.f.	H _{AVG} ft.	Q _{AVG} cfs	dT hours
45.00	7052	6542	23641	4.50		
44.00	6032	5560	17099	3.50		
43.00	5088	4653	11539	2.50	0.1253	10.3
42.00	4218	3821	6886	1.00	0.0774	13.7
WQVSE 41.45	3781.3	1621	4686	0.73	0.0649	6.9
41.00	3424	3065	3065	0.50	0.0526	16.2
40.00	2706	0	0	0.00		

DRAW DOWN TIME = 24.0

**FOREBAY SIZING CALCULATIONS
FOR
WILLIAMSBURG LANDING**

LMDG File No. 2000312-000.07

- James City County requires a forebay to be sized to contain 0.1 inches per impervious area of contributing drainage. 0.1-inch is 0.0083 feet. The forebay must be 4 to 6 feet deep.

Basin 2

- The impervious area from Basin 2's drainage area within the project limits is 3.052 acres, or 132,945 square feet. The impervious area from Woodhaven (Phase 1) that drains into Basin 2 is 1.186 acres, or 51,665 square feet. Total impervious area within Basin 2 is 4.238 acres, or 184,610 square feet.
- The forebay volume required is 1532.3 cubic feet (0.0083 * 184610).
- Calculate the volume provided per the design on the plans:

ELEVATION	SURFACE AREA (square feet)	INCREMENTAL VOLUME (cubic feet)	TOTAL VOLUME (cubic feet)
46.0	154	0	0
47.0	392	273	273
48.0	720	556	829
49.0	1139	929.5	1,758.5

- As the total volume provided (1,758.5 cubic feet) is greater than the total volume required (1,532.3 cubic feet), the forebay, as designed, is acceptable.

CHANNEL PROTECTION VOLUME CALCULATION

Project Name : Williamsburg Landing, Phase 2
Basin 2

Project # : 2000312-000.15

One Year Precipitation : P = 2.8 Inches

PRE-DEVELOPMENT CONDITIONS :

Drainage Area : $DA_{PRE} = 4.84$ Acres
SCS Curve Number : $CN_{PRE} = 50$ Unitless
Time of Concentration : $T_{C_{PRE}} = 0.6$ Hours

I_a/P	C_0	C_1	C_2
0.10	2.55323	-0.61512	-0.16403
0.30	2.46532	-0.62257	-0.11657
0.35	2.41896	-0.61594	-0.08820
0.40	2.36409	-0.59857	-0.05621
0.45	2.29238	-0.57005	-0.02281
0.50	2.20282	-0.51599	-0.01259

Initial abstraction ; $I_a = 0.2 \times (1000/CN - 10) = 2.000$ Inches
 $I_a/P = 0.71$

Accumulated direct runoff : $Q_U = (P - I_a)^2 / (P + 4 \times I_a) = 0.06$ Inches

Unit Peak Discharge : $q_u = 207$ cfs/sq.mile/in.
 $\log(q_u) = C_0 + C_1 \log(T_c) + C_2 [\log(T_c)]^2$
 C_0, C_1, C_2 : Coefficients from TABLE F1 above

Pre-development peak discharge : $q_p = q_u \times DA \times Q_U / 640 = 0.09$ c.f.s.

POST DEVELOPMENT CONDITIONS :

Drainage Area : $DA_{POST} = 7.85$ Acres
SCS Curve Number : $CN_{POST} = 65$ Unitless
Time of Concentration : $T_{C_{POST}} = 0.31$ Hours

Initial abstraction ; $I_a = 1.077$ Inches
 $I_a/P = 0.38$

Accumulated direct runoff : $Q_U = 0.42$ Inches

Unit Peak Discharge : $q_u = 512$ cfs/sq.mile/in.

Post development peak discharge rate : $q_i = q_p = 2.62$ c.f.s.

Ration of outflow to inflow : * $q_o/q_i = 11.98 \times q_u^{0.937} = 0.0347$

* Direct calculation using equation for T=24hr. developed by Stewart Comstock, P.E., MDE

Peak outflow discharge : $q_o = 0.0909$ c.f.s.

Ratio of storage volume to runoff volume : $V_s/V_r = 0.64$
 $V_s/V_r = 0.683 - 1.43(q_o/q_i) + 1.64(q_o/q_i)^2 - 8.04(q_o/q_i)^3 =$

Required Storage Volume : $V_s = V_s/V_r \times Q_U \times A / 12 \times 43560 = 7563$ cubic feet

ESTIMATED POND FULL DRAWDOWN

$H_{TRIAL} = 1.5$ Feet

$A_o = 0.0154359$ sq. ft.

$d_o = 1.6822931$ inches

BMP BASIN 2

$D_{ORIFICE} = 1.75$ inches

W.S.E. (feet)	AREA s.f.	INC. VOL c.f.	STORAGE c.f.	H_{AVG} ft.	Q_{AVG} cfs	ΔT hours
45.00	7052	6542	23641	4.50		
44.00	6032	5560	17099	3.50		
43.00	5088	4653	11539	2.50	0.1253	10.3
42.00	4218	3821	6886	1.00	0.0774	13.7
WQVSE 41.45	3781.3	1621	4686	0.73	0.0649	6.9
41.00	3424	3065	3065	0.50	0.0526	16.2
40.00	2706	0	0	0.00		

DRAW DOWN TIME = 24.0

**BMP POINT CALCULATIONS
FOR
WILLIAMSBURG LANDING DEVELOPMENT**

LMDG File No. 2000312-000.07

- Per phase 1, site area to the east of the Colonial Pipeline easement is 33.26 acres. A total of 11.20 acres on the west side of the Colonial Pipeline easement is developable as a 3rd phase.
- The total site area for BMP Point Calculations is 44.46 acres (33.26 on east plus 11.20 on west).
- Per phase 1 calculations, 23.05 acres of natural open space is located on the north and west side of the existing facility.
- Dry Basin 1 (Part of Phase 1) is an extended detention basin to the north side of the existing facility. This basin serves a drainage area of 6.20 acres.

$$\text{BMP Points} = \frac{6.20}{44.46} \times 4 = \underline{\underline{0.56 \text{ BMP points}}}$$

- Dry Basin 2 (Part of Phase 1) was designed as an extended detention system with a timber wall. As part of Phase 2, the extended detention system will become the forebay for a small wet pond to be constructed on the west side of the Colonial Pipeline easement. The wet pond and forebay will be designed to serve a drainage area of 4.20 acres.

$$\text{BMP Points} = \frac{4.40}{44.46} \times 6 = \underline{\underline{0.59 \text{ BMP points}}}$$

- Basin 3, to be constructed as part of Phase 2, will be an extended detention wet pond. This basin will be constructed on the west side of the Colonial Pipeline easement, with the forebay construction on the east side of the easement. The basin will be designed to handle 16.90 acres.

$$\text{BMP Points} = \frac{16.90}{44.46} \times 10 = \underline{\underline{3.80 \text{ BMP points}}}$$

- A total of 3 acres of the open space from Phase 1 will be utilized for the construction of BMPs as part of Phase 2. However, 2.88 acres of open space will remain in place in Phase 2. Thus, 22.93 acres of open space will exist on the site.

$$\text{BMP Points} = \frac{22.93}{67.51} \times 100 \times 0.15 = \underline{\underline{5.09 \text{ BMP points}}}$$

- Total BMP Points for Site = 0.56 + 0.59 + 3.80 + 5.09 = **10.04 BMP points**

- NOTE: As the 11.20 acres to the west is included in these calculations, no BMP is required for Phase 3 of this development.

**BMP POINT CALCULATIONS
FOR
WILLIAMSBURG LANDING DEVELOPMENT**

LMDG File No. 2000312-000.07

- Per phase 1, site area to the east of the Colonial Pipeline easement is 33.26 acres. A total of 11.20 acres on the west side of the Colonial Pipeline easement is developable as a 3rd phase.
- The total site area for BMP Point Calculations is 44.46 acres (33.26 on east plus 11.20 on west).
- Per phase 1 calculations, 23.05 acres of natural open space is located on the north and west side of the existing facility.
- Dry Basin 1 (Part of Phase 1) is an extended detention basin to the north side of the existing facility. This basin serves a drainage area of 6.20 acres.

$$\text{BMP Points} = \frac{6.20}{44.46} \times 4 = \underline{\underline{0.56 \text{ BMP points}}}$$

- Dry Basin 2 (Part of Phase 1) was designed as an extended detention system with a timber wall. As part of Phase 2, the extended detention system will become the forebay for a small wet pond to be constructed on the west side of the Colonial Pipeline easement. The wet pond and forebay will be designed to serve a drainage area of 4.20 acres.

$$\text{BMP Points} = \frac{4.40}{44.46} \times 6 = \underline{\underline{0.59 \text{ BMP points}}}$$

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- A total of 3 acres of the open space from Phase 1 will be utilized for the construction of BMPs as part of Phase 2. However, 2.88 acres of open space will remain in place in Phase 2. Thus, 22.93 acres of open space will exist on the site.

$$\text{BMP Points} = \frac{22.93}{67.51} \times 100 \times 0.15 = \underline{\underline{5.09 \text{ BMP points}}}$$

- Total BMP Points for Site = 0.56 + 0.59 + 3.80 + 5.09 = **10.04 BMP points**
- NOTE: As the 11.20 acres to the west is included in these calculations, no BMP is required for Phase 3 of this development.

LANDMARK DESIGN GROUP



May 12, 2004

Ms. Ellen Cook
Planner
James City County
101 E Mounts Bay Road
Williamsburg, VA 23187-8784

Re: SP-023-04, Williamsburg Landing Site Plan Amendment

Dear Ms. Cook:

Attached are 10 sets of the above referenced plan, revised according to comments in your March 26, 2004 and April 2, 2004 letters. In response to those comments, we offer the following.

Planning

1. The plans have been revised to reflect the original road names.
2. See Item #1.
3. See Item #1.

Environmental (March 19, 2004)

1. The BMP/Stormwater Management access road has been relocated as recommended and a curb wipe down has been added.
2. The sediment basin has been relocated.
3. Acknowledged.

Environmental (April 6, 2004)

1. This is inconsistent with what has been approved for other projects with similar soils. A properly prepared 1:1 slope should perform adequately for this temporary function and we are confident that the sitework contractor working this project is accordingly consistent.
2. Retaining Wall Detail.
 - a. Acknowledged.
 - b. The concrete collars have been revised.
 - c. Note has been added to plan sheet C-14.
 - d. The concrete collars are not to function as anti-steep collars. Rather, they are to provide hard edges to lay the segmental block to.
 - e. Specifications sheet C-17 has been added to the plan set.

3. No elevation changes are proposed for the final stage of the project and only temporary grading changes are proposed for the temporary sediment basin stage of construction.
4. The plans include a professional engineers seal, and this is sufficient documentation of the proper application of the design.
- 4. A baffle has been added to plan sheet C-2.
5. Upon approval of this amendment, the plan sheets can be re-indexed into the full set. No additional work is needed.

- Fire

1. The plans have been revised to reflect the original road names.
2. The original site plan has been approved with the current waterline layout. We have not revised any of the water system as part of this site plan amendment.

Please call if you have any questions or need further information.

Best regards,

The LandMark Design Group, Inc.



Stephen A. Romeo, L.S.
Principal

- SAR/tmp

- Enclosure

Larry S. Barry, PE., President
Norman H. Mason, L.S., VP
Vaughn B. Rinner, C.L.A.
Elizabeth J. Anderson, PE.
Kenneth A. Dierks
Robert P. Kerr, R.E.P., P.W.S.
Clayton E. Massey, PE.



Charles R. Orsborne, L.S.
Stephen A. Romeo, L.S.
Kenneth E. Rodman, Jr., PE.
Mark W. Strickland, PE.
William R. Turner, Jr., A.I.C.P.
A. Gary Webb, PE.

December 4, 2002

Mr. Christopher Johnson
Senior Planner
James City County
P.O. Box 8784
Williamsburg, VA 23187-8784

Re: S-91-02. Williamsburg Landing, Inc., Boundary Line Adjustment Plat

Dear Chris:

We are pleased to submit, for approval, ten copies of the revised boundary line adjustment plat for the above referenced project. In regards to the comments of your letter dated November 8, 2002, we offer the following:

County Engineer:

1. The Deed for the proposed conservation easement is forthcoming from Paul W. Gerhardt, Esq., Kaufman and Canoles, P.C. Copies of the proposed plat will be forwarded to Wayland Bass.

Environmental:

1. Based on a telephone conversation between C.J. Bodnar and Darryl Cook on Tuesday, Dec. 3rd, 2002, the revised BMP Point calculations are attached. These calculations correspond with the open space area on the plat. The acreage is shown on the attached "Plat of Conservation Easement", dated December 2, 2002.

Please contact me if you have any questions or wish to further discuss this.

Best regards,
The LandMark Design Group Inc.

A handwritten signature in cursive script that reads "Stephen Romeo".

Stephen A. Romeo, L.S.
Principal

SAR/tmp

Copy: Wayland Bass, County Engineer, w/encl.
Darryl Cook, P.E., Director, Environmental Division, w/encl.
Paul W. Gerhardt, Esq., Kaufman & Canoles, P.C., w/encl.
William A. Doig, Williamsburg Landing, w/encl.
File 2000312

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

MODIFIED RATIONAL METHOD
 ---- Graphical Summary for Maximum Required Storage ----

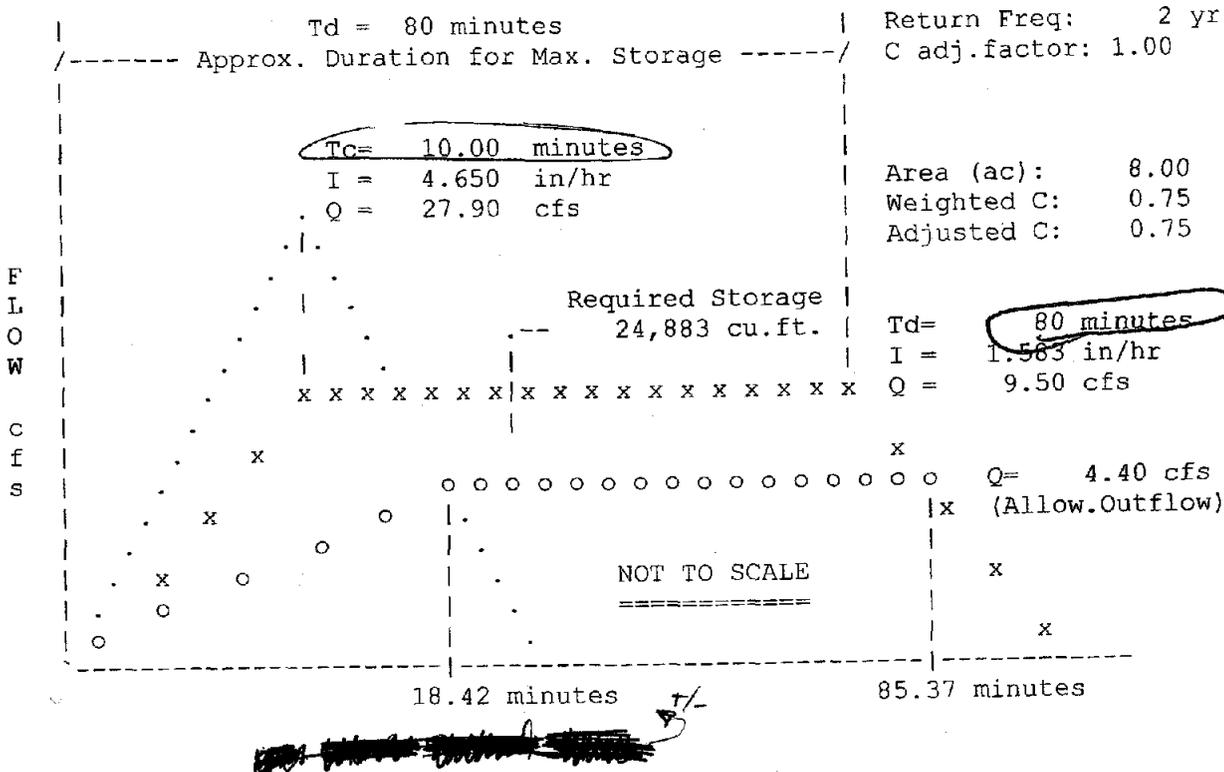
First peak outflow point assumed to occur at Tc hydrograph recession leg.

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

NEW SEDIMENT BASIN #3

 * RETURN FREQUENCY: 2 yr | Allowable Outflow: 4.40 cfs *
 * 'C' Adjustment: 1.000 | Required Storage: 24,883 cu.ft. *

 * Peak Inflow: 9.50 cfs | Inflow .HYD stored: L3-2IN .HYD *



24 AND 25 LETA

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

**** Modified Rational Hydrograph ****
 Weighted C = 0.750 Area= 8.000 acres Tc = 10.00 minutes
 Adjusted C = 0.750 Td= 80.00 min. I= 1.58 in/hr Qp= 9.50 cfs
 RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
 Output file: L3-2IN .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
 For the 2 Year Storm

Time Minutes	Time increment = 1.00 Minutes						
	Time on left represents time for first Q in each row.						
0.00	0.00	0.95	1.90	2.85	3.80	4.75	5.70
7.00	6.65	7.60	8.55	9.50	9.50	9.50	9.50
14.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
21.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
28.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
35.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
42.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
49.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
56.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
63.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
70.00	9.50	9.50	9.50	9.50	9.50	9.50	9.50
77.00	9.50	9.50	9.50	9.50	8.55	7.60	6.65
84.00	5.70	4.75	3.80	2.85	1.90	0.95	0.00

9.5 CFS FOR 78 HOURS
THIS GRAPHUM EXCEEDS PRE-DEVELOPMENT COMPS

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
const. phase	0.750	8.00						
			10.00	0.750	0.750	4.650	8.00	27.90

NEW SEDIMENT BASIN #3

STRUCTURE

24 AND 25 YEAR
 ROLLINGS

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

MODIFIED RATIONAL METHOD
 ---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at Tc hydrograph recession leg.

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

RETURN FREQUENCY: 2 yr 'C' Adjustment = 1.000 Allowable Q = 4.40 cfs

Hydrograph file duration= 80.00 minutes
 Hydrograph file: L3-2IN .HYD Tc = 10.00 minutes
 ::

							VOLUMES	
Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	Inflow (cu.ft.)	Storage (cu.ft.)	
0.750	0.750	10	4.650	8.00	27.90	16,740	14,100	
0.750	0.750	15	3.950	8.00	23.70	21,330	17,407	
0.750	0.750	20	3.500	8.00	21.00	25,200	19,988	
0.750	0.750	30	2.800	8.00	16.80	30,240	22,458	
0.750	0.750	40	2.300	8.00	13.80	33,120	22,773	
0.750	0.750	50	2.000	8.00	12.00	36,000	23,076	
0.750	0.750	60	1.800	8.00	10.80	38,880	23,370	

***** Storage Maximum
 0.750 0.750 80 1.583 8.00 9.50 | 45,600 24,883

0.750	0.750	120	1.150	8.00	6.90	49,680	18,634
0.750	0.750	180	0.750	8.00	4.50	48,600	2,162
0.750	0.750	240	0.600	8.00	3.60	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

MODIFIED RATIONAL METHOD
 ---- Graphical Summary for Maximum Required Storage ----

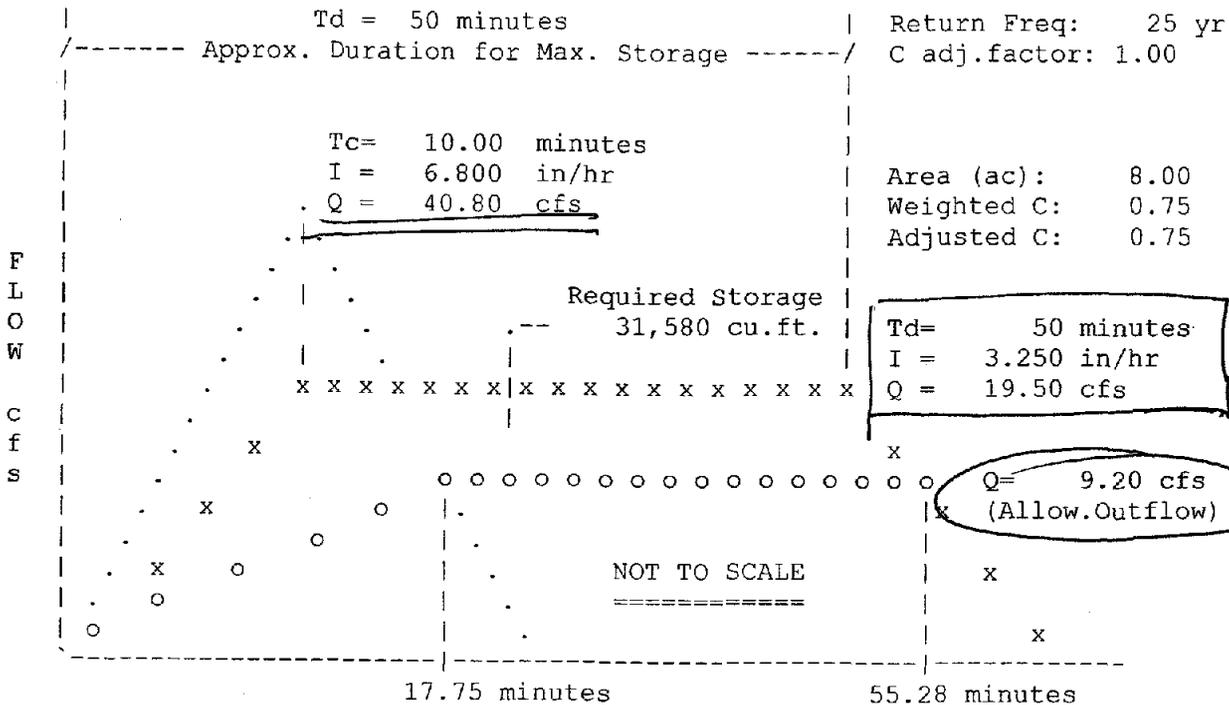
First peak outflow point assumed to occur at Tc hydrograph recession leg.

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

NEW SEDIMENT BASIN #3

 * RETURN FREQUENCY: 25 yr | Allowable Outflow: 9.20 cfs *
 * 'C' Adjustment: 1.000 | Required Storage: 31,580 cu.ft. *

 * Peak Inflow: 19.50 cfs Inflow .HYD stored: L3-25IN .HYD *



24 AND 25 YEAR
 RAINFALLS

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

**** Modified Rational Hydrograph ****

Weighted C = 0.750 Area= 8.000 acres Tc = 10.00 minutes

Adjusted C = 0.750 Td= 50.00 min. I= 3.25 in/hr Qp= 19.50 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.00
 Output file: L3-25IN .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
 For the 25 Year Storm

Time increment = 1.00 Minutes

Time on left represents time for first Q in each row.

Time Minutes	0.00	1.95	3.90	5.85	7.80	9.75	11.70
0.00	0.00	1.95	3.90	5.85	7.80	9.75	11.70
7.00	13.65	15.60	17.55	19.50	19.50	19.50	19.50
14.00	19.50	19.50	19.50	19.50	19.50	19.50	19.50
21.00	19.50	19.50	19.50	19.50	19.50	19.50	19.50
28.00	19.50	19.50	19.50	19.50	19.50	19.50	19.50
35.00	19.50	19.50	19.50	19.50	19.50	19.50	19.50
42.00	19.50	19.50	19.50	19.50	19.50	19.50	19.50
49.00	19.50	19.50	17.55	15.60	13.65	11.70	9.75
56.00	7.80	5.85	3.90	1.95	0.00		

19.50 CFS FOR 41 HOURS?

Quick TR-55 Ver.5.46 S/N:
 Executed: 17:46:24 03-15-2004

Williamsburg Landing
 Expansion SP-17-02
 New Sediment Basin #3

* * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * *

$$Q = \text{adj} * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
 adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
 'C' adjustment, k = 1
 Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
const. phase	0.750	8.00						
			10.00	0.750	0.750	6.800	8.00	40.80

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

Outflow Rating Table for Structure #3
CULVERT-CR Circular Culvert (With Inlet Control)

BARREL CONTROL 1/2
Q = CA (64.4 · HW)^{1/2}

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

Elevation (ft)	Q (cfs)	Computation Messages
49.00	0.0	E < E1=55.51
49.50	0.0	E < E1=55.51
50.00	0.0	E < E1=55.51
50.50	0.0	E < E1=55.51
51.00	0.0	E < E1=55.51
51.50	0.0	E < E1=55.51
52.00	0.0	E < E1=55.51
52.50	0.0	E < E1=55.51
53.00	0.0	E < E1=55.51
53.50	0.0	E < E1=55.51
54.00	0.0	E < E1=55.51
54.50	0.0	E < E1=55.51
55.00	0.0	E < E1=55.51
55.50	0.0	E < E1=55.51
56.00	15.3	Submerged: HW =7.0
56.50	15.9	Submerged: HW =7.5
57.00	16.5	Submerged: HW =8.0
57.50	17.0	Submerged: HW =8.5
58.00	17.6	Submerged: HW =9.0

4" ORIFICE W/ 1' HEAD
Q = 0.38 cfs

Qc

Used Unsubmerged Equ. Form (1) for elev. less than 50.44 ft
Used Submerged Equation for elevations greater than 50.63 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=50.44 ft; Q1=4.8 cfs; Dc=.89 ft; E2=50.63 ft; Q2=5.49 cfs

POND-2 Version: 5.20
S/N:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

CALCULATED 03-16-2004 13:04:01
DISK FILE: a:LANDING3.VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqrt(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
49.00	4,700.00	4,700	0	0	0
50.50	*I*	5,052	14,624	7,312	7,312
52.00	*I*	5,416	15,161	15,161	15,161
55.50	*I*	6,315	16,463	35,671	35,671 - 1371
58.00	7,000.00	7,000	17,436	52,308	52,308

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

$$IA = (\text{sq. rt}(\text{Area1}) + ((E_i - E_1) / (E_2 - E_1)) * (\text{sq. rt}(\text{Area2}) - \text{sq. rt}(\text{Area1})))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1, Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

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

$$\text{Volume} = (1/3) * (EL2 - EL1) * (\text{Area1} + \text{Area2} + \text{sq. rt.}(\text{Area1} * \text{Area2}))$$

where: EL1, EL2 = Lower and upper elevations of the increment
Area1, Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20
Date Executed:

S/N:
Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

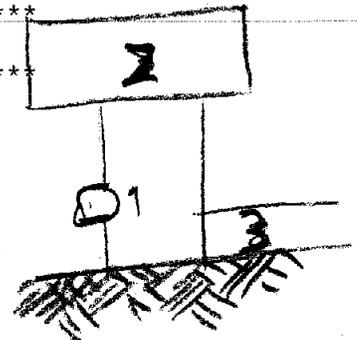
Outlet Structure File: a:LANDING3.STR
Planimeter Input File: a:LANDING3.VOL
Rating Table Output File: a:LANDING3.PND

Min. Elev.(ft) = 49 Max. Elev.(ft) = 58 Incr.(ft) = .5

Additional elevations (ft) to be included in table:

SYSTEM CONNECTIVITY

Structure	No.	Q Table	Q Table
ORIFICE-VC	1	->	1
STAND PIPE	2	->	2
CULVERT-CR	3	->	3



Outflow rating table summary was stored in file:
a:LANDING3.PND

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

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

Elevation (ft)	Q (cfs)	Contributing Structures
49.00	0.0	
49.50	0.0	
50.00	0.0	
50.50	0.0	
51.00	0.0	
51.50	0.0	
52.00	0.0	
52.50	3.0	1
53.00	3.0	1
53.50	3.0	1
54.00	3.0	1
54.50	3.0	1
55.00	3.1	1
55.50	3.1	1 +2
56.00	35.0	1 +2 +3
56.50	66.1	1 +2 +3
57.00	106.2	1 +2 +3
57.50	153.4	1 +2 +3
58.00	170.2	1 +2 +3

15" RCP @ 3/8 (AS PROPOSED)
HAS CAPACITY OF 6.46 CFS
FREE FLOW. AT ELEV. 51.42, FLOW
Goes TO 6.75. AT 52.42, Q=9.54
53.42, Q=11.08
54.42, Q=13.52
55.42, Q=17.02

ENTIRE PS OR LFO

SYSTEM IS UNDER BARREL CONTROL

OVERFLOW?
NO EQ!

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

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

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	52.00001
E2 elev.(ft)?	58.001
Orifice coeff.?	.6
Invert elev.(ft)?	52.00001
Datum elev.(ft)?	0
Diameter (ft)?	.33

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

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

Elevation (ft)	Q (cfs)	Computation Messages
49.00	0.0	E < E1= 52.00001
49.50	0.0	E < E1= 52.00001
50.00	0.0	E < E1= 52.00001
50.50	0.0	E < E1= 52.00001
51.00	0.0	E < E1= 52.00001
51.50	0.0	E < E1= 52.00001
52.00	0.0	E < E1= 52.00001
52.50	3.0	H =52.5
53.00	3.0	H =53.0
53.50	3.0	H =53.5
54.00	3.0	H =54.0
54.50	3.0	H =54.5
55.00	3.1	H =55.0
55.50	3.1	H =55.5
56.00	3.1	H =56.0
56.50	3.1	H =56.5
57.00	3.1	H =57.0
57.50	3.1	H =57.5
58.00	3.1	H =58.0

C = .6 A = 8.552988E-02 sq.ft.
H (ft) = Table elev. - Datum elev. (0 ft)
Q (cfs) = C * A * sqrt(2g * H)

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

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

STAND PIPE

Stand Pipe with weir or orifice flow

E1 elev.(ft)? 55.5
E2 elev.(ft)? 58.001
Crest elev.(ft)? 55.5
Diameter (ft)? 5
Weir coefficient? 3
Orifice coefficient? .6
Start transition elev.(ft) @ ?
Transition height (ft)?

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20
Date Executed:

S/N:
Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

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

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

Elevation (ft)	Q (cfs)	Computation	Messages
49.00	0.0	E < Inv.El. = 55.5	
49.50	0.0	E < E1 = 55.5	
50.00	0.0	E < E1 = 55.5	
50.50	0.0	E < E1 = 55.5	
51.00	0.0	E < E1 = 55.5	
51.50	0.0	E < E1 = 55.5	
52.00	0.0	E < E1 = 55.5	
52.50	0.0	E < E1 = 55.5	
53.00	0.0	E < E1 = 55.5	
53.50	0.0	E < E1 = 55.5	
54.00	0.0	E < E1 = 55.5	
54.50	0.0	E < E1 = 55.5	
55.00	0.0	E < E1 = 55.5	
55.50	0.0	Weir:	H = 0.0
56.00	16.7	Weir:	H = .5
56.50	47.1	Weir:	H = 1.0
57.00	86.6	Weir:	H = 1.5
57.50	133.3	Weir:	H = 2.0
58.00	149.5	Orifice:	H = 2.5

BARRIER CONTROL

Weir Cw = 3 Weir length = 15.70796 ft
Orifice Co = .6 Orifice area = 19.63496 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. = 57.50624 ft

Outlet Structure File: LANDING3.STR

POND-2 Version: 5.20

S/N:

Date Executed:

Time Executed:

Williamsburg Landing
Expansion SP-17-02
New Sediment Basin #3

>>>>> Structure No. 3 <<<<<<
(Input Data)

CULVERT-CR

Circular Culvert (With Inlet Control)

E1 elev.(ft)?	55.51
E2 elev.(ft)?	58.001
Diam. (ft)?	1.25
Inv. el.(ft)?	49
Slope (ft/ft)?	.01
T1 ratio?	
T2 ratio?	
K Coeff.?	.0098
M Coeff.?	2
c Coeff.?	.0398
Y Coeff.?	.67
Form 1 or 2?	1
Slope factor?	-.5

**BMP POINT CALCULATIONS
FOR
WILLIAMSBURG LANDING DEVELOPMENT, PHASE 2**

LMDG File No. 2000312-000.15

- Per boundary of site, the site area is 50.22 acres. Of this acreage, 14.93 is on the west side of the Colonial Pipeline Easement as part of a future phase and will not be included in this calculation. Thus, the total site area for these calculations is 35.29 acres.
- Per recorded conservation easements for Phase 1, 25.01 acres of natural open space is located on the north and west side of the existing facility. Of this 25.01 acres, 0.41 acres is on this parcel. Thus, the total area for credit calculation is 59.89 acres (35.29 + 25.01 - 0.41).

$$\text{BMP Points} = \frac{25.01}{59.89} \times 100 \times 0.10 = \underline{\underline{4.18 \text{ BMP points}}}$$

- Dry Basin 1 (Part of Phase 1) is an extended detention basin to the north side of the existing facility. This basin serves a drainage area of 5.19 acres, per the Phase 1 as-builts.

$$\text{BMP Points} = \frac{5.19}{35.29} \times 4 = \underline{\underline{0.59 \text{ BMP points}}}$$

- Dry Basin 2 (Part of Phase 1) was designed as an extended detention system with a timber wall. As part of Phase 2, the extended detention system will become the forebay for an extended detention wet pond to be constructed on the west side of the Colonial Pipeline easement. The wet pond and forebay will be designed to serve a drainage area of 7.85 acres.

$$\text{BMP Points} = \frac{7.85}{35.29} \times 10 = \underline{\underline{2.22 \text{ BMP points}}}$$

- Basin 3, to be constructed as part of Phase 2, will be a series of timber walls designed to provide water quality and flow attenuation. This basin will be constructed within the existing ravine on the west side of the Colonial Pipeline easement and the area between Cottage 6 and the Colonial Pipeline easement. The basin will be designed to handle 13.15 acres.

$$\text{BMP Points} = \frac{13.15}{35.29} \times 4 = \underline{\underline{1.49 \text{ BMP points}}}$$

- A total of 9.19 acres of open space will be recorded as part of a conservation easement in Phase 2.

$$\text{BMP Points} = \frac{9.19}{35.29} \times 100 \times 0.15 = \underline{\underline{3.91 \text{ BMP points}}}$$



Larry S. Barry, PE., President
Norman H. Mason, L.S., VP
Vaughn B. Rinner, C.L.A.
Elizabeth J. Anderson, PE.
Kenneth A. Dierks
Robert P. Kerr, R.E.P., P.W.S.
Clayton E. Massey, PE.

Charles R. Orsborne, L.S.
Stephen A. Romeo, L.S.
Kenneth E. Rodman, Jr., PE.
Mark W. Strickland, PE.
William R. Turner, Jr., A.I.C.P.
A. Gary Webb, PE.

December 4, 2002

Mr. Christopher Johnson
Senior Planner
James City County
P.O. Box 8784
Williamsburg, VA 23187-8784

Re: S-91-02. Williamsburg Landing, Inc., Boundary Line Adjustment Plat

Dear Chris:

We are pleased to submit, for approval, ten copies of the revised boundary line adjustment plat for the above referenced project. In regards to the comments of your letter dated November 8, 2002, we offer the following:

County Engineer:

1. The Deed for the proposed conservation easement is forthcoming from Paul W. Gerhardt, Esq., Kaufman and Canoles, P.C. Copies of the proposed plat will be forwarded to Wayland Bass.

Environmental:

1. Based on a telephone conversation between C.J. Bodnar and Darryl Cook on Tuesday, Dec. 3rd, 2002, the revised BMP Point calculations are attached. These calculations correspond with the open space area on the plat. The acreage is shown on the attached "Plat of Conservation Easement", dated December 2, 2002.

Please contact me if you have any questions or wish to further discuss this.

Best regards,
The LandMark Design Group Inc.

A handwritten signature in black ink that reads "Stephen Romeo".

Stephen A. Romeo, L.S.
Principal

SAR/tmp

Copy: Wayland Bass, County Engineer, w/encl.
Darryl Cook, P.E., Director, Environmental Division, w/encl.
Paul W. Gerhardt, Esq., Kaufman & Canoles, P.C., w/encl.
William A. Doig, Williamsburg Landing, w/encl.
File 2000312



Hampton Roads | Central Virginia | Middle Peninsula
 6421 Canon Way, Gloucester, VA 23061
 Phone (804) 693-4450 / Fax (804) 693-2520
 aesva.com



Letter of Transmittal

ATTN: **Pat Menichino**

CO.: **James City County**

Address:

cc:

DATE 4/26/11	JOB NO. 8162-14
FROM: Nick Botta	
RE Williamsburg Landing Low Flow Structure Detail for Sheet Pile Walls	

WE ARE SENDING YOU THE FOLLOWING ITEMS:

- Attached
 Under separate cover via

- Original(s) Print(s) Plan(s) Specification(s) Change Order
 Copy of letter(s) Other:

COPIES	DATE	No. of Pages	DESCRIPTION
6	4/26/11	1	Low Flow Structure Detail

THESE ARE TRANSMITTED as checked below:

- For your approval For your signature For review and comment
 For your use As you requested As requested by:
 Other:

REMARKS: *For Bmps CC-035*

VIA: Hand Deliver UPS Ground UPS Next Day Air USPS Mail Other:

If enclosures are not as noted, kindly notify us at once.

Pat Menichino

From: Pat Menichino
Sent: Thursday, May 05, 2011 9:02 AM
To: 'Botta, Nick'
Cc: Darryl Cook
Subject: RE: Williamsburg Landing - Sheet Pile Wall Low Flow Structure

Nick,

We received revised plans on 4/26/11 and they look acceptable. The height of the 4' pipe should be consistent with the elevations of the original structures.

Have the contractor provide us with his start date.

Thanks,

Pat

From: Botta, Nick [<mailto:nick.botta@aesva.com>]
Sent: Thursday, April 14, 2011 2:18 PM
To: Pat Menichino
Cc: Darryl Cook; Bruce Milne
Subject: RE: Williamsburg Landing - Sheet Pile Wall Low Flow Structure

Pat,

1. Yes, we plan to have A1 riprap over the top of the filter cloth wrapped stone.
2. I understand the issue of clogging. A similar design is used at the BMP on the east side of the Woodhaven Building at Williamsburg Landing and it has worked very well with minimal maintenance. With upstream areas primarily stabilized, we feel that this can work.
3. The bottom of the 48" half pipe will be buried at least 2 feet below the invert of the orifice in the sheet pile wall to help stabilize it. A1 riprap will then cover that fill material so I believe this will prevent the short circuiting.
4. With regard to the trash rack on top of the half-pipe, I'm not sure how to handle that at this time. I honestly didn't give it any thought because the wooden boxes didn't have a trash rack on top. I'll see what I can come up with although I'm pretty sure there is no pre-manufactured device I can install on a half-pipe.

We had a difficult time coming up with the trash rack component for the 4" orifice. There was no pre-manufactured device that we could use over the 4" orifice or at the end of a 4" pipe extending upstream of the 48" half-pipe. And because the half-pipe has a circular outer surface, it would be difficult to customize a trash rack. This is why we came up with the idea of a perforated pipe wrapped with stone and filter fabric.

If the overall concept is OK with you, we will formalize our plan and resubmit it to you for your final review.

Thanks,

Nick Botta, P.E.
AES Consulting Engineers

PAT -

Looks ok to me - as long

as we are comfortable with

the height of the pipe @ 4'.

It would need to be consistent

w/ the plans although it seems

like that is about the height

of the boxes (wooden structures)

in the field Darryl



Hampton Roads | Central Virginia | Middle Peninsula
Office (804) 693-4450
aesva.com

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Please consider the environment before printing this email.

From: Pat Menichino [<mailto:pmenichi@james-city.va.us>]
Sent: Thursday, April 14, 2011 8:40 AM
To: Botta, Nick
Cc: Darryl Cook
Subject: RE: Williamsburg Landing - Sheet Pile Wall Low Flow Structure

Nick,

We have four comments on the proposed structures.

The filter cloth wrapped around the stone is exposed at the ground surface. We recommend an additional layer of stone (A1 rip rap?) be placed on top of the filter cloth.

The filter cloth /stone wrapped perforated pipe orifice will require maintenance to keep it from clogging with debris and litter.

The 48" half pipe should be installed with a bottom elevation that is deep enough to prevent the stormwater flows from entering underneath the pipe, and exiting through the sheet pile orifice, thereby short circuiting the perforated pipe system.

A trash guard for the top of the half pipe?

Thanks,

Pat

Patrick T. Menichino
Project Manager
Stormwater Specialist



General Services Department
5320 Palmer Lane, Suite 2A
Williamsburg, VA 23188
P: 757-259-1443
F: 757-259-5833
jccEgov.com

From: Botta, Nick [<mailto:nick.botta@aesva.com>]
Sent: Wednesday, April 13, 2011 9:55 AM
To: Pat Menichino
Subject: Williamsburg Landing - Sheet Pile Wall Low Flow Structure

Pat,
Per our discussions, attached is a design for the replacement of the wooden low flow structures at the sheet pile walls at Williamsburg Landing.
Let me know what you think of this concept.

Thanks,

Nick Botta, P.E.
AES Consulting Engineers



Hampton Roads | Central Virginia | Middle Peninsula
Office (804) 693-4450
aesva.com

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 Please consider the environment before printing this email.

Date Record Created:

WS_BMPNO:

Print Record

Created By:

CC035

WATERSHED CC
BMP ID NO 035
PLAN NO SP-17-02

PRINTED ON
Thursday, March 11, 2010
2:57:06 PM

TAX PARCEL
PIN NO
CONSTRUCTION DATE
PROJECT NAME Williamsburg Landing Expansion PH 2

FACILITY LOCATION
CITY-STATE

CURRENT OWNER

OWNER ADDRESS

OWNER ADDRESS 2

CITY-STATE-ZIP CODE

OWNER PHONE 0

MAINT AGREEMENT No

EMERG ACTION PLAN No

Get Last BMP No

Return to Menu

MAINTENANCE PLAN No

SITE AREA acre 25.48

LAND USE

old BMP TYP Dry Pond

JCC BMP CODE F2 Dry ED with forebay

POINT VALUE

SVC DRAIN AREA acres 14.62

SERVICE AREA DESCRI

IMPERV AREA acres 0.00

RECV STREAM

EXT DET-WQ-CTRL No

WTR QUAL VOL acre-ft

CHAN PROT CTRL No

CHAN PROT VOL acre-ft

SW/FLOOD CONTROL No

GEOTECH REPORT No

CTRL STRUC DESC

CTRL STRUC SIZE inches

OTLT BARRL DESC

OTLT BARRL SIZE inch

EMERG SPILLWAY No

DESIGN HW ELEV

PERM POOL ELEV

2-YR OUTFLOW cfs 0.00

10-YR OUTFLOW cfs 0.00

REC DRAWING No

CONSTR CERTIF No

LAST INSP DATE

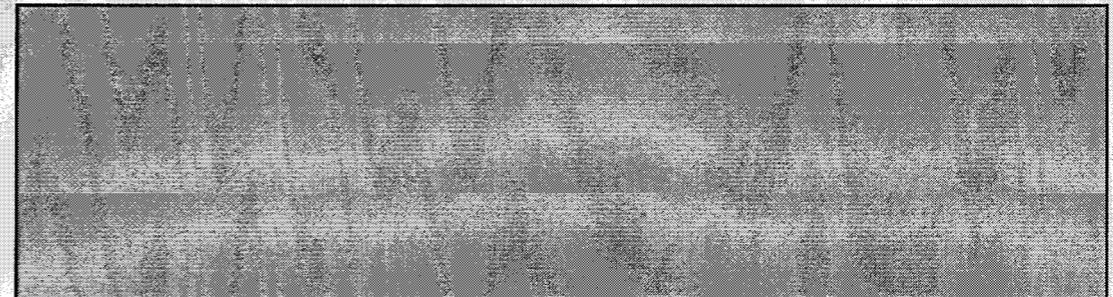
Inspected by:

INTERNAL RATING

MISC/COMMENTS

Segmental block retaining wall,
downstream sheet piling & stilling basins

Additional Comments:



Date Record Created:

WS_BMPNO:

Print Record

Created By:

CC035

PRINTED ON
Thursday, March 11, 2010
2:57:06 PM

WATERSHED CC
 BMP ID NO 035
 PLAN NO SP-17-02
 TAX PARCEL
 PIN NO
 CONSTRUCTION DATE
 PROJECT NAME Williamsburg Landing Expansion PH 2
 FACILITY LOCATION
 CITY-STATE
 CURRENT OWNER
 OWNER ADDRESS
 OWNER ADDRESS 2
 CITY-STATE-ZIP CODE
 OWNER PHONE 0
 MAINT AGREEMENT No
 EMERG ACTION PLAN No

MAINTENANCE PLAN

No
 SITE AREA acre 25.48
 LAND USE
 old BMP TYP Dry Pond
 JCC BMP CODE F2 Dry ED with forebay
 POINT VALUE

SVC DRAIN AREA acres 14.62

SERVICE AREA DESCRI

IMPERV AREA acres 0.00
 RECV STREAM
 EXT DET-WQ-CTRL No
 WTR QUAL VOL acre-ft
 CHAN PROT CTRL No
 CHAN PROT VOL acre-ft
 SW/FLOOD CONTROL No
 GEOTECH REPORT No

CTRL STRUC DESC

CTRL STRUC SIZE inches
 OTLT BARRL DESC
 OTLT BARRL SIZE inch
 EMERG SPILLWAY No
 DESIGN HW ELEV
 PERM POOL ELEV
 2-YR OUTFLOW cfs 0.00
 10-YR OUTFLOW cfs 0.00
 REC DRAWING No

CONSTR CERTIF No

LAST INSP DATE

Inspected by:

INTERNAL RATING

MISC/COMMENTS

Segmental block retaining wall,
downstream sheet piling & stilling basins

Get Last BMP No

Return to Menu

Additional Comments:

[Empty text box for additional comments]

JAMES CITY COUNTY ENVIRONMENTAL DIVISION

Surety Tracking Sheet

Date: 7/21/2009

Due Date: _____

Project Name: Williamsburg Landray Phase 2 Expansion

Requested By: _____ Phone #: _____

Date Notified: _____ Case Number: SP-017-02

Siltation Surety: Original \$ _____ Current \$ 260,000 Needed \$ _____

- Calculate Evaluate/Reduce Release

Work to be completed for SILTATION Surety

- Stabilization of all disturbed areas
Removal of temporary erosion control measures
Submission of as-built drawings for stormwater management facility
Submission of construction certification for the stormwater management facility
Completion of field-related BMP items
Other -
Comments-

Subdivision Surety: Original \$ _____ Current \$ _____ Needed \$ _____

*maximum reduction of 80% of original bond amount unless project is to be released

- Calculate Evaluate/Reduce Release

Work to be completed for SUBDIVISION Surety

- Paving of streets
Dedication of streets to Virginia Dept of Transportation (VDOT) Amount Needed \$
Completion of water and sewer systems (JCSA) Amount Needed \$
Completion of water and sewer punchlist items
Submission of as-built drawings for water and sewer systems
Installation of street lights and street signs
Other -
Comments-

INDICATE YOUR APPROVAL BY INITIALING THE APPROPRIATE BLANK:

INSP INSP CHF WTSHD ENV
SUPV SUPV ENG PLNR DIR

RELEASE PROJECT _____

JAMES CITY COUNTY ENVIRONMENTAL DIVISION

Surety Tracking Sheet

Date: 7/21/2009

Due Date: _____

Project Name: Williamsburg Landing Phase 2 Expansion

Requested By: _____ Phone #: _____

Date Notified: _____ Case Number: SP-017-02

Siltation Surety: Original \$ _____ Current \$ 260,000 Needed \$ _____

- Calculate
- Evaluate/Reduce
- Release

Work to be completed for SILTATION Surety

- Stabilization of all disturbed areas
- Removal of temporary erosion control measures
- Submission of as-built drawings for stormwater management facility
- Submission of construction certification for the stormwater management facility
- Completion of field-related BMP items
- Other -
- Comments-

Subdivision Surety: Original \$ _____ Current \$ _____ Needed \$ _____

*maximum reduction of 80% of original bond amount unless project is to be released

- Calculate
- Evaluate/Reduce
- Release

Work to be completed for SUBDIVISION Surety

- Paving of streets
- Dedication of streets to Virginia Dept of Transportation **VDOT**
Amount Needed \$ _____
- Completion of water and sewer systems **JCSA**
Amount Needed \$ _____
- Completion of water and sewer punchlist items
- Submission of as-built drawings for water and sewer systems
- Installation of street lights and street signs
- Other -
- Comments-

INDICATE YOUR APPROVAL BY INITIALING THE APPROPRIATE BLANK:

INSP _____	INSP SUPV _____	CHF ENG _____	WTSHD PLNR _____	ENV DIR _____
------------	-----------------	---------------	------------------	---------------

RELEASE PROJECT _____