



CERTIFICATE OF AUTHENTICITY

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

BMPNUMBER: MC047

DATE VERIFIED: June 16, 2016

QUALITY ASSURANCE TECHNICIAN: Charles E. Lovett II

A handwritten signature in cursive script that reads "Charles E. Lovett II".

LOCATION: WILLIAMSBURG, VIRGINIA



Stormwater Division

MEMORANDUM

Date: April 4, 2012
To: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services
From: Leah Hardenbergh
PO: 110426
Re: Files Approved for Scanning

General File ID or BMP ID: MC047
PIN: 3841600100
Owner Name (if known): MIDLANDS OFFICE BUILDING (THE)
Legal Property Description: CA MIDTOWN OFFICE CONDOMINIUMS;
LOT 2 S-1 MIDLANDS
Site Address: 3917 MIDLANDS ROAD

(For internal use only):

Box # 4

Agreements (in file as of scan date): Y Book or Doc #: 000022218

MC-047

Contents for Stormwater Management Facilities As-built Files

Each file is to contain:

- ①. As-built plan
- ②. Completed construction certification
- ③. Construction Plan
- ④. Design Calculations
- ⑤. Watershed Map
- ⑥. Maintenance Agreement
7. Correspondence with owners
- ⑧. Inspection Records
9. Enforcement Actions

COPY

AGREEMENT AND DECLARATION OF
COVENANTS TO CONSTRUCT, MAINTAIN
AND PROVIDE ACCESS TO A STORMWATER FACILITY

This AGREEMENT, made this 16th day of June 2000, by and between Andy and Peggy Piplico and all successors in interest, (COVENANTORS) and the COUNTY OF JAMES CITY, VIRGINIA (COUNTY), a political subdivision of the Commonwealth of Virginia.

The COVENANTORS are the owners of the real property, with improvements thereon, designated as Lot 2 and Lot 3, The Midlands, ref. Tax map (38-4)(16-2), & (38-4) (16-3) commonly known as 3917 Midlands Road and 3909 Midlands Road.

NOW, THEREFORE, in consideration of the mutual covenants herein contained it is agreed that the COUNTY will allow the COVENANTORS to develop, complete and occupy an office building on Lot 3, in accordance with the Site Plan (designated SP- 100-00) approved by the COUNTY, in conjunction with constructing and maintaining a stormwater facility serving lots 2 and 3 in accordance with the conditions contained within this AGREEMENT, on Lot 2.

WITNESSETH:

We, the COVENANTORS, 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 COVENANTORS shall provide surety in the amount of \$20,000.00 acceptable to the County Attorney, for performance of this AGREEMENT in the amount agreed to by both parties.
2. The COVENANTORS shall construct the stormwater water quality facility(FACILITY) as shown on a County approved BMP plan facility to be designed by Ralph Simmons, P.E., and that the construction will conform with the "Virginia Erosion and Sedimentation Control Handbook" third edition, and the James City County Guidelines for Design and Construction of Stormwater Management BMPs.
3. The COVENANTORS agree that the construction of said FACILITY will be completed, accepted and approved by the COUNTY no later than June 30th, 2001.
4. If the COVENANTORS fail to construct the facility in accordance with the stipulations contained in this AGREEMENT, the COUNTY may use the surety to construct or complete the FACILITY. On satisfactory completion of the FACILITY, the COUNTY shall release the surety provided in paragraph 1.

Instrument # 000022218

Recorded on: Nov. 28, 2000

5. The COVENANTORS shall provide maintenance for the FACILITY located on and serving the above described property to ensure that the FACILITY is and remains in proper working condition in accordance with the approved design standards, and with the law and applicable executive regulations.

6. The COVENANTORS shall provide and maintain perpetual access from public right-of-ways to the FACILITY for the COUNTY, its agents, and its contractors.

7. The COVENANTORS shall grant the COUNTY, its agents and its contractors a right of entry to the FACILITY for the purpose of inspecting, operation, installing, constructing, reconstructing, maintaining or repairing the FACILITY.

8. If after fifteen (15) days written notice by the COUNTY, the COVENANTORS SHALL FAIL TO MAINTAIN THE FACILITY in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may assess the COVENANTORS and/or all property serviced by the FACILITY for the cost of the work and any applicable penalties.

9. The COVENANTORS shall indemnify and save the COUNTY harmless from any and all claims for damages to persons or property arising from the installation, constructing, maintenance, repair, operation or use of the FACILITY. Except as to such claims that may arise out of maintenance or construction activities undertaken by the COUNTY or its agents.

10. The COVENANTORS shall promptly notify the County when the COVENANTORS legally transfer any of the COVENANTORS ownership in or responsibilities for the FACILITY: THE COVENANTORS shall supply the County with a copy of the document of transfer, executed by both parties.

11. The COVENANTS contained herein shall run with the land and shall bind the COVENANTORS and the COVENANTORS'S heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of the property served by the FACILITY.

12. This AGREEMENT shall be recorded in the circuit court clerks office for the County of James City, Virginia.

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this _____ day of _____, 19____.

COVENANTOR(S)

[Signature]

Print Name/Title

Andy Piplico / Owner

ATTEST:

[Signature]
Kamie A. Probst

COVENANTOR(S)

[Signature]

Print Name/Title

Peggy K. Piplico / Owner

ATTEST:

[Signature]
Kamie A. Probst

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF James City

I hereby certify that on this 14 day of November, 192000, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of James City, aforesaid personally appeared Andy + Peggy Piplico and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 14 day of November, 192000.

[Signature]
Notary Public

My Commission expires: 8/31/2002

Approved as to form:

[Signature]
Deputy County Attorney

This Declaration of Covenants prepared by:

[Signature]
(Print Name)

owner
(Title)

118 N. M. Point Dr
(Address)

Williamsburg, VA 23185
(City) (State) (Zip)

The form of this deed is approved and pursuant to Resolution of the Board of Supervisors of James City County, Virginia, duly adopted on the 17th day of May, 1993, this conveyance is hereby accepted on behalf of said County.

[Signature]
Frank Morton III, County Attorney
Leo P. Rogers, Deputy

Pipico & Assoc
P.O. Box 1338
Wm86 VA 23187
565-0003

GPIN 38416 0000 2
0.85AL
Zone LB
Lot 2 - sec 1 MIDLANDS

James City County, Virginia
Environmental Division

Stormwater Management/BMP Facilities
Record Drawing/Construction Certification
Review Tracking Form

County Plan No.: SP-100-00 (Amend SP-076-01)
Project Name: MIDLANDS ROAD LOT 2
Stormwater Management Facility: BMP #2 Dry Pond (3917 MIDLANDS RD)
Phase: I II III

Information Received. Date: Dec 27 '01
Administrative Check.
 Record Drawing Date: 10/01/01 RALPH SIMMONS
 Construction Certification Date: 27 Sept 01 R.S.
 RD/CC Standard Forms (Required after Feb 1st 2001 Only)
 Insp/Maint Agreement Info: YES
 BMP Maintenance Plan Location: Sheet C5
 Other:

Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
 Yes No Location: Note 19 Sheet C4; Note #4 Sheet C2
Assign County BMP ID Code Code: MC047

Log into Division's "As-Built" Tracking Log
Add Location to GIS Database Map. Obtain GIS site information (GPIN, Owner, Site Area, Address, etc.)
Preliminary Log into BMP Database (BMP ID #, Site Plan #, GPIN, Project Name)
Active Project File Review (correspondence, H&H, etc.).
Initial As-Built File setup (label, copy hydraulics, BMP information, etc.).
Inspector Check of RD/CC.

Pre-Inspection Drawing Review - Approved Plan (Quick look prior to field inspection)
Final Inspection (FI) Performed Date: 1/15/02; Reinspect 5-20-02
Record Drawing (RD) Review Date: 1/15/02
Construction Certification (CC) Review Date: 1/15/02

Actions:
 No comments.
 Comments. Letter Forwarded. Date: 1/16/02
 Record Drawing (RD)
 Construction Certification (CC)
 Construction-Related (CR)
 Site Issues (SI)
 Other:

Second Submission: MAY 21 '02
 Third Submission:
 Acceptable for stormwater management facility purposes (RD/CC/CR/Other). Proceed with bond release.
 Notify Darryl/Joan/Pat of acceptability using email (preferred), form or verbal.
 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.
 Digital Photographs obtained.
 Add to JCC Hydrology & Hydraulic database (optional).

US ACOE Permit
00-R 2314

BMP Certification Information Acceptable
Plan Reviewer: [Signature] Date: 5-23-02

Hold \$8,000

3/15/01

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: Lot 2, Midlands Road
Structure/BMP Name: BMP 1 & BMP 2
Project Location: 3917 Midlands Road
BMP Location: Lots 3 & 2 (respectively)
County Plan No.: SP - 76 - 01

Project Type: Residential Business Tax Map/Parcel No.: 38-4, 16-2
 Commercial Office BMP ID Code (if known): MC047
 Institutional Industrial Zoning District: Limited Business, LB
 Public Roadway Land Use: Business/office
 Other Site Area (sf or acres): 0.85 Acres

Brief Description of Stormwater Management/BMP Facility: BMP #1, located on lot 3 (Dry Extended Detention) provided WQ Storage & route all storms to flow to BMP #2. Approx. 0.77 acres is sewed by BMP #1. BMP #2 (Dry Extended Detention) serves 3.34 acres for WQ (2.57 Acres) & One year Channel Erosion

Nearest Visible Landmark to SWM/BMP Facility: Existy bldg on Lot 3.

Nearest Vertical Ground Control (if known):

JCC Geodetic Ground Control USGS Temporary Arbitrary Other

Station Number or Name: Mt Rim on property

Datum or Reference Elevation: 86.74

Control Description: Property Boundary

Control Location from Subject Facility: Property boundary

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: 2/1/01
Facility Monitored by County Representative during Construction: Yes No Unknown
Name of Site Work Contractor Who Constructed Facility: William Cowan Construction
Name of Professional Firm Who Routinely Monitored Construction: Ralph C. Simmons, PE
Date of Completion for SWM/BMP Facility: 3/15/01
Date of Record Drawing/Construction Certification Submittal: 12/27/01

(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: Andy Piplico
Mailing Address: 118 Northpoint Drive
Williamsburg VA 23185
Business Phone: 565-0003 Fax: 565-0416
Contact Person: Andy Piplico Title: Owner

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: Simmons Engineering Inc
Mailing Address: 4732 Longhill Rd, Suite 3103
Williamsburg VA 23188
Business Phone: 258-5000
Fax: 258-3758
Responsible Plan Preparer: Ralph C. Simmons PE
Title: President
Plan Name: Lot 2, Midlands Road
Firm's Project No. 00-105
Plan Date: 28 Jun 00 Rev'd 8/4/01
Sheet No.'s Applicable to SWM/BMP Facility: C1 / C2 / C3 / C4 / C5

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

Name: William Cowan Construction
Mailing Address: Po Box 695
Toano VA 23108
Business Phone: 566-4809
Fax: _____
Contact Person: William Cowan
Site Foreman/Supervisor: Same as Contact Person
Specialty Subcontractors & Purpose (for BMP Construction Only):
None

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

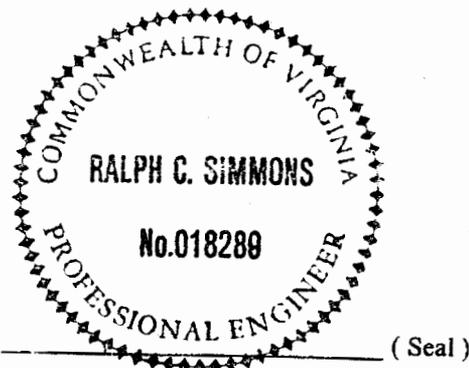
Record Drawing Certification

Firm Name: Simmons Engineering Inc.
Mailing Address: 4732 Longhill Rd
Suite 3103, Williamsburg VA 23188
Business Phone: 258-5000
Fax: 258 3758

Name: Ralph C. Simmons PE
Title: President
Signature: [Signature]
Date: 27 Sep 01

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.

Asbuilt conditions are field verified with modifications checked to confirm original design.



Virginia Registered Professional Engineer or Certified Land Surveyor

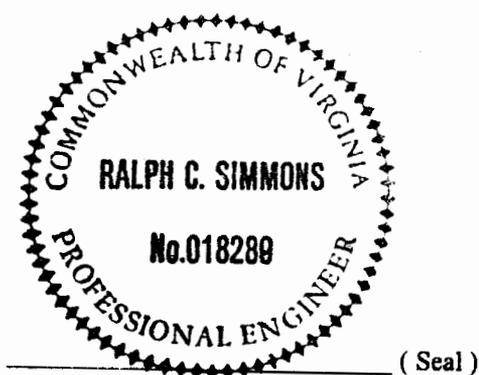
Construction Certification

Firm Name: Simmons Engineering Inc.
Mailing Address: 4732 Longhill Rd
Suite 3103, Williamsburg VA 23188
Business Phone: 258-5000
Fax: 258-3758

Name: Ralph C. Simmons, PE
Title: President
Signature: [Signature]
Date: 27 Sep 01

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.

Continuous onsite inspection of backfill, compaction or other soils work is not certified.



Virginia Registered Professional Engineer

Andy + Peggy Piplico.
Andrew m. + Peggy K Piplico
118 North Point Drive
Wmby VA. 23185-4450
(532-2888)

Section 5 - Record Drawing and Construction Certification Requirements and Instructions:

PreConstruction Meeting - Provides an opportunity to review SWM / BMP facility construction, maintenance and operation plans and address any questions regarding construction and/or monitoring of the structure. The ~~design engineer, certifying professionals (if different),~~ Owner/Applicant, Contractor and County representative(s) are encouraged to attend the preconstruction meeting. Advanced notice to the Environmental Division is requested. Usually, this requirement can be met simultaneously with Erosion and Sediment Control preconstruction meetings held for the project.

A fully completed **STORMWATER MANAGEMENT / BMP FACILITIES, RECORD DRAWING and CONSTRUCTION CERTIFICATION FORM** and **RECORD DRAWING CHECKLIST**. All applicable sections shall be completed in their entirety and certification statements signed and sealed by the registered professional responsible for individual record drawing and/or construction certification.

The Record Drawing shall be prepared by a Registered Professional Engineer or Certified Land Surveyor for the drainage system of the project including any Best Management Practices.

Construction Certification. Construction of Stormwater Management / BMP facilities which contain impoundments, embankments and related engineered appurtenances including subgrade preparation, compacted soils, structural fills, liners, geosynthetics, filters, seepage controls, cutoffs, toe drains, hydraulic flow control structures, etc. shall be visually observed and monitored by a Registered Professional Engineer or his/her authorized representative. The Engineer must certify that the structure, embankment and associated appurtenances were built in accordance with the approved design plan, specifications and stormwater management plan and standard accepted construction practice and shall submit a written certification and/or drawings to the Environmental Division as required. Soil and compaction test reports, concrete test reports, inspection reports, logs and other required construction material or installation documentation may be required by the Environmental Division to substantiate the certification, if specifically requested. The Engineer shall have the authority and responsibility to make minor changes to the approved plan, in coordination with the assigned County inspector, in order to compensate for unsafe or unusual conditions encountered during construction such as those related to bedrock, soils, groundwater, topography, etc. as long as changes do not adversely affect the integrity of the structure(s). Major changes to the approved design plan or structure must be reviewed and approved by the original design professional and the James City County Environmental Division.

No
RCB

Record Drawing and Construction Certifications are required within **thirty (30) days** of the completion of Stormwater Management / BMP facility construction. Submittals must be reviewed and accepted by James City County Environmental Division prior to final inspection, acceptance and bond/surety release.

Submitted
12/27/01

Dual Purpose Facilities - Completion of construction also includes an interim stage for Stormwater Management / BMP facilities which serve dual purpose as temporary sediment basins during construction and as permanent stormwater management / BMP facilities following construction, once development and stabilization are substantially complete. For these dual purpose facilities, construction certification is required once the temporary sediment basin phase of construction is complete. Final record drawing and construction certification of additional permanent components is required once permanent facility construction is complete.

Interim Construction Certification is required for those dual purpose embankment-type facilities that are generally ten (10) feet or greater in dam height (*) and may not be converted, modified or begin function as a permanent SWM / BMP structure for a period generally ranging from six (6) to eighteen (18) months or more from issuance of a Land Disturbance permit for construction.

Interim or final record drawing and construction certifications are not required for temporary sediment basins which are designed and constructed in accordance with current minimum standards and specifications for temporary sediment basins per the Virginia Erosion and Sediment Control Handbook (VESCH); have a temporary service life of less than eighteen (18) months; and will be removed completely once associated disturbed areas are stabilized, unless a distinct hazard to the public's health, safety and welfare is determined by the Environmental Division due to the size or presence of the structure or due to evidence of improper construction.

(*Note: Dam Height as referenced above is generally defined as the vertical distance from the natural bed of the stream or waterway at the downstream toe of the embankment to the top of the embankment structure in accordance with 4VAC50-20-30, Virginia Impoundment Structure Regulations and the Virginia Dam Safety Program.)

- Record Drawings shall provide, at a minimum, all information as shown within these requirements and the attached **RECORD DRAWING CHECKLIST** specific to the type of SWM/BMP facility being constructed. Other additional record data may be formally requested by the James City County Environmental Division. *(Note: Refer to the current edition of the James City County Guidelines for Design and Construction of Stormwater Management BMP's manual for a complete list of acceptable BMP's. Currently there are over 20 acceptable water quality type BMP's accepted by the County.)*
- Record Drawings shall consist of blue/black line prints and a reproducible (mylar, sepia, diazo, etc.) set of the approved stormwater management plan including applicable plan views, profiles, sections, details, maintenance plans, etc. as related to the subject SWM / BMP facility. The set shall indicate "**RECORD DRAWING**" in large text in the lower right hand corner of each sheet with record elevations, dimensions and data drawn in a clearly annotated format and/or boxed beside design values. Approved design plan values, dimensions and data shall not be removed or erased. Drawing sheet revision blocks shall be modified as required to indicate record drawing status. Elevations to the nearest 0.1' are sufficiently accurate except where higher accuracy is needed to show positive drainage. Certification statements as shown in Section 4 of the Record Drawing and Construction Certification Form, *or similar forms thereof*, and professional signatures and seals, with dates matching that of the record drawing status in the revision or title block, are also required on all associated record drawing plans, prints or reproducibles.
- Submission Requirements. Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system, it is requested that the record drawings also be submitted to the Environmental Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Environmental Division staff at the time of final submission.

**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.)

- XX 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.
- XX 2. Elevations to the nearest 0.1' unless higher accuracy is needed to show positive drainage.
- XX 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).
- XX 4. All plan sheet revision blocks modified to indicate date and record drawing status.
- XX 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.
- XX 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.
- XX 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.
- XX 4. Top widths, berm widths and embankment side slopes.
- XX 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.
- INC 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.
- INC 7. Profile or elevations along the entire centerline of the emergency spillway. Emergency spillway may be steeper, but no flatter or narrower than design.
- XX 8. Elevation of the principal spillway crest or outlet crest of the structure.

- XX 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.
- XX 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.
- XX 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.
- INC 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.**
- INC 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**
- XX 14. Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.
- XX 15. Outlet barrel diameter, length, slope, type and thickness class of material and type of flared end sections, headwall or endwall.
- INC 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.
- INC 17. BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan
- INC 18. Maintenance plan taken from approved design plan transposed onto record drawing set.
- N/A 19. Fencing location and type, if applicable to facility.
- XX 20. BMP vicinity properly cleaned of stockpiles and construction debris.
- XX 21. No visual signs of erosion or channel degradation immediately downstream of facility.
- N/A 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

B-11 N/A

**STORMWATER MANAGEMENT / BMP FACILITIES
AS-BUILT PLAN CHECKLIST**

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

VII. Group E - Open Channel Systems (Includes E-1 Wet Swales (Check Dams); E-2 Dry Swales; and E-3 Biofilters)

- E1. All requirements of Section II, Minimum Standards, apply to Group E facilities as applicable.
- E2. Open channel system has constructed longitudinal slope of less than four (4) percent.
- E3. No visual signs of erosion in the open channel system's soil and/or vegetative cover.
- E4. Open channel side slopes are no steeper than 2H:1V at any location. Preferred channel sideslope is 3H:1V or flatter.
- E5. No visual signs of ponding are present at any location in the open channel system, except at rock check dam locations for E-1 systems (Wet Swales).
- E6. For E-2 BMPs (Dry Swales), an underdrain system was provided.
- E7. Treated timber or rock check dams provided as pretreatment devices for the open channel system.
- E8. Gravel diaphragm provided in areas where lateral sheet flow from impervious surfaces are directly connected to the open channel system.
- E9. Grass cover/stabilization in the open channel system appears adaptable to the specific soils and hydric conditions for the site and along the channel system.
- E10. Open channel system areas with grass covers higher than four (4) to six (6) inches were properly mowed.
- E11. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.
- E12. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.
- E13. For E-3 BMPs (Biofilters), the bottom width is six (6) feet maximum at any location.
- E14. For E-3 BMPs (Biofilters), sideslopes are 3H:1V maximum at any location.
- E15. For E-3 BMPs (Biofilters), the constructed channel slope is less than or equal to three (3) percent at any location.
- E16. For E-3 BMPs (Biofilters), the constructed grass channel is approximately equivalent to the constructed roadway length.

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

Lot 3
BMP #1
Lot 1
+
Lot 2

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

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

- XX F1. All requirements of Section II, Minimum Standards, apply to Group F facilities.
- XX F2. Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.
- N/A F3. Timber wall BMP used in intermittent stream only. (ie. Prohibited in perennial streams.)
- N/A F4. Forebay provided approximately 20 ft. upstream of the facility. Forebays generally 4 to 6 feet in depth.
- XX F5. A ~~reverse slope pipe~~, vertical stand pipe ~~or mini-barrel~~ and riser was provided to prevent clogging.
- N/A F6. Principal spillway and outlet barrel provided consisting of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.
- N/A F7. Mini-barrel and riser, if used, contains a removable trash rack to reduce clogging.
- XX F8. Low flow orifice, if used, has a ~~minimum diameter of three (3) inches or two (2) inches~~ ^{5/8" ϕ} internal orifice control was utilized and a small, cage type external trash rack.
- N/A F9. Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.
- N/A F10. Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.
- XX F11. Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.
- XX F12. ~~Stilling basin~~ or standard outlet protection provided at principal spillway outlet.
- XX F13. Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, ~~slope is less than twenty (20) percent~~ and appropriate stabilization provided for equipment and vehicle use. Access extends to ~~forebay, standpipe and timber wall~~, as applicable.
- XX F14. No visual signs of ~~undercutting of timber walls~~ or clogging of the low orifice were present.
- XX F15. No visual signs of erosion or channel degradation immediately downstream of facility.
- XX F16. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

- XX F1. All requirements of Section II, Minimum Standards, apply to Group F facilities.
- XX F2. Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.
- N/A F3. Timber wall BMP used in intermittent stream only. (ie. Prohibited in perennial streams.)
- XX F4. Forebay provided ^Yapproximately 20 ft. upstream of the facility. Forebays generally 4 to 6 feet in ~~depth.~~ W/ 3'± Depth.
- XX F5. A ~~reverse slope pipe, vertical stand pipe or mini-barrel~~ and riser was provided to prevent clogging.
- XX F6. Principal spillway and outlet barrel ~~provided consisting of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.~~
- XX F7. ~~Mini-barrel and~~ riser, if used, contains a removable trash rack to reduce clogging.
- XX F8. Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack. 1-3/8" φ
- N/A F9. Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.
- N/A F10. Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.
- XX F11. Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.
- XX F12. Stilling basin or standard outlet protection provided at principal spillway outlet.
- XX F13. Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, ~~slope is less than twenty (20) percent~~ and appropriate stabilization provided for equipment and vehicle use. Access extends to forebay, ~~standpipe and timber wall,~~ as applicable.
- XX F14. No visual signs of ~~undercutting of timber walls or~~ clogging of the low orifice were present.
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- XX F16. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

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

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

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

- G1. All requirements of Section II, Minimum Standards, apply to Group G facilities as applicable.
- G2. Constructed impervious areas appear to conform with locations indicated on the approved plan and appear less than sixty (60) percent impervious in accordance with the requirements of the James City County Chesapeake Bay Preservation Ordinance.
- G3. Dedicated open space areas are in undisturbed common areas, conservation easements or are protected by other enforceable instruments that ensures perpetual protection.
- G4. Provisions included to clearly specify how the natural vegetated areas utilized as dedicated open space will be managed and field identified (marked).
- G5. Adequate protection measures were implemented during construction to protect the defined dedicated open space areas.
- G6. Dedicated open space areas were not disturbed during construction (ie. cleared, grubbed or graded).

11/25/13

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

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

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

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

- XX SD1. All requirements of Section II, Minimum Standards, apply to Storm Drainage Systems.
- XX SD2. Horizontal location of all pipe and structures relative to the SWM/BMP facility.
- XX SD3. Type, top elevation and invert elevation of all access type structures (inlets, manholes, etc.).
- XX SD4. Material type, size or diameter, class, invert elevations, lengths and slopes for all pipe segments.
- XX SD5. Class, length, width and depth of riprap and outlet protections or dimensions of special energy dissipation structures.

XII. Other Systems

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

- O1. ^{N/A} All requirements of Section II, Minimum Standards, apply to this section.
- O2. Certification criteria to be determined on a case-by-case basis by the Environmental Division specific to the proposed SWM/BMP facility.

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

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

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

File: Shared\SWMProg\BMP\Certi\RDCC.wpd

Record Drawing Notes:

These Record Drawings are of BMPs #1 and #2 of Lots 3 & 2 (respectively) of Midlands Road. Original design of BMP #1 for Lot 3 was prepared as a Bio-Retention Basin and approved by JCC Staff under site plan number SP-89-99. The construction of two Dry Extended Detention Basins provides a total of 21.2 Chesapeake Bay BMP Points.

Field survey was performed by LandTech Resources, Inc.

Summary of design concept:

BMP#1 lies upstream of BMP#2. BMP#1 provides for Water Quality (WQ) Treatment of 0.77 post-development acres (0.35 imperivous acres). WQ storage and control are provided by the primary spillway (modified DI-1). The 100-Year Storm Event is routed thru the structure via the secondary spillway (6' weir). All flows are directed to BMP#2.

BMP#2 discharges to an existing natural swale to off-property. The primary structure is a 36" Aluminized Metal Pipe Riser and controls the Water Quality Treatment volume for 2.57 post-development acres (1.24 imperivous acres). The BMP also stores and controls the 1-Year Channel Erosion Storm Event to below the riser's rim. The 10 Year Storm Event is stored and controlled by the primary spillway's rim.

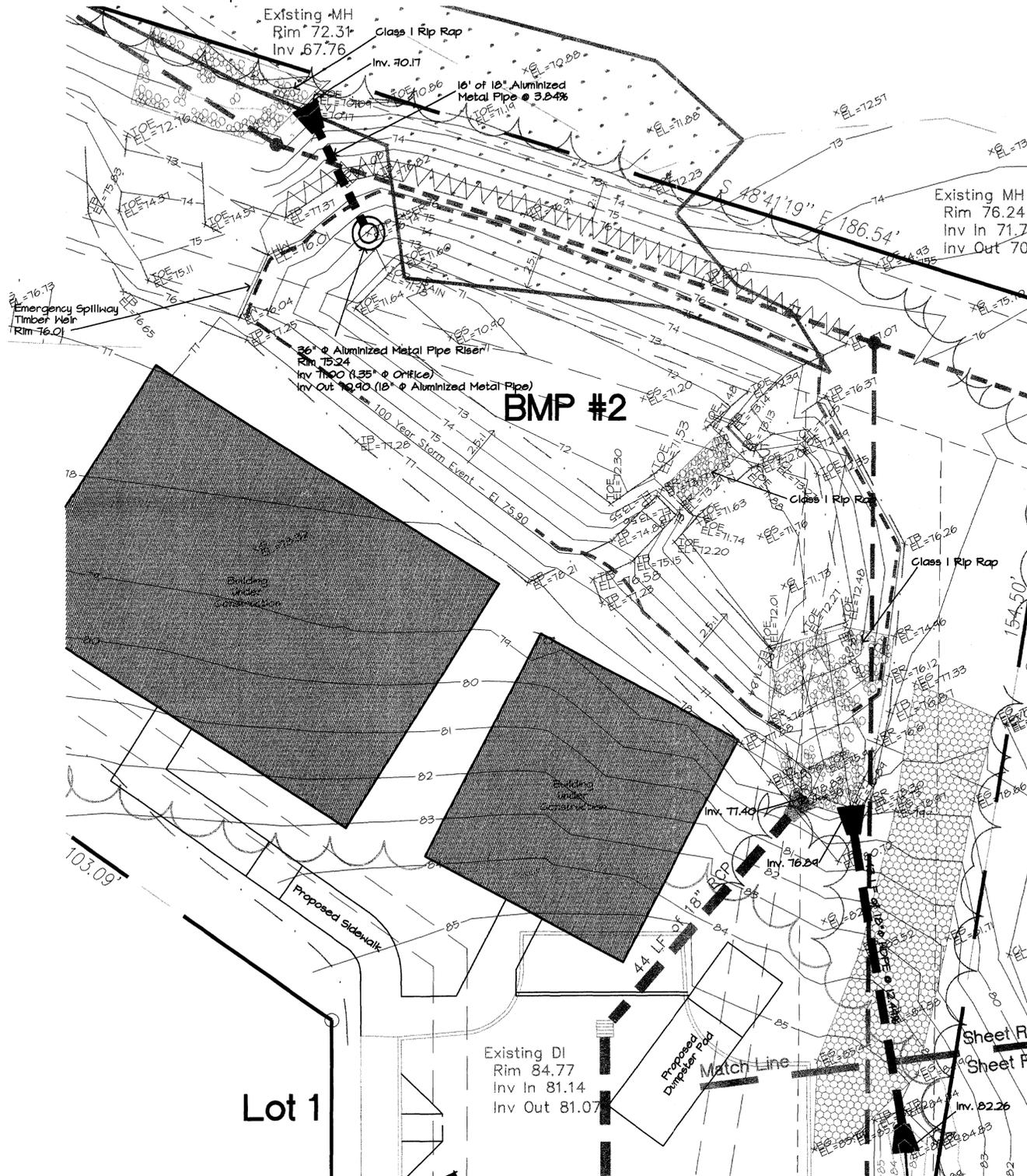
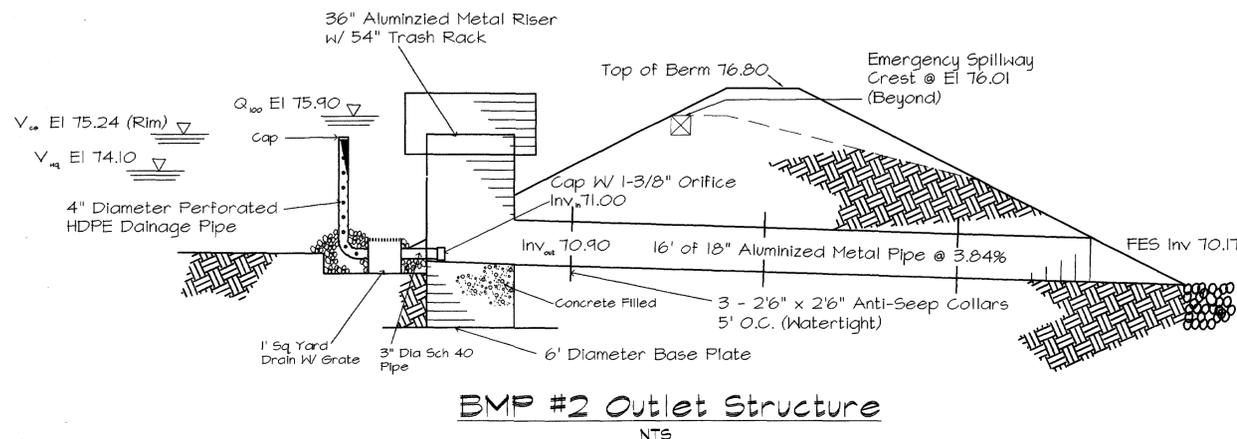
The 100-Year Storm Event for the entire 3.34 acre watershed is routed and designed to remain below BMP#2's Emergency Spillway rim.

Stormwater Management Maintenance Easement:

A maintenance and access easement is established that originates off the existing parking lot area and extends along each side of the gravel access drive as shown on the plans. The easement is extended to encompass BMP #2 embankment, graded side slopes, emergency spillway, forebay, riser and outlet structures. The easement will include drainage system structures from existing and new off site drainage areas.

BMP #2 Table

	Design			As-Built		
	Elevation	Volume (cf)	Flow (cfs)	Elevation	Volume (cf)	Flow (cfs)
Water Quality	73.80	4,497	0.08	74.10	4,495	0.08
Channel Erosion	75.03	7,840	0.09	75.24	7,976	0.10
100 Year	75.65	-	13.59	75.90	-	14.75
Emergency Spillway	75.70	-	-	76.01	-	-
Top of Berm	76.65	-	-	76.80	-	-



Maintenance Plan for BMP #2 of Lot 2 - Midlands Road

A maintenance program is required to ensure the Stormwater Management (SWM) / Best Management Practice (BMP) facility functions as designed and to provide for reasonable aesthetic conditions. Proper maintenance is encouraged to prevent the introduction of debris and sediment at inflow locations, pretreatment areas, the BMP itself, its principal control structures and downstream waterways. Following installation and establishment of vegetation in disturbed site areas, inspections for sediment buildups will be performed at least quarterly. It is anticipated that under normal conditions, sediment removal will be required every 5 to 10 years. If other construction or related land-disturbing activities are performed upslope of the BMP, adequate protection measures should be implemented with inspections performed at least once weekly.

The Owner or its designated representative will inspect the SWM/BMP structure after each significant rainfall event or the following working day if a weekend or holiday occurs. A significant rainfall for this structure is defined as one (1) inch or more of gauged rainfall within a 24 hour period. Once per year (more or less) a representative of the County may jointly inspect the structure. Appropriate action, performed at the cost of the owner will be taken to ensure appropriate maintenance. Where structures are to be maintained jointly, allocation of maintenance costs will be in accordance with terms established in maintenance agreements. Keys to locked access points or structures shall be made available to the County upon request.

BMP Description:

BMP #2 serves a drainage area of 3.34 acres associated with the Midlands Road area. The facility is a 4-point, dry-type detention facility, County Type F-2 BMP. A dry-type detention pond temporarily stores runoff and is normally dry during non-rainfall periods. Typically draw down times range from 24 to 72 hours following a storm event. Principal structures associated with the BMP consist of two 18 inch inflow storm drains, a 36 inch vertical aluminized metal riser, 18 inch aluminized metal outlet barrel and 6 ft. wide, grass-lined trapezoidal shaped emergency overflow channel. There is one opening in the riser to provide for water quality and one-year channel erosion drawdown. During the 100-year storm, the maximum water level should rise to about 0.62 feet above the top of the riser and within one foot below the top of dam. During this type of larger storm event, the emergency spillway, which is located through the embankment directly west of the riser structure, will not normally discharge flow. If functioning properly, normal storm events should reach an elevation just below the top of the riser and the pond should draw down in about 24 to 36 hours.

Inspection and maintenance of the facility will consist of the following additional measures:

1. Inspect for sediment buildup by visual observation and a physical determination of sediment depth within pond storage areas. If the depth of sediment reaches the depth of 6 inches above the bottom of the "Sediment Forebay" of the pond (or Cleanout Elevation of 72.30), removal is required. At the same time, or at least once per year, clean pretreatment devices, the riser bottom and outlet pipes of accumulated sediments. Dispose of sediments removed from the facility at an acceptable disposal area. (Note: Cleanout Elevation corresponds to 10 percent of the Water Quality Volume).

2. Perform maintenance mowing of pond grasses at least twice each year. Grasses such as tall fescue should be mowed in early summer after emergence of the heads on cool season grasses and in late fall to prevent seeds of annual weeds from maturing. Mowing of legumes can be less frequent. Trees, shrubs and woody vegetation are not permitted to grow along or on any part of the embankment that was constructed using engineered (compacted) fills.
3. Perform soil sampling on stabilized pond soil areas at least once every 4 years. Soil sampling and testing should be performed by qualified independent soil testing laboratory such as VPI&SU. Apply additional lime and fertilizer in accordance with test recommendations.
4. In stabilized pond areas, if vegetation covers less than 40% of soil surfaces, lime, fertilize and seed in accordance with recommendations for new seedlings. If vegetation covers more than 40% but less than 70% of soil surfaces, lime, fertilize and over seed in accordance with current seeding recommendations or requirements of the Virginia Erosion and Sediment Control Handbook (VESCH).
5. Perform quarterly inspections of the riser section and crest spillway for the observance of collected trash and debris. Immediately remove any trash or debris that prevents the movement of water. Remove any trash and litter downstream and at storm drain or channel inflow locations to maintain the integrity of the structure and provide an attractive appearance.
6. Perform yearly structural inspections of the facility for damage. Structural inspection shall be performed on the riser, anti-vortex device, trash rack, orifices/weirs, outlet barrel and pond embankment. Exposed metal surfaces shall be re-painted or re-galvanized to minimize rust damage or replaced if rust damage is irreversible. If damage is evident, further investigation by a professional engineer may be required to assess the integrity of the structure.
7. Perform quarterly inspections of the graded side slopes of the facility for signs of animal/rodent borrows or slope erosion. Immediately perform necessary repairs, refilling or reseeding.
8. Perform yearly observations of perimeter areas surrounding the facility to ensure changes in land use, topography or access have not occurred and do not affect the operation, maintenance, access or safety features as provided. Appropriate action is required to ensure adequacy and to provide a clear, safe passage for maintenance vehicles to the engineered embankment and principal flow control structures.
9. 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.
10. 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.

Simmons Engineering, Inc.
Civil Engineering Design And Consulting

Williamsburg Business Center
4732 Langhill Road, Suite 3103
Williamsburg, VA 23188

Voice: (757) 258-5000
Fax: (757) 258-3758
E-mail: rcs@simmonseng.com

Designed By: rcs
Scale: 1" = 10'
Drawn By: C.A.N.
Date: October 1, 2001

Professional Engineer
No. 572062
State of Virginia

By	App.	Date
rcs	Per Environmental Staff Comments Ltr. Dtd 1/15/02	rcs 5/14/02
	Revision	

Lot 2, Midlands Road
Record Drawing Plan
County Plan Number SP-100-00
BMP ID No. MC 047

James City County
Virginia

00-105 RD1

Record Drawing Notes:

These Record Drawings are of BMPs #1 and #2 of Lots 3 & 2 (respevtively) of Midlands Road. Original design of BMP #1 for Lot 3 was prepared as a Bio-Retention Basin and approved by JCC Staff under site plan number SP-89-99. The construction of two Dry Extended Detention Basins provides a total of 27.2 Chesapeake Bay BMP Points.

Field survey was performed by LandTech Resources, Inc.

Summary of design concept:

BMP#1 lies upstream of BMP#2. BMP#1 provides for Water Quality (WQ) Treatment of 0.77 post-development acres (0.35 impervious acres). WQ storage and control are provided by the primary spillway (modified DI). The 100-Year Storm Event is routed thru the structure via the secondary spillway (6' weir). All flows are directed to BMP#2.

BMP#2 discharges to an existing natural swale to off-property. The primary structure is a 36" ϕ CMP Riser and controls the Water Quality Treatment volume for 2.57 post-development acres (1.24 impervious acres). The BMP also stores and controls the 1-Year Channel Erosion Storm Event to below the riser's rim. The 10 Year Storm Event is stored and controlled by the primary spillway's rim.

The 100-Year Storm Event for the entire 3.34 acre watershed is routed and designed to remain below BMP#2's Emergency Spillway rim.

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	Design			As-Built		
	Elevation	Volume (cf)	Flow (cfs)	Elevation	Volume (cf)	Flow (cfs)
Water Quality	73.80	4,497	0.08	74.10	4,495	0.08
Channel Erosion	75.03	7,840	0.09	75.24	7,976	0.10
100 Year	75.65	-	13.59	75.90	-	14.75
Emergency Spillway	75.70	-	-	76.01	-	-
Top of Berm	76.65	-	-	76.80	-	-

Stage-Storage-Discharge Worksheet BMP #2
BMP #2 Record Drawing
Project No. 00-105

Elev	Storage Volume		Water Quality Orifice		Weir		Total Q	
	CF	Ac. Ft.	a = El = h	0.01 71.00 Q	Length = 9.42 El = 75.24 Q		CFS	Elev
71	0	0.000	0.00	0.000	0.00	0.00	0.00	71
72	592	0.014	1.00	0.048	0.00	0.00	0.05	72
73	2119	0.049	2.00	0.068	0.00	0.00	0.07	73
73.1	2338.3	0.054	2.10	0.070	0.00	0.00	0.07	73.1
73.2	2557.6	0.059	2.20	0.071	0.00	0.00	0.07	73.2
73.3	2776.9	0.064	2.30	0.073	0.00	0.00	0.07	73.3
73.4	2996.2	0.069	2.40	0.075	0.00	0.00	0.07	73.4
73.5	3215.5	0.074	2.50	0.076	0.00	0.00	0.08	73.5
73.6	3434.8	0.079	2.60	0.078	0.00	0.00	0.08	73.6
73.7	3654.1	0.084	2.70	0.079	0.00	0.00	0.08	73.7
73.8	3873.4	0.089	2.80	0.081	0.00	0.00	0.08	73.8
73.9	4092.7	0.094	2.90	0.082	0.00	0.00	0.08	73.9
74	4312	0.099	3.00	0.083	0.00	0.00	0.08	74
74.1	4531.3	0.104	3.10	0.085	0.00	0.00	0.08	74.1
74.2	4750.6	0.109	3.20	0.086	0.00	0.00	0.09	74.2
74.3	4969.9	0.114	3.30	0.087	0.00	0.00	0.09	74.3
74.4	5189.2	0.119	3.40	0.089	0.00	0.00	0.09	74.4
74.5	5408.5	0.124	3.50	0.090	0.00	0.00	0.09	74.5
74.6	5627.8	0.129	3.60	0.091	0.00	0.00	0.09	74.6
74.7	5847.1	0.134	3.70	0.093	0.00	0.00	0.09	74.7
74.8	6066.4	0.139	3.80	0.094	0.00	0.00	0.09	74.8
74.9	6285.7	0.144	3.90	0.095	0.00	0.00	0.10	74.9
75	6505.0	0.149	4.00	0.096	0.00	0.00	0.10	75
75.24	7976.6	0.183	4.24	0.099	0.00	0.00	0.10	75.24
75.9	10729	0.236	4.90	0.107	0.66	14.65	14.75	75.9
76	10629	0.244	5.00	0.108	0.76	18.10	18.21	76



Lot 1
 Show Detail of Riser sheet C5
 Annotate as required w/ final layout
 Add MP sheet C5
 Add 3rd man basement note sheet plan

Record Drawing Plan
 Scale: 1" = 10'

MC 047
SP-100-00
 BEFORE DIGGING CALL 'MISS UTILITY'
 OF VIRGINIA AT 1-800-552-7001

Simmons Engineering, Inc.
 Civil Engineering Design And Consulting
 Williamsburg Business Center
 4732 Longhill Road, Suite 3103
 Williamsburg, VA 23188
 Voice: (757) 258-5000
 Fax: (757) 258-3758
 E-mail: rcsPE@QuikNet.net

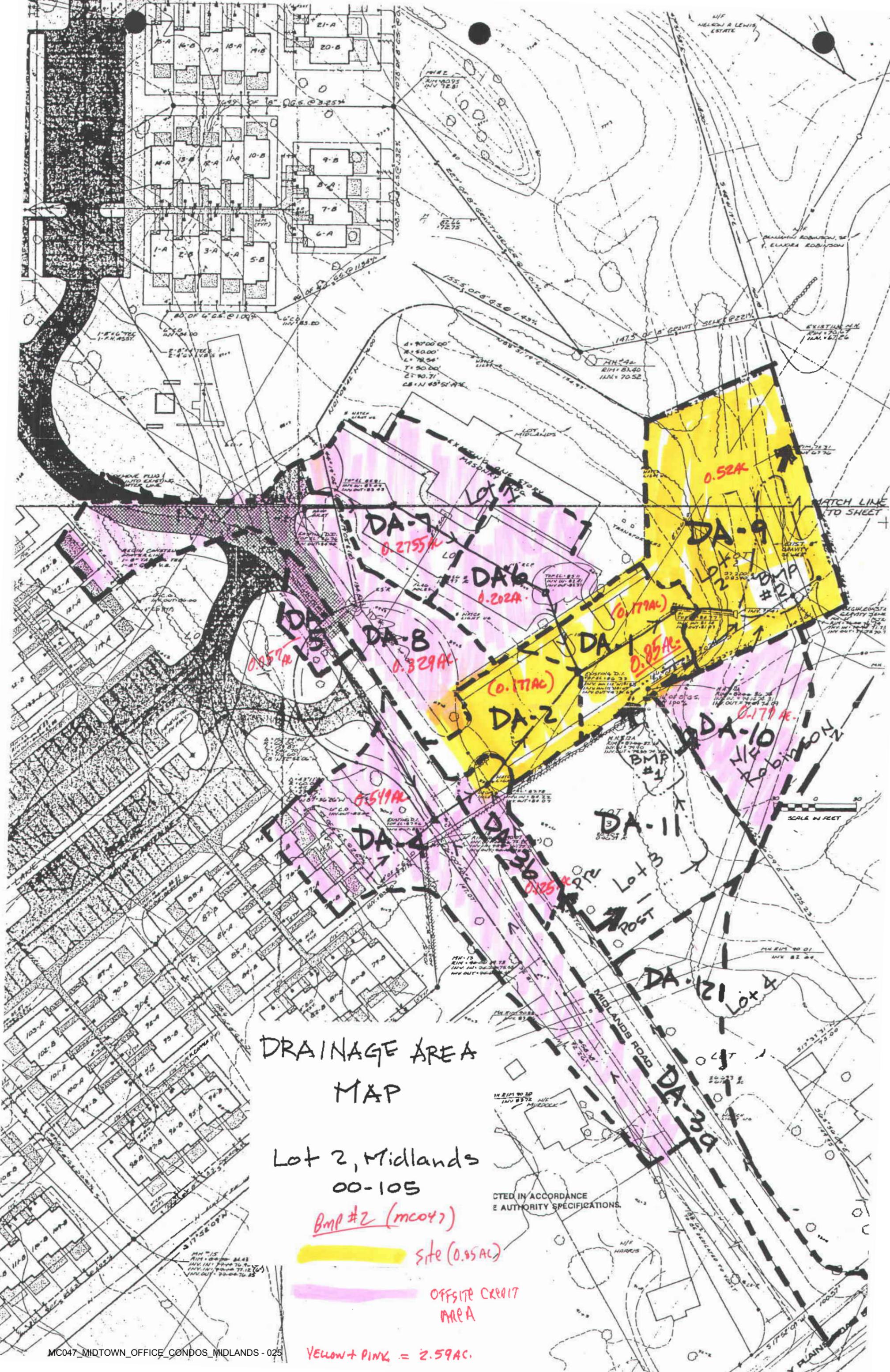
Professional Engineer
 RALPH C. SIMMONS
 No. 018289
 COMMONWEALTH OF VIRGINIA

James City County
 Virginia

00-105 RD1

Scale: 1" = 10'
 Date: October 1, 2001
 Drawn By: C.A.N.
 Designed By: rcs

REVIEW SET MC 047 (SA-100-00); MC 048 (SP-89-99)



DRAINAGE AREA
MAP

Lot 2, Midlands
00-105

BMP #2 (mco47)

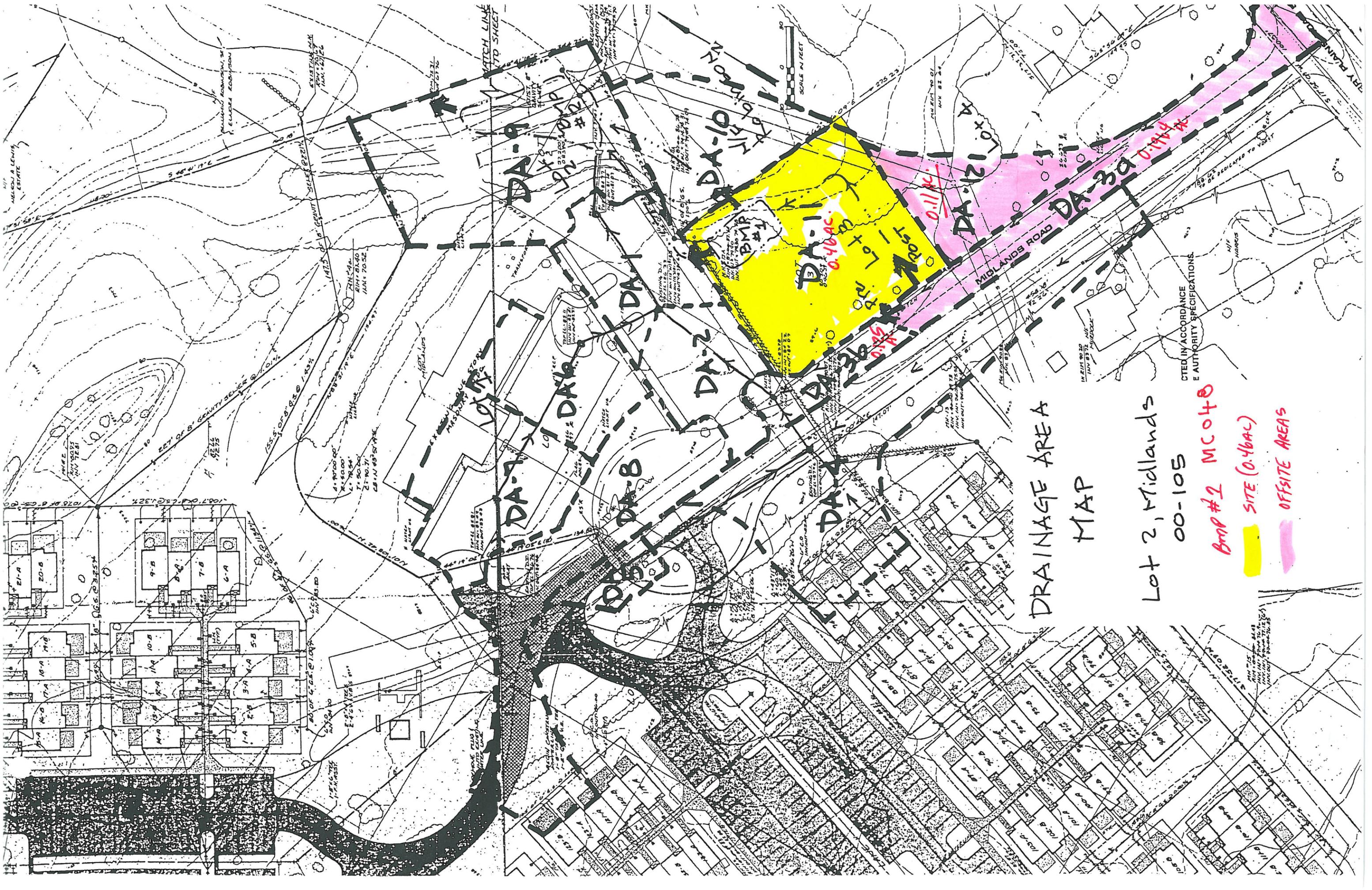
Site (0.95 AC)

OFFSITE CREDIT
AREA

Yellow + Pink = 2.59 AC.



DRAINAGE
MAPS
(Treatment
Area)



DRAINAGE AREA
MAP

Lot 2, Midlands
00-105

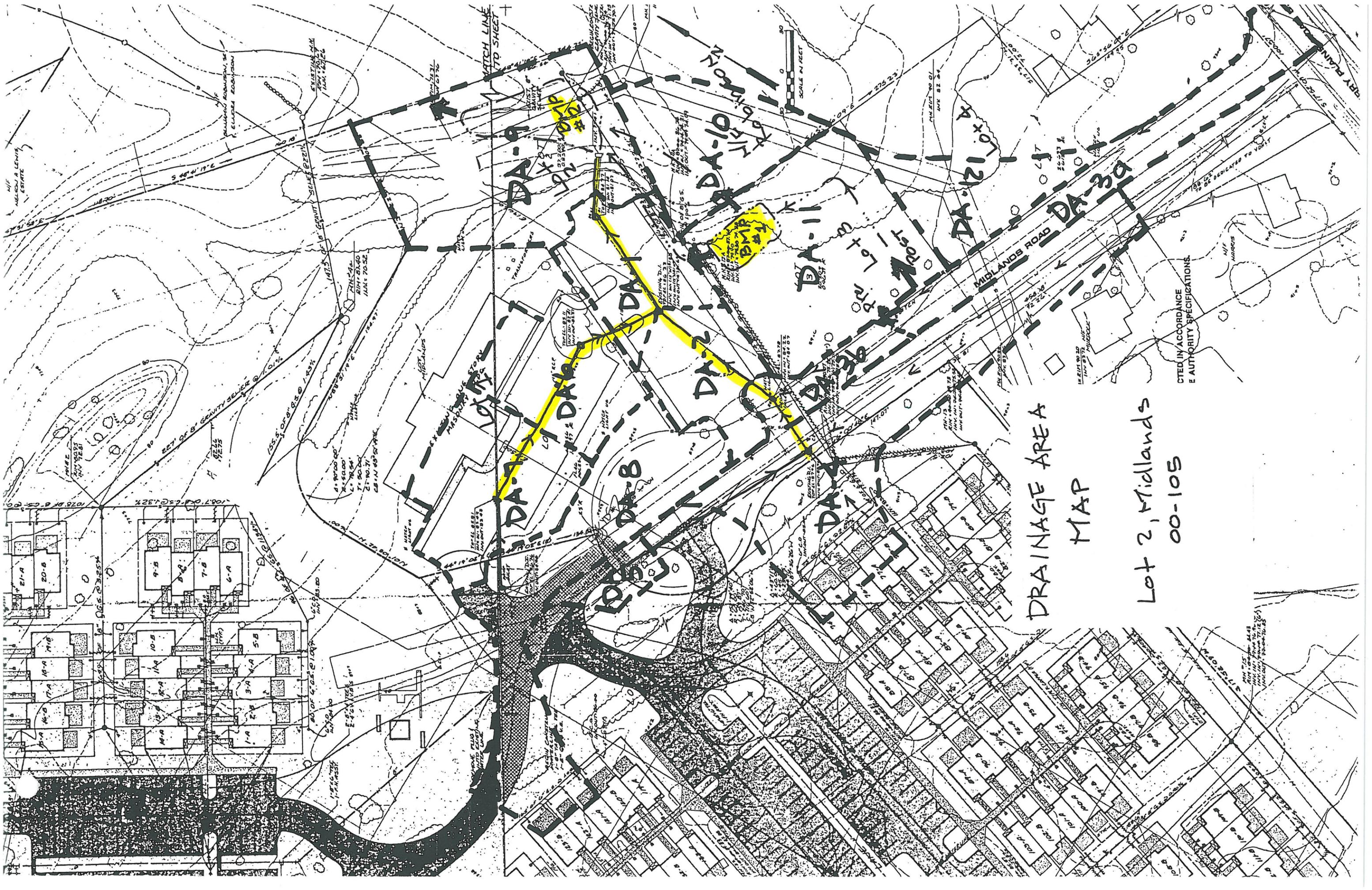
NOTED IN ACCORDANCE
WITH AUTHORITY SPECIFICATIONS

BMP #2 MC040

SITE (0.46 AC)

OFFSITE AREAS





DRAINAGE AREA

MAP

Lot 2, Midlands

00-105

NOTED IN ACCORDANCE
WITH AUTHORITY SPECIFICATIONS

Statistics

Address 3917 Midlands Road
 Magistrial District Berkeley
 Zoning Limited Business District, LB
 Tax Map Lot 2, Tax Map 38-4, 16-2

15' Side Landscap

Site Area 0.85 Acres (37,200 SF)

Utilities:
 Water Public
 Sewer Public

Building Statistics:

Stories Two Stories
 Square Footage 6,500 SF
 Height Less Than 35'

SP-076-0100-00
Amend's

VDOT:

ITE Code 710, General Office Building
 Peak Hour Trip Generation 10 Vehicle Trips

Site Statistics:

Setbacks:

Front Yard (ROW) 50'
 Side Yard 20'
 Side & Rear Yard Adjoining Residential 35'

Parking:

Required Parking (1 Space /250 SF) 26 Spaces
 Handicap Spaces 2 Spaces
 Van Accessible Handicap Spaces 1 Space
 Parking Provided 29 Spaces
 Van Accessible Hanicap Spaces 2 spaces

Impervious Area:

Building Footprint 0.09 Acres (3,790 SF New) - 10.19%
 Parking 0.27 Acres (11,557 SF Existing) - 31.07%
 Sidewalk 0.03 Acres (864 SF Existing & 558 SF New) - 3.82%

Total Impervious Area 0.35 Acres (15,347 SF) - 41.26%
 0.385 16,769 SF 45.29%

Open Space:

Required 0.30 Acres (13,020 SF) - 35%
 Provided 0.50 Acres (21,853 SF) - 58.74%
 0.469 20,431 SF 54.92%

Total Disturbed Area

Wetlands Area Disturbed 0.39 Acres

0.03 Acres

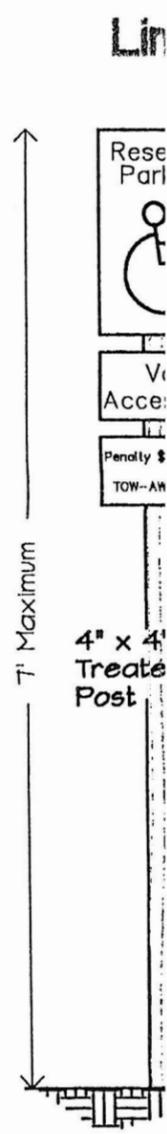
Owner/Developer

Mr. Andy Piplico
 PO Box 222
 Williamsburg, VA 23185

The Planning Director granted a modification to Sectio City County Ordinance to disturb and construct the BMF Transitional Buffer.

The Planning Director granted a waiver of the Right of requirement since the parking lot is already installed c to provide the required buffer per Sections 24-96 (a) County Ordinance

C:\Drawings\00-105\00-105\rvsd-sp\00-105rvsd-sp.dwg, 08/07/01 12:35:03 PM



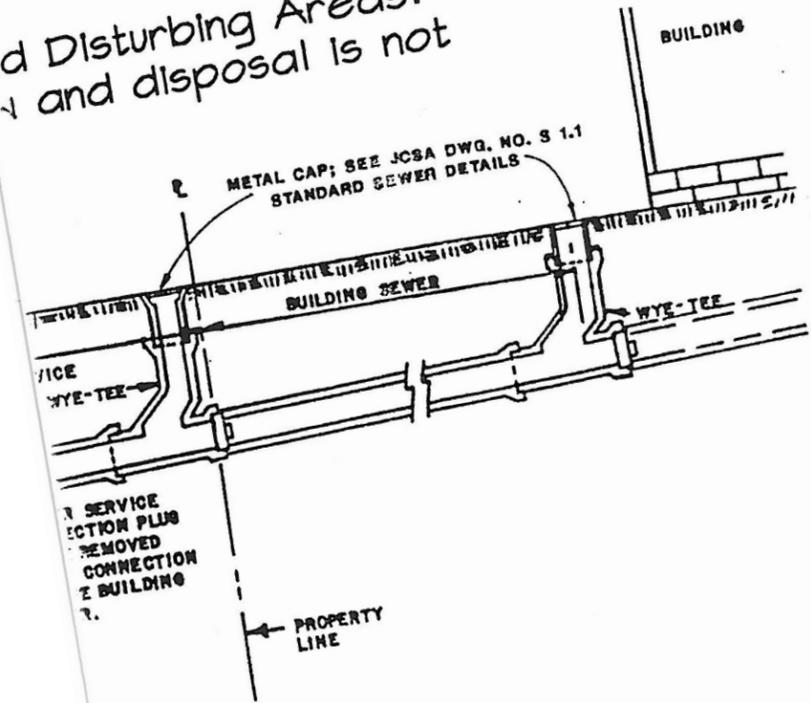
Handic
 Sic

be placed
 accordance with Section
 subdivision Ordinance.

be held responsible for
 the BMP, its outflow
 outfall pipes and shall be
 from any liability caused
 to failure of the same.

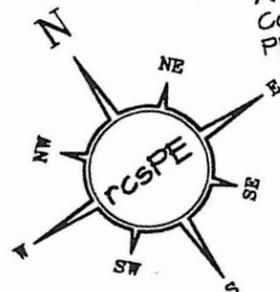
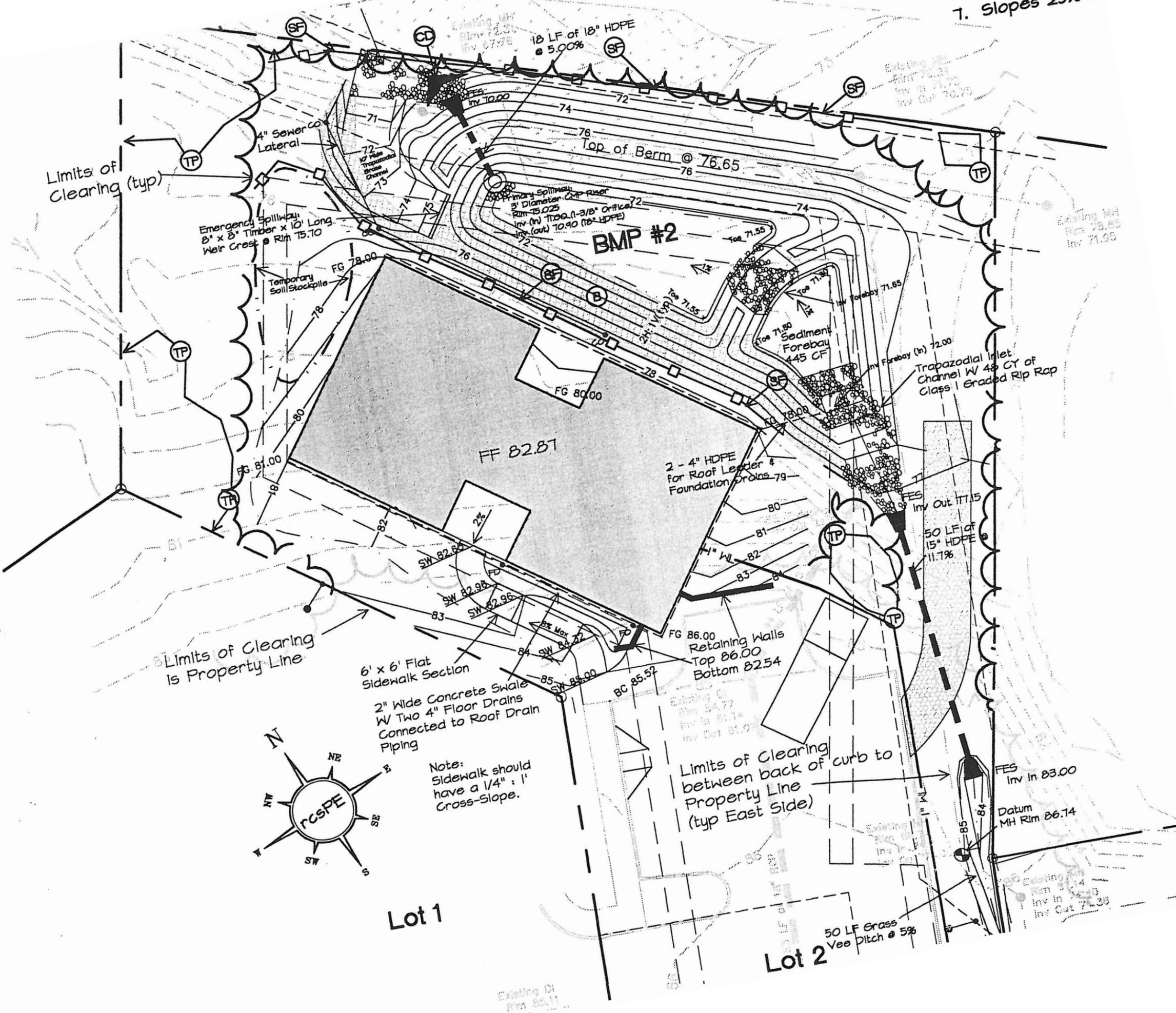
tion of the dam/berm will
 a professional engineer
 ed the structure during

d Disturbing Areas:
 and disposal is not



LATERALS TO BE DEDICATED TO THE
 RITY SHALL BE PVC SDR 23.5 OR SCHEDULE 40

cal Sewer Service



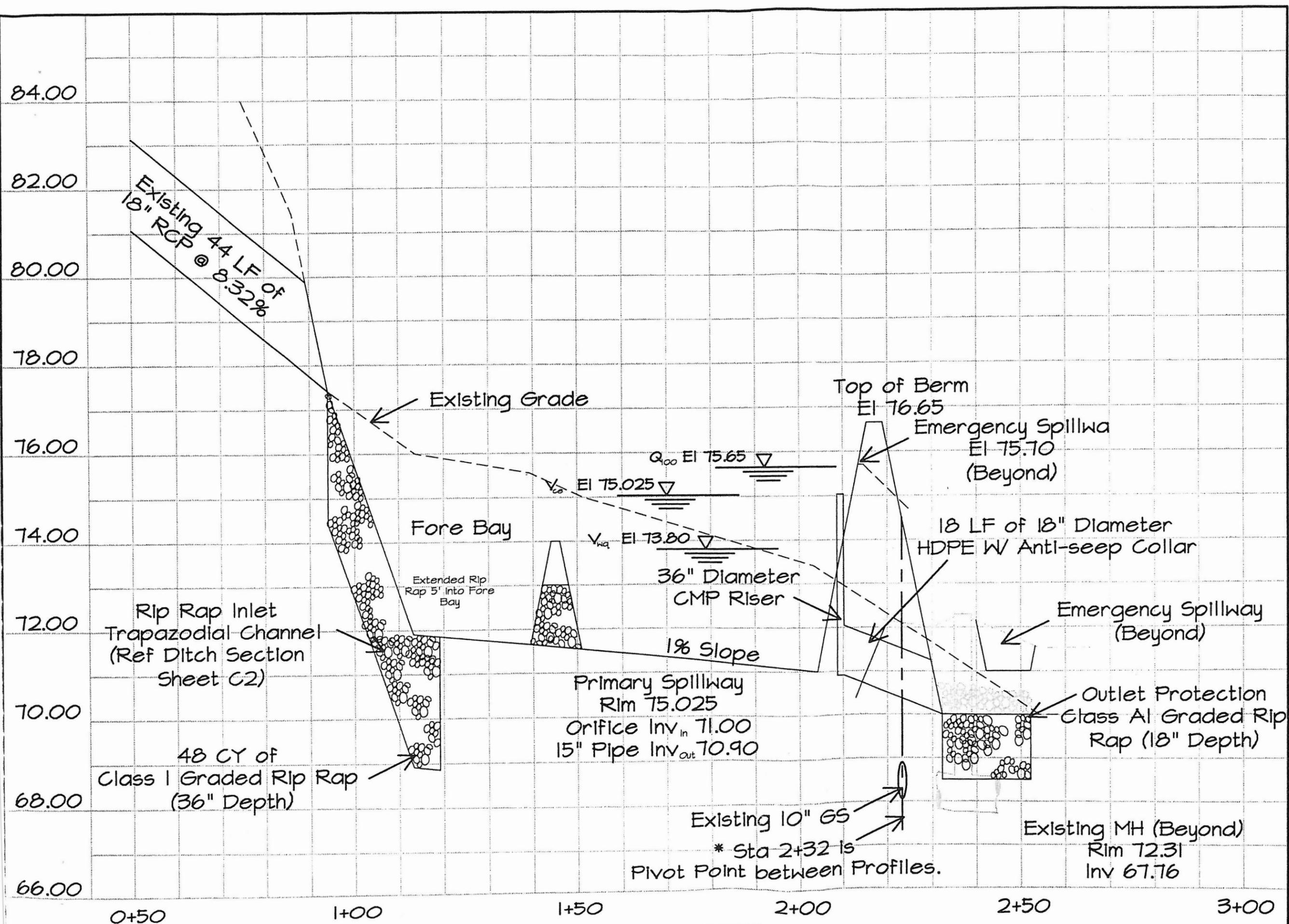
Lot 1

Lot 2

Note:
 Sidewalk should
 have a 1/4" : 1'
 Cross-Slope.

Limits of Clearing
 between back of curb to
 Property Line
 (typ East Side)

7. Slopes 20%



Ralph C. Simmons, P.E.
Consulting Engineer

4732 Longhill Road, Suite 3103
Williamsburg Business Center
Williamsburg, VA 23188

Voice: (757) 258-5000
Fax: (757) 258-3758



and shall conform

orrow area. It should
and frozen or other
and the cutoff trench
eration may be given
uction are supervised

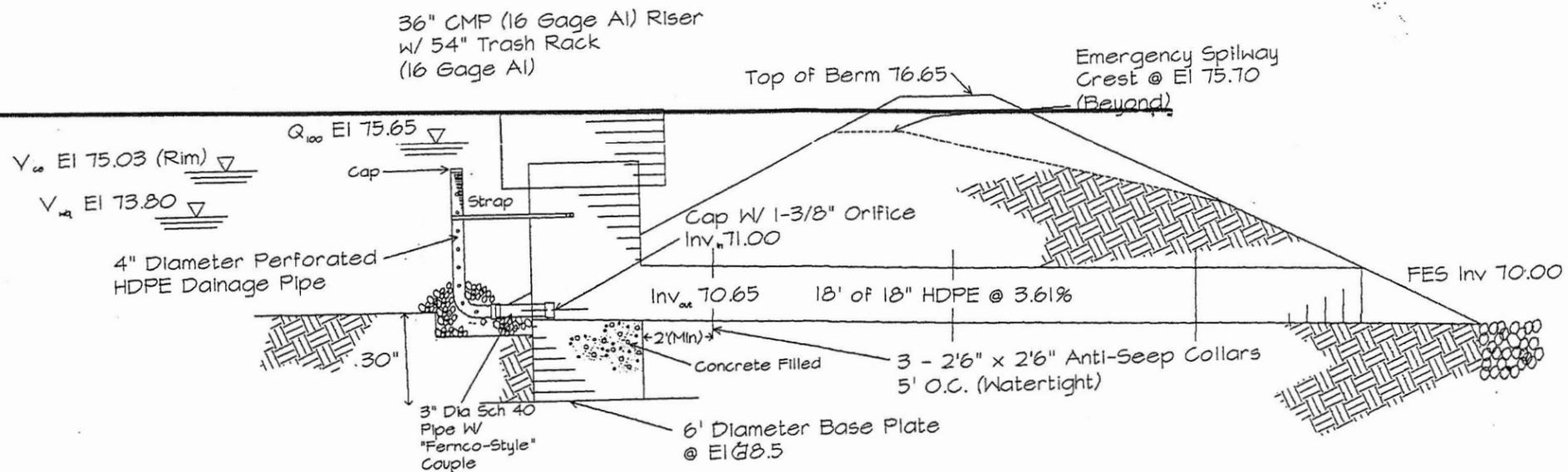
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able borrow material
ne principal spillway
nto the embankment.

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roctor Test (ASTM
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e bottom width of the
the minimum width
e or as shown on the
ne backfill should be
ure maximum density

MC047_MIDTOWN_OFFICE_CONDOSMIDLANDS



Riser Detail

Primary Spillway Detail - BMP #2

Maintenance Plan for BMP #2 of Lot 2 - Midlands Road

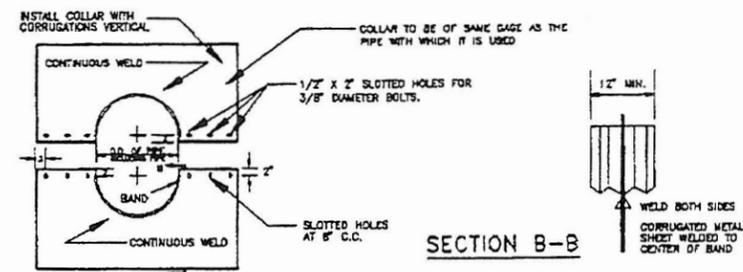
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DETAILS OF CORRUGATED METAL ANTI-SEEP COLLAR



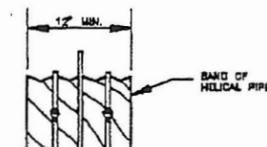
ELEVATION OF UNASSEMBLED COLLAR

NOTES FOR COLLARS:

- ALL MATERIALS TO BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
- WHEN SPECIFIED ON THE PLANS, COATING OF COLLARS SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
- UNASSEMBLED COLLARS SHALL BE MARKED BY PAINTING OR TAGGING TO IDENTIFY MATCHING PAIRS.
- THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.
- EACH COLLAR SHALL BE FURNISHED WITH TWO 1/2" DIAMETER RODS WITH STANDARD TANK LUGS FOR CONNECTING COLLARS TO PIPE.

DETAIL OF HELICAL PIPE ANTI-SEEP COLLAR

SIZE AND SPACING OF SLOTTED OPENINGS SHALL BE THE SAME AS SHOWN FOR CW COLLAR. USE RODS AND LUGS TO CLAMP BANDS SECURELY TO PIPE.



NOTE FOR BANDS AND COLLARS: MODIFICATIONS OF THE DETAILS SHOWN MAY BE USED PROVIDING EQUAL WATERTIGHTNESS IS MAINTAINED AND DETAILED DRAWINGS ARE SUBMITTED AND APPROVED BY THE ENGINEER PRIOR TO DELIVERY.

ISOMETRIC VIEW

Ralph C. Simmons, P.E.
Consulting Engineer

4732 Longhill Road, Suite 3103
Williamsburg Business Center
Williamsburg, VA 23188

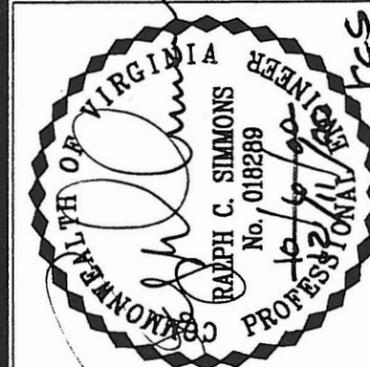
Voice: (757) 258-5000
Fax: (757) 258-3758
E-mail: rcsPE@QuixNet.net

Designed By: rcs

Drawn By: rcs

Scale: As Shown

Date: 28 Jun 00



BMP #2 Specifications

Storm Drainage Pipe

1. HDPE pipe shall conform to the requirements of AASHTO M294, Type S.
2. Corrugated Aluminum Alloy Pipe may be substituted for the HDPE pipe and shall conform to AASHTO M196.

Riser Pipe

Corrugated Aluminum Alloy Pipe shall conform to AASHTO M196.

Earth Fill

1. **Material** - Fill material should be taken from an approved, designated borrow area. It should be free of roots, stumps, wood, rubbish, stones greater than 6 inches, and frozen or other objectionable materials. Fill material for the center of the embankment and the cutoff trench should conform to Unified Soil Classification GC, SC, or CL. Consideration may be given to the use of other materials in the embankment if the design and construction are supervised by a geotechnical engineer.
2. **Placement** - Areas on which fill is to be placed should be scarified before its placement. Fill material should be placed in layers a maximum of 8 inches thick (before compaction), which should be continuous over the entire length of the fill. The most permeable borrow material should be placed in the downstream portions of the embankment. The principal spillway must be installed concurrently with fill placement and **not excavated** into the embankment.
3. **Compaction** - Fill material should be compacted with appropriate compaction equipment such as a sheepsfoot, rubber-tired or vibratory roller. The number of required passes by the compaction equipment over the fill material may vary with soil conditions. Fill material should contain sufficient moisture such that the required degree of compaction will be obtained with the equipment used.

The minimum required density is 95% of maximum dry density with a moisture content within $\pm 2\%$ of the optimum, unless otherwise specified by the engineer. Each layer of the fill should be compacted as necessary to obtain minimum density and the engineer should certify, at the time of construction, that each fill layer meets the minimum density requirement. All compaction is to be determined by either Standard Proctor Test (ASTM D698) or the Modified Proctor Test (ASTM D1557) as directed by the geotechnical engineer based on site and soil conditions and the size and type of structure being built.
4. **Cutoff Trench** - The cutoff trench should be excavated into impervious material along or parallel to the centerline of the embankment as shown on the plans. The bottom width of the trench should be governed by the equipment used for excavation, with the minimum width being 4 feet. The depth should be at least 4 feet below existing grade or as shown on the plans. The side slopes of the trench should be 1H:1V or flatter. The backfill should be compacted with construction equipment, rollers, or hand tampers to assure maximum density and minimum permeability.
5. **Top Soil** - The surface layer of compacted fill should be scarified prior to placement of at least 6 inches of top soil. The top soil shall be stabilized with in accordance with the Virginia Erosion and Sediement Control Handbook, latest edition.

Structure and Conduit Backfill

Backfill that is beside pipes or structures should be of the same type and quality as specified for the adjoining fill material. The fill should be placed in horizontal layers not to exceed 4 inches in thickness and compacted by hand tampers or other manually directed compaction equipment. The material should completely fill all spaces under and beside the pipe. During the backfilling operation, equipment should not be driven closer than 4 feet, as measured horizontally, to any part of a structure. Also, equipment should **NEVER** be driven over any part of a structure or pipe, unless compacted fill has been placed to a depth specified by the structural live load capacity of the structure or pipe in order to adequately distribute the load.

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3. Perfo performe accordan

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to AASHTO M196.

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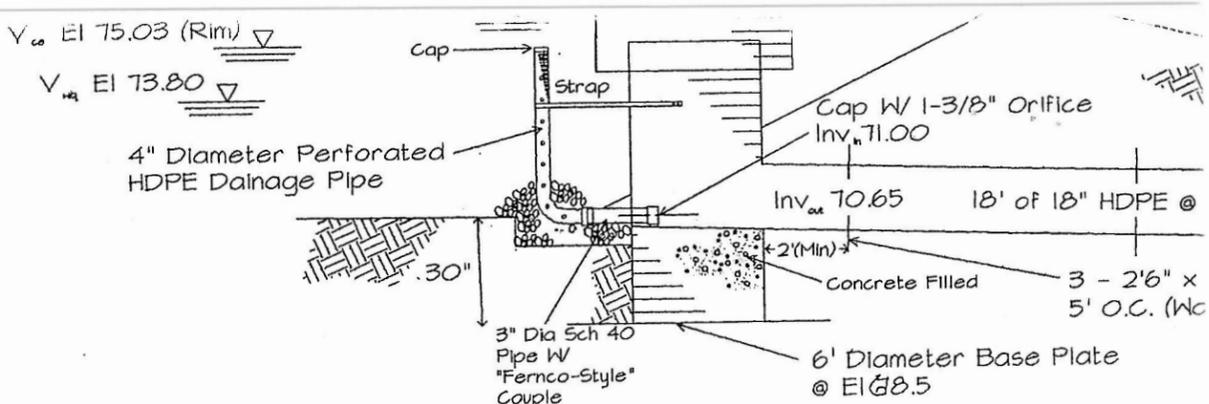
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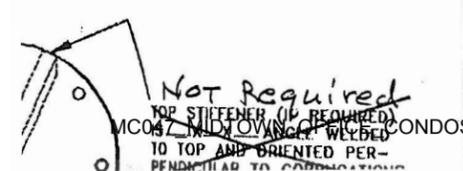
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Inspection and maintenance of the facility will consist of the following additional measures:

1. Inspect for sediment buildup by visual observation and a physical determination of sediment depth within pond storage areas. If the depth of sediment reaches the depth of 6 inches above the bottom of the "Sediment Forebay" of the pond (or Cleanout Elevation of 72.30), removal is required. At the same time, or at least once per year, clean pretreatment devices, the riser bottom and outlet pipes of accumulated sediments. Dispose of sediments removed from the facility at an acceptable disposal area. (Note: Cleanout Elevation corresponds to 10 percent of the Water Quality Volume).
2. Perform maintenance mowing of pond grasses at least twice each year. Grasses such as tall fescue should be mowed in early summer after emergence of the heads on cool season grasses and in late fall to prevent seeds of annual weeds from maturing. Mowing of legumes can be less frequent. Trees, shrubs and woody vegetation are not be permitted to grow along or on any part of the embankment that was constructed using engineered (compacted) fills.
3. Perform soil sampling on stabilized pond soil areas at least once every 4 years. Soil sampling and testing should be performed by qualified independent soil testing laboratory such as VPI&SU. Apply additional lime and fertilizer in accordance with test recommendations.
4. In stabilized pond areas, if vegetation covers less than 40 % of soil surfaces, lime, fertilize and seed in accordance with recommendations for new seedlings. If vegetation covers more than 40 % but less than 70 % of soil surfaces, lime, fertilize and over seed in accordance with current seeding recommendations or requirements of the Virginia Erosion and Sediment Control Handbook (VESCH).
5. Perform quarterly inspections of the riser section and crest spillway for the observance of collected trash and debris. Immediately remove any trash or debris that prevents the movement of water. Remove any trash and litter downstream and at storm drain or channel inflow locations to maintain the integrity of the structure and provide an attractive appearance.
6. Perform yearly structural inspections of the facility for damage. Structural inspection shall be performed on the riser, anti-vortex device, trash rack, orifices/weirs, outlet barrel and pond embankment. Exposed metal surfaces shall be re-painted or re-galvanized to minimize rust damage or replaced if rust damage is irreversible. If damage is evident, further investigation by a professional engineer may be required to assess the integrity of the structure.
7. Perform quarterly inspections of the graded side slopes of the facility for signs of animal/rodent borrows or slope erosion. Immediately perform necessary repairs.

CE DESIGN r2



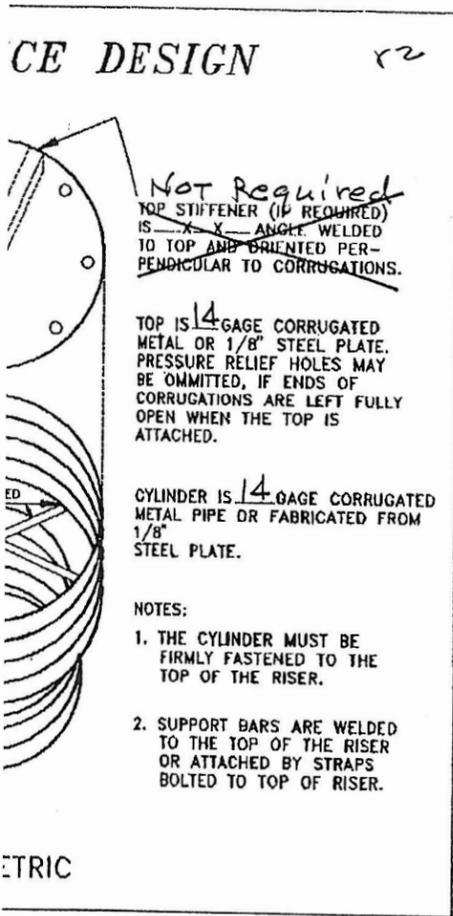
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7. Perform quarterly inspections of the graded side slopes of the facility for signs of animal/rodent borrows or slope erosion. Immediately perform necessary repairs, refilling or reseedling.
8. Perform yearly observations of perimeter areas surrounding the facility to ensure changes in land use, topography or access have not occurred and do not affect the operation, maintenance, access or safety features as provided. Appropriate action is required to ensure adequacy and to provide a clear, safe passage for maintenance vehicles to the engineered embankment and principal flow control structures.
9. Inspect and exercise pond drain valves, if provided, on a regular basis.
10. Record Keeping. The owner or designated representative shall keep reasonable, accurate written records of inspections performed for the structure. Records shall document routine maintenance and/or repairs performed. Copies shall be provided to the County upon request.
11. The facility shall not accept additional drainage or be modified in any way without prior consent or approval by the Environmental Division of James City County.

**James City County, Virginia
Environmental Division
Stormwater Management Program**

**Stormwater Management Design Plan
Staff "Quick" Review**

Plan No. SP - 100 - 00 Date/Time: 3:45 9/25/00
 Project Name: MIDLANDS ROAD LOT 2
 Rough Location: MIDLANDS ROAD NORTHSIDE 600' WEST SR 616 STRAN. PLAINS RD.
 ADC Map: Sheet 5 Grid: H - 9 First Review 9/26/00
 Flood Map / Zone: 510201- 00 035B Zone: X Review

Drainage Area: Onsite Only Offsite Only Combination of Both
 Description: Outside 500-7 YEAR FLOODPLAIN
 Submitted: Y N
 Demolition Plan (if applicable) Sheets: _____
 Site, Geometric or Layout Plan Sheets: C1
 Grading Plan Sheets: C2
 Storm Drainage Plan Sheets: C2
 E&SC Plan Sheets: C2
 Environmental Inventory Sheets: _____
 Note & Detail Sheets Sheets: C3, C4
 Drainage Map(s) Report dated 9/20/00.
 Soils Map
 E&SC and SWM plan checklists.
 E&SC Design Report (Attachment).
 E&SC and Stormwater Management / Drainage Narrative.
 Stormwater Management Design Report (Attachment).
 Geotechnical Report (Attachment).
 Waivers, Variances, Exceptions included (Attachments in Writing).
 VESCH CBPO (RPA, Steep Slope) Other: _____
 Other (List): PREVIOUS APPROVAL LOT 3 BURETENTION SP-89-99

JCC GIS Database: Zoning: L - B Tax Parcel ID: (38-4,16-2) 38416000020
 Receiving Water: MILL CREEK Site Acreage: 0.854 acres / s.f.

Other Known Approvals:
 Site Plan Information: Owner: Andy Pipico 10 Box 222 WBG VA 23185
 Zoning: L - B Description: Limited Business
 Site Area: 0.85 acres / s.f.
 Disturbed Area: 0.39 acres / s.f. (45.8%)
 Disturbance > 5 acres, NPDES Notice of Intent required. NO
 Impervious Cover: ? 0.382 acres / s.f. (44.75%)
 Less than or equal to 60 percent. Meets CBPO requirements.
 More than 60 percent. Does Not Meet CBPO requirements. 55.25
 Open / Green Space: 0.44 0.472 acres / s.f. (48.24%)

Site Development Plan:
 Residential, Lots, etc. Commercial (B R) Govern./Institutional Industrial
 Roadways or Entrances Parking or Loading Water Sanitary Sewer
 Landscaping SWM/BMP facilities Manmade Drainage Parks, Amenities
 Pump/Lift Station Dams (regulated) Other, 6675 SF BUILDING

LOT 2
MIDLANDS
3917 MIDLANDS RD.

NEW
BLDG
3780 SF
(0.087 AC.)
INCLD
240 SF
NEW 4020 SF

SCOTT EST.
40,290
LESS THAN 60%?

• INCLD IMPERV SIDEWALK, ETC.
• BMP

Soils Information:
Soil Survey Sheet
22

Site: _____
DA: _____
BMP: _____
Description of Soils at BMP: _____

Hydric: Yes No
HSG: _____
Hydric: Yes No

BMP Control:
BMP Types:

None Onsite Offsite Previous Approved Manufactured BMP
1- Name: _____ (JCC BMP Type F-2), Points 4
2- Name: _____ (JCC BMP Type _____), Points _____
3- Name: _____ (JCC BMP Type _____), Points _____

OnSite Drainage Type:

Reinforced Concrete Pipe Corrugated Metal Pipe Aluminum Type Pipe
 Corrugated Polyethylene Pipe PVC Type Pipe Open Channel Type P6-2A
 Culverts Type: _____
 Other (Specify): _____

1. VDOT Standards & Specifications Referenced for work **within** R/W: Yes No
2. VDOT Standards & Specifications Referenced for work **outside** R/W: Yes No

Site Limitations:

RPA ARMA Steep Slopes Delineated Wetlands
 Hydric Soils? Critical Soils Vegetated Buffers
 Defined Natural Drainage Features onsite Downstream Storm/Culv.
 Evidence of Downstream Channel Erosion (by Field Observation) _____
 Floodplain Problem Drainage Area Stormwater Hotspot
 Site Activities may warrant a General VPDES Permit for Discharge of Stormwater Associated with Industrial Activities (ie. process water, batch plants, etc.).
 Other (Specify): _____

Site Stormwater Management / BMP Control (Add sheets if necessary for Multiple Onsite Facilities):

<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	# <u>Bmp #2 (Lot 2) DRY Pond</u>		
Predev (Present)	DA = <u>3.36</u> ac.	C/CN = <u>0.49</u>	Tc = <u>11.5</u> <u>(min)</u> / hrs.
2-year	<u>7.24</u>	cfs	<u>0.50</u>
10-year	<u>8.56</u>	cfs	
100-year	<u>13.5</u>	cfs	
PostDev w/o Detention (Inflow)	DA = <u>3.36</u> ac.	C/CN = <u>0.55</u>	Tc = <u>11.5</u> <u>(min)</u> / hrs.
2-year	<u>7.71</u>	cfs	
10-year	<u>8.79</u>	cfs	
100-year	<u>12.59</u>	cfs	
PostDev with Detention (Routed)	DA = <u>3.36</u> ac.	C/CN = <u>0.58</u>	Tc = <u>11.5</u> min / hrs.
2-year	7.23	cfs	at El. 74.45
10-year	8.52	cfs	at El. 74.55
100-year (DHW)	12.51 <u>13.59</u>	cfs	at El. 74.895 <u>75.65</u>

Downstream Tailwater Assumption for Pond Routing:

Routed Peak Discharges (Outflows) from BMP meets Predevelopment Allowables: Yes No
Appears to Meet VESCH / E&SC Ordinance / CBP Ordinance Requirements: Yes No

BMP #1
DA = 0.77 AC.
Imp = 0.35 AC.

NO PROVISION FOR 24 hr det of 1-yr; 24 hour storm!!

Pond / BMP Design Data (Add Sheet If Necessary for Multiple Onsite Facilities):

Check if None Provided: BMP # 2 Type: LOT 2 DRY POND F-2

Y N * See Below for Pertinent Water Quality Treatment Design Information.

Top of Facility El. 76.2 76.65
 Design High Water El. 75.70 74.895 75.65
 Emergency Spillway (E.S.) Crest El. 75.70 73.80 BW: 10' SS: 2H:1V 1.5' depth

FreeBoard 1.00 75.03 1 ft. or > with E.S. 36" ALUM.
 Acceptable Not Acceptable. 2 ft. or > w/o E.S.
 Principal Spillway (Riser) Crest El. 73.80 Size/Type: 6" PCAN R/L/COMP

Principal Spillway Crest 1 ft. below crest of emergency spillway. Yes No N/A
 Stage-Storage Curve or Data
 Outlet Rating Curve or Table (Discharge Structure Rating) or Volume 7840 cfs

1-year design storm El. _____ or Volume _____
 1-year, 24 hour detention criteria for Stream Channel Protection. Yes No N/A
 Extended Detention Provided (Min. 24 hours) Yes No N/A

Normal/Permanent Pool El. N/A 15.7 N/A
 Orifice/Weir #1 (highest El.) El. 73.80 15.7 Type: 10' WIDE WEIR ES
 Orifice/Weir #2 El. 73.80 Type: 6" (PCAN) Ø, 24" Ø (COMPS)

Orifice/Weir #3 El. _____ Type: _____
 Orifice/Weir #4 El. _____ Type: _____
 Orifice/Weir #5 (lowest El.) El. 71.00 Type: 1.35" Ø (1-3/8" ORIF) ✓

Low Flow Orifice (ExDet, CPv) El. 71.00 ✓ Type: " "
 Pond Drain w/ Valve El. _____ Type: _____
 Pond Bottom El. 71.00 ✓ Riser Height: 4.03'

Steps or Access Provided (for over 4 ft. depth) N/A
 Riser Base Bottom El. _____ Type: _____
 Core Trench N/A

Anti-Seep Collars or other acceptable Seepage Control Method. N/A
 Principal Spillway Anti-Vortex Device and Trash Rack. Type: 4000 TYPE CONC. ALUM.
 Low Flow Orifice Cage-Type Trash Rack. Type: Pert. PVC 4" Ø

Outlet Barrel: Type/Class: CPP CPP Size: 18"
 Inv. U/S: 71.70.65 Inv D/S: 70.90 70.00
 Slope: 3.61% Length: 24 18 (ft.)

Flared End Section. Matches Outlet Barrel material type.
 Outlet Protection.
 Standard riprap outlet protection (OP) Type: NONE SHOWN - 20x10 CLASS A.I.
 Special Dissipator Structure (SDS) Type: _____

Sediment / Cleanout Elevation El. 71.50 or Depth 6"
 Adequate Channel Downstream of BMP: 1-year, 24-hour, or MS # 19 criteria. NONE

Sketch or Notes, If Necessary:

NO OK 24 hr det, 1-yr 24 hr storm (CPV)

$V_{WQ} = \frac{EL}{73.80}$
 $V_{SCP} = \frac{EL}{75.025}$

2H:1V typ
POWD SS?

* WQV Design Information.

Imperv. Area 48,402 SF
 WQTV 2" 1PIA
 Vol. Required 4035 cft (0.09 AC-FT)
 Vol. Provided 4035 cft
4497 cft 4497 cft

Sediment Trap & Basins

Temporary Sediment Trap # 1 X DA = X < 3 acres
 Temporary Sediment Trap # 2 X DA = X < 3 acres
 Temporary Sediment Basin # 1 X DA = X BMP # _____ convert.
 Temporary Sediment Basin # 2 X DA = X BMP # _____ convert.

E&SC Plan Comments: BMP is not a TSB.



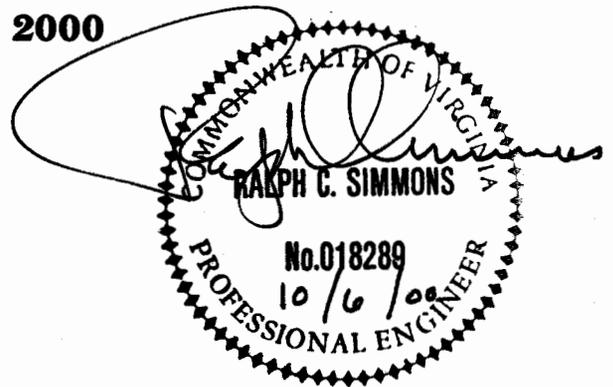
MC047
SP-100-00

**Lot 2
Midlands Road**

**Storm Water Drainage
&
Management Calculations
Project Number 00-105**

August 20, 2000

Revised October 6, 2000



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I. Introduction

These calculations accompany and support project drawings titled "Lot 2, Midlands Road" with project number 00-105. Calculations and drawings are revised per James City County Comment letter dated September 25, 2000.

This calculations book is laid out in four major divisions. The first division is the Project Description, which includes a drainage area map and gives a brief description of the project's storm water concept both "pre" and "post" development. The second division organizes the calculations for the storm water management BMPs and is further divided into three subdivisions, which include Water Quality Analysis, and Design Calculations to modify the existing BMP on Lot 3, and sizing the BMP on located on Lot 2. The third division uses calculations from the storm water flows to size and determine materials for storm drainage structures and ditches. The final division is the "Summary". An appendix is provided for all pertinent support material.

II. Project Description w/ Drainage Area Map

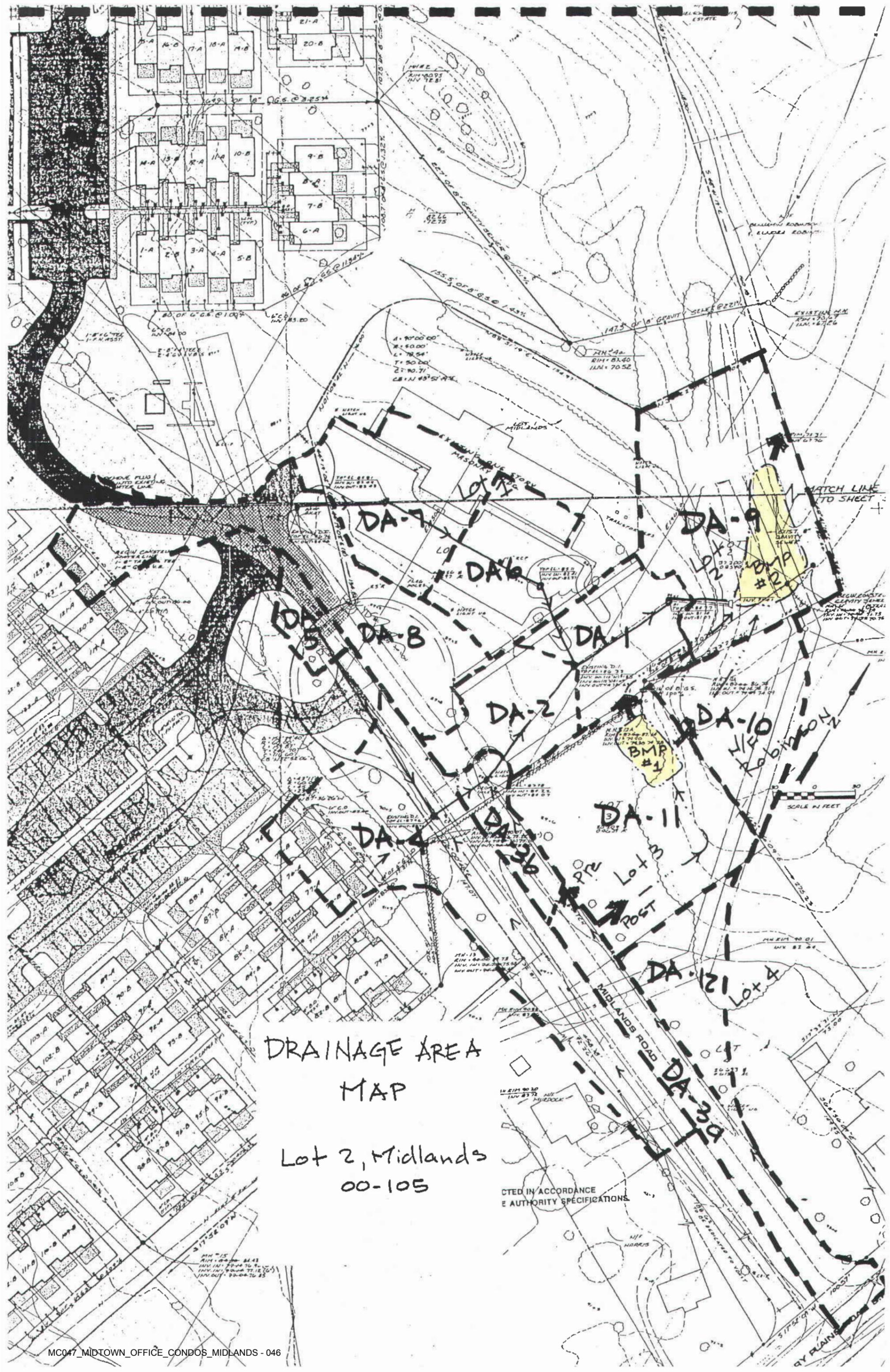
The primary purpose of this project is to provide for a new office building on Lot 2 located on Midlands Road, the address is 3917 Midlands Road. The owner and developer chose to revise plans for Lot 3 (3909 Midlands Road) to consolidate storm water facilities for the two lots. This consolidation allows for a less intense storm water management BMP and yet provides for treatment of a larger area currently receiving none. This was coordinated in the "Conceptual Plan" phase with the James City County Planning Department, and Environmental Division. Conceptual plans were also reviewed by the JCSA, as the location of the BMP on Lot 2 may impact an existing sanitary sewer main.

The small pond on Lot 3 is referred to as BMP #1, being the first in sequence. BMP #1 will control and treat the Water Quality Volume for the drainage area that flows through that lot, approximately 15,172 SF (0.35 acres) of post-development impervious area. BMP #1 structure was constructed by previously approved plans (reference SP-89-99) and will be modified in a plan amendment based on these calculations. Flows are released to the existing channel at pre-development rate that crosses the corner of the adjoining "Robinson" lot (3801 Strawberry Plains Road) as shown on the "Drainage Area Map". Flows from higher events to the 100-year storm event are routed through the BMP and discharged to a constructed channel to be located on lot 2 that flows to the BMP on that lot, referred to as BMP #2.

Lot 2 is a 37,200 SF parcel with an existing 11,764 SF paved parking lot and sidewalk. The planned development will add a new building with a footprint of 3,780

SF and incidental impervious area of approximately 240 SF. Lot 2 is also the discharge point of the total watershed of 3.34 acres.

The design is advanced based on discussions and review with JCC Environmental Division that treating offsite drainage areas would permit the use of a "4 point BMP" and eliminate the need for a "Bio-retention BMP" on lot 3.



DRAINAGE AREA
MAP

Lot 2, Midlands
00-105

DRAWN IN ACCORDANCE
WITH AUTHORITY SPECIFICATIONS.

Pre Development

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.5	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	5,774	0	1,926	0	7,700	0.75
2	Lot 2 Pavement	5,990	0	1,710	0	7,700	0.77
3a	Midlands Road	4,356	0	4,200	0	8,556	0.61
3b	Midlands Road	2,644	0	2,800	0	5,444	0.59
4	Apartments & Mdlns	4,860	2,200	16,840	0	23,900	0.48
5	Midlands Road	1,238	0	1,238	0	2,476	0.60
6	Lot 1	5,400	1,400	2,000	0	8,800	0.76
7	Lot 1	8,400	2,520	1,080	0	12,000	0.85
8	Lot 1 & Mdlns	4,840	0	9,500	0	14,340	0.50
9	Lot 2 Bldg	0	0	2,650	19,150	21,800	0.21
10	Robinson Parcel	0	0	0	7,800	7,800	0.20
11	Lot 3	0	0	20,209	0	20,209	0.30
12	Lot 4	2,800	0	1,992	0	4,792	0.65
Square Footage		46,302	6,120	66,145	26,950	145,517	0.50
Acreage		1.06	0.14	1.52	0.62	3.34	

DA IMPERV
 EXIST.
 IMPERV = 1.06 + 0.14 = 1.20 AC

Post Development

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.3	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	5,774	0	1,926	0	7,700	0.75
2	Lot 2 Pavement	5,990	0	1,710	0	7,700	0.77
3a	Midlands Road	4,356	0	4,200	0	8,556	0.61
3b	Midlands Road	2,644	0	2,800	0	5,444	0.59
4	Apartments & Mdlns	4,860	2,200	16,840	0	23,900	0.48
5	Midlands Road	1,238	0	1,238	0	2,476	0.60
6	Lot 1	5,400	1,400	2,000	0	8,800	0.76
7	Lot 1	8,400	2,520	1,080	0	12,000	0.85
8	Lot 1 & Mdlns	4,840	0	9,500	0	14,340	0.50
9	Lot 2 Bldg	240	3,780	14,480	3,300	21,800	0.40
10	Robinson Parcel	4,680	0	0	3,120	7,800	0.62
11	Lot 3	6,000	2,016	12,193	0	20,209	0.54
12	Lot 4	2,800	0	1,992	0	4,792	0.65
Square Footage		57,222	11,916	69,959	6,420	145,517	0.58
Acreage		1.31	0.27	1.61	0.15	3.34	

DA IMPERV.
NEW IMPERV. (1.31 + 0.27) = 1.58
 EXIST IMPERV = 1.20 AC.

 0.38 AC NEW

III. Storm Water Management Pond Calculations

This division is divided into three sections. The first section, "Water Quality Analysis" determines the level of treatment required to meet the JCC Chesapeake Bay Ordinance. The second and third sections are design calculations for the two, ten and 100-year storm events for BMP #1 and #2, respectively. They are further divided into subsections for storm calculations, pond and release structures sizing.

A. Water Quality Analysis

Water Quality Treatment is accomplished at both BMPs for the total watershed of 145,517 SF (3.34 acres). BMP #1 serves a total area of 33,557 SF (0.77 acres). BMP #1 includes all of Lot 3 (DA-11), the southeast corner of Lot 4 (DA-12), and approximately 350 LF of the inbound lane of Midlands Road from Strawberry Plains Road (DA-3a). The breakdown of the watershed area is provided in Appendix "A", "BMP #1 Watershed Pre and Post Development Tables". Approximately 20,209 SF (0.46 acres) is considered onsite, with the balance of approximately 13,348 SF (0.31 acres) offsite. Offsite areas represent 66% of the onsite area.

BMP #2 serves the balance of the watershed, approximately 111,960 SF (2.57 acres). A breakdown of the watershed by drainage area is provided in Appendix "C", "BMP #2 Watershed Pre and Post Development Tables". Of that the new development of Lot 2 (DA-9) accounts for 21,800 SF (0.50 acres) and is considered onsite. Therefore offsite contribution is 514 % of onsite area being treated in BMP #2. As shown in the following "Worksheet for BMP Point System", the 10 points is calculated and exceeded with a total of 27.2 points provided by the two BMPs.

Worksheet for BMP Point System

*F-2
DRY ED
w/ FOREBAY*

A. STRUCTURAL BMP POINT ALLOCATION

	<u>BMP</u>	<u>BMP Points</u>		<u>Fraction of Site Served by BMP</u>		<u>Weighted BMP Points</u>
BMP#1 {	Onsite	(F2) 4	x	$\frac{0.46}{0.46} = 1$	=	4
	Offsite	(F2) 4	x	$\frac{0.31}{0.46} = 0.66$	=	2.64
BMP#2 {	Onsite	(F2) 4	x	$\frac{0.5}{0.5} = 1$	=	4
	Offsite	(F2) 4	x	$\frac{2.07}{0.5} = 4.14$	=	16.56

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 27.2

B. NATURAL OPEN SPACE CREDIT

<u>Fraction of Site</u>		<u>Natural Open Space Credit</u>		<u>Points for Natural Open Space</u>
	x	(0.1 per 1%)	=	
	x	(0.15 per 1%)	=	

TOTAL NATURAL OPEN SPACE CREDIT: _____

C. TOTAL WEIGHTED POINTS

<u>27.2</u>	+	<u>∅</u>	=	<u>27.2</u>
Structural BMP Points		Natural Open Space Points		Total

11

B. BMP #1 Design

BMP #1 exists and is modified by these calculations to serve as a Dry Extended Detention BMP in lieu of a BioRetention BMP previously designed by others (reference SP-89-99). A site plan sketch follows and an amended site plan will be submitted at a later date for this BMP. The "Stage-Storage Worksheet" is based on the site plan sketch. BMP #1 will provide storage for the water quality volume, and routing of all other storms via a combination of the BMP's outlet structure and an outfall ditch/pipe constructed on Lot 2 that leads to BMP #2. BMP #2 will provide detention for the One Year Channel Erosion year storm events its portion of the watershed, and route the 100-year storm for the entire site. Design of the outfall ditch onto Lot 2 is calculated in Division IV "Storm Water Drainage Structures".

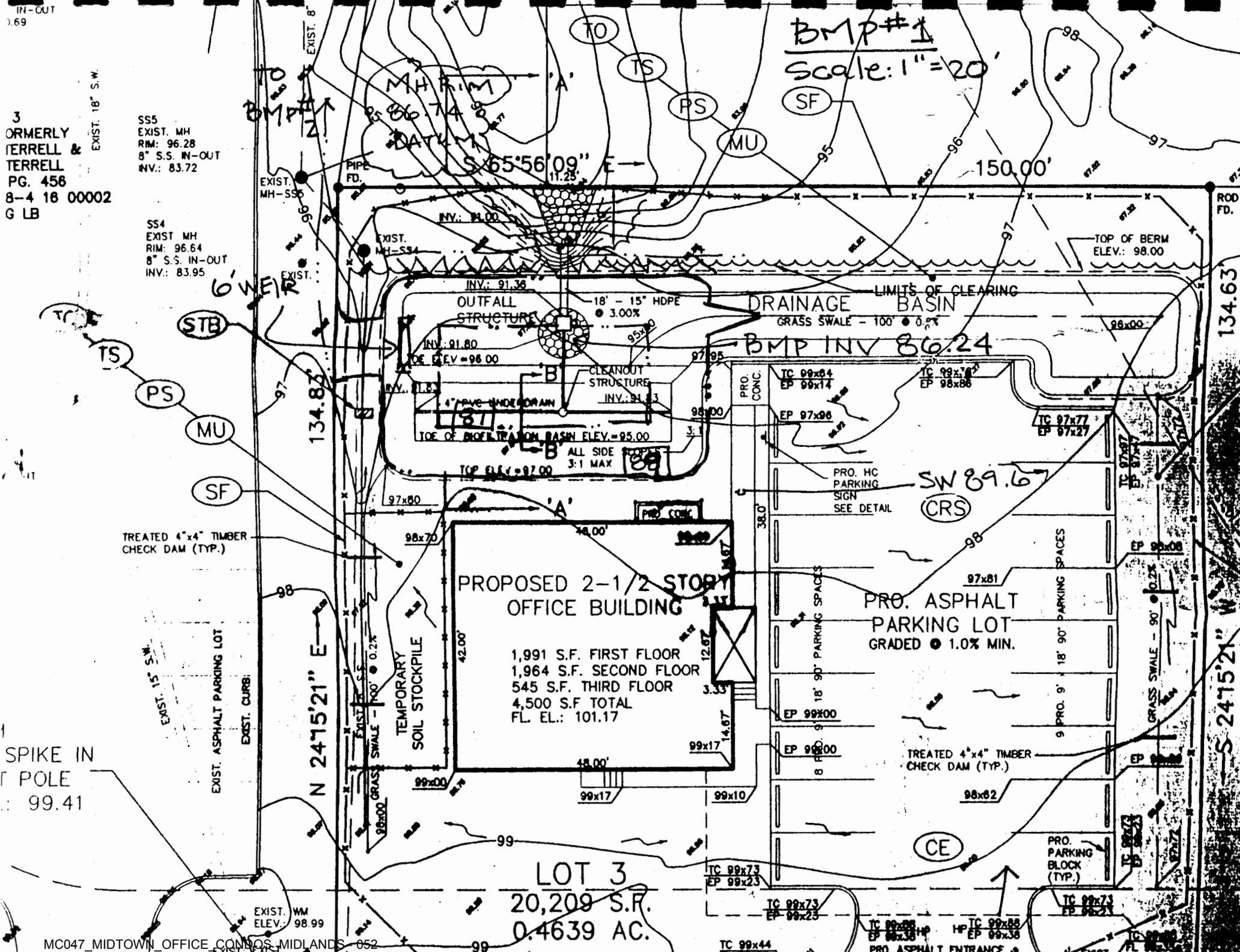
3
FORMERLY
TERRELL &
TERRELL
PG. 458
8-4 18 00002
G LB

EXIST. 18" S.W.

SS5
EXIST. MH
RM: 96.28
8" S.S. IN-OUT
INV.: 83.72

SS4
EXIST. MH
RM: 96.64
8" S.S. IN-OUT
INV.: 83.95

BMP#1
Scale: 1" = 20'



TREATED 4"x4" TIMBER
CHECK DAM (TYP.)

EXIST. 15" S.W.

EXIST. ASPHALT PARKING LOT

EXIST. CURB

N 24'15'21" E

SPIKE IN
POLE
99.41

PROPOSED 2-1/2 STORY
OFFICE BUILDING

1,991 S.F. FIRST FLOOR
1,964 S.F. SECOND FLOOR
545 S.F. THIRD FLOOR
4,500 S.F. TOTAL
FL. EL.: 101.17

LOT 3

20,209 S.F.
0.4639 AC.

EXIST. WM
ELEV. 98.99

134.63

S 24'15'21" W

ROO
FD.

EXIST.
PRO.

1. BMP #1 Water Quality Volume

BMP #1 will treat storm water runoff from Drainage Areas 11, 12 and 3a as shown in the "Post Development BMP #1" of Appendix "A", "BMP #1 Watershed Pre and Post Development Tables".

$$V_{wq} = 15,172 \text{ SF} \times 1 \text{ in} / 12 \text{ in} / \text{ft} = 1,264 \text{ CF or } 0.03 \text{ ac-ft}$$

The following hand calculations determine the maximum flow rates and resize the existing outlet structure.

a. The maximum hydraulic head for the water quality volume is based on the existing structure. The existing Rim will be raised to 87.34 to provide storage for V_{wq} . The outlet orifice is centered on the 4" PVC outlet pipe in the drop inlet elevation 81.84.

$$\therefore h = 87.24 - 81.84 = 5.5'$$

b. Determine Q_{max} resulting from a 30 hr drawdown, given $V_{wq} = 1,264 \text{ cf}$:

$$Q_{avg} = 1,264 \text{ cf} / (30 \text{ hrs} \times 3600 \text{ Sec}) \\ = 0.0117 \text{ cfs}$$

$$Q_{max} = Q_{avg} \times 2 = 0.023$$

c. Determine the required orifice diameter:

$$Q_{wq} = ca\sqrt{2gh} \quad \therefore a = \frac{Q}{c\sqrt{2gh}} \\ = \frac{0.023}{0.6\sqrt{2(32.2)(5.5)}} \\ = 0.0020 \text{ ft}^2$$

$$d = \sqrt{\frac{4a}{\pi}} = \sqrt{\frac{4(0.0020)}{\pi}} = 0.0509'$$

$$\text{or } 0.611" \phi \text{ or } 5/8" \phi$$

2. BMP #1 100 Year Storm Calculations

The storm water calculations in Appendix "B" and summarized in the below are based on "Modified Rational Method, Critical Storm Duration" IAW the *Virginia Storm Water Management Handbook*. The difference between Pre and Post Development calculations are the flows from Midlands Road that in Pre Development flowed directly to the Drop Inlet in front of Lot 2. The construction of Lot 3's entrance road created a short circuit and now routs storm water from approximately 350 LF of the inbound lane of Midlands Road through the Lot 3 and BMP #1. Drainage area and "C" value calculations for BMP #1 are located in Appendix "A" as previously referred.

Summary of Storm Water Calculations BMP #1

<u>Condition</u>	<u>Drainage Area</u>	<u>C</u>	<u>T_c</u>	<u>I_c</u>	<u>Q₁₀₀</u>
Pre-Developed	0.57	0.37	5	9.7	2.05
Post-Developed	0.77	0.57	9.75	5.54	2.43

3. BMP #1 Sizing

Using the "Stage-Storage Worksheet" the following "Stage-Storage-Discharge Worksheet" was developed. As can be seen, the Vwq level @ 87.34 provides 1,264 cf storage as required with a total discharge of 0.023 cfs as required.

All storm events up to the 100 year storm are routed to elevation 87.61. Maximum discharge thru the primary outlet is 0.024 cfs.

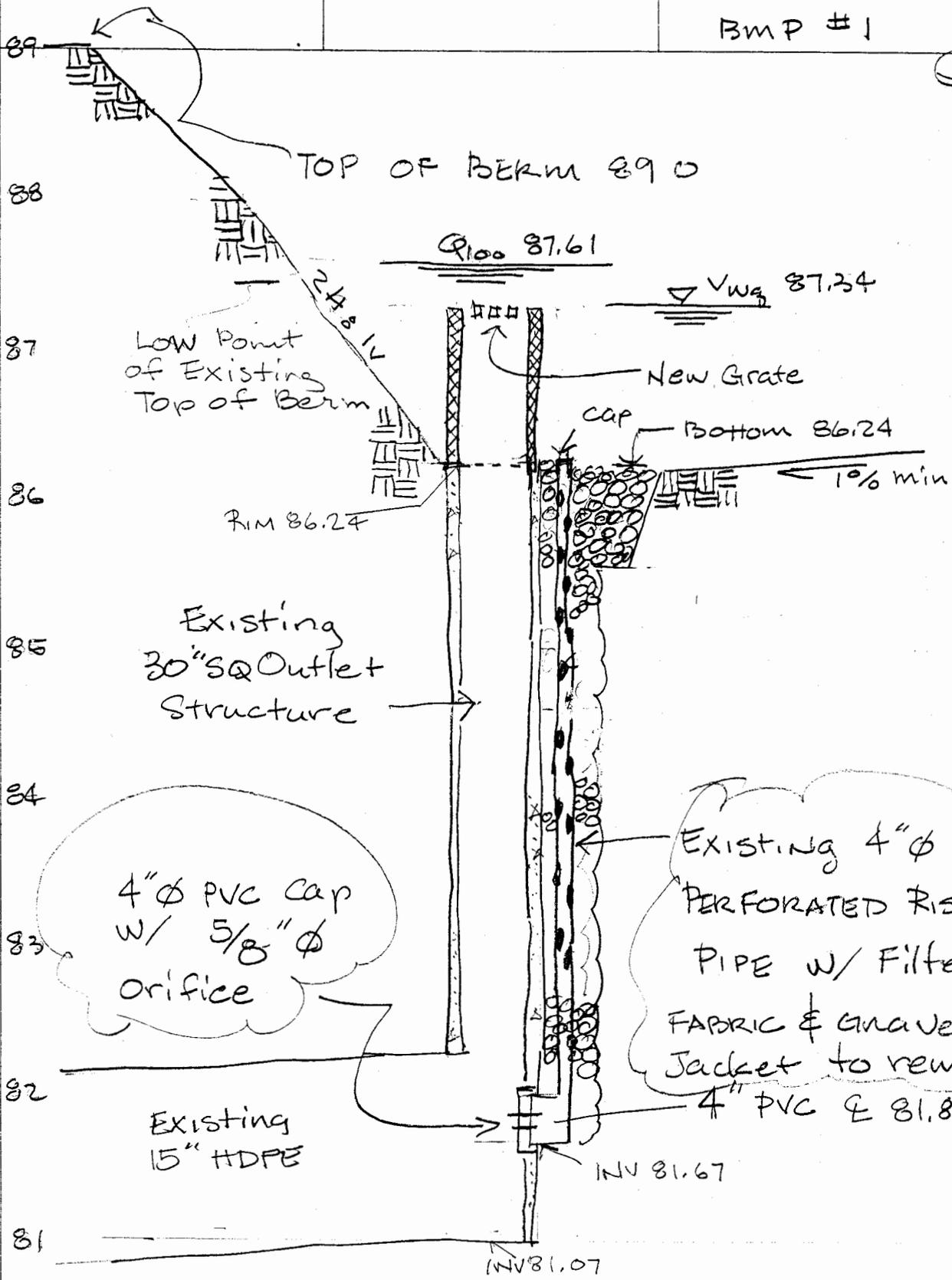
	Required		Actual		
	V	Q	Outlet Structure	Ditch	
			V	Q	Q
Water Quality	1,264	0.02	1,264	0.02	-
100 Year	N/A	2.05	N/A	0.024	2.44

The outfall ditch onto Lot 2 will be designed with a maximum flow rate of 2.44 cfs

Stage-Storage-Discharge Worksheet BMP #1

Elev		Storage Volume		Water Quality Orifice		Weir		2 Year Orifice		Total Q	
		CF	Ac. Ft.	a = El = h	Q	Length = El = h	Q	a = El = h	Q	CFS	Elev
81.07	Outlet Pipe	0	0.000	0.00	0.000	0.00	0.00	0.00	0.000	0.00	81.07
81.67	Orifice Invert	0	0.000	0.00	0.000	0.00	0.00	0.00	0.000	0.00	81.67
86.2	LP BMP	0	0.000	4.36	0.021	0.00	0.00	0.00	0.000	0.02	86.2
86.30		51	0.001	4.46	0.021	0.00	0.00	0.00	0.000	0.02	86.3
86.40		102	0.002	4.56	0.022	0.00	0.00	0.00	0.000	0.02	86.4
86.50		153	0.004	4.66	0.022	0.00	0.00	0.00	0.000	0.02	86.5
86.60		204	0.005	4.76	0.022	0.00	0.00	0.00	0.000	0.02	86.6
86.70		355	0.008	4.86	0.022	0.00	0.00	0.00	0.000	0.02	86.7
86.80		506	0.012	4.96	0.023	0.00	0.00	0.00	0.000	0.02	86.8
86.90		657	0.015	5.06	0.023	0.00	0.00	0.00	0.000	0.02	86.9
87.00		808	0.019	5.16	0.023	0.00	0.00	0.00	0.000	0.02	87
87.10		942.3	0.022	5.26	0.023	0.00	0.00	0.00	0.000	0.02	87.1
87.20		1076.6	0.025	5.36	0.023	0.00	0.00	0.00	0.000	0.02	87.2
87.30		1210.9	0.028	5.46	0.024	0.00	0.00	0.00	0.000	0.02	87.3
87.34	V _{wq}	1264.62	0.029	5.50	0.024	0.00	0.00	0.00	0.000	0.02	87.34
87.40		1345.2	0.031	5.56	0.024	0.06	0.26	0.00	0.000	0.28	87.4
87.50		1479.5	0.034	5.66	0.024	0.16	1.11	0.00	0.000	1.14	87.5
87.60		1613.8	0.037	5.76	0.024	0.26	2.31	0.00	0.000	2.33	87.6
87.61	Q ₁₀₀	1627.23	0.037	5.77	0.024	0.27	2.44	0.00	0.000	2.47	87.61
87.70		1748.1	0.040	5.86	0.024	0.36	3.76	0.00	0.000	3.78	87.7
87.80		1882.4	0.043	5.96	0.025	0.46	5.43	0.00	0.000	5.45	87.8
87.90		2016.7	0.046	6.06	0.025	0.56	7.29	0.00	0.000	7.32	87.9
88.00		2151	0.049	6.16	0.025	0.66	9.33	0.00	0.000	9.35	88
88.10		2366.3	0.054	6.26	0.025	0.76	11.53	0.00	0.000	11.55	88.1
88.20		2581.6	0.059	6.36	0.026	0.86	13.88	0.00	0.000	13.90	88.2
88.30		2796.9	0.064	6.46	0.026	0.96	16.37	0.00	0.000	16.39	88.3
88.40		3012.2	0.069	6.56	0.026	1.06	18.99	0.00	0.000	19.02	88.4
88.50		3227.5	0.074	6.66	0.026	1.16	21.74	0.00	0.000	21.76	88.5
88.60		3442.8	0.079	6.76	0.026	1.26	24.61	0.00	0.000	24.64	88.6
88.70		3658.1	0.084	6.86	0.026	1.36	27.60	0.00	0.000	27.62	88.7
88.80		3873.4	0.089	6.96	0.027	1.46	30.70	0.00	0.000	30.72	88.8
88.90		4088.7	0.094	7.06	0.027	1.56	33.90	0.00	0.000	33.93	88.9
89.00		4304	0.099	7.16	0.027	1.66	37.21	0.00	0.000	37.24	89

(1)



BMP #1 Outfall Diagram

DATUM MH LOT 2 , RIM 86.74 (see Plan)

42-381 50 SHEETS 5 SQUARE
 42-382 100 SHEETS 5 SQUARE
 42-389 200 SHEETS 5 SQUARE

NATIONAL

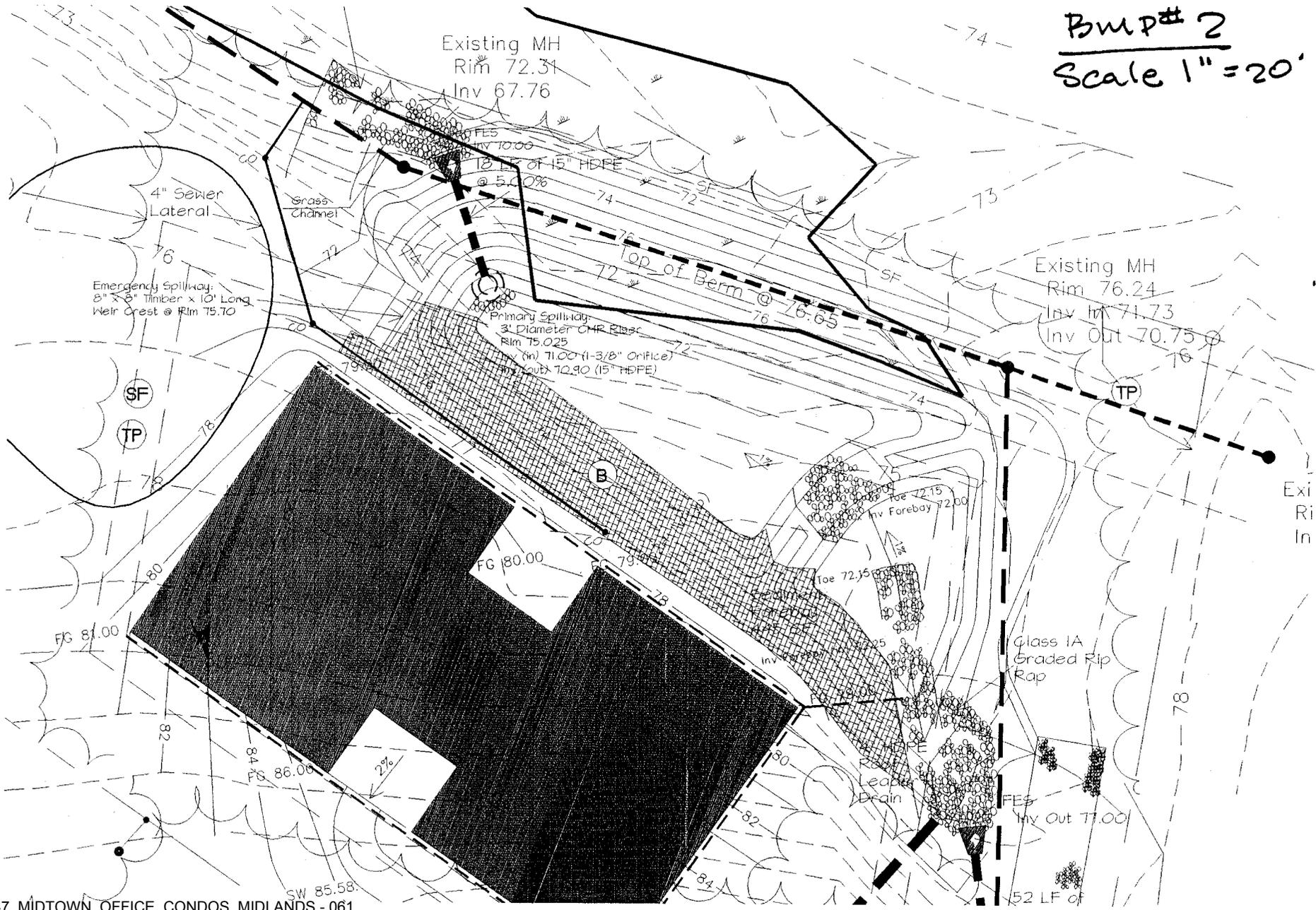
C. BMP #2 Design

BMP #2 is designed as a Dry Extended Detention BMP and is located on Lot 2..

Flows from the entire watershed flow to BMP #2. Water quality volumes and the One Year Channel Erosion storm event are treated for all areas except areas previously treated by BMP #1. BMP #2 will treat 111,960 SF (2.57 acres) of area. Of that 53,966 SF (1.24 acres) are post-development impervious. Which include projecting the build out of that corner of the "Robinson" parcel. BMP #2 is designed to rout the 100 year storm for the entire watershed (3.34 acres).

A site plan sketch follows and is used to develop the "Stage-Storage Worksheet".

BMP# 2
Scale 1"=20'



Stage-Storage Worksheet

PROJECT: 00-105, Lot 2 Midlands SHEET OF

COUNTY: JCC COMPUTED BY: TCG DATE: 8/20/00

DESCRIPTION: BMP #2

ATTACH COPY OF TOPO: SCALE - 1" = 20 ft.

1	2	3	4	5	6	7	8
ELEV.	AREA (in ²)	AREA (ft ²)	AVG. AREA (ft ²)	INTERVAL	VOL. (ft ³)	TOTAL VOLUME	
						(ft ³)	(ac.ft.)
71		0				0	0
72		1651	826	1	826	826	0.02
73		2074	1863	1	1863	2689	0.06
74		2525	2300	1	2300	4989	0.11
75		3006	2766	1	2766	7755	0.18
76		3818	3412	1	3412	11,167	0.26
76		4187	4003	.65	2602	13,769	0.32
- Top of Berm							

71

1. BMP #2 Water Quality Volume

BMP #2 will treat storm water runoff from all Drainage Areas except those treated by BMP #1 as shown Appendix "C", "Post Development BMP #1".

$$\begin{aligned} \text{BMP \#2 Impervious Area} &= \text{Total Watershed Impervious Area} - \text{BMP \#1} \\ &\text{Impervious Area} \\ &= 69,138 \text{ SF} - 15,172 \text{ SF} \\ &= 53,966 \text{ SF} \end{aligned}$$

$$V_{wq} = 53,966 \text{ SF} \times 1 \text{ in} / 12 \text{ in} / \text{ft.} = 4,497 \text{ CF or } 0.10 \text{ ac-ft}$$

The following hand calculations determine the maximum flow rates and size the new outlet structure.

- a. Determine maximum hydraulic head (h_{max}) corresponding to the required water quality volume from the "Stage-Storage Worksheet".

$$V_{wq} = 0.10 \text{ ac-ft}$$

Water quality volume will flood between contours 73 & 74

$$\therefore \frac{74 - x}{74 - 73} = \frac{0.11 - 0.10}{0.11 - 0.06}$$

$$\frac{74 - x}{1} = \frac{0.01}{0.05}$$

$$3.7 - 0.05x = 0.01$$

$$x = 73.8$$

V_{wq} floods to 73.8 Elevation

- b. Determine Q_{max} resulting from a 30 hr drawdown, given $V_{wq} = 4,497 \text{ cf}$

$$Q_{avg} = 4,497 \text{ cf} / (30 \text{ hrs} \times 3600 \text{ sec})$$

$$= 0.042 \text{ cfs}$$

$$Q_{max} = Q_{avg} \times 2 = 0.08 \text{ cfs}$$

C. Determine the required orifice diameter:

$$Q = Ca\sqrt{2gh}$$

$$\therefore a = \frac{Q}{C\sqrt{2gh}}$$

$$a = \frac{0.08}{0.6\sqrt{2(32.2)(2.6)}}$$

$$= 0.01 \text{ ft}^2$$

$$d = \sqrt{\frac{4a}{\pi}}$$

$$= \sqrt{\frac{4 \times 0.01}{\pi}}$$

$$= 0.11' \text{ or } 1.35" \phi$$

Develop a "stage-storage-discharge worksheet"

$$Q = Ca\sqrt{2gh}$$

$$= 0.6(0.01)\sqrt{2(32.2)h}$$

$$= 0.048\sqrt{h}$$

2. BMP #2 One Year Channel Erosion and 100 Year Storm Calculations

The storm water calculations in Appendix "D" and summarized in the table below are based on the "Modified Rational Method, Critical Storm Duration" IAW the Virginia Storm Water Management Handbook.

Summary of Storm Water Calculations BMP #2

Condition	Drainage Area	C	T_c	I_c	Q₁₀₀
Pre-Developed	3.34	0.50	11.5	8.2	13.69
Post-Developed	3.34	0.58	11.5	7.06	13.02

To calculate the One Year Channel Erosion storm event runoff is first calculated using the following TR-55 worksheet. The One Year Storm will require a total volume of 7,840 cf, which includes the Water Quality Volume. The 100 year storm is stacked on the One Year Storm Volume. The outlet orifice remains the same as that calculated for the Water Quality flows.

Worksheet 2: Runoff curve number and runoff

Project 00-105, Lot 2 By rCS Date 10/6/00
 Location Lot 2 Checked _____ Date _____
 Circle one: Present **Developed** BMP #2

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area <input type="checkbox"/> acres <input type="checkbox"/> mi ² <input type="checkbox"/> %	Product of CN x area
		Table 2-2	Fig. 2-3	Fig. 2-4		
C	Roof	98			.23	22.54
C	Pavement	98			1.01	98.99
C	Lawn (good)	74			1.18	87.32
C	Woods	70			.15	10.5
					Totals =	2.57 219.34

^{1/} Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{219.34}{2.57} = 85.3$$
 Use CN = 85

2. Runoff

Frequency yr
 Rainfall, P (24-hour) in
 Runoff, Q in
 (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
1		
2.8		
1.42		

One Year Channel Erosion:

One year frequency design storm
rainfall = 2.8.

From TR-55 Worksheet 2.

$$\text{Runoff} = 1.42$$

$$V_{ce} = 2.57 \times 1.42 \times \frac{1}{12} = 0.3 \text{ Acre-ft}$$

$$V_{ce} \quad 0.6 (0.3) = 0.18 \text{ acer-ft} / 7840 \text{ cf}$$

$$Q_{avg} = \frac{7840}{24 (3600)} = 0.09$$

$$a = \frac{Q}{C \sqrt{2gh}} = \frac{0.09}{0.6 \sqrt{2 (32.2) (4.1)}} \\ = 0.009$$

$$d = \sqrt{\frac{4a}{\pi}} = \sqrt{\frac{4 (0.009)}{\pi}} = 0.11' \phi \\ = 1.3'' \phi$$

use $1\frac{5}{8}'' \phi$

3. BMP #2 Sizing

This section calculates storage and outlet structure sizes given the "Stage-Storage Worksheet" previously developed for BMP #2. Flow rates for the two and ten storms are maintained at pre-development rates. The 100 year storm is routed through the BMP. The resulting "Stage-Storage-Discharge Worksheet" follows.

Using the "Storage - Storage - Discharge Worksheet" determine the weir size to handle the 100 year Storms events.

The weir elevation is set at 75.03 at the upper level of the water quality volume. Using trial & error on the Spreadsheet to determine the Weir length that will meet or exceed the 100 year post development flow rate.

~~Two Year Storm :~~

~~Given $V_2 = 674$ CF~~

~~$$\Sigma V = V_2 + V_{wg} = 674 + 4035$$

$$= 4,709 \text{ CF}$$~~

~~@ $Q_2 = 7.54$ cfs~~

~~Ten Year Storm :~~

~~Given $V_{10} = 1,433$ CF~~

~~$$\Sigma V = V_{10} + V_2 + V_{wg} = 1433 + 674 + 4035$$

$$= 6,142 \text{ CF}$$~~

~~@ $Q_{10} = 8.91$ cfs~~

100 year Storm : $Q_{100} = 13.02$ cfs

From the "... worksheet" and after several trial & errors attempts a 36" Φ riser with baffles a weir length of 9.42' is used

To summarize the "... worksheet"

@ $Q = 0.073$ cfs @ Elevation 73.80
providing 4529 cf of storage

@ $Q_{CE} = 0.87$ cfs @ Elevation 75.03
providing 7839 cf

$Q_{100} = 13.59$ cfs @ Elevation 75.65
providing 1.0' of freeboard.

Stage-Storage-Discharge Worksheet BMP #2

Elev	Storage Volume		Water Quality Orifice		Weir		Total Q	
	CF	Ac. Ft.	a = El = h	Q	Length = El = h	Q	CFS	Elev
71	Orifice Invert	0	0.00	0.000	0.00	0.00	0.00	71
72		826	1.00	0.043	0.00	0.00	0.04	72
73		2689	2.00	0.061	0.00	0.00	0.06	73
73.1		2919	2.10	0.063	0.00	0.00	0.06	73.1
73.2		3149	2.20	0.064	0.00	0.00	0.06	73.2
73.3		3379	2.30	0.066	0.00	0.00	0.07	73.3
73.4		3609	2.40	0.067	0.00	0.00	0.07	73.4
73.5		3839	2.50	0.069	0.00	0.00	0.07	73.5
73.6		4069	2.60	0.070	0.00	0.00	0.07	73.6
73.7		4299	2.70	0.071	0.00	0.00	0.07	73.7
73.8	V_{wq}	4529	2.80	0.073	0.00	0.00	0.07	73.8
73.9		4759	2.90	0.074	0.00	0.00	0.07	73.9
74		4989	3.00	0.075	0.00	0.00	0.08	74
74.1		5265.6	3.10	0.076	0.00	0.00	0.08	74.1
74.2		5542.2	3.20	0.078	0.00	0.00	0.08	74.2
74.3		5818.8	3.30	0.079	0.00	0.00	0.08	74.3
74.4		6095.4	3.40	0.080	0.00	0.00	0.08	74.4
74.45		6233.7	3.45	0.080	0.00	0.00	0.08	74.45
74.5		6372	3.50	0.081	0.00	0.00	0.08	74.5
74.55		6510.3	3.55	0.082	0.00	0.00	0.08	74.55
74.6		6648.6	3.60	0.082	0.00	0.00	0.08	74.6
74.7		6925.2	3.70	0.083	0.00	0.00	0.08	74.7
74.8		7201.8	3.80	0.084	0.00	0.00	0.08	74.8
74.9		7478.4	3.90	0.086	0.00	0.00	0.09	74.9
75		7755	4.00	0.087	0.00	0.00	0.09	75
75.025	V_{ce}	7840.3	4.03	0.087	0.00	0.00	0.09	75.025
75.65	Q_{100}	9972.8	4.65	0.093	0.63	13.50	13.59	75.65
75.7	Emergency Spillway							
76		11167	5.00	0.097	0.97	26.30	26.40	76
76.65	Top of Berm	13769						

IV. Storm Water Drainage Structures

This section designs related outfall structures and ditches of this project. The following structures are designed here:

- A. BMP #1 Outfall Ditch/Pipe
- B. BMP #2 Rip Rap Inlet Channel
- C. BMP #2 Forebay
- D. BMP #2 Rip Rap Outlet Protection
- E. BMP #2 Emergency Spillway
- F. BMP #2 Outlet Barrel Calculations
- G. BMP #2 Riser Buoyancy Calculations

A. BMP #1 Outfall Ditches

The outfall ditch fall from BMP #1 will carry up to the 100 year flows as previously discussed.

$Q_{max} = 2.44$ cfs. Design a grass lined v-ditch.

Vee Ditch Calculations

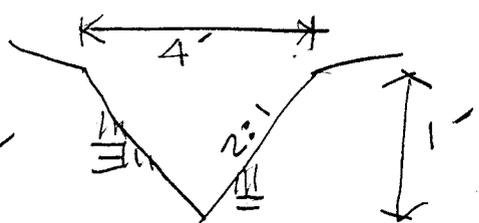
Description: **BMP #1 Secondary Outfall (A - B)**

Slope = 0.05
 Q = 2.44
 n = 0.046
 M = 2

y	R	Area	Velocity	Q
1.5	0.67	4.50	5.54	24.94
1.4	0.63	3.92	5.29	20.75
1.3	0.58	3.38	5.04	17.02
1.2	0.54	2.88	4.77	13.75
1.1	0.49	2.42	4.50	10.90
1	0.45	2.00	4.22	8.45
0.9	0.40	1.62	3.94	6.38
0.8	0.36	1.28	3.64	4.66
0.7	0.31	0.98	3.33	3.26
0.6	0.27	0.72	3.00	2.16
0.5	0.22	0.50	2.66	1.33
0.4	0.18	0.32	2.29	0.73
0.3	0.13	0.18	1.89	0.34
0.2	0.09	0.08	1.44	0.11
0.1	0.04	0.02	0.90	0.02
T&E:	0.28	0.78	3.08	2.41

0.27' FB
100-YEAR

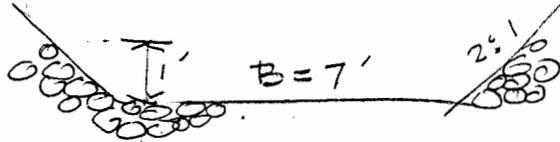
Maximum depth of water is 0.63'



B. BMP #2 Rip Rap Inlet Channel

$Q = 13.69 \text{ cfs}$

Slope = 25%



1. Ref Plate 3.19-3*

*(Ref to S Manual)

use $d_{50} = 1.0$ for depth of flow = 0.3'

Trapezoidal Ditch Calculations

Description: **BMP #2 Inlet from BMP #1 & Waters**

Slope = 0.25
 Q = 13.69
 n = 0.033
 M = 2
 b = 7

y	R	Area	Velocity	Q
1.5	1.09	15.00	23.98	359.70
1.4	1.03	13.72	23.10	316.88
1.3	0.97	12.48	22.18	276.81
1.2	0.91	11.28	21.23	239.44
1.1	0.85	10.12	20.23	204.74
1	0.78	9.00	19.19	172.69
0.9	0.72	7.92	18.09	143.26
0.8	0.65	6.88	16.92	116.43
0.7	0.58	5.88	15.68	92.20
0.6	0.51	4.92	14.34	70.56
0.5	0.43	4.00	12.89	51.55
0.4	0.35	3.12	11.28	35.19
0.3	0.27	2.28	9.47	21.59
0.2	0.19	1.48	7.35	10.88
0.1	0.10	0.72	4.72	3.40

T&E:
 0.229 0.21 1.71 8.01 13.67

2. Plate 3.19-4* : $B/d = 7/0.3 = 23.3$

3. Plate 3.19-5* : For $d_{50} = 1.0$
 Angle of repose = 42°

4. Plate 3.19-6*: for $k_2 = 0.77$

$$5. d_{50} \times \frac{k_1}{k_2} = d'_{50}$$

$$1.0 \times \frac{0.78}{0.77} = 1.01' \text{ or } 12.16''$$

$$\text{use } d_{50} = 12''$$

$$d_{100} = 1.5 \times 12'' = 18''$$

$$\text{Thickness} = 2 \times 18'' = 36''$$

Use Class I Graded Rip Rap.

C. BMP # Forebay

Impervious Area being treated
by BMP # 2 is 53,966 SF (1.24 Acres),

Forebay Size:

$$1.24 \text{ Acres} \times 0.1 \text{ in} / 12 \text{ in} / \text{ft} = 0.01 \text{ Ac-Ft}$$

0.01 Ac-Ft or 450 CF.

495 CF
PROVIDED.

42,381 50 SHEETS 5 SQUARE
42,382 100 SHEETS 5 SQUARE
42,389 200 SHEETS 5 SQUARE
NATIONAL

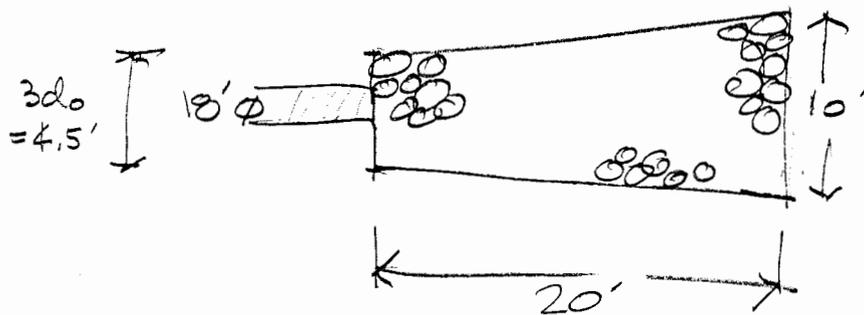
D. BMP # 2 Rip Rap Outlet Protection

Size the outlet protection to handle flows from BMP # 100 yr storm : $Q_{100} = 13,50$

Outlet Pipe Diameter = 18" ϕ
w/ tailwater condition $> 0.5 D_o$

$$d_{50} = 0.3' \quad L_a = 21'$$

use 0.5' ϕ
Rip Rap



RIP RAP OUTLET DIMENSIONS

NTS

$$d_{50} = 6''$$

$$d_{100} = 1.5 \times 6'' = 9''$$

$$\text{Thickness} = 2 \times 9'' = 18''$$

8 CY of Class A1
Graded RR

use Class A1
Graded RR
 $d_{50} = 0.9'$

E. BMP #2 Emergency Spillway

All storms are passed in the Primary Spillway. An EMERGENCY Spillway is placed at $\$175.7$ to keep flows from ever topping the berm.

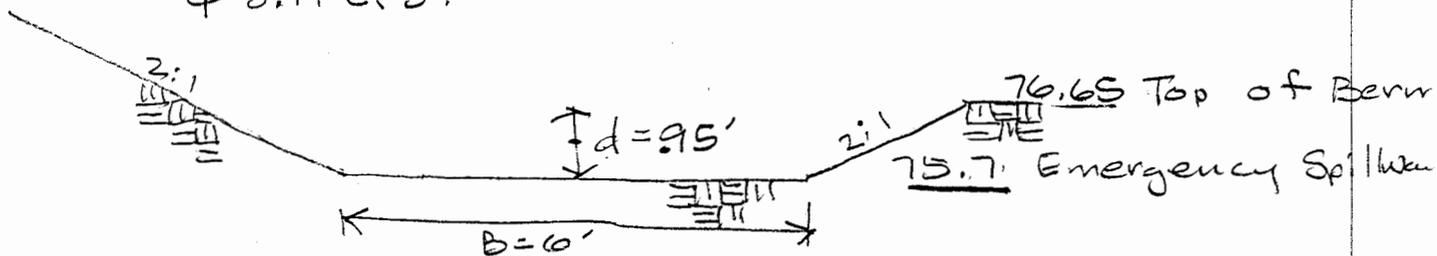
Trapazoidal Ditch Calculations

Description: **BMP #2 Emergency Spillway**

Slope = 0.2
 Q = ???
 n = 0.046
 M = 2
 b = 10

y	R	Area	Velocity	Q
1.5	1.17	19.50	16.07	313.28
1.4	1.10	17.92	15.46	277.04
1.3	1.04	16.38	14.83	242.94
1.2	0.97	14.88	14.18	210.95
1.1	0.90	13.42	13.49	181.08
1	0.83	12.00	12.78	153.33
0.9	0.76	10.62	12.02	127.69
0.8	0.68	9.28	11.23	104.17
0.7	0.61	7.98	10.38	82.80
0.6	0.53	6.72	9.46	63.60
0.5	0.45	5.50	8.48	46.63
0.4	0.37	4.32	7.39	31.94
0.3	0.28	3.18	6.18	19.65
0.2	0.19	2.08	4.78	9.94
0.1	0.10	1.02	3.05	3.11

Velocities become erodable at over 0.1' depth & 3.11 cfs.

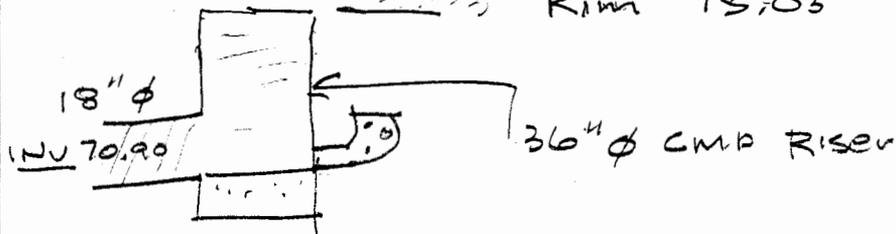


Emergency spillway will handle 128 cfs before the berm is topped.

F. BMP #2 ^{Outlet} Barrel Calculations

$$Q_{100} = 13.69 \text{ cfs} \quad \text{Elevation } 75.65$$

$$\text{Rim } 75.03$$



Inlet Control:

use Sq Edge Condition 1

Determine if 18" ϕ is adequate w/o backing up to the Rim.

$$w/ 18" \phi \text{ Pipe } \neq 13.69 \text{ cfs (100-yr)}$$

$$HW/D = 2.3$$

$$HW = 3.45' < 4.10' (4.08')$$

Outlet Control: Equation?

$$Q = a \sqrt{\frac{2gh}{1 + K_m + K_p L}}$$

$$= 1.57 \sqrt{\frac{2(32.2)(4.0)}{1 + 1 + (0.0182)(18)}}$$

$$= 1.57 \sqrt{\frac{258}{2.32}}$$

$$= 16.53 \text{ cfs} > 13.69 \text{ cfs}$$

$$K_m = K_b + K_p$$

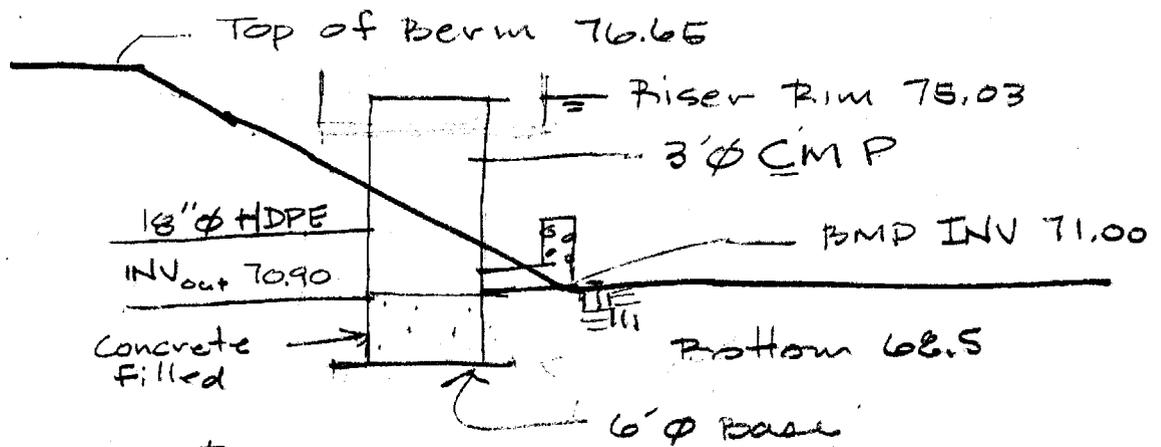
$$= (.5 + .5)$$

$$= 1$$

18" ϕ BARREL WORKS FOR EITHER
CONDITION.

BMP #2

9. Riser Buoyancy Calculations

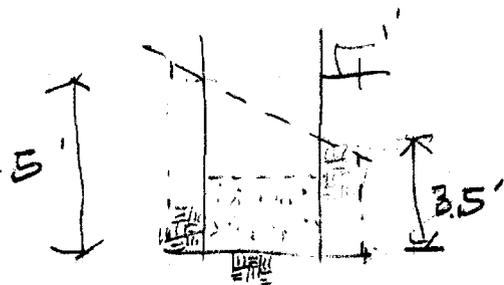


Buoyant Force :

$$\begin{aligned} \text{Riser Volume} &= (75.03 - 68.5) \times \pi (1.5)^2 \\ &= 6.53 \times 7.07 \\ &= 46.2 \text{ cf} \end{aligned}$$

$$\begin{aligned} \text{Force} &= 46.2 \text{ cf} \times 62.4 \#/\text{cf} \\ &= 2,883 \# \uparrow \end{aligned}$$

Resisting Force :



$$\text{Concrete Filled} \quad \pi (1.5)^2 \times 2.5 \times 150 \#/\text{cf} = 2651 \#$$

Earth :

$$\begin{aligned} \text{Average ht. around riser} &= 3.5' \\ (\pi (2.5)^2 - \pi (1.5)^2) \times 4 \times 110 \#/\text{cf} &= \\ (19.63 - 7.07) \times 4 \times 110 &= \frac{5,526 \#}{8,177 \#} \end{aligned}$$

Adequate w/only base

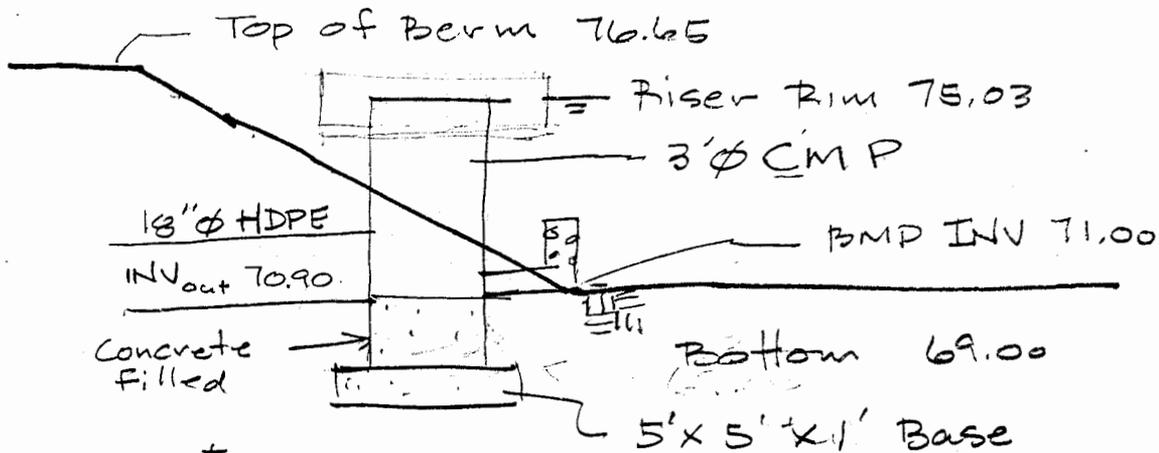
$$\text{Force} = \frac{8,177 \#}{2,651 \#}$$

$$= 3.08 > 1.25$$

IT DON'T FLOAT.

BMP #2

9. Riser Buoyancy Calculations

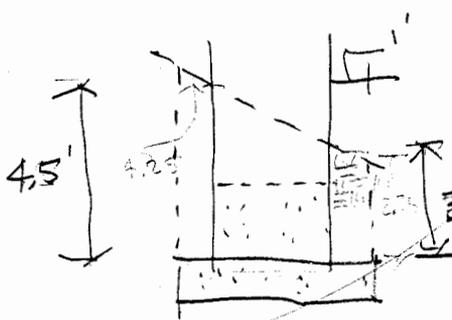


Buoyant Force:

$$\begin{aligned} \text{Riser Volume} &= (75.03 - 69) \times \pi (1.5)^2 \\ &= 6.03 \times 7.07 \\ &= 42.6 \text{ cf} \end{aligned}$$

$$\begin{aligned} \text{Force} &= 42.6 \text{ cf} \times 62.4 \#/\text{cf} \\ &= 2,660 \# \uparrow \end{aligned}$$

Resisting Force:



Concrete Base:
 $5' \times 5' \times 1' \times 150 \#/\text{cf} = 3750 \#$

Concrete Filled:
 $\pi (1.5)^2 \times 2' \times 150 \#/\text{cf} = 2121 \#$

Earth:

Average ht. around riser = 3.5'

$$(\pi (2.5)^2 - \pi (1.5)^2) \times 3.5 \times 110 \#/\text{cf} =$$

$$(19.63 - 7.07) \times 3.5 \times 110 = \frac{4838 \#}{10709}$$

$$\text{Force} = \frac{10709 \# \downarrow}{2660 \# \uparrow} = 4.03 > 1.25$$

IT DON'T FLOAT.

V. Summary

Storm water flows from the 3.34-acre drainage basin will be treated on Lots 2 and 3 achieving a total of 29.2 water quality points.

The Dry Extended Detention Pond on Lot 3 (BMP #1) will provide storage and control for the "water quality storm" for 0.77 acres. Storm events up to the 100 year storm for that same area are routed through BMP #1 to a combination of the outlet structure and the constructed ditch/pipe located on Lot 2 that flows to BMP #2.

The Dry Extended Detention Pond on Lot 2 (BMP #2) will provide storage and control for the "water quality storm" for 2.57 acres of the drainage basin. BMP #2 routes the 100 year storm for the entire watershed. The primary spillway controls all storm events. An emergency spillway is provided above all storm events, to prevent topping of the berm.

Appendix

Appendix A

**BMP #1 Watershed Area Pre and Post Development
Tables**

Pre Development BMP #1

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.3	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	0	0	0	0	0	#DIV/0!
2	Lot 2 Pavement	0	0	0	0	0	#DIV/0!
3a	Midlands Road	0	0	0	0	0	#DIV/0!
3b	Midlands Road	0	0	0	0	0	#DIV/0!
4	Apartments & Mdlns	0	0	0	0	0	#DIV/0!
5	Midlands Road	0	0	0	0	0	#DIV/0!
6	Lot 1	0	0	0	0	0	#DIV/0!
7	Lot 1	0	0	0	0	0	#DIV/0!
8	Lot 1 & Mdlns	0	0	0	0	0	#DIV/0!
9	Lot 2 Bldg	0	0	0	0	0	#DIV/0!
10	Robinson Parcel	0	0	0	0	0	#DIV/0!
11	Lot 3	0	0	20,209	0	20,209	0.30
12	Lot 4	2,800	0	1,992	0	4,792	0.65
	Square Footage	2,800	0	22,201	0	25,001	0.37
	Acreage	0.06	0.00	0.51	0.00	0.57	

Post Development BMP #1

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.3	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	0	0	0	0	0	#DIV/0!
2	Lot 2 Pavement	0	0	0	0	0	#DIV/0!
3a	Midlands Road	4,356	0	4,200	0	8,556	0.61
3b	Midlands Road	0	0	0	0	0	#DIV/0!
4	Apartments & Mdlnds	0	0	0	0	0	#DIV/0!
5	Midlands Road	0	0	0	0	0	#DIV/0!
6	Lot 1	0	0	0	0	0	#DIV/0!
7	Lot 1	0	0	0	0	0	#DIV/0!
8	Lot 1 & Mdlnds	0	0	0	0	0	#DIV/0!
9	Lot 2 Bldg	0	0	0	0	0	#DIV/0!
10	Robinson Parcel	0	0	0	0	0	#DIV/0!
11	Lot 3	6,000	2,016	12,193	0	20,209	0.54
12	Lot 4	2,800	0	1,992	0	4,792	0.65
	Square Footage	13,156	2,016	18,385	0	33,557	0.57
	Acreage	0.30	0.05	0.42	0.00	0.77	

Appendix B

BMP #1 Storm Water Calculations

Summary of Storm Water Calculations BMP #1

Condition	Drainage										
	Area	C	T _c	I _c	Q ₂	V ₂	I _c	Q ₁₀	V ₁₀	I _c	Q ₁₀₀
Pre-Developed	0.57	0.37	5	5.7	1.20		6.55	1.38		9.7	2.05
Post-Developed	0.77	0.57	9.75	3.44	1.51	721	3.98	1.75	1277	5.54	2.43

Storm Water Calculations BMP #1

Determine the 2-year critical storm Flow Rate and Volumes:

C = developed condition runoff coefficient =	0.57
A = drainage area =	0.77
t_c = post-developed time of concentration =	9.75
q_{p2} = allowable peak flow =	1.20
a_2 = 2-year rainfall constant =	121.86
b_2 = 2-year rainfall constant =	16.58
Calculate T_{d2} =	18.89 minutes
Calculate I_2 =	3.44 in/hr
$Q_{d2} = C I_2 A$	
Calculate Q_{d2} =	1.51 cfs
Calculate V_2 =	721 cf
=	0.02 ac-ft

Determine the 10-year critical storm Flow Rate and Volumes:

C = developed condition runoff coefficient =	0.57
A = drainage area =	0.77
t_c = post-developed time of concentration =	9.75
q_{p10} = allowable peak flow =	1.38
a_{10} = 10-year rainfall constant =	185.06
b_{10} = 10-year rainfall constant =	20.81
Calculate T_{d10} =	25.67 minutes
Calculate I_{10} =	3.98 in/hr

$$Q_{110} = C I_{10} A$$

$$\text{Calculate } Q_{110} = 1.75 \text{ cfs}$$

$$\text{Calculate } V_{10} = 1277 \text{ cf}$$

$$= 0.03 \text{ ac-ft}$$

Determine the 100-year critical storm Flow Rate and Volumes:

$$C = \text{developed condition runoff coefficient} = 0.57$$

$$A = \text{drainage area} = 0.77$$

$$t_c = \text{post-developed time of concentration} = 9.75$$

$$q_{p100} = \text{allowable peak flow} = 2.05$$

$$a_{100} = 100\text{-year rainfall constant} = 279.14$$

$$b_{100} = 100\text{-year rainfall constant} = 23.67$$

$$\text{Calculate } T_{d100} = 26.76 \text{ minutes}$$

$$\text{Calculate } I_{100} = 5.54 \text{ in/hr}$$

$$Q_{1100} = C I_{100} A$$

$$\text{Calculate } Q_{110} = 2.43 \text{ cfs}$$

$$\text{Calculate } V_{10} = 1716 \text{ cf}$$

$$= 0.04 \text{ ac-ft}$$

Appendix C

**BMP #2 Watershed Area Pre and Post Development
Tables**

Pre Development BMP #2

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.3	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	5,774	0	1,926	0	7,700	0.75
2	Lot 2 Pavement	5,990	0	1,710	0	7,700	0.77
3a	Midlands Road	4,356	0	4,200	0	8,556	0.61
3b	Midlands Road	2,644	0	2,800	0	5,444	0.59
4	Apartments & Mdlns	4,860	2,200	16,840	0	23,900	0.48
5	Midlands Road	1,238	0	1,238	0	2,476	0.60
6	Lot 1	5,400	1,400	2,000	0	8,800	0.76
7	Lot 1	8,400	2,520	1,080	0	12,000	0.85
8	Lot 1 & Mdlns	4,840	0	9,500	0	14,340	0.50
9	Lot 2 Bldg	0	0	2,650	19,150	21,800	0.21
10	Robinson Parcel	0	0	0	7,800	7,800	0.20
11	Lot 3	0	0	0	0	0	#DIV/0!
12	Lot 4	0	0	0	0	0	#DIV/0!
Square Footage		43,502	6,120	43,944	26,950	120,516	0.52
Acreage		1.00	0.14	1.01	0.62	2.77	

Post Development BMP #2

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.5	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	5,774	0	1,926	0	7,700	0.75
2	Lot 2 Pavement	5,990	0	1,710	0	7,700	0.77
3a	Midlands Road	0	0	0	0	0	#DIV/0!
3b	Midlands Road	2,644	0	2,800	0	5,444	0.59
4	Apartments & Mdlns	4,860	2,200	16,840	0	23,900	0.48
5	Midlands Road	1,238	0	1,238	0	2,476	0.60
6	Lot 1	5,400	1,400	2,000	0	8,800	0.76
7	Lot 1	8,400	2,520	1,080	0	12,000	0.85
8	Lot 1 & Mdlns	4,840	0	9,500	0	14,340	0.50
9	Lot 2 Bldg	240	3,780	14,480	3,300	21,800	0.40
10	Robinson Parcel	4,680	0	0	3,120	7,800	0.62
11	Lot 3	0	0	0	0	0	#DIV/0!
12	Lot 4	0	0	0	0	0	#DIV/0!
Square Footage		44,066	9,900	51,574	6,420	111,960	0.58
Acreage		1.01	0.23	1.18	0.15	2.57	

Appendix D

BMP #2 Storm Water Calculations

Summary of Storm Water Calculations BMP #2

Condition	Drainage Area	C	T_c	I_c	Q₂	V₂	I_c	Q₁₀	V₁₀	I_c	Q₁₀₀
Pre-Developed	3.34	0.50	11.5	4.4	7.35		5.2	8.68		8.2	13.69
Post-Developed	3.34	0.58	11.5	4.11	7.96	933	4.93	9.09	1843	7.06	13.02

Storm Water Calculations BMP #2

Determine the 2-year critical storm Flow Rate and Volumes:

C = developed condition runoff coefficient =	0.58
A = drainage area =	3.34
t_c = post-developed time of concentration =	11.5
q_{p2} = allowable peak flow =	7.35
a_2 = 2-year rainfall constant =	121.86
b_2 = 2-year rainfall constant =	16.58
Calculate T_{d2} =	13.09 minutes
Calculate I_2 =	4.11 in/hr
$Q_{p2} = CI_2A$	
Calculate Q_{p2} =	7.96 cfs
Calculate V_2 =	933 cf
=	0.02 ac-ft

Determine the 10-year critical storm Flow Rate and Volumes:

C = developed condition runoff coefficient =	0.58
A = drainage area =	3.18
t_c = post-developed time of concentration =	11.5
q_{p10} = allowable peak flow =	8.68
a_{10} = 10-year rainfall constant =	185.06
b_{10} = 10-year rainfall constant =	20.81
Calculate T_{d10} =	16.74 minutes
Calculate I_{10} =	4.93 in/hr

$$Q_{10} = C_{10}A$$

$$\text{Calculate } Q_{10} = 9.09 \text{ cfs}$$

$$\text{Calculate } V_{10} = 1843 \text{ cf}$$

$$= 0.04 \text{ ac-ft}$$

Determine the 100-year critical storm Flow Rate and Volumes:

$$C = \text{developed condition runoff coefficient} = 0.58$$

$$A = \text{drainage area} = 3.18$$

$$t_c = \text{post-developed time of concentration} = 11.5$$

$$q_{p100} = \text{allowable peak flow} = 13.69$$

$$a_{100} = 100\text{-year rainfall constant} = 279.14$$

$$b_{100} = 100\text{-year rainfall constant} = 23.67$$

$$\text{Calculate } T_{d100} = 15.87 \text{ minutes}$$

$$\text{Calculate } I_{100} = 7.06 \text{ in/hr}$$

$$Q_{100} = C_{100}A$$

$$\text{Calculate } Q_{100} = 13.02 \text{ cfs}$$

$$\text{Calculate } V_{100} = 1038 \text{ cf}$$

$$= 0.02 \text{ ac-ft}$$

Appendix D
Construction Sequence

Sequence of Construction

1. Obtain Land Disturbing Permit from James City County.
2. Set up onsite Preconstruction Conference with JCC Environmental Division, 253-6670.
3. Locate existing sanitary lines in construction area of BMP #2, mark and stake. All heavy equipment will cross mains will be on proper matting where cover over existing sanitary lines is less than 3' or where conditions make it necessary to prevent damage to existing utilities.
4. Place silt fence along slope bottom on Northern property line.
5. Place tree protection measures as shown on the approved plans.
6. Clear and grub site. All materials to be removed and disposed of offsite in authorized dump site.
7. Strip topsoil and stockpile in location as shown on the approved plans.
8. Place silt fence around perimeter toe of stockpile.
9. Place pond outlet pipe and rip rap outlet protection. Use stone for the outlet protection to create a temporary Check Dam at the outlet pipe as shown on the plans.
10. Rough grade site constructing building pad and BMP berm.
11. Place building pad stone or temporary seeding.
12. Place pipe and swale leading from BMP #1, and place Rip Rap at BMP #2's inlet channel.
13. Place topsoil in and around BMP area. Seed and mulch.
14. Place erosion blanket on 2H:1V slope between BMP #2 and building pad.
15. Place silt fence uphill of pond and around and on down slope areas of building pad.
16. Seed and mulch all denuded areas as soon as possible.

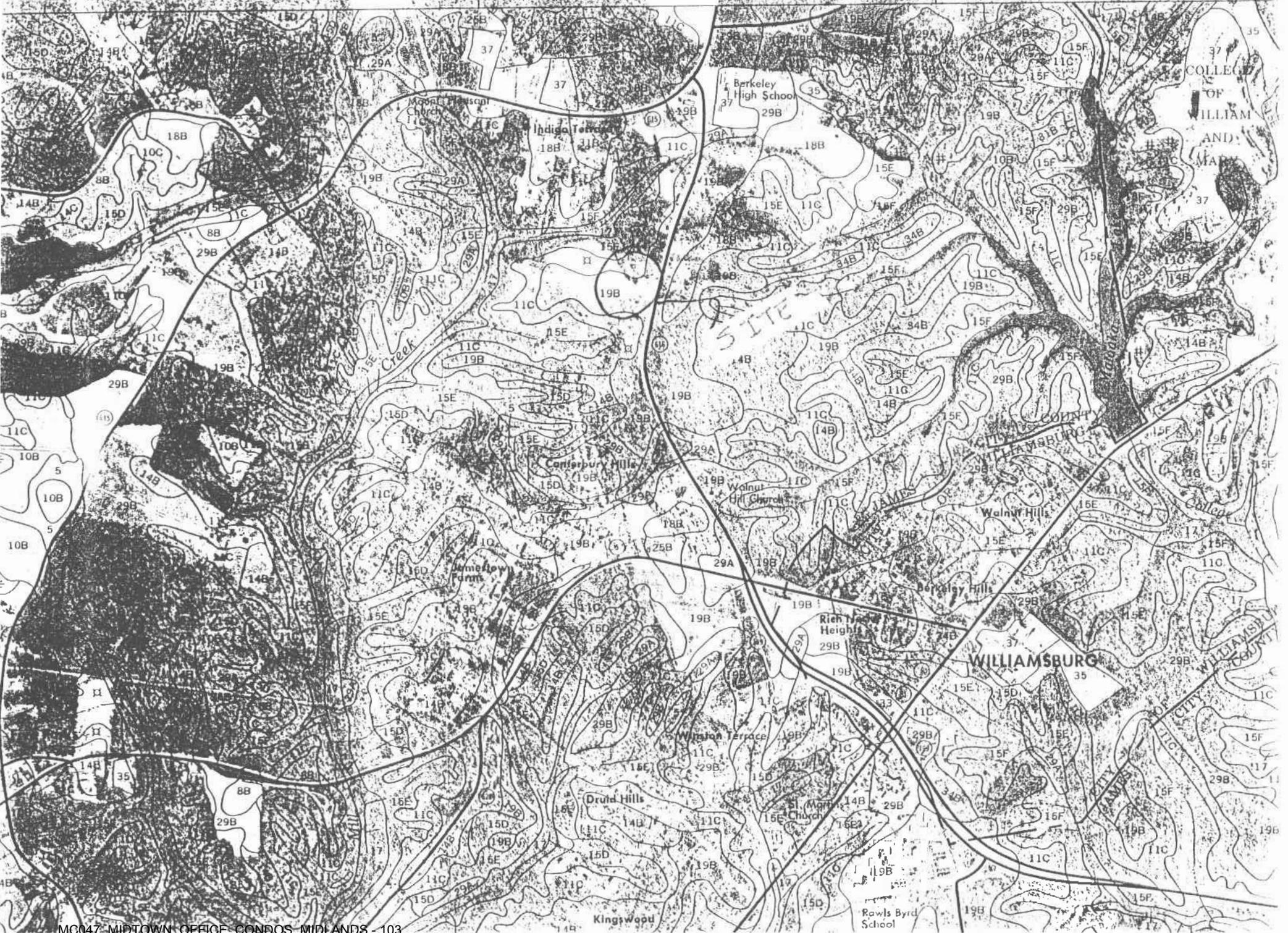
Appendix F

Erosion & Sediment Control Narrative

Erosion & Sediment Control Narrative for Lot 2 – Midlands Road

Development of Lot 2 of Midlands Road will require clearing less than 0.50 acre. Clearing activities are for the most part at the rear of the property where the new building and BMP #2 will be constructed. As can be seen on the attached soils map from the *Soil Survey of James City...*, soils on this site are general classified as SlagleEmporia-Suffolk. Soils under this classification are deep, moderately well drained and well drained soils that dominantly are loamy and are gently sloping to very steep; on uplands.

The construction sequence will first set up silt fence at the furthest downslope of the project prior to clearing. Establishing new stabilized/protected channels will be the next priority to insure continuity of stormwater drainage across the property. Construction of the BMP and building pad, and immediate stabilization of each area as final grade is achieved. EC-2 (Blanket) is placed on the slope between the BMP and the building pad to prevent erosion of that slope. Additional silt fence is placed on the downslope of the building pad and temporary stock pile.



Appendix G

BMP Maintenance Plan

Maintenance Plan for BMP #2 of Lot 2 – Midlands Road

A maintenance program is required to ensure the Stormwater Management (SWM) / Best Management Practice (BMP) facility functions as designed and to provide for reasonable aesthetic conditions. Proper maintenance is encouraged to prevent the introduction of debris and sediment at inflow locations, pretreatment areas, the BMP itself, its principal control structures and downstream waterways. Following installation and establishment of vegetation in disturbed site areas, inspections for sediment buildups will be performed at least quarterly. It is anticipated that under normal conditions, sediment removal will be required once every 5 to 10 years. If other construction or related land-disturbing activities are performed upslope of the BMP, adequate protection measures should be implemented with inspections performed at least once weekly.

The Owner or its designated representative will inspect the SWM/BMP structure after each significant rainfall event or the following working day if a weekend or holiday occurs. A significant rainfall for this structure is defined as one (1) inch or more of gauged rainfall within a 24 hour period. Once per year (more or less) a representative of the County may jointly inspect the structure. Appropriate action, performed at the cost of the owner will be taken to ensure appropriate maintenance. Where structures are to be maintained jointly, allocation of maintenance costs will be in accordance with terms established in maintenance agreements. Keys to locked access points or structures shall be made available to the County upon request.

BMP Description:

BMP #2 serves a drainage area of 3.34 acres associated with the Midlands Road area. The facility is a 4 point, dry-type detention facility, County Type F-2 BMP. A dry-type detention pond temporarily stores runoff and is normally dry during non-rainfall periods. Typically draw down times range from 24 to 72 hours following a storm event. Principal structures associated with the BMP consist of 1-18 inch & 1-15 inch inflow storm drains, a 36 inch vertical CMP riser, 18 inch HDPE outlet barrel and 6 ft. wide, grass-lined trapezoidal shaped emergency overflow channel. There is one opening in the riser to provide for water quality and one-year channel erosion drawdown. During the 100-year storm, the maximum water level should rise to about 0.62 feet above the top of the riser and within one foot below the top of dam. During this type of larger

storm event, the emergency spillway, which is located through the embankment directly west of the riser structure, will not normally discharge flow. If functioning properly, normal storm events should reach an elevation just below the top of the riser and the pond should draw down in about 24 to 36 hours.}

Inspection and maintenance of the facility will consist of the following additional measures:

1. Inspect for sediment buildup by visual observation and a physical determination of sediment depth within pond storage areas. If the depth of sediment reaches the depth of 6 inches above the bottom of pond (or Cleanout Elevation of 71.50), removal is required. At the same time, or at least once per year, clean pretreatment devices, the riser bottom and outlet pipes of accumulated sediments. Dispose of sediments removed from the facility at an acceptable disposal area. (Note: Cleanout Elevation corresponds to 10 percent of the Water Quality Volume).

FOREBAY?

2. Perform maintenance mowing of pond grasses at least twice each year. Grasses such as tall fescue should be mowed in early summer after emergence of the heads on cool season grasses and in late fall to prevent seeds of annual weeds from maturing. Mowing of legumes can be less frequent. Trees, shrubs and woody vegetation are not be permitted to grow along or on any part of the embankment that was constructed using engineered (compacted) fills.

3. Perform soil sampling on stabilized pond soil areas at least once every 4 years. Soil sampling and testing should be performed by qualified independent soil testing laboratory such as VPI&SU. Apply additional lime and fertilizer in accordance with test recommendations.

4. In stabilized pond areas, if vegetation covers less than 40 % of soil surfaces, lime, fertilize and seed in accordance with recommendations for new seedlings. If vegetation covers more than 40 % but less than 70 % of soil surfaces, lime, fertilize and over seed in accordance with current seeding recommendations or requirements of the Virginia Erosion and Sediment Control Handbook (VESCH).

5. Perform quarterly inspections of the riser section and crest spillway for the observance of collected trash and debris. Immediately remove any trash or debris that prevents the movement of water. Remove any trash and litter downstream and at storm drain or channel inflow locations to maintain the integrity of the structure and provide an attractive appearance.
6. Perform yearly structural inspections of the facility for damage. Structural inspection shall be performed on the riser, anti-vortex device, trash rack, orifices/weirs, outlet barrel and pond embankment. Exposed metal surfaces shall be re-painted or re-galvanized to minimize rust damage or replaced if rust damage is irreversible. If damage is evident, further investigation by a professional engineer may be required to assess the integrity of the structure.
7. Perform quarterly inspections of the graded side slopes of the facility for signs of animal/rodent borrows or slope erosion. Immediately perform necessary repairs, refilling or reseedling.
8. Perform yearly observations of perimeter areas surrounding the facility to ensure changes in land use, topography or access have not occurred and do not affect the operation, maintenance, access or safety features as provided. Appropriate action is required to ensure adequacy and to provide a clear, safe passage for maintenance vehicles to the engineered embankment and principal flow control structures.
9. Inspect and exercise pond drain valves, if provided, on a regular basis.
10. Record Keeping. The owner or designated representative shall keep reasonable, accurate written records of inspections performed for the structure. Records shall document routine maintenance and/or repairs performed. Copies shall be provided to the County upon request.
11. The facility shall not accept additional drainage or be modified in any way without prior consent or approval by the Environmental Division of James City County.

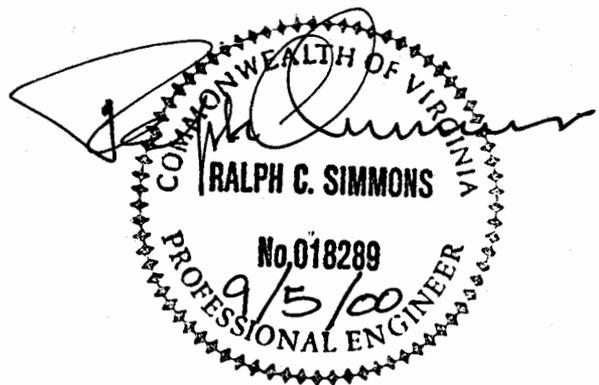
SP-100-00



**Lot 2
Midlands Road**

**Storm Water Drainage
&
Management Calculations**

August 20, 2000



SITE = 0.85 AC
IMP COVER

OA-1
OA-2
OA-9

5400
5400

4100

14,900 SF

0.3421 AC.

0.3421 / 0.85 = 40.2%

**Ralph C Simmons, PE
Consulting Engineer**
4732 Longhill Road, Suite 3103
Williamsburg Business Center
Williamsburg, Virginia 23188

SJT.
CHECK
SET.

VOID

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- IV. Storm Water Drainage Structure Calculations**
- V. Summary**

Appendix

- A. BMP #1 Watershed Area Pre and Post Development Tables**
- B. BMP #1 Storm Water Calculations**
- C. BMP #2 Watershed Area Pre and Post Development Tables**
- D. BMP #2 Storm Water Calculations**

I. Introduction

These calculations accompany and support project drawings titled "Lot 2, Midlands Road" with project number 00-105.

This calculations book is laid out in four major divisions. The first division is the Project Description, which includes a drainage area map and gives a brief description of the project's storm water concept both "pre" and "post" development. The second division organizes the calculations for the storm water management ponds and is further divided into three subdivisions which include Water Quality Analysis, and Design Calculations to modify the existing pond on Lot 3, and sizing the pond on located on Lot 2. The third division uses calculations from the storm water flows to size and determine materials for storm drainage structures and ditches. The final division is the "Summary". An appendix is provided for all pertinent support material.

II. Project Description w/ Drainage Area Map

The primary purpose of this project is to provide for a new office building on Lot 2 located on Midlands Road, the address is 3917 Midlands Road. The owner and developer chose to revise plans for Lot 3 (3909 Midlands Road) to consolidate storm water facilities for the two lots. This consolidation allows for a less intense storm water management BMP and yet provides for treatment of a larger area currently receiving none. This was coordinated in the "Conceptual Plan" phase with the James City County Planning Department, and Environmental Division. Conceptual plans were also reviewed by the JCSA, as the location of the BMP on Lot 2 may impact an existing sanitary sewer main.

BMP #1 - LOT 3

The small pond on Lot 3 is referred to as BMP #1, being the first in sequence. BMP #1 will control and treat the Water Quality Volume for the drainage area that flows through that lot, approximately 15,172 SF (0.35 acres) of post-development impervious area. BMP #1 structure was constructed by previously approved plans and will be modified in a plan amendment based on these calculations. BMP #1 also provides for storage of the two year storm event. Flows are released to the existing channel at pre-development rate that crosses the corner of the adjoining "Robinson" lot (3801 Strawberry Plains Road) as shown on the "Drainage Area Map". Flows from the ten, and 100 year storm events are routed through the pond and discharged to a constructed channel to be located on lot 2 that flows to the BMP on that lot, referred to as BMP #2.

*24 hour def of
100-year, 24
hour storm*

Lot 2 is a 37,200 SF parcel with an existing 10,980 SF paved parking lot. The planned development will add a new building with a footprint of 3,825 SF and

incidental impervious area of approximately 250 SF. Lot 2 is also the discharge point of a total watershed of 3.36 acres.

The design is advanced based on discussions and discussions and review with JCC Environmental Division that treating offsite drainage areas would permit the use of a "4 point BMP" and eliminate the need for a "Bio-retention BMP" on lot 3.

Pre Development

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.3	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	5,400	0	2,300	0	7,700	0.72
2	Lot 2 Pavement	5,400	0	2,300	0	7,700	0.72
3a	Midlands Road	4,356	0	4,200	0	8,556	0.61
3b	Midlands Road	2,644	0	2,800	0	5,444	0.59
4	Apartments & Mdlns	4,860	2,200	16,840	0	23,900	0.48
5	Midlands Road	1,238	0	1,238	0	2,476	0.60
6	Lot 1	5,400	1,400	2,000	0	8,800	0.76
7	Lot 1	8,400	2,520	1,080	0	12,000	0.85
8	Lot 1 & Mdlns	4,840	0	9,500	0	14,340	0.50
9	Lot 2 Bldg	0	0	2,651	20,000	22,651	0.21
10	Robinson Parcel	0	0	0	7,800	7,800	0.20
11	Lot 3	0	0	20,209	0	20,209	0.30
12	Lot 4	2,800	0	1,992	0	4,792	0.65
Square Footage		45,338	6,120	67,110	27,800	146,368	0.49
Acreage		1.04	0.14	1.54	0.64	3.36	

Post Development

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.3	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	5,400	0	2,300	0	7,700	0.72
2	Lot 2 Pavement	5,400	0	2,300	0	7,700	0.72
3a	Midlands Road	4,356	0	4,200	0	8,556	0.61
3b	Midlands Road	2,644	0	2,800	0	5,444	0.59
4	Apartments & Mdlns	4,860	2,200	16,840	0	23,900	0.48
5	Midlands Road	1,238	0	1,238	0	2,476	0.60
6	Lot 1	5,400	1,400	2,000	0	8,800	0.76
7	Lot 1	8,400	2,520	1,080	0	12,000	0.85
8	Lot 1 & Mdlns	4,840	0	9,500	0	14,340	0.50
9	Lot 2 Bldg	250	3,850	15,251	3,300	22,651	0.39 CHANGED
10	Robinson Parcel	0	0	0	7,800	7,800	0.20
11	Lot 3	6,000	2,016	12,193	0	20,209	0.54
12	Lot 4	2,800	0	1,992	0	4,792	0.65
Square Footage		51,588	11,986	71,694	11,100	146,368	0.55
Acreage		1.18	0.28	1.65	0.25	3.36	

III. Storm Water Management Pond Calculations

This division is divided into three sections. The first section is the "Water Quality Analysis" to determine the level of treatment required to meet the JCC Chesapeake Bay Ordinance. The second and third sections are design calculations for the two, ten and 100 year storm events for BMP #1 and #2, respectively. They are further divided into subsections for storm calculations, pond and release structures sizing.

A. Water Quality Analysis

Water Quality Treatment is accomplished at both BMPs for the total watershed of 146,368 SF (3.36 acres). BMP #1 serves a total area of 33,557 SF (0.77 acres). BMP #1 includes all of Lot 3 (DA-11), the southeast corner of Lot 4 (DA-12), and approximately 350 LF of the inbound lane of Midlands Road from Strawberry Plains Road (DA-3a). The breakdown of the watershed area is provided in Appendix "A", "BMP #1 Watershed Pre and Post Development Tables". Approximately 20,209 SF (0.46 acres) is considered onsite, with the balance of approximately 13,348 SF (0.31 acres) offsite. Offsite areas represent 66% of the onsite area.

0.46
0.31

0.77
2.59

3.36

BMP #2 serves the balance of the watershed, approximately 112,811 SF (2.59 acres). A breakdown of the watershed by drainage area is provided in Appendix "C", "BMP #2 Watershed Pre and Post Development Tables". Of that the new development of Lot 2 (DA-9) accounts for 20,000 SF (0.46 acres) and is considered onsite. Therefore offsite contribution is 464 % of onsite area being treated in BMP #2. As shown in the following "Worksheet for BMP Point System", the 10 points is calculated and exceeded with a total of 29.2 points provided by the two BMPs.

0.46 AC
OF
0.85 AC
SITE

BMP #1 SITE 0.46 AC
DA OFFSITE 0.31 AC. (3A, 12)

BMP #2 SITE 0.85 AC (0.46 REDEV)
DA OFFSITE 1.19 AC (4, 5, 6, 7, 8, 10, 3b)

3b 0.125 AC.
4 0.549 AC.
5 0.0568 AC.
6 0.202 AC
7 0.2755 AC.
8 0.329 AC.
10 0.179 AC

1.71 AC. \approx 1.74 AC.

BMP must treat impervious areas from
DA 3, 12, 3b, 4, 5, 6, 7, 8, 10

BMP #1 0.77 AC. DA.
#2 2.59 AC DA.
3.36

BMP 2 OFFSITE
2.59
0.85
1.74 AC. \pm

Worksheet for BMP Point System

*0.85 AC
LOT 2
0.46 AC SITE.*

A. STRUCTURAL BMP POINT ALLOCATION

	BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
<i>Bmp #1 LOT 2</i>	Onsite	(F2) 4	x	$\frac{0.46}{0.46} = 1$	=	4
	Offsite	(F2) 4	x	$\frac{0.31}{0.46} = 0.66$	=	2.64
<i>Bmp #2 LOT 3</i>	Onsite	(F2) 4	x	$\frac{0.46}{0.46} = 1$	=	4
	Offsite	(F2) 4	x	$\frac{2.51}{0.46} = 5.44$	=	18.56
TOTAL WEIGHTED STRUCTURAL BMP POINTS:						<u>29.2</u>

B. NATURAL OPEN SPACE CREDIT

*2.59 - (0.85 - 0.46)
= 2.28*

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
_____	x	(0.1 per 1%)	=	_____
_____	x	(0.15 per 1%)	=	_____

TOTAL NATURAL OPEN SPACE CREDIT: _____

C. TOTAL WEIGHTED POINTS

<u>29.2</u>	+	<u>0</u>	=	<u>29.2</u>
Structural BMP Points		Natural Open Space Points		Total

- ~~4 - 0.54 AC~~
- ~~5 - 0.057 AC~~
- ~~6 - 0.20 AC~~
- ~~7 - 0.275~~
- ~~1.07 AC~~
- ~~30 - 0.25 AC~~
- ~~1.195 AC~~
- ~~10 - 0.791 AC~~
- ~~1.374 AC~~

CHECK:

SITE 0.46 LOT 2 - 0.85 LOT 3

$\frac{0.46}{0.46} = 1.0$	x	4	=	4.00
$\frac{0.31}{0.46} = 0.66$	x	4	=	2.64
$\frac{0.85}{0.85} = 1.0$	x	4	=	4.00
$\frac{1.71}{0.85} = 2.01$	x	4	=	8.04
				<u>18.68</u>

∴ Appears to meet 10 point system.

B. BMP #1 Design

BMP #1 is existing and is modified by these calculations to serve as a Dry Extended Detention BMP in lieu of a BioRetention BMP previously designed by others. A site plan sketch follows and an amended site plan will be submitted at a later date for this BMP. The "Stage-Storage Worksheet" is based on the site plan sketch. The water quality volume will raise to an elevation of 86.24, the rim of the existing outlet structure. BMP #1 will provide storage for the water quality and two year volumes, and routing of all other storms via a combination of the BMP's outlet structure and a ditch constructed on Lot 2 that leads to BMP #2. BMP #2 will provide detention for the two and ten year storm events, and rout the 100 year storm for the entire site. Design of the outfall ditch onto Lot 2 is calculated in "Storm Water Drainage Structures".

MH RIM
86.74
DATA

Existing
Outlet Structure
RIM 86.24

Top of Berm 88.0

BMP INV 84.6

SW 89.67
(CRS)

PROPOSED 2-1/2 STORY
OFFICE BUILDING

1,991 S.F. FIRST FLOOR
1,964 S.F. SECOND FLOOR
545 S.F. THIRD FLOOR
4,500 S.F. TOTAL
FL. EL.: 101.17

PRO. ASPHALT
PARKING LOT
GRADED @ 1.0% MIN.

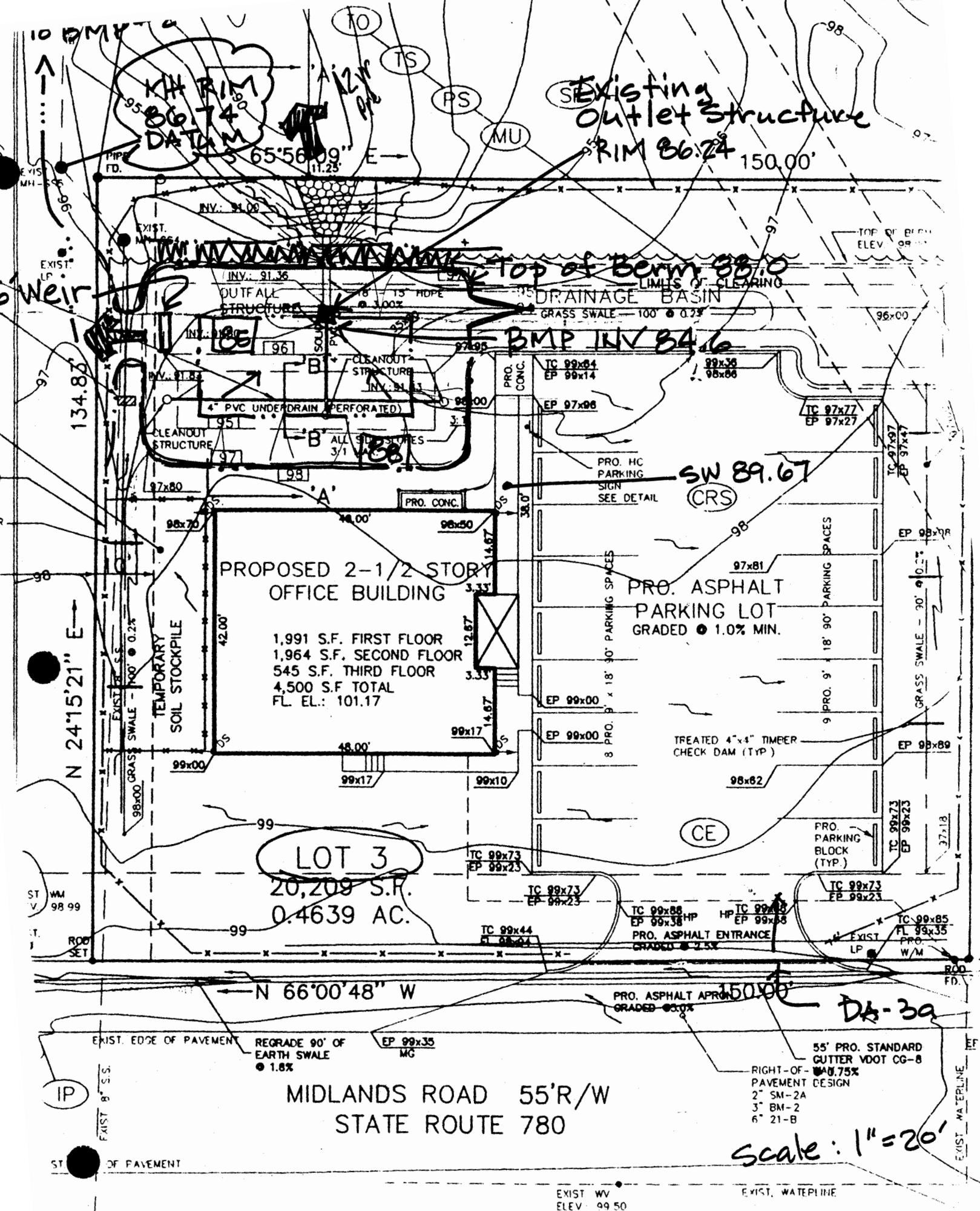
LOT 3
20,209 S.F.
0.4639 AC.

(CE)

N 66°00'48" W

MIDLANDS ROAD 55'R/W
STATE ROUTE 780

Scale: 1" = 20'



Stage-Storage Worksheet

PROJECT: 00-105, Lot 2 Midlands SHEET OF
 COUNTY: JCC COMPUTED BY: RCS DATE: 8/20/00
 DESCRIPTION: BMP # 1
 ATTACH COPY OF TOPO: SCALE - 1" = 20 ft.

1	2	3	4	5	6	7	8
ELEV.	AREA (in ²)	AREA (ft ²)	AVG. AREA (ft ²)	INTERVAL	VOL. (ft ³)	TOTAL VOLUME (ft ³) (ac.ft.)	
84.6		0				0	0
85		740	370	.4	148	148	0.063
86		1075	908	1	908	1056	0.024
86.24		1170	1123	.24	270	1326	0.030
87		1470	1320	.76	1003	2329	0.053
88		1925	1698	1	1698	4027	0.092

1. Water Quality Volume

BMP #1 will treat storm water runoff from Drainage Areas 11, 12 and 3a as shown in the "Post Development BMP #1" of Appendix "A", "BMP #1 Watershed Pre and Post Development Tables".

✓

$$V_{wq} = 15,172 \text{ SF} \times 1 \text{ in} / 12 \text{ in} / \text{ft} = 1,264 \text{ CF or } 0.03 \text{ ac-ft}$$

The following hand calculations determine the maximum flow rates and resize the existing outlet structure.

	<u>DA</u>	<u>Imp AREA</u>
11-	20,209	8016
12-	4,792	2800
3A-	8556	4356
	<u>33557</u>	<u>15,172 SF</u>

a. The maximum hydraulic head for the water quality volume is based on the existing structure. The rim is the high water for V_{wg} , elevation 86.24. The outlet orifice is centered on the 4" PVC outlet pipe in the drop inlet elevation 81.84.

$$\therefore h = 86.24 - 81.84 = 4.4'$$

b. Determine Q_{max} resulting from a 30 hr drawdown, given $V_{wg} = 1,264 \text{ cf} = \text{Vol RAD}$

$$Q_{avg} = 1,264 \text{ cf} / (30 \text{ hrs} \times 3600 \text{ sec}) \\ = 0.0117 \text{ cfs} \checkmark$$

$$Q_{max} = Q_{avg} \times 2 = 0.023 \text{ cfs} \checkmark$$

See the following outfall diagram.

c. Determine the required orifice diameter:

$$Q_{wg} = ca\sqrt{2gh} \quad \therefore a = \frac{Q}{c\sqrt{2gh}} \\ = \frac{0.023 \checkmark}{0.6\sqrt{2(32.2)(4.4)}} \\ = 0.00228 \text{ ft}^2 \checkmark$$

$$d = \sqrt{\frac{4a}{\pi}} = \sqrt{\frac{4(0.00228)}{\pi}} = 0.0539'$$

or 0.65" ϕ or $\frac{5}{8} \phi$

2. Two, Ten, and 100 Year Storm Calculations

The storm water calculations in Appendix "B" and summarized in the below are based on "Modified Rational Method, Critical Storm Duration" IAW the Virginia Storm Water Management Handbook. The difference between Pre and Post Development calculations are the flows from Midlands Road that in Pre Development flowed directly to the Drop Inlet in front of Lot 2. The construction of Lot 3's entrance road created a short circuit and now routes storm water from approximately 350 LF of the inbound lane of Midlands Road through the Lot 3 and BMP #1. Drainage area and "C" value calculations for BMP #1 are located in Appendix "A" as previously referred.

Summary of Storm Water Calculations BMP #1

Condition	Drainage Area	C	T _c	I _c	Q ₂	V ₂	I _c	Q ₁₀	V ₁₀	I _c	Q ₁₀₀
Pre-Developed	0.57	0.37	5	5.7	1.20		6.55	1.38		9.7	2.05
Post-Developed w/o 0.17	0.77 ✓	0.57 ✓	9.75	3.44	1.51	721	3.98	1.75	1277	5.54	2.43

LOT 3 H+H
 PRE Q2 1.08 cfs
 PRE Q10 2.20 cfs
 PRE Q100 3.39 cfs

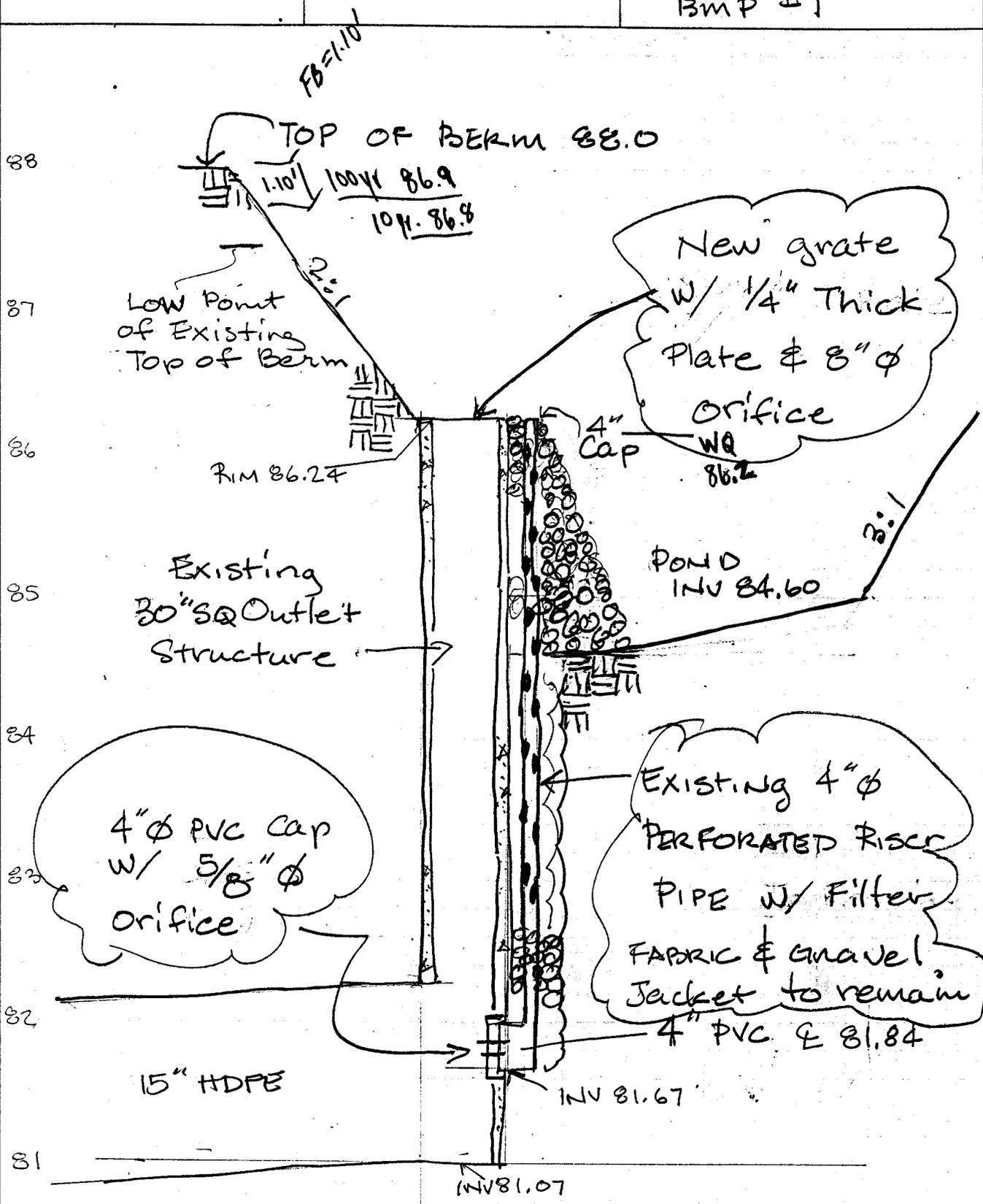
Stage-Storage-Discharge Worksheet BMP #1

Elev	Storage Volume	CF	Ac. Ft.	Water Quality Orifice		Weir		2 Year Orifice		Total Q	
				a =	Q	Length =	Q	a =	Q	CFS	Elev
				h	h	h	h	h	h		
81.07	Outlet Pipe	0	0.000	0.00	0.000	0.00	0.00	0.00	0.000	0.00	81.07
81.67	Orifice Invert	0	0.000	0.00	0.000	0.00	0.00	0.00	0.000	0.00	81.67
84.6	LP BMP	0	0.000	2.76	0.018	0.00	0.00	0.00	0.000	0.02	84.6
84.7		37	0.001	2.86	0.019	0.00	0.00	0.00	0.000	0.02	84.7
84.8		74	0.002	2.96	0.019	0.00	0.00	0.00	0.000	0.02	84.8
84.9		111	0.003	3.06	0.019	0.00	0.00	0.00	0.000	0.02	84.9
85.0		148	0.003	3.16	0.020	0.00	0.00	0.00	0.000	0.02	85
85.1		238.8	0.005	3.26	0.020	0.00	0.00	0.00	0.000	0.02	85.1
85.2		329.6	0.008	3.36	0.020	0.00	0.00	0.00	0.000	0.02	85.2
85.3		420.4	0.010	3.46	0.020	0.00	0.00	0.00	0.000	0.02	85.3
85.4		511.2	0.012	3.56	0.021	0.00	0.00	0.00	0.000	0.02	85.4
85.5		602	0.014	3.66	0.021	0.00	0.00	0.00	0.000	0.02	85.5
85.6		692.8	0.016	3.76	0.021	0.00	0.00	0.00	0.000	0.02	85.6
85.7		783.6	0.018	3.86	0.022	0.00	0.00	0.00	0.000	0.02	85.7
85.8		874.4	0.020	3.96	0.022	0.00	0.00	0.00	0.000	0.02	85.8
85.9		965.2	0.022	4.06	0.022	0.00	0.00	0.00	0.000	0.02	85.9
86.0		1056	0.024	4.16	0.022	0.00	0.00	0.00	0.000	0.02	86
86.1		1183.3	0.027	4.26	0.023	0.00	0.00	0.00	0.000	0.02	86.1
86.2	V_{weir}	1310.6	0.030	4.36	0.023	0.00	0.00	0.00	0.000	0.02	86.2
86.3		1437.9	0.033	4.46	0.023	0.00	0.00	0.06	0.416	0.44	86.3
86.4		1565.2	0.036	4.56	0.024	0.00	0.00	0.16	0.679	0.70	86.4
86.5		1692.5	0.039	4.66	0.024	0.00	0.00	0.26	0.865	0.89	86.5
86.6		1819.8	0.042	4.76	0.024	0.00	0.00	0.36	1.018	1.04	86.6
86.7	V_2	1947.1	0.045	4.86	0.024	0.00	0.00	0.46	1.151	1.18	86.7
86.8	Q_{10}	2074.4	0.048	4.96	0.025	0.10	0.55	0.56	1.270	1.84	86.8
86.9	Q_{100}	2201.7	0.051	5.06	0.025	0.20	1.56	0.66	1.379	2.96	86.9
87.0		2329	0.053	5.16	0.025	0.30	2.86	0.76	1.479	4.36	87
87.1		2498.8	0.057	5.26	0.025	0.40	4.40	0.86	1.574	6.00	87.1
87.2		2668.6	0.061	5.36	0.026	0.50	6.15	0.96	1.663	7.84	87.2
87.3		2838.4	0.065	5.46	0.026	0.60	8.09	1.06	1.747	9.86	87.3
87.4		3008.2	0.069	5.56	0.026	0.70	10.19	1.16	1.828	12.04	87.4
87.5		3178	0.073	5.66	0.026	0.80	12.45	1.26	1.905	14.38	87.5
87.6		3347.8	0.077	5.76	0.026	0.90	14.86	1.36	1.979	16.86	87.6
87.7		3517.6	0.081	5.86	0.027	1.00	17.40	1.46	2.051	19.48	87.7
87.8		3687.4	0.085	5.96	0.027	1.10	20.07	1.56	2.120	22.22	87.8
87.9		3857.2	0.089	6.06	0.027	1.20	22.87	1.66	2.187	25.09	87.9
88.0		4027	0.092	6.16	0.027	1.30	25.79	1.76	2.251	28.07	88

WQ 86.2

10 - EL. 86.8
100 - EL. 86.9

42,381 50 SHEETS 5 SQUARE
42,382 100 SHEETS 5 SQUARE
42,383 200 SHEETS 5 SQUARE
NATIONAL



BMP #1 Outfall Diagram

DATUM MH LOT 2, RIM 86.74 (see plan)

C. BMP #2 Design

BMP #2 is designed as a Dry Extended Detention BMP and is located on Lot 2. in lieu of a Bioretention BMP as previously designed. BMP #2 will detain for the two and ten year storm events, and rout the 100 year storm for the entire watershed (3.36 acres). Flows from the entire watershed flow to BMP #2. Water quality volumes are treated for all areas except areas previously treated by BMP #1. BMP #2 will treat 112,811 SF (2.59 acres) of area. Of that 48,402 SF (1.11 acres) are post-development impervious.

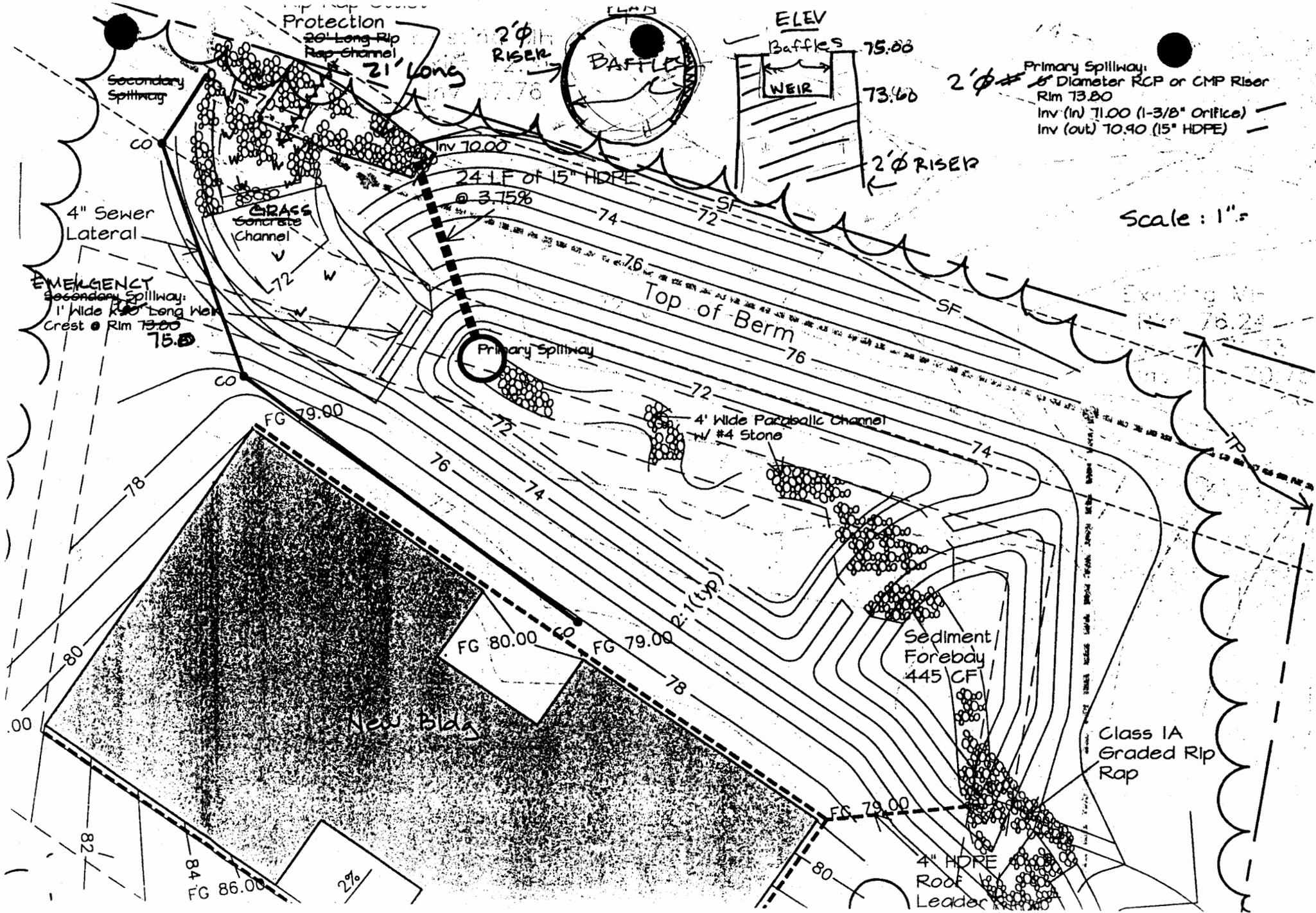
*DID NOT COMPLY
24 hr det of
1-yr, 24hr
storm?*

BMP #2 will detain and release the two and ten year storms at pre-development rates for the entire site of 146,368 SF (3.36 acres). The 100 year storm is routed.

A site plan sketch follows and is used to develop the "Stage-Storage Worksheet".

	IMP AREA
3A	4356
12	2800
3b	2644
4	7060
5	1238
6	6800
7	10920
8	4840
10	0
	<hr/>
	40658

CREDIT WAS TAKEN ←



Primary Spillway:
 6" Diameter RCP or CMP Riser
 Rim 73.80
 Inv (in) 71.00 (1-3/8" Orifice)
 Inv (out) 70.90 (15" HDPE)

Scale: 1" = 5'

BMP #2

1. Water Quality Volume

BMP #2 will treat storm water runoff from all Drainage Areas except those treated by BMP #1 as shown Appendix "C", "Post Development BMP #1".

BMP #2 Impervious Area = Total Watershed Impervious Area - BMP #1
Impervious Area

$$\begin{aligned} &= 63,574 \text{ SF} - 15,172 \text{ SF} \checkmark \\ &= 48,402 \text{ SF} \checkmark \end{aligned}$$

$$V_{wq} = 48,402 \text{ SF} \times 1 \text{ in} / 12 \text{ in} / \text{ft} = 4,035 \text{ CF} \text{ or } 0.09 \text{ ac-ft} \checkmark$$

The following hand calculations determine the maximum flow rates and size the new outlet structure.

2. Two, Ten, and 100 Year Storm Calculations

The storm water calculations in Appendix "D" and summarized in the table below are based on the "Modified Rational Method, Critical Storm Duration" IAW the Virginia Storm Water Management Handbook.

Summary of Storm Water Calculations BMP #2

Condition	Drainage Area	C	T _c	I _c	Q ₂	V ₂	I _c	Q ₁₀	V ₁₀	I _c	Q ₁₀₀
Pre-Developed	3.36 ✓	0.49 ✓	11.5	4.4	7.24		5.2	8.56		8.2	13.5
Post-Developed w/o QRT	3.36	0.55 ✓	11.5	4.17	7.71	679	5.03	8.79	1418	7.20	12.59

Routed
 2
 10
 100
 7.23 @ EL

3. BMP Sizing

This section calculates storage and outlet structure sizes given the "Stage-Storage Worksheet" previously developed for BMP #2. Flow rates for the two and ten storms are maintained at pre-development rates. The 100 year storm is routed through the BMP. The resulting "Stage-Storage-Discharge Worksheet" follows.

a: Determine maximum hydraulic head (h_{max}) corresponding to the required water quality volume from the "Stage - Storage Worksheet".

$$V_{wq} = 0.09 \text{ ac-ft} \checkmark$$

Water quality volume will flood between contours 73 & 74

$$\therefore \frac{74 - x}{74 - 73} = \frac{0.11 - 0.09}{0.11 - 0.06}$$

$$\frac{74 - x}{1} = \frac{0.02}{0.05}$$

$$3.7 - 0.05x = 0.02$$

$$x = 73.6$$

V_{wq} floods to 73.6 Elevation

b. Determine Q_{max} resulting from a 30 hr drawdown, given $V_{wq} = 4035 \text{ cf}$

$$Q_{avg} = 4035 \text{ cf} / (30 \text{ hrs} \times 3600 \text{ sec})$$

$$= 0.037 \text{ cfs}$$

$$Q_{max} = Q_{avg} \times 2 = 0.075$$

C. Determine the required orifice diameter :

$$Q = C_a \sqrt{2gh}$$

$$\therefore a = \frac{Q}{C \sqrt{2gh}}$$

$$a = \frac{0.075}{0.6 \sqrt{2(32.2)(2.6)}}$$

$$= 0.01 \text{ ft}^2$$

$$d = \sqrt{\frac{4a}{\pi}}$$

$$= \sqrt{\frac{4 \times 0.01}{\pi}}$$

$$= 0.11' \text{ or } 1.35" \phi$$

Develop a "stage-storage-discharge worksheet"

$$Q = C_a \sqrt{2gh}$$

$$= 0.6(0.01) \sqrt{2(32.2)h}$$

$$= 0.048 \sqrt{h}$$

From the "... worksheet" and after several trial & errors attempts a 24" Φ riser with baffles a weir length of 3.14' is used

To summarize the "... worksheet"

@ $Q_2 = 7.24$ cfs @ Elevation 74.45
providing 6,024 cf > 4709 cf OK

@ $Q_{10} = 8.56$ cfs @ Elevation 74.55
providing 6,254 cf > 6142 cf OK

$Q_{100} = 13.50$ cfs @ Elevation 74.895
providing 1.41' of freeboard.

Stage-Storage-Discharge Worksheet BMP #2

PLAN SHOWS 10' WIDE ES @ EL. 73.80

Elev		Storage Volume		Water Quality Orifice		Weir		Total Q	
		CF	Ac. Ft.	a = El = h	Q	Length = El = h	Q	CFS	Elev
71	Orifice Invert	0	0.000	0.00	0.000	0.00	0.00	0.00	71
72		826	0.019	1.00	0.048	0.00	0.00	0.05	72
73		2089	0.062	2.00	0.068	0.00	0.00	0.07	73
73.1		2919	0.067	2.10	0.070	0.00	0.00	0.07	73.1
73.2		3149	0.072	2.20	0.071	0.00	0.00	0.07	73.2
73.3		3379	0.078	2.30	0.073	0.00	0.00	0.07	73.3
73.4		3609	0.083	2.40	0.075	0.00	0.00	0.07	73.4
73.5		3839	0.088	2.50	0.076	0.00	0.00	0.08	73.5
73.6	V_{wq} & Riser Rim	4069	0.093	2.60	0.078	0.00	0.00	0.08	73.6
73.7		4299	0.099	2.70	0.079	0.10	0.29	0.37	73.7
73.8		4529	0.104	2.80	0.081	0.20	0.81	0.90	73.8
73.9		4759	0.109	2.90	0.082	0.30	1.50	1.58	73.9
74		4989	0.115	3.00	0.083	0.40	2.30	2.39	74
74.1		5219	0.120	3.10	0.085	0.50	3.22	3.30	74.1
74.2		5449	0.125	3.20	0.086	0.60	4.23	4.32	74.2
74.3		5679	0.130	3.30	0.087	0.70	5.33	5.42	74.3
74.4		5909	0.136	3.40	0.089	0.80	6.52	6.60	74.4
74.45	V_2	6024	0.138	3.45	0.089	0.85	7.14	7.23	74.45
74.5		6139	0.141	3.50	0.090	0.90	7.77	7.86	74.5
74.55	V_{10}	6254	0.144	3.55	0.091	0.95	8.43	8.52	74.55
74.6		6369	0.146	3.60	0.091	1.00	9.11	9.20	74.6
74.7		6599	0.151	3.70	0.093	1.10	10.51	10.60	74.7
74.8		6829	0.157	3.80	0.094	1.20	11.97	12.06	74.8
74.9		7059	0.162	3.90	0.095	1.30	13.50	13.59	74.9
74.895	V_{100}	7047.5	0.162	3.90	0.095	1.30	13.42	13.51	74.895
75		7755	0.178	4.00	0.096	1.40	15.08	15.18	75
76	Top of Berm	1105	0.255	5.00	0.108	2.40	33.86	33.96	76

IV. Storm Water Drainage Structures

This section designs related outfall structures and ditches of this project. The following structures are designed here:

BMP #1 Outfall Ditches

BMP #2 Rip Rap Outlet

BMP #2 Emergency Spillway

A: BMP # 1 Outfall Ditches

The outfall ditch fall from BMP # 1 will carry ten & 100 year flows as previously discussed.
 $Q_{max} = 1.60$ cfs. Design a grass lined v-ditch.

Vee Ditch Calculations

Description: **BMP #1 Secondary Outfall (A - B)**

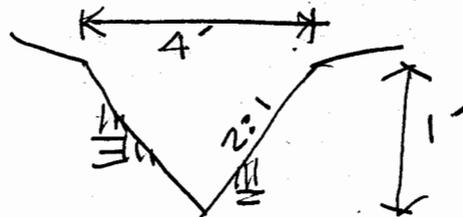
Slope = 0.0353
 $Q = 1.60$
 $n = 0.046$
 $M = 2$

y	R	Area	Velocity	Q
1.5	0.67	4.50	4.66	20.96
1.4	0.63	3.92	4.45	17.43
1.3	0.58	3.38	4.23	14.30
1.2	0.54	2.88	4.01	11.55
1.1	0.49	2.42	3.78	9.16
1	0.45	2.00	3.55	7.10
0.9	0.40	1.62	3.31	5.36
0.8	0.36	1.28	3.06	3.91
0.7	0.31	0.98	2.79	2.74
0.6	0.27	0.72	2.52	1.81
0.5	0.22	0.50	2.23	1.12
0.4	0.18	0.32	1.92	0.61
0.3	0.13	0.18	1.58	0.29
0.2	0.09	0.08	1.21	0.10
0.1	0.04	0.02	0.76	0.02

T&E:

0.57 0.25 0.65 2.44 1.58

Maximum depth of water is 0.6'.

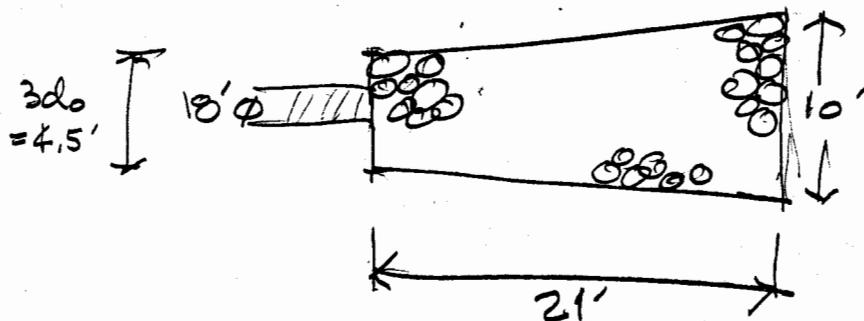


B. BMP # 2 Rip Rap Outlet Protection

Size the outlet protection to handle flows from BMP # 100 yr storm : $Q_{100} = 13.50$

Outlet Pipe Diameter = 18" ϕ
w/ Tailwater condition $> 0.5 D_o$

$d_{50} = 0.3'$ $L_a = 21'$
use 0.5' ϕ
Rip Rap



RIP RAP OUTLET DIMENSIONS

NTS

C. BMP #2 Emergency Spillway

All storms are passed in the Primary Spillway. Provide a spillway at the high water mark of 75.00 to keep flows from ever topping the berm.

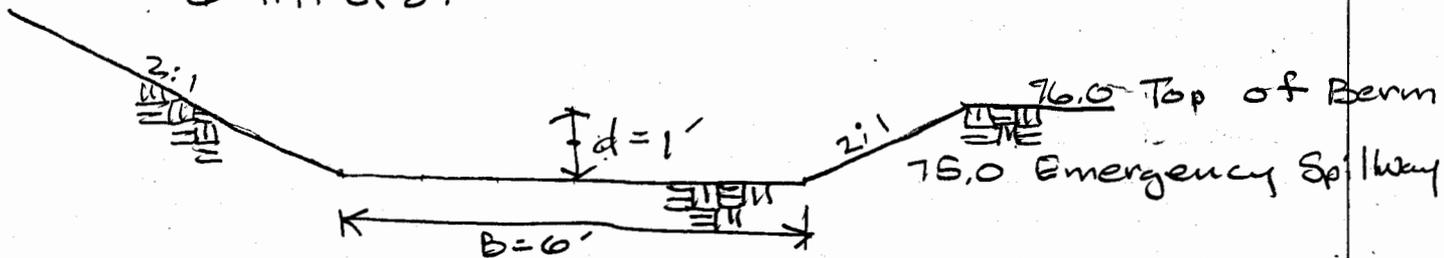
Trapazodial Ditch Calculations

Description: **BMP #2 Emergency Spillway**

Slope = 0.167
 Q = ????
 n = 0.046
 M = 2
 b = 6

y	R	Area	Velocity	Q
1.5	1.06	13.50	13.78	186.08
1.4	1.00	12.32	13.28	163.60
1.3	0.95	11.18	12.76	142.62
1.2	0.89	10.08	12.21	123.11
1.1	0.83	9.02	11.65	105.05
1	0.76	8.00	11.05	88.41
0.9	0.70	7.02	10.43	73.19
0.8	0.63	6.08	9.76	59.36
0.7	0.57	5.18	9.05	46.90
0.6	0.50	4.32	8.29	35.82
0.5	0.42	3.50	7.46	26.11
0.4	0.35	2.72	6.54	17.79
0.3	0.27	1.98	5.50	10.89
0.2	0.19	1.28	4.28	5.48
0.1	0.10	0.62	2.76	1.71

Velocities become erodable at over 0.1' depth & 1.71 cfs.



Emergency Spillway will handle 88 cfs before the berm is topped.

V. Summary

Storm water flows from the 3.36-acre drainage basin will be treated on Lots 2 and 3 achieving a total of 29.2 water quality points.

The Dry Extended Detention Pond on Lot 3 (BMP #1) will provide storage and control for the "water quality storm" for 0.77 acres. The two year storm is detained and release at pre-development flow rates through the existing BMP modified outlet structure. The ten and 100 year storm events for that same area are routed through BMP #1 to a combination of the outlet structure and the new ditch located on Lot 2 that flows to BMP #2.

The Dry Extended Detention Pond on Lot 2 (BMP #2) will provide storage and control for the "water quality storm" for 2.59 acres of the drainage basin. BMP #2 provides storage and detention for the entire 3.36 acre basin for the two, and ten year storm events, and routing of the 100 year. The primary spillway controls all storm events. An emergency spillway is provided above all storm events.

Appendix

Appendix A

**BMP #1 Watershed Area Pre and Post Development
Tables**

Pre Development BMP #1

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.3	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	0	0	0	0	0	#DIV/0!
2	Lot 2 Pavement	0	0	0	0	0	#DIV/0!
3a	Midlands Road	0	0	0	0	0	#DIV/0!
3b	Midlands Road	0	0	0	0	0	#DIV/0!
4	Apartments & Mdlns	0	0	0	0	0	#DIV/0!
5	Midlands Road	0	0	0	0	0	#DIV/0!
6	Lot 1	0	0	0	0	0	#DIV/0!
7	Lot 1	0	0	0	0	0	#DIV/0!
8	Lot 1 & Mdlns	0	0	0	0	0	#DIV/0!
9	Lot 2 Bldg	0	0	0	0	0	#DIV/0!
10	Robinson Parcel	0	0	0	0	0	#DIV/0!
11	Lot 3	0	0	20,209	0	20,209	0.50
12	Lot 4	2,800	0	1,992	0	4,792	0.65
Square Footage		2,800	0	22,201	0	25,001	0.57
Acreage		0.06	0.00	0.51	0.00	0.57	

Post Development BMP #1

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.3	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	0	0	0	0	0	#DIV/0!
2	Lot 2 Pavement	0	0	0	0	0	#DIV/0!
3a	Midlands Road	4,356	0	4,200	0	8,556	0.61
3b	Midlands Road	0	0	0	0	0	#DIV/0!
4	Apartments & Mdnds	0	0	0	0	0	#DIV/0!
5	Midlands Road	0	0	0	0	0	#DIV/0!
6	Lot 1	0	0	0	0	0	#DIV/0!
7	Lot 1	0	0	0	0	0	#DIV/0!
8	Lot 1 & Mdnds	0	0	0	0	0	#DIV/0!
9	Lot 2 Bldg	0	0	0	0	0	#DIV/0!
10	Robinson Parcel	0	0	0	0	0	#DIV/0!
11	Lot 3	6,000	2,016	12,193	0	20,209	0.54
12	Lot 4	2,800	0	1,992	0	4,792	0.65
Square Footage		13,156	2,016	13,385	0	33,557	0.57
Acreage		0.30	0.05	0.42	0.00	0.77	

Appendix B

BMP #1 Storm Water Calculations

Summary of Storm Water Calculations BMP #1

Condition	Drainage Area	C	T_c	I_c	Q₂	V₂	I_c	Q₁₀	V₁₀	I_c	Q₁₀₀
Pre-Developed	0.57	0.37	5	5.7	1.20		6.55	1.38		9.7	2.05
Post-Developed	0.77	0.57	9.75	3.44	1.51	721	3.98	1.75	1277	5.54	2.43

Storm Water Calculations BMP #1

Determine the 2-year critical storm Flow Rate and Volumes:

$$C = \text{developed condition runoff coefficient} = 0.57$$

$$A = \text{drainage area} = 0.77$$

$$t_c = \text{post-developed time of concentration} = 9.75$$

$$q_{p,2} = \text{allowable peak flow} = 1.20$$

$$a_2 = \text{2-year rainfall constant} = 121.86$$

$$b_2 = \text{2-year rainfall constant} = 16.58$$

$$\text{Calculate } T_{d2} = 18.89 \text{ minutes}$$

$$\text{Calculate } i_2 = 3.44 \text{ in/hr}$$

$$Q_{p2} = C i_2 A$$

$$\text{Calculate } Q_{p2} = 1.51 \text{ cfs}$$

$$\text{Calculate } V_2 = 721 \text{ cf}$$

$$= 0.02 \text{ ac-ft}$$

Determine the 10-year critical storm Flow Rate and Volumes:

$$C = \text{developed condition runoff coefficient} = 0.57$$

$$A = \text{drainage area} = 0.77$$

$$t_c = \text{post-developed time of concentration} = 9.75$$

$$q_{p,10} = \text{allowable peak flow} = 1.38$$

$$a_{10} = \text{10-year rainfall constant} = 185.06$$

$$b_{10} = \text{10-year rainfall constant} = 20.81$$

$$\text{Calculate } T_{d10} = 25.67 \text{ minutes}$$

$$\text{Calculate } i_{10} = 3.98 \text{ in/hr}$$

$$Q_{10} = C_{10}A$$

$$\text{Calculate } Q_{10} = 1.75 \text{ cfs}$$

$$\text{Calculate } V_{10} = 1277 \text{ cf}$$

$$= 0.03 \text{ ac-ft}$$

Determine the 100-year critical storm Flow Rate and Volumes:

$$C = \text{developed condition runoff coefficient} = 0.57$$

$$A = \text{drainage area} = 0.77$$

$$t_p = \text{post-developed time of concentration} = 9.75$$

$$q_{p100} = \text{allowable peak flow} = 2.05$$

$$a_{100} = 100\text{-year rainfall constant} = 279.14$$

$$b_{100} = 100\text{-year rainfall constant} = 23.67$$

$$\text{Calculate } T_{a100} = 26.76 \text{ minutes}$$

$$\text{Calculate } I_{100} = 5.54 \text{ in/hr}$$

$$Q_{100} = C_{100}A$$

$$\text{Calculate } Q_{100} = 2.43 \text{ cfs}$$

$$\text{Calculate } V_{100} = 1716 \text{ cf}$$

$$= 0.04 \text{ ac-ft}$$

Appendix C

**BMP #2 Watershed Area Pre and Post Development
Tables**

Pre Development BMP #2

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.5	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	5,400	0	2,300	0	7,700	0.72
2	Lot 2 Pavement	5,400	0	2,300	0	7,700	0.72
3a	Midlands Road	4,356	0	4,200	0	8,556	0.61
3b	Midlands Road	2,644	0	2,800	0	5,444	0.59
4	Apartments & Mdlnds	4,860	2,200	16,840	0	23,900	0.48
5	Midlands Road	1,238	0	1,238	0	2,476	0.60
6	Lot 1	5,400	1,400	2,000	0	8,800	0.76
7	Lot 1	8,400	2,520	1,080	0	12,000	0.85
8	Lot 1 & Mdlnds	4,840	0	9,500	0	14,340	0.50
9	Lot 2 Bldg	0	0	2,651	20,000	22,651	0.21
10	Robinson Parcel	0	0	0	7,800	7,800	0.20
11	Lot 3	0	0	20,209	0	20,209	0.30
12	Lot 4	2,800	0	1,992	0	4,792	0.65
Square Footage		45,338	6,120	67,110	27,800	146,368	0.49
Acreage		1.04	0.14	1.54	0.64	3.36	

Post Development BMP #2

Drainage Area #	Description	Pavement C=0.9	Bldg C=0.9	Lawn C=0.3	Wooded C=0.2	Total Area	C
1	Lot 2 Pavement	5,400	0	2,300	0	7,700	0.72
2	Lot 2 Pavement	5,400	0	2,300	0	7,700	0.72
3a	Midlands Road	4,356	0	4,200	0	8,556	0.61
3b	Midlands Road	2,644	0	2,800	0	5,444	0.59
4	Apartments & Mdlns	4,860	2,200	16,840	0	23,900	0.48
5	Midlands Road	1,238	0	1,238	0	2,476	0.60
6	Lot 1	5,400	1,400	2,000	0	8,800	0.76
7	Lot 1	8,400	2,520	1,080	0	12,000	0.85
8	Lot 1 & Mdlns	4,840	0	9,500	0	14,340	0.50
9	Lot 2 Bldg	250	3,850	15,251	3,300	22,651	0.39
10	Robinson Parcel	0	0	0	7,800	7,800	0.20
11	Lot 3	6,000	2,016	12,193	0	20,209	0.54
12	Lot 4	2,800	0	1,992	0	4,792	0.65
Square Footage		51,583	11,986	71,694	11,100	146,368	0.55
Acreage		1.18	0.28	1.65	0.25	3.36	

Handwritten calculations:
~~51,583~~
~~11,986~~
~~63,574~~

Appendix D

BMP #2 Storm Water Calculations

Summary of Storm Water Calculations BMP #2

Condition	Drainage Area	C	T_c	I_c	Q₂	V₂	I_c	Q₁₀	V₁₀	I_c	Q₁₀₀
Pre-Developed	3.36	0.49	11.5	4.4	7.24		5.2	8.56		8.2	13.50
Post-Developed	3.36	0.55	11.5	4.17	7.71	679	5.03	8.79	1418	7.20	12.59

Storm Water Calculations BMP #2

Determine the 2-year critical storm Flow Rate and Volumes:

$$C = \text{developed condition runoff coefficient} = 0.55$$

$$A = \text{drainage area} = 3.36$$

$$t_c = \text{post-developed time of concentration} = 11.5$$

$$q_{p2} = \text{allowable peak flow} = 7.24$$

$$a_2 = \text{2-year rainfall constant} = 121.86$$

$$b_2 = \text{2-year rainfall constant} = 16.58$$

$$\text{Calculate } T_{d2} = 12.61 \text{ minutes}$$

$$\text{Calculate } I_2 = 4.17 \text{ in/hr}$$

$$Q_{p2} = CI_2A$$

$$\text{Calculate } Q_{d2} = 7.71 \text{ cfs}$$

$$\text{Calculate } V_2 = 679 \text{ cf}$$

$$= 0.02 \text{ ac-ft}$$

Determine the 10-year critical storm Flow Rate and Volumes:

$$C = \text{developed condition runoff coefficient} = 0.55$$

$$A = \text{drainage area} = 3.18$$

$$t_c = \text{post-developed time of concentration} = 11.5$$

$$q_{p10} = \text{allowable peak flow} = 8.56$$

$$a_{10} = \text{10-year rainfall constant} = 185.06$$

$$b_{10} = \text{10-year rainfall constant} = 20.81$$

$$\text{Calculate } T_{d10} = 16.02 \text{ minutes}$$

$$\text{Calculate } I_{10} = 5.03 \text{ in/hr}$$

$$Q_{10} = C I_{10} A$$

$$\text{Calculate } Q_{10} = 8.79 \text{ cfs}$$

$$\begin{aligned} \text{Calculate } V_{10} &= 1418 \text{ cf} \\ &= 0.03 \text{ ac-ft} \end{aligned}$$

Determine the 100-year critical storm Flow Rate and Volumes:

$$C = \text{developed condition runoff coefficient} = 0.55$$

$$A = \text{drainage area} = 3.18$$

$$t_0 = \text{post-developed time of concentration} = 11.5$$

$$q_{p100} = \text{allowable peak flow} = 13.50$$

$$a_{100} = 100\text{-year rainfall constant} = 279.14$$

$$b_{100} = 100\text{-year rainfall constant} = 23.67$$

$$\text{Calculate } T_{d100} = 15.11 \text{ minutes}$$

$$\text{Calculate } I_{100} = 7.20 \text{ in/hr}$$

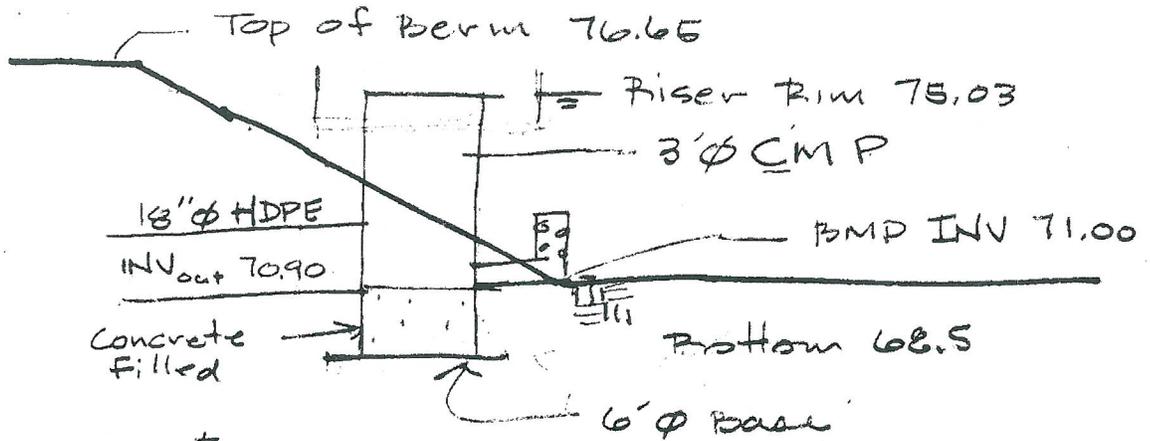
$$Q_{100} = C I_{100} A$$

$$\text{Calculate } Q_{100} = 12.59 \text{ cfs}$$

$$\begin{aligned} \text{Calculate } V_{100} &= 479 \text{ cf} \\ &= 0.01 \text{ ac-ft} \end{aligned}$$

BMP #2

9. Riser Buoyancy Calculations

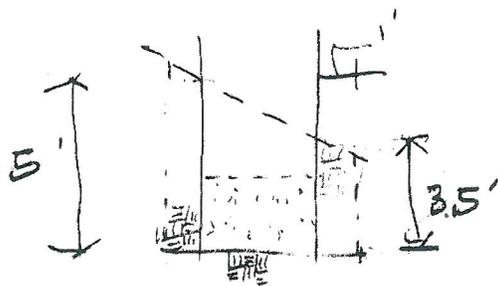


Buoyant Force:

$$\begin{aligned} \text{Riser Volume} &= (75.03 - 68.5) \times \pi (1.5)^2 \\ &= 6.53 \times 7.07 \\ &= 46.2 \text{ cf} \end{aligned}$$

$$\begin{aligned} \text{Force} &= 46.2 \text{ cf} \times 62.4 \text{ \#/cf} \\ &= 2,883 \text{ \#} \uparrow \end{aligned}$$

Resisting Force:



Concrete Filled
 $\pi (1.5)^2 \times 2.5 \times 150 \text{ \#/ft} = 2651 \text{ \#}$
 Earth:

Average ht. around riser = 3.5'
 $(\pi (2.5)^2 - \pi (1.5)^2) \times 4 \times 110 \text{ \#/ft} =$
 $(19.63 - 7.07) \times 4 \times 110 = \frac{5,526 \text{ \#}}{8,177 \text{ \#}}$

Adequate w/only base
 $\text{Force} = \frac{8,177 \text{ \#}}{2,651 \text{ \#}}$

$$= 3.08 > 1.25$$

IT DON'T FLOAT.

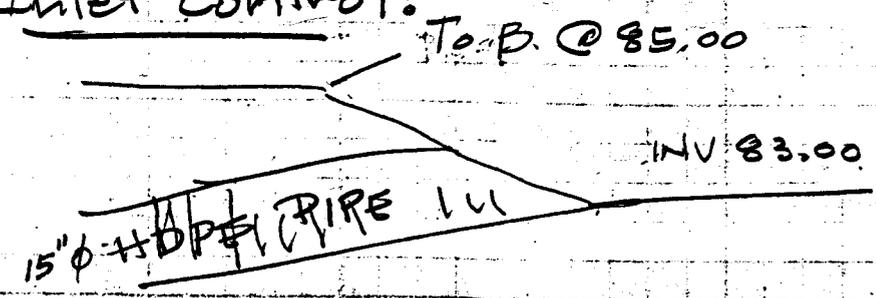
IV A, (Continued)

16.16.10
JCF

Size the culvert pipe under the gravel access road to carry:

$$Q_{\text{max}} = 2.44 \text{ cfs}$$

Inlet Control:



50 LF of
15" HDPE
11.7%

Ref p 181 of UDOT Drainage Manual.

$$w/ 15" \phi \text{ Pipe } \& \ 2Q = 2.44 \text{ cfs}$$

$$HW/d = 0.73$$

$$HW = 0.91' < 2' \text{ Actual.}$$

Inlet Control works

[Faded handwritten notes and calculations, including the equation Q = 1.49 C_d A V and other illegible scribbles.]

15" ϕ Culvert Works



Ralph Simmons
258-5000
Lot 3 - Bioretention
Lot 2 - New Redev. Planned.

Ralph C. Simmons, P. E.
Consulting Engineer
4732 Longhill Road, Suite 3103
Williamsburg, VA 23188
(757) 258-5000 Fax (757) 258-3758
E-mail: rcsPE@QuixNet.net

May 9, 2000

Mr. Andy Piplico
PO Box 1338
Williamsburg, VA 23187

FOR SCOTT THOMAS
CONCEPT PLAN STAGE

RE: Storm Water Management Analysis
Lots 2 & 3 Midlands Road
James City County
Project # 00-105

Sent via fax 565-0416

Dear Andy,

This is the result of my review and analysis of the Storm Water Management (SWM) requirements for lots 2 & 3 of Midlands Road.

I met with Scott Thomas, PE of JCC Environmental Division, and discussed with him the following three options and scenarios as alternatives to construction of the Bioretention BMP on lot 3.

In the first option, "A", I analyzed the scenario of using the designed bioretention system for lot 3, and constructing a new BMP for lot 2. Due to the larger offsite area, approximately 1.25 + acres, that drains thru lot 2, only three (3) BMP Points are required for development of that lot. Available are BMP systems like the "Open Channel System" (E1 or E2) or "Extended Dry Detention System" (F1 or F2). You are not be limited to those, but options have grown.

? Option "B" analyzed the scenario of consolidating the flows from both lots, and constructing a detention basin on lot 3 to release water across the existing channel on the Robinson parcel at a predevelopment rate. A SWM BMP would be constructed on lot 2 and control storm water from approximately 2.5 acres. Of that area lots 2 and 3 contribute 0.98 acres. Because of the volume of offsite area serviced, only 3.95 BMP Points are required, meaning you would be able to construct the same BMPs as described in Option "A".

→
CookWB
AT
Option C

Option "C" is similar to "B", but eliminates the construction of the basin on lot 3 all together. Optional too, but eliminate from this scenario are the flows from the Robinson parcel. Storm water flows from lot 3 would be channeled to the BMP on lot 2, as you and I discussed earlier onsite. The drainage area in this option is less, with about 2.37 acres served. Again lots 2 and 3 contribute 0.98 acres. Required BMP Points are 4.22. That would bump some of the options for BMPs; the options now would be Small Wet Pond (A1), Wetlands (B1 or B2), or Pocket Sand Filter (D6). I will say this about my calculations, they are conservative and after walking the site again (offsite too), I feel that the contributing acreage is larger and would open Option "C" to the

C:\My Documents\report 00-105 midlands road.doc.doc

● Page 2

May 10, 2000

same BMPs menu as "A" and "B", with cost being the only concern.

Mr. Thomas agreed with my analysis and indicated that any of these options were acceptable. He also indicated that the County would be willing to work with you on the timing and construction of the revised plan. If you desire to go forward with revising the plan and designing a facility on lot 2 in lieu of the bioretention BMP on lot 3, the County would require approved plans and additional bond paid to gain occupancy for lot 3. This also would allow you to schedule its construction for a later date. The plan for lot 2, may or may not include site development of the buildings you plan to construct on lot 2, but should include any planned flows.

Please call me with questions.

Sincerely,

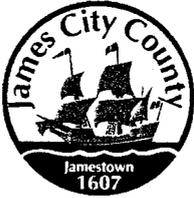
Ralph C. Simmons, P.E.
Principal

*for the
fundamental
on lot 2*

*but preferred
option C using
a small wet
pond.*

*which option is
suggested*

*LOT 2 - new
LOT 3 - Bioret.*



DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6671 Fax: (757) 253-6850 E-MAIL: devtman@james-city.va.us

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codecomp@james-city.va.us

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PLANNING
(757) 253-6685
planning@james-city.va.us

COUNTY ENGINEER
(757) 253-6678
INTEGRATED PEST MANAGEMENT
(757) 253-2620

January 15, 2002

Andrew M. Piplico
118 Northpoint Drive
Williamsburg, Va. 23185

*Reinspect
5-20-02
10:00am
SJT*

Re: Midlands Lot 2 (3917 Midlands Road)
County Plan SP-100-00, Amended SP-76-01
Stormwater Management Facility BMP # 2
County BMP ID Code: MC 047

Dear Mr. Piplico:

The Environmental Division has reviewed a record drawing and construction certification as submitted December 27th 2001 for the above referenced project. The record drawing provides as-built information for the larger dry extended detention facility located north of the two new buildings on Lot 2.

Based on our review of information as submitted and a concurrent field observation as performed on January 15th 2002, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility:

Construction Certification:

1. The construction certification dated September 27th 2001 is **satisfactory**.

Record Drawing:

2. Add the detention basin outlet structure detail as provided on Sheet C5 of the approved plan to the as-built (record) drawing for the facility. This detail provides important information about the riser and outflow structure for the facility. Annotate the detail as necessary with constructed information, especially changes that occurred to the primary flow control structure. A Nyloplast plastic grate was added to the low flow orifice and aluminized pipe was used for the riser and outlet barrel rather than corrugated metal and corrugated polyethylene as shown on the plans. (Note: As addition of the Nyloplast drain was not per the approved plan, this feature needs to be correctly shown on the as-built drawing or removed and the riser configuration built in accordance with the original approved plan set. Based on our review of the as-built and as a result of our final inspection, this feature is considered minor in nature and may help prevent long-term clogging of the low flow orifice. Therefore, is our preference that this feature remain in place and as-builts for the BMP reflect final configuration of the primary flow control structure for the basin.)

*REV
PO RCVD
5-23-02*

✓ 3. Record drawing RD1 reflects use of a 15-inch HDPE barrel through the dam embankment. Based on field inspection, an 18-inch aluminized pipe barrel with an end section was installed. Correct the discrepancy on the record drawing.
5-23-02

✓ 4. Add the stormwater maintenance easement note from Sheet C2 and the maintenance plan from Sheet C5 of the approved plan to record drawing RD1. As the record drawing will be utilized for future inspection and maintenance purposes, these items should be on the record plan.
5-23-02

✓ 5. Show the following additional information on the record drawing: label type (class) of riprap as installed at the inflow and outflow points from the sediment forebay.
5-23-02

6. Sign and date the professional seal on record drawing sheet RD1.

7. If possible add the following County identifiers to the lower right hand corner of record drawing RD1: County Plan Number SP-100-00 and BMP ID No. MC 047.

Construction-Related Items:

✓ 8. As the dam embankment is now stabilized, remove silt fence present along the entire downstream toe of the dam embankment.

✓ 9. Remove all litter and trash present within the sediment forebay, the bottom of the basin, the pond interior sideslopes and in areas between the buildings and BMP.

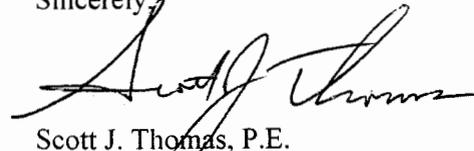
✓ 10. Remove accumulated sediment present within the level section of the emergency spillway and stabilize with seed and mulch. The emergency spillway should have a uniform grass lining.

✓ 11. Stabilize all disturbed areas associated with onsite site construction. At the time of inspection, building construction was still active and most of the yard areas surrounding the buildings were in a disturbed condition. Silt fences between disturbed area and the basin should not be removed until adequate stabilization is achieved.

Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed.

Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Joe Buchite, at 757-253-6643 if you have any further comments or questions.

Sincerely,



Scott J. Thomas, P.E.
Civil Engineer
Environmental Division

cc: Ralph Simmons, Simmons Engineering Inc. (via fax)

G:\SWMPProg\AsBuilts\SP10000.mc047

Transmittal

Simmons Engineering, Inc
Civil Engineering Design and Consulting

4732 Longhill Road, Suite 3103
 Williamsburg Business Center
 Williamsburg, VA 23188
 (757) 258-5000
 mobile: (757) 871-4538
 fax: (757) 258-3758

e-mail: rcsPE@QuixNet.net

To: Ms. Scott Thomas, PE

Date: May 20, 2002

JCC Environmental Division

Mounts Bay Road

Williamsburg VA 23187



Re: Record Drawing Submittal

Lot 2, Midlands Road, Project No. 00-105

Number of Copies	Date	Number of Pages	Description
1	5/14/02	2	Revised Record Drawings, Prints
1	5/14/02	2	Revised Record Drawings, Film
1	1/15/02	4	Environmental Division Review Comments

*SP-100-00
 SP-7b-01
 MC047*

For Approval For Your Action For Information As Requested For Your Use

• **Comments:** Thanks for your support.

Ralph C. Simmons, PE
 President

cc: Andy Piplico



DEVELOPMENT MANAGEMENT

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COUNTY ENGINEER
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INTEGRATED PEST MANAGEMENT
(757) 253-2620

January 15, 2002

Andrew M. Piplico
18 Northpoint Drive
Williamsburg, Va. 23185

Re: Midlands Lot 2 (3917 Midlands Road)
County Plan SP-100-00, Amended SP-76-01
Stormwater Management Facility BMP # 2
County BMP ID Code: MC 047

Dear Mr. Piplico:

The Environmental Division has reviewed a record drawing and construction certification as submitted December 27th 2001 for the above referenced project. The record drawing provides as-built information for the larger dry extended detention facility located north of the two new buildings on Lot 2.

Based on our review of information as submitted and a concurrent field observation as performed on January 15th 2002, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility:

Construction Certification:

1. The construction certification dated September 27th 2001 is satisfactory.

Record Drawing:

RCV
OK

2. Add the detention basin outlet structure detail as provided on Sheet C5 of the approved plan to the as-built (record) drawing for the facility. This detail provides important information about the riser and outflow structure for the facility. Annotate the detail as necessary with constructed information, especially changes that occurred to the primary flow control structure. A Nyloplast plastic grate was added to the low flow orifice and aluminized pipe was used for the riser and outlet barrel rather than corrugated metal and corrugated polyethylene as shown on the plans. (Note: As addition of the Nyloplast drain was not per the approved plan, this feature needs to be correctly shown on the as-built drawing or removed and the riser configuration built in accordance with the original approved plan set. Based on our review of the as-built and as a result of our final inspection, this feature is considered minor in nature and may help prevent long-term clogging of the low flow orifice. Therefore, is our preference that this feature remain in place and as-builts for the BMP reflect final configuration of the primary flow control structure for the basin.)

Complete.

741

OK ✓
5-23-02 Rch
OK ✓
5-23-02 Rch
OK ✓
5-23-02 Rch
OK ✓
5-23-02 Rch
OK ✓
5-23-02 Rch

Record drawing RD1 reflects use of a 15-inch HDPE barrel through the dam embankment. Based on field inspection, an 18-inch aluminized pipe barrel with an end section was installed. Correct the discrepancy on the record drawing. **Complete**

Add the stormwater maintenance easement note from Sheet C2 and the maintenance plan from Sheet C5 of the approved plan to record drawing RD1. As the record drawing will be utilized for future inspection and maintenance purposes, these items should be on the record plan. **Complete**

Show the following additional information on the record drawing: label type (class) of riprap as installed at the inflow and outflow points from the sediment forebay. **Complete**

Sign and date the professional seal on record drawing sheet RD1. ✓

If possible add the following County identifiers to the lower right hand corner of record drawing RD1: County Plan Number SP-100-00 and BMP ID No. MC 047. **Complete**

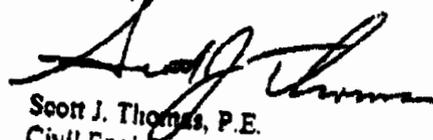
Construction-Related Items:

- 8. As the dam embankment is now stabilized, remove silt fence present along the entire downstream toe of the dam embankment.
- 9. Remove all litter and trash present within the sediment forebay, the bottom of the basin, the pond interior sideslopes and in areas between the buildings and BMP.
- 10. Remove accumulated sediment present within the level section of the emergency spillway and stabilize with seed and mulch. The emergency spillway should have a uniform grass lining.
- 11. Stabilize all disturbed areas associated with onsite site construction. At the time of inspection, building construction was still active and most of the yard areas surrounding the buildings were in a disturbed condition. Silt fences between disturbed area and the basin should not be removed until adequate stabilization is achieved.

Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed.

Please contact me at 757-253-6639 or the assigned Environmental Division Inspector, Joe Eluchite, at 757-253-6643 if you have any further comments or questions.

Sincerely,



Scott J. Thomas, P.E.
Civil Engineer
Environmental Division

cc: Ralph Simmons, Simmons Engineering Inc. (via fax)

Q:\S1\MProg\AsBuilts\SP1000.mc047

Scott Thomas

Modified:

Tue 7/17/2001 10:30 AM

Midlands Road Lot 2

SP-100-00

Dry Pond BMP # 2

Per a request to reduce the original bond of \$ 20,000 for the project, it was my determination that the facility was substantially complete construction-wise and approximately 60 percent overall and the bond could be reduced to \$ 8,000. This was based on my observations during construction, conversation with Pat and followup visit following construction. Some bond is required to be held until such time as the record drawing and construction certification is received, especially related to final elevations of the riser crest, top of dam embankment and the downstream embankment slope, which in this case was allowed at a steeper slope. I warned the owner/engineer on several occasions that we would not allow construction of the sideslopes of the dam any steeper than that approved on the plan.

Ralph C. Simmons, P.E.
Consulting Engineer
4732 Longhill Road, Suite 3103
Williamsburg, VA 23188
(757) 258-5000 Fax (757) 258-3758
E-mail: rcsPE@QuixNet.net



June 29, 2000

Mr. Daryl Cook, PE
101 Mounts Bay Road
PO Box 8784
Williamsburg, VA 23187-8784

RE: Storm Water Management Structures for
Lot 2 and Lot 3 on Midlands Road
James City County
Project # 00-105

Sent Via Fax: 259-4032

Dear Mr. Cook:

This is a preliminary design summary of the proposed storm water management structures to be used to support development of Lots 2 & 3 of Midlands Road. This letter and attached conceptual plan are provided to determine the bond amount required for the consolidated BMP.

I am also providing a copy of this letter and drawings to Mr. Danny Poe, PE of JCSA for his blessing of this concept to construct the proposed BMP over the existing sanitary sewer main and easement. Attached to his copy, is a profile of the existing sewer main with planned improvements.

As we previously discussed, the proposed BMP will be constructed on Lot 2 to support new construction on both Lots 2 & 3. We propose to use a dry BMP, the Extended-Detention Basin. I calculate that structure to handle the Water Quality Volume of 5,700 cf, and an additional 1,800 cf maximum for the 2-year and the 10-year storm events. The maximum depth of water will be approximately 4 ± feet before discharging to the emergency spillway. The basin will be stepped to maintain cover over the existing sanitary sewer main.

The basin on Lot 2 will eliminate the need for the planned BMP on Lot 3. We propose to use the existing outlet structure on Lot 3 to control the 1-year frequency storm to release the flow from Lot 3 over a 24-hour period to an existing channel that will flow to the BMP on Lot 2. I calculate that volume to be approximately 1,700 cf. The additional flows from the 10 and 100 year storms will be routed through the small detention structure and channeled either thru Lot 2 via swale or into the natural channel that was to be used in the original design. Both routes will discharge to the Extended-Detention Basin on Lot 2.

Please use this information to determine the bond amount for the proposed BMP in lieu of the one previously designed on Lot 3. As per my conversation with Ms. Jill Schmidle of the JCC Planning Department an amendment to the existing Lot 3 plans will be required once the site plan for Lot 2 with BMP is submitted and approved.

Your quick response to this letter is appreciated. Please call me with questions.

Sincerely,

Ralph C. Simmons, PE
Principal

cc: Mr. Andy Piplico
Ms. Jill Schmidle
Mr. Danny Poe, PE

A:\s-00-105, midlands road 6-29-00.doc

Record Drawing/Construction Certification Submittal for a BMP Facility

Date:

12/31/01

Inspector:

- Pat Menichino
 Gerry Lewis
 Beth Davis
 Mike Woolson
 Joe Buchite
 Other: _____

Checked
by Inspector
OK!

Project:

MIDLANDS ROAD LOT 2 AND LOT 3 (3909 MIDLANDS)

BMP Facility:

BMP #2 (DRY POND) AND BMP #1 (3917 MIDLANDS)

Plan No.

SP-100-00 AND SP-89-99 (BIURET CELL)

BMP ID Code:

MC 047 + MC 048

I have received a transmittal for a Record Drawing and Construction Certification for the above referenced facility on Dec 27 '01. Prior to full engineering review of these items and a field inspection, I am first forwarding the items to you to cursory review in case any major field changes were performed that I should be aware of and/or to ensure the record drawing accurately portrays what you saw in the field. Please review the drawing and return to me promptly so I can proceed with the review for certification purposes.

During my review, I will look at issues related to the BMP and its primary inflow and outflow conveyance systems, and will make comment in the following areas: Record Drawing (RD), Construction Certification (CC) and Construction-Related (CR) punch list items. If you have any other related non-BMP site issues such as erosion, stabilization, removal of erosion & sediment controls, etc. that are not related to the BMP, I can easily add these items to any comment letter that I may forward to the Owner/Engineer. Let me know if any outstanding site issues remain.

If I don't hear from you I will ask you if any other outstanding issues remain before I forward any letters to the Owner/Engineer.

Scott

INSPECTORS COMMENT
- Nyoplast Drain Added
- O/S SLOPE STEEP

SWMPProg\BMP\ConInsp\Insp.trans

Transmittal



Simmons Engineering, Inc.

4732 Longhill Road, Suite 3103
Williamsburg Business Center
Williamsburg, VA 23188
(757) 258-5000
mobile: (757) 871-4538
fax: (757) 258-3758

e-mail: rcsPE@QuixNet.net

To: Mr. Daryl Cook

Date: 12/27/2001

JCC Environmental Division

Mounts Bay Road

Williamsburg VA 23187

Re: Record Drawing Submittal

Lot 2, Midlands Road

Number of Copies	Date	Number of Pages	Description
1	10/1/01	2	Record Drawing of Lot 2 Midlands Road
1	---	13	Certification Forms

For Approval For Your Action For Information As Requested For Your Use

● **Comments:**

Ralph C. Simmons, PE
President

Cc: Andy Piplico



**James City County Environmental Division
Stormwater Management / BMP Inspection Report
Detention and Retention Pond Facilities**

SP-100-00
GPIN 3841600002
PH 3

County BMP ID Code (if known): MC047

Name of Facility: MIDLANDS ROAD Lot 2 BMP No.: 1 of 2 Date: 1-15-02

Location: 3917 MIDLANDS ROAD

Name of Owner: ANDREW PIPILIO

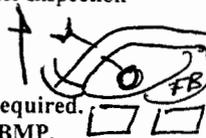
Name of Inspector: SJ Thomas, APRILCO (Present)

Type of Facility: DRY POND with Forebay

Weather Conditions: Sunny, Mild, 50's Type: Final Inspection County BMP Inspection Program Owner Inspection

If an inspection item is not applicable, mark NA, otherwise mark the appropriate column.

- O.K. - The item checked is in adequate condition and the maintenance program is currently satisfactory. No action required.
- Routine - The item checked requires attention, but does not present an immediate threat to the function/integrity of the BMP.
- Urgent - The item checked requires immediate attention to keep the BMP operational and to prevent damage to the facility.



Provide an explanation and details in the comment column, if routine or urgent are marked.

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes: <u>Earth Embankment; 24 in SS; EC-2 MATTER</u>				
Grass Height	✓			<u>GRASS + WEEDS</u>
Vegetation Condition	✓			
Tree Growth	✓			<u>None</u>
Erosion	✓			
Trash & Debris		✓		<u>SF on BS toe. Trash in basin</u>
Seepage	✓			<u>None observed.</u>
Fencing or Benches	✓			<u>None.</u>
Interior Landscaping/Planted Areas: <input type="checkbox"/> None <input type="checkbox"/> Constructed Wetland/Shallow Marsh <input checked="" type="checkbox"/> Naturally Established Vegetation				
Vegetated Conditions	✓			<u>Dry Pond</u>
Trash & Debris	✓	<u>some</u>		<u>Shallow Marsh @ Riser.</u>
Floating Material	✓	<u>some</u>		
Erosion	✓			<u>None.</u>
Sediment	✓			<u>Little.</u>
Dead Plant	✓			
Aesthetics	✓			<u>OK for Dry Pond.</u>
Other				
Notes: <u>SCRVPS TWO BUILDINGS + PARKING AREA</u>				

Facility Item	U.K.	Routine	Urgent	Comments
Water Pools: <input type="checkbox"/> Permanent Pool (Retention Basin) <input type="checkbox"/> Shallow Marsh (Detention Basin) <input checked="" type="checkbox"/> None, Dry (Detention Basin)				
Shoreline Erosion	✓			Small 1" deep pool 10x20 At riser
Algae	✓			
Trash & Debris	✓			
Sediment	✓			Little 1" e riser
Aesthetics				
Other				Forebay (Back) sediment 1" deep
Inflows (Describe Types/Locations): Dual pipes to forebay. HOPE + RCP, CLASS I riprap.				
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			Some
Sediment	✓			Less than 2" in FB. OK.
Outlet Protection	✓			CLASS I riprap. Large Pad.
Other	✓			CLASS I rock @ FB out. 2' High.
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type): ALUMN AASHTO M274 36" DIA				
Condition of Structure	✓			ASTM A 929
Corrosion	✓			None.
Trash and Debris	✓			None
Sediment	✓			None.
Vegetation				
Other				4" perf PVC LFORIF; 12"x12" drain.
Principal Outlet Structure - Barrel, Conduit, etc.: 18" RCP ALUMN ^{UPOT #1 STIAL} WITH END SECTION				
Condition of Structure	✓			water 1" deep @ end section.
Settlement	✓			
Trash & Debris	✓			
Erosion/Sediment	✓			
Outlet Protection	✓			CLASS I Channel.
Other				
Emergency Spillway (Overflow): 10' wide; TRAPEZ; GRASS; with timber check.				
Vegetation	✓			
Lining		✓		Sediment in ES; 2"
Erosion				
Trash & Debris				
Other				
Notes: Forebay 20x40' w/ CLASS I				

Misuse Type Conditions:

Mosquito Breeding			
Animal Burrows	✓		
Graffiti	✓		
Other	✓		

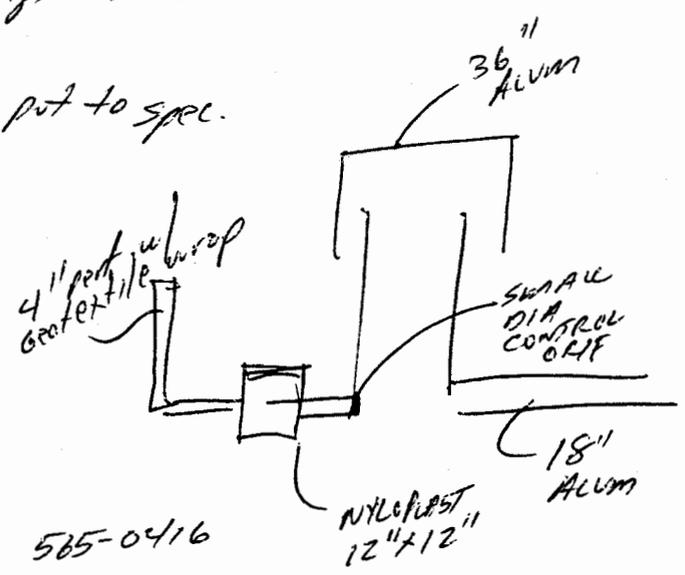
Surrounding Perimeter Conditions: *Buildings - office*

Land Uses	✓		<i>office</i>
Vegetation		✓	<i>Stabilize ground build</i>
Trash & Debris		✓	<i>Trash</i>
Aesthetics	✓		
Access / Maintenance Roads or Paths	✓		<i>EASY ACCESS FROM PARKING</i>
Other	✓		

Remarks:

- A STABILIZE AREA BETWEEN BUILDINGS + BMP.*
- A SF + TRASH*
- O SHOW FINAL CONFIG OF LF OUTLET OR PUT TO SPEC.*
- D STABILIZE ES WITH GRASS.*

Note: *River cap not removable, bolted, no access hatch*



D Provide LANDSCAPE IDEAS TO ANDY 585-0416

Overall Environmental Division Internal Rating: 3

Signature: *[Signature]*
 Title: *CIVIL ENGINEER ENV DIV*

Date: *1-15-02 12:30 pm*

WATERSHED	MC	MAINTENANCE PLAN	Yes	CTRL STRUC DESC	Alum Riser
BMP ID NO	047	SITE AREA acre	0.85	CTRL STRUC SIZE inches	36
PLAN NO	SP-100-00	LAND USE	Limited Business	OTLT BARRL DESC	CPP Barrel
TAX PARCEL	(38-04)(16-02)	old BMP TYP		OTLT BARRL SIZE inch	15
PIN NO	3841600002	JCC BMP CODE	F2 Dry ED with forebay		
CONSTRUCTION DATE	3/15/2001	POINT VALUE	4	EMERG SPILLWAY	Yes
PROJECT NAME	Midlands Road Lot 2 (BMP # 2)			DESIGN HW ELEV	75.9
FACILITY LOCATION	3917 Midlands Road			PERM POOL ELE	na
CITY-STATE	Williamsburg, Va. 23188	SVC DRAIN AREA acres	2.57	2-YR OUTFLOW cfs	7.23
CURRENT OWNER	Andrew M & Peggy K Piplico			10-YR OUTFLOW cfs	8.52
OWNER ADDRESS	118 North Point Drive			REC DRAWING	Yes
OWNER ADDRESS 2		SERVICE AREA DESCRI	Onsite & Offsite area		
CITY-STATE-ZIP CODE	Williamsburg, Va. 23185	IMPERV AREA acres	1.24	CONSTR CERTI	Yes
OWNER PHONE	532-2888	RECV STREAM	UT of Mill Creek		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	Yes	LAST INSP DATE	1/15/2002
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	0.1	INTERNAL RATING	3
		CHAN PROT CTRL	Yes	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	0.18	SP amend SP-76-01. Dry Pond BMP #	
		SW/FLOOD CONTROL	Yes	2 w/fb serves offsite area. Nyoplast LF	
		GEOTECH REPORT	No	drain.	

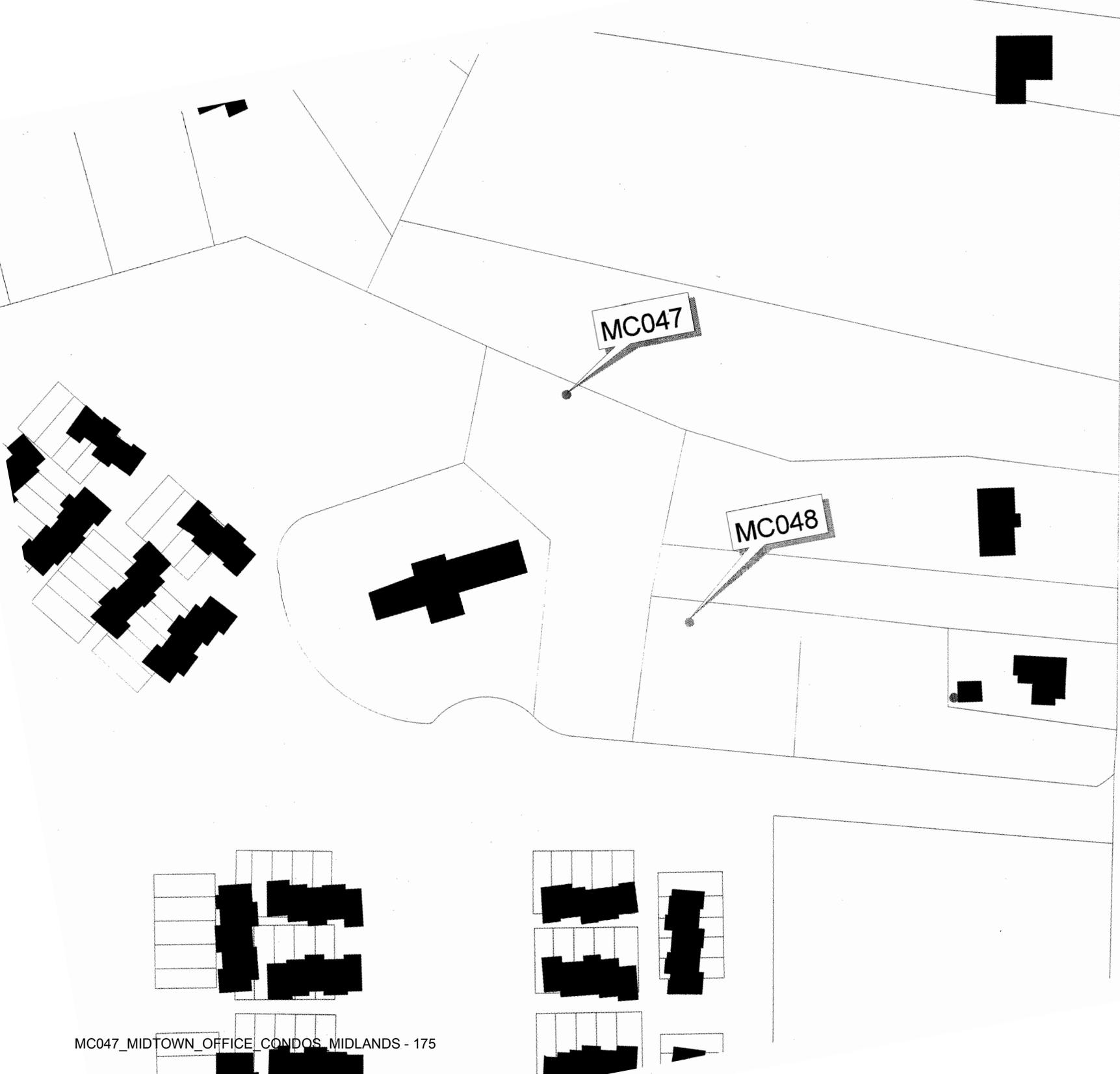
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MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	Yes		
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	0.1		
		CHAN PROT CTRL	Yes		
		CHAN PROT VOL acre-ft	0.18		
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	No		

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MC047

MC048

ENVIRONMENTAL DIVISION REVIEW COMMENTS
MIDLANDS ROAD LOT 2
PLAN NO. SP - 100 - 00
September 26, 2000

SJT

General Comments:

1. ✓ A Land Disturbing Permit and Siltation Agreement, with surety, are required for this project.
2. ✓ An Inspection/Maintenance Agreement shall be executed with the County for the BMP facility for this project.
- ✓ 3. ✓ As-built drawings must be provided for the dry detention basin on completion. Also, a note shall be provided on the plan stating that upon completion, the construction of the dam will be certified by a professional engineer who has inspected the structure during construction.
- ✓ 4. ✓ Wetlands. Prior to initiating grading or other on-site activities on any portion of a lot or parcel, all wetland permits required by federal, state and county laws and regulations shall be obtained and evidence of such submitted to the Environmental Division. Refer to Section 23-9(b)(8) of the Chapter 23 Chesapeake Bay Preservation ordinance.
- ✓ 5. ✓ Site Tabulation. Provide proposed impervious cover estimates in the site tabulation.
- ✓ 6. ✓ Existing Features. On Sheet C1, show the approximate location of the existing building and bioretention area (BMP # 1) on Lot 3 and reference approved County Plan SP-89-99.

Floodplain:

- ✓ 7. ✓ Provide a note referencing the correct FEMA FIRM panel and any designated special flood hazard areas or zone designations associated with this site, as applicable.

Chesapeake Bay Preservation:

- ✓ 8. ✓ Environmental Inventory. Please provide an environmental inventory in accordance with Section 23-10(2) of the Chesapeake Bay Preservation ordinance. Components include tidal wetlands, tidal shores, non-tidal wetlands in RPA, resource protection areas, non-tidal wetlands in RMA, hydric soils and slopes 25 percent or greater.

Erosion & Sediment Control Plan:

- ✓ 9. ✓ Temporary Stockpile Areas. Show any temporary soil stockpile, staging and equipment storage areas (with required erosion and sediment controls) or indicate on the plans that none are anticipated for the project site.

- ✓ 10. ✓ Offsite Land Disturbing Areas. Identify any offsite land disturbing areas including borrow, waste, or disposal sites (with required erosion and sediment controls) or indicate on the plans that none are anticipated for this project.
- ✓ 11. ✓ Sequence of Construction. Provide a sequence of construction which outlines installation of erosion and sediment control measures for this portion of the project and associated site and utility work. Proper sequencing of BMP # 2 construction will be an important component in the erosion and sediment control plan for work activities.
- ✓ 12. ✓ E&SC Narrative. Provide a brief erosion and sediment control plan narrative in accordance with VESCH requirements. The narrative should include important site, adjacent parcel, soil and development information as well as specific control and stabilization measures proposed for site work activities.
- ✓ 13. ✓ Soils Data. Provide a map and brief descriptions of all soil types associated with the project, including the drainage basin to the BMP, based on the James City and York Counties and the City of Williamsburg Soil Survey (issued 1985).
- ✓ 14. ✓ Existing Drainage. Describe how flows/runoff within the existing Lot 2 storm drainage system will be handled during construction of BMP # 2.
- ✓ 15. ✓ Limits of Work. Label and distinctly show the proposed limit of clearing and grading around the site periphery on the grading and erosion & sediment control plan Sheet C2..
- ✓ 16. ✓ Silt Fence. Extend silt fence along the northern limit of work (downslope of basin) in a west direction to provide coverage for the entire disturbed area associated with basin construction. Since this measure is the primary control measure for land disturbance use of wire-reinforced or super silt fence is recommended.
- ✓ 17. ✓ Standard Symbols. Use standard symbols and keys for all proposed E&SC measures per Chapter 3 of the VESCH (SF, OP, IP, SCC, PS, MU, etc.).
- ✓ 18. ✓ Stabilization. *STD E&SC #12 COVERS.* Stabilization will be an important component of the E&SC plan for the site. Clearly include provisions in the sequence of construction and E&SC plan and narrative for immediate stabilization (seeding and mulching) of graded areas associated with BMP # 2.
- ✓ 19. ✓ Basin. Explain if the dry detention facility (BMP # 2) is to serve dual purpose function as a temporary sediment basin during construction. If so, compliance with VESCH Minimum Standard 3.14 is required along with supporting computations (Sediment Basin Design Data Sheets) and details. Include a modification plan to properly convert the temporary sediment basin to a permanent dry pond as necessary. *NOT USED. ELSC PLAN SUFFICIENT.*
- ✓ 20. ✓ Outlet Protection. Provide construction plan information for the outlet protection at the pond barrel outlet consistent with that shown in the design report (calculations) . Include riprap size and depth, dimensions and estimated quantity.

Stormwater Management / Drainage:

21. ✓ BMP # 2 Point System Worksheet. If offsite credit is to be taken for DA-10, then the postdevelopment C factor used for peak flow computations should reflect that of developed conditions. Also, the value of 2.59 acres as used in the offsite credit calculation for BMP # 2 reflects a balance of the total watershed less area to BMP # 1 (3.36 ac - 0.77 ac. = 2.59 ac.). A portion of this area (0.46 acres) was already accounted for in the onsite credit calculation portion of BMP # 2, thus it was double credited. Revise the BMP point system computation accordingly. (Note: It appears offsite credits were taken for DA-3a and DA-12 for BMP #1 and DA-3b, 4, 5, 6, 7, 8 and 10 for BMP # 2).
22. ✓ Stream Channel Protection. Include provisions in the design of BMP # 2 (Lot 2) to ensure compliance with current stream channel protection criteria downstream (below) the BMP facility. Current stream channel protection criteria for James City County requires 24-hour extended detention of runoff from the 1-year, 24-hour frequency storm (post-developed) instead of reduction of the 2-year peak rate as previously required by MS-19 of the Virginia Erosion and Sediment Control regulations. The SCS Type II, 24-hour storm duration rainfall depth for the 1-year storm event in James City County is 2.8 inches. BMP # 2 would be required to meet current stream channel protection criteria. *CPV 78404 @ EL. 75.025*
23. ✓ BMP # 1 Discharge. The narrative describes 10- and 100-year bypass overflow from BMP # 1 (at Lot 3) to be discharged to the constructed paved channel on Lot 2 and ultimately discharged into BMP # 2 (on Lot 2). No specific construction plan information or details were provided on the construction plan. Also, the origin of the Lot 2 concrete V-ditch is unclear on Sheet C2.
24. ✓ BMP # 1 Hydrology. The allowable predevelopment discharge values for Lot 3 site design as presented in the Lot 2 drainage report for the 2-, 10- and 100- year events were 1.20 cfs, 1.38 cfs and 2.05 cfs, respectively. These values do not appear consistent with previous Lot 3 design computations under approved plan SP-89-99. The previous values for the 2-, 10- and 100-year events were shown as 1.08 cfs, 2.20 cfs and 3.39 cfs respectively. Please explain differences.
25. ✓ BMP # 2. Placement of wax mirtles and river birch trees on the north pond embankment as proposed on landscape plan Sheet LS1 appears to directly conflict with State and County criteria to not allow trees, shrubs and woody plants on and along embankments of BMP facilities. Please address. *AZALEA VARIETIES. APPEARS OK.*
26. ✓ BMP # 2. Label all pond and sediment forebay cut-fill slopes (ie. 4H:1V, 3H:1V, etc.) as intended per the design plan. Show final design 1-, 2-, 10- and 100-year design water surface elevations on the pond plan, profile and details as applicable. *2H:1V SEE NOTE @ END. OK BUT NOT HAPPY WITH.*
27. ✓ BMP # 2. Provide a profile section through the embankment along the principal riser and outlet barrel structure. Include information relative to construction of the riser, barrel and embankment including sub-grade preparation, fill material and placement, soil compaction, concrete anti-seep collars (or toe drain), pipe bedding/backfill or cradle and core trench, as applicable for a dry pond design.

28. BMP # 2 Riser Detail. Show all critical design elevations and construction data on the principal spillway detail as provided on Sheet C2, consistent with that in the design report including pipe/orifice sizes, weir dimensions, invert elevations, riser crest elevation, hood size (and specific detail), pond bottom elevation and cleanout depth. *SHOW AV/TR DETAIL FOR ALUMINIZED.*
29. ✓ BMP # 2 Concrete Riser. Specify watertight reinforced concrete pipe meeting the requirements of ASTM C361 for the reinforced concrete pipe riser. Provide dimensions and specifications for the concrete flotation base, including embedment of the riser into the base. Provide flotation (buoyancy) computations for the base/riser structure. *USE OF AASHTO M196 ALUM.*
30. ✓ BMP # 2 Spot Elevations. Show proposed spot elevations along the interior of the detention basin to ensure positive drainage from the forebay to the riser structure. The riprap pilot channel (low flow trickle channel) is not a requirement for detention facilities per the JCC BMP manual and may be eliminated if desired.
31. ✓ BMP # 2 Tailwater. It appears tailwater conditions directly downstream of the BMP # 2 were not considered in the pond's hydraulics and routings. Please evaluate the potential for a tailwater condition at the barrel outlet and subsequent effects to the pond's outlet discharges and design water surface elevations. *INLET CONTROLLED.*
32. ✓ BMP # 2 Design. Design computations and the construction plan are inconsistent. Computations in the report show a 24 inch diameter riser and the construction plan shows a 6 ft. diameter riser. Computations in the report show a riser crest at El. 73.6 and the construction plan shows a crest elevation at El. 73.8. Also, the stage-storage-discharge routing sheet in the computations does not show the emergency spillway discharge component, which could have a considerable effect on discharge and design WSEL's. In addition, the principal and emergency spillway crests are shown at the same elevation (El. 73.8) on Sheet C2. Usually separation between principal spillway riser crest and the emergency spillway crest is one (1) foot minimum per VSMH, Minimum Standard 3.02. *36" RISER; RC 75'03; ES CREST 75.70; 0.7' SEPAR.*
33. ✓ BMP # 2. Provide calculations to support the required design capacity of the detention pond forebay. Typically, pretreatment forebays are based on 0.1 inch of runoff per impervious acre of contributing drainage and can be considered in the total water quality volume.
34. ✓ BMP # 2. Provide a corrugated polyethylene flared end section at the end of the pond barrel. *FES SHOWN.*
35. ✓ BMP # 2 Low Flow Orifice. Minimum diameter of low flow orifices (for water quality) is 3 inch, unless internal orifice protection is used then minimum diameter is 2 inch. Refer to the JCC BMP manual. *4" Ø PVC WITH 1-3/8" DRILLED IN CAP.*
36. ✓ BMP # 2 Barrel. Indicate pipe type and specifications required for the corrugated polyethylene pond outlet barrel (ASTM M294 Type S, etc.) or reference the appropriate VDOT Road and Bridge Standards. If VDOT standards are not referenced, provide a typical bedding and installation detail. Ensure minimum cover requirements during construction are maintained and the allowable maximum height of final cover for the type of pipe selected is not exceeded for deflection, buckling and bending. *CPP AASHTO M294 TYPE S.*

37. Maintenance Plan. Provide a maintenance plan for BMP # 2. Section 23-10(4) of the Chesapeake Bay Preservation Ordinance requires stormwater management plans to include a long-term schedule for inspection and maintenance of stormwater management/BMP facilities. The plan should be specific for a dry detention facility. *NEED ON PLAN. CO depth in Forebay.*
38. ✓ BMP # 2 Access. Include provisions for maintenance and access to the BMP including a maintenance/access easement and pathway from the paved parking lot. Minimum requirements are 10 ft. width, maximum slope of 20 percent and an acceptable surfacing for vehicles.
39. ✓ Storm Drains. On Sheet C2, provide data for the existing storm drain system present on Lot 2 (parking area). Include inlet types, inlet rim elevations, inlet inverts and pipe types, sizes, lengths, inverts and slopes as appropriate.
40. ✓ Labels. Consistent with the drainage report, label the BMP on Lot 2 as BMP # 2 on all plan, profiles and details.
41. ✓ SP-89-99. Based on modifications as outlined in the calculation report, it is confirmed a revised site plan (amendment) would be necessary for BMP # 1 on Lot 3. This BMP was previously approved as a bioretention area under County Plan SP-89-99 and would now be converted to a dry detention or shallow marsh facility.

Δ Easements → around BMP + onsite SD system from Lot 3

▷ NO SET CRITERIA FOR EMB. SS FOR DRY PONDS.
 DID NOT CATCH 2H:1V DS SLOPE ON 1ST REVIEW.
 BASED ON PREV PLAN VIEW (1"=20') SCALE, I
 thought the SS were 4H:1V.
MAKE SURE AS-BUILT reflects 2H:1V No steeper.

