GC-004

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

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 28th day of September, 2004, between D. Marc Illman, and all successors in interest, ("COVENANTOR(S),") owner(s) of the following property:
Street Address: 2878 Monticello Ave, Williamsburg, VA.
Legal Description: Point Pinewood (16 Acres) 2878 Monticello
Project Name: Milanville Kennel
Document No. 020024919, Deed Book —, Page No. —;
Instrument No. —, and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

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

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

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

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

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

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

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

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

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

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

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

COVENANTOR(S)

D. MARC ELLMAN

Print Name/Title OWNER

ATTEST:

_____

COVENANTOR(S)

_____

Print Name/Title _____

ATTEST:

_____

COMMONWEALTH OF VIRGINIA

~~CITY~~/COUNTY OF James City

I hereby certify that on this 28th day of September, 2004, before the subscribed, a Notary Public of the State of Virginia, and for the ~~City~~/County of James City, aforesaid personally appeared D. Marc Illman and did acknowledge the aforegoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 28th day of September, 2004.

Joan Eddleman
Notary Public

My Commission expires: 10-31-08

Approved as to form:

~~Asst~~ County Attorney

This Declaration of Covenants prepared by:

D. Marc ILLMAN
(Print Name)

Owner
(Title)

2878 Monticello Ave
(Address)

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

757-565-0489
(Phone Number)

drainage1.pre

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: Milawille Kennels
Structure/BMP Name: Wet Pond
Project Location: 2878 Monticello Ave.
BMP Location: 2878 Monticello Ave
County Plan No.: SP - 54 - 04

Project Type: ☐ Residential ☐ Business
☐ Commercial ☐ Office
☐ Institutional ☐ Industrial
☐ Public ☐ Roadway
☒ Other Kennel

Tax Map/Parcel No.: 4420100006
BMP ID Code (if known): GC 004
Zoning District:: A1
Land Use: Kennel
Site Area (sf or acres): 15.01

Brief Description of Stormwater Management/BMP Facility: Wet Pond with forebay to receive washdown runoff from kennel. (AND HANDLE NEW IMPERVIOUS COVER)

Nearest Visible Landmark to SWM/BMP Facility: Kennel

Nearest Vertical Ground Control (if known):
☐ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other
Station Number or Name:
Datum or Reference Elevation:
Control Description:
Control Location from Subject Facility:

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: Oct 2004
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No ☒ Unknown
Name of Site Work Contractor Who Constructed Facility: Mark Illman / Owner
Name of Professional Firm Who Routinely Monitored Construction: Unkown
Date of Completion for SWM/BMP Facility: January 2005
Date of Record Drawing/Construction Certification Submittal: 2/4/05

(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: Milanville Kennels
Mailing Address: 2878 Montecello Ave
Williamsburg, Va 23188
Business Phone: (757) 565-0429 Fax: (757) 645-4358
Contact Person: Marc Illman 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: LandTech Resources, Inc.
Mailing Address: 5810-F Hoorctown Rd.
Williamsburg, Va 23188
Business Phone: (757) 565-1677
Fax: (757) 565-0782
Responsible Plan Preparer: Kenneth M. Jenkins, P.E.
Title: Senior Engineer
Plan Name: Site Plan of Milanville Kennels
Firm's Project No. 04-078
Plan Date: 2/24/04
Sheet No.'s Applicable to SWM/BMP Facility: C2 / C4 / C5 / ____ / ____

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

Name: Marc Illman / Owner
Mailing Address: 2878 Montecello Ave
Williamsburg, Va. 23188
Business Phone: (757) 565-0429
Fax: (757) 645-4358
Contact Person: Marc Illman
Site Foreman/Supervisor: ____
Specialty Subcontractors & Purpose (for BMP Construction Only): ____

Section 4 - Professional Certifications:

Certifying Professionals: *(Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional Engineer is responsible for the inspection, monitoring and certification of Stormwater Management / BMP facilities during its construction.)*

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: LandTech Resources, Inc
Mailing Address: 5810-F Mooretown Rd
Williamsburg, Va. 23188
Business Phone: (757) 565-1677
Fax: (757) 565-0782

Name: Kenneth M. Jenkins, P.E.
Title: Senior Engineer

Signature: Kenneth M. Jenkins
Date: 2/14/05

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
K.M. JENKINS II
No.022872
2/14/05
PROFESSIONAL ENGINEER

_____ (Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: _____
Mailing Address: _____
_____
Business Phone: _____
Fax: _____

Name: _____
Title: _____

Signature: _____
Date: _____

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.

See Report ECS

_____ (Seal)

Virginia Registered Professional Engineer

A-3 BMP

GPIN 4420100006

James City County, Virginia
Environmental Division

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

County Plan No.: SP-54-04
Project Name: MILANVILLE KENNELS
Stormwater Management Facility: WET POND W/ FOREBAY
BMP Phase #: ☐ I ☐ II ☒ III

- ☑ Information Package Received. Date/By: 2/4/05 LANDTECH
- ☐ Administrative Check.
  - ☑ Record Drawing Date/By: Cert 2/4/05 LANDTECH, RMD 2/4/05
  - ☑ Construction Certification Date/By: 1-13-05 GETSOLUTIONS INC.
  - ☑ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
  - ☑ Insp/Maint Agreement #/Date: #040026352 10/19/04
  - ☑ BMP Maintenance Plan Location: Sheet C2
  - ☐ Other: SUP-21-03; DOG KENNEL WASH DOWN TO BMP (No Public Sewer)
- ☑ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
  ☑ Yes ☐ No Location: Note 20 Sheet C4
- ☑ Assign **County BMP ID Code #**: Code: GC 004
- ☑ Preliminary Input/Log into Division's "As-Built Tracking Log"
- ☑ Add Location to GIS Database Map. Obtain site information (GPIN, Owner, Site Area, Address, etc.)
- ☑ *Preliminary Log into Access* BMP Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
- ☑ Active Project File Review (correspondence, H&H, etc.).
- ☑ Initial As-Built File setup (Label, copy hydraulics, BMP plan and detail information, etc.).
- ☑ Inspector Check of RD/CC (forward to inspector using transmittal for cursory review). Molly OK.
- ☑ Pre-Inspection Drawing Review - Approved Plan (Quick look prior to Field Inspection). 3/7/05
- ☑ Final Inspection (FI) Performed Date: 3/7/05 SJT, WAC
- ☑ Record Drawing (RD) Review (***) Date: 3/8/05
- ☑ Construction Certification (CC) Review Date: 3/8/05
- ☑ Actions:
  - ☑ No comments.
  - ☐ Comments. Letter Forwarded. Date:
    - ☐ Record Drawing (RD)
    - ☐ Construction Certification (CC)
    - ☐ Construction-Related (CR)
    - ☐ Site Issues (SI)
    - ☑ Other: Molly- handle site stabilization issue.

MISC. - ASKED LANDTECH TO PUT BMP DETAILS ON AB + provide extra copy & reproducible. ✓ DONE

- ☐ Second Submission:
- ☐ Reinspection (if necessary):
- ☑ Acceptable for stormwater managment facility purposes (RD/CC/CR/Other). Proceed with bond release.
- ☐ Notify Inspector and Inspector Supervisor using "Surety Request Form".
- ☐ Check/Clean active file of any remaining material and finish "As-Built" file.
- ☑ Add to County BMP Inventory/Inspection schedule (Phase I, II or III)
- ☑ Copy Final Inspection Report into County BMP Inspection Program file.
- ☑ Obtain Digital Photographs of BMP and log into computer.
- ☑ Request mylar/reproducible from As-Built plan preparer.
- ☑ Complete "As-built Tracking Log"
- ☑ Last check of BMP Access Database.
- ☐ Add to JCC Hydrology & Hydraulic database (optional).
- ☑ Add to PRIDE BMP ratings database.

Final Sign-Off

Plan Reviewer: [signature] Date: 3/8/05

*** See separate checklist, if needed.

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

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

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

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

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

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

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

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

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

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

☒ Record Drawings shall provide, at a minimum, all information as shown within these requirements and the attached **RECORD DRAWING CHECKLIST** specific to the type of SWM/BMP facility being constructed. Other additional record data may be formally requested by the James City County Environmental Division. *(Note: Refer to the current edition of the James City County Guidelines for Design and Construction of Stormwater Management BMP's manual for a complete list of acceptable BMP's. Currently there are over 20 acceptable water quality type BMP's accepted by the County.)*

☒ Record Drawings shall consist of blue/black line prints and a reproducible (mylar, sepia, diazo, etc.) set of the approved stormwater management plan including applicable plan views, profiles, sections, details, maintenance plans, etc. as related to the subject SWM / BMP facility. The set shall indicate **"RECORD DRAWING "** in large text in the lower right hand corner of each sheet with record elevations, dimensions and data drawn in a clearly annotated format and/or boxed beside design values. Approved design plan values, dimensions and data shall not be removed or erased. Drawing sheet revision blocks shall be modified as required to indicate record drawing status. Elevations to the nearest 0.1' are sufficiently accurate except where higher accuracy is needed to show positive drainage. Certification statements as shown in Section 4 of the Record Drawing and Construction Certification Form, ***or similar forms thereof***, and professional signatures and seals, with dates matching that of the record drawing status in the revision or title block, are also required on all associated record drawing plans, prints or reproducibles.

☒ Submission Requirements. Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system, it is requested that the record drawings also be submitted to the Environmental Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Environmental Division staff at the time of final submission.

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.)*

XX 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.

NA 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.

NA 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.

NA 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.** LandTech not present 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.** LandTech not present 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.

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

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

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

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

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

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

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

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Transmittal

LandTech Resources, Inc.
Surveying - Mapping - GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Tel: 757-565-1677 Fax: 757-565-0782

To: Scott Thomas. P.E.
Company: JCC Environmental Division
From: Kenneth Jenkins
Date: 3/8/05
Job Name/Number: 04-078

The following have been sent:

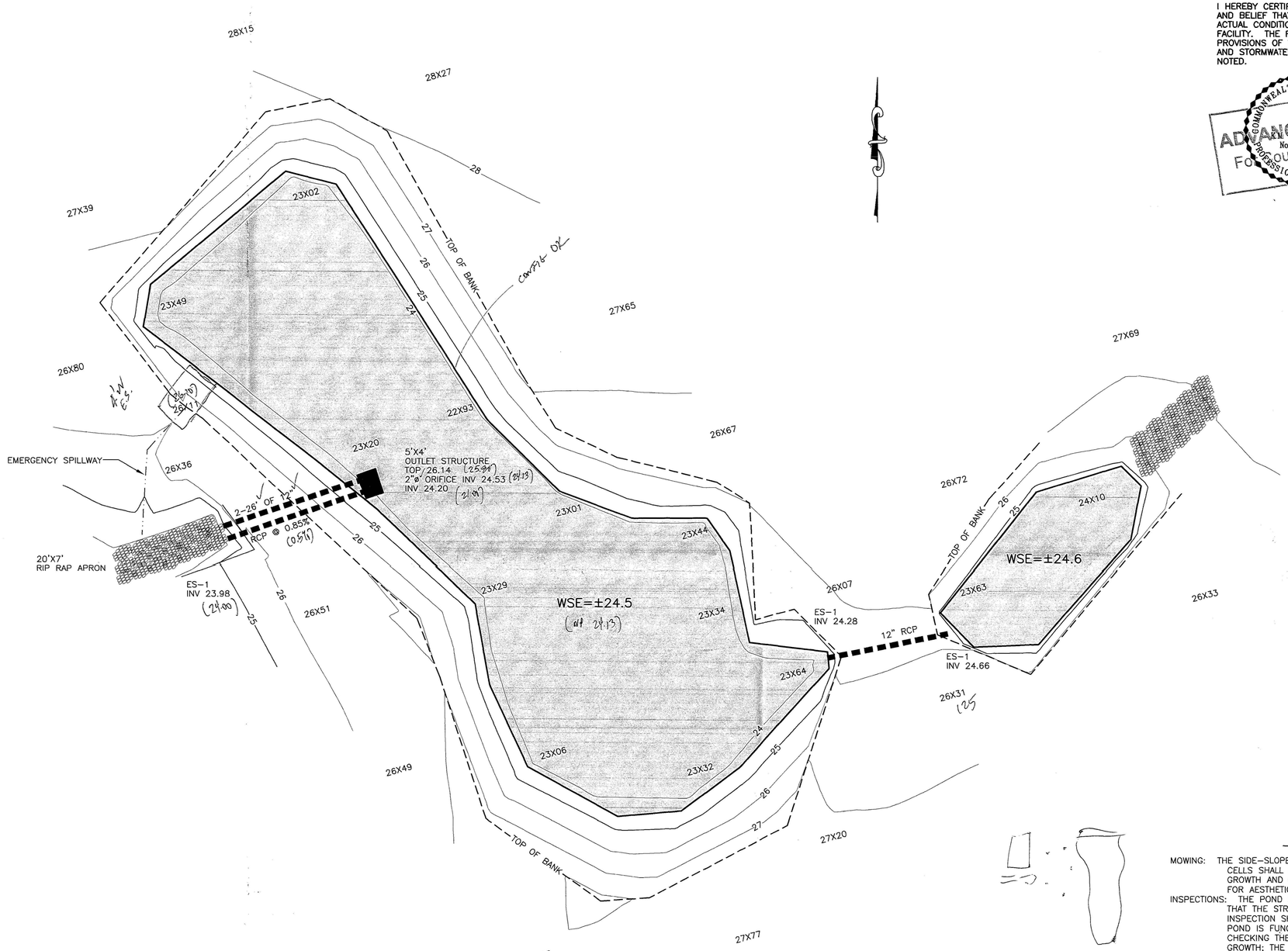
- ☐ as requested
- ☒ for review and comment
- ☐ please sign and return
- ☐ for temporary use, please return by _____

Quantity	Drawing Date	Description
1	2/4/05	BMP Record Drawing (Paper Copy)
1	2/4/05	BMP Record Drawing (Mylar Copy)

Remarks:

cc:Marc Illman

Signature: Kenneth M. Jenkins



BMP DETAILS FROM SHEET C4

RECORD DRAWING CERTIFICATION

I HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE ACTUAL CONDITION OF THE STORMWATER MANAGEMENT/BMP FACILITY. THE FACILITY APPEARS TO CONFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN, SPECIFICATIONS AND STORMWATER MANAGEMENT PLAN, EXCEPT AS SPECIFICALLY NOTED.

COMMONWEALTH OF VIRGINIA
ADVANCE COPY
K.M. JENKINS II
No. 022872
For County Review
PROFESSIONAL ENGINEER

MAINTENANCE PLAN

MOWING: THE SIDE-SLOPES, EMBANKMENT, AND EMERGENCY SPILLWAY OF THE WET POND CELLS SHALL BE BE MOWED A MINIMUM OF TWICE A YEAR TO PREVENT WOODY GROWTH AND CONTROL WEEDS. MORE FREQUENT MOWINGS MAY BE REQUIRED FOR AESTHETIC REASONS.

INSPECTIONS: THE POND CELLS SHALL BE INSPECTED ON AN ANNUAL BASIS TO ENSURE THAT THE STRUCTURE OPERATES IN THE MANNER ORIGINALLY INTENDED. THE INSPECTION SHALL BE CONDUCTED DURING WET WEATHER TO DETERMINE IF THE POND IS FUNCTIONING PROPERLY. INSPECTION PRIORITIES SHALL INCLUDE CHECKING THE EMBANKMENT FOR SUBSIDENCE, EROSION, CRACKING, AND TREE GROWTH; THE CONDITION OF THE EMERGENCY SPILLWAY, THE ACCUMULATION OF SEDIMENT, CLOGGING OF THE BARREL AND OUTLET STRUCTURE; THE ADEQUACY OF THE DOWNSTREAM CHANNEL EROSION PROTECTION MEASURES; ANY MODIFICATIONS WHICH HAVE OCCURED TO THE CONTRIBUTING WATERSHED AND THE POND STRUCTURE; AND THE STABILITY OF THE SIDE-SLOPES. INSPECTIONS SHALL BE CARRIED OUT WITH THE "AS-BUILT" POND PLANS IN HAND.

DEBRIS & LITTER REMOVAL: AS PART OF THE PERIODIC MOWING OPERATIONS, DEBRIS AND LITTER SHALL BE REMOVED FROM THE SURFACE OF THE POND. PARTICULAR ATTENTION SHALL BE PAID TO FLOATABLE DEBRIS AROUND THE RISER, AND THE OUTLET SHALL BE CHECKED FOR POSSIBLE CLOGGING.

EROSION CONTROL: THE POND SIDE-SLOPES, EMERGENCY SPILLWAY AND EMBANKMENT ALL MAY SUFFER FROM SLUMPING AND EROSION. CORRECTIVE MEASURES SUCH AS REGRADING AND REVEGETATION MAY BE NECESSARY. SIMILARLY, THE RIPRAP PROTECTING THE CHANNEL NEAR THE OUTLET MAY NEED TO BE REPAIRED OR REPLACED.

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10 0 10 20 30
Scale: 1" = 10'

MILANVILLE KENNELS
BMP RECORD DRAWING
WET POND
COUNTY PLAN NO. SP-54-04
James City County Virginia

SUT REVIEW SET

NO.	DATE	REVISION / COMMENT / NOTE

LandTech Resources, Inc.
Surveying • GPS • Engineering
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

SCALE: 1" = 10'
DATE: 2/4/05
JOB: 04-078
DRAWN BY: KMJ
SHEET: 1 OF 1

GC 004 SP-54-04

APPROX. LIMITS OF 100' RPA BUFFER (SEE NOTE #9)

EX SHED

EX SHED

TEMPORARY STOCKPILE AREA AND STAGING & EQUIPMENT STORAGE AREA

PROPOSED 6,920 SF KENNEL FF 31.5± FG 31.0±

EX STABLE

EXISTING DITC

EX GARAGE

20" PINE

PINE

APPROXIMATE LIMITS OF DISTURBED AREA (PROJECT AREA)

EX SHED

EX STABLE

EX SHED

APPROXIMATE LIMITS OF WETLANDS PER DELINEATION BY RICKMOND ENGINEERING, INC. JULY 2004 (TYP.)

SF

PS

PS

SF

OP

CIP

TP

SF

SP-54-04
CC004

STANDARD PROCTOR.

5. THE CONTRACTOR SHALL INSTALL A MINIMUM OF 4-INCHES OF TOP
6. THE CONTRACTOR SHALL ENSURE THE GEOTECHNICAL ENGINEER PR CONSTRUCTION.

S 81°35'08" E 192.98'

S 72°54'08" E 295.13'

EX. FENCE

EX STABLE

EXISTING DITCH

APPROX. LIMITS OF 100' RPA BUFFER (SEE NOTE #9)

EXTERIOR 6' PRIVACY FENCE (TYP.)

157.4'

162.0'

EX SHED

EX SHED

EX POOL

EX HOUSE

EX GARAGE

EX 1-1/4" WL

306.9'

INTERIOR 6' CHAIN LINK FENCE (TYP.)

PROPOSED 6,920 SF KENNEL FF 31.5± FG 31.0±

PROPOSED 8'X6' CONC. PAD W/ ROOF

GRASS EMERGENCY SPILLWAY BOTTOM WIDTH = 4' CREST ELEV 26.10

OUTLET STRUCTURE VDOT DI-1 TOP 25.80 2"ø ORIFICE INV 24.13 2-12" INV 24.13 BTM 21.00

EX. SEPTIC TANK

20" PINE

EX ARBOR

30" PINE

CONNECT NEW 1- PVC WS TO EX. W

WATER LEVEL ELEV 24.13

6" DRAIN INV 24.5

6" PVC DRAIN @ 1.04%

EXTERIOR 6' PRIVACY FENCE (TYP.)

REMOVE EX. FENCE WHERE REQUIRED TO CONSTRUCT KENNEL

4" PVC LAT @ 1.04%

1" PVC WS

PROPOSED 4' SIDEW W/ 2' GRAVEL EDGI EACH SIDE, MATCH GRADE

EW-6 INV 24.00 12'X13'X26" VDOT CLASS I RIP RAP APRON

2-26' OF 12" RCP @ 0.5%

EX 12" HDPE INV 24.68

FOREBAY TOP 25.0 BOTTOM 24.0

EX SHED

EX. DRAINFIELD

EX. SEPTIC TANK

EX. 4" LAT.

VAN ACCESS H/C SIGN

TOP OF BERM ELEV 26.5

POND BOTTOM ELEV 22.0

25' BUFFER

CONNECT NEW 4" PVC LAT TO EX. LAT.

26" PINE

30" PINE

EX WELL

INV 25.1

EX STABLE

9'X18' H/C SPACE W/ 8' AISLE TO MATCH EX. GRADE

DISCONNECT EX. 4" LAT. FROM STABLE AND CAP (SEE NOTE #4)

EX SHED

EX 25 SPACE GRAVEL LOT

INV 27.35

INV 27.20

EX CMP

APPROXIMATE LIMITS OF WETLANDS PER DELINEATION

N 10°

NOTES:
1. STEEL TO CONFORM TO ASTM A-36.
2. ALL SURFACES TO BE COATED WITH GALVANIZING COMPOUND AFTER WELDING.
3. TRASH RACK TO BE CENTERED OVER OPENING.

WELD 1"X1"X1/8" ANGLE IRON OVER ALL EDGES

LOW MAINTENANCE SLOPE (STEEPER THAN 3:1)

– KENTUCKY 31 TALL FESCUE	93–108 LBS.
– COMMON BERMUDAGRASS **	0–15 LBS.
– RED TOP GRASS	2 LBS.
– SEASONAL NURSE CROP *	20 LBS.
– SERICEA LESPEDEZA **	20 LBS.
	150 LBS.

* USE SEASONAL NURSE CROP IN ACCORDANCE WITH SEEDING DATES AS STATED BELOW:
FEBRUARY, MARCH THROUGH APRIL ..... ANNUAL RYE
MAY 1ST THROUGH AUGUST ..... FOXTAIL MILLET
SEPTEMBER, OCTOBER THROUGH NOVEMBER 15TH ..... ANNUAL RYE
NOVEMBER 16TH THROUGH JANUARY ..... WINTER RYE

** MAY THROUGH OCTOBER, USE HULLED SEED. ALL OTHER SEEDING PERIODS, USE UNHULLED SEED. WEEPING LOVEGRASS MAY BE ADDED TO ANY SLOPE OR LOW-MAINTENANCE MIX DURING WARM SEEDING PERIODS; ADD 10-20 LBS./ACRE IN MIXES.

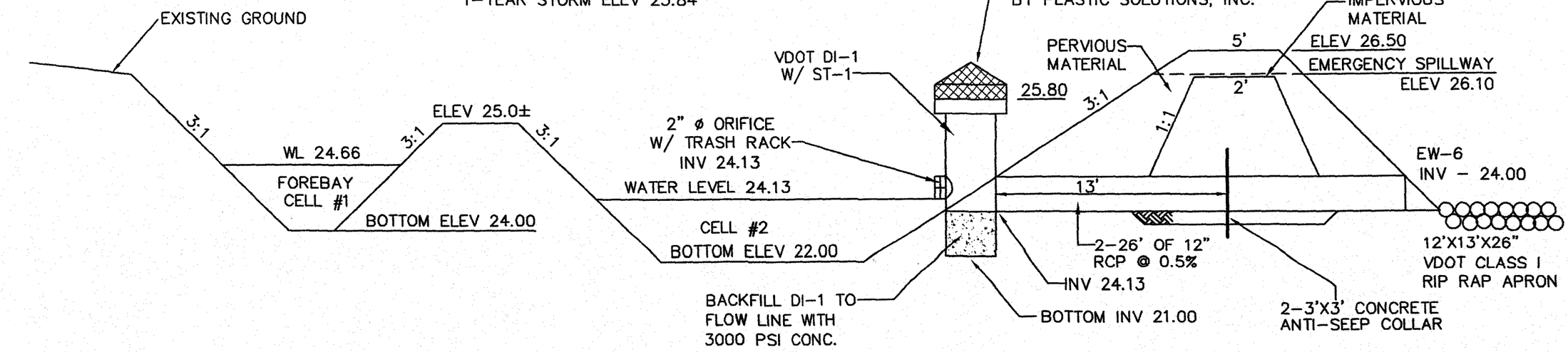
2'-8"

4" x 4" SALT TREATED POST (TYP)

8"X8" CONCRETE FOUNDATION (TYP)

RASH RACK DETAIL

EXTERIOR PRIVACY FENCE DETAIL



ELEV 26.50

R SHALL PLACE FILL MATERIAL IN 6" TO 8" LIFTS AND COMPACT TO 95% MAXIMUM DRY DENSITY AT 95% OPTIMUM MOISTURE CONTENT.
R SHALL PROVIDE FILL MATERIAL FREE OF ORGANICS, STUMPS, ROOTS AND OTHER DELETERIOUS MATERIAL.
F UNSUITABLE MATERIAL UNDER THE EMBANKMENT SHALL BE COMPLETED UNDER THE SUPERVISION OF A GEOTECHNICAL ENGINEER.
OF THE IMPERVIOUS MATERIAL EARTHEN EMBANKMENT SHALL BE COMPLETED UNDER THE SUPERVISION OF A GEOTECHNICAL ENGINEER.
ET VDOT STANDARDS AND SPECIFICATIONS.

NOT TO SCALE

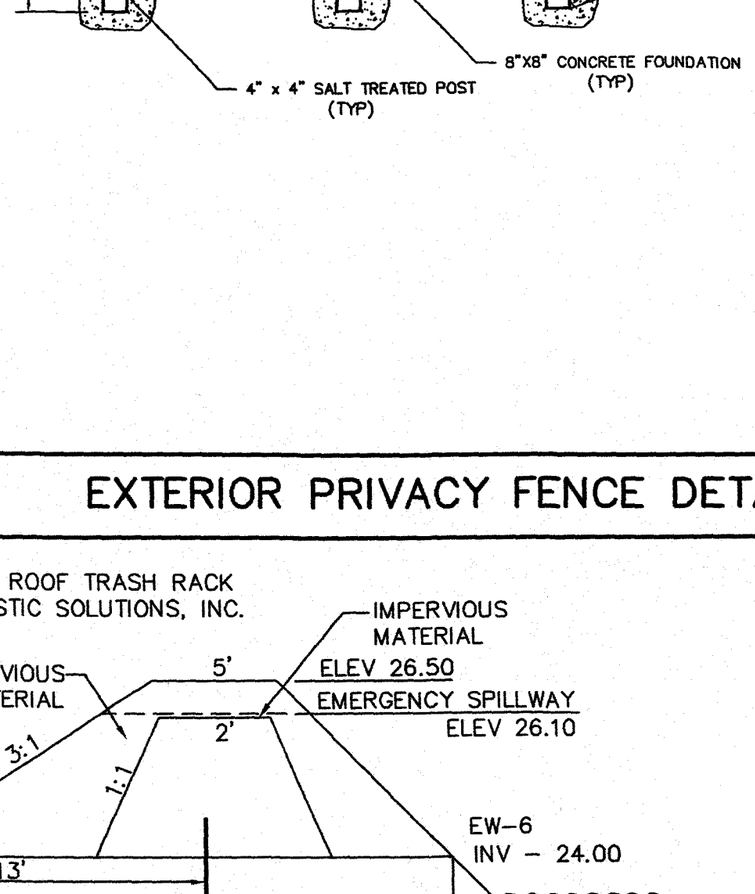
WET POND BMP DETAIL

GF

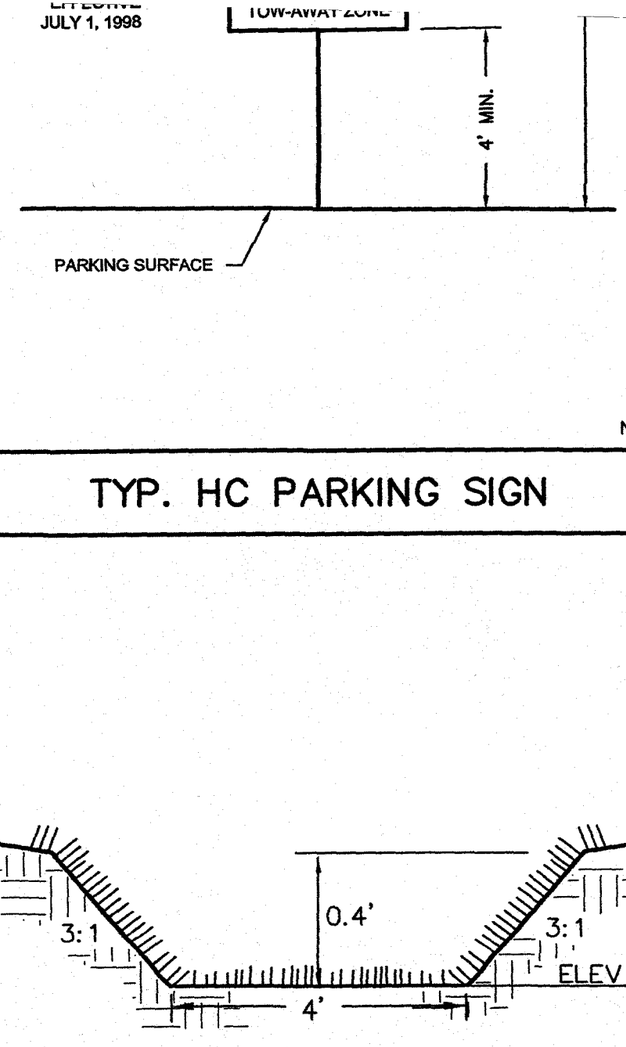
20 LBS.
20 LBS.
150 LBS.

...ING DATES AS STATED BELOW:
..... ANNUAL RYE
..... FOXTAIL MILLET
15TH ..... ANNUAL RYE
..... WINTER RYE

...ER SEEDING PERIODS, USE
... ANY SLOPE OR LOW-
...0-20 LBS./ACRE IN MIXES.



EXTERIOR PRIVACY FENCE DETAIL



NOT TO SCALE

TYP. HC PARKING SIGN

...OPTIMUM MOISTURE CONTENT.

...EOTECHNICAL ENGINEER.
... GEOTECHNICAL ENGINEER.

NOT TO SCALE

...MP DETAIL

GRASS EMERGENCY SPILLWAY DETAIL

NO.							2	1

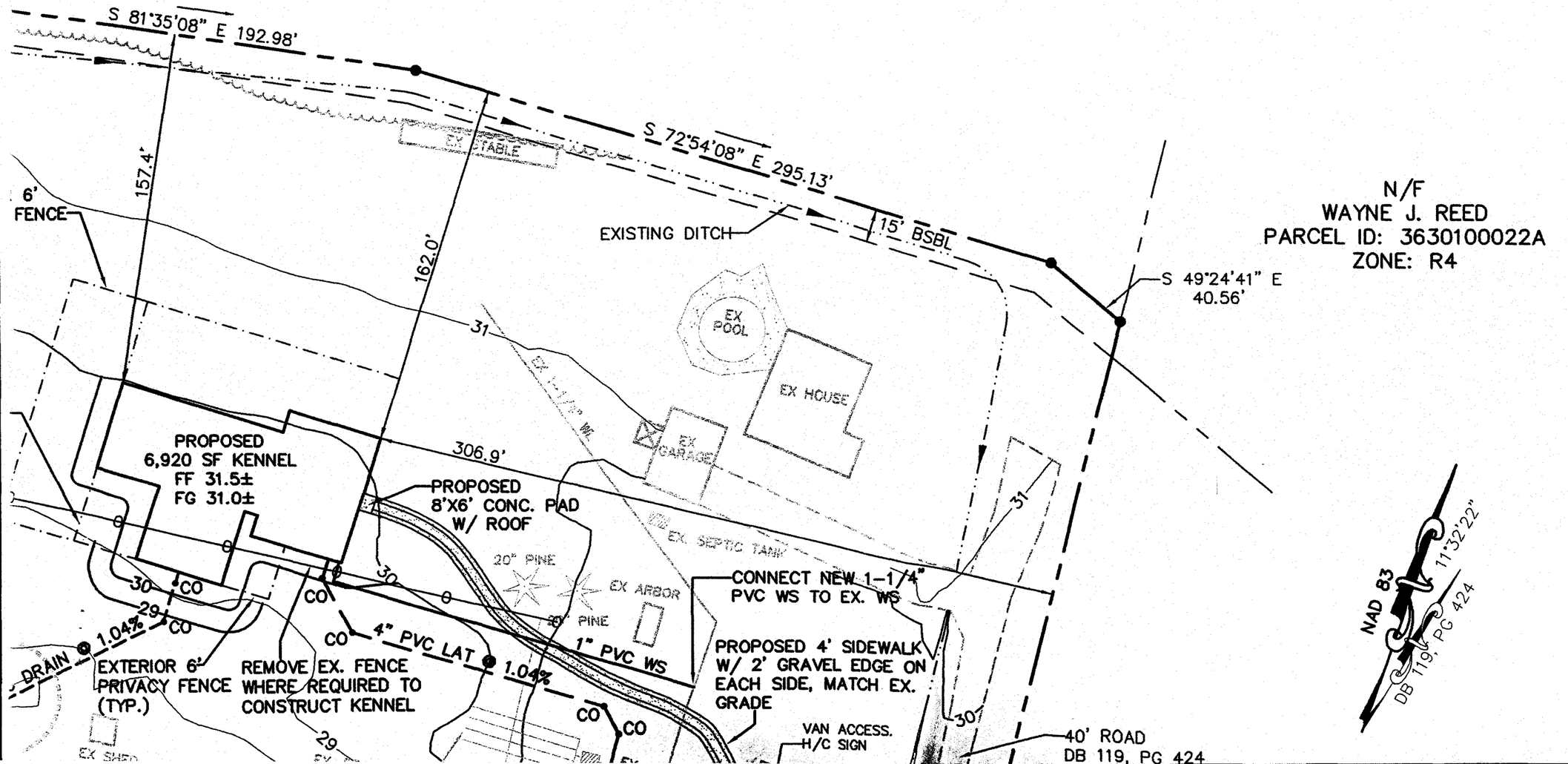
COMMONWEALTH OF VIRGINIA
K.M. JENKINS II
No. 022872
PROFESSIONAL ENGINEER

LandTech Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

SCALE: 1" = 20'
DATE: 2/24/04
JOB: 04-078
DRAWN BY: KMJ
SHEET: C4 OF 5

WET POND EARTHEN EMBANKMENT GENERAL CONSTRUCTION NOTES

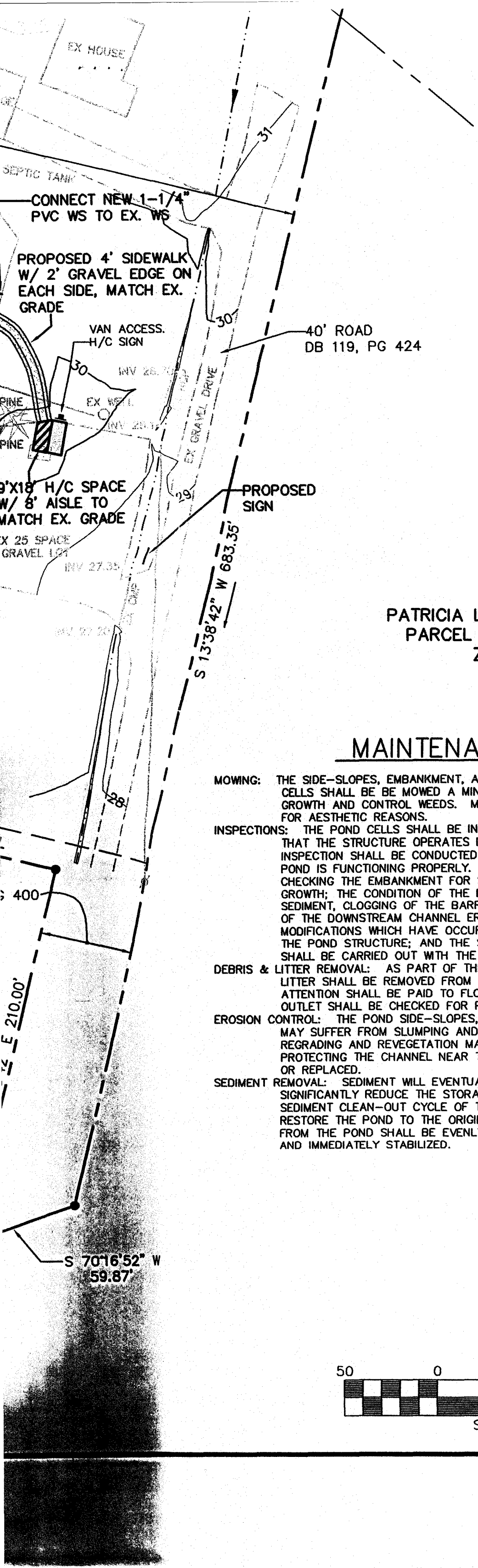
1. THE CONTRACTOR SHALL PROVIDE ALL LABOR AND MATERIALS REQUIRED TO CONSTRUCT THE WET POND, BEST MANAGEMENT PRACTICE.
2. THE CONTRACTOR SHALL PROVIDE THE SERVICES OF A GEOTECHNICAL ENGINEER. THE GEOTECHNICAL ENGINEER SHALL PROVIDE TESTING AND SAMPLING REQUIRED TO INSURE PROPER INSTALLATION OF THE EMBANKMENT SOILS. TESTING SHALL INCLUDE SOIL CLASSIFICATION, PERMEABILITY, PLASTICITY INDEX, AND COMPACTION. TESTING METHODS SHALL COMPLY WITH ASTM GUIDELINES AND SHALL BE PAID FOR BY THE CONTRACTOR. THE GEOTECHNICAL ENGINEER SHALL CERTIFY PROPER CONSTRUCTION AT THE COMPLETION OF THE PROJECT PRIOR TO OWNER ACCEPTANCE.
3. THE CONTRACTOR SHALL DISPOSE OF UNSUITABLE SOILS OFF-PROPERTY AT THE CONTRACTORS EXPENSE. ON-SITE DISPOSAL WILL REQUIRE WRITTEN AUTHORIZATION FROM THE OWNER.
4. THE CONTRACTOR SHALL UNDERCUT FOR THE EMBANKMENT IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS. THE EMBANKMENT SHALL BE BACK FILLED WITH SOIL CLASSIFICATION GROUPS SM, SC, OR CL AS DEFINED BY THE UNIFIED SOIL CLASSIFICATION SYSTEM. SOILS SHALL HAVE A MINIMUM OF 15% FINES, PLASTICITY INDEX OF 30% AND A PERMEABILITY OF 0.0004 IN./SEC. OR LESS. FILL SHALL BE INSTALLED IN 8-INCH LIFTS OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER. COMPACTION FOR FILLS WILL EXCEED 95% STANDARD PROCTOR.
5. THE CONTRACTOR SHALL INSTALL A MINIMUM OF 4-INCHES OF TOPSOIL MATERIAL TO COVER THE EMBANKMENT.
6. THE CONTRACTOR SHALL ENSURE THE GEOTECHNICAL ENGINEER PROVIDES A CONSTRUCTION CERTIFICATION AT THE COMPLETION OF CONSTRUCTION.



MILANVILLE KENNELS
2878 MONTICELLO AVENUE
LAYOUT PLAN

James City County Virginia

COMMENT / NOTE	
LTR. DTD. 7/19/04	
LTR. DTD. 5/24/04	



N/F
PATRICIA L. ROBERTS ET UX
PARCEL ID: 4510100002
ZONE: A1

MAINTENANCE PLAN

MOWING: THE SIDE-SLOPES, EMBANKMENT, AND EMERGENCY SPILLWAY OF THE WET POND CELLS SHALL BE BE MOWED A MINIMUM OF TWICE A YEAR TO PREVENT WOODY GROWTH AND CONTROL WEEDS. MORE FREQUENT MOWINGS MAY BE REQUIRED FOR AESTHETIC REASONS.

INSPECTIONS: THE POND CELLS SHALL BE INSPECTED ON AN ANNUAL BASIS TO ENSURE THAT THE STRUCTURE OPERATES IN THE MANNER ORIGINALLY INTENDED. THE INSPECTION SHALL BE CONDUCTED DURING WET WEATHER TO DETERMINE IF THE POND IS FUNCTIONING PROPERLY. INSPECTION PRIORITIES SHALL INCLUDE CHECKING THE EMBANKMENT FOR SUBSIDENCE, EROSION, CRACKING, AND TREE GROWTH; THE CONDITION OF THE EMERGENCY SPILLWAY, THE ACCUMULATION OF SEDIMENT, CLOGGING OF THE BARREL AND OUTLET STRUCTURE; THE ADEQUACY OF THE DOWNSTREAM CHANNEL EROSION PROTECTION MEASURES; ANY MODIFICATIONS WHICH HAVE OCCURED TO THE CONTRIBUTING WATERSHED AND THE POND STRUCTURE; AND THE STABILITY OF THE SIDE-SLOPES. INSPECTIONS SHALL BE CARRIED OUT WITH THE "AS-BUILT" POND PLANS IN HAND.

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50 0 50 100 150
Scale: 1" = 50'

NO.	DATE	REVISION / COMMENT / NOTE
2	8/2/04	REV PER JCC LTR. DTD. 7/19/04
1	6/7/04	REV PER JCC LTR. DTD. 5/24/04

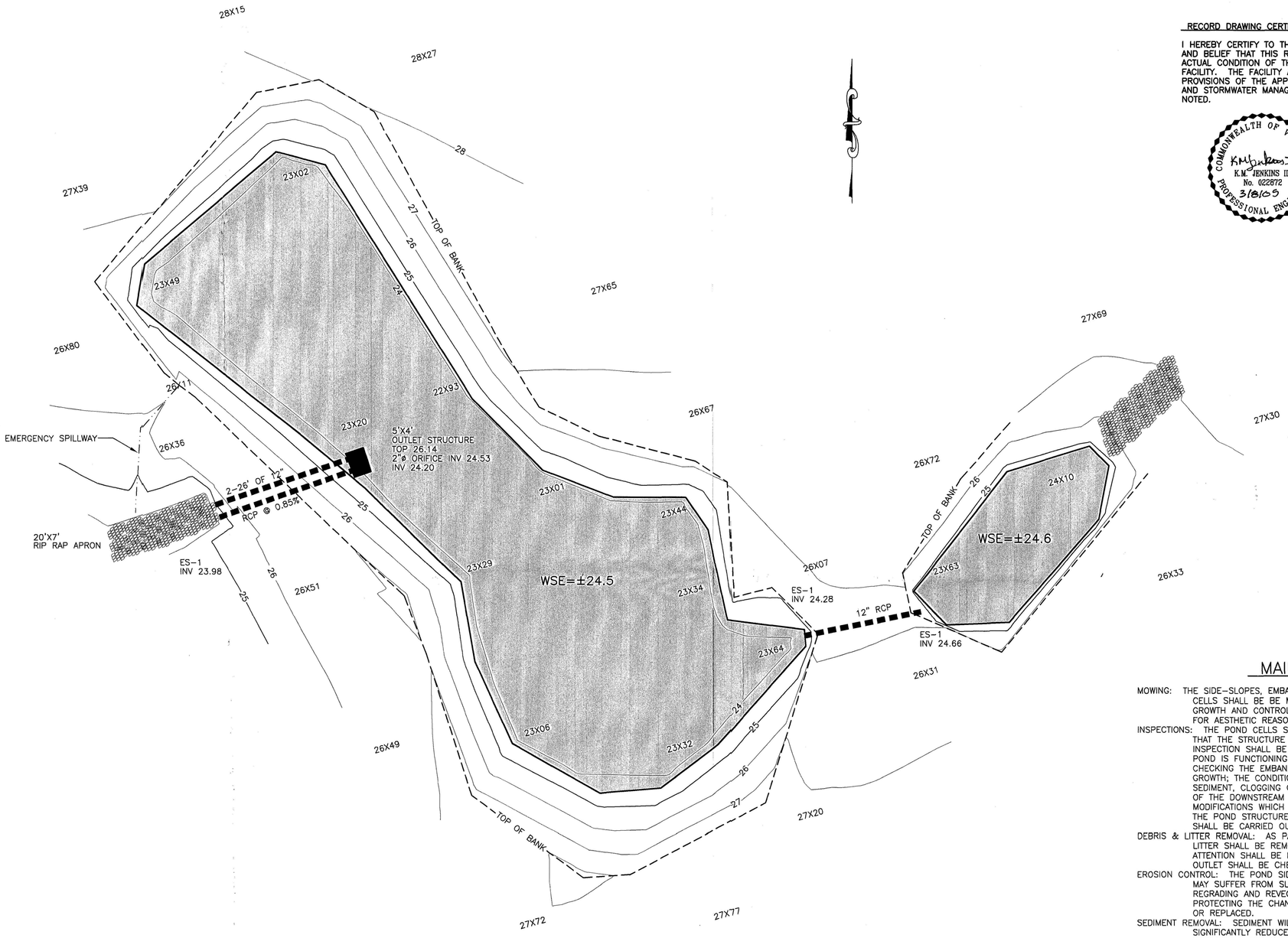
2

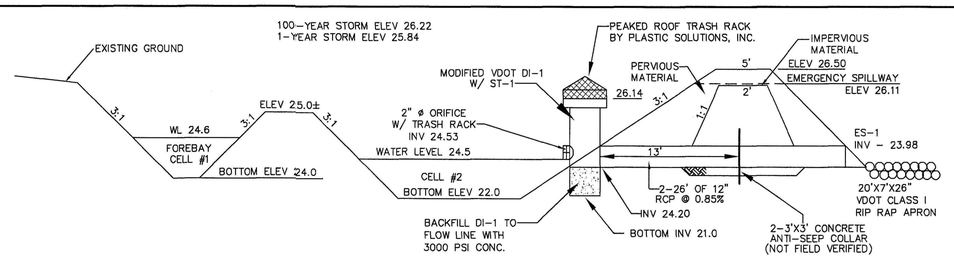
James City Co

COMMONWEALTH OF VIRGINIA
K.M. JENKINS II
No. 022872
PROFESSIONAL ENGINEER
013164

LandTech Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

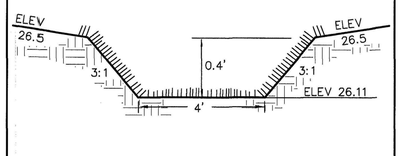
SCALE: 1" = 50'
DATE: 2/24/04
JOB: 04-078
DRAWN BY: KMJ
SHEET: C2 OF 5





NOT TO SCALE

WET POND BMP DETAIL



NOT TO SCALE

GRASS EMERGENCY SPILLWAY DETAIL

RECORD DRAWING CERTIFICATION

I HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE ACTUAL CONDITION OF THE STORMWATER MANAGEMENT/BMP FACILITY. THE FACILITY APPEARS TO CONFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN, SPECIFICATIONS AND STORMWATER MANAGEMENT PLAN, EXCEPT AS SPECIFICALLY NOTED.

COMMONWEALTH OF VIRGINIA
K.M. JENKINS II
No. 022872
3/8/05
PROFESSIONAL ENGINEER

MAINTENANCE PLAN

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APPROVED
James City County
Environmental Division
By: [signature]
Date: 3-8-05

10 0 10 20 30
Scale: 1" = 10'

MILANVILLE KENNELS
BMP RECORD DRAWING
WET POND
COUNTY PLAN NO. SP-54-04
James City County Virginia

NO.	DATE	REVISION / COMMENT / NOTE
1	3/8/05	REV PER JCCED TELECON 3/8/05

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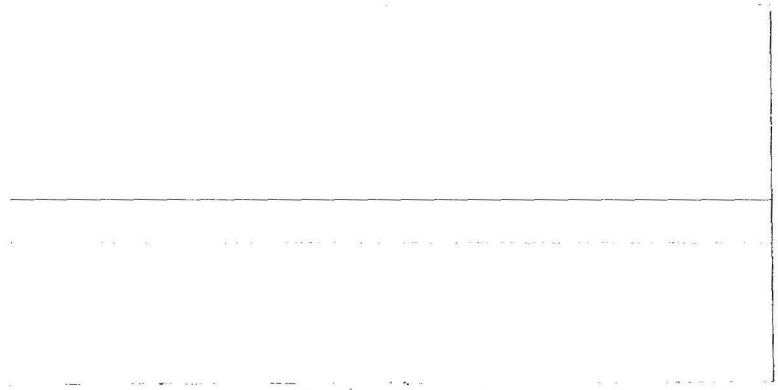
DRAWN BY: KMJ
SHEET: 1 OF 1

SP-54-04; GC004

SCOTT,

THIS GOES WITH THE MILLENNIUM KOMATSU AS-BUILT & CC INFORMATION.

BILL



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Solutions, Inc.

Geotechnical · Environmental · Testing


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GC 004
SP-54-04

CONSULTING ENGINEERS COUNCIL OF VIRGINIA
COALITION OF AMERICAN STRUCTURAL ENGINEERS

CATEGORY REPORT OF SPECIAL INSPECTIONS (AGENT #2)

Project: Milanville Kennels, Inc.

Location: James City County, Virginia

Permit Applicant: Marc and Elizabeth Illman
Applicant Address: 2878 Monticello Avenue
Williamsburg, VA 23188

Architect of Record: N/A

Structural Engineer of Record: Fletcher & Associates, PC

To the best of my information, knowledge and belief, the field testing services for special inspections required for this project, as itemized in the statement of special inspections (Agent #2) have been completed.

Respectfully Submitted for,
G.E.T. Solutions, Inc. (Agent #2)

Glenn W. Hohmeier
Print Name

Signature

COMMONWEALTH OF VIRGINIA
1-13-05
GLENN W. HOHMEIER
No. 036235
PROFESSIONAL ENGINEER

1592 Penniman Road, Suite E • Williamsburg, VA 23185 • Phone (757) 564-6452 • Fax (757) 564-6453
info@getsolutionsinc.com

Construction Materials Testing and Field Engineering Services - Report No. 1
Milanville Kennels, Inc.
James City County, Virginia
G E T Project No: WM04-165T
January 10, 2005
Prepared For: D. Marc Illman

GET Solutions, Inc.

Geotechnical · Environmental · Testing

GET
Solutions, Inc.

Geotechnical · Environmental · Testing

January 10, 2005

TO: D. Marc Illman
2878 Monticello Avenue
Williamsburg, Virginia 23188

RE: Construction Materials Testing and Field Engineering Services
Milanville Kennels, Inc.
James City County, Virginia
G E T Project No: WM04-165T
Report No. 1

Dear Mr. Illman:

As requested, a representative of **G E T Solutions Inc.** visited the project site between October and December of 2004. The purpose of our visits was as follows:

- Visually inspect and proofroll the subgrade soils for the building pad
- Observe the base of the footing excavations
- Evaluate the foundation bearing soils
- Inspect the footing dimensions and reinforcing steel within the observed footings
- Collect bulk soil samples of the on-site and imported fill for laboratory testing
- Perform compaction testing on the building pad fill
- Inspection of the BMP embankment dam area, including anti-seepage collar, and key way
- Perform compaction testing on the soil materials associated with the key way and dam area

Subgrade Evaluation – Building Pad

During our site visit on October 6, 2004, the exposed subgrade soils within the building pad were proofrolled under the observation of the **G E T Solutions Inc** representative. The proofroll operation generally revealed stable subgrade conditions under applied wheel loads. Based on our field observations, the observed subgrade soils were considered suitable for select fill (SAND) placement as required to establish proper grades (on the order of 12 inches).

Footing Excavations

A representative of **G E T Solutions, Inc.** visited the project site on October 26, 2004 in order to evaluate the foundation bearing soils for the footings associated with the construction of the Milanville Kennels structure. At the time of our site visit, the footing excavation was completed to the required 3-foot depth. In addition, water was observed in several areas of the footing excavation. **G E T** recommended removal of the water from the excavation prior to placing the required 18 inches of 57 stone. The owner/contractor prepared and began to pump the water from the excavations at the time of our visit.

On October 27, 2004, a **G E T** representative visited the site to reinspect the footing excavations. Upon arrival, the owner/contractor had dewatered and generally removed the loose wet soils from the base of the footing excavations. In order to evaluate the foundation bearing soils, the entire footing was probed with a steel probe rod and several 3 to 4 foot deep hand auger borings were performed within the base of the excavations. The recovered soils were generally consistent with the Geotechnical Study Report dated February 9, 2004 prepared by Foundation Engineering Sciences, Inc. Probe penetrations throughout the base of the excavations indicated stable footing subgrade conditions. In addition, we also observed the foundation excavation dimensions which appeared to be in general accordance with the project plans. Based on our field observations, testing and inspection procedures, the observed foundation excavations were considered suitable for 57 stone and reinforcing steel placement.

On October 28, 2004, a **G E T** representative visited the site to inspect the required 57 stone and reinforcing steel placement within the footing excavations. The footing dimensions and reinforcing steel placement appeared to be in general accordance with the project plans. Based on our field observations, the observed footing excavations were considered suitable for concrete placement.

The reader is referred to the attached sketch for the approximate footing locations inspected within the building pad.

Compaction Testing – Building Pad

During our site visit on November 19, 2004, compaction testing was conducted on the building pad select fill (SAND). Compaction testing was performed on the SAND fill at a rate of at least 1 test per 2,000 square feet of the building pad area. The compaction test results, which are included as an attachment to this report, indicated that the backfill materials were compacted to at least the specified 95% of the standard Proctor maximum dry density (ASTM D 698).

During our site visits, a bulk soil sample was collected and transported to our Williamsburg laboratory for standard Proctor analysis in accordance with ASTM D 698. The bulk sample was comprised of imported brown poorly graded SAND (SP-SM). The Moisture Density Test Report (Proctor Curve) is included as an attachment.

Dam and Key Way Inspection

A representative of **G E T Solutions Inc.** visited the site on October 7, 2004 in order to perform an inspection of the dam area and key way. Based on our observations, the dam area and key way required minimal fill in order to achieve proper grade. The owner/contractor was advised to remove remaining topsoil from top of dam area prior to placing fill. Test pits were performed within the dam and key way areas revealing Silty CLAY (CL) soil material. Based on our visual inspection procedures, the on-site natural soils appear to be suitable for key way and dam construction and in accordance with the project plans. Compaction testing was completed within the key way, storm pipe and dam area. The compaction test results, which are attached to this report, indicated that the natural soils were compacted to at least 95% of the standard Proctor maximum dry density (ASTM D 698).

During our site visits on October 28 and December 21, 2004, we conducted an inspection of the installed storm pipes, anti-seepage collars and control structures. Based on our visual observations, these facilities within the BMP area were observed to have been constructed in accordance with the project plans.

During our site visits, a bulk soil sample of on-site material was collected and transported to our Williamsburg laboratory for standard proctor analysis in accordance with ASTM D 698. The bulk sample was comprised of Silty CLAY (CL) with trace Sand. The Moisture Density Test Report (Proctor Curve) is included as an attachment.

January 10, 2005

We appreciate the opportunity to offer our services to you, and trust that you will call this office with any questions that you may have.

Respectfully Submitted,
GET Solutions, Inc.

Sandra Peterson
Staff Geologist

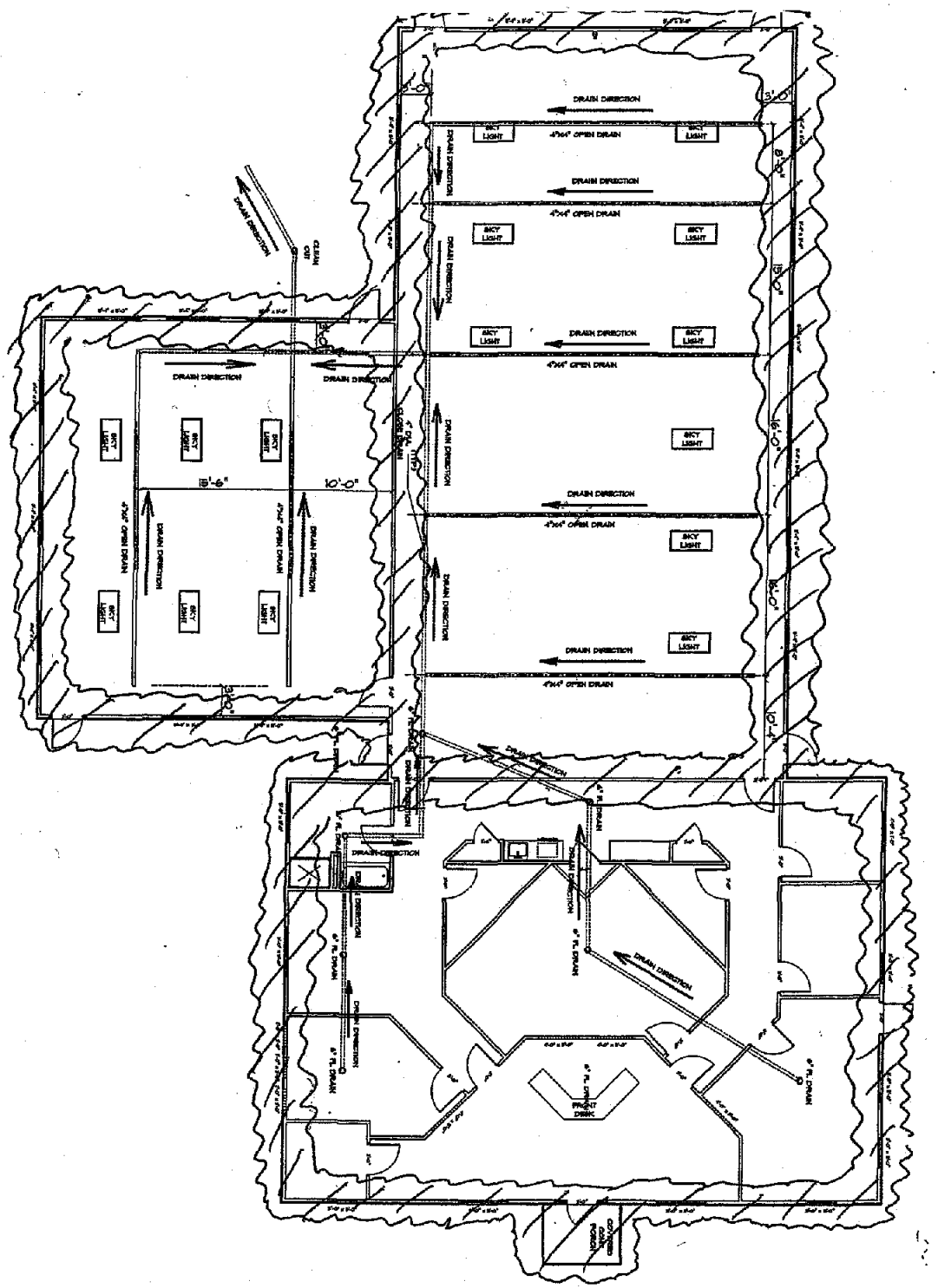
Glenn W. Hohmeier, P.E.
Sr. Project Engineer
VA Lic. # 036735

Distribution: (3) Client

Attachments:
Footing Inspection Location Sketch
Compaction Test Reports
Moisture Density Test Reports (Proctor Curves)
Anti-Seepage Location Sketch
Dam Area Inspection Sketch

FOOTING INSPECTION LOCATION SKETCH

Figure 1



Locations are approximate

FOOTING INSPECTION LOCATION SKETCH

PROJECT:	**Milanville Kennels** **James City County, Virginia**	**SCALE: NTS**
PROJECT NO:	**WM04-165T**	**DATE: 10/28/04**
CLIENT:	**Milanville Kennels, Inc.**	**PLOT BY: GW**

COMPACTION TEST REPORTS

G E T Solutions, Inc.
1592 Penniman Road, Suite E
Williamsburg, VA 23185
Phone: 757-564-6452 Fax: 757-564-6453

COMPACTION TEST REPORT

Project: Milanville Kennels
Project Location: James City County, Virginia
Client: Milanville Kennels, Inc.
General Contractor: Milanville Kennels, Inc.
Grading Contractor: Milanville Kennels, Inc.

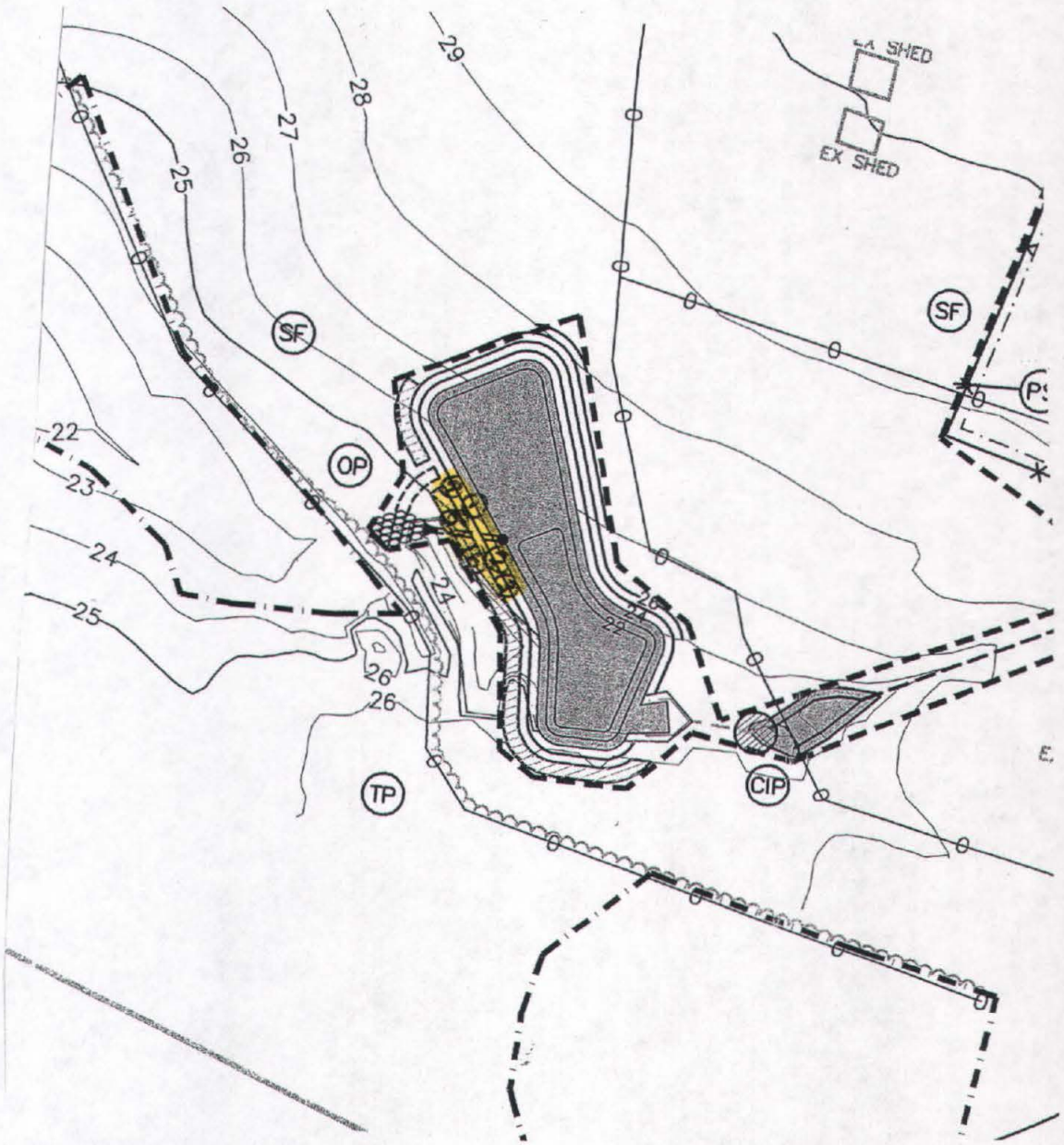
Date: 10-8-04
Technician: L. Young
Job #: WM04-165T
Weather: Sunny Temp (°F): 70's
General Location: Keyway

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation Below Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	21.0	103.4	1	95	100	X		2' BFG	Keyway
2	19.1	104.1	1	95	100	X		2' BFG	Keyway
3	15.1	104.6	1	95	101	X		1' BFG	Keyway
4	16.2	103.0	1	95	99	X		1' BFG	Keyway
5	17.2	104.2	1	95	100	X		At FG	Keyway
6	18.9	104.5	1	95	101	X		At FG	Keyway

Compaction Equipment Used: Troxler 3430
(1) Test Location Established By: Estimate
(2) Depth of Elev. of Test Established By: Estimate
(3) Test Conducted On: Backfill over Keyway
(4) Proctor Type: ASTM D698
Remarks: BFG = Below Finish Grade

Proctor No.: 1
Max. Density (PCF): 103.6
Opt. Moisture (%): 19.6

Figure 1



Locations are approximate

LOCATION SKETCH

PROJECT:	Milanville Kennels James City County, Virginia	SCALE: NTS
PROJECT NO:	WM04-165T	DATE: 10/8/04
CLIENT:	Milanville Kennels, Inc.	PLOT BY: LY

G E T Solutions, Inc.
1592 Penniman Road, Suite E
Williamsburg, VA 23185
Phone: 757-564-6452 Fax: 757-564-6453

COMPACTION TEST REPORT

Project: Milanville Kennels
Project Location: James City County, Virginia
Client: Milanville Kennels, Inc.
General Contractor: Milanville Kennels, Inc.
Grading Contractor: Milanville Kennels, Inc.

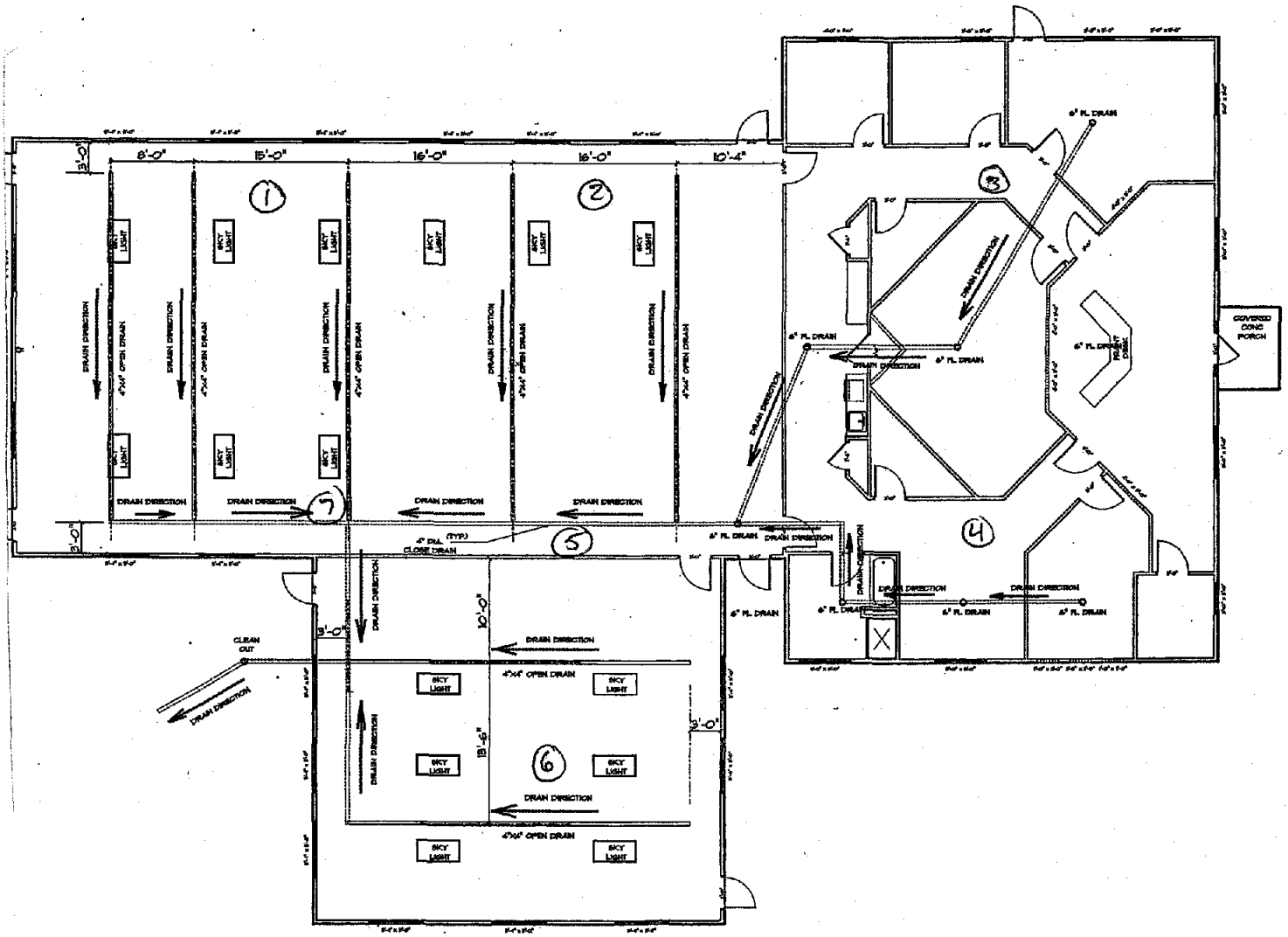
Date: 11-19-04
Technician: L. Young
Job #: WM04-165T
Weather: Clear Temp (°F): 55°
General Location: Building Pad

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation Below Finish Floor (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	13.4	111.1	2	95	99	X		6" BFF	See Attached Sketch
2	12.9	113.6	2	95	101	X		6" BFF	See Attached Sketch
3	13.3	111.6	2	95	100	X		6" BFF	See Attached Sketch
4	13.5	111.2	2	95	100	X		6" BFF	See Attached Sketch
5	12.5	113.0	2	95	101	X		6" BFF	See Attached Sketch
6	12.2	112.8	2	95	100	X		6" BFF	See Attached Sketch
7	13.0	113.5	2	95	101	X		6" BFF	See Attached Sketch

Compaction Equipment Used: Troxler 3430
(1) Test Location Established By: Estimate
(2) Depth of Elev. of Test Established By: Estimate
(3) Test Conducted On: Building Pad Fill
(4) Proctor Type: ASTM D698
Remarks: BFF = Below Finish Floor

Proctor No.: 2
Max. Density (PCF): 111.7
Opt. Moisture (%): 10.6

Figure 1



Locations are approximate

LOCATION SKETCH

PROJECT:	**Milanville Kennels** **James City County, Virginia**	**SCALE: NTS**
PROJECT NO:	**WM04-165T**	**DATE: 11/19/04**
CLIENT:	**Milanville Kennels, Inc.**	**PLOT BY: LY**

MOISTURE DENSITY TESTS (PROCTOR CURVES)

MOISTURE DENSITY TEST REPORT (PROCTOR CURVE)

Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
0-1 Ft Below	CL	A-7-6	30.8		46	21		96.3

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 103.6 pcf Optimum moisture = 19.6 %	Mottled, brown to tan, Silty CLAY (CL) with trace sand

Project No. WM04-165T **Client:** D. Mark Illman

Project: Milanville Kennels

• **Location:** On Site Material

Remarks:

Proctor Id #1

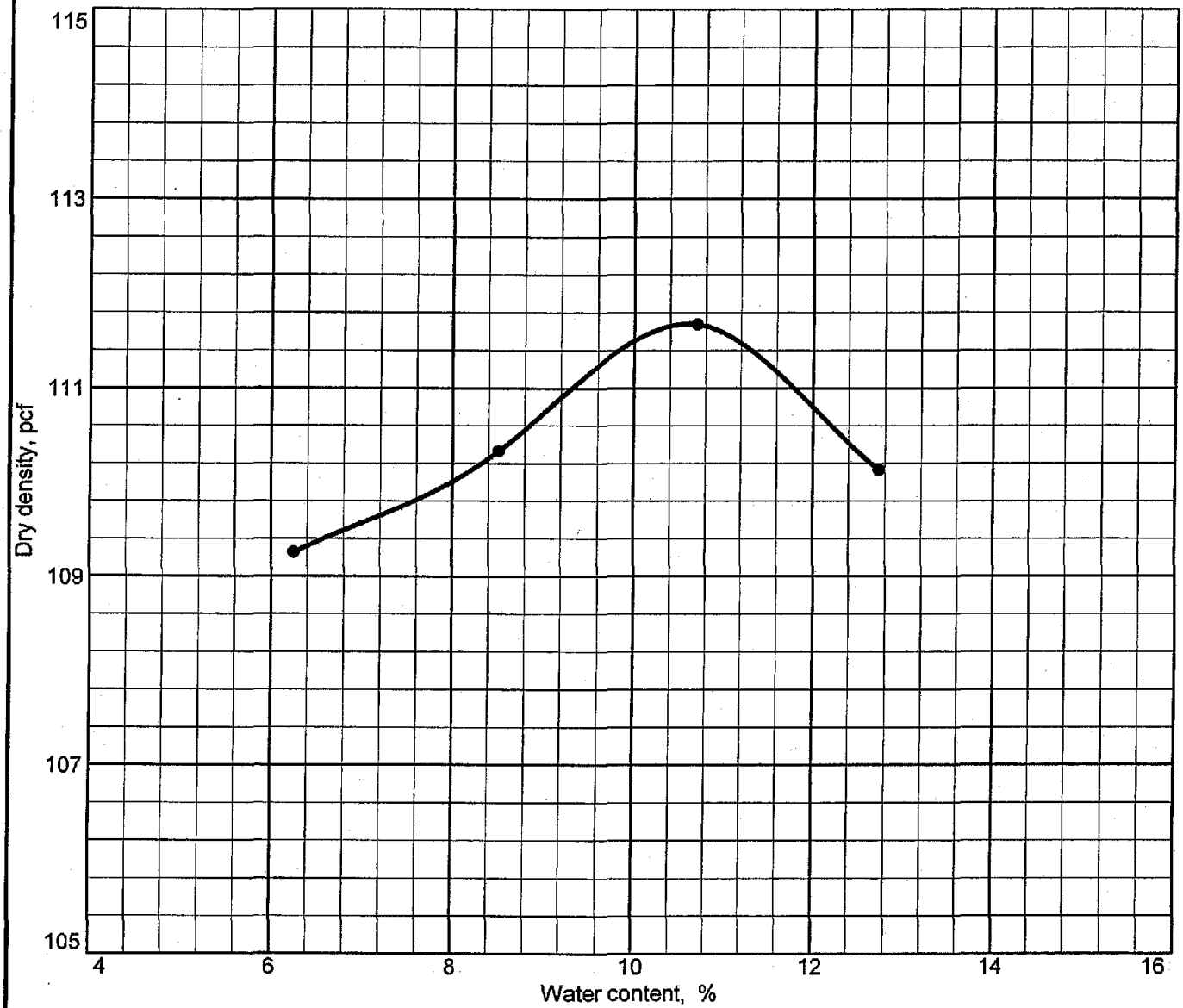
Sample Obtained: 10/7/04

MOISTURE DENSITY TEST REPORT (PROCTOR CURVE)

GET SOLUTIONS, INC.

Figure 1

MOISTURE DENSITY TEST REPORT (PROCTOR CURVE)



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
N/A	SP-SM	A-1-b	7.3		NP	NP	10.3	7.3

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 111.7 pcf Optimum moisture = 10.6 %	Brown, poorly graded SAND (SP-SM) with trace Silt and Gravel

Project No. WM04-165T **Client:** D. Mark Illman

Project: Milanville Kennels

● **Location:** Imported Fill

Remarks:

Proctor Id #2

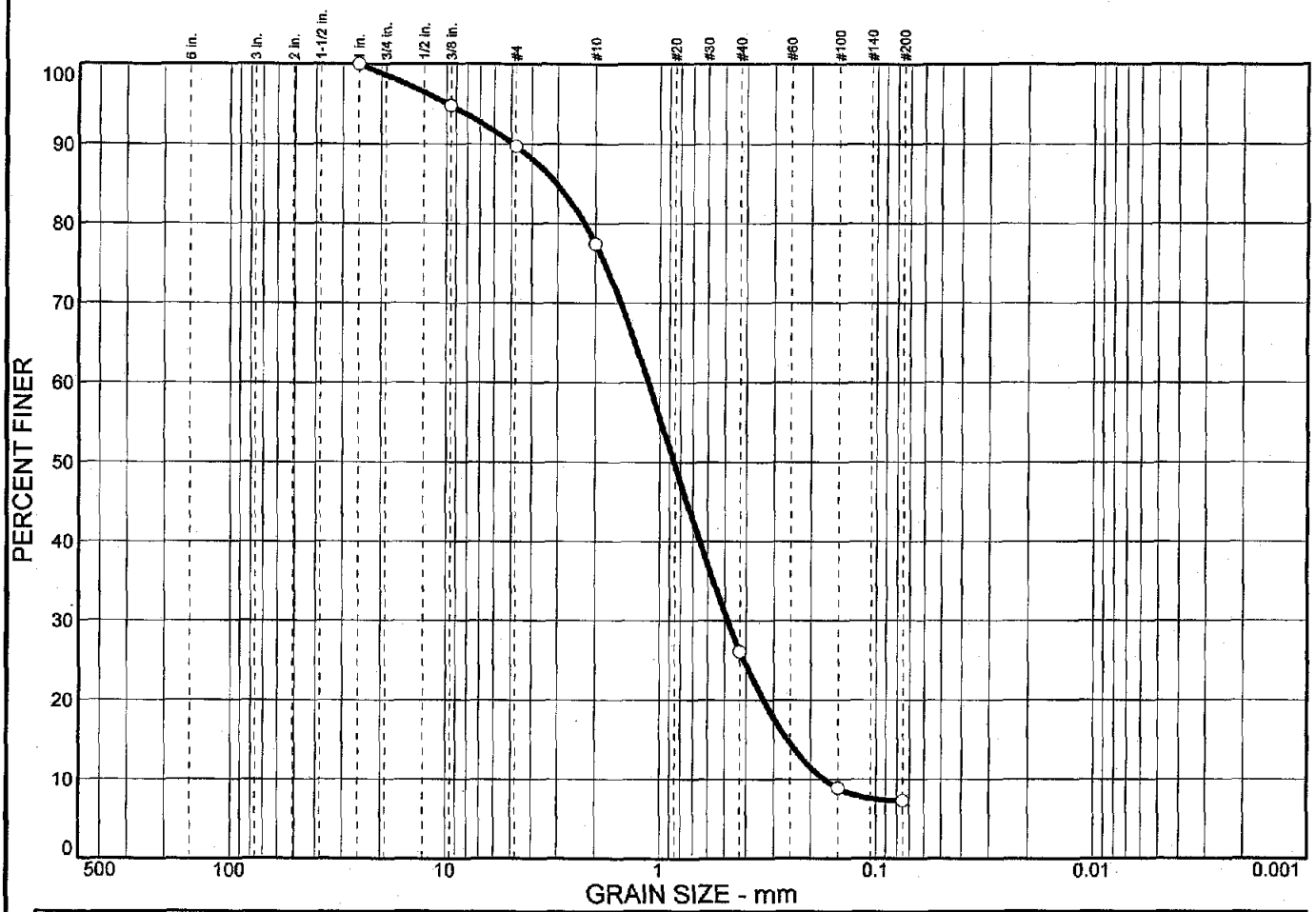
Sample Obtained: 11/19/04

MOISTURE DENSITY TEST REPORT (PROCTOR CURVE)

GET SOLUTIONS, INC.

Figure 1

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	10.3	82.4	7.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/8 in.	94.8		
#4	89.7		
#10	77.4		
#40	26.1		
#100	8.9		
#200	7.3		

* (no specification provided)

Soil Description

Brown, poorly graded SAND (SP-SM) with trace Silt and Gravel

Atterberg Limits

PL= LL= NP PI= NP

Coefficients

D_{85}= 3.04 D_{60}= 1.13 D_{50}= 0.859
D_{30}= 0.485 D_{15}= 0.258 D_{10}= 0.174
C_u= 6.51 C_c= 1.20

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

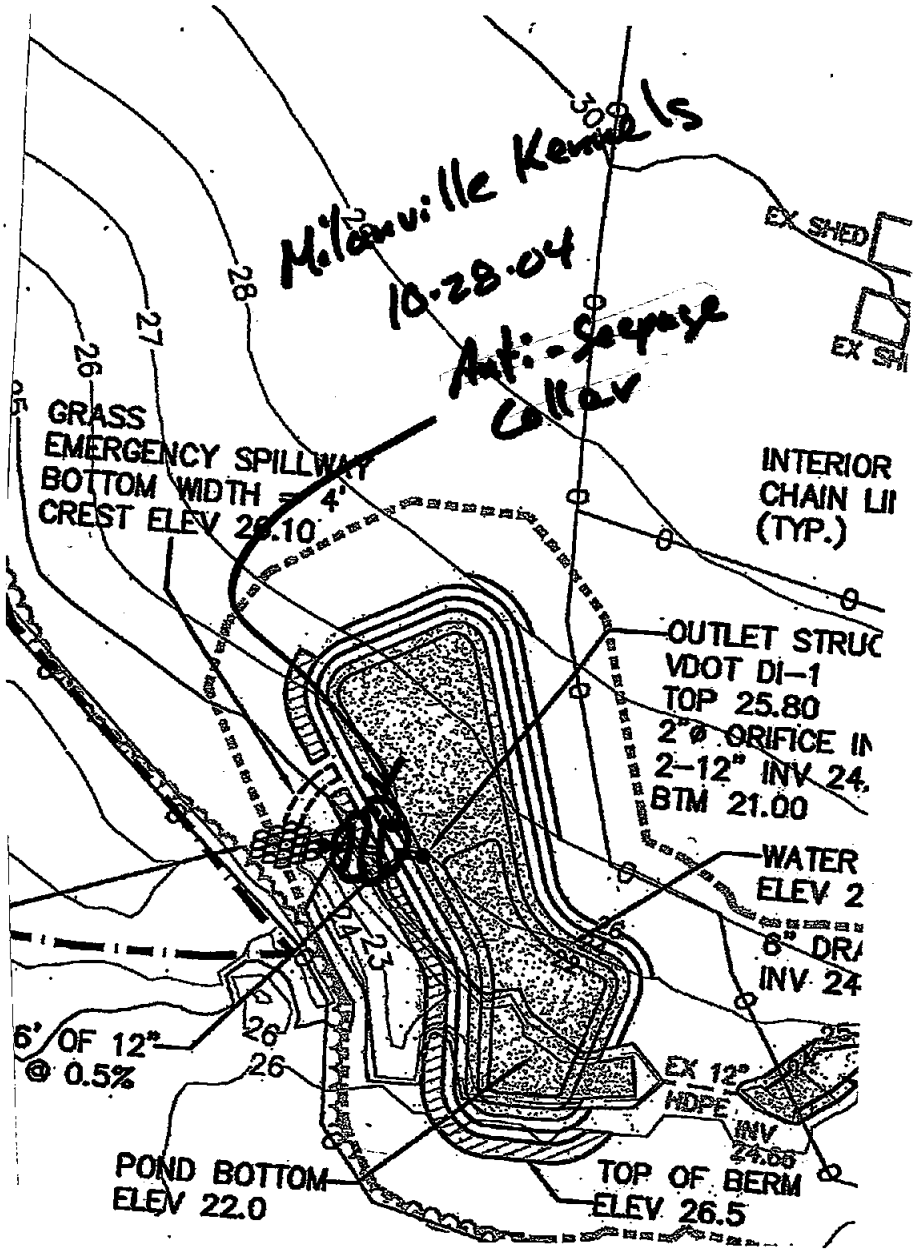
Proctor Id #2
Sample Obtained: 11/19/04

Sample No.: PR #2 **Source of Sample:** **Date:** 11/23/04
Location: Imported Fill **Elev./Depth:** N/A

GET SOLUTIONS, INC.

Client: D. Mark Illman
Project: Milanville Kennels
Project No: WM04-165T **Figure** 1a

ANTI-SEEPAGE LOCATION SKETCH



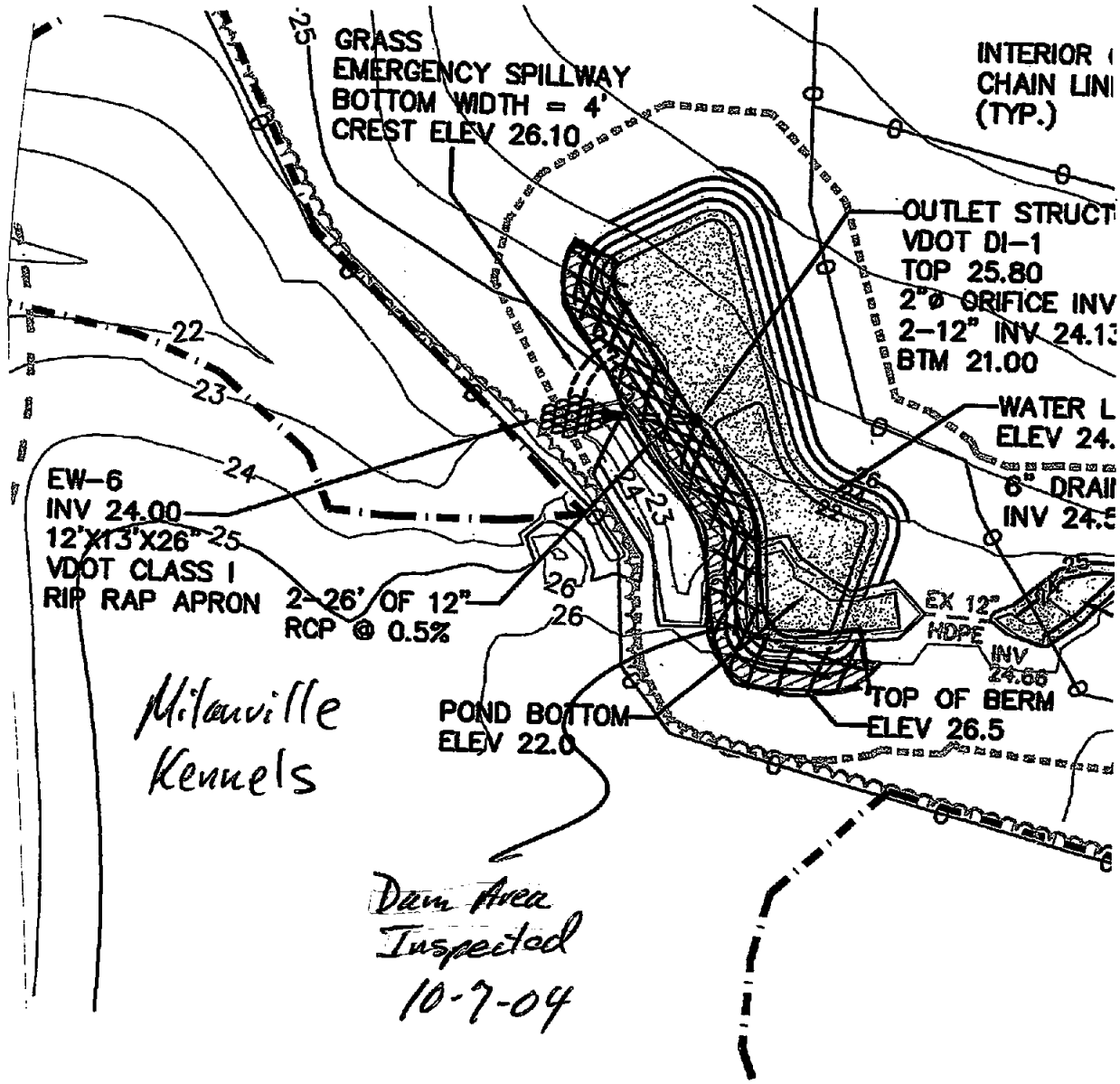
Locations are approximate

ANTI-SEEPAGE LOCATION SKETCH

PROJECT:	**Milanville Kennels**	
	James City County, Virginia	**SCALE: NTS**
PROJECT NO:	**WM04-165T**	**DATE: 10/28/04**
CLIENT:	**Milanville Kennels, Inc.**	**PLOT BY: GW**

DAM AREA INSPECTION SKETCH

Figure 1



Locations are approximate

DAM AREA INSPECTION SKETCH

PROJECT:	**Milanville Kennels**	
	James City County, Virginia	**SCALE: NTS**
PROJECT NO:	**WM04-165T**	**DATE: 10/7/04**
CLIENT:	**Milanville Kennels, Inc.**	**PLOT BY: GW**

Erosion and Sediment Control Narrative

for

Milanville Kennels

April 13, 2004
Revised June 10, 2004
Revised August 2, 2004

Project Number 04-078

SP-54-04
3RD SUB

LandTech Resources, Inc.
5810-F Mooretown Road, Williamsburg, VA
Phone 757-565-1677 **Fax 757-565-0782**

Erosion and Sediment Control Narrative

for

Milanville Kennels

April 13, 2004
Revised June 10, 2004
Revised August 2, 2004

Project Number 04-078

LandTech Resources, Inc.
5810-F Mooretown Road, Williamsburg, VA
Phone 757-565-1677 **Fax 757-565-0782**

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MAINTENANCE

Temporary Stone Construction Entrance – 3.02
Silt Fence – 3.05
Culvert Inlet Protection – 3.08
Permanent Seeding – 3.32

FIGURES

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PROJECT DESCRIPTION

The project consists of the construction of a 6,920 sf kennel at 2878 Monticello Ave. in James City County, Virginia. The site is 15.01 acres with a total of 0.85 acres to be covered by impervious surfaces after construction is complete. The total disturbed area is approximately 0.96 acres.

EXISTING CONDITIONS

Currently the site is open in the front and wooded in the rear. The site slopes from the north to the south at approximately 1.5% and contains an existing residence, garage and stable.

ADJACENT AREAS

The site is bounded on the north, south, east and west existing residential lots.

OFF-SITE AREA

There are no off-site areas proposed to be disturbed in association with this project. However, if it becomes necessary to disturb off-site areas, a revised erosion and sediment control plan will be prepared and submitted to the county for review and approval.

SOILS

Chickahominy (9)

This soil is deep, nearly level, and poorly drained.

Typically, the surface layer of this soil is dark grayish brown and grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of at least 85 inches. It is mostly gray silty clay loam, silty clay, and clay loam with yellowish brown mottles.

The permeability of this Chickahominy soil is very slow, and the erosion hazard is slight. The subsoil has a high shrink-swell potential.

Emporia complex (15E)

This complex consists of areas of deep, steep, well drained Emporia soils and areas of similar soils that formed over layers of fossil shells.

Typically, the surface layer of Emporia soils is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is pale brown loam 5 inches thick. The subsoil extends to a depth of 50 inches. It is yellowish brown loam with mostly strong brown mottles in the upper part; yellowish brown, firm sandy clay loam with strong brown and gray mottles in the middle part; and mottled gray and brown, firm sandy clay loam in the lower part. The substratum is variegated brown, red, and gray, firm sandy clay loam to a depth of at least 75 inches.

In these Emporia soils, permeability is moderate in the upper part of the subsoil and moderately slow in the lower part. The erosion hazard is severe and the subsoil has moderate shrink-swell potential.

Newflat (23)

This soil is deep, nearly level, and somewhat poorly drained.

Typically, the surface layer of this soil is dark grayish brown and light yellowish brown silt loam about 8 inches thick. The upper 3 inches of the subsoil is pale brown silty clay loam. Below this, to a depth of at least 80 inches, the subsoil is light olive brown clay or gray clay with mostly yellowish brown mottles.

The permeability of this Newflat soil is very slow and the erosion hazard is slight. The subsoil has a high shrink-swell potential.

Peawick (27)

This soil is deep, nearly level, and moderately well drained.

Typically, the surface layer of this soil is dark grayish brown silt loam about 2 inches thick. The upper 14 inches of the subsoil is light yellowish brown silty clay loam and yellowish brown silty clay. The next 25 inches of the subsoil is mottled brown and gray silty clay. The lower part of the subsoil is mostly mottled, gray silty clay and clay to a depth of at least 99 inches.

The permeability of this Peawick soil is very slow and the erosion hazard is slight. The subsoil has high shrink-swell potential.

CRITCAL EROSION AREAS

The critical erosion area associated with this site is the on-site RPA area located at the southern end of the site. To prevent sediment from entering this area, it is imperative that the contractor install all erosion and sediment control measures shown on these plans before any land disturbing activities commence. Regular inspection and maintenance is also required for all erosion and sediment control measures to keep them functioning as designed.

EROSION AND SEDIMENT CONTROL MEASURES

Unless otherwise indicated, all structural and vegetative erosion and sediment control practices shall be constructed and maintained according to minimum standards and specifications of the latest edition of Virginia Erosion and Sediment Control Handbook (VESCH). The minimum standards shall be adhered to unless otherwise waived or approved by variance.

STRUCTURAL PRACTICES

Temporary Stone Construction Entrance – 3.02

A construction entrance shall be provided at the point of ingress and egress to reduce the amount of mud transported onto paved public roads by motor vehicles and runoff.

Silt Fence – 3.05

Silt fence shall be placed around the limits of clearing to intercept and detain small amounts of sediment from disturbed areas during construction operations.

Culvert Inlet Protection – 3.08

Culvert inlet protection shall be installed at the inlet to storm sewer culverts as depicted on the plans.

Outlet Protection – 3.18

Outlet protection shall be provided to prevent scour at stormwater outlets, to protect the outlet structure, and to minimize the potential for downstream erosion.

VEGETATIVE PRACTICES

Permanent Seeding – 3.32

All denuded areas, which will be left dormant for extended periods of time, shall be seeded with permanent vegetation immediately following grading. Selection of the seed mixture will depend on the time of year it is applied.

MANAGEMENT STRATEGIES

- Sediment trapping measures will be installed as the first step in grading and will be seeded and mulched immediately following installation.
- Temporary seeding or other stabilization will follow immediately after grading.
- The contractor shall be responsible for the installation and maintenance of all erosion and sediment control practices depicted on the Plans.
- After achieving adequate stabilization, the temporary controls will be cleaned and removed. Any areas disturbed in the removal process shall be graded, top soiled, and seeded accordingly.

PERMANENT STABILIZATION

All areas disturbed by construction shall be stabilized with permanent seeding immediately following finish grading. Seeding shall be accomplished with Kentucky 31 Tall Fescue according to Standards and Specifications 3.32, Permanent Seeding of the VESCH. Soil

stabilization blankets will be installed over slopes, which have been brought to final grade and have been seeded to protect the slopes from rill and gully erosion and to allow seed to germinate properly. Mulch (straw or fiber) will be used on relatively flat areas. In all seeding operations, seed, fertilizer and lime will be applied prior to mulching.

STORMWATER MANAGEMENT

This project is for the construction of a 6,920 sf kennel with runs. A Wet Extended Detention Pond (Type A-3 BMP) will be utilized to treat the daily kennel wash down runoff by maximizing bacteria removal through the design and use of a three cell wet pond. The wet pond will also release the 1-year post-development storm over 24 hours and pass the 100-year post-development storm with 0.28 feet of freeboard. NOT THREE CELL NOW. 2

CALCULATIONS

Appendix A contains design calculations for the onsite BMP.

MAINTENANCE

In general, all erosion and sediment control measures will be checked daily and after each significant rainfall. The following items will be checked in particular:

Temporary Stone Construction Entrance – 3.02

The entrance shall be maintained in a condition, which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic dressing with additional stone or the washing and reworking of existing stone as conditions demand. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately. The use of water trucks to remove materials dropped, washed, or tracked onto roadways will not be permitted under any circumstances.

Silt Fence – 3.05

Silt Fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting.

Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier still be necessary, the fabric shall be replaced promptly.

Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.

Any sediment deposits remaining in place after the silt fence is not longer required shall be dressed to conform with the existing grade, prepared and seeded.

Culvert Inlet Protection – 3.08

The structure shall be inspected after each rain and repairs made as needed.

Aggregate shall be replaced or cleaned when inspection reveals that clogged voids are causing ponding, which interfere with on-site construction.

Sediment shall be removed and the impoundment restored to its original dimensions when sediment has accumulated to one-half the design depth. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems.

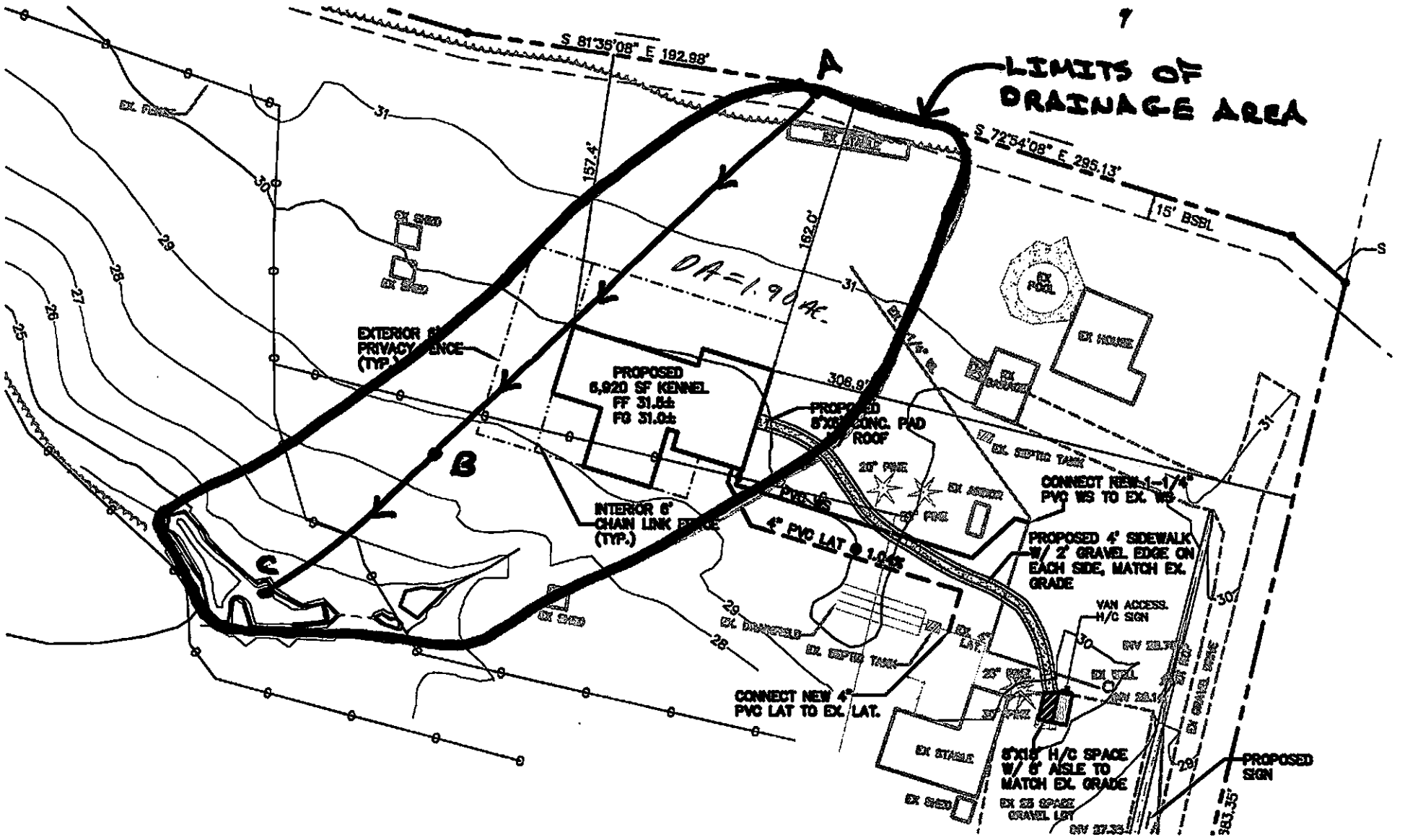
Temporary structures shall be removed when they have served their useful purpose but not before the upslope area has been permanently stabilized.

Permanent Seeding – 3.32

The seeded/mulched areas should be checked regularly to ensure that a good stand is established and maintained. Areas should be fertilized, mulched and re-seeded as needed. When it is clear that plants have not germinated on an area or have died, these areas must be re-seeded immediately to prevent erosion damage. However, it is extremely important to determine for what reason germination did not take place and make any corrective action necessary prior to re-seeding the area.

- Fertilizer shall be applied using approved fertilization methods and equipment.
- Formulations and application rates shall conform to the guidelines given in VESCH.
- Maintain a ground cover or organic mulch around trees that is adequate to prevent erosion, protect roots, and hold water.

FIGURE 1


LIMITS OF DRAINAGE AREA
S 81°35'08" E 192.98'
S 72°54'08" E 295.13'
15' BSBL
A
B
C
DA=1.90 AC.
157.4'
162.0'
306.9'
EX. FENCE
EX. SHED
EX. SHED
EXTERIOR 6' PRIVACY FENCE (TYP.)
PROPOSED 6,920 SF KENNEL FF 31.6± FG 31.0±
PROPOSED 6'X8' CONC. PAD ROOF
EX. POOL
EX. HOUSE
EX. GARAGE
EX. SEPTIC TANK
INTERIOR 6' CHAIN LINK FENCE (TYP.)
4" PVC LAT ± 140'
CONNECT NEW 1-1/4" PVC WS TO EX. WS
PROPOSED 4' SIDEWALK W/ 2' GRAVEL EDGE ON EACH SIDE, MATCH EX. GRADE
VAN ACCESS. H/C SIGN
EX. LAT.
EX. DRIVEWAY
EX. SEPTIC TANK
CONNECT NEW 4" PVC LAT TO EX. LAT.
EX. STABLE
EX. SHED
8'X16' H/C SPACE W/ 8' AISLE TO MATCH EX. GRADE
EX. 23 SPACE GRAVEL LOT
EX. GRAVEL DRIVE
PROPOSED SIGN
1"=80'

APPENDIX A

04-078
4/5/04

BMP Design

A wet extended detention pond (JCC BMP A-3) will be used to treat the washdown runoff from the kennel. The impervious area of the kennel is 6968 sf.

Treatment Volume – 2.0 inches / impervious acre

Impervious Area = 6968 sf

$$WQv = \frac{6968\ sf \mid 2\ in \mid 1\ ft}{\mid \mid 12\ in} = 1{,}162\ cf$$

REQUIRED
1" = 581 cF IN PP
1" = 581 cF IN EXT DET

PROVIDED
PP 674 / cF >> 581 cF.
EP 7935 >> 581 cF.

Dry Storage = 581 cf

Wet Storage = 581 cf

Worksheet 2: Runoff curve number and runoff

Project	By	Date
Milanville Kennel	KMJ	4/9/04
Location	**Checked**	**Date**
James City Co., Va.		

Check one: ☒ Present ☐ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Figure 2-3	CN 1/ Figure 2-4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
Newflat D	Pasture (Poor)	89			1.90	

1/ Use only one CN source per line

Totals ➡

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = _____ = _____ ; Use CN ➡ 89

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	1		
Rainfall, P (24-hour)	in	2.8		
Runoff, Q	in	1.7		

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
Milanville Kennel	KMJ	4/9/04
Location	**Checked**	**Date**
James City Co., Va.		

Check one: ☒ Present ☐ Developed

Check one: ☒ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

	Segment ID	AB		
1.	Surface description (table 3-1)	Prairie		
2.	Manning's roughness coefficient, n (table 3-1)	0.15		
3.	Flow length, L (total L † 300 ft) ft	300		
4.	Two-year 24-hour rainfall, P_2 in	3.5		
5.	Land slope, s ft/ft	.010		
6.	$T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ Compute T_t hr	.50	+	= .50

Shallow concentrated flow

	Segment ID	BC		
7.	Surface description (paved or unpaved)	Unpaved		
8.	Flow length, L ft	150		
9.	Watercourse slope, s ft/ft	.020		
10.	Average velocity, V (figure 3-1) ft/s	2.3		
11.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr	.02	+	= .02

Channel flow

	Segment ID			
12.	Cross sectional flow area, a ft^2			
13.	Wetted perimeter, p_w ft			
14.	Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft			
15	Channel slope, s ft/ft			
16.	Manning's roughness coefficient, n			
17.	$V = \frac{1.49\ r^{2/3} s^{1/2}}{n}$ Compute V ft/s			
18.	Flow length, L ft			
19.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr		+	=

20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) Hr .52

Worksheet 5a: Basic watershed data

Project				Location				By		Date
Milanville Kennel				James City Co., Va.				KMJ		4/9/04
Check one: ☒ Present ☐ Developed				Frequency (yr)				Checked		Date

~~Subarea name~~ Storm	Drainage area	Time of concentration	Travel time through subarea	Downstream subarea names	Travel time summation to outlet	24-hr rainfall	Runoff curve number	Runoff		Initial abstraction	
	A_m (mi²)	T_c (hr)	T_t (hr)		ΣT_t (hr)	P (in)	CN	Q (in)	A_mQ (mi²—in)	I_a (in)	I_a/P
1	.0030	0.52				2.8	89	1.7	.0051	0.247	.09

From worksheet 3 | From worksheet 2 | From table 5-1

Worksheet 5b: Basic watershed data

Project	Location	By	Date
Milanville Kennel	James City Co., Va.	KMS	4/9/04
Check one: ☒ Present ☐ Developed	Frequency (yr)	Checked	Date

~~Subarea~~ name	Basic watershed data used 1/				Select and enter hydrograph times in hours from exhibit 5-II 2/										
	Subarea T_c (hr)	ΣT_t to outlet (hr)	I_a/P	A_mQ (mi^2—in)					12.4						
					Discharges at selected hydrograph times 3/ (cfs)										
Storm															
1	0.52		.09	.0051					2.70						
Composite hydrograph at outlet															

1/ Worksheet 5a. Rounded as needed for use with exhibit 5.
2/ Enter rainfall distribution type used.
3/ Hydrograph discharge for selected times is A_mQ multiplied by tabular discharge from appropriate exhibit 5.

Worksheet 2: Runoff curve number and runoff

Project	By	Date
Milanville Kennel	KMJ	4/9/04
Location	**Checked**	**Date**
James City Co., Va		

Check one: ☐ Present ☒ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Figure 2-3	CN 1/ Figure 2-4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
Newflat D	Pasture (Poor)	89			1.73	153.97
Newflat D	Roof	98			.17	16.66
1/ Use only one CN source per line				Totals ➡	1.90	170.63

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{170.63}{1.90} = 89.8$; Use CN ➡ 90 ✓

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	1	100	
Rainfall, P (24-hour)	in	2.8 ✓	8.0 ✓	
Runoff, Q	in	1.8	6.8	

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
Milaville Kennel	KMJ	4/9/04
Location	**Checked**	**Date**
James City Co., Va.		

Check one: ☐ Present ☒ Developed

Check one: ☐ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

Segment ID	AB		
1. Surface description (table 3-1)	Prairie		
2. Manning's roughness coefficient, n (table 3-1)	0.15		
3. Flow length, L (total L † 300 ft) ft	300		
4. Two-year 24-hour rainfall, P_2 in	3.5		
5. Land slope, s ft/ft	.010		
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\, s^{0.4}}$ Compute T_t hr	.50	+	= .50

Shallow concentrated flow

Segment ID	BC		
7. Surface description (paved or unpaved)	Unpaved		
8. Flow length, L ft	150		
9. Watercourse slope, s ft/ft	.020		
10. Average velocity, V (figure 3-1) ft/s	2.3		
11. $T_t = \frac{L}{3600\ V}$ Compute T_t hr	.02	+	= .02

Channel flow

Segment ID			
12. Cross sectional flow area, a ft^2			
13. Wetted perimeter, p_w ft			
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft			
15 Channel slope, s ft/ft			
16. Manning's roughness coefficient, n			
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ft/s			
18. Flow length, L ft			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t hr		+	=
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) Hr			.52

Same as pre

Worksheet 5a: Basic watershed data

Project	Location	By	Date
Milanville Kennel	James City Co., Va.	KMJ	4/9/04
Check one: ☐ Present ☒ Developed	Frequency (yr)	Checked	Date

~~Subarea name~~ Storm	Drainage area	Time of concentration	Travel time through subarea	Downstream subarea names	Travel time summation to outlet	24-hr rainfall	Runoff curve number	Runoff		Initial abstraction	
	A_m	T_c	T_t		ΣT_t	P	CN	Q	A_mQ	I_a	I_a/P
	(mi^2)	(hr)	(hr)		(hr)	(in)		(in)	(mi^2—in)	(in)	
1	.0030	0.52				2.8	90	1.8	.0054	0.222	.08
100	.0030	0.52				8.0	90	6.8	.0204	0.222	.03

From worksheet 3 | From worksheet 2 | From table 5-1

Worksheet 5b: Basic watershed data

Project	Location	By	Date
Milanville Kennel	James City Co., Va.	HMJ	4/9/04
Check one: ☐ Present ☒ Developed	Frequency (yr)	Checked	Date

Subarea name Storm	Basic watershed data used 1/				Select and enter hydrograph times in hours from exhibit 5-II 2/											
	Subarea T_c (hr)	ΣT_t to outlet (hr)	I_a/P	A_mQ (mi^2—in)					12.4							
					Discharges at selected hydrograph times 3/ (cfs)											
1	0.52		.08	.0054					2.86							
100	0.52		.03	.0204					10.79							
Composite hydrograph at outlet																

1/ Worksheet 5a. Rounded as needed for use with exhibit 5.
2/ Enter rainfall distribution type used.
3/ Hydrograph discharge for selected times is A_mQ multiplied by tabular discharge from appropriate exhibit 5.

1-Year Hydrograph

```
1*********************************     SCSHYDRO     *********************************
 *********************************   Version 3.21   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNEL
    User: LandTech Resources
    Date: 04/09/2004    Friday
    Time: 12:27:00
   Input: MK1.IN
  Output: MK1.OUT
```

PROGRAM EXECUTION

NUMBER OF STORMS TO BE MODELED	:	1
NUMBER OF CHANNELS	:	0
NUMBER OF SUBAREAS	:	1
UPSTREAM HYDROGRAPHS ENTER AT	:	0 LOCATIONS
NUMBER OF TIME STEPS	:	300
COMPUTATIONAL TIME INCREMENT	:	.100 Hours

NOTE: The DURATION of the final computed hydrograph(s) for this watershed system will be 30.000 hours.

UNIT HYDROGRAPH METHODOLOGY

The SCS DIMENSIONLESS UNIT HYDROGRAPH is used in all runoff computations.
The peak rate factor (PRF) for all unit hydrographs is 484 (U.S. Customary units) or 2.08356 (Metric units).

```
1*********************************     SCSHYDRO     *********************************
 *********************************   Version 3.21   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNEL
    User: LandTech Resources
    Date: 04/09/2004    Friday
    Time: 12:27:00
   Input: MK1.IN
  Output: MK1.OUT
```

SUBAREA DATA

SUBAREA ID NO	AREA (mi2)	TIME OF CONCENTRATION (hrs)	CURVE NUMBER	BASEFLOW (cfs)	DOWNSTREAM CHANNELS
1	.0030	.520	90.00	.0	

Composite Watershed Curve Number = 90.00
Minimum Subarea Time of Concentration = .520 hours.

```
1*********************************     SCSHYDRO     *********************************
```

```
********************************  Version 3.21  ********************************
******************  COMPUTER-AIDED HYDROLOGY & HYDRAULICS  ******************

PROJECT: MILANVILLE KENNEL
   User: LandTech Resources
   Date: 04/09/2004    Friday
   Time: 12:27:00
  Input: MK1.IN
 Output: MK1.OUT
                                                  RETURN PERIOD (yrs):      1

=======================   RAINFALL HYETOGRAPH INFORMATION   ======================


        RAINFALL HYETOGRAPH: SCS TYPE II
        RAINFALL DURATION:    24.00 Hours
        RAINFALL DEPTH:        2.80 Inches


RAINFALL HYETOGRAPH,
SCS TYPE II
Time (Hours), Total Depth (Inches):

     .000,   .00      2.000,   .06      4.000,   .13      6.000,   .22
    7.000,   .27      8.000,   .34      8.500,   .37      9.000,   .41
    9.500,   .46      9.750,   .48     10.000,   .51     10.500,   .57
   11.000,   .66     11.500,   .79     11.750,  1.00     12.000,  1.86
   12.500,  2.06     13.000,  2.16     13.500,  2.24     14.000,  2.30
   16.000,  2.46     20.000,  2.67     24.000,  2.80
1********************************     SCSHYDRO     ********************************
 ********************************  Version 3.21  ********************************
 ******************  COMPUTER-AIDED HYDROLOGY & HYDRAULICS  ******************

 PROJECT: MILANVILLE KENNEL
   Input: MK1.IN
  Output: MK1.OUT
                                                  RETURN PERIOD (yrs):      1


   SUBAREA     1       SUBAREA     1       SUBAREA     1       SUBAREA     1


    AREA (square miles)              :        .0030
    TIME OF CONCENTRATION (hrs):      :        .52
    RUNOFF CURVE NUMBER              :      90.00
    BASEFLOW (cfs)                   :        .00
    DOWNSTREAM CHANNELS              :

                                SUBAREA RUNOFF (cfs)

TIME:    +.00    +.10    +.20    +.30    +.40    +.50    +.60    +.70    +.80    +.90
(hrs)    hrs     hrs     hrs     hrs     hrs     hrs     hrs     hrs     hrs     hrs
-------  ------  ------  ------  ------  ------  ------  ------  ------  ------  ------
  .00 |    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 1.00 |    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 2.00 |    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 3.00 |    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 4.00 |    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 5.00 |    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 6.00 |    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 7.00 |    .01     .01     .01     .01     .01     .01     .01     .01     .01     .02
 8.00 |    .02     .02     .02     .02     .02     .03     .03     .03     .03     .03
 9.00 |    .03     .04     .04     .04     .04     .05     .05     .05     .06     .06
10.00 |    .06     .07     .07     .08     .08     .09     .09     .10     .11     .13
11.00 |    .14     .15     .16     .19     .21     .24     .28     .37     .58    1.02
12.00 |   1.77    2.51    2.80    2.55    2.04    1.54    1.20     .97     .78     .63
13.00 |    .53     .46     .41     .36     .33     .30     .28     .26     .24     .23
14.00 |    .22     .21     .21     .21     .20     .20     .19     .19     .18     .17
```

15.00	.16	.16	.15	.14	.14	.13	.13	.12	.12	.12
16.00	.11	.11	.11	.11	.11	.10	.10	.10	.10	.10
17.00	.10	.10	.10	.10	.10	.10	.09	.09	.09	.09
18.00	.09	.09	.09	.09	.09	.09	.09	.09	.08	.08
19.00	.08	.08	.08	.08	.08	.08	.08	.08	.08	.07
20.00	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
21.00	.07	.07	.06	.06	.06	.06	.06	.06	.06	.06
22.00	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
23.00	.06	.06	.06	.05	.05	.05	.05	.05	.05	.05
24.00	.05	.05	.05	.03	.02	.02	.01	.01	.00	.00
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK RUNOFF (cfs): 2.80
TIME TO PEAK (hrs): 12.20

1********** SCSHYDRO **********
********** Version 3.21 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNEL
User: LandTech Resources
Date: 04/09/2004 Friday
Time: 12:27:00
Input: MK1.IN
Output: MK1.OUT

RETURN PERIOD (yrs): 1

DOWNSTREAM HYDROGRAPH

DISCHARGE (cfs)

TIME: (hrs)	+.00 hrs	+.10 hrs	+.20 hrs	+.30 hrs	+.40 hrs	+.50 hrs	+.60 hrs	+.70 hrs	+.80 hrs	+.90 hrs
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
6.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
7.00	.01	.01	.01	.01	.01	.01	.01	.01	.01	.02
8.00	.02	.02	.02	.02	.02	.03	.03	.03	.03	.03
9.00	.03	.04	.04	.04	.04	.05	.05	.05	.06	.06
10.00	.06	.07	.07	.08	.08	.09	.09	.10	.11	.13
11.00	.14	.15	.16	.19	.21	.24	.28	.37	.58	1.02
12.00	1.77	2.51	2.80	2.55	2.04	1.54	1.20	.97	.78	.63
13.00	.53	.46	.41	.36	.33	.30	.28	.26	.24	.23
14.00	.22	.21	.21	.21	.20	.20	.19	.19	.18	.17
15.00	.16	.16	.15	.14	.14	.13	.13	.12	.12	.12
16.00	.11	.11	.11	.11	.11	.10	.10	.10	.10	.10
17.00	.10	.10	.10	.10	.10	.10	.09	.09	.09	.09
18.00	.09	.09	.09	.09	.09	.09	.09	.09	.08	.08
19.00	.08	.08	.08	.08	.08	.08	.08	.08	.08	.07
20.00	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
21.00	.07	.07	.06	.06	.06	.06	.06	.06	.06	.06
22.00	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
23.00	.06	.06	.06	.05	.05	.05	.05	.05	.05	.05
24.00	.05	.05	.05	.03	.02	.02	.01	.01	.00	.00
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK DISCHARGE (cfs): 2.80
TIME TO PEAK (hrs): 12.20
Hydrograph Saved In: MK1.DAT

1********** SCSHYDRO **********
********** Version 3.21 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNEL
User: LandTech Resources
Date: 04/09/2004 Friday
Time: 12:27:00
Input: MK1.IN
Output: MK1.OUT

RETURN PERIOD (yrs): 1

HYDROLOGIC SUMMARY
Volumes, Losses, and Discharges

SCS TYPE II Hyetograph.
SCS DIMENSIONLESS UNIT HYDROGRAPH was used.
APPLIED RAINFALL DEPTH (inches): 2.80

1-YR.

		VOLUME OF RAINFALL APPLIED (ac-ft)	VOLUME OF RUNOFF (ac-ft)	RAINFALL LOSSES (percent)	PEAK DISCHARGE (cfs)	PEAK DISCHARGE (cfs/ac)
SUBAREA	1	.44800	.28892	35.51	2.803	1.460
TOTAL WATERSHED		.44800	.28892	35.51	2.803	1.460

TOTAL WATERSHED AREA (square miles): .0030
TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED (ac-ft): .2889
COMPOSITE WATERSHED CURVE NUMBER: 90.00
MINIMUM SUBAREA TIME OF CONCENTRATION: .520 hours.

NOTE: "VOLUME OF RUNOFF" includes surface runoff only; baseflows are not included in this summation. The "TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED" includes all baseflows.

1

100-Year Hydrograph

```
1*******************************     SCSHYDRO     *******************************
 *******************************   Version 3.21   *******************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNEL
    User: LandTech Resources
    Date: 04/09/2004    Friday
    Time: 12:27:54
   Input: MK100.IN
  Output: MK100.OUT



 ============================   PROGRAM EXECUTION   ============================


                        NUMBER OF STORMS TO BE MODELED    :     1
                        NUMBER OF CHANNELS                :     0
                        NUMBER OF SUBAREAS                :     1
                        UPSTREAM HYDROGRAPHS ENTER AT     :     0 LOCATIONS
                        NUMBER OF TIME STEPS              :   300
                        COMPUTATIONAL TIME INCREMENT      :  .100 Hours

 NOTE:   The DURATION of the final computed hydrograph(s) for this watershed
         system will be 30.000 hours.



 ========================   UNIT HYDROGRAPH METHODOLOGY   ========================


 The SCS DIMENSIONLESS UNIT HYDROGRAPH is used in all runoff computations.
 The peak rate factor (PRF) for all unit hydrographs is 484 (U.S. Customary
 units) or 2.08356 (Metric units).
1*******************************     SCSHYDRO     *******************************
 *******************************   Version 3.21   *******************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNEL
    User: LandTech Resources
    Date: 04/09/2004    Friday
    Time: 12:27:54
   Input: MK100.IN
  Output: MK100.OUT


 ================================   SUBAREA DATA   ================================


                        TIME OF
 SUBAREA      AREA      CONCENTRATION    CURVE     BASEFLOW
  ID NO       (mi2)        (hrs)         NUMBER     (cfs)     DOWNSTREAM CHANNELS
 _______   _________   _____________   _________   ________   ___________________

       1       .0030           .520      90.00         .0


     Composite Watershed Curve Number = 90.00
 Minimum Subarea Time of Concentration =  .520 hours.
1*******************************     SCSHYDRO     *******************************
```

```
********************************  Version 3.21  ********************************
******************  COMPUTER-AIDED HYDROLOGY & HYDRAULICS  ******************

PROJECT: MILANVILLE KENNEL
   User: LandTech Resources
   Date: 04/09/2004    Friday
   Time: 12:27:54
  Input: MK100.IN
 Output: MK100.OUT
                                                  RETURN PERIOD (yrs):    100

=======================  RAINFALL HYETOGRAPH INFORMATION  =======================


        RAINFALL HYETOGRAPH: SCS TYPE II
        RAINFALL DURATION:    24.00 Hours
        RAINFALL DEPTH:        8.00 Inches


RAINFALL HYETOGRAPH,
SCS TYPE II
Time (Hours), Total Depth (Inches):

     .000,   .00      2.000,   .18      4.000,   .38      6.000,   .64
    7.000,   .78      8.000,   .96      8.500,  1.06      9.000,  1.18
    9.500,  1.30      9.750,  1.38     10.000,  1.45     10.500,  1.63
   11.000,  1.88     11.500,  2.26     11.750,  2.86     12.000,  5.30
   12.500,  5.88     13.000,  6.18     13.500,  6.39     14.000,  6.56
   16.000,  7.04     20.000,  7.62     24.000,  8.00
1********************************     SCSHYDRO     ********************************
 ********************************  Version 3.21  ********************************
 ******************  COMPUTER-AIDED HYDROLOGY & HYDRAULICS  ******************

 PROJECT: MILANVILLE KENNEL
   Input: MK100.IN
  Output: MK100.OUT
                                                  RETURN PERIOD (yrs):    100


   SUBAREA     1       SUBAREA     1       SUBAREA     1       SUBAREA     1


    AREA (square miles)          :        .0030
    TIME OF CONCENTRATION (hrs):        .52
    RUNOFF CURVE NUMBER          :      90.00
    BASEFLOW (cfs)               :        .00
    DOWNSTREAM CHANNELS          :

                                SUBAREA RUNOFF (cfs)

TIME:    +.00    +.10    +.20    +.30    +.40    +.50    +.60    +.70    +.80    +.90
(hrs)     hrs     hrs     hrs     hrs     hrs     hrs     hrs     hrs     hrs     hrs
-------|-------------------------------------------------------------------------------
  .00  |    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 1.00  |    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 2.00  |    .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 3.00  |    .01     .01     .01     .02     .02     .02     .03     .03     .03     .03
 4.00  |    .04     .04     .04     .05     .05     .06     .06     .07     .07     .08
 5.00  |    .08     .08     .09     .09     .09     .09     .10     .10     .10     .10
 6.00  |    .11     .11     .11     .12     .13     .13     .13     .14     .14     .14
 7.00  |    .15     .15     .16     .17     .18     .18     .19     .20     .20     .20
 8.00  |    .21     .21     .22     .23     .24     .25     .26     .27     .27     .28
 9.00  |    .29     .30     .31     .32     .33     .34     .35     .36     .38     .39
10.00  |    .40     .42     .44     .47     .50     .52     .55     .58     .63     .68
11.00  |    .72     .77     .84     .94    1.05    1.13    1.29    1.66    2.49    4.13
12.00  |   6.77    9.24   10.09    9.02    7.14    5.33    4.12    3.28    2.61    2.11
13.00  |   1.75    1.51    1.33    1.18    1.06     .96     .89     .84     .78     .74
14.00  |    .70     .68     .66     .66     .65     .63     .61     .59     .56     .54
```

15.00	.52	.50	.48	.46	.44	.42	.41	.39	.38	.37
16.00	.36	.35	.34	.34	.33	.33	.33	.32	.32	.32
17.00	.31	.31	.31	.31	.30	.30	.30	.29	.29	.29
18.00	.29	.28	.28	.28	.27	.27	.27	.27	.26	.26
19.00	.26	.26	.25	.25	.25	.24	.24	.24	.24	.23
20.00	.23	.23	.23	.22	.22	.22	.21	.21	.21	.21
21.00	.20	.20	.20	.20	.20	.19	.19	.19	.19	.19
22.00	.19	.18	.18	.18	.18	.18	.18	.18	.17	.17
23.00	.17	.17	.17	.17	.17	.17	.17	.17	.17	.17
24.00	.17	.16	.14	.11	.07	.05	.03	.02	.01	.01
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK RUNOFF (cfs): 10.09
TIME TO PEAK (hrs): 12.20

1********** SCSHYDRO **********
********** Version 3.21 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNEL
User: LandTech Resources
Date: 04/09/2004 Friday
Time: 12:27:54
Input: MK100.IN
Output: MK100.OUT

RETURN PERIOD (yrs): 100

DOWNSTREAM HYDROGRAPH

DISCHARGE (cfs)

TIME: (hrs)	+.00 hrs	+.10 hrs	+.20 hrs	+.30 hrs	+.40 hrs	+.50 hrs	+.60 hrs	+.70 hrs	+.80 hrs	+.90 hrs
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3.00	.01	.01	.01	.02	.02	.02	.03	.03	.03	.03
4.00	.04	.04	.04	.05	.05	.06	.06	.07	.07	.08
5.00	.08	.08	.09	.09	.09	.09	.10	.10	.10	.10
6.00	.11	.11	.11	.12	.13	.13	.13	.14	.14	.14
7.00	.15	.15	.16	.17	.18	.18	.19	.20	.20	.20
8.00	.21	.21	.22	.23	.24	.25	.26	.27	.27	.28
9.00	.29	.30	.31	.32	.33	.34	.35	.36	.38	.39
10.00	.40	.42	.44	.47	.50	.52	.55	.58	.63	.68
11.00	.72	.77	.84	.94	1.05	1.13	1.29	1.66	2.49	4.13
12.00	6.77	9.24	10.09	9.02	7.14	5.33	4.12	3.28	2.61	2.11
13.00	1.75	1.51	1.33	1.18	1.06	.96	.89	.84	.78	.74
14.00	.70	.68	.66	.66	.65	.63	.61	.59	.56	.54
15.00	.52	.50	.48	.46	.44	.42	.41	.39	.38	.37
16.00	.36	.35	.34	.34	.33	.33	.33	.32	.32	.32
17.00	.31	.31	.31	.31	.30	.30	.30	.29	.29	.29
18.00	.29	.28	.28	.28	.27	.27	.27	.27	.26	.26
19.00	.26	.26	.25	.25	.25	.24	.24	.24	.24	.23
20.00	.23	.23	.23	.22	.22	.22	.21	.21	.21	.21
21.00	.20	.20	.20	.20	.20	.19	.19	.19	.19	.19
22.00	.19	.18	.18	.18	.18	.18	.18	.18	.17	.17
23.00	.17	.17	.17	.17	.17	.17	.17	.17	.17	.17
24.00	.17	.16	.14	.11	.07	.05	.03	.02	.01	.01
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK DISCHARGE (cfs): 10.09
TIME TO PEAK (hrs): 12.20
Hydrograph Saved In: MK100.DAT

1********** SCSHYDRO **********
********** Version 3.21 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNEL
User: LandTech Resources
Date: 04/09/2004 Friday
Time: 12:27:54
Input: MK100.IN
Output: MK100.OUT

RETURN PERIOD (yrs): 100

========== HYDROLOGIC SUMMARY ==========
========== Volumes, Losses, and Discharges ==========

SCS TYPE II Hyetograph.
SCS DIMENSIONLESS UNIT HYDROGRAPH was used.
APPLIED RAINFALL DEPTH (inches): 8.00

	VOLUME OF RAINFALL APPLIED (ac-ft)	VOLUME OF RUNOFF (ac-ft)	RAINFALL LOSSES (percent)	PEAK DISCHARGE (cfs)	PEAK DISCHARGE (cfs/ac)
SUBAREA 1	1.2800	1.0916	14.72	10.088	5.254
TOTAL WATERSHED	1.2800	1.0916	14.72	10.088	5.254

100-YEAR POST INFLOW TO BMP

TOTAL WATERSHED AREA (square miles): .0030
TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED (ac-ft): 1.0916
COMPOSITE WATERSHED CURVE NUMBER: 90.00
MINIMUM SUBAREA TIME OF CONCENTRATION: .520 hours.

NOTE: "VOLUME OF RUNOFF" includes surface runoff only; baseflows are not included in this summation. The "TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED" includes all baseflows.

1

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PROJECT NAME Milanville Kennel
PROJECT NO. 04-078
SHEET NO. _____ OF _____
CALCULATED BY KMJ DATE 4/9/04
SCALE _____

Compute Stream Channel Protection Volume (Cpv):

Step 1. Develope Site Hydrologic & TR-55 Input Parameters

Condition	CN	Tc	Qo, 1-Year St.	Q, 1-Year
Pre-Developed	89	0.52	1.7	2.70
Developed	90	0.52	1.8	2.86

Step 2. Utilize MDE Method to Compute Storage Volume

Initial Abstraction (Ia) for CN of 90 is 0.222

Ia/P = 0.222/2.8 = .08

Tc = 0.52 hrs

From TR-55, Exhibit 4-II:
qu = 540 csm/in

Qo/Qi = .032

From TR-55, Figure 6.1
For Type III Distribution

$Vs/Vr = 0.683 - 1.43(Qo/Qi) + 1.64(Qo/Qi)^2 - 0.804(Qo/Qi)^3$

$Vs/Vr = 0.683 - 1.43(.032) + 1.64(.032)^2 - 0.804(.032)^3$

$Vs/Vr = 0.683 - 0.046 + .002 - 0$

$Vs/Vr = 0.639$

$Vs = 0.639(1.8")(1/12)(1.9) = 0.182$ ac-ft = 7,935 cf

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Step 3. Define average ED Release Rate

$$Q_o = \frac{7{,}933\ cf - 58\ cf}{24\ hr} \left| \frac{1\ hr}{60\ m} \right| \frac{1\ m}{60\ s} = 0.085\ cfs$$

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SHEET NO. _____ OF _____
CALCULATED BY KMS DATE 8/2/04
SCALE _____

WET POND STAGE - STORAGE

Elev (ft)	ΔElev (ft)	SA (sf)	STORAGE (cf)	ACCUM STORAGE (cf)
22.0		1228		0
	1.0		2262	
23.0		3296		2262
	1.0		3810	
24.0		4324		6072
	1.0		5149	
25.0		5974		11,221
	1.0		7185	
26.0		8396		18,406
	0.5		4605	
26.50		10,026		23,011

Standing Water Elev 24.13 Volume = 6,741 cf

The Wet Storage treatment volume required of 581 cf is stored within the standing water volume of 6,741 cf

The Dry Storage treatment volume required of 581 cf is stored within the 24 hr. channel protection volume of 7,935 cf

Channel Protection Volume of 7,935 cf rises to Elev 25.39

Top BMP Elev 26.50

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CALCULATED BY KMS DATE 4/13/04
SCALE _____

DESIGN ORIFICE TO PASS
1-YEAR POST-DEVELOPMENT
STORM OVER 24-HOURS

$Q = 0.6A\sqrt{2gh}$ - orifice equation

orifice invert @ elev 24.13

$Q = 0.085$ cfs ✓

$h = 25.39 - 24.13 = 1.26$ L.F.D. ✓

$.085 = 0.6A\sqrt{2(32.2)(1.26)}$

$A = \pi r^2 = .0157\ ft^2$

$r = .0708'$

USE 2" DIAMETER ORIFICE ✓
AT ELEV 24.13, $A = .0218\ ft^2$

Elev	H	Q
24.13	0	0
25.00	.87	0.10
26.00	1.87	0.14
26.50	2.37	0.16

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SHEET NO. _____ OF _____
CALCULATED BY KMJ DATE 4/13/04
SCALE _____

DESIGN OUTLET WEIR

$Q = CLH^{3/2}$

VDOT DI-1

$L = 2.5' \times 4 = 10'$

$C = 3.1$

ELEV	H	Q
25.80	0	0
26.00	0.20	2.77
26.50	0.70	18.16

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SHEET NO. _____ OF _____
CALCULATED BY KMS DATE 8/2/04
SCALE _____

DESIGN OUTLET BARREL

2-26' of 12" RCP @ 0.5%

$INV_I = 24.13$
$INV_O = 24.00$

Q	d_n	d_c	V_n	R	H	h_o	h_{so}	HW	HW_{elev}
0	—	—	—	—	—	—	—	—	24.13
2	0.44	0.42	3.02	0.23	0.34	0.71	0.13	0.92	25.05
4	0.67	0.60	3.56	0.29	0.43	0.80	0.13	1.10	25.23
6	1.00	1.00	3.80	0.25	0.52	1.00	0.13	1.39	25.52
8	1.00	1.00	5.06	0.25	0.92	1.00	0.13	1.79	25.92
10	1.00	1.00	6.33	0.25	1.43	1.00	0.13	2.30	26.43

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = 2 ft.

Slope of upstream face of embankment (Z) = 3 :1.

Slope of principal spillway barrel (S_b) = 0.5 %

Length of barrel in saturated zone (L_s) = 15 ft.

24. Number of collars required = 1 dimensions = 3'x3'

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = _____

Design High Water = _____

Emergency Spillway Crest = _____

Principal Spillway Crest = _____

Dewatering Orifice Invert = _____

Cleanout Elevation = _____

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = _____

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SCALE _____

DESIGN EMERGENCY SPILLWAY

Grass Spillway

Elevation = 26.10

Bottom Width = 4' ✓

Slope = 8%

D = 0.4'

Length = 20'

Side slope = 3:1

n = .035

Elev	H	Q
26.10	0	0
26.50	0.40	11.65

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PROJECT NAME Mrlonville Kennels
PROJECT NO. 04-078
SHEET NO. _____ OF _____
CALCULATED BY KMJ DATE 4/13/04
SCALE _____

STAGE - STORAGE - DISCHARGE

STAGE (FT)	STORAGE (AC-FT)	DISCHARGE (CFS)
24.13	0.1042	0
25.00	0.1371	0.10
25.80	0.1816	0.14
26.00	0.1927	2.91
26.10	0.1965	5.24
26.50	0.2302	19.96

1-Year Routing

```
1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNELS
    User: LandTech Resources
    Date: 08/02/2004    Monday
    Time: 16:44:08
  Output: MKP1.OUT


 SOLUTION FOR  1  STORMS.


 TIME INCREMENT:    .100  Hours


 STORM
 NUMBER   HYDROGRAPH IN FILE:
 ______   ____________________________________________________________

   1      MK1.DAT
```

STORM NUMBER	PEAK INFLOW (cfs)	ALLOWABLE PEAK DISCHARGE (cfs)	DURATION (min)	RUNOFF VOLUME (ft3)	TAILWATER STAGE (ft)
1	2.803	N/A	1794.00	.1259E+05	24.930

```
1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNELS
    User: LandTech Resources
    Date: 08/02/2004    Monday
    Time: 16:44:08
  Output: MKP1.OUT


 Stage-Area-Discharge
 Filename: MKPOND.DAT

          TAILWATER STAGE:   24.930 feet.
            INITIAL STAGE:   24.930 feet.

 ==================   STAGE-STORAGE-DISCHARGE RELATIONSHIP   ==================

 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<   STORM  1      >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

STAGE (ft)	STORAGE VOLUME (ac-ft)	DISCHARGE (cfs)
24.130	.0000	.0000
25.000	.1046	.1000
25.800	.2317	.1400
26.000	.2691	2.910
26.100	.2886	5.240
26.500	.3738	19.96

```
1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************
```

PROJECT: MILANVILLE KENNELS
User: LandTech Resources
Date: 08/02/2004 Monday
Time: 16:44:08
Output: MKP1.OUT

TAILWATER STAGE: 24.930 feet.
INITIAL STAGE: 24.930 feet.

<<<<<<<<<<<<<<<<<<<< ROUTING RESULTS FOR STORM 1 >>>>>>>>>>>>>>>>>>>>

MAXIMUM ELEVATION: 25.84 feet.
MAXIMUM INFLOW: 2.803 cfs.
MAXIMUM OUTFLOW: .6682 cfs.
MAXIMUM STORAGE: .2388 acre-feet.

CONTINUITY ERROR: .218E-03 percent.

TIME (min)	INFLOW RATE (cfs)	OUTFLOW RATE (cfs)	POND SURFACE ELEVATION (ft)
0	.000	.000	24.930
6	.000	.000	24.930
12	.000	.000	24.930
18	.000	.000	24.930
24	.000	.000	24.930
30	.000	.000	24.930
36	.000	.000	24.930
42	.000	.000	24.930
48	.000	.000	24.930
54	.000	.000	24.930
60	.000	.000	24.930
66	.000	.000	24.930
72	.000	.000	24.930
78	.000	.000	24.930
84	.000	.000	24.930
90	.000	.000	24.930
96	.000	.000	24.930
102	.000	.000	24.930
108	.000	.000	24.930
114	.000	.000	24.930
120	.000	.000	24.930
126	.000	.000	24.930
132	.000	.000	24.930
138	.000	.000	24.930
144	.000	.000	24.930
150	.000	.000	24.930
156	.000	.000	24.930
162	.000	.000	24.930
168	.000	.000	24.930
174	.000	.000	24.930
180	.000	.000	24.930
186	.000	.000	24.930
192	.000	.000	24.930
198	.000	.000	24.930
204	.000	.000	24.930
210	.000	.000	24.930
216	.000	.000	24.930
222	.000	.000	24.930
228	.000	.000	24.930
234	.000	.000	24.930
240	.000	.000	24.930
246	.000	.000	24.930
252	.000	.000	24.930
258	.000	.000	24.930
264	.000	.000	24.930

270	.000	.000	24.930
276	.000	.000	24.930
282	.000	.000	24.930
288	.000	.000	24.930
294	.000	.000	24.930
300	.000	.000	24.930
306	.000	.000	24.930
312	.000	.000	24.930
318	.000	.000	24.930
324	.000	.000	24.930
330	.000	.000	24.930
336	.000	.000	24.930
342	.000	.000	24.930
348	.000	.000	24.930
354	.000	.000	24.930
360	.000	.000	24.930
366	.000	.000	24.930
372	.000	.000	24.930
378	.000	.000	24.930
384	.001	.000	24.930
390	.002	.000	24.930
396	.002	.000	24.930
402	.003	.001	24.930
408	.004	.001	24.931
414	.004	.001	24.931
420	.005	.001	24.931
426	.006	.002	24.931
432	.007	.002	24.931
438	.008	.003	24.932
444	.010	.003	24.932
450	.011	.004	24.933
456	.012	.004	24.933
462	.014	.005	24.934
468	.015	.006	24.934
474	.016	.007	24.935
480	.017	.007	24.935
486	.018	.008	24.936
492	.020	.009	24.936
498	.021	.010	24.937
504	.023	.011	24.938
510	.025	.012	24.939
516	.027	.013	24.939
522	.029	.015	24.940
528	.031	.016	24.941
534	.033	.017	24.942
540	.034	.019	24.943
546	.036	.020	24.944
552	.039	.021	24.945
558	.041	.023	24.946
564	.044	.025	24.947
570	.047	.026	24.948
576	.049	.028	24.950
582	.052	.030	24.951
588	.056	.032	24.952
594	.059	.034	24.954
600	.062	.036	24.955
606	.065	.039	24.957
612	.070	.041	24.959
618	.076	.044	24.961
624	.083	.047	24.963
630	.089	.050	24.965
636	.095	.053	24.967
642	.103	.057	24.970
648	.114	.061	24.973
654	.125	.066	24.976
660	.135	.072	24.980
666	.147	.078	24.984
672	.165	.084	24.989
678	.189	.092	24.994
684	.214	.100	25.001
690	.236	.100	25.007

696	.277	.101	25.015
702	.369	.101	25.027
708	.578	.102	25.046
714	1.020	.104	25.082
720	1.768	.107	25.149
726	2.506	.113	25.255
732	2.803	.119	25.387
738	2.546	.126	25.520
744	2.039	.132	25.632
750	1.538	.136	25.718
756	1.203	.139	25.782
762	.968	.425	25.821
768	.778	.635	25.836
774	.633	.668	25.838
780	.529	.627	25.835
786	.460	.565	25.831
792	.408	.504	25.826
798	.364	.448	25.822
804	.328	.400	25.819
810	.299	.360	25.816
816	.278	.327	25.813
822	.261	.300	25.812
828	.245	.278	25.810
834	.230	.259	25.809
840	.219	.243	25.807
846	.212	.230	25.807
852	.208	.221	25.806
858	.206	.215	25.805
864	.203	.210	25.805
870	.198	.205	25.805
876	.192	.201	25.804
882	.185	.195	25.804
888	.178	.189	25.804
894	.171	.182	25.803
900	.164	.175	25.803
906	.157	.168	25.802
912	.151	.162	25.802
918	.145	.155	25.801
924	.139	.149	25.801
930	.133	.143	25.800
936	.129	.140	25.800
942	.124	.140	25.799
948	.120	.140	25.798
954	.117	.140	25.797
960	.114	.140	25.796
966	.111	.140	25.794
972	.109	.140	25.793
978	.107	.140	25.791
984	.106	.139	25.789
990	.105	.139	25.788
996	.104	.139	25.786
1002	.103	.139	25.784
1008	.102	.139	25.782
1014	.101	.139	25.780
1020	.100	.139	25.778
1026	.099	.139	25.776
1032	.098	.139	25.774
1038	.097	.139	25.772
1044	.096	.138	25.770
1050	.096	.138	25.767
1056	.095	.138	25.765
1062	.094	.138	25.763
1068	.093	.138	25.761
1074	.092	.138	25.758
1080	.091	.138	25.756
1086	.090	.138	25.753
1092	.090	.138	25.751
1098	.089	.137	25.748
1104	.088	.137	25.746
1110	.087	.137	25.743
1116	.086	.137	25.741

1122	.085	.137	|	25.738
1128	.084	.137	|	25.735
1134	.083	.137	|	25.732
1140	.083	.136	|	25.730
1146	.082	.136	|	25.727
1152	.081	.136	|	25.724
1158	.080	.136	|	25.721
1164	.079	.136	|	25.718
1170	.078	.136	|	25.715
1176	.078	.136	|	25.712
1182	.077	.135	|	25.709
1188	.076	.135	|	25.706
1194	.075	.135	|	25.703
1200	.074	.135	|	25.700
1206	.073	.135	|	25.697
1212	.072	.135	|	25.693
1218	.072	.135	|	25.690
1224	.071	.134	|	25.687
1230	.070	.134	|	25.684
1236	.069	.134	|	25.680
1242	.068	.134	|	25.677
1248	.067	.134	|	25.673
1254	.067	.133	|	25.670
1260	.066	.133	|	25.666
1266	.065	.133	|	25.663
1272	.064	.133	|	25.659
1278	.064	.133	|	25.656
1284	.063	.133	|	25.652
1290	.063	.132	|	25.649
1296	.062	.132	|	25.645
1302	.061	.132	|	25.641
1308	.061	.132	|	25.637
1314	.060	.132	|	25.634
1320	.060	.132	|	25.630
1326	.059	.131	|	25.626
1332	.059	.131	|	25.623
1338	.058	.131	|	25.619
1344	.058	.131	|	25.615
1350	.057	.131	|	25.611
1356	.057	.130	|	25.607
1362	.057	.130	|	25.604
1368	.056	.130	|	25.600
1374	.056	.130	|	25.596
1380	.056	.130	|	25.592
1386	.055	.129	|	25.588
1392	.055	.129	|	25.584
1398	.055	.129	|	25.580
1404	.054	.129	|	25.577
1410	.054	.129	|	25.573
1416	.054	.128	|	25.569
1422	.054	.128	|	25.565
1428	.054	.128	|	25.561
1434	.054	.128	|	25.557
1440	.054	.128	|	25.553
1446	.052	.127	|	25.549
1452	.045	.127	|	25.545
1458	.035	.127	|	25.541
1464	.024	.127	|	25.536
1470	.015	.127	|	25.530
1476	.010	.126	|	25.524
1482	.006	.126	|	25.518
1488	.004	.126	|	25.512
1494	.002	.125	|	25.505
1500	.002	.125	|	25.499
1506	.001	.125	|	25.493
1512	.001	.124	|	25.486
1518	.000	.124	|	25.480
1524	.000	.124	|	25.473
1530	.000	.123	|	25.467
1536	.000	.123	|	25.461
1542	.000	.123	|	25.454

1548	.000	.122		25.448
1554	.000	.122		25.441
1560	.000	.122		25.435
1566	.000	.121		25.429
1572	.000	.121		25.422
1578	.000	.121		25.416
1584	.000	.120		25.410
1590	.000	.120		25.404
1596	.000	.120		25.397
1602	.000	.120		25.391
1608	.000	.119		25.385
1614	.000	.119		25.379
1620	.000	.119		25.373
1626	.000	.118		25.366
1632	.000	.118		25.360
1638	.000	.118		25.354
1644	.000	.117		25.348
1650	.000	.117		25.342
1656	.000	.117		25.336
1662	.000	.116		25.330
1668	.000	.116		25.324
1674	.000	.116		25.318
1680	.000	.116		25.312
1686	.000	.115		25.306
1692	.000	.115		25.300
1698	.000	.115		25.294
1704	.000	.114		25.288
1710	.000	.114		25.282
1716	.000	.114		25.276
1722	.000	.113		25.270
1728	.000	.113		25.264
1734	.000	.113		25.258
1740	.000	.113		25.252
1746	.000	.112		25.246
1752	.000	.112		25.241
1758	.000	.112		25.235
1764	.000	.111		25.229
1770	.000	.111		25.223
1776	.000	.111		25.217
1782	.000	.111		25.212
1788	.000	.110		25.206
1794	.000	.110		25.200
1800	.000	.110		25.194
1806	.000	.109		25.189
1812	.000	.109		25.183
1818	.000	.109		25.177
1824	.000	.109		25.172
1830	.000	.108		25.166
1836	.000	.108		25.160
1842	.000	.108		25.155
1848	.000	.107		25.149
1854	.000	.107		25.144
1860	.000	.107		25.138
1866	.000	.107		25.132
1872	.000	.106		25.127
1878	.000	.106		25.121
1884	.000	.106		25.116
1890	.000	.106		25.110
1896	.000	.105		25.105
1902	.000	.105		25.099
1908	.000	.105		25.094
1914	.000	.104		25.089
1920	.000	.104		25.083
1926	.000	.104		25.078
1932	.000	.104		25.072
1938	.000	.103		25.067
1944	.000	.103		25.062
1950	.000	.103		25.056
1956	.000	.103		25.051
1962	.000	.102		25.046
1968	.000	.102		25.040

1974	.000	.102	25.035
1980	.000	.101	25.030
1986	.000	.101	25.024
1992	.000	.101	25.019
1998	.000	.101	25.014
2004	.000	.100	25.009
2010	.000	.100	25.003
2016	.000	.097	24.998
2022	.000	.089	24.992
2028	.000	.082	24.987
2034	.000	.075	24.982
2040	.000	.069	24.978
2046	.000	.063	24.974
2052	.000	.058	24.970
2058	.000	.053	24.967
2064	.000	.048	24.964
2070	.000	.044	24.961
2076	.000	.041	24.958
2082	.000	.037	24.956
2088	.000	.034	24.954
2094	.000	.031	24.952
2100	.000	.029	24.950
2106	.000	.026	24.948
2112	.000	.024	24.947
2118	.000	.022	24.945
2124	.000	.020	24.944
2130	.000	.019	24.943
2136	.000	.017	24.942
2142	.000	.016	24.941
2148	.000	.014	24.940
2154	.000	.013	24.939
2160	.000	.012	24.938
2166	.000	.011	24.938
2172	.000	.010	24.937
2178	.000	.009	24.936
2184	.000	.008	24.936
2190	.000	.008	24.935
2196	.000	.007	24.935
2202	.000	.007	24.935
2208	.000	.006	24.934
2214	.000	.005	24.934
2220	.000	.005	24.934
2226	.000	.005	24.933
2232	.000	.004	24.933
2238	.000	.004	24.933
2244	.000	.004	24.932
2250	.000	.003	24.932
2256	.000	.003	24.932
2262	.000	.003	24.932
2268	.000	.003	24.932
2274	.000	.002	24.932
2280	.000	.002	24.931
2286	.000	.002	24.931
2292	.000	.002	24.931
2298	.000	.002	24.931
2304	.000	.001	24.931
2310	.000	.001	24.931
2316	.000	.001	24.931
2322	.000	.001	24.931
2328	.000	.001	24.931
2334	.000	.001	24.931
2340	.000	.001	24.931
2346	.000	.001	24.931
2352	.000	.001	24.931
2358	.000	.001	24.930
2364	.000	.001	24.930
2370	.000	.001	24.930
2376	.000	.001	24.930
2382	.000	.000	24.930

1********** PONDOPT **********
********** Version 1.83 **********

********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNELS
User: LandTech Resources
Date: 08/02/2004 Monday
Time: 16:44:08
Output: MKP1.OUT

ROUTING SUMMARY ----------
SIMULATION MODE ----------
FOR THE ABOVE CASE ----------

STORM NUMBER	PEAK STAGE (ft)	PEAK STORAGE (ac-ft)	PEAK INFLOW (cfs)	PEAK OUTFLOW (cfs)
1	25.838	.239	2.803	.668

PRE-2
2.70CFS

1-YEAR BMP OUT
0.668 CFS

100-Year Routing

```
1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNELS
    User: LandTech Resources
    Date: 08/02/2004    Monday
    Time: 16:45:03
  Output: MKP100.OUT


 SOLUTION FOR  1  STORMS.


 TIME INCREMENT:   .100  Hours


 STORM
 NUMBER   HYDROGRAPH IN FILE:
 ------   ---------------------------------------------------------

   1      MK100.DAT



                                ALLOWABLE
                    PEAK          PEAK                        RUNOFF      TAILWATER
          STORM     INFLOW      DISCHARGE     DURATION       VOLUME        STAGE
          NUMBER    (cfs)         (cfs)       (min)          (ft3)         (ft)
          ------   ---------   ----------   ----------   ------------   ----------

            1        10.088       N/A        1794.00     .4755E+05       24.930

1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNELS
    User: LandTech Resources
    Date: 08/02/2004    Monday
    Time: 16:45:03
  Output: MKP100.OUT


 Stage-Area-Discharge
 Filename: MKPOND.DAT

          TAILWATER STAGE:   24.930 feet.
            INITIAL STAGE:   24.930 feet.

 ==================   STAGE-STORAGE-DISCHARGE RELATIONSHIP   ==================

 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<   STORM  1      >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                          STORAGE
              STAGE       VOLUME          DISCHARGE
              (ft)        (ac-ft)           (cfs)
             ---------   ----------      ----------

               24.130       .0000            .0000
               25.000       .1046            .1000
               25.800       .2317            .1400
               26.000       .2691           2.910
               26.100       .2886           5.240
               26.500       .3738           19.96
1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************
```

PROJECT: MILANVILLE KENNELS
User: LandTech Resources
Date: 08/02/2004 Monday
Time: 16:45:03
Output: MKP100.OUT

TAILWATER STAGE: 24.930 feet.
INITIAL STAGE: 24.930 feet.

<<<<<<<<<<<<<<<<<<<< ROUTING RESULTS FOR STORM 1 >>>>>>>>>>>>>>>>>>>>

MAXIMUM ELEVATION: 26.22 feet.
MAXIMUM INFLOW: 10.09 cfs.
MAXIMUM OUTFLOW: 9.498 cfs.
MAXIMUM STORAGE: .3132 acre-feet.

CONTINUITY ERROR: .792E-04 percent.

TIME (min)	INFLOW RATE (cfs)	OUTFLOW RATE (cfs)	POND SURFACE ELEVATION (ft)
0	.000	.000	24.930
6	.000	.000	24.930
12	.000	.000	24.930
18	.000	.000	24.930
24	.000	.000	24.930
30	.000	.000	24.930
36	.000	.000	24.930
42	.000	.000	24.930
48	.000	.000	24.930
54	.000	.000	24.930
60	.000	.000	24.930
66	.000	.000	24.930
72	.000	.000	24.930
78	.000	.000	24.930
84	.000	.000	24.930
90	.000	.000	24.930
96	.000	.000	24.930
102	.000	.000	24.930
108	.000	.000	24.930
114	.000	.000	24.930
120	.000	.000	24.930
126	.000	.000	24.930
132	.000	.000	24.930
138	.000	.000	24.930
144	.000	.000	24.930
150	.000	.000	24.930
156	.000	.000	24.930
162	.001	.000	24.930
168	.002	.000	24.930
174	.004	.000	24.930
180	.007	.001	24.931
186	.010	.001	24.931
192	.013	.002	24.932
198	.016	.003	24.932
204	.019	.004	24.933
210	.022	.006	24.934
216	.025	.007	24.935
222	.028	.009	24.936
228	.031	.011	24.937
234	.034	.012	24.939
240	.037	.014	24.940
246	.040	.016	24.941
252	.044	.018	24.943
258	.049	.021	24.945
264	.054	.023	24.946

270	.060	.026	24.948
276	.064	.029	24.950
282	.068	.032	24.953
288	.072	.035	24.955
294	.076	.039	24.957
300	.079	.042	24.959
306	.082	.045	24.962
312	.085	.048	24.964
318	.088	.052	24.966
324	.091	.055	24.968
330	.094	.058	24.971
336	.097	.061	24.973
342	.100	.064	24.975
348	.102	.067	24.977
354	.105	.070	24.979
360	.107	.073	24.981
366	.110	.076	24.983
372	.115	.079	24.985
378	.120	.082	24.988
384	.125	.086	24.990
390	.130	.089	24.992
396	.134	.093	24.995
402	.138	.096	24.997
408	.141	.100	25.000
414	.144	.100	25.002
420	.146	.100	25.005
426	.150	.100	25.007
432	.157	.100	25.010
438	.166	.101	25.013
444	.176	.101	25.017
450	.184	.101	25.021
456	.190	.101	25.025
462	.196	.101	25.030
468	.200	.102	25.035
474	.203	.102	25.040
480	.207	.102	25.045
486	.211	.103	25.051
492	.219	.103	25.057
498	.229	.103	25.063
504	.240	.103	25.070
510	.249	.104	25.077
516	.257	.104	25.085
522	.265	.105	25.093
528	.274	.105	25.102
534	.282	.106	25.111
540	.289	.106	25.120
546	.297	.106	25.130
552	.307	.107	25.140
558	.319	.108	25.151
564	.332	.108	25.162
570	.343	.109	25.174
576	.353	.109	25.186
582	.364	.110	25.199
588	.379	.111	25.213
594	.392	.111	25.227
600	.404	.112	25.242
606	.417	.113	25.258
612	.439	.114	25.274
618	.468	.115	25.292
624	.497	.116	25.311
630	.522	.117	25.331
636	.547	.118	25.353
642	.584	.119	25.376
648	.633	.120	25.402
654	.681	.121	25.430
660	.722	.123	25.460
666	.767	.125	25.492
672	.840	.126	25.527
678	.943	.128	25.567
684	1.046	.131	25.612
690	1.131	.133	25.662

696	1.293	.136	25.718
702	1.664	.139	25.788
708	2.485	.935	25.857
714	4.131	2.047	25.938
720	6.772	3.944	26.044
726	9.237	6.991	26.148
732	10.088	9.216	26.208
738	9.021	9.498	26.216
744	7.137	8.316	26.184
750	5.327	6.580	26.136
756	4.120	5.076	26.093
762	3.281	4.165	26.054
768	2.613	3.359	26.019
774	2.109	2.760	25.989
780	1.750	2.371	25.961
786	1.510	2.024	25.936
792	1.331	1.741	25.916
798	1.182	1.514	25.899
804	1.062	1.331	25.886
810	.965	1.182	25.875
816	.893	1.064	25.867
822	.837	.971	25.860
828	.784	.896	25.855
834	.737	.832	25.850
840	.700	.779	25.846
846	.677	.737	25.843
852	.665	.706	25.841
858	.656	.684	25.839
864	.645	.669	25.838
870	.630	.654	25.837
876	.610	.638	25.836
882	.588	.620	25.835
888	.565	.599	25.833
894	.542	.578	25.832
900	.519	.556	25.830
906	.497	.533	25.828
912	.477	.512	25.827
918	.457	.491	25.825
924	.439	.471	25.824
930	.422	.452	25.823
936	.406	.434	25.821
942	.392	.418	25.820
948	.380	.403	25.819
954	.368	.389	25.818
960	.359	.377	25.817
966	.351	.367	25.816
972	.344	.358	25.816
978	.338	.350	25.815
984	.333	.343	25.815
990	.329	.338	25.814
996	.326	.333	25.814
1002	.323	.329	25.814
1008	.320	.325	25.813
1014	.317	.322	25.813
1020	.314	.319	25.813
1026	.311	.316	25.813
1032	.308	.313	25.812
1038	.305	.310	25.812
1044	.302	.307	25.812
1050	.300	.304	25.812
1056	.297	.301	25.812
1062	.294	.299	25.811
1068	.291	.296	25.811
1074	.289	.293	25.811
1080	.286	.290	25.811
1086	.283	.288	25.811
1092	.280	.285	25.810
1098	.278	.282	25.810
1104	.275	.279	25.810
1110	.272	.276	25.810
1116	.269	.274	25.810

1122	.266	.271	|	25.809
1128	.264	.268	|	25.809
1134	.261	.265	|	25.809
1140	.258	.263	|	25.809
1146	.255	.260	|	25.809
1152	.253	.257	|	25.808
1158	.250	.254	|	25.808
1164	.247	.252	|	25.808
1170	.244	.249	|	25.808
1176	.242	.246	|	25.808
1182	.239	.243	|	25.807
1188	.236	.241	|	25.807
1194	.234	.238	|	25.807
1200	.231	.235	|	25.807
1206	.228	.233	|	25.807
1212	.225	.230	|	25.806
1218	.223	.227	|	25.806
1224	.220	.224	|	25.806
1230	.217	.222	|	25.806
1236	.215	.219	|	25.806
1242	.212	.216	|	25.806
1248	.210	.214	|	25.805
1254	.207	.211	|	25.805
1260	.205	.209	|	25.805
1266	.203	.207	|	25.805
1272	.200	.204	|	25.805
1278	.198	.202	|	25.804
1284	.196	.200	|	25.804
1290	.194	.198	|	25.804
1296	.192	.196	|	25.804
1302	.190	.194	|	25.804
1308	.189	.192	|	25.804
1314	.187	.190	|	25.804
1320	.185	.188	|	25.803
1326	.184	.186	|	25.803
1332	.182	.185	|	25.803
1338	.181	.183	|	25.803
1344	.179	.182	|	25.803
1350	.178	.180	|	25.803
1356	.177	.179	|	25.803
1362	.175	.177	|	25.803
1368	.174	.176	|	25.803
1374	.173	.175	|	25.803
1380	.172	.174	|	25.802
1386	.171	.173	|	25.802
1392	.170	.172	|	25.802
1398	.170	.171	|	25.802
1404	.169	.170	|	25.802
1410	.168	.169	|	25.802
1416	.168	.169	|	25.802
1422	.167	.168	|	25.802
1428	.167	.168	|	25.802
1434	.166	.167	|	25.802
1440	.166	.167	|	25.802
1446	.160	.165	|	25.802
1452	.140	.158	|	25.801
1458	.108	.142	|	25.800
1464	.075	.140	|	25.798
1470	.047	.140	|	25.793
1476	.030	.139	|	25.788
1482	.019	.139	|	25.782
1488	.012	.139	|	25.776
1494	.008	.138	|	25.769
1500	.005	.138	|	25.762
1506	.003	.138	|	25.755
1512	.002	.137	|	25.748
1518	.001	.137	|	25.741
1524	.001	.137	|	25.734
1530	.000	.136	|	25.727
1536	.000	.136	|	25.720
1542	.000	.136	|	25.713

1548	.000	.135		25.706
1554	.000	.135		25.699
1560	.000	.135		25.692
1566	.000	.134		25.685
1572	.000	.134		25.678
1578	.000	.134		25.671
1584	.000	.133		25.664
1590	.000	.133		25.657
1596	.000	.133		25.650
1602	.000	.132		25.643
1608	.000	.132		25.636
1614	.000	.131		25.629
1620	.000	.131		25.623
1626	.000	.131		25.616
1632	.000	.130		25.609
1638	.000	.130		25.602
1644	.000	.130		25.595
1650	.000	.129		25.589
1656	.000	.129		25.582
1662	.000	.129		25.575
1668	.000	.128		25.569
1674	.000	.128		25.562
1680	.000	.128		25.555
1686	.000	.127		25.549
1692	.000	.127		25.542
1698	.000	.127		25.535
1704	.000	.126		25.529
1710	.000	.126		25.522
1716	.000	.126		25.516
1722	.000	.125		25.509
1728	.000	.125		25.503
1734	.000	.125		25.496
1740	.000	.124		25.490
1746	.000	.124		25.483
1752	.000	.124		25.477
1758	.000	.124		25.470
1764	.000	.123		25.464
1770	.000	.123		25.457
1776	.000	.123		25.451
1782	.000	.122		25.445
1788	.000	.122		25.438
1794	.000	.122		25.432
1800	.000	.121		25.426
1806	.000	.121		25.419
1812	.000	.121		25.413
1818	.000	.120		25.407
1824	.000	.120		25.401
1830	.000	.120		25.394
1836	.000	.119		25.388
1842	.000	.119		25.382
1848	.000	.119		25.376
1854	.000	.118		25.370
1860	.000	.118		25.363
1866	.000	.118		25.357
1872	.000	.118		25.351
1878	.000	.117		25.345
1884	.000	.117		25.339
1890	.000	.117		25.333
1896	.000	.116		25.327
1902	.000	.116		25.321
1908	.000	.116		25.315
1914	.000	.115		25.309
1920	.000	.115		25.303
1926	.000	.115		25.297
1932	.000	.115		25.291
1938	.000	.114		25.285
1944	.000	.114		25.279
1950	.000	.114		25.273
1956	.000	.113		25.267
1962	.000	.113		25.261
1968	.000	.113		25.255

1974	.000	.112	25.249
1980	.000	.112	25.244
1986	.000	.112	25.238
1992	.000	.112	25.232
1998	.000	.111	25.226
2004	.000	.111	25.220
2010	.000	.111	25.215
2016	.000	.110	25.209
2022	.000	.110	25.203
2028	.000	.110	25.197
2034	.000	.110	25.192
2040	.000	.109	25.186
2046	.000	.109	25.180
2052	.000	.109	25.175
2058	.000	.108	25.169
2064	.000	.108	25.163
2070	.000	.108	25.158
2076	.000	.108	25.152
2082	.000	.107	25.147
2088	.000	.107	25.141
2094	.000	.107	25.135
2100	.000	.106	25.130
2106	.000	.106	25.124
2112	.000	.106	25.119
2118	.000	.106	25.113
2124	.000	.105	25.108
2130	.000	.105	25.102
2136	.000	.105	25.097
2142	.000	.105	25.091
2148	.000	.104	25.086
2154	.000	.104	25.081
2160	.000	.104	25.075
2166	.000	.103	25.070
2172	.000	.103	25.064
2178	.000	.103	25.059
2184	.000	.103	25.054
2190	.000	.102	25.048
2196	.000	.102	25.043
2202	.000	.102	25.038
2208	.000	.102	25.032
2214	.000	.101	25.027
2220	.000	.101	25.022
2226	.000	.101	25.017
2232	.000	.101	25.011
2238	.000	.100	25.006
2244	.000	.100	25.001
2250	.000	.093	24.995
2256	.000	.085	24.990
2262	.000	.078	24.985
2268	.000	.072	24.980
2274	.000	.066	24.976
2280	.000	.060	24.972
2286	.000	.055	24.969
2292	.000	.051	24.965
2298	.000	.046	24.962
2304	.000	.043	24.960
2310	.000	.039	24.957
2316	.000	.036	24.955
2322	.000	.033	24.953
2328	.000	.030	24.951
2334	.000	.028	24.949
2340	.000	.025	24.948
2346	.000	.023	24.946
2352	.000	.021	24.945
2358	.000	.019	24.944
2364	.000	.018	24.942
2370	.000	.016	24.941
2376	.000	.015	24.940
2382	.000	.014	24.940
2388	.000	.013	24.939
2394	.000	.012	24.938

2400	.000	.011	|	24.937
2406	.000	.010	|	24.937
2412	.000	.009	|	24.936
2418	.000	.008	|	24.936
2424	.000	.007	|	24.935
2430	.000	.007	|	24.935
2436	.000	.006	|	24.934
2442	.000	.006	|	24.934
2448	.000	.005	|	24.934
2454	.000	.005	|	24.933
2460	.000	.004	|	24.933
2466	.000	.004	|	24.933
2472	.000	.004	|	24.933
2478	.000	.003	|	24.932
2484	.000	.003	|	24.932
2490	.000	.003	|	24.932
2496	.000	.003	|	24.932
2502	.000	.002	|	24.932
2508	.000	.002	|	24.932
2514	.000	.002	|	24.931
2520	.000	.002	|	24.931
2526	.000	.002	|	24.931
2532	.000	.002	|	24.931
2538	.000	.001	|	24.931
2544	.000	.001	|	24.931
2550	.000	.001	|	24.931
2556	.000	.001	|	24.931
2562	.000	.001	|	24.931
2568	.000	.001	|	24.931
2574	.000	.001	|	24.931
2580	.000	.001	|	24.931
2586	.000	.001	|	24.930
2592	.000	.001	|	24.930
2598	.000	.001	|	24.930
2604	.000	.001	|	24.930
2610	.000	.001	|	24.930
2616	.000	.000	|	24.930

1********** PONDOPT **********
********** Version 1.83 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNELS
User: LandTech Resources
Date: 08/02/2004 Monday
Time: 16:45:03
Output: MKP100.OUT

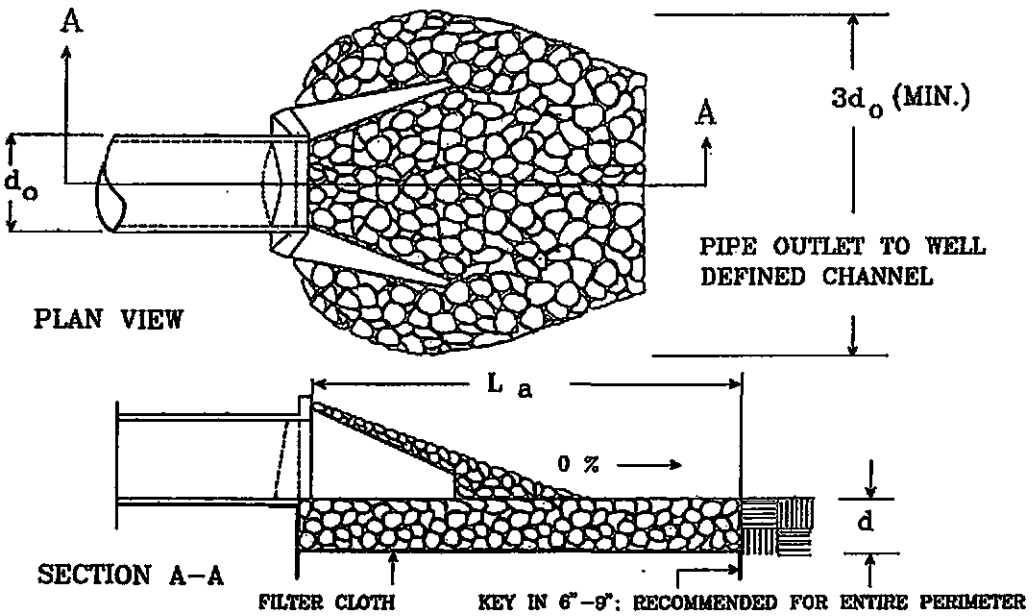
ROUTING SUMMARY ----------
SIMULATION MODE ----------
FOR THE ABOVE CASE ----------

STORM NUMBER	PEAK STAGE (ft)	PEAK STORAGE (ac-ft)	PEAK INFLOW (cfs)	PEAK OUTFLOW (cfs)
1	26.216	.313	10.088	9.498

LandTech
Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME Milanville Kennels
PROJECT NO. 04-078
SHEET NO. _____ OF _____
CALCULATED BY KMJ DATE 4/14/04
SCALE _____

DESIGN OUTLET PROTECTION



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

Plate 3.18-3
Q = 9.50 cfs
d = 1.25'
3d = 4'
La = 12'
W = d + La = 13'
d_{50} = 0.35'

USE 12' x 13' x 26' ✓
VDOT CLASS I
RIP RAP APRON

Erosion and Sediment Control Narrative

for

Milanville Kennels

April 13, 2004
Revised June 10, 2004

Project Number 04-078

SP-54-04
2ND Submission
- Type A-3 BMP
- Will accept animal waste
- Special bacteria provisions per PCWMP recommendations

LandTech Resources, Inc.
5810-F Mooretown Road, Williamsburg, VA
Phone 757-565-1677 **Fax 757-565-0782**

stamp + seal

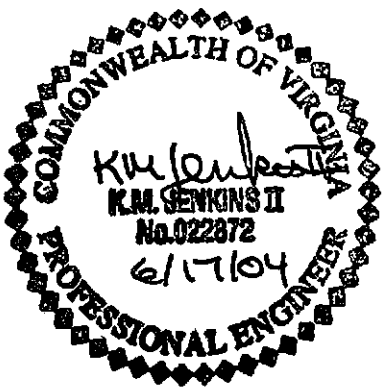
Erosion and Sediment Control Narrative

for

Milanville Kennels

April 13, 2004
Revised June 10, 2004

Project Number 04-078



LandTech Resources, Inc.
5810-F Mooretown Road, Williamsburg, VA
Phone 757-565-1677 **Fax 757-565-0782**

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PROJECT DESCRIPTION

The project consists of the construction of a 6,920 sf kennel at 2878 Monticello Ave. in James City County, Virginia. The site is 15.01 acres with a total of 0.85 acres to be covered by impervious surfaces after construction is complete. The total disturbed area is approximately 1.1 acres.

EXISTING CONDITIONS

Currently the site is open in the front and wooded in the rear. The site slopes from the north to the south at approximately 1.5% and contains an existing residence, garage and stable.

ADJACENT AREAS

The site is bounded on the north, south, east and west existing residential lots.

OFF-SITE AREA

There are no off-site areas proposed to be disturbed in association with this project. However, if it becomes necessary to disturb off-site areas, a revised erosion and sediment control plan will be prepared and submitted to the county for review and approval.

SOILS

Chickahominy (9)

This soil is deep, nearly level, and poorly drained.

Typically, the surface layer of this soil is dark grayish brown and grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of at least 85 inches. It is mostly gray silty clay loam, silty clay, and clay loam with yellowish brown mottles.

The permeability of this Chickahominy soil is very slow, and the erosion hazard is slight. The subsoil has a high shrink-swell potential.

Emporia complex (15E)

This complex consists of areas of deep, steep, well drained Emporia soils and areas of similar soils that formed over layers of fossil shells.

Typically, the surface layer of Emporia soils is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is pale brown loam 5 inches thick. The subsoil extends to a depth of 50 inches. It is yellowish brown loam with mostly strong brown mottles in the upper part; yellowish brown, firm sandy clay loam with strong brown and gray mottles in the middle part; and mottled gray and brown, firm sandy clay loam in the lower part. The substratum is variegated brown, red, and gray, firm sandy clay loam to a depth of at least 75 inches.

In these Emporia soils, permeability is moderate in the upper part of the subsoil and moderately slow in the lower part. The erosion hazard is severe and the subsoil has moderate shrink-swell potential.

Newflat (23)

This soil is deep, nearly level, and somewhat poorly drained.

Typically, the surface layer of this soil is dark grayish brown and light yellowish brown silt loam about 8 inches thick. The upper 3 inches of the subsoil is pale brown silty clay loam. Below this, to a depth of at least 80 inches, the subsoil is light olive brown clay or gray clay with mostly yellowish brown mottles.

The permeability of this Newflat soil is very slow and the erosion hazard is slight. The subsoil has a high shrink-swell potential.

Peawick (27)

This soil is deep, nearly level, and moderately well drained.

Typically, the surface layer of this soil is dark grayish brown silt loam about 2 inches thick. The upper 14 inches of the subsoil is light yellowish brown silty clay loam and yellowish brown silty clay. The next 25 inches of the subsoil is mottled brown and gray silty clay. The lower part of the subsoil is mostly mottled, gray silty clay and clay to a depth of at least 99 inches.

The permeability of this Peawick soil is very slow and the erosion hazard is slight. The subsoil has high shrink-swell potential.

CRITCAL EROSION AREAS

The critical erosion area associated with this site is the on-site RPA area located at the southern end of the site. To prevent sediment from entering this area, it is imperative that the contractor install all erosion and sediment control measures shown on these plans before any land disturbing activities commence. Regular inspection and maintenance is also required for all erosion and sediment control measures to keep them functioning as designed.

EROSION AND SEDIMENT CONTROL MEASURES

Unless otherwise indicated, all structural and vegetative erosion and sediment control practices shall be constructed and maintained according to minimum standards and specifications of the latest edition of Virginia Erosion and Sediment Control Handbook (VESCH). The minimum standards shall be adhered to unless otherwise waived or approved by variance.

STRUCTURAL PRACTICES

Temporary Stone Construction Entrance – 3.02

A construction entrance shall be provided at the point of ingress and egress to reduce the amount of mud transported onto paved public roads by motor vehicles and runoff.

Silt Fence – 3.05

Silt fence shall be placed around the limits of clearing to intercept and detain small amounts of sediment from disturbed areas during construction operations.

Culvert Inlet Protection – 3.08

Culvert inlet protection shall be installed at the inlet to storm sewer culverts as depicted on the plans.

Permanent Diversion Dike – 3.09

A permanent diversion dike shall be installed as depicted on the plans to divert off-site storm runoff from draining through the proposed BMP.

Outlet Protection – 3.18

Outlet protection shall be provided to prevent scour at stormwater outlets, to protect the outlet structure, and to minimize the potential for downstream erosion.

VEGETATIVE PRACTICES

Permanent Seeding – 3.32

All denuded areas, which will be left dormant for extended periods of time, shall be seeded with permanent vegetation immediately following grading. Selection of the seed mixture will depend on the time of year it is applied.

MANAGEMENT STRATEGIES

- Sediment trapping measures will be installed as the first step in grading and will be seeded and mulched immediately following installation.
- Temporary seeding or other stabilization will follow immediately after grading.
- The contractor shall be responsible for the installation and maintenance of all erosion and sediment control practices depicted on the Plans.
- After achieving adequate stabilization, the temporary controls will be cleaned and removed. Any areas disturbed in the removal process shall be graded, top soiled, and seeded accordingly.

PERMANENT STABILIZATION

All areas disturbed by construction shall be stabilized with permanent seeding immediately following finish grading. Seeding shall be accomplished with Kentucky 31 Tall Fescue according to Standards and Specifications 3.32, Permanent Seeding of the VESCH. Soil stabilization blankets will be installed over slopes, which have been brought to final grade and have been seeded to protect the slopes from rill and gully erosion and to allow seed to germinate properly. Mulch (straw or fiber) will be used on relatively flat areas. In all seeding operations, seed, fertilizer and lime will be applied prior to mulching.

STORMWATER MANAGEMENT

This project is for the construction of a 6,920 sf kennel with runs. A Wet Extended Detention Pond (Type A-3 BMP) will be utilized to treat the daily kennel wash down runoff by maximizing bacteria removal through the design and use of a three cell wet pond. The wet pond will also release the 1-year post-development storm over 24 hours and pass the 100-year post-development storm with 1.02 feet of freeboard.

CALCULATIONS

Appendix A contains design calculations for the onsite BMP.

MAINTENANCE

In general, all erosion and sediment control measures will be checked daily and after each significant rainfall. The following items will be checked in particular:

Temporary Stone Construction Entrance – 3.02

The entrance shall be maintained in a condition, which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic dressing with additional stone or the washing and reworking of existing stone as conditions demand. All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately. The use of water trucks to remove materials dropped, washed, or tracked onto roadways will not be permitted under any circumstances.

Silt Fence – 3.05

Silt Fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting.

Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life and the barrier still be necessary, the fabric shall be replaced promptly.

Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.

Any sediment deposits remaining in place after the silt fence is not longer required shall be dressed to conform with the existing grade, prepared and seeded.

Culvert Inlet Protection – 3.08

The structure shall be inspected after each rain and repairs made as needed.

Aggregate shall be replaced or cleaned when inspection reveals that clogged voids are causing ponding, which interfere with on-site construction.

Sediment shall be removed and the impoundment restored to its original dimensions when sediment has accumulated to one-half the design depth. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems.

Temporary structures shall be removed when they have served their useful purpose but not before the upslope area has been permanently stabilized.

Permanent Diversion Dike – 3.09

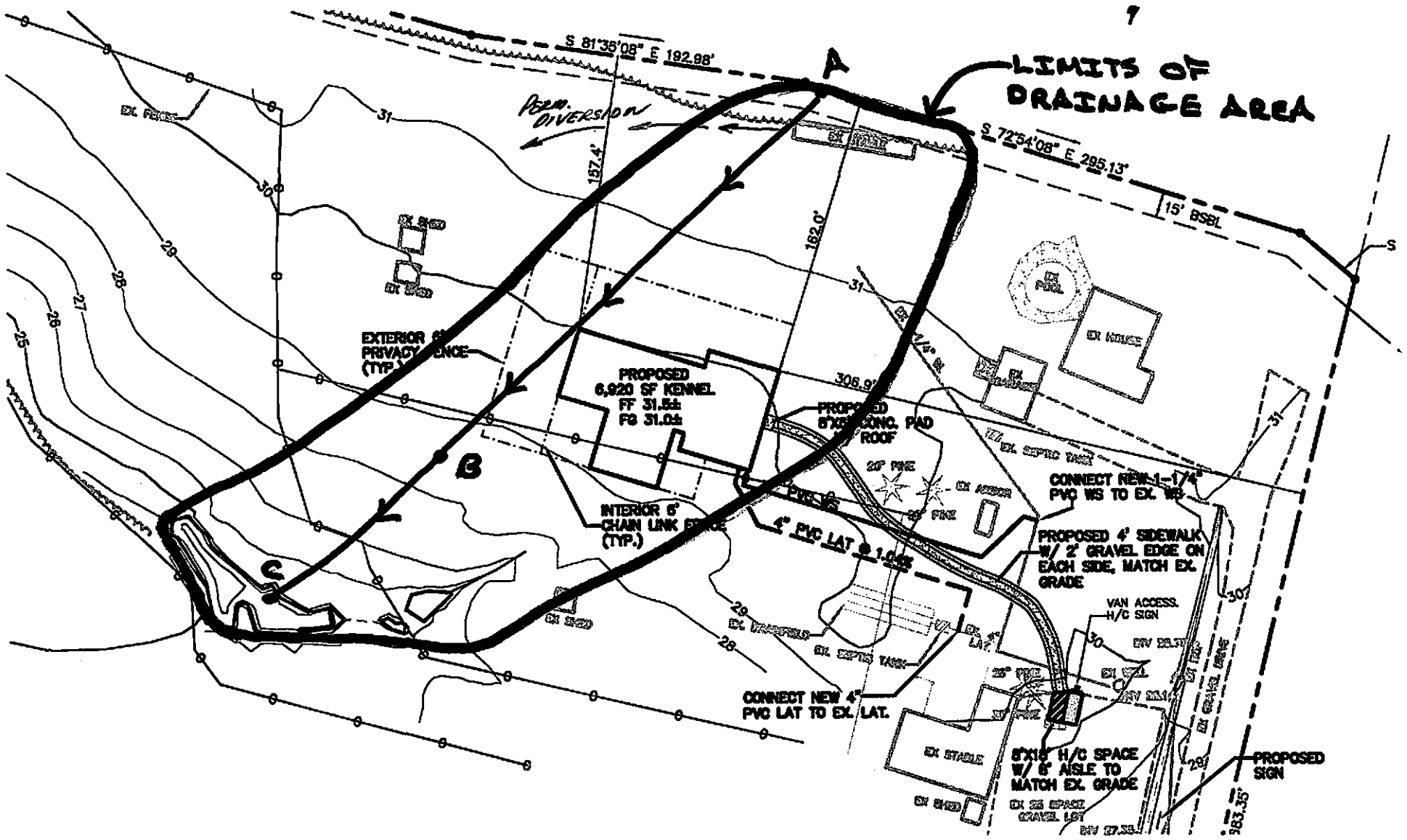
The measure shall be inspected after every storm and repairs made to the dike as necessary. Once every two weeks, whether a storm event has occurred or not, the measure shall be inspected and repairs made if needed. Damages caused by construction traffic or any other activity must be repaired before the end of each day.

Permanent Seeding – 3.32

The seeded/mulched areas should be checked regularly to ensure that a good stand is established and maintained. Areas should be fertilized, mulched and re-seeded as needed. When it is clear that plants have not germinated on an area or have died, these areas must be re-seeded immediately to prevent erosion damage. However, it is extremely important to determine for what reason germination did not take place and make any corrective action necessary prior to re-seeding the area.

- Fertilizer shall be applied using approved fertilization methods and equipment.
- Formulations and application rates shall conform to the guidelines given in VESCH.
- Maintain a ground cover or organic mulch around trees that is adequate to prevent erosion, protect roots, and hold water.

FIGURE 1


LIMITS OF DRAINAGE AREA
S 81°35'08" E 192.98'
S 72°54'08" E 295.13'
15' BSBL
POOL DIVERSION
157.4'
162.0'
306.9'
EXTERIOR 6' PRIVACY FENCE (TYP.)
PROPOSED 6,920 SF KENNEL FF 31.5± FG 31.0±
PROPOSED 8'X8' CONC. PAD ROOF
INTERIOR 6' CHAIN LINK FENCE (TYP.)
4" PVC LAT @ 1.0%
EX. SEPTIC TANK
EX. DRAINFIELD
EX. HOUSE
EX. POOL
EX. STABLE
EX. SHED
EX. 22 SPACE GRAVEL LOT
CONNECT NEW 1-1/4" PVC WS TO EX. WS
PROPOSED 4' SIDEWALK W/ 2' GRAVEL EDGE ON EACH SIDE, MATCH EX. GRADE
VAN ACCESS. H/C SIGN
CONNECT NEW 4" PVC LAT TO EX. LAT.
8'X18' H/C SPACE W/ 6' AISLE TO MATCH EX. GRADE
PROPOSED SIGN
383.35'
A
B
C
1"=80'

APPENDIX A

04-078
4/5/04

BMP Design

A wet extended detention pond (JCC BMP A-3) will be used to treat the washdown runoff from the kennel. The impervious area of the kennel is 6968 sf.

Treatment Volume – 2.0 inches / impervious acre

Impervious Area = 6968 sf

$$WQv = \frac{6968\,sf \mid 2in \mid 1ft}{\mid \mid 12in} = 1{,}162\,cf$$

Dry Storage = 581 cf

Wet Storage = 581 cf

Worksheet 2: Runoff curve number and runoff

Project	By	Date
Milanville Kennel	KMJ	4/9/04
Location	**Checked**	**Date**
James City Co., Va.		

Check one: ☒ Present ☐ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Figure 2-3	CN 1/ Figure 2-4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
Newflat D	Pasture (Poor)	89			1.90	
					Totals ➡	

1/ Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = _____ = _____ ; **Use CN ➡** 89

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	1		
Rainfall, P (24-hour)	in	2.8		
Runoff, Q	in	1.7		

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
Milenville Kennel	KMJ	4/9/04
Location	**Checked**	**Date**
James City Co., Va.		

Check one: ☒ Present ☐ Developed

Check one: ☒ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

	Segment ID	AB	
1.	Surface description (table 3-1)	Prairie	
2.	Manning's roughness coefficient, n (table 3-1)	0.15	
3.	Flow length, L (total L † 300 ft) ft	300	
4.	Two-year 24-hour rainfall, P_2 in	3.5	
5.	Land slope, s ft/ft	.010	
6.	$T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr	.50 +	= .50

Shallow concentrated flow

	Segment ID	BC	
7.	Surface description (paved or unpaved)	Unpaved	
8.	Flow length, L ft	150	
9.	Watercourse slope, s ft/ft	.020	
10.	Average velocity, V (figure 3-1) ft/s	2.3	
11.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr	.02 +	= .02

Channel flow

	Segment ID		
12.	Cross sectional flow area, a ft^2		
13.	Wetted perimeter, p_w ft		
14.	Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft		
15	Channel slope, s ft/ft		
16.	Manning's roughness coefficient, n		
17.	$V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ft/s		
18.	Flow length, L ft		
19.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr	+	=
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) Hr		.52

Worksheet 5a: Basic watershed data

Project	Location	By	Date
Milanville Kennel	James City Co., Va.	KMJ	4/9/04
Check one: ☒ Present ☐ Developed	Frequency (yr)	Checked	Date

~~Subarea name~~ Storm	Drainage area A_m (mi^2)	Time of concentration T_c (hr)	Travel time through subarea T_t (hr)	Downstream subarea names	Travel time summation to outlet ΣT_t (hr)	24-hr rainfall P (in)	Runoff curve number CN	Runoff Q (in)	A_mQ (mi^2—in)	Initial abstraction I_a (in)	I_a/P
1	.0030	0.52				2.8	89	1.7	.0051	0.247	.09

From worksheet 3 | From worksheet 2 | From table 5-1

Worksheet 5b: Basic watershed data

Project	Location	By	Date
Milanville Kennel	James City Co., Va.	KMS	4/9/04
Check one: ☒ Present ☐ Developed	Frequency (yr)	Checked	Date

~~Subarea~~ name	Basic watershed data used 1/				Select and enter hydrograph times in hours from exhibit 5-II 2/											
Storm	Subarea T_c (hr)	ΣT_t to outlet (hr)	I_a/P	A_mQ (mi^2—in)					12.4							
					Discharges at selected hydrograph times 3/ (cfs)											
1	0.52		.09	.0051					2.70							
Composite hydrograph at outlet																

1/ Worksheet 5a. Rounded as needed for use with exhibit 5.
2/ Enter rainfall distribution type used.
3/ Hydrograph discharge for selected times is A_mQ multiplied by tabular discharge from appropriate exhibit 5.

Worksheet 2: Runoff curve number and runoff

Project	By	Date
Milanville Kennel	KMJ	4/9/04
Location	**Checked**	**Date**
James City Co., Va		

Check one: ☐ Present ☒ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Figure 2-3	CN 1/ Figure 2-4	Area ☒ acres ☐ mi² ☐ %	Product of CN x area
Newflat D	Pasture (Poor)	89			1.73	153.97
Newflat D	Road	98			.17	16.66
					Totals ➡	
1.90	170.63					

1/ Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{170.63}{1.90} = 89.8$; Use CN ➡ 90

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	1	100	
Rainfall, P (24-hour)	in	2.8	8.0	
Runoff, Q	in	1.8	6.8	

(Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
Hilowville Kennel	KMJ	4/9/04
Location	**Checked**	**Date**
James City Co., Va.		

Check one: ☐ Present ☒ Developed

Check one: ☐ T_c ☐ T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

	Segment ID	AB	
1.	Surface description (table 3-1)	Prairie	
2.	Manning's roughness coefficient, n (table 3-1)	0.15	
3.	Flow length, L (total L † 300 ft) ft	300	
4.	Two-year 24-hour rainfall, P_2 in	3.5	
5.	Land slope, s ft/ft	.010	
6.	$T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr	.50 +	= .50

Shallow concentrated flow

	Segment ID	BC	
7.	Surface description (paved or unpaved)	Unpaved	
8.	Flow length, L ft	150	
9.	Watercourse slope, s ft/ft	.020	
10.	Average velocity, V (figure 3-1) ft/s	2.3	
11.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr	.02 +	= .02

Channel flow

	Segment ID		
12.	Cross sectional flow area, a ft^2		
13.	Wetted perimeter, p_w ft		
14.	Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft		
15	Channel slope, s ft/ft		
16.	Manning's roughness coefficient, n		
17.	$V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V ft/s		
18.	Flow length, L ft		
19.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr	+	=
20.	Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) Hr		.52

Worksheet 5a: Basic watershed data

Project	Location	By	Date
Milanville Kennel	James City Co., Va.	KMS	4/9/04
Check one: ☐ Present ☒ Developed	Frequency (yr)	Checked	Date

~~Subarea name~~ Storm	Drainage area A_m (mi^2)	Time of concentration T_c (hr)	Travel time through subarea T_t (hr)	Downstream subarea names	Travel time summation to outlet ΣT_t (hr)	24-hr rainfall P (in)	Runoff curve number CN	Runoff Q (in)	$A_m Q$ (mi^2—in)	Initial abstraction I_a (in)	I_a/P
1	.0030	0.52				2.8	90	1.8	.0054	0.222	.08
100	.0030	0.52				8.0	90	6.8	.0204	0.222	.03

From worksheet 3 | From worksheet 2 | From table 5-1

Worksheet 5b: Basic watershed data

Project	Location	By	Date
Milenville Kennel	James City Co., Va.	HMJ	4/9/04
Check one: ☐ Present ☒ Developed	Frequency (yr)	Checked	Date

Subarea name STORM	Basic watershed data used 1/				Select and enter hydrograph times in hours from exhibit 5-II 2/											
	Subarea T_c (hr)	ΣT_t to outlet (hr)	I_a/P	A_mQ (mi^2—in)					12.4							
					Discharges at selected hydrograph times 3/ (cfs)											
1	0.52		.08	.0054					2.86							
100	0.52		.03	.0204					10.79							
Composite hydrograph at outlet																

1/ Worksheet 5a. Rounded as needed for use with exhibit 5.
2/ Enter rainfall distribution type used.
3/ Hydrograph discharge for selected times is A_mQ multiplied by tabular discharge from appropriate exhibit 5.

1-Year Hydrograph

```
1*******************************     SCSHYDRO     *******************************
 *******************************   Version 3.21   *******************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNEL
    User: LandTech Resources
    Date: 04/09/2004    Friday
    Time: 12:27:00
   Input: MK1.IN
  Output: MK1.OUT
```

PROGRAM EXECUTION

NUMBER OF STORMS TO BE MODELED	:	1
NUMBER OF CHANNELS	:	0
NUMBER OF SUBAREAS	:	1
UPSTREAM HYDROGRAPHS ENTER AT	:	0 LOCATIONS
NUMBER OF TIME STEPS	:	300
COMPUTATIONAL TIME INCREMENT	:	.100 Hours

NOTE: The DURATION of the final computed hydrograph(s) for this watershed system will be 30.000 hours.

UNIT HYDROGRAPH METHODOLOGY

The SCS DIMENSIONLESS UNIT HYDROGRAPH is used in all runoff computations.
The peak rate factor (PRF) for all unit hydrographs is 484 (U.S. Customary units) or 2.08356 (Metric units).

```
1*******************************     SCSHYDRO     *******************************
 *******************************   Version 3.21   *******************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNEL
    User: LandTech Resources
    Date: 04/09/2004    Friday
    Time: 12:27:00
   Input: MK1.IN
  Output: MK1.OUT
```

SUBAREA DATA

SUBAREA ID NO	AREA (mi2)	TIME OF CONCENTRATION (hrs)	CURVE NUMBER	BASEFLOW (cfs)	DOWNSTREAM CHANNELS
1	.0030	.520	90.00	.0	

Composite Watershed Curve Number = 90.00
Minimum Subarea Time of Concentration = .520 hours.

```
1*******************************     SCSHYDRO     *******************************
```

```
********************************  Version 3.21  ********************************
******************  COMPUTER-AIDED HYDROLOGY & HYDRAULICS  ******************

PROJECT: MILANVILLE KENNEL
   User: LandTech Resources
   Date: 04/09/2004    Friday
   Time: 12:27:00
  Input: MK1.IN
 Output: MK1.OUT
                                                  RETURN PERIOD (yrs):      1

======================   RAINFALL HYETOGRAPH INFORMATION   ====================


        RAINFALL HYETOGRAPH: SCS TYPE II
        RAINFALL DURATION:    24.00 Hours
        RAINFALL DEPTH:        2.80 Inches


RAINFALL HYETOGRAPH,
SCS TYPE II
Time (Hours), Total Depth (Inches):

      .000,   .00      2.000,   .06      4.000,   .13      6.000,   .22
     7.000,   .27      8.000,   .34      8.500,   .37      9.000,   .41
     9.500,   .46      9.750,   .48     10.000,   .51     10.500,   .57
    11.000,   .66     11.500,   .79     11.750,  1.00     12.000,  1.86
    12.500,  2.06     13.000,  2.16     13.500,  2.24     14.000,  2.30
    16.000,  2.46     20.000,  2.67     24.000,  2.80
1********************************     SCSHYDRO     ********************************
********************************  Version 3.21  ********************************
******************  COMPUTER-AIDED HYDROLOGY & HYDRAULICS  ******************

PROJECT: MILANVILLE KENNEL
  Input: MK1.IN
 Output: MK1.OUT
                                                  RETURN PERIOD (yrs):      1

   SUBAREA     1       SUBAREA     1       SUBAREA     1       SUBAREA     1

    AREA (square miles)          :        .0030
    TIME OF CONCENTRATION (hrs):        .52
    RUNOFF CURVE NUMBER          :      90.00
    BASEFLOW (cfs)               :        .00
    DOWNSTREAM CHANNELS          :

                          SUBAREA RUNOFF (cfs)

TIME:    +.00    +.10    +.20    +.30    +.40    +.50    +.60    +.70    +.80    +.90
(hrs)     hrs     hrs     hrs     hrs     hrs     hrs     hrs     hrs     hrs     hrs
-------|-------------------------------------------------------------------------------
  .00  |   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 1.00  |   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 2.00  |   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 3.00  |   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 4.00  |   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 5.00  |   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 6.00  |   .00     .00     .00     .00     .00     .00     .00     .00     .00     .00
 7.00  |   .01     .01     .01     .01     .01     .01     .01     .01     .01     .02
 8.00  |   .02     .02     .02     .02     .02     .03     .03     .03     .03     .03
 9.00  |   .03     .04     .04     .04     .04     .05     .05     .05     .06     .06
10.00  |   .06     .07     .07     .08     .08     .09     .09     .10     .11     .13
11.00  |   .14     .15     .16     .19     .21     .24     .28     .37     .58    1.02
12.00  |  1.77    2.51    2.80    2.55    2.04    1.54    1.20     .97     .78     .63
13.00  |   .53     .46     .41     .36     .33     .30     .28     .26     .24     .23
14.00  |   .22     .21     .21     .21     .20     .20     .19     .19     .18     .17
```

15.00	.16	.16	.15	.14	.14	.13	.13	.12	.12	.12
16.00	.11	.11	.11	.11	.11	.10	.10	.10	.10	.10
17.00	.10	.10	.10	.10	.10	.10	.09	.09	.09	.09
18.00	.09	.09	.09	.09	.09	.09	.09	.09	.08	.08
19.00	.08	.08	.08	.08	.08	.08	.08	.08	.08	.07
20.00	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
21.00	.07	.07	.06	.06	.06	.06	.06	.06	.06	.06
22.00	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
23.00	.06	.06	.06	.05	.05	.05	.05	.05	.05	.05
24.00	.05	.05	.05	.03	.02	.02	.01	.01	.00	.00
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK RUNOFF (cfs): 2.80
TIME TO PEAK (hrs): 12.20

1********** SCSHYDRO **********
********** Version 3.21 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNEL
User: LandTech Resources
Date: 04/09/2004 Friday
Time: 12:27:00
Input: MK1.IN
Output: MK1.OUT

RETURN PERIOD (yrs): 1

DOWNSTREAM HYDROGRAPH

DISCHARGE (cfs)

TIME: (hrs)	+.00 hrs	+.10 hrs	+.20 hrs	+.30 hrs	+.40 hrs	+.50 hrs	+.60 hrs	+.70 hrs	+.80 hrs	+.90 hrs
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
5.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
6.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
7.00	.01	.01	.01	.01	.01	.01	.01	.01	.01	.02
8.00	.02	.02	.02	.02	.02	.03	.03	.03	.03	.03
9.00	.03	.04	.04	.04	.04	.05	.05	.05	.06	.06
10.00	.06	.07	.07	.08	.08	.09	.09	.10	.11	.13
11.00	.14	.15	.16	.19	.21	.24	.28	.37	.58	1.02
12.00	1.77	2.51	2.80	2.55	2.04	1.54	1.20	.97	.78	.63
13.00	.53	.46	.41	.36	.33	.30	.28	.26	.24	.23
14.00	.22	.21	.21	.21	.20	.20	.19	.19	.18	.17
15.00	.16	.16	.15	.14	.14	.13	.13	.12	.12	.12
16.00	.11	.11	.11	.11	.11	.10	.10	.10	.10	.10
17.00	.10	.10	.10	.10	.10	.10	.09	.09	.09	.09
18.00	.09	.09	.09	.09	.09	.09	.09	.09	.08	.08
19.00	.08	.08	.08	.08	.08	.08	.08	.08	.08	.07
20.00	.07	.07	.07	.07	.07	.07	.07	.07	.07	.07
21.00	.07	.07	.06	.06	.06	.06	.06	.06	.06	.06
22.00	.06	.06	.06	.06	.06	.06	.06	.06	.06	.06
23.00	.06	.06	.06	.05	.05	.05	.05	.05	.05	.05
24.00	.05	.05	.05	.03	.02	.02	.01	.01	.00	.00
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK DISCHARGE (cfs): 2.80
TIME TO PEAK (hrs): 12.20
Hydrograph Saved In: MK1.DAT

1********** SCSHYDRO **********
********** Version 3.21 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNEL
User: LandTech Resources
Date: 04/09/2004 Friday
Time: 12:27:00
Input: MK1.IN
Output: MK1.OUT

RETURN PERIOD (yrs): 1

HYDROLOGIC SUMMARY
Volumes, Losses, and Discharges

SCS TYPE II Hyetograph.
SCS DIMENSIONLESS UNIT HYDROGRAPH was used.
APPLIED RAINFALL DEPTH (inches): 2.80

	VOLUME OF RAINFALL APPLIED (ac-ft)	VOLUME OF RUNOFF (ac-ft)	RAINFALL LOSSES (percent)	PEAK DISCHARGE (cfs)	PEAK DISCHARGE (cfs/ac)
SUBAREA 1	.44800	.28892	35.51	2.803	1.460
TOTAL WATERSHED	.44800	.28892	35.51	2.803	1.460

TOTAL WATERSHED AREA (square miles): .0030
TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED (ac-ft): .2889
COMPOSITE WATERSHED CURVE NUMBER: 90.00
MINIMUM SUBAREA TIME OF CONCENTRATION: .520 hours.

NOTE: "VOLUME OF RUNOFF" includes surface runoff only; baseflows are not included in this summation. The "TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED" includes all baseflows.

1

100-Year Hydrograph

```
1*******************************     SCSHYDRO     *******************************
 *******************************   Version 3.21   *******************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNEL
    User: LandTech Resources
    Date: 04/09/2004    Friday
    Time: 12:27:54
   Input: MK100.IN
  Output: MK100.OUT



==============================    PROGRAM EXECUTION    ==============================


                        NUMBER OF STORMS TO BE MODELED    :     1
                        NUMBER OF CHANNELS                :     0
                        NUMBER OF SUBAREAS                :     1
                        UPSTREAM HYDROGRAPHS ENTER AT     :     0 LOCATIONS
                        NUMBER OF TIME STEPS              :   300
                        COMPUTATIONAL TIME INCREMENT      :  .100 Hours

 NOTE:   The DURATION of the final computed hydrograph(s) for this watershed
         system will be 30.000 hours.



==========================    UNIT HYDROGRAPH METHODOLOGY    ==========================


 The SCS DIMENSIONLESS UNIT HYDROGRAPH is used in all runoff computations.
 The peak rate factor (PRF) for all unit hydrographs is 484 (U.S. Customary
 units) or 2.08356 (Metric units).
1*******************************     SCSHYDRO     *******************************
 *******************************   Version 3.21   *******************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNEL
    User: LandTech Resources
    Date: 04/09/2004    Friday
    Time: 12:27:54
   Input: MK100.IN
  Output: MK100.OUT


================================    SUBAREA DATA    ================================


                          TIME OF
 SUBAREA      AREA      CONCENTRATION    CURVE     BASEFLOW
  ID NO       (mi2)        (hrs)         NUMBER     (cfs)     DOWNSTREAM CHANNELS
 --------   ---------   --------------   --------   --------   --------------------

       1       .0030           .520      90.00         .0


     Composite Watershed Curve Number = 90.00
 Minimum Subarea Time of Concentration =  .520 hours.
1*******************************     SCSHYDRO     *******************************
```

```
********************************  Version 3.21  ********************************
******************  COMPUTER-AIDED HYDROLOGY & HYDRAULICS  ******************

PROJECT: MILANVILLE KENNEL
   User: LandTech Resources
   Date: 04/09/2004    Friday
   Time: 12:27:54
  Input: MK100.IN
 Output: MK100.OUT

                                                  RETURN PERIOD (yrs):    100

==========================  RAINFALL HYETOGRAPH INFORMATION  ==========================


        RAINFALL HYETOGRAPH: SCS TYPE II
        RAINFALL DURATION:    24.00 Hours
        RAINFALL DEPTH:        8.00 Inches


RAINFALL HYETOGRAPH,
SCS TYPE II
Time (Hours), Total Depth (Inches):

      .000,   .00      2.000,   .18      4.000,   .38      6.000,   .64
     7.000,   .78      8.000,   .96      8.500,  1.06      9.000,  1.18
     9.500,  1.30      9.750,  1.38     10.000,  1.45     10.500,  1.63
    11.000,  1.88     11.500,  2.26     11.750,  2.86     12.000,  5.30
    12.500,  5.88     13.000,  6.18     13.500,  6.39     14.000,  6.56
    16.000,  7.04     20.000,  7.62     24.000,  8.00
1********************************     SCSHYDRO     ********************************
 ********************************  Version 3.21  ********************************
 ******************  COMPUTER-AIDED HYDROLOGY & HYDRAULICS  ******************

PROJECT: MILANVILLE KENNEL
  Input: MK100.IN
 Output: MK100.OUT

                                                  RETURN PERIOD (yrs):    100

   SUBAREA     1       SUBAREA     1       SUBAREA     1       SUBAREA     1


    AREA (square miles)          :        .0030
    TIME OF CONCENTRATION (hrs):        .52
    RUNOFF CURVE NUMBER          :      90.00
    BASEFLOW (cfs)               :        .00
    DOWNSTREAM CHANNELS          :

                              SUBAREA RUNOFF (cfs)

TIME:   +.00   +.10   +.20   +.30   +.40   +.50   +.60   +.70   +.80   +.90
(hrs)    hrs    hrs    hrs    hrs    hrs    hrs    hrs    hrs    hrs    hrs
-------|------ ------ ------ ------ ------ ------ ------ ------ ------ ------
  .00  |   .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
 1.00  |   .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
 2.00  |   .00    .00    .00    .00    .00    .00    .00    .00    .00    .00
 3.00  |   .01    .01    .01    .02    .02    .02    .03    .03    .03    .03
 4.00  |   .04    .04    .04    .05    .05    .06    .06    .07    .07    .08
 5.00  |   .08    .08    .09    .09    .09    .09    .10    .10    .10    .10
 6.00  |   .11    .11    .11    .12    .13    .13    .13    .14    .14    .14
 7.00  |   .15    .15    .16    .17    .18    .18    .19    .20    .20    .20
 8.00  |   .21    .21    .22    .23    .24    .25    .26    .27    .27    .28
 9.00  |   .29    .30    .31    .32    .33    .34    .35    .36    .38    .39
10.00  |   .40    .42    .44    .47    .50    .52    .55    .58    .63    .68
11.00  |   .72    .77    .84    .94   1.05   1.13   1.29   1.66   2.49   4.13
12.00  |  6.77   9.24  10.09   9.02   7.14   5.33   4.12   3.28   2.61   2.11
13.00  |  1.75   1.51   1.33   1.18   1.06    .96    .89    .84    .78    .74
14.00  |   .70    .68    .66    .66    .65    .63    .61    .59    .56    .54
```

15.00	.52	.50	.48	.46	.44	.42	.41	.39	.38	.37
16.00	.36	.35	.34	.34	.33	.33	.33	.32	.32	.32
17.00	.31	.31	.31	.31	.30	.30	.30	.29	.29	.29
18.00	.29	.28	.28	.28	.27	.27	.27	.27	.26	.26
19.00	.26	.26	.25	.25	.25	.24	.24	.24	.24	.23
20.00	.23	.23	.23	.22	.22	.22	.21	.21	.21	.21
21.00	.20	.20	.20	.20	.20	.19	.19	.19	.19	.19
22.00	.19	.18	.18	.18	.18	.18	.18	.18	.17	.17
23.00	.17	.17	.17	.17	.17	.17	.17	.17	.17	.17
24.00	.17	.16	.14	.11	.07	.05	.03	.02	.01	.01
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK RUNOFF (cfs): 10.09
TIME TO PEAK (hrs): 12.20

1********** SCSHYDRO **********
********** Version 3.21 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNEL
User: LandTech Resources
Date: 04/09/2004 Friday
Time: 12:27:54
Input: MK100.IN
Output: MK100.OUT

RETURN PERIOD (yrs): 100

DOWNSTREAM HYDROGRAPH

DISCHARGE (cfs)

TIME: (hrs)	+.00 hrs	+.10 hrs	+.20 hrs	+.30 hrs	+.40 hrs	+.50 hrs	+.60 hrs	+.70 hrs	+.80 hrs	+.90 hrs
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
1.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
2.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
3.00	.01	.01	.01	.02	.02	.02	.03	.03	.03	.03
4.00	.04	.04	.04	.05	.05	.06	.06	.07	.07	.08
5.00	.08	.08	.09	.09	.09	.09	.10	.10	.10	.10
6.00	.11	.11	.11	.12	.13	.13	.13	.14	.14	.14
7.00	.15	.15	.16	.17	.18	.18	.19	.20	.20	.20
8.00	.21	.21	.22	.23	.24	.25	.26	.27	.27	.28
9.00	.29	.30	.31	.32	.33	.34	.35	.36	.38	.39
10.00	.40	.42	.44	.47	.50	.52	.55	.58	.63	.68
11.00	.72	.77	.84	.94	1.05	1.13	1.29	1.66	2.49	4.13
12.00	6.77	9.24	10.09	9.02	7.14	5.33	4.12	3.28	2.61	2.11
13.00	1.75	1.51	1.33	1.18	1.06	.96	.89	.84	.78	.74
14.00	.70	.68	.66	.66	.65	.63	.61	.59	.56	.54
15.00	.52	.50	.48	.46	.44	.42	.41	.39	.38	.37
16.00	.36	.35	.34	.34	.33	.33	.33	.32	.32	.32
17.00	.31	.31	.31	.31	.30	.30	.30	.29	.29	.29
18.00	.29	.28	.28	.28	.27	.27	.27	.27	.26	.26
19.00	.26	.26	.25	.25	.25	.24	.24	.24	.24	.23
20.00	.23	.23	.23	.22	.22	.22	.21	.21	.21	.21
21.00	.20	.20	.20	.20	.20	.19	.19	.19	.19	.19
22.00	.19	.18	.18	.18	.18	.18	.18	.18	.17	.17
23.00	.17	.17	.17	.17	.17	.17	.17	.17	.17	.17
24.00	.17	.16	.14	.11	.07	.05	.03	.02	.01	.01
25.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
26.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
27.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
28.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
29.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

PEAK DISCHARGE (cfs): 10.09
TIME TO PEAK (hrs): 12.20
Hydrograph Saved In: MK100.DAT

1********** SCSHYDRO **********
********** Version 3.21 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNEL
User: LandTech Resources
Date: 04/09/2004 Friday
Time: 12:27:54
Input: MK100.IN
Output: MK100.OUT

RETURN PERIOD (yrs): 100

HYDROLOGIC SUMMARY
Volumes, Losses, and Discharges

SCS TYPE II Hyetograph.
SCS DIMENSIONLESS UNIT HYDROGRAPH was used.
APPLIED RAINFALL DEPTH (inches): 8.00

	VOLUME OF RAINFALL APPLIED (ac-ft)	VOLUME OF RUNOFF (ac-ft)	RAINFALL LOSSES (percent)	PEAK DISCHARGE (cfs)	PEAK DISCHARGE (cfs/ac)
SUBAREA 1	1.2800	1.0916	14.72	10.088	5.254
TOTAL WATERSHED	1.2800	1.0916	14.72	10.088	5.254

TOTAL WATERSHED AREA (square miles): .0030
TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED (ac-ft): 1.0916
COMPOSITE WATERSHED CURVE NUMBER: 90.00
MINIMUM SUBAREA TIME OF CONCENTRATION: .520 hours.

NOTE: "VOLUME OF RUNOFF" includes surface runoff only; baseflows are not included in this summation. The "TOTAL VOLUME OF DISCHARGE LEAVING WATERSHED" includes all baseflows.

1

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PROJECT NAME Milanville Kennel
PROJECT NO. 04-078
SHEET NO. _____ OF _____
CALCULATED BY KMJ DATE 4/9/04
SCALE _____

Compute Stream Channel Protection Volume (Cpv):

Step 1. Develope Site Hydrologic & TR-55 Input Parameters

Condition	CN	Tc	Qo, 1-Year St.	Q, 1-Year
Pre-Developed	89	0.52	1.7	2.70
Developed	90	0.52	1.8	2.86

Step 2. Utilize MDE Method to Compute Storage Volume

Initial Abstraction (Ia) for CN of 90 is 0.222

Ia/P = 0.222/2.8 = .08

Tc = 0.52 hrs

From TR-55, Exhibit 4-II:
qu = 540 csm/in

Qo/Qi = .032

From TR-55, Figure 6.1
For Type II Distribution

$Vs/Vr = 0.683 - 1.43(Qo/Qi) + 1.64(Qo/Qi)^2 - 0.804(Qo/Qi)^3$

$Vs/Vr = 0.683 - 1.43(.032) + 1.64(.032)^2 - 0.804(.032)^3$

$Vs/Vr = 0.683 - 0.046 + .002 - 0$

$Vs/Vr = 0.639$

$Vs = 0.639(1.8")(1/12)(1.9) = 0.182$ ac-ft = 7,935 cf

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SHEET NO. _____ OF _____
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SCALE _____

Step 3. Define average ED Release Rate

$$Q_o = \frac{7{,}935\,cf - 581\,cf}{24\,hr} \left| \frac{1\,hr}{60\,m} \right| \frac{1\,m}{60s} = 0.085\,cfs$$

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SHEET NO. _____ OF _____
CALCULATED BY KMS DATE 4/13/04
SCALE _____

WET POND STAGE-STORAGE

Elev (ft)	ΔElev (ft)	SA (sf)	STORAGE (cf)	ACCUM STORAGE (cf)
19		950		0
	1.0		1158	
20		1366		1158
	1.0		1732	
21		2098		2890
	1.0		2478	
22		2858		5368
	1.0		3328	
23		3798		8696
	1.0		4302	
24		4806		12,998
	1.0		5405	
25		6004		18,403
	1.0		8276	
26		10,548		26,679

Standing Water Elev 22.00 Volume = 5368 cf

The wet storage treatment volume required of 581 cf is stored within the standing water volume of 5368 cf

The dry storage treatment volume required of 581 cf is stored within the 24 hr channel protection volume of 7,933 cf.

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SCALE _____

Channel Protection Volume at 7,933 cf rises to Elev 24.06 ✓

Top BMP Elev 26.00

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CALCULATED BY KMS DATE 4/13/04
SCALE _____

DESIGN ORIFICE TO PASS
1-YEAR POST-DEVELOPMENT
STORM OVER 24-HOURS

$Q = 0.6A\sqrt{2gh}$ - orifice equation

orifice invert @ Elev 22.00

$Q = 0.085$ cfs ✓

$h = 24.06 - 22.00 = 2.06$ ✓

$.085 = 0.6A\sqrt{2(32.2)(2.06)}$

$A = \pi r^2 = .0123\ ft^2$

$r = .0626'$

USE 2" DIAMETER ORIFICE ✓
AT ELEV 22.00, $A = .0218\ ft^2$

Elev	H	Q
22.00	0	0
23.00	1	0.11
24.00	2	0.15
24.06	2.06	0.15
25.00	3	0.18
26.00	4	0.21

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PROJECT NO. 04-078
SHEET NO. _____ OF _____
CALCULATED BY KMJ DATE 4/13/04
SCALE _____

DESIGN OUTLET WEIR

$Q = C L H^{3/2}$

VDOT DI-1

$L = 2.5' \times 4 = 10'$

$C = 3.1$

ELEV	H	Q
24.06	0	0
25.00	0.94	28.25
26.00	1.94	83.77

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PROJECT NO. 04-078
SHEET NO. _____ OF _____
CALCULATED BY KHS DATE 4/13/04
SCALE _____

DESIGN OUTLET BARREL

26' OF 15" RCP @ 1.0%

INV_I = 22.51
INV_O = 22.25

Q	d_n	d_c	v_n	R	H	h_o	h_{so}	H_w	HW_{elev}
0	—	—	—	—	—	—	—	—	22.51
2	0.44	0.56	5.24	0.24	0.90	0.90	.26	1.54	24.05
4	0.64	0.81	6.29	0.32	1.18	1.03	.26	1.95	24.46
6	0.83	0.99	6.89	0.36	1.37	1.12	.26	2.23	24.74
8	1.09	1.12	7.05	0.38	1.41	1.19	.26	2.34	24.85
10	1.25	1.25	8.13	0.31	1.98	1.25	.26	2.97	25.48
12	1.25	1.25	9.76	0.31	2.86	1.25	.26	3.85	26.36

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = 5 ft.

Slope of upstream face of embankment (Z) = 3 :1.

Slope of principal spillway barrel (S_b) = 1.0 %

Length of barrel in saturated zone (L_s) = 26 ft.

24. Number of collars required = 1 dimensions = 4' x 4'

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = _____

Design High Water = _____

Emergency Spillway Crest = _____

Principal Spillway Crest = _____

Dewatering Orifice Invert = _____

Cleanout Elevation = _____

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = _____

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PROJECT NO. 04-078
SHEET NO. _____ OF _____
CALCULATED BY KMS DATE 4/13/04
SCALE _____

DESIGN EMERGENCY SPILLWAY

Grass Spillway

Elevation = 25.00

Bottom Width = 4'

Slope = 4%

Length = 65'

Side slope = 3:1

n = .035

Elev	H	Q
25.00	0	0
26.00	1.0	45.87

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PROJECT NAME Millenville Kennels
PROJECT NO. 04-078
SHEET NO. _____ OF _____
CALCULATED BY KMJ DATE 4/13/04
SCALE _____

STAGE - STORAGE - DISCHARGE

STAGE (FT)	STORAGE (AC-FT)	DISCHARGE (CFS)
22.00	0.0656	0
23.25	0.0930	0
24.00	0.1103	0.15
24.06	0.1120	0.15
25.00	0.1378	8.66
26.00	0.2421	57.26

1-Year Routing

```
1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNELS
    User: LandTech Resources
    Date: 04/14/2004 Wednesday
    Time: 08:20:11
  Output: MKP1.OUT


 SOLUTION FOR  1  STORMS.


 TIME INCREMENT:   .100  Hours


 STORM
 NUMBER   HYDROGRAPH IN FILE:
 ------   ---------------------------------------------------------

   1      MK1.DAT



                                ALLOWABLE
                     PEAK         PEAK                      RUNOFF      TAILWATER
          STORM     INFLOW     DISCHARGE    DURATION       VOLUME        STAGE
          NUMBER     (cfs)       (cfs)       (min)         (ft3)         (ft)
          ------   ---------   ---------   ---------   -----------   ---------

            1         2.803       N/A       1794.00     .1259E+05      23.250

1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNELS
    User: LandTech Resources
    Date: 04/14/2004 Wednesday
    Time: 08:20:11
  Output: MKP1.OUT


 Stage-Area-Discharge
 Filename: MKPOND.DAT

          TAILWATER STAGE:   23.250 feet.
            INITIAL STAGE:   23.250 feet.

 ==================   STAGE-STORAGE-DISCHARGE RELATIONSHIP   ==================

 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<   STORM  1      >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                      STORAGE
          STAGE       VOLUME        DISCHARGE
          (ft)        (ac-ft)         (cfs)
          ---------   -----------   -----------

            22.000        .0000          .0000
            23.250        .9863E-01      .0000
            24.000        .1748          .1500
            24.060        .1814          .1500
            25.000        .2986         8.660
            26.000        .4862         57.26
1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************
```

PROJECT: MILANVILLE KENNELS
User: LandTech Resources
Date: 04/14/2004 Wednesday
Time: 08:20:11
Output: MKP1.OUT

TAILWATER STAGE: 23.250 feet.
INITIAL STAGE: 23.250 feet.

<<<<<<<<<<<<<<<<<<<< ROUTING RESULTS FOR STORM 1 >>>>>>>>>>>>>>>>>>>>

MAXIMUM ELEVATION: 24.24 feet.
MAXIMUM INFLOW: 2.803 cfs.
MAXIMUM OUTFLOW: 1.743 cfs.
MAXIMUM STORAGE: .2034 acre-feet.

CONTINUITY ERROR: .290E-05 percent.

TIME (min)	INFLOW RATE (cfs)	OUTFLOW RATE (cfs)	POND SURFACE ELEVATION (ft)
0	.000	.000	23.250
6	.000	.000	23.250
12	.000	.000	23.250
18	.000	.000	23.250
24	.000	.000	23.250
30	.000	.000	23.250
36	.000	.000	23.250
42	.000	.000	23.250
48	.000	.000	23.250
54	.000	.000	23.250
60	.000	.000	23.250
66	.000	.000	23.250
72	.000	.000	23.250
78	.000	.000	23.250
84	.000	.000	23.250
90	.000	.000	23.250
96	.000	.000	23.250
102	.000	.000	23.250
108	.000	.000	23.250
114	.000	.000	23.250
120	.000	.000	23.250
126	.000	.000	23.250
132	.000	.000	23.250
138	.000	.000	23.250
144	.000	.000	23.250
150	.000	.000	23.250
156	.000	.000	23.250
162	.000	.000	23.250
168	.000	.000	23.250
174	.000	.000	23.250
180	.000	.000	23.250
186	.000	.000	23.250
192	.000	.000	23.250
198	.000	.000	23.250
204	.000	.000	23.250
210	.000	.000	23.250
216	.000	.000	23.250
222	.000	.000	23.250
228	.000	.000	23.250
234	.000	.000	23.250
240	.000	.000	23.250
246	.000	.000	23.250
252	.000	.000	23.250
258	.000	.000	23.250
264	.000	.000	23.250

270	.000	.000	23.250
276	.000	.000	23.250
282	.000	.000	23.250
288	.000	.000	23.250
294	.000	.000	23.250
300	.000	.000	23.250
306	.000	.000	23.250
312	.000	.000	23.250
318	.000	.000	23.250
324	.000	.000	23.250
330	.000	.000	23.250
336	.000	.000	23.250
342	.000	.000	23.250
348	.000	.000	23.250
354	.000	.000	23.250
360	.000	.000	23.250
366	.000	.000	23.250
372	.000	.000	23.250
378	.000	.000	23.250
384	.001	.000	23.250
390	.002	.000	23.250
396	.002	.000	23.250
402	.003	.000	23.251
408	.004	.000	23.251
414	.004	.000	23.251
420	.005	.000	23.251
426	.006	.000	23.252
432	.007	.000	23.252
438	.008	.001	23.253
444	.010	.001	23.254
450	.011	.001	23.254
456	.012	.001	23.255
462	.014	.001	23.256
468	.015	.001	23.257
474	.016	.002	23.258
480	.017	.002	23.260
486	.018	.002	23.261
492	.020	.002	23.262
498	.021	.003	23.264
504	.023	.003	23.265
510	.025	.003	23.267
516	.027	.004	23.269
522	.029	.004	23.271
528	.031	.005	23.273
534	.033	.005	23.275
540	.034	.005	23.277
546	.036	.006	23.280
552	.039	.006	23.282
558	.041	.007	23.285
564	.044	.008	23.288
570	.047	.008	23.291
576	.049	.009	23.294
582	.052	.010	23.298
588	.056	.010	23.301
594	.059	.011	23.305
600	.062	.012	23.309
606	.065	.013	23.313
612	.070	.014	23.318
618	.076	.014	23.322
624	.083	.016	23.328
630	.089	.017	23.333
636	.095	.018	23.339
642	.103	.019	23.346
648	.114	.021	23.353
654	.125	.022	23.361
660	.135	.024	23.370
666	.147	.026	23.379
672	.165	.028	23.390
678	.189	.030	23.402
684	.214	.033	23.416
690	.236	.036	23.431

696	.277	.040	23.449
702	.369	.044	23.472
708	.578	.051	23.506
714	1.020	.063	23.567
720	1.768	.085	23.674
726	2.506	.118	23.840
732	2.803	.150	24.041
738	2.546	1.198	24.176
744	2.039	1.703	24.232
750	1.538	1.743	24.236
756	1.203	1.571	24.217
762	.968	1.347	24.192
768	.778	1.128	24.168
774	.633	.933	24.147
780	.529	.771	24.129
786	.460	.643	24.114
792	.408	.547	24.104
798	.364	.472	24.096
804	.328	.414	24.089
810	.299	.368	24.084
816	.278	.331	24.080
822	.261	.303	24.077
828	.245	.280	24.074
834	.230	.260	24.072
840	.219	.244	24.070
846	.212	.231	24.069
852	.208	.221	24.068
858	.206	.215	24.067
864	.203	.210	24.067
870	.198	.206	24.066
876	.192	.201	24.066
882	.185	.195	24.065
888	.178	.189	24.064
894	.171	.182	24.064
900	.164	.175	24.063
906	.157	.168	24.062
912	.151	.162	24.061
918	.145	.155	24.061
924	.139	.150	24.060
930	.133	.150	24.059
936	.129	.150	24.057
942	.124	.150	24.056
948	.120	.150	24.054
954	.117	.150	24.051
960	.114	.150	24.049
966	.111	.150	24.046
972	.109	.150	24.043
978	.107	.150	24.040
984	.106	.150	24.037
990	.105	.150	24.033
996	.104	.150	24.030
1002	.103	.150	24.026
1008	.102	.150	24.023
1014	.101	.150	24.019
1020	.100	.150	24.016
1026	.099	.150	24.012
1032	.098	.150	24.008
1038	.097	.150	24.004
1044	.096	.150	24.000
1050	.096	.149	23.996
1056	.095	.148	23.991
1062	.094	.147	23.987
1068	.093	.147	23.983
1074	.092	.146	23.978
1080	.091	.145	23.974
1086	.090	.144	23.970
1092	.090	.143	23.965
1098	.089	.142	23.961
1104	.088	.141	23.957
1110	.087	.140	23.952
1116	.086	.140	23.948

1122	.085	.139	23.943
1128	.084	.138	23.939
1134	.083	.137	23.935
1140	.083	.136	23.930
1146	.082	.135	23.926
1152	.081	.134	23.922
1158	.080	.133	23.917
1164	.079	.133	23.913
1170	.078	.132	23.909
1176	.078	.131	23.904
1182	.077	.130	23.900
1188	.076	.129	23.896
1194	.075	.128	23.891
1200	.074	.127	23.887
1206	.073	.127	23.883
1212	.072	.126	23.878
1218	.072	.125	23.874
1224	.071	.124	23.870
1230	.070	.123	23.865
1236	.069	.122	23.861
1242	.068	.121	23.857
1248	.067	.120	23.852
1254	.067	.120	23.848
1260	.066	.119	23.844
1266	.065	.118	23.839
1272	.064	.117	23.835
1278	.064	.116	23.831
1284	.063	.115	23.827
1290	.063	.114	23.822
1296	.062	.114	23.818
1302	.061	.113	23.814
1308	.061	.112	23.810
1314	.060	.111	23.806
1320	.060	.110	23.801
1326	.059	.109	23.797
1332	.059	.109	23.793
1338	.058	.108	23.789
1344	.058	.107	23.785
1350	.057	.106	23.781
1356	.057	.105	23.777
1362	.057	.105	23.773
1368	.056	.104	23.769
1374	.056	.103	23.766
1380	.056	.102	23.762
1386	.055	.102	23.758
1392	.055	.101	23.754
1398	.055	.100	23.750
1404	.054	.099	23.747
1410	.054	.099	23.743
1416	.054	.098	23.740
1422	.054	.097	23.736
1428	.054	.097	23.733
1434	.054	.096	23.729
1440	.054	.095	23.726
1446	.052	.094	23.722
1452	.045	.094	23.719
1458	.035	.093	23.714
1464	.024	.092	23.709
1470	.015	.091	23.703
1476	.010	.089	23.697
1482	.006	.088	23.690
1488	.004	.087	23.684
1494	.002	.085	23.677
1500	.002	.084	23.670
1506	.001	.083	23.664
1512	.001	.081	23.657
1518	.000	.080	23.650
1524	.000	.079	23.644
1530	.000	.078	23.638
1536	.000	.076	23.631
1542	.000	.075	23.625

1548	.000	.074	23.619
1554	.000	.073	23.613
1560	.000	.071	23.607
1566	.000	.070	23.602
1572	.000	.069	23.596
1578	.000	.068	23.590
1584	.000	.067	23.585
1590	.000	.066	23.579
1596	.000	.065	23.574
1602	.000	.064	23.569
1608	.000	.063	23.564
1614	.000	.062	23.559
1620	.000	.061	23.554
1626	.000	.060	23.549
1632	.000	.059	23.544
1638	.000	.058	23.539
1644	.000	.057	23.534
1650	.000	.056	23.530
1656	.000	.055	23.525
1662	.000	.054	23.521
1668	.000	.053	23.517
1674	.000	.052	23.512
1680	.000	.052	23.508
1686	.000	.051	23.504
1692	.000	.050	23.500
1698	.000	.049	23.496
1704	.000	.048	23.492
1710	.000	.048	23.488
1716	.000	.047	23.484
1722	.000	.046	23.480
1728	.000	.045	23.476
1734	.000	.045	23.473
1740	.000	.044	23.469
1746	.000	.043	23.466
1752	.000	.042	23.462
1758	.000	.042	23.459
1764	.000	.041	23.455
1770	.000	.040	23.452
1776	.000	.040	23.449
1782	.000	.039	23.446
1788	.000	.038	23.442
1794	.000	.038	23.439
1800	.000	.037	23.436
1806	.000	.037	23.433
1812	.000	.036	23.430
1818	.000	.035	23.427
1824	.000	.035	23.425
1830	.000	.034	23.422
1836	.000	.034	23.419
1842	.000	.033	23.416
1848	.000	.033	23.414
1854	.000	.032	23.411
1860	.000	.032	23.408
1866	.000	.031	23.406
1872	.000	.031	23.403
1878	.000	.030	23.401
1884	.000	.030	23.398
1890	.000	.029	23.396
1896	.000	.029	23.394
1902	.000	.028	23.391
1908	.000	.028	23.389
1914	.000	.027	23.387
1920	.000	.027	23.385
1926	.000	.026	23.382
1932	.000	.026	23.380
1938	.000	.026	23.378
1944	.000	.025	23.376
1950	.000	.025	23.374
1956	.000	.024	23.372
1962	.000	.024	23.370
1968	.000	.024	23.368

1974	.000	.023	23.366
1980	.000	.023	23.364
1986	.000	.022	23.362
1992	.000	.022	23.361
1998	.000	.022	23.359
2004	.000	.021	23.357
2010	.000	.021	23.355
2016	.000	.021	23.354
2022	.000	.020	23.352
2028	.000	.020	23.350
2034	.000	.020	23.349
2040	.000	.019	23.347
2046	.000	.019	23.346
2052	.000	.019	23.344
2058	.000	.019	23.343
2064	.000	.018	23.341
2070	.000	.018	23.340
2076	.000	.018	23.338
2082	.000	.017	23.337
2088	.000	.017	23.335
2094	.000	.017	23.334
2100	.000	.017	23.333
2106	.000	.016	23.331
2112	.000	.016	23.330
2118	.000	.016	23.329
2124	.000	.015	23.327
2130	.000	.015	23.326
2136	.000	.015	23.325
2142	.000	.015	23.324
2148	.000	.014	23.322
2154	.000	.014	23.321
2160	.000	.014	23.320
2166	.000	.014	23.319
2172	.000	.014	23.318
2178	.000	.013	23.317
2184	.000	.013	23.316
2190	.000	.013	23.315
2196	.000	.013	23.314
2202	.000	.013	23.313
2208	.000	.012	23.312
2214	.000	.012	23.311
2220	.000	.012	23.310
2226	.000	.012	23.309
2232	.000	.012	23.308
2238	.000	.011	23.307
2244	.000	.011	23.306
2250	.000	.011	23.305
2256	.000	.011	23.304
2262	.000	.011	23.303
2268	.000	.010	23.302
2274	.000	.010	23.301
2280	.000	.010	23.301
2286	.000	.010	23.300
2292	.000	.010	23.299
2298	.000	.010	23.298
2304	.000	.009	23.297
2310	.000	.009	23.297
2316	.000	.009	23.296
2322	.000	.009	23.295
2328	.000	.009	23.294
2334	.000	.009	23.294
2340	.000	.009	23.293
2346	.000	.008	23.292
2352	.000	.008	23.292
2358	.000	.008	23.291
2364	.000	.008	23.290
2370	.000	.008	23.290
2376	.000	.008	23.289
2382	.000	.008	23.288
2388	.000	.008	23.288
2394	.000	.007	23.287

2400	.000	.007	23.287
2406	.000	.007	23.286
2412	.000	.007	23.285
2418	.000	.007	23.285
2424	.000	.007	23.284
2430	.000	.007	23.284
2436	.000	.007	23.283
2442	.000	.007	23.283
2448	.000	.006	23.282
2454	.000	.006	23.282
2460	.000	.006	23.281
2466	.000	.006	23.281
2472	.000	.006	23.280
2478	.000	.006	23.280
2484	.000	.006	23.279
2490	.000	.006	23.279
2496	.000	.006	23.278
2502	.000	.006	23.278
2508	.000	.005	23.277
2514	.000	.005	23.277
2520	.000	.005	23.276
2526	.000	.005	23.276
2532	.000	.005	23.276
2538	.000	.005	23.275
2544	.000	.005	23.275
2550	.000	.005	23.274
2556	.000	.005	23.274
2562	.000	.005	23.274
2568	.000	.005	23.273
2574	.000	.005	23.273
2580	.000	.004	23.272
2586	.000	.004	23.272
2592	.000	.004	23.272
2598	.000	.004	23.271
2604	.000	.004	23.271
2610	.000	.004	23.271
2616	.000	.004	23.270
2622	.000	.004	23.270
2628	.000	.004	23.270
2634	.000	.004	23.269
2640	.000	.004	23.269
2646	.000	.004	23.269
2652	.000	.004	23.268
2658	.000	.004	23.268
2664	.000	.004	23.268
2670	.000	.004	23.268
2676	.000	.003	23.267
2682	.000	.003	23.267
2688	.000	.003	23.267
2694	.000	.003	23.266
2700	.000	.003	23.266
2706	.000	.003	23.266
2712	.000	.003	23.266
2718	.000	.003	23.265
2724	.000	.003	23.265
2730	.000	.003	23.265
2736	.000	.003	23.265
2742	.000	.003	23.264
2748	.000	.003	23.264
2754	.000	.003	23.264
2760	.000	.003	23.264
2766	.000	.003	23.264
2772	.000	.003	23.263
2778	.000	.003	23.263
2784	.000	.003	23.263
2790	.000	.003	23.263
2796	.000	.002	23.262
2802	.000	.002	23.262
2808	.000	.002	23.262
2814	.000	.002	23.262
2820	.000	.002	23.262

2826	.000	.002	23.262
2832	.000	.002	23.261
2838	.000	.002	23.261
2844	.000	.002	23.261
2850	.000	.002	23.261
2856	.000	.002	23.261
2862	.000	.002	23.260
2868	.000	.002	23.260
2874	.000	.002	23.260
2880	.000	.002	23.260
2886	.000	.002	23.260
2892	.000	.002	23.260
2898	.000	.002	23.259
2904	.000	.002	23.259
2910	.000	.002	23.259
2916	.000	.002	23.259
2922	.000	.002	23.259
2928	.000	.002	23.259
2934	.000	.002	23.259
2940	.000	.002	23.258
2946	.000	.002	23.258
2952	.000	.002	23.258
2958	.000	.002	23.258
2964	.000	.002	23.258
2970	.000	.002	23.258
2976	.000	.002	23.258
2982	.000	.002	23.258
2988	.000	.001	23.257
2994	.000	.001	23.257
3000	.000	.001	23.257
3006	.000	.001	23.257
3012	.000	.001	23.257
3018	.000	.001	23.257
3024	.000	.001	23.257
3030	.000	.001	23.257
3036	.000	.001	23.257
3042	.000	.001	23.256
3048	.000	.001	23.256
3054	.000	.001	23.256
3060	.000	.001	23.256
3066	.000	.001	23.256
3072	.000	.001	23.256
3078	.000	.001	23.256
3084	.000	.001	23.256
3090	.000	.001	23.256
3096	.000	.001	23.256
3102	.000	.001	23.255
3108	.000	.001	23.255
3114	.000	.001	23.255
3120	.000	.001	23.255
3126	.000	.001	23.255
3132	.000	.001	23.255
3138	.000	.001	23.255
3144	.000	.001	23.255
3150	.000	.001	23.255
3156	.000	.001	23.255
3162	.000	.001	23.255
3168	.000	.001	23.255
3174	.000	.001	23.254
3180	.000	.001	23.254
3186	.000	.001	23.254
3192	.000	.001	23.254
3198	.000	.001	23.254
3204	.000	.001	23.254
3210	.000	.001	23.254
3216	.000	.001	23.254
3222	.000	.001	23.254
3228	.000	.001	23.254
3234	.000	.001	23.254
3240	.000	.001	23.254
3246	.000	.001	23.254

3252	.000	.001		23.254
3258	.000	.001		23.254
3264	.000	.001		23.254
3270	.000	.001		23.253
3276	.000	.001		23.253
3282	.000	.001		23.253
3288	.000	.001		23.253
3294	.000	.001		23.253
3300	.000	.001		23.253
3306	.000	.001		23.253
3312	.000	.001		23.253
3318	.000	.001		23.253
3324	.000	.001		23.253
3330	.000	.001		23.253
3336	.000	.001		23.253
3342	.000	.001		23.253
3348	.000	.001		23.253
3354	.000	.001		23.253
3360	.000	.001		23.253
3366	.000	.001		23.253
3372	.000	.001		23.253
3378	.000	.001		23.253
3384	.000	.001		23.253
3390	.000	.000		23.252

1********** PONDOPT **********
********** Version 1.83 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNELS
User: LandTech Resources
Date: 04/14/2004 Wednesday
Time: 08:20:11
Output: MKP1.OUT

ROUTING SUMMARY ----------
SIMULATION MODE ----------
FOR THE ABOVE CASE ----------

STORM NUMBER	PEAK STAGE (ft)	PEAK STORAGE (ac-ft)	PEAK INFLOW (cfs)	PEAK OUTFLOW (cfs)
1	24.236	.203	2.803	1.743

100-Year Routing

```
1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNELS
    User: LandTech Resources
    Date: 04/14/2004 Wednesday
    Time: 08:22:42
  Output: MKP100.OUT


 SOLUTION FOR  1  STORMS.


 TIME INCREMENT:   .100  Hours


 STORM
 NUMBER   HYDROGRAPH IN FILE:
 ------   ---------------------------------------------------------

   1      MK100.DAT



                                ALLOWABLE
                     PEAK         PEAK                      RUNOFF      TAILWATER
            STORM    INFLOW     DISCHARGE    DURATION      VOLUME        STAGE
            NUMBER   (cfs)       (cfs)       (min)        (ft3)         (ft)
            ------  ---------  ----------  ----------  ------------  ----------

              1       10.088       N/A       1794.00    .4755E+05      23.250

1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************

 PROJECT: MILANVILLE KENNELS
    User: LandTech Resources
    Date: 04/14/2004 Wednesday
    Time: 08:22:42
  Output: MKP100.OUT


 Stage-Area-Discharge
 Filename: MKPOND.DAT

          TAILWATER STAGE:   23.250 feet.
            INITIAL STAGE:   23.250 feet.

 ==========   STAGE-STORAGE-DISCHARGE RELATIONSHIP   ==========

 <<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<   STORM  1      >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

                          STORAGE
              STAGE       VOLUME          DISCHARGE
              (ft)        (ac-ft)           (cfs)
             ---------  ------------  ------------

               22.000       .0000          .0000
               23.250       .9863E-01      .0000
               24.000       .1748          .1500
               24.060       .1814          .1500
               25.000       .2986         8.660
               26.000       .4862         57.26
1*********************************     PONDOPT      *********************************
 *********************************   Version 1.83   *********************************
 ******************   COMPUTER-AIDED HYDROLOGY & HYDRAULICS   ******************
```

PROJECT: MILANVILLE KENNELS
User: LandTech Resources
Date: 04/14/2004 Wednesday
Time: 08:22:42
Output: MKP100.OUT

TAILWATER STAGE: 23.250 feet.
INITIAL STAGE: 23.250 feet.

<<<<<<<<<<<<<<<<<<<< ROUTING RESULTS FOR STORM 1 >>>>>>>>>>>>>>>>>>>>

MAXIMUM ELEVATION: 24.98 feet.
MAXIMUM INFLOW: 10.09 cfs.
MAXIMUM OUTFLOW: 8.478 cfs.
MAXIMUM STORAGE: .2961 acre-feet.

CONTINUITY ERROR: .344E-04 percent.

TIME (min)	INFLOW RATE (cfs)	OUTFLOW RATE (cfs)	POND SURFACE ELEVATION (ft)
0	.000	.000	23.250
6	.000	.000	23.250
12	.000	.000	23.250
18	.000	.000	23.250
24	.000	.000	23.250
30	.000	.000	23.250
36	.000	.000	23.250
42	.000	.000	23.250
48	.000	.000	23.250
54	.000	.000	23.250
60	.000	.000	23.250
66	.000	.000	23.250
72	.000	.000	23.250
78	.000	.000	23.250
84	.000	.000	23.250
90	.000	.000	23.250
96	.000	.000	23.250
102	.000	.000	23.250
108	.000	.000	23.250
114	.000	.000	23.250
120	.000	.000	23.250
126	.000	.000	23.250
132	.000	.000	23.250
138	.000	.000	23.250
144	.000	.000	23.250
150	.000	.000	23.250
156	.000	.000	23.250
162	.001	.000	23.250
168	.002	.000	23.250
174	.004	.000	23.250
180	.007	.000	23.251
186	.010	.000	23.252
192	.013	.000	23.252
198	.016	.001	23.253
204	.019	.001	23.255
210	.022	.001	23.256
216	.025	.002	23.258
222	.028	.002	23.260
228	.031	.002	23.262
234	.034	.003	23.265
240	.037	.003	23.267
246	.040	.004	23.270
252	.044	.005	23.273
258	.049	.005	23.277
264	.054	.006	23.281

270	.060	.007	23.285
276	.064	.008	23.289
282	.068	.009	23.294
288	.072	.010	23.299
294	.076	.011	23.304
300	.079	.012	23.309
306	.082	.013	23.315
312	.085	.014	23.321
318	.088	.015	23.326
324	.091	.016	23.332
330	.094	.018	23.339
336	.097	.019	23.345
342	.100	.020	23.351
348	.102	.022	23.358
354	.105	.023	23.364
360	.107	.024	23.371
366	.110	.026	23.378
372	.115	.027	23.385
378	.120	.028	23.392
384	.125	.030	23.400
390	.130	.032	23.408
396	.134	.033	23.416
402	.138	.035	23.424
408	.141	.037	23.433
414	.144	.038	23.441
420	.146	.040	23.450
426	.150	.042	23.458
432	.157	.044	23.468
438	.166	.045	23.477
444	.176	.047	23.487
450	.184	.050	23.498
456	.190	.052	23.509
462	.196	.054	23.520
468	.200	.056	23.532
474	.203	.059	23.544
480	.207	.061	23.555
486	.211	.063	23.567
492	.219	.066	23.580
498	.229	.068	23.592
504	.240	.071	23.606
510	.249	.074	23.620
516	.257	.077	23.634
522	.265	.080	23.649
528	.274	.083	23.664
534	.282	.086	23.680
540	.289	.089	23.696
546	.297	.093	23.713
552	.307	.096	23.730
558	.319	.099	23.747
564	.332	.103	23.766
570	.343	.107	23.784
576	.353	.111	23.804
582	.364	.115	23.824
588	.379	.119	23.845
594	.392	.123	23.866
600	.404	.128	23.888
606	.417	.132	23.911
612	.439	.137	23.935
618	.468	.142	23.961
624	.497	.148	23.988
630	.522	.150	24.016
636	.547	.150	24.045
642	.584	.246	24.071
648	.633	.413	24.089
654	.681	.526	24.101
660	.722	.607	24.110
666	.767	.670	24.117
672	.840	.732	24.124
678	.943	.806	24.132
684	1.046	.893	24.142
690	1.131	.983	24.152

696	1.293	1.089	24.164
702	1.664	1.269	24.184
708	2.485	1.641	24.225
714	4.131	2.410	24.310
720	6.772	3.814	24.465
726	9.237	5.748	24.678
732	10.088	7.555	24.878
738	9.021	8.478	24.980
744	7.137	8.294	24.960
750	5.327	7.342	24.854
756	4.120	6.133	24.721
762	3.281	5.010	24.597
768	2.613	4.058	24.492
774	2.109	3.274	24.405
780	1.750	2.653	24.337
786	1.510	2.181	24.284
792	1.331	1.830	24.246
798	1.182	1.565	24.216
804	1.062	1.361	24.194
810	.965	1.200	24.176
816	.893	1.075	24.162
822	.837	.978	24.151
828	.784	.901	24.143
834	.737	.836	24.136
840	.700	.782	24.130
846	.677	.739	24.125
852	.665	.707	24.122
858	.656	.686	24.119
864	.645	.670	24.117
870	.630	.655	24.116
876	.610	.639	24.114
882	.588	.620	24.112
888	.565	.600	24.110
894	.542	.579	24.107
900	.519	.556	24.105
906	.497	.534	24.102
912	.477	.512	24.100
918	.457	.491	24.098
924	.439	.471	24.095
930	.422	.452	24.093
936	.406	.435	24.091
942	.392	.418	24.090
948	.380	.403	24.088
954	.368	.390	24.086
960	.359	.378	24.085
966	.351	.367	24.084
972	.344	.358	24.083
978	.338	.350	24.082
984	.333	.343	24.081
990	.329	.338	24.081
996	.326	.333	24.080
1002	.323	.329	24.080
1008	.320	.325	24.079
1014	.317	.322	24.079
1020	.314	.319	24.079
1026	.311	.316	24.078
1032	.308	.313	24.078
1038	.305	.310	24.078
1044	.302	.307	24.077
1050	.300	.304	24.077
1056	.297	.302	24.077
1062	.294	.299	24.076
1068	.291	.296	24.076
1074	.289	.293	24.076
1080	.286	.290	24.076
1086	.283	.288	24.075
1092	.280	.285	24.075
1098	.278	.282	24.075
1104	.275	.279	24.074
1110	.272	.277	24.074
1116	.269	.274	24.074

1122	.266	.271	24.073
1128	.264	.268	24.073
1134	.261	.266	24.073
1140	.258	.263	24.072
1146	.255	.260	24.072
1152	.253	.257	24.072
1158	.250	.255	24.072
1164	.247	.252	24.071
1170	.244	.249	24.071
1176	.242	.246	24.071
1182	.239	.244	24.070
1188	.236	.241	24.070
1194	.234	.238	24.070
1200	.231	.235	24.069
1206	.228	.233	24.069
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1242	.212	.217	24.067
1248	.210	.214	24.067
1254	.207	.211	24.067
1260	.205	.209	24.067
1266	.203	.207	24.066
1272	.200	.204	24.066
1278	.198	.202	24.066
1284	.196	.200	24.066
1290	.194	.198	24.065
1296	.192	.196	24.065
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1308	.189	.192	24.065
1314	.187	.190	24.064
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1362	.175	.178	24.063
1368	.174	.176	24.063
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1380	.172	.174	24.063
1386	.171	.173	24.063
1392	.170	.172	24.062
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1404	.169	.170	24.062
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1440	.166	.167	24.062
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1542	.000	.134	23.919

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1596	.000	.116		23.828
1602	.000	.114		23.818
1608	.000	.112		23.809
1614	.000	.110		23.800
1620	.000	.108		23.791
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1674	.000	.094		23.718
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1914	.000	.049		23.494
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3564	.000	.001	23.253
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3606	.000	.000	23.252

1********** PONDOPT **********
********** Version 1.83 **********
********** COMPUTER-AIDED HYDROLOGY & HYDRAULICS **********

PROJECT: MILANVILLE KENNELS
User: LandTech Resources
Date: 04/14/2004 Wednesday
Time: 08:22:42
Output: MRP100.OUT

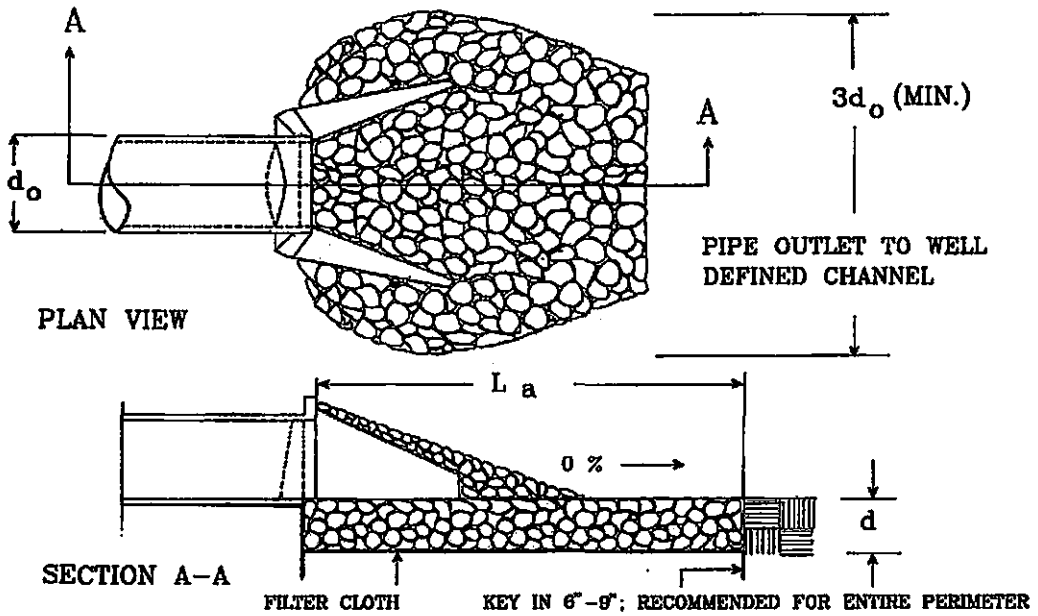
ROUTING SUMMARY ----------
SIMULATION MODE ----------
FOR THE ABOVE CASE ----------

STORM NUMBER	PEAK STAGE (ft)	PEAK STORAGE (ac-ft)	PEAK INFLOW (cfs)	PEAK OUTFLOW (cfs)
1	24.980	.296	10.088	8.478

LandTech Resources, Inc.
Surveying • Engineering • GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Phone: (757) 565-1677 Fax: (757) 565-0782
web: landtechresources.com

PROJECT NAME Milanville Kennels
PROJECT NO. 04-078
SHEET NO. _____ OF _____
CALCULATED BY KMJ DATE 4/14/04
SCALE _____

DESIGN OUTLET PROTECTION



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

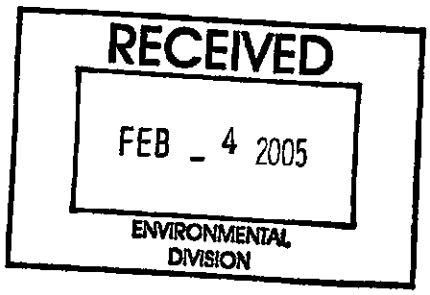
Plate 3.18-3
Q = 8.48 cfs
d_o = 1.25'
$3d_o$ = 4'
La = 11'
W = d_o + La = 13'
d_{50} = 0.35'

USE 11' x 13' x 26"
VDOT CLASS I
RIP RAP APRON

Transmittal

LandTech Resources, Inc.
Surveying - Mapping - GPS
5810-F Mooretown Road, Williamsburg, VA 23188
Tel: 757-565-1677 Fax: 757-565-0782

To: Scott Thomas. P.E.
Company: JCC Environmental Division
From: Kenneth Jenkins
Date: 2/4/05
Job Name/Number: 04-078



The following have been sent:
- ☐ as requested
- ☒ for review and comment
- ☐ please sign and return
- ☐ for temporary use, please return by _____

Quantity	Drawing Date	Description
1	2/4/05	BMP Record Drawings
1	2/4/05	BMP Record Drawing Certification Form
		Millanville Kennels
		GC 004 SP5404

Remarks:

cc:Marc Illman

Signature: Kenneth M. Jenkins

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

SP-54-04
GPIN 4420100006

County BMP ID Code (if known): GC004

Name of Facility: Milanville Kennels BMP No.: 1 of 1 Date: 3-7-05

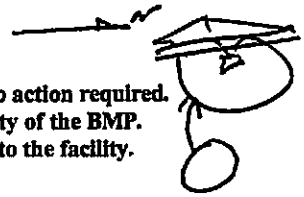
Location: 2878 Monticello Avenue.

Name of Owner: MILANVILLE Kennels (MARCUMAN) 565-0429

Name of Inspector: SJThomas, WA CAIN

Type of Facility: 2-CELL WET POND

Weather Conditions: Sunny, Warm 60'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.

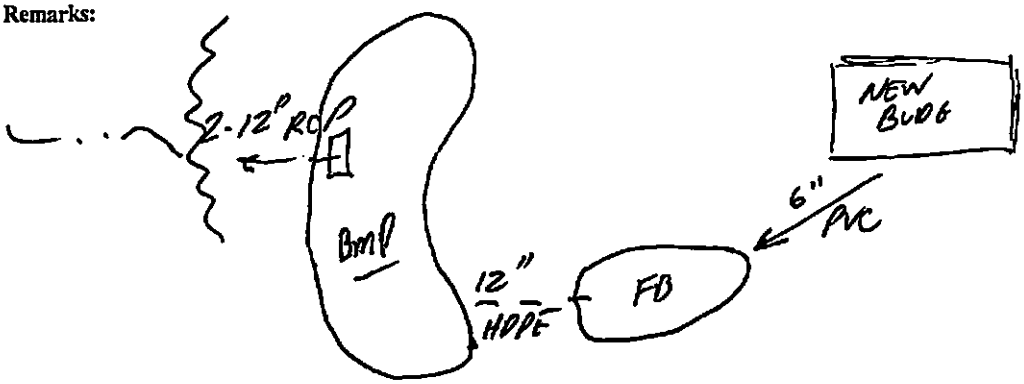
Provide an explanation and details in the comment column, if routine or urgent are marked.

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:	3' HIGH EARTH DAM, 5' TOP 3H:1V SS.			
Grass Height			✓	NO GRASS, BARE SOIL
Vegetation Condition			✓	
Tree Growth			✓	
Erosion	✓			None.
Trash & Debris	✓			
Seepage	✓			
Fencing or Benches	N/A			
Interior Landscaping/Planted Areas:	☒ None	☐ Constructed Wetland/Shallow Marsh	☐ Naturally Established Vegetation	
Vegetated Conditions	✓			
Trash & Debris	✓			
Floating Material	✓			FAKE DUCK DECOYS
Erosion	✓			
Sediment	✓			
Dead Plant	✓			
Aesthetics	✓			BARE SOIL
Other				
Notes:	Serves New Barn & Horse Pasture LAND			

Item	O.K.	Routine	Urgent	Comments
Pools: ☑ Permanent Pool (Retention Basin) ☐ Shallow Marsh (Detention Basin) ☐ None, Dry (Detention Basin)				
Shoreline Erosion	✓			Bare soil
Algae	✓			
Trash & Debris	✓			
Sediment	✓			
Aesthetics				
Other				
Inflows (Describe Types/Locations): 6" PVC & O.C TO 50'x15' FOREBAY, 12" HDPE				
Condition of Structure	✓			Forebay 2' deep
Erosion	✓			
Trash and Debris	✓			
Sediment	✓			
Outlet Protection	✓			
Other	✓			
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type): DI-1 STRUCTURE w/ 2" PVC LFO				
Condition of Structure	✓			OVAL 12" OUTLET BARREL (20'L)
Corrosion	✓			
Trash and Debris	✓			
Sediment	✓			
Vegetation	✓			
Other	✓			
Principal Outlet Structure - Barrel, Conduit, etc.: 12" RCP w/ ES-1				
Condition of Structure	✓			
Settlement	✓			
Trash & Debris	✓			
Erosion/Sediment			✓	Bare soil
Outlet Protection	✓			CL I RIPRAP 35'L x 8'W
Other				
Emergency Spillway (Overflow): ES @ Northend.				
Vegetation	✓			None
Lining	✓			
Erosion	✓			
Trash & Debris	✓			
Other	✓			
Notes: 6" ϕ DIC WASH-DOWN DRAIN from NEW BLDG.				

Item	O.K.	Routine	Urgent	Comments
Surface Type Conditions:				
Mosquito Breeding	✓			
Animal Burrows	✓			
Graffiti	✓			
Other	✓			
Surrounding Perimeter Conditions:	Pasture & BLDG EAST, WESTWOODED			
Land Uses	✓			Bare Pasture
Vegetation	·		✓	None
Trash & Debris	✓			
Aesthetics	✓			
Access /Maintenance Roads or Paths				EASY ACCESS from MAIN DRIVE. WATCH ELECTRIC FENCE
Other				

Remarks:



- Stabilize Disturbed Area. Most area around BMP is disturbed due to horse traffic.
- 12" HDPE between FB & MAIN Pond Clogged w/ soil clumps.

Overall Environmental Division Internal Rating: 3

Signature: [signature] P.E. **Date:** 3/07/05

Title: Civil Engineer

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ENVIRONMENTAL DIVISION REVIEW COMMENTS
MILANVILLE KENNELS
COUNTY PLAN NO. SP – 54 - 04
June 4, 2004

General:

KWS 1. A Land-Disturbing Permit and Siltation Agreement, with surety, are required for this project. Owner Action

KWS 2. Prior to issuance of a Land-Disturbing permit for the project, it must be verified that the Phase I archaeological study was submitted to and approved by the Director of Planning (per Condition # 7, SUP-21-03). Owner Action

KWS 3. A Standard Inspection / Maintenance agreement is required to be executed with the County due to the proposed stormwater conveyance systems and Stormwater Management/BMP facilities associated with this project. Owner Action

KWS 4. Record Drawing and Construction Certification. The stormwater management/BMP facility as proposed for this project will require submission, review and approval of a record drawing (as-built) and construction certification prior to release of the posted bond/surety. Provide notes on the plan accordingly to ensure this activity is adequately coordinated and performed before, during and following construction in accordance with current County guidelines. See Note #6 on sheet C2

KWS 5. VPDES. It appears land disturbance for the project may exceed one (1) acre. Therefore, it is the owner's responsibility to register for a General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities, in accordance with current requirements of the Virginia Department of Environmental Quality and 9 VAC 25-180-10 et seq. Contact the Tidewater Regional Office of the DEQ at (757) 518-2000 or the Central Office at (804) 698-4000 for further information. Owner provided with registration & termination forms.

KWS 6. Watershed. Provide a note on the cover sheet of the plans indicating that the site is situated within the Gordon Creek watershed of James City County. Provided as Note #8 on sheet C1

KWS 7. Professional seal and signature is required on the final erosion and sediment control and stormwater management design report.

Chesapeake Bay Preservation:

KWS 8. Perennial Streams. A site-specific perennial stream determination will need to be submitted for all streams on and adjacent to the project. Acceptable methods for this determination are contained in the Chesapeake Bay Local Assistance Department's guidance document entitled Determinations of Water Bodies with Perennial Flow. If perennial streams are present, a 100-foot buffer is required around them and any wetlands contiguous and connected by surface flow to the stream. The streams to the south and west, as previously indicated on the plot plan submitted with the SUP application, will need to be examined for perennial flow. Waiver request letter enclosed

KWS 9. Inventory. Items listed under the Environmental Inventory on the cover sheet are inconsistent with information currently required per Section 23-10(2) of the Chesapeake Bay Preservation ordinance. Refer to the ordinance for the seven specific components that are required. Revised on sheet C1

Need to show approx. Location

KWS 10. Wetlands. Wetlands on the parcel must be delineated and shown on the site plan as part of the environmental inventory. See revised environmental inventory on sheet C1

KWS 11. RPA. The "approximate limits of RPA per James City County GIS" as shown on the plan sheets should be removed. RPA locations are to be determined by proper wetland and perennial stream delineation. See revised environmental inventory on sheet C1 Need to show correct approx. locations.

Erosion & Sediment Control Plan:

KWS 12. Proposed Grading. As proposed finished floor elevation are above well above existing ground elevations, show proposed grading and limits of fill required around the new kennel building Provided on sheet C2 & C3

KWS 13. E&SC/Drainage Plan. The drainage area map presented in the design report appears incorrect. The north drainage divide, which is currently shown as matching the north property border, would extend well into the adjacent north tract. Based on County GIS five ft. topography, the offsite drainage area contributing to the north portion of this site could extend well over 400 ft. to the north onto the n/f Edwards tract (GPIN 3630100017). It does not appear that any existing offsite area has been considered in the design of the erosion and sediment control plan or the proposed BMP for the site. Permanent diversion dike provided on northern property line on sheet C2 & C3

KWS 14. E&SC Plan. The silt fence in the proposed location exceeds the design parameters for slope length and drainage area behind the fence per Minimum Standard & Spec. 3.05 of the VESCH. In order to be able to use perimeter silt fences (as intended) and to avoid use of the BMP (as a sediment basin) or the need for new sediment trapping facilities, use a temporary diversion dike along the north side of the building, to shed existing upslope "clean" drainage to the west and east around proposed disturbed areas. Diversion Dike provided on sheet C3

KWS 15. Stabilization. Immediate stabilization of disturbed areas will be an important measure for erosion, sediment and runoff control for the plan of development. Therefore, it is requested that fill slopes associated with building pad construction be stabilized immediately after grading is complete. Building construction on the level pad site can still commence, not to be stabilized till after completion. Adjust Step # 2 to include immediate stabilization of fill slopes. Also, provide appropriate reference to coastal plain region per Minimum Standard & Spec. 3.32 of the VESCH. Step #2 revised on sheet C3

KWS 16. BMP. Based on the plans and design report, it does not appear the pond will be utilized as a temporary sediment basin during construction. Provide a note on the plan that the proposed BMP is not to be used for sediment trapping purposes during land-disturbing activities. See Note #1 on sheet C3

KWS 17. Sequence of Construction. Clarify Step # 8 of the sequence of construction. Revised

KWS 18. Outlet Protections. Information on plan Sheet C2 for the outlet protection pad at the pond barrel outfall conflicts with information on the BMP detail on Sheet C4 and sizing computations in the design report. Revised on sheet C2

KWS 19. Tree Protection. Provide tree protection in accordance with the provisions of Minimum Standard & Specification 3.38 of the VESCH, as applicable. Provided on sheet C3

Stormwater Management / Drainage:

KWS 20. Animal Waste Issue. If the washdown-waste discharge from the kennel building is not to be conveyed into the septic drainfield and there is ***no other option***, obviously our Division would prefer that it be conveyed to a BMP for treatment rather than direct discharge to a natural waterway tributary to Gordon Creek. Typical water quality BMP's per the County BMP manual are designed to effectively treat keystone pollutants from impervious areas, mainly phosphorus, not bacteria. To be more effective in bacteria removal, the BMPs must be modified with special design considerations. If there is no other option including discharge to a septic drainfield, then some of these design features must be incorporated into the proposed basin. Revise the plans to either meet the SUP conditions or modify the BMP accordingly. (*For guidance on this matter, refer to Section 6, pages 69-71 of the Powhatan Creek Stormwater Master Plan, which outlines how BMPs in the County manual can be modified to maximize bacteria removal in mainstem areas. In no case will infiltration type facilities be allowed under this scenario. Briefly, these options include: using shallow, separate cells to create high light conditions; 48 hour detention; inlet/outlet design that prevent re-suspension of sediments; and shallow benches and wetlands that increase plankton communities.)* *

KWS 21. Stormwater Management. Based on a full review of the project, it appears that existing and proposed impervious area for the site is well under 10 percent; therefore, water quality BMPs are not required for the development project. However, it will appear the basin will be necessary to meet quantity control criteria in accordance with the Chapter 8 Erosion and Sediment Control ordinance, the County BMP manual and Minimum Standard # 19 of the Virginia Erosion and Sediment Control regulations (unless channel adequacy computations are provided to show otherwise) and also to serve as a treatment mechanism should the animal waste discharge not be conveyed to a septic drainfield system. If this is the case, the BMP would not have to have all features in accordance with the County BMP manual (although fully encouraged) but would have to have features to maximize bacteria removal as outlined in the comment above. The 1-year post-development storm is released at less than the pre-development rate

KWS 22. Drainage Area. The total postdevelopment drainage area to the proposed pond (1.90 acres) appears grossly incorrect, unless permanent diversions are used to get upslope drainage area away from the pond. Based on County GIS information, it would appear that drainage area to the basin could be as much as 8 acres if offsite area to the north is included. Permanent diversion dike provided on sheet C2 & C3.

KWS 23. BMP Outfall. Due to a lack of existing topographical information, it is unclear if the outfall from the BMP discharges to a well-defined receiving channel. Provide additional field run or County topography as necessary. Additional topography provided on sheet C2+C3

KWS 24. BMP. Show the design water surface elevations for the 1- and 100-year storm events on the pond detail on Sheet C4. Provided

KWS 25. Principal Spillway Crest. The flat DI-1 grate top unit as proposed for the principal spillway structure is not acceptable for use. James City County and the Virginia Stormwater Management Handbook (VSMH) do not recommend flat grates for trash racks due to clogging and maintenance problems. Structures with flow over the top should include a removable, non-clogging anti-vortex trash rack such as a sleeve or hood-type inlet or a sloped bar grate. Sloped grates, recessed into the embankment, with larger bar unit such as a modified VDOT DI-7 grate are preferred; however, beehive, convex, basket type, inverted DI-5 type or similar applications, such as HDPE trash racks per Technical Bulletin # 7 of the VaDCR can be considered on a case-by-case basis. Provide appropriate riser, grate and bar details as applicable. Peaked Roof Trash Rack provided on sheet C4

* The BMP has been divided into three cells (including forebay), two of which are less than 18" deep, and planted with wetland plants. The outlet orifice is at 2" which is the minimum diameter.

KWS 26. Pond Barrel. Generally, reinforced concrete pipe meeting the requirements of ASTM C361or ASTM C76 is required for pond outlet barrels. However, due to the simple nature of this project/BMP, corrugated polyethylene pipe will be allowed under the following conditions. Clearly specify type of pipe (AASHTO M294 type S, etc.); clearly provide an installation detail specific to installation as an outlet pipe through a dam; identify minimum cover requirement both during and following construction; and ensure the flexible pipe structural design is adequate for final cover based on manufacturer recommendations or in accordance with Corrugated Polyethylene Pipe Association recommendations. Revised to RCP on sheet C2 C4.

KWS 27. Pond Construction. Provide computations and details showing specific construction information for anti-seep collars along the pond barrel and for construction information (details) on the emergency spillway (size, depth, lining, side slope, etc.). Calculations provided in narrative & details on sheet 4

KWS 28. Buffers. Show the pond buffer which is 25 feet outward (landward or upland) from the 100-year design high water surface elevation of the pond. No future structures or disturbance would be allowed within the pond buffer zone, without issuance of variance through our Division. Provided on sheet C2

KWS 29. Pretreatment. Although not required, it is recommended that the existing small pond and 12-inch culvert area just upland of the proposed pond be modified to serve as a pretreatment forebay, which would enhance settling of suspended solids and serve as pretreatment of runoff prior to entry into the main pond cell. There would be no set minimum volume requirements for this forebay, use existing features and topography to the best scenario. Shallow forebay excavated on sheet C2+C3

KWS 30. Maintenance Plan. Provide a maintenance plan for the stormwater management/BMP facility. Section 23-10(4)(b) 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. Provided on sheet C2