PERMIT #564

LANDFILL

Revised December 5, 1995

Permit Issued: March 2, 1994

Amendment I: December 7, 1994

Amendment II: April 19, 1995

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOUTHWEST REGIONAL OFFICE

355-A Deadmore Street, Abingdon, Virginia 24210

(276) 676-4800 Fax (276) 676-4899

www.deq.virginia.gov

Doug Domenech
Secretary of Natural Resources

David K. Paylor
Director
Allen J Newman PE
Regional Director

December 11, 2013

Mr. Matthew Anderson
Tazewell County Dept. of Engineering
108 East Main Street
Tazewell, Virginia 24651

RE: Tazewell County Landfill
SWP564 (Amendment 15)
Minor Amendment – Closure and Post Closure Plan Update

Dear Mr. Anderson:

The Department of Environmental Quality (DEQ) Southwest Regional Office (SWRO) has reviewed the amendment package, which was submitted as part of a minor modification request. The amendment package includes an updated Closure and Post Closure Care Plan, entitled "Closure and Post Closure Care Plan – Tazewell County Sanitary Landfill – Permit No. 564" revision dated September 2013. The submittal has been reviewed for technical adequacy and regulatory compliance and appears to meet the requirements for Sanitary Landfills in §9 VAC 20-81-100 through 260 and the Part B Permit in §9 VAC 20-81-470.

In accordance with 9 VAC 20-81-600.F.2.c. of the Virginia Solid Waste Management Regulations (VSWMR, 9 VAC 20-81 *et seq.*), incorporation of these modifications into Permit No. 564 is a minor modification requiring director approval. In order to document this modification, please incorporate a copy of this letter and its referenced attachments into each copy of Permit No. 564.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date of service of this decision to initiate an appeal of this decision, by filing notice with:

David K. Paylor, Director
Virginia Department of Environmental Quality
ATTN: Land Protection & Revitalization Division
P.O. Box 1105
Richmond, Virginia 23218

In the event that this decision is served to you by mail, three days are added to that period. Please refer to Part Two of the rules of the Supreme Court of Virginia, which describes the required content of the Notice of Appeal, including specification of the Circuit Court to which an appeal is taken, and additional requirements governing appeals from decisions of administrative agencies.

In accordance with 9 VAC 20-81-600.F.2.d., the permittee is required to notify the local governing body of this modification within 90 days of this letter.

Please note that it is the responsibility of applicant to obtain any other permits or authorizations that may be necessary. If there are any questions, please contact Daniel P. Scott, PE, at (276) 676-4866 or daniel.scott@deq.virginia.gov.

Sincerely,

Allen J. Newman
DEQ Southwest
Regional Director

c: SWP564 Permit File
SWRO – Stacy Bowers, Inspector
SWRO – Daniel Manweiler, Land Protection Manager
T&L – Greg Widener (gwidener@t-l.com)
Cardno MM&A – Steve Stansfield (steve.stansfield@cardno.com)

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
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Doug Domenech
Secretary of Natural Resources

David K. Paylor
Director

Allen J Newman PE
Regional Director

SOLID WASTE FACILITY PERMIT

PERMIT NUMBER 564

Facility Name: Tazewell County Sanitary Landfill

Facility Type: Sanitary Landfill

Latitude: N 37°11'06"

Site Location: Tazewell County

Longitude: W 81°26'39"

Location Description: The facility is located at Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing closed landfill on the parcel (Permit 116/488. The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional area for ancillary features

Background: Tazewell County is the Permittee and the Owner/Operator of the solid waste disposal facility. The facility is to serve as a solid waste disposal site for the Virginia Counties of Tazewell, Bland, Buchanan, Dickenson, Giles, Montgomery, Russell, Pulaski, Smyth and Wythe, and the West Virginia Counties of Monroe, Logan, McDowell, Mercer, Raleigh, and Summers, and refuse haulers having a valid permit issued by Tazewell County. The facility is authorized to receive non-hazardous municipal solid waste. The landfill receives an average of 300 tons (i.e., 420 cubic yards) refuse per day based on a 6 day workweek, Monday through Saturday (1800 tons per week maximum). Phase I, II, III, and IV have an ultimate capacity of about 3.8 million cubic yards and have an expected life of about 29 years. This permit was originally issued on March 2, 1994.

Permit Highlights:

Permit Amendment #15 (Minor)	This amendment allows the incorporation of the updated Closure and Post Closure Care Plan, entitled "Closure and Post Closure Care Plan – Tazewell County Sanitary Landfill – Permit No. 564" revision dated September 2013
Permit Amendment #14 (Major)	This amendment allows the incorporation of a Corrective Action Plan (CAP) and an Updated Groundwater Monitoring Plan for Corrective Action into the Permit.

Permit Amendment #13 (Minor)	This amendment allows the incorporation of the Construction Document, issued October 17, 2012 for the Tazewell LFG Development Project and for the Gas Management Plan for The Tazewell County Landfill, PE stamp dated November 8, 2012.
Permit Amendment #12 (Minor)	This amendment allows the use of the September 2011 revised Groundwater Monitoring Plan.
Permit Amendment #11 (Minor)	This amendment will allow the use of a replacement tarp and tarp deployment system.
Permit Amendment #10 (Minor)	This amendment will allow the installation of a tire shredder and the use of tire shred in a 50:50 blend with soil as an ADC.
Permit Amendment #9 (Minor)	Phase 4 will be divided into Phase 4A and 4B. Also includes a modification of the base grade and leachate collection system for Phase 4A
Permit Amendment #8 (Minor)	Text change on page 8 of the operations manual and page 8 of the design report. Allows an average 300 tons per day based on a 6 day workweek.
Permit Amendment #7 (Minor):	This minor amendment allows for the dividing of Phase III cell into Phase IIIA and Phase IIIB
Permit Amendment #6 (Minor):	This minor amendment allowed for leachate recirculation.
Permit Amendment #5 (Minor):	This minor amendment expands the capacity from 100 tons per day to 300 tons per day.
Permit Amendment #4 (Minor):	This minor amendment modifies the groundwater sampling method.
Permit Amendment #3 (Minor):	This minor amendment reduces the number of gas monitoring wells in the Gas Management Plan.
Permit Amendment #2 (Minor):	This minor amendment modification is to revise the Practical Quantization Limit (PQL) specified for analyses of volatile organic constituents.
Permit Amendment #1 (Minor):	This minor amendment allows for the alternate burial of tires without cutting or splitting.

This permit includes permit modules and associated permit attachments, which are, in general, based on information submitted in the permit application. Permit Module I includes general permit conditions. Design and Construction are included in Permit Module III. Groundwater monitoring is included in Permit Modules X and Closure and Post-Closure are contained in Permit Modules XII and XIII.

THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
106 East Main Street
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, III, X, XI, XII, XIII, and XIV These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board. In accordance with Chapter 14, § 10.1 - 1408.1 D of the Code of Virginia, prior to issuing this permit, any comments by the local government and general public have been investigated and evaluated and it has been determined that the facility poses no substantial present or potential danger to human health or the environment. The permit contains such conditions and requirements as are deemed necessary to comply with the requirements of the Virginia Code, the regulations of the Board, and to prevent substantial or present danger to human health or the environment.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of § 10.1-1408.1 A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended.

Original Permit:	March 2, 1994
Amendment #01	December 7, 1994
Amendment #02	April 19, 1995
Amendment #03	December 28, 1995
Amendment #04	March 2, 1998
Amendment #05	August 15, 2000
Amendment #06	January 22, 2002
Amendment #07	March 18, 2004
Amendment #08	May 24, 2006

Amendment #09	July 25, 2007
Amendment #10	December 5, 2007
Amendment #11	August 18, 2011
Amendment #12	October 20, 2011
Amendment #13	December 12, 2012
Amendment #14	June 7, 2013

APPROVED:

Allen J. Newman, PE
Regional Director

DATE: 12/11/13

Amendment # 15

PERMIT MODULES

REFERENCE LIST

PERMIT MODULE I - GENERAL PERMIT CONDITIONS

PERMIT MODULE III - DESIGN AND CONSTRUCTION

PERMIT ATTACHMENT III-1 CONSTRUCTION QUALITY ASSURANCE PLAN
PERMIT ATTACHMENT III-2 DESIGN DRAWINGS

PERMIT MODULE X – DETECTION MONITORING

PERMIT MODULE XI – ASSESSMENT MONITORING

PERMIT MODULES XII/XIII - CLOSURE AND POST-CLOSURE CARE

PERMIT MODULE XIV – GROUNDWATER CORRECTIVE ACTION AND MONITORING PLAN

NOTES:

1. Should information contained in any permit module that consists of documents submitted by the permittee, conflict with the any requirement or condition contained in Permit Modules I, III, X, XI, XII, XIII, XIV, or 9VAC20-81, the regulatory/permit module requirement or condition shall prevail (unless an appropriate variance has been granted). The Department is not responsible for spelling, typographical, or syntax errors in modules based on information submitted by the permittee.

2. The Post-Closure Care Plan, emergency contact list, may be revised with Department notification in accordance with 9VAC20-81-600.F.1.

PERMIT DOCUMENTS

The documents listed below are hereby incorporated into this permit and the permittee is subject to all conditions contained therein. It is the responsibility of the permittee to properly maintain and update these documents. Any version with a revision date other than as listed below is not considered to be the official approved version and is subject to Department review and approval prior to being recognized as the "permitted" version

1. Part B Application:
   a. *Phase 4A Development for the Tazewell County Landfill* prepared by Thompson & Litton, dated July 2007.
   b. *Design Report*, prepared by Joyce Engineering, last revised January 12, 1994
   c. *Construction Quality Assurance Plan and Technical Specifications*, prepared by Joyce Engineering, last revised January 12, 1994
   d. *Leachate Management Plan, Design Report*, prepared by Joyce Engineering, last revised January 12, 1994
   e. *Landfill Gas Management Plan*, prepared by Thompson & Litton, dated/last revised October 2012;
   f. *Updated Groundwater Monitoring Plan*, prepared by Marshall Miller & Associates, last revised February 2009.
   g. *Revised Groundwater Monitoring Plan*, prepared by Marshall Miller & Associates, last revised September 2011.
   h. *Corrective Action Plan and Corrective Action Monitoring Plan,* prepared by Marshall Miller & Associates, dated April 2012.
   i. *Updated Groundwater Monitoring Plan for Corrective Action,* prepared by Marshall Miller Associates, last revised August 2012.
   j. Closure and Post Closure Care Plan – Tazewell County Sanitary Landfill – Permit No. 564 - revision dated September 2013

The following documents have been submitted to satisfy permit or regulatory requirements; however, they are considered reference documents and are not incorporated into Permit No. 564. This list may not be all-inclusive.

1. *Part A Permit Application*, Tazewell County Sanitary Landfill, prepared by RLS & Company and Joyce Engineering, dated November 1989.
2. *Construction Quality Assurance Report, Phase III Expansion,* prepared by Alliance Consulting, dated November 2003.
3. *Improvements to Stormwater Pond,* prepared by Marshall Miller Associates, dated October 14, 2011.

PERMIT MODULE I
GENERAL PERMIT CONDITIONS

I.A. EFFECT OF PERMIT

The permittee is allowed to dispose solid waste on-site in accordance with the conditions of this permit. Any disposal of solid waste not authorized by this permit is prohibited. Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under Sections 10.1-1402(18), 10.1-1402(19), or 10.1-1402(21) of the Virginia Waste Management Act (Chapter 14, Title 10.1, Code of Virginia (1950), as amended); or any other law or regulation for protection of public health or the environment. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby. For purposes of this permit, terms used herein shall have the same meaning as those in the Virginia Waste Management Act, and Part I and other pertinent parts of the Virginia Solid Waste Management Regulations (VSWMR, 9VAC20-81), unless this permit specifically provides otherwise; where terms are not defined in the regulations or the permit, the meaning associated with such terms shall be defined by the generally accepted scientific or industrial meaning of the term or a standard dictionary reference. "Director" means the Director of the Department of Environmental Quality, or his designated or authorized representative.

I.B. DUTIES AND REQUIREMENTS

The permittee shall comply with all conditions of this permit and 9VAC20-81. The effect of this permit is detailed in 9VAC20-81-490, and it shall be the duty of the permittee to ensure the applicable requirements are met. Additionally, the permittee is subject to the recording and reporting requirements detailed in 9VAC20-81-530. In addition to these requirements, the following additional conditions are invoked per 9VAC20-81-430, and shall be complied with:

I.B.1. Noncompliance may be authorized by a schedule of compliance [9VAC20-81-490.D. and 9VAC20-81-490.H.]. Any other permit noncompliance constitutes a violation of Virginia Waste Management Act and is grounds for enforcement action, or for permit revocation, revocation and reissuance, or modification [9VAC20-81-570 and 9VAC20-81-600].

I.B.2 The permittee shall comply with the requirements of this permit and any provisions of RCRA Subtitle D (Title 40, Code of Federal Regulations, Section 258) requirements as they become applicable upon their effective date. This permit may not act as a shield against compliance with any part of RCRA or any other applicable federal regulation, state regulation or state law.

I.B.3. In an enforcement action, it shall not be a defense for the permittee that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

I.B.4. In the event of noncompliance with this permit, the permittee shall take all reasonable steps to minimize releases of solid wastes or waste constituents to the environment and shall carry out measures to prevent substantial adverse impacts on human health or the environment.

I.B.5. The permittee shall at all times properly operate and maintain all units (and related appurtenances) which are installed or used by the permittee to achieve compliance with the operations manual and the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing, and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary equipment only when necessary to achieve compliance with the conditions of this permit.

I.B.6. The permittee shall furnish to the Director, within a reasonable time, any relevant information that the Director may request to determine compliance with this permit, regulations or the Act. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit by the date specified in the request.

I.B.7. The permittee shall allow the Director, or an authorized representative, at a reasonable time, upon the presentation of appropriate credentials, to:

I.B.7.a. Enter the permitted facility where a regulated unit or activity is located or conducted, or where records must be kept under the conditions of this permit;

I.B.7.b. Have access to and copy any records that must be kept under the conditions of this permit;

I.B.7.c. Inspect any unit, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

I.B.7.d. Sample or monitor, for the purposes of assuring permit compliance or as otherwise authorized by Virginia Waste Management Act, any substances or parameters at any location within his control.

I.B.8. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample to be analyzed must be the appropriate method from the latest edition of Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA Publication SW-846, if available.

Laboratory samples shall be analyzed in accordance with 1 VAC 30-45, Certification for Noncommercial Environmental Laboratories, or 1 VAC 30-46, Accreditation for Commercial Environmental Laboratories.

I.B.9. This permit is not transferable to any person, unless approved by the Director. The Director may require modification or revocation and reissuance of the permit pursuant to 9VAC20-81-490.G. Before transferring ownership or operation of the facility during its operational life, the permittee shall notify the new owner or operator in writing of the requirements of Parts III and V, of the Virginia Solid Waste Management Regulations, the Financial Assurance Regulations, 9VAC20-70, and this permit.

I.B.10. In accordance with § 10.1-1408.2, all facilities must have a Certified Operator as required by the Board of Waste Management Facility Operators-Licensing Regulations, 18 VAC 155-20.

I.B.11. Specifications for all drainage media should specify that the material shall contain no greater than 15% calcium carbonate equivalent. Department literature regarding research on leachate collection media indicates that weight loss greater than 15% results in an unacceptable loss of performance. If a greater percentage is specified or allowed, a demonstration that performance is not adversely affected must be provided to the Department for review and approval.

I.B.12. Recirculation of collected leachate shall not be allowed, in accordance with 9VAC20-81-210.D.3., except when the area to be irrigated is underlain by a composite liner system. Furthermore, in accordance with 9VAC20-81-200.C.3.c., decomposition gas condensate may be recirculated into the landfill provided the facility complies with the composite liner requirement and the leachate control

system requirements of Part III of VSWMR. A composite liner system is a system designed to meet the requirements of 9VAC20-81-130.J.1

I.B.13. The closure cost estimate must reflect the maximum cost of closure at all times. The owner has the responsibility to maintain the closure and post closure cost estimate and associated financial assurance funding as conditions change.

I.B.14. Land-clearing, excavation, and construction activities that involve the disturbance of wetlands or streams shall not commence without authorization from the Virginia Water Protection (VWP) Program and/or Army Corps of Engineers.

I.B.15. Blasting operations shall be conducted to avoid changes in the hydrogeologic character of the remaining underlying formations, and to avoid creation of instabilities or irregularities in these that might potentially lead to damage to the impermeable membrane to be installed. It shall be ensured that adjacent landfill facilities not be damaged, which includes the geosynthetic landfill liner and gas and groundwater compliance monitoring locations

I.B.16. The facility shall maintain and follow an approved Erosion & Sediment Control Plan for all land-disturbing activities in accordance with the Erosion and Sediment Control Regulations, 4 VAC 50-30.

I.C. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The permittee shall maintain a complete copy of the Solid Waste Permit and incorporated Permit Documents at the facility, or another location approved by the director, until post-closure is complete and certified by a professional engineer, and shall maintain amendments, revisions, and modification to these documents. In addition, the facility shall maintain the following additional documents:

I.C.1. Operations Manual with annual certification by Responsible Official

I.C.2. Detailed, written estimate, in current dollars, of the cost of closing the facility, post-closure care and corrective action measures

I.C.3. All other documents/records required and applicable from the following:

I.C.3.a. Monitoring records from leachate, gas, and groundwater monitoring.

I.C.3.b. Inspection records as required from construction/installation, operational, closure, post-closure inspection requirements.

I.C.3.c. Personnel training records

I.C.3.d. Daily operational records (i.e., solid waste received and processed, fill area records, records of special wastes accepted, a logbook which is a daily narrative account of the activities at the landfill).

I.C.3.e. Construction quality assurance reports, record drawings and engineers certifications for all new liner and/or final cover construction

I.C.4. An approved copy of the complete Part A permit application

I.C.5. Documentation of the authorization to discharge leachate into the publicly owned treatment works, leachate volumes sent to the POTW, and periodic leachate sampling analytical results (proposed connection).

I.D. DOCUMENTS TO BE SUBMITTED

In addition to the documents/records/reports to be submitted per the requirements of this permit or 9VAC20-81, the permittee shall also submit the following documents to the Director according to indicated schedules:

I.D.1. Prior to expansion into each new phase, the permittee shall submit all required certification documents per 9VAC20-81-490.A., and:

I.D.1.a. Authorization from the publicly owned treatment works to discharge the increased volume of leachate and wastewater to the sewerage system and treatment works (proposed connection).

I.D.1.b. Report and supporting documents resulting from quality control/quality assurance activities performed during construction and installation of the liner/drainage systems, including the installation contractor's written acceptance of the surfaces to be lined, synthetic liner manufacturer and installer warranties, laboratory test results of the permeability of the clay liner and the drainage media overlying the liner, and representative copies (sufficient to demonstrate responsible control) of the accumulated inspection schedules resulting from the professional engineer's oversight of the construction.

I.D.2. In accordance with 9VAC20-81-490.A., certification from a design engineer, who must be a professional engineer licensed to practice in the Commonwealth, that the construction of the facility has been completed in accordance with the permit, approved plans and specifications and is ready to begin operation. A certification will be required for each lined phase of development.

I.D.3. Certification (separate from I.D.2, above) from the Construction Quality Assurance (CQA) officer that the approved CQA plan has been successfully carried out and that the constructed unit meets all requirements of the permitted CQA plan, in accordance with 9VAC20-81-130.Q. A certification will be required for each lined phase of development. The CQA officer must be a professional engineer licensed to practice in Virginia.

I.D.4. The as-built plans of all new groundwater and gas monitoring wells shall be submitted as these wells are installed. Information to be included on the as-built plans shall include, but is not limited to, the total depth of the well, the surveyed elevations of the top of casing and ground surface (or apron), and the length and location of the screened interval and annular space seal. All dimensions are to be shown on well construction schematics.

I.E. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DIRECTOR

All reports, notifications, or other submissions which are required by this permit to be sent or given to the Director should be sent to:

Virginia Department of Environmental Quality
Southwest Regional Office
355-A Deadmore Street
Abingdon, Virginia 24210

I.F. SITE SPECIFIC CONDITIONS

The provisions of this section are in addition to the permit conditions and regulatory requirements and are specifically developed for this facility. The permittee shall comply with all conditions of this section, as follows:

I.F.1. The final permit is based on permit application submittals (drawings and reports) that may contain the word "proposed' and similarly tentative language. The documents that are incorporated into Permit No. 564 have been evaluated for administrative and technical adequacy and have been approved as proposed.

Therefore, any references to a design, construction, operation, monitoring or closure criteria are considered to be approved as proposed.

I.F.2. The facility is subject to the conditions listed in the Part A approval letter dated January 1991.

I.G. PERMIT AMENDMENTS

I.G.1. The permit was modified by a minor modification (Amendment 01) allowing for the alternate burial of tires without cutting or splitting.

I.G.2. The permit was modified by a minor modification (Amendment 02) allowing for the revision of the Practical Quantitation Limit (PQL) specified for analyses of volatile organic constituents.

I.G.3. The permit was modified by a minor modification (Amendment 03) allowing the reduction of the number of gas monitoring wells in the Gas Management Plan.

I.G.4. The permit was modified by a minor modification (Amendment 04) allowing the modification of the groundwater sampling method.

I.G.5. The permit was modified by a minor modification (Amendment 05) allowing the expansion of the facility capacity from 100 tons per day to 300 tons per day.

I.G.6. The permit was modified by a minor modification (Amendment 06) allowing the use of leachate recirculation.

I.G.7. The permit was modified by a minor modification (Amendment 07) allowing the dividing of Phase III cell into Phase IIIA and Phase IIIB.

I.G.8. The permit was modified by a minor modification (Amendment 08) allowing changes to the text of the operations manual and the design report allowing an average 300 tons per day based on a 6 day workweek

I.G.9. The permit was modified by a minor modification (Amendment 09) allowing Phase 4 to be divided into Phase 4A and 4B. Also includes a modification of the base grade and leachate collection system for Phase 4A.

I.G.10. The permit was modified by a minor modification (Amendment 10) allowing the installation of a tire shredder and the use of tire shred in a 50:50 blend with soil as an ADC.

I.G.11. The permit was modified by a minor modification (Amendment 11) allowing the use of a replacement tarp and tarp deployment system

I.G.12. The permit was modified by a minor modification (Amendment 12) allowing revisions to the Groundwater Monitoring Plans including updated Modules X & XI

I.G.13 The permit was modified by a minor modification (Amendment 13) allowing the incorporation of the Construction Document, issued October 17, 2012 for the Tazewell LFG Development Project and the Gas Management Plan for The Tazewell County Landfill, PE stamp dated November 8, 2012.

I.G.14 The permit is modified by a major modification (Amendment 14), allowing the incorporation of a Corrective Action Plan (CAP), dated April 2012, and an Updated Groundwater Monitoring Plan for Corrective Action, dated August 2012, into the Permit.

I.G.15 The permit is modified by a minor modification (Amendment 15) allowing the incorporation of updated Closure and Post Closure Care Plan, entitled "Closure and Post Closure Care Plan – Tazewell County Sanitary Landfill – Permit No. 564" revision dated September 2013.

8/15/07 RG

COPY BOS, EMC PAT, QUINTO, SAM 2 GARY

JUL 27 2007

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
SOUTHWEST REGIONAL OFFICE

L. Preston Bryant, Jr.
Secretary of Natural Resources

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www.deq.virginia.gov

David K. Paylor
Director

Michael D. Overstreet
Regional Director

July 25, 2007

Mr. James Spencer
Tazewell County Administrator
106 East Main Street
Tazewell, VA 24651

RE: Tazewell County Sanitary Landfill
Permit #564
Minor Amendment Approval

Dear Mr. Spencer:

This correspondence is in response to the request for an amendment of Permit #564 to split Phase 4 into Phase 4A and 4B and includes modification of base grades and the leachate collection system for Phase 4A. This activity is a minor amendment, in accordance with §9 VAC 20-80-620.F.1.b. of the *Virginia Solid Waste Management Regulations* (VSWMR, §9 VAC 20-80-10, et. seq.). The proposed action is consistent with the requirements of VSWMR, and is hereby approved. The approval is based on the following condition:

1. Phase 4B will require a major modification of the Permit to provide for changes to the liner system and the leachate collection system.

A copy of this letter and Permit Module I must be attached to each copy of Permit #564 to document this amendment approval. In addition, Drawings 1 through 10 of 'Phase 4A Development for the Tazewell County Sanitary Landfill' must also be included with the Permit.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date of service of this decision to initiate an appeal of this decision, by filing notice with:

David K. Paylor, Director
Virginia Department of Environmental Quality
ATTN: Waste Division
P.O. Box 1105
Richmond, Virginia 23218

In the event that this decision is served to you by mail, three days are added to that period. Please refer to Part Two of the rules of the Supreme Court of Virginia, which describes the required content of the Notice of Appeal, including specification of the Circuit Court to which an appeal is taken, and additional requirements governing appeals from decisions of administrative agencies.

In accordance with §9 VAC 20-80-620.F.1.a(2), you are required to send a notice of the modification to the governing body of the county, city, or town in which the facility is located. This notification shall be made within 90 days after the Director approves the request.

Please note that it is the responsibility of the permittee to obtain any other permit or authorizations that may be necessary. Your attention to this matter is appreciated. If you have any questions, please contact James L. Stump at (276) 676-4856.

Sincerely,

Dallas R. Sizemore
Deputy Regional Director

Attachments:
Module I

xc: Gregory D. Widener, P.E., Thompson & Litton
Linda Stull, letter only
Permit File #564

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 564

Facility Name:	Tazewell County Sanitary Landfill	
Facility Type:	Sanitary Landfill	**Latitude:** N 37°11'06"
Site Location:	Tazewell County	**Longitude: W** 81°26'39"

Location Description: The facility is located at Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing closed landfill on the parcel (Permit 116/488). The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional area for ancillary features

Background: Tazewell County is the Permittee and the Owner/Operator of the solid waste disposal facility. The facility is to serve as a solid waste disposal site for the Virginia Counties of Tazewell, Bland, Buchanan, Dickenson, Giles, Montgomery, Russell, Pulaski, Smyth and Wythe, and the West Virginia Counties of Monroe, Logan, McDowell, Mercer, Raleigh, and Summers, and refuse haulers having a valid permit issued by Tazewell County. The facility is authorized to receive non-hazardous municipal solid waste as specified in Permit Module II "Operations". The landfill receives an average of 300 tons (i.e., 420 cubic yards) refuse per day based on a 6 day workweek, Monday through Saturday (1800 tons per week maximum). Phase I, II, III, and IV have an ultimate capacity of about 3.8 million cubic yards and has an expected life of about 29 years. This permit was originally issued on March 2, 1994.

Permit Highlights:

Permit amendment #9 (Minor)	Phase 4 will be divided into Phase 4A and 4B. Also includes a modification of the base grade and leachate collection system for Phase 4A.
Permit Amendment #8 (Minor)	Text change on page 8 of the operations manual and page 8 of the design report. Allows an average 300 tons per day based on a 6 day workweek.
Permit Amendment #7(Minor):	This minor amendment allows for the dividing of Phase III cell into Phase IIIA and Phase IIIB.

Permit Amendment #6(Minor):	This minor amendment allowed for leachate recirculation.
Permit Amendment #5 (Minor):	This minor amendment expands the capacity from 100 tons per day to 300 tons per day.
Permit Amendment #4 (Minor):	This minor amendment modifies the groundwater sampling method.
Permit Amendment #3 (Minor):	This minor amendment reduces the number of gas monitoring wells in the Gas Management Plan.
Permit Amendment #2 (Minor):	This minor amendment modification is to revise the Practical Quantitation Limit (PQL) specified for analyses of volatile organic constituents.
Permit Amendment #1 (Minor):	This minor amendment allows for the alternate burial of tires without cutting or splitting.

This permit includes permit modules and associated permit attachments, which are, in general, based on information submitted in the permit application. Permit Module I includes general permit conditions. Operations of the facility is included in Permit Module II. Design and Construction are included in Permit Module III. Groundwater monitoring is included in Permit Modules X. Closure and Post-Closure are contained in Permit Modules XII and XIII.

THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
106 East Main Street
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Module I, Permit Module II, Permit Module III, Permit Modules X, Permit Module XII, Permit Module XIII and the associated permit attachments. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board. In accordance with Chapter 14, ∋10.1 – 1408.1(D) of the Code of Virginia, prior to issuing this permit, any comments by the local government and general public have been investigated and evaluated and it has been determined that the proposed facility poses no substantial present or potential danger to human health or the environment. The permit contains such conditions and requirements as are deemed necessary to comply with the requirements of the Virginia Code, the regulations of the Board, and to prevent substantial or present danger to human health or the environment.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of §10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended.

Original Permit No. 564 issued: March 2, 1994
Amendment #1: December 7, 1994
Amendment #2: April 19, 1995
Amendment #3: December 28, 1995
Amendment #4 March 2, 1998
Amendment #5 August 15, 2000
Amendment #6 June 22, 2002
Amendment #7 March 18, 2004
Amendment #8 May 24, 2006

APPROVED:

Dallas R. Sizemore
Deputy Regional Director

DATE: 7/25/07
Amendment #9

PERMIT MODULES AND PERMIT ATTACHMENTS[1]

REFERENCE LIST

PERMIT MODULE I -- GENERAL PERMIT CONDITIONS

PERMIT MODULE II[2] -- OPERATIONS

PERMIT MODULE III -- DESIGN AND CONSTRUCTION

PERMIT ATTACHMENT III-1 CONSTRUCTION QUALITY ASSURANCE PLAN
PERMIT ATTACHMENT III-2 DESIGN DRAWINGS

PERMIT MODULE X – GROUNDWATER MONITORING - FINAL DETECTION

PERMIT MODULES XII/XIII CLOSURE AND POST-CLOSURE CARE

NOTES:

1. Should information contained in any permit module that consists of documents submitted by the permittee, conflict with any requirement or condition contained in the Permit Modules I, II, III, X, XII, or XIV or the §9 VAC 20-80-10 et seq., Amendment 3, the regulatory/permit module requirement or condition shall prevail (unless an appropriate variance has been granted). The Department is not responsible for spelling, typographical, or syntax errors in modules based on information submitted by the permittee.

2. The Emergency/Contingency Plan (Permit Module II), or the Closure and Post-Closure Plan (Permit Module XII/XIII), may be revised with Department approval.

PERMIT MODULE I

GENERAL PERMIT CONDITIONS

I.A. EFFECT OF PERMIT

The permittee is allowed to dispose solid waste on-site in accordance with the conditions of this permit. Any disposal of solid waste not authorized by this permit is prohibited. Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under Sections 10.1-1402(18), 10.1-1402(19), or 10.1-1402(21) of the Virginia Waste Management Act (Chapter 14, Title 10.1, Code of Virginia (1950), as amended); or any other law or regulation for protection of public health or the environment. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby. For purposes of this permit, terms used herein shall have the same meaning as those in the Virginia Waste Management Act, and Part I and other pertinent parts of the Virginia Solid Waste Management Regulations, §9 VAC 20-80-10 et seq., latest amendment, unless this permit specifically provides otherwise; where terms are not defined in the regulations or the permit, the meaning associated with such terms shall be defined by the generally accepted scientific or industrial meaning of the term or a standard dictionary reference. "Director" means the Director of the Department of Environmental Quality, or his designated or authorized representative.

I.B. DUTIES AND REQUIREMENTS

The permittee shall comply with all conditions of this permit and §9 VAC 20-80-10 et. seq., latest amendment. The effect of this permit is detailed in §9 VAC 20-80-550, and it shall be the duty of the permittee to insure the applicable requirements are met. Additionally, the permittee is subject to the recording and reporting requirements detailed in §9 VAC 20-80-570. The facility will be designed and constructed per the requirements of Permit Module III, operated and maintained per Permit Module II, closed and maintained in post-closure per Permit Modules XII/XIII, subject to a groundwater monitoring program per Permit Modules X. In addition to these requirements, the following additional conditions are invoked per §9 VAC 20-80-490, and shall be complied with:

I.B.1. Noncompliance may be authorized by a schedule of compliance [§9 VAC 20-80-550.C. and §9 VAC 20-80-550.G.]. Any other permit noncompliance constitutes a violation of the Virginia Waste Management Act and is grounds for enforcement action, or for permit revocation, revocation and reissuance, or modification [§9 VAC 20-80-600 and §9 VAC 20-80-620].

I.B.2 The permittee shall comply with the requirements of this permit and any provision of RCRA Subtitle D (Title 40, Code of Federal regulations, Section 258) requirements as they become applicable upon their effective date. This permit may not act as a shield against compliance with any part of RCRA or any other applicable federal regulation, state regulation or state law.

I.B.3. In an enforcement action, it shall not be a defense for the permittee that it would have been

necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

I.B.4. In the event of noncompliance with this permit, the permittee shall take all reasonable steps to minimize releases of solid wastes or waste constituents to the environment and shall carry out measures to prevent significant adverse impacts on human health or the environment.

I.B.5. The permittee shall at all times properly operate and maintain all units (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary equipment only when necessary to achieve compliance with the conditions of this permit.

I.B.6. The permittee shall furnish to the Director, within a reasonable time, any relevant information, which the Director may request to determine compliance with this permit, regulations or the Act. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit by the date specified in the request.

I.B.7. The permittee shall allow the Director, or an authorized representative, upon the presentation of appropriate credentials, to:

I.B.7.a. Enter at reasonable times upon the permitted facility where a regulated unit or activity is located or conducted, or where records must be kept under the conditions of this permit;

I.B.7.b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

I.B.7.c. Inspect at reasonable times any unit, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

I.B.7.d. Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by Virginia Waste Management Act, any substances or parameters at any location within his control.

I.B.8. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample to be analyzed must be the appropriate method from the latest edition of Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA Publication SW-846.

I.B.9. This permit is not transferable to any person, unless approved by the Director. The Director may require modification or revocation and reissuance of the permit pursuant to §9 VAC 20-80-550.F. Before transferring ownership or operation of the facility during its

operational life, the permittee shall notify the new owner or operator in writing of the requirements of Parts V and VII, of the Virginia Solid Waste Management Regulations, the Financial Assurance Regulations, §9 VAC 20-70-10 et. seq., latest edition, and this permit.

I.B.10 EPA has issued a final New Source Performance Standard (NSPS) for Municipal Solid Waste (MSW) Landfills under 40 CFR Part 60, Subpart WWW. This NSPS is applicable to each MSW landfill with a design capacity of 2.5 million cubic meters or 2.5 million megagrams that commenced construction, reconstruction, or modification or began accepting waste on or after May 30, 1991. Since your facility appears to be a new or modified source subject to this standard, you may be required to: (1) submit an application and receive an air permit prior to commencing construction in accordance with 9 VAC 5, Chapter 80, (2) submit an initial design capacity reporting accordance with 40 CFR §60.752(a) within 90 days of commencing construction, (3) submit an initial NMOC emission rate reports in accordance with 40 CFR §60.757(b)(1)(i) within 90 days of commencing construction and annually thereafter, and (4) submit a landfill gas collection and control design plan in accordance with 40 CFR §60.752(b)(2)(i) within 1 year of submitting an NMOC emission rate report of 50 megagrams of NMOC per year or greater. Reports and applications shall be submitted to the DEQ Southwest Regional Office, Air Permit Manager. Copies of the permit application may be obtained from DEQ Southwest Regional Office or downloaded from the DEQ website at www.deq.virginia.gov. Final determination of permit and NSPS applicability and other requirements will be provided by DEQ Southwest Regional Office.

I.B.11. All facilities must have a Certified Operator as required by the Board of Waste Management Facility Operators-Licensing Regulations, §18 VAC 155-20-10 et. seq.

I.B.12. Specifications for all drainage media should specify that the material shall contain no greater than 15% calcium carbonate equivalent. Department literature regarding research on leachate collection media indicates that weight loss greater than 15% results in an unacceptable loss of performance. If a greater percentage is specified or allowed, a demonstration that performance is not adversely effected must be provided to the Department for review and approval.

I.B.13. Recirculation of collected leachate shall not be allowed, in accordance with §9 VAC 20-80-290.D.3, except when the area to irrigated is underlain by a composite liner system. Furthermore, in accordance with §9 VAC 20-80-280.E.2.c, decomposition gas condensate may be recirculated into the landfill provided the facility complies with the composite liner requirement and the leachate control system requirements of Part V of VSWMR. A composite liner system is a system designed to meet the requirements of §9 VAC 20-80-250.B.9.

I.B.14. Effective January 7, 1998, in accordance with §9 VAC 20-70-50.A.1, §9 VAC 20-70-50.A.2, §9 VAC 20-70-50.A.3, and §9 VAC 20-70-50.E.2 of the Financial Assurance Regulations for Solid Waste Facilities (FAR, §9 VAC 20-70-10 et. seq.), this facility shall provide a proper financial responsibility mechanism for facility closure activities, post-closure care, and corrective action activities. These costs shall be based on a detailed, written estimate, and must be for closure by a third party who is not a parent or subsidiary of the owner or operator.

I.C. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The permittee shall maintain the following documents at the facility, or readily accessible to Department representatives, until post-closure is complete and certified by a professional engineer, and shall maintain amendments, revisions, and modification to these documents:

I.C.1. Complete set of full scale Design Plans/Drawings and Design Report

I.C.2. Operations Manual

I.C.3. Closure and Post-Closure Plan

I.C.4. Gas Remediation Plan

I.C.5. Detailed, written estimate, in current dollars, of the cost of closing the facility, post-closure care and corrective action measures.

I.C.6. All other documents/records required and applicable from the following:

I.C.6 a. Monitoring records from leachate, gas, and groundwater monitoring.
I.C.6.b. Inspection records as required from construction/installation, operational, closure, post-closure inspection requirements.
I.C.6.c. Personnel training records.
I.C.6.d. Daily operational records (i.e., solid waste received and processed, fill area records, records of special wastes accepted, a log book which is a daily narrative account of the activities at the landfill).
I.C.6.e. Construction quality assurance reports, record drawings, and engineers' certifications for all new cells.

I.C.7. A copy of the Part A Application, if available.

I.D. DOCUMENTS TO BE SUBMITTED

In addition to the documents/records/reports to be submitted per the requirements of this permit or §9 VAC 20-80-10 et. seq., the permittee shall also submit the following documents to the Director according to indicated schedules:

I.D.1. Prior to facility operation, and prior to expansion into each new phase, the permittee shall submit all required certification documents per §9 VAC 20-80-550.A., and:

I.D.1.a. Authorizations from an owner of a permitted sewage treatment plant to discharge leachate and wastewater to an approved sewerage system and treatment works.

I.D.1.b. Report and supporting documents resulting from quality control/quality assurance activities performed during construction and installation of the liner/drainage systems, including the installation contractor's written acceptance of the surfaces to

be lined, synthetic liner manufacturer and installer warranties, permeability test results of the drainage media overlying the liner, and representative copies (sufficient to demonstrate responsible control) of the accumulated inspection schedules resulting from the professional engineer's oversight of the construction.

I.D.2. In accordance with §9 VAC 20-80-550.A.1, certification from a design engineer, who must be a professional engineer licensed to practice in Virginia, that the construction of the facility has been completed in accordance with the permit, approved plans, and specifications and is ready to begin operation. A certification will be required for each lined phase of development.

I.D.3. Certification, (separate from I.D.2 above) from the Construction Quality Assurance (CQA) officer that the approved CQA plan has been successfully carried out and that the constructed unit meets all requirements of the CQA plan, in accordance with §9 VAC 20-80-250.B.18. A certification will be required for each lined phase of development. The CQA officer must be a professional engineer licensed to practice in Virginia.

I.D.4. The as-built plans of all new groundwater monitoring wells shall be submitted as these wells are installed. Information to be included on the as-built plans shall include, but is not limited to, the total depth of the well, the surveyed elevations of the top of casing and ground surface (or apron), and the length and location of the screened interval and annular space seal. All dimensions are to be shown on well construction schematics.

I.D.5. Prior to construction, documentation shall be submitted to the DEQ South Central Regional Office, which demonstrates compliance with applicable storm water regulations concerning construction activities.

I.D.6. After completion of the post-closure period, the permittee shall submit certification to the Director stating that post-closure care was performed in accordance with Permit Modules XII and XIII, Closure and Post-Closure Plan.

I.E. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DIRECTOR

All reports, notifications, or other submissions which are required by this permit to be sent or given to the Director should be sent to:

Virginia Department of Environmental Quality
Southwest Regional Office
355 Deadmore Street
PO Box 1688
Abingdon, Virginia 24212

I.F. SITE SPECIFIC CONDITIONS

The provisions of this section are in addition to the permit conditions and regulatory requirements and are specifically developed for this facility. The permittee shall comply with the condition of this section, as follows:

I.F.1. The permittee shall comply with all applicable rules and regulations and obtain all required permits for construction and operation of this facility.

I.F.2. All accepted special waste must meet the requirements set forth in VSWMR, Part VIII.

I.F.3. In accordance with §9 VAC 20-80-250.D.2.d, intermediate cover of at least six inches of compacted soil in addition to daily cover shall be applied whenever an additional lift of refuse is not to be applied within 30 days. The Applicant has submitted a variance request to use synthetic or soil intermediate cover to control odor, disease, vectors, and litter. The Department may approve experimental use of synthetic materials as intermediate cover for a six-month period as a demonstration that the material is a good substitute for soil intermediate cover. At the end of the six-month period, a report must be submitted to the Department that discusses the effectiveness of the material, under what conditions the Contingency Plan had to be implemented, and whether permanent use of the material is warranted. The report must contain discussion on the effectiveness of controlling animals and vectors, limiting erosion and precipitation infiltration, and minimizing fires and nuisances as stated in the request. A decision will be made then by the Department whether to approve the material for intermediate cover. If the material is demonstrated to be a good substitute for soil intermediate cover after a six-month demonstration period, the the Director will allow that use.

I.F.4. The permittee shall inform the Department at least two weeks in advance of any new cell construction.

I.F.5 The permittee shall seek approval from the Department of any proposed "as-built" changes that alter the permitted design prior to installation.

Copy Sandy Isaac Howard

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
Fax (804) 698-4500 TDD (804) 698-4021
www.deq.state.va.us

Robert G. Burnley
Director

(804) 698-4000
1-800-592-5482

May 24, 2004

Richard Farthing
Tazewell County Administrator
315 School Street
Tazewell, Virginia 24651

RE: Tazewell County Sanitary LF
2003 Annual Report
- Permit # 564 (#116)
- Detection Monitoring
- Wetlands Determination Approval (5/21/02)

Dear Mr. Farthing:

This letter acknowledges the receipt and review of the 2003 Annual Report, dated February 2004, submitted to the Virginia Department of Environmental Quality (Department) by Environmental Monitoring Incorporated (EMI), on behalf of the County as specified under 9 VAC 20-80-300.E.

Based on the Department's review of the potentiometric surface map, groundwater elevation data, and the location of the existing monitor wells, the monitor well network appears to be operating in a manner appropriate to measure background conditions and to assess any potential impact to groundwater from the landfill. Attached, please find the comments generated during the Department's review of the statistical analysis section of the Annual Report. Mr. Keceli may be contacted at (804) 698-4246.

For further assistance with these matters, please feel free to contact me at (804) 698-4283 or gxchriste@deq.state.va.us.

With regards,

Geoff Christe
Environmental Engineer Senior

Attachment

cc: File Copy
Howard Freeland, DEQ-CO
Dallas Sizemore, DEQ-SW Regional Office
Randy Porter, EMI Professional Services, Norton, Virginia

DEQ
Department of Environmental Quality

OFFICE OF WASTE PROGRAMS

MEMO

TO: Geoff Christe

THROUGH: Sanjay Thirunagari ST

FROM: Hasan Keceli HK.

DATE: March 30, 2004

CC: Howard Freeland

SUBJECT: Statistical Review of the 2003 Annual Report for Tazewell Co. Landfill, Permit # 564

Per your request, I have reviewed the 2003 annual report for the Tazewell County Sanitary Landfill. Based on the information provided in the report and my review, the Department concurs with the facility's conclusion that none of the parameters for the 2003 sampling events has shown a statistical exceedance above the limit calculated for the upgradient wells. If the facility has any question regarding this memorandum, I can be reached at (804) 698-4246.

copy Dear, Sandy
San ; Hey

* What do we need to do?
BS

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

Street Address: 355 Deadmore Street, Abingdon, Virginia 24210
Mailing Address: P.O. Box 1688, Abingdon, Virginia 24212-1688
Fax: (276) 676-4899
www.deq.state.va.us

Robert G. Burnley
Director

Michael D. Overstreet
Regional Director
(276) 676-4800

March 18, 2004

Mr. James Spencer
Tazewell County Administrator
106 East Main Street
Tazewell, VA 24651

RE: Tazewell County Sanitary Landfill
Permit #564
Minor Amendment Approval

Dear Mr. Spencer:

This correspondence is in response to the request for the amendment of Permit #564 to divide Phase III cell construction into Phase IIIA and Phase IIIB. This activity is a minor amendment, in accordance with §9 VAC 20-80-620.F.1.b and Table 7.2, Item H.4 of the *Virginia Solid Waste Management Regulations* (VSWMR, §9 VAC 20-80-10, et. seq.). The proposed action is consistent with the requirements of VSWMR, and is hereby approved.

A copy of this letter and Permit Module I must be attached to each copy of Permit #564 to document this amendment approval. In addition, the design drawing, Phase III Part A and Part B Modification, must be incorporated into each copy of Permit #564.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date of service of this decision to initiate an appeal of this decision, by filing notice with:

Robert G. Burnley, Director
Virginia Department of Environmental Quality
ATTN: Waste Division
P.O. Box 10009
Richmond, Virginia 23240-0009

In the event that this decision is served to you by mail, three days are added to that period. Please refer to Part Two of the rules of the Supreme Court of Virginia, which describes the required content of the Notice of Appeal, including specification of the Circuit Court to which an appeal is taken, and additional requirements governing appeals from decisions of administrative agencies.

In accordance with §9 VAC 20-80-620.F.1.a(2), you are required to send a notice of the modification to the governing body of the county, city, or town in which the facility is located. This notification shall be made within 90 days after the Director approves the request.

Please note that it is the responsibility of the permittee to obtain any other permit or authorizations that may be necessary. Your attention to this matter is appreciated. If you have any questions, please contact James L. Stump at (276) 676-4856.

Sincerely,

Dallas R. Sizemore
Deputy Regional Director

Attachments:
Module I

xc: Permit file
Linda Stull, letter only
Henry Murray, Tazewell County Engineer, letter only
Sandy Etter, Landfill Manager, letter only

COMMONWEALTH of VIRGINIA

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street Address: 355 Deadmore Street, Abingdon, Virginia 24210
Mailing Address: P.O. Box 1688, Abingdon, Virginia 24212-1688
Fax: (276) 676-4899
www.deq.state.va.us

Robert G. Burnley
Director

Michael D. Overstreet
Regional Director
(276) 676-4800

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 564

Facility Name:	Tazewell County Sanitary Landfill	
Facility Type:	Sanitary Landfill	**Latitude:** N 37°11'06"
Site Location:	Tazewell County	**Longitude: W** 81°26'39"

Location Description: The facility is located Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing closed landfill on the parcel (Permit 116/488. The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional area for ancillary features

Background: Tazewell County is the Permittee and the Owner/Operator of the solid waste disposal facility. The facility is to serve as a solid waste disposal site for the Virginia Counties of Tazewell, Bland, Buchanan, Dickenson, Giles Montgomery, Russell, Pulaski, Smythe and Wythe, and the West Virginia Counties of Monroe, Logan, McDowell, Mercer, Raleigh, and Summers, and refuse haulers having a valid permit issued by Tazewell County. The facility is authorized to receive non-hazardous municipal solid waste as specified in Permit Module II "Operations". The landfill receives approximately 300 tons (i.e., 420 cubic yards) refuse per day. Phase I, II, III, IV have an ultimate capacity of about 3.8 million cubic yards and has an expected life of about 29 years. This permit was originally issued on March 2, 1994.

Permit Highlights:

Permit Amendment #6(Minor):	This minor amendment allows for the dividing of Phase III cell into Phase IIIA and Phase IIIB
Permit Amendment #6(Minor):	This minor amendment allowed for leachate recirculation.
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THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
106 East Main Street
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Module I, Permit Module II, Permit Module III, Permit Modules X, Permit Module XII, Permit Module XIII and the associated permit attachments. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board. In accordance with Chapter 14, §10.1 – 1408.1(D) of the Code of Virginia, prior to issuing this permit, any comments by the local government and general public have been investigated and evaluated and it has been determined that the proposed facility poses no substantial present or potential danger to human health or the environment. The permit contains such conditions and requirements as are deemed necessary to comply with the requirements of the Virginia Code, the regulations of the Board, and to prevent substantial or present danger to human health or the environment.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of §10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended.

Original Permit No. 564 issued: March 2, 1994
Amendment #1: December 7, 1994
Amendment #2: April 19, 1995
Amendment #3: December 28, 1995
Amendment #4 March 2, 1998
Amendment #5 August 15, 2000

APPROVED:

for Dallon N. Symons

Robert G. Burnley
Director

DATE: 3/19/04
Amended

PERMIT MODULES AND PERMIT ATTACHMENTS[1]

REFERENCE LIST

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PERMIT MODULE III -- DESIGN AND CONSTRUCTION

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PERMIT ATTACHMENT III-2 DESIGN DRAWINGS

PERMIT MODULE X – GROUNDWATER MONITORING - FINAL DETECTION

PERMIT MODULES XII/XIII CLOSURE AND POST-CLOSURE CARE

NOTES:

1. Should information contained in any permit module that consists of documents submitted by the permittee, conflict with the any requirement or condition contained in the Permit Modules I, II, III, X, XI, XII, or XIV or the §9 VAC 20-80-10 et seq., Amendment 3, the regulatory/permit module requirement or condition shall prevail (unless an appropriate variance has been granted). The Department is not responsible for spelling, typographical, or syntax errors in modules based on information submitted by the permittee.

2. The Emergency/Contingency Plan (Permit Module II), or the Closure and Post-Closure Plan (Permit Module XII/XIII), may be revised with Department approval.

PERMIT MODULE I

GENERAL PERMIT CONDITIONS

I.A. EFFECT OF PERMIT

The permittee is allowed to dispose solid waste on-site in accordance with the conditions of this permit. Any disposal of solid waste not authorized by this permit is prohibited. Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under Sections 10.1-1402(18), 10.1-1402(19), or 10.1-1402(21) of the Virginia Waste Management Act (Chapter 14, Title 10.1, Code of Virginia (1950), as amended); or any other law or regulation for protection of public health or the environment. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby. For purposes of this permit, terms used herein shall have the same meaning as those in the Virginia Waste Management Act, and Part I and other pertinent parts of the Virginia Solid Waste Management Regulations, §9 VAC 20-80-10 et seq., latest amendment, unless this permit specifically provides otherwise; where terms are not defined in the regulations or the permit, the meaning associated with such terms shall be defined by the generally accepted scientific or industrial meaning of the term or a standard dictionary reference. "Director" means the Director of the Department of Environmental Quality, or his designated or authorized representative.

I.B. DUTIES AND REQUIREMENTS

The permittee shall comply with all conditions of this permit and §9 VAC 20-80-10 et. seq., latest amendment. The effect of this permit is detailed in §9 VAC 20-80-550, and it shall be the duty of the permittee to insure the applicable requirements are met. Additionally, the permittee is subject to the recording and reporting requirements detailed in §9 VAC 20-80-570. The facility will be designed and constructed per the requirements of Permit Module III, operated and maintained per Permit Module II, closed and maintained in post-closure per Permit Modules XII/XIII, subject to a groundwater monitoring program per Permit Modules X. In addition to these requirements, the following additional conditions are invoked per §9 VAC 20-80-490, and shall be complied with:

I.B.1. Noncompliance may be authorized by a schedule of compliance [§9 VAC 20-80-550.C. and §9 VAC 20-80-550.G.]. Any other permit noncompliance constitutes a violation of the Virginia Waste Management Act and is grounds for enforcement action, or for permit revocation, revocation and reissuance, or modification [§9 VAC 20-80-600 and §9 VAC 20-80-620].

I.B.2 The permittee shall comply with the requirements of this permit and any provision of RCRA Subtitle D (Title 40, Code of Federal regulations, Section 258) requirements as they become applicable upon their effective date. This permit may not act as a shield against compliance with any part of RCRA or any other applicable federal regulation, state regulation or state law.

I.B.3. In an enforcement action, it shall not be a defense for the permittee that it would have been

necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

I.B.4. In the event of noncompliance with this permit, the permittee shall take all reasonable steps to minimize releases of solid wastes or waste constituents to the environment and shall carry out measures to prevent significant adverse impacts on human health or the environment.

I.B.5. The permittee shall at all times properly operate and maintain all units (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary equipment only when necessary to achieve compliance with the conditions of this permit.

I.B.6. The permittee shall furnish to the Director, within a reasonable time, any relevant information, which the Director may request to determine compliance with this permit, regulations or the Act. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit by the date specified in the request.

I.B.7. The permittee shall allow the Director, or an authorized representative, upon the presentation of appropriate credentials, to:

I.B.7.a. Enter at reasonable times upon the permitted facility where a regulated unit or activity is located or conducted, or where records must be kept under the conditions of this permit;

I.B.7.b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

I.B.7.c. Inspect at reasonable times any unit, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

I.B.7.d. Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by Virginia Waste Management Act, any substances or parameters at any location within his control.

I.B.8. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample to be analyzed must be the appropriate method from the latest edition of Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA Publication SW-846.

I.B.9. This permit is not transferable to any person, unless approved by the Director. The Director may require modification or revocation and reissuance of the permit pursuant to §9 VAC 20-80-550.F. Before transferring ownership or operation of the facility during its

operational life, the permittee shall notify the new owner or operator in writing of the requirements of Parts V and VII, of the Virginia Solid Waste Management Regulations, the Financial Assurance Regulations, §9 VAC 20-70-10 et. seq., latest edition, and this permit.

I.B.10 EPA has issued a final New Source Performance Standard (NSPS) for Municipal Solid Waste (MSW) Landfills under 40 CFR Part 60, Subpart WWW. This NSPS is applicable to each MSW landfill with a design capacity of 2.5 million cubic meters or 2.5 million megagrams that commenced construction, reconstruction, or modification or began accepting waste on or after May 30, 1991. Since your facility appears to be a new or modified source subject to this standard, you may be required to: (1) submit an application and receive an air permit prior to commencing construction in accordance with 9 VAC 5, Chapter 80, (2) submit an initial design capacity reporting accordance with 40 CFR §60.752(a) within 90 days of commencing construction, (3) submit an initial NMOC emission rate reports in accordance with 40 CFR §60.757(b)(1)(i) within 90 days of commencing construction and annually thereafter, and (4) submit a landfill gas collection and control design plan in accordance with 40 CFR §60.752(b)(2)(i) within 1 year of submitting an NMOC emission rate report of 50 megagrams of NMOC per year or greater. Reports and applications shall be submitted to the DEQ Southwest Regional Office, Air Permit Manager. Copies of the permit application may be obtained from DEQ Southwest Regional Office or downloaded from the DEQ website at www.deq.state.va.us. Final determination of permit and NSPS applicability and other requirements will be provided by DEQ Southwest Regional Office.

I.B.11. All facilities must have a Certified Operator as required by the Board of Waste Management Facility Operators-Licensing Regulations, §18 VAC 155-20-10 et. seq.

I.B.12. Specifications for all drainage media should specify that the material shall contain no greater than 15% calcium carbonate equivalent. Department literature regarding research on leachate collection media indicates that weight loss greater than 15% results in an unacceptable loss of performance. If a greater percentage is specified or allowed, a demonstration that performance is not adversely effected must be provided to the Department for review and approval.

I.B.13. Recirculation of collected leachate shall not be allowed, in accordance with §9 VAC 20-80-290.D.3, except when the area to irrigated is underlain by a composite liner system. Furthermore, in accordance with §9 VAC 20-80-280.E.2.c, decomposition gas condensate may be recirculated into the landfill provided the facility complies with the composite liner requirement and the leachate control system requirements of Part V of VSWMR. A composite liner system is a system designed to meet the requirements of §9 VAC 20-80-250.B.9.

I.B.14. Effective January 7, 1998, in accordance with §9 VAC 20-70-50.A.1, §9 VAC 20-70-50.A.2, §9 VAC 20-70-50.A.3, and §9 VAC 20-70-50.E.2 of the Financial Assurance Regulations for Solid Waste Facilities (FAR, §9 VAC 20-70-10 et. seq.), this facility shall provide a proper financial responsibility mechanism for facility closure activities, post-closure care, and corrective action activities. These costs shall be based on a detailed, written estimate, and must be for closure by a third party who is not a parent or subsidiary of the owner or operator.

I.C. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The permittee shall maintain the following documents at the facility, or readily accessible to Department representatives, until post-closure is complete and certified by a professional engineer, and shall maintain amendments, revisions, and modification to these documents:

I.C.1. Complete set of full scale Design Plans/Drawings and Design Report

I.C.2. Operations Manual

I.C.3. Closure and Post-Closure Plan

I.C.4. Gas Remediation Plan

I.C.5. Detailed, written estimate, in current dollars, of the cost of closing the facility, post-closure care and corrective action measures.

I.C.6. All other documents/records required and applicable from the following:

I.C.6 a. Monitoring records from leachate, gas, and groundwater monitoring.
I.C.6.b. Inspection records as required from construction/installation, operational, closure, post-closure inspection requirements.
I.C.6.c. Personnel training records.
I.C.6.d. Daily operational records (i.e., solid waste received and processed, fill area records, records of special wastes accepted, a log book which is a daily narrative account of the activities at the landfill).
I.C.6.e. Construction quality assurance reports, record drawings, and engineers' certifications for all new cells.

I.C.7. A copy of the Part A Application, if available.

I.D. DOCUMENTS TO BE SUBMITTED

In addition to the documents/records/reports to be submitted per the requirements of this permit or §9 VAC 20-80-10 et. seq., the permittee shall also submit the following documents to the Director according to indicated schedules:

I.D.1. Prior to facility operation, and prior to expansion into each new phase, the permittee shall submit all required certification documents per §9 VAC 20-80-550.A., and:

I.D.1.a. Authorizations from an owner of a permitted sewage treatment plant to discharge leachate and wastewater to an approved sewerage system and treatment works.

I.D.1.b. Report and supporting documents resulting from quality control/quality assurance activities performed during construction and installation of the liner/drainage systems, including the installation contractor's written acceptance of the surfaces to

be lined, synthetic liner manufacturer and installer warranties, permeability test results of the drainage media overlying the liner, and representative copies (sufficient to demonstrate responsible control) of the accumulated inspection schedules resulting from the professional engineer's oversight of the construction.

I.D.2. In accordance with §9 VAC 20-80-550.A.1, certification from a design engineer, who must be a professional engineer licensed to practice in Virginia, that the construction of the facility has been completed in accordance with the permit, approved plans, and specifications and is ready to begin operation. A certification will be required for each lined phase of development.

I.D.3. Certification, (separate from I.D.2 above) from the Construction Quality Assurance (CQA) officer that the approved CQA plan has been successfully carried out and that the constructed unit meets all requirements of the CQA plan, in accordance with §9 VAC 20-80-250.B.18. A certification will be required for each lined phase of development. The CQA officer must be a professional engineer licensed to practice in Virginia.

I.D.4. The as-built plans of all new groundwater monitoring wells shall be submitted as these wells are installed. Information to be included on the as-built plans shall include, but is not limited to, the total depth of the well, the surveyed elevations of the top of casing and ground surface (or apron), and the length and location of the screened interval and annular space seal. All dimensions are to be shown on well construction schematics.

I.D.5. Prior to construction, documentation shall be submitted to the DEQ South Central Regional Office, which demonstrates compliance with applicable storm water regulations concerning construction activities.

I.D.6. After completion of the post-closure period, the permittee shall submit certification to the Director stating that post-closure care was performed in accordance with Permit Modules XII and XIII, Closure and Post-Closure Plan.

I.E. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DIRECTOR

All reports, notifications, or other submissions which are required by this permit to be sent or given to the Director should be sent to:

Virginia Department of Environmental Quality
Southwest Regional Office
355 Deadmore Street
PO Box 1688
Abingdon, Virginia 24212

I.F. SITE SPECIFIC CONDITIONS

The provisions of this section are in addition to the permit conditions and regulatory requirements and are specifically developed for this facility. The permittee shall comply with the condition of this section, as follows:

I.F.1. The permittee shall comply with all applicable rules and regulations and obtain all required permits for construction and operation of this facility.

I.F.2. All accepted special waste must meet the requirements set forth in VSWMR, Part VIII.

I.F.3. In accordance with §9 VAC 20-80-250.D.2.d, intermediate cover of at least six inches of compacted soil in addition to daily cover shall be applied whenever an additional lift of refuse is not to be applied within 30 days. The Applicant has submitted a variance request to use synthetic or soil intermediate cover to control odor, disease, vectors, and litter. The Department may approve experimental use of synthetic materials as intermediate cover for a six-month period as a demonstration that the material is a good substitute for soil intermediate cover. At the end of the six-month period, a report must be submitted to the Department that discusses the effectiveness of the material, under what conditions the Contingency Plan had to be implemented, and whether permanent use of the material is warranted. The report must contain discussion on the effectiveness of controlling animals and vectors, limiting erosion and precipitation infiltration, and minimizing fires and nuisances as stated in the request. A decision will be made then by the Department whether to approve the material for intermediate cover. If the material is demonstrated to be a good substitute for soil intermediate cover after a six-month demonstration period, the the Director will allow that use.

I.F.4. The permittee shall inform the Department at least two weeks in advance of any new cell construction.

I.F.5 The permittee shall seek approval from the Department of any proposed "as-built" changes that alter the permitted design prior to installation.

COMMONWEALTH of VIRGINIA

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street Address: 355 Deadmore Street, Abingdon, Virginia 24210
Mailing Address: P.O. Box 1688, Abingdon, Virginia 24212-1688
Fax: (276) 676-4899
www.deq.state.va.us

Robert G. Burnley
Director

Michael D. Overstreet
Regional Director
(276) 676-4800

March 18, 2004

Mr. James Spencer
Tazewell County Administrator
106 East Main Street
Tazewell, VA 24651

RE: Tazewell County Sanitary Landfill
Permit #564
Minor Amendment Approval

Dear Mr. Spencer:

This correspondence is in response to the request for the amendment of Permit #564 to divide Phase III cell construction into Phase IIIA and Phase IIIB. This activity is a minor amendment, in accordance with §9 VAC 20-80-620.F.1.b and Table 7.2, Item H.4 of the *Virginia Solid Waste Management Regulations* (VSWMR, §9 VAC 20-80-10, et. seq.). The proposed action is consistent with the requirements of VSWMR, and is hereby approved.

A copy of this letter and Permit Module I must be attached to each copy of Permit #564 to document this amendment approval. In addition, the design drawing, Phase III Part A and Part B Modification, must be incorporated into each copy of Permit #564.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date of service of this decision to initiate an appeal of this decision, by filing notice with:

COPY SANDY / HENRY

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
Fax (804) 698-4500 TDD (804) 698-4021
www.deq.state.va.us

Robert G. Burnley
Director

(804) 698-4000
1-800-592-5482

July 30, 2003

Richard Farthing
Tazewell County Administrator
315 School Street
Tazewell, Virginia 24651

RE: Tazewell County Sanitary LF
2002 Annual Report
- Permit # 564 (#116)
- Detection Monitoring

Dear Mr. Farthing:

This letter acknowledges the receipt and review of the 2002 Annual Report, dated February 2003, submitted to the Virginia Department of Environmental Quality (Department) by Environmental Monitoring Incorporated (EMI), on behalf of the County as specified under 9 VAC 20-80-250.D.8. Based on the Department's review of the potentiometric surface map, groundwater elevation data, and the location of the existing monitor wells, the monitor well network appears to be operating in a manner appropriate to measure background conditions and to assess any potential impact to groundwater from the landfill.

Attached, please find the comments generated during the Department's review of the statistical analysis section of the Annual Report. Please ensure that Mr. Keceli's comments are accurately addressed during future Annual Report submissions. Please also note that future verification sampling actions must be completed within 30-days of completion of the compliance period's laboratory analytical results. Verification sampling actions undertaken after the 30-day period must be submitted as part of an Alternate Source Demonstration to remain consistent with the VSWMR.

For further assistance with these matters, please feel free to contact me at (804) 698-4283 or gxchriste@deq.state.va.us.

With regards,

Geoff Christe
Environmental Engineer Senior

Attachment (1)
- Statistical Review Memo

cc: File Copy
Howard Freeland, DEQ-CO
Dallas Sizemore, DEQ-SW Regional Office

Randy Porter
EMI Professional Services
PO Box 1190
Norton, Virginia 24273

DEQ
Department of Environmental Quality

OFFICE OF WASTE PROGRAMS

MEMO

TO: Geoff Christe

FROM: Hasan Keceli HK

DATE: July 29, 2003

CC: Howard Freeland
Sanjay Thirunagari

SUBJECT: Statistical Review of the 2002 Annual Report for Tazewell Co. Landfill, Permit # 564

Per your request, I have reviewed the 2002 annual report for the above facility.

It was noticed that facility has used arbitrary laboratory limits of quantitation as a upper non-parametric prediction limit to compare concentrations in the downgradient wells when the background dataset has quantified values. For future analysis, the facility is advised to use the highest quantified value in the background dataset as a upper non-parametric prediction limit to compare the concentrations in the downgradient wells.

Based on the information provided in the report, the Department concurs with the facility's conclusion that cis-1, 2-Dichloroethylene has been quantified at concentrations above the reporting limit which is a statistical significant increase in downgradient well MW-2R (1.1 ug/L) for the Jan 2002 sampling event. If the facility has any question regarding this memorandum, I can be reached at (804) 698-4246.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

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Mailing Address: P.O. Box 1688, Abingdon, Virginia 24212-1688
Fax: (276) 676-4899
www.deq.state.va.us

Robert G. Burnley
Director

Michael D. Overstreet
Regional Director
(276) 676-4800

March 14, 2003

Mr. James H. Spencer III
Tazewell County Administrator
106 East Main Street
Tazewell, Virginia 24651

RE: Alternate Daily Cover Material (ADC)
Internal Road Material
Tazewell County Landfill, Solid Waste Permit #564

Dear Mr. Spencer:

This correspondence is in response to your request, dated February 14, 2003; to use tire shred received from the Slaughter Tire pile project as an alternate daily cover material and as roadbed material for internal landfill roads at the Tazewell County Landfill.

In accordance with 9 VAC 20-80-250.C.2.c of the Virginia Solid Waste Management Regulations (VSWMR, 9 VAC 20-80-10, et seq.), the Director may approve an alternate material of an alternate thickness if the owner or operator can demonstrate that the alternate material is effective at controlling disease vectors, fires, odors, blowing litter and scavenging, without presenting a threat to human health and the environment.

The Department hereby authorizes the use of the tire shred mixed with soil in a ratio of 50:50 (by volume), for a period of 270 days in order to test the effectiveness of the material as an alternate daily cover. The final decision on the continuing use of the alternate material would be dependent on the results of the demonstration period. This authorization is contingent on the following stipulations;

Alternate Daily Cover (ADC)

1. The alternate daily cover system may be used for a period of 270 days in order to evaluate the effectiveness of the alternate cover material at controlling disease vectors, fires, odors, blowing litter and scavenging without presenting a threat to human health and the environment. At the end of the demonstration period, Tazewell County shall submit a report to the Department that discusses the effectiveness of the alternate daily cover material under all weather conditions and whether permanent use of the material is warranted. The report shall discuss the effectiveness of the tire shred and soil mixture (in a 50:50 ratio) at controlling animals and disease vectors, fires, odors, blowing litter, scavenging, other nuisances and limiting erosion. Special attention should be directed to assessing the erodability of the alternate daily cover material and its ability to provide effective cover until intermediate cover has been applied.

2. The alternate daily cover shall consist of at least six inches (after compaction) of the tire shred and soil mixture, which shall be applied directly over the waste.

3. Each piece of the tire shred shall not exceed 40 square inches in size, shall be no more than 10 inches in length and shall include no cupped sections.

4. The continued use of the alternate daily cover material after the demonstration period shall not be allowed until specifically authorized by the amendment of Permit #564. If Tazewell County chooses to discontinue the use of tire shred as ADC, the amendment of the facility permit, permit fees, and the detailed report will no longer be required. Instead, the County shall submit a letter stating it intends to discontinue using tire shred as ADC.

5. Based on the outcome of the demonstration, a decision will be made by the Department whether to approve the material as an alternate daily cover. The approval for continued use, as an alternate daily cover requires the amendment of Permit #564, in accordance with 9 VAC 20-80-620.F.1.a and Appendix 7.4 of VSWMR. The submittal for the amendment requires a modification of the Operations Manual and a permit application fee of $900.00. The Operations Manual must specify the stockpile locations, the means of applying the alternate daily cover, the amount of soil to be blended with the tire shred and other requirements of VSWMR.

6. The alternate material shall be used only as daily cover. All other cover must be as specified in VSWMR and Permit #564.

7. As required by 9 VAC 20-80-250.C.2, a three-day stockpile of soil shall be maintained at the facility for contingency use.

8. The use of the alternate material shall cease if the material is not effective at achieving the purposes of daily cover set forth in 9 VAC 20-80-250.C.2.c, if the use of the alternate cover material results in nuisances, or if the alternate material is erodible and results in waste being exposed.

9. All waste shall be covered at the end of the working day.

10. The Solid Waste Compliance Manager in the Southwest Virginia Regional Office (276-676-4800) shall be notified when the use of the alternate material will begin. The use of the alternate material is not authorized until this notification has been made.

Internal Road Material

1. Tire shred can be used as internal (waste footprint) road material in appropriate thickness.

If you have any questions regarding this matter, please contact me at (276) 676-4842

Sincerely,

Dallas R. Sizemore

Dallas Sizemore
Deputy Regional Director

cc: DEQ – Dallas Sizemore Southwest Regional Office
Linda Stull, Southwest Regional Office
DEQ - E. Paul Farrell, Jr., Central Office
Facility File – SWP #564

Mr. Sandy Etter
Environmental Control Director
Tazewell County Virginia
106 East Main Street
Tazewell, Virginia 24651

Mr. Henry Murray P.E.
Tazewell County Engineer
106 East Main Street
Tazewell, Virginia 24651

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

January 22, 2002

Mr. Sandy Etter
Environmental Control Director
County of Tazewell
315 School Street
Box 2
Tazewell, Virginia 24651

Re: Minor Amendment of Permit No. 564
Incorporation of Leachate Recirculation
Tazewell County Sanitary Landfill
Tazewell County, Virginia

Dear Mr. Etter:

The Office of Waste Permitting has completed processing the minor amendment request dated September 8, 2000 that you submitted on behalf of Tazewell County for the referenced facility. As you know, the amendment primarily regards the incorporation on leachate recirculation into the facility's operating plan as an alternative for leachate management. Changes to the permit relative to the minor amendment are as follows: (1) the design report has been modified to update design information relative to the incorporation of leachate recirculation; and, (2) an addendum has been added to the operations and maintenance manual outlining the details of leachate recirculation as an alternative for leachate management. Please find enclosed the revised pages of Permit # 564 that have been modified as a result of these requests. These include the following:

- Updated pages (ii) and (iii) of the permit introductory pages
- An updated page I-8 of Module I;
- Pages 13, 22, 23, 25, 26, 32, and 33 of the Design Report have been revised to address design considerations relative to the incorporation of leachate recirculation as an option for leachate management.
- Section V.A on page 13 of the Operations and Maintenance Manual is revised to address leachate recirculation as an option for leachate management.

- Appendix D is added to the operations and maintenance manual to incorporate and specify the leachate recirculation methodology to be used for leachate recirculation at the landfill.

Please incorporate these revised and/or revised documents into all copies of the permit. Also retain a copy of this letter to document the approved modification. If you have any questions regarding this letter please contact me at (804) 698-4239.

Sincerely,

Donald H. Brunson, III
Environmental Engineer Senior
Office of Waste Permitting

Attachments

cc: Henry Murray (w/ attachments)
Tazewell County Engineer/Planner
315 School Street, Box 2
Tazewell, Virginia 24651

Dallas Sizemore, SWRO, DEQ, (letter only)
Linda Stull, SWRO, DEQ (w/ attachments
Paul Farrell, OWP, DEQ (letter only)
Don Brunson, OWP DEQ (letter only)
Artie Kappel, OWP, DEQ (letter only)

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

January 22, 2002

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Environmental Control Director
County of Tazewell
315 School Street
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Tazewell, Virginia 24651

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Incorporation of Leachate Recirculation
Tazewell County Sanitary Landfill
Tazewell County, Virginia

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- An updated page I-8 of Module I;
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- Section V.A on page 13 of the Operations and Maintenance Manual is revised to address leachate recirculation as an option for leachate management.

- Appendix D is added to the operations and maintenance manual to incorporate and specify the leachate recirculation methodology to be used for leachate recirculation at the landfill.

Please incorporate these revised and/or revised documents into all copies of the permit. Also retain a copy of this letter to document the approved modification. If you have any questions regarding this letter please contact me at (804) 698-4239.

Sincerely,

Donald H. Brunson, III
Environmental Engineer Senior
Office of Waste Permitting

Attachments

cc: Henry Murray (w/ attachments)
Tazewell County Engineer/Planner
315 School Street, Box 2
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Artie Kappel, OWP, DEQ (letter only)

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COMMONWEALTH OF VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
WASTE DIVISION

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 564

Facility Name: Tazewell County Sanitary Landfill

Facility Type: Sanitary Landfill **Latitude:** 37:11:06 North

Site Location: Tazewell County **Longitude:** 81:26:39 West

Location Description: The facility is located near Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing landfill on the parcel (Permit 116/488) which is to be closed once the new landfill area is ready for operation. The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional areas for ancillary features.

Background: Tazewell County is the Permittee and the Owner/Operator of the solid waste disposal facility. The facility is to serve as a solid waste disposal site for Tazewell County, Towns of Tazewell, Bluefield, Richlands, Cedar Bluff, and Pocohontas, and refuse removers having a valid permit issued by Tazewell County. The facility is authorized to receive non-hazardous municipal solid waste as specified in Permit Module II "Operations". The landfill receives approximately 100 tons (i.e., 200 cubic yards) refuse per day. Phases 1,2,3, and 4 have a ultimate capacity of about 3.8 million cubic yards and has an expected life of about 60 years.

Permit Highlights: This permit includes six permit modules and three permit attachments which are, in general, based on information submitted in the permit application. Permit Module I contains general permit conditions. Permit Module II is the facility's operations and maintenance manual. Permit Module III consists of the project design report, design drawings, and project specifications. Permit Attachment III-1 is the construction quality assurance plan. Permit Attachment III-1 is the design drawings. Permit Module X contains regulatory conditions with regard to groundwater monitoring, and Permit Attachment X-1 is the facility groundwater monitoring plan. Permit Modules XII is the facility's closure plan and Module XIII is the post closure care plan.

Permit Highlights: This permit includes six permit modules and three permit attachments which are, in general, based on information submitted in the permit application. Permit Module I contains general permit conditions. Permit Module II is the facility's operations and maintenance manual. Permit Module III consists of the project design report and project specifications. Permit Attachment III-1 is the construction quality assurance plan. Permit Attachment III-2 is the design drawings. Permit Module X contains regulatory conditions with regard to groundwater monitoring, and Permit Attachment X-1 is the facility groundwater-monitoring plan. Permit Module XII is the facility's closure plan and Module XIII is the post closure care plan. The liner design of the facility incorporates a composite liner consisting of 2 feet of clay overlaid by a 60-mil synthetic flexible membrane liner (FML). There is also a provision for a trial use of alternate daily cover, which is a geotextile material. The groundwater-monitoring network for this facility includes two (2) upgradient (background) wells and six (6) downgradient monitoring wells. The permittee shall sample and analyze all monitoring wells at least semiannually. Section I.H. of permit module I contains dates and details of amendments to this permit.

Permit Amendment: This permit is amended in accordance with a request for a minor amendment dated September 8, 2000. Final submission of required documentation was received on December 5, 2001. The request regards the incorporation of leachate recirculation as an option for leachate management at the facility. The amendment necessitates modifications of the facility design report and operations manual. The design report is modified to update the evaluation of the amount of leachate head on the liner. Appendix D is added to the operations material to incorporate and specify the leachate recirculation methodology to be used for leachate recirculation at the landfill. This amendment is documented in greater detail in Permit Module I, Section I.H.6.

THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, III, X, XII, XIII, and Permit Attachments III-1, III-2 and X-1. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

12-1-2001

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PERMIT MODULES AND PERMIT ATTACHMENTS[1]

REFERENCE LIST

PERMIT MODULE I -- GENERAL PERMIT CONDITIONS

PERMIT MODULE II[2] -- OPERATIONS

PERMIT MODULE III -- DESIGN AND CONSTRUCTION

PERMIT ATTACHMENT III-1 -- CONSTRUCTION QUALITY ASSURANCE PLAN

PERMIT ATTACHMENT III-2 -- DESIGN DRAWINGS

PERMIT MODULE X -- GROUNDWATER MONITORING - FINAL DETECTION

PERMIT ATTACHMENT X-1 -- GROUNDWATER MONITORING PROGRAM

PERMIT MODULES XII AND XIII[3] -- CLOSURE AND POST-CLOSURE CARE

NOTES:

1. Should information contained in any permit module that consists of documents submitted by the permittee, conflict with the any requirement or condition contained in the permit modules I, X, XI, or the VR 672-20-10, the regulatory/permit module requirement or condition shall prevail (unless an appropriate variance has been granted). The Department is not responsible for spelling, typographical, or syntax errors in modules based on information submitted by the permittee. As permit attachments are typically extracts from submitted information, they may contain references to calculations or other supporting information which is omitted from the permit document. However, all information submitted in support of the permit application may be found in Department files.

2. The Emergency/Contingency Plan (Appendix B of Permit Module II), may be revised with Department approval.

3. The Closure Plan (contained in Permit Module XII), may be revised. The amended plan shall be placed in the operating record. An alternate final cover design must be approved by the Department.

PERMIT MODULE I

GENERAL PERMIT CONDITIONS

I.A. EFFECT OF PERMIT

The permittee is allowed to dispose solid waste on-site in accordance with the conditions of this permit. Any disposal of solid waste not authorized by this permit is prohibited. Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under Sections 10.1-1402(18), 10.1-1402(19), or 10.1-1402(21) of the Virginia Waste Management Act (Chapter 14, Title 10.1, Code of Virginia (1950), as amended); or any other law or regulation for protection of public health or the environment. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby. For purposes of this permit, terms used herein shall have the same meaning as those in the Virginia Waste Management Act, and Part I and other pertinent parts of the Virginia Solid Waste Management Regulations (VR 672-20-10), unless this permit specifically provides otherwise; where terms are not defined in the regulations or the permit, the meaning associated with such terms shall be defined by the generally accepted scientific or industrial meaning of the term or a standard dictionary reference. "Director" means the Director of the Department of Environmental Quality, or his designated or authorized representative.

I.B. DUTIES AND REQUIREMENTS

The permittee shall comply with all conditions of this permit and VR 672-20-10. The effect of this permit is detailed in §7.7, VR 672-20-10, and it shall be the duty of the permittee to insure the applicable requirements are met. Additionally, the permittee is subject to the recording and reporting requirements detailed in §7.9, VR 672-20-10. The facility will be designed and constructed per the requirements of Permit Module III, as applicable, operated and maintained per Permit Module II, closed and maintained in post-closure per Permit Module XII and XIII, and subject to a groundwater monitoring program per Permit Module X. In addition to these requirements, the following additional conditions are invoked per §7.1, VR 672-20-10, and shall be complied with:

I.B.1. Noncompliance may be authorized by a schedule of compliance [§§ 7.7.C and 7.7.G, VR 672-20-10]. Any other permit noncompliance constitutes a violation of Virginia Waste Management Act and is grounds for enforcement action, or for permit revocation, revocation and reissuance, or modification [§§ 7.12 and 7.14, VR 672-20-10].

I.B.8. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample to be analyzed must be the appropriate method from the latest edition of Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA Publication SW-846.

I.B.9. This permit is not transferable to any person, unless approved by the Director. The Director may require modification or revocation and reissuance of the permit pursuant to § 7.7.F, VR 672-20-10. Before transferring ownership or operation of the facility during its operational life, the permittee shall notify the new owner or operator in writing of the requirements of Parts V and VII, of the Virginia Solid Waste Management Regulations, the Financial Assurance Regulations (VR 672-20-1) and this permit.

I.C. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The permittee shall maintain the following documents at the facility, or readily accessible to Department representatives, until post-closure is complete and certified by a professional engineer, and shall maintain amendments, revisions, and modification to these documents:

I.C.1. Design Plans.

I.C.2. Operations Manual.

I.C.3. Closure and Post-Closure Plan.

I.C.4. Groundwater Monitoring Plan.

I.C.5. All other documents/records required:

I.C.5.a. Monitoring records from leachate, gas, and groundwater monitoring.

I.C.5.b. Inspection records as required from construction/installation, operational, closure, post-closure inspection requirements.

I.C.5.c. Personnel training records.

I.C.5.d. Daily operational records (i.e., solid waste received and processed, fill area records, records of special wastes accepted, a logbook which is a daily narrative account of the activities at the landfill).

I.D.4. In accordance with Section I.F.1, the permittee must submit a report assessing the effectiveness of the geotextile daily cover. The report must demonstrate that the material is as effective as 6 inches of soil in controlling disease vectors, fires, blowing litter, erosion, infiltration, and nuisances.

I.E. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DIRECTOR

All reports, notifications, or other submissions which are required by this permit to be sent or given to the Director should be sent by certified mail to:

Director
Virginia Department of Environmental Quality
Waste Division
P.O. Box 10009
Richmond, VA 23240-0009

I.F. SITE SPECIFIC CONDITIONS

The provisions of this section are in addition to the permit conditions and regulatory requirements and are specifically developed for this facility. The permittee shall comply with all conditions of this section, as follows:

I.F.1. As specified in §5.1.C.2.c, VR 672-20-10, the Department of Environmental Quality, Waste Division allows the use alternate daily cover, subject to approval by the Director. The geotextile daily cover must meet or exceed the minimum specifications established in the design report (see Module III). Prior to implementing the use of alternate daily cover, the permittee must develop a contingency plan which addresses conditions under which soil is required instead of the geotextile daily cover, with provisions for an ample supply of soil (at least three days supply) in proximity to the working face and the necessary equipment to apply the soil to the working face. The report required by Section I.D.4, of this permit must be submitted for review and approval in accordance with the time-frame established in Section I.G.1, of this permit.

I.G. COMPLIANCE SCHEDULE

The permittee shall report to the Director in writing compliance with the requirements contained in the following compliance schedule.

I.G.1. Six months after the facility begins operation, the permittee shall submit to the Department of Environmental Quality, Waste Division, the report required by Section I.D.4, of this permit evaluating the performance of the geotextile daily cover.

develop a contingency plan which addresses conditions under which soil is required instead of the geotextile daily cover, with provisions for an ample supply of soil (at least three days supply) in proximity to the working face and the necessary equipment to apply the soil to the working face. The report required by Section I.D.4, of this permit must be submitted for review and approval in accordance with the time-frame established in Section I.G.1, of this permit.

I.G. COMPLIANCE SCHEDULE

The permittee shall report to the Director in writing compliance with the requirements contained in the following compliance schedule.

I.G.1 Six months after the facility begins operation, the permittee shall submit to the Department of Environmental Quality, Waste Division, the report required by Section I.D.4, of this permit evaluating the performance of the geotextile daily cover.

Post-it™ Fax Note 7671 | Date 11/4/94 | # of pages 1
To Henry Mu... | From Bob Jones
Co./Dept. Tayewell Co | Co. JET
Phone # | Phone #
Fax (703) 98[illegible]-3521 | Fax #

Raleigh, Summers, and Wyoming. Accordingly, the facility's Operations and Maintenance Manual has been revised to reflect this new service area. Other changes to the manual include updating the facility's landfill development timetable and personnel description.

I.H.5.b. The facility's Safety Plan has been revised to update the emergency contact list.

I.H.5.c. The facility's Design Report has been modified to update the material balance for phases I, II, III, and IV. The daily waste volume will rise from 100 tons (200 cy) to 300 tons (420 cy) a day. Through the use of alternate daily cover, the volume of the waste will increase from 3,281,530 cy to 3,662,068 cy. Because of the increase in the daily waste stream the facility's life expectancy has been revised to account for a decreased life span, from 60 years to 29 years.

I.H.6. This permit is amended in accordance with a request for a minor amendment dated September 8, 2000. Final submission of required documentation was received on December 5, 2001. The request regards the incorporation of leachate recirculation as an option for leachate management at the facility. The amendment necessitates modifications of the facility design report and operations manual. The design report is modified to update the evaluation of the amount of leachate head on the liner. The documents amended include the following:

I.H.6.a. Appendix D is added to the operations and maintenance manual to incorporate and specify the leachate recirculation methodology to be used for leachate recirculation at the landfill.

I.H.6.b. Section V.A on page 13 of the Operations and Maintenance Manual is revised to address leachate recirculation as an option for leachate management.

I.H.6.c. Pages 13, 22, 23, 25, 26, 32, and 33 of the Design Report have been revised to address design considerations relative to the incorporation of leachate recirculation as an option for leachate management.

12-1-2001

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COMMONWEALTH OF VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
WASTE DIVISION

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 564

Facility Name: Tazewell County Sanitary Landfill

Facility Type: Sanitary Landfill **Latitude:** 37:11:06 North

Site Location: Tazewell County **Longitude:** 81:26:39 West

Location Description: The facility is located near Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing landfill on the parcel (Permit 116/488) which is to be closed once the new landfill area is ready for operation. The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional areas for ancillary features.

Background: Tazewell County is the Permittee and the Owner/Operator of the solid waste disposal facility. The facility is to serve as a solid waste disposal site for Tazewell County, Towns of Tazewell, Bluefield, Richlands, Cedar Bluff, and Pocohontas, and refuse removers having a valid permit issued by Tazewell County. The facility is authorized to receive non-hazardous municipal solid waste as specified in Permit Module II "Operations". The landfill receives approximately 100 tons (i.e., 200 cubic yards) refuse per day. Phases 1,2,3, and 4 have a ultimate capacity of about 3.8 million cubic yards and has an expected life of about 60 years.

Permit Highlights: This permit includes six permit modules and three permit attachments which are, in general, based on information submitted in the permit application. Permit Module I contains general permit conditions. Permit Module II is the facility's operations and maintenance manual. Permit Module III consists of the project design report, design drawings, and project specifications. Permit Attachment III-1 is the construction quality assurance plan. Permit Attachment III-1 is the design drawings. Permit Module X contains regulatory conditions with regard to groundwater monitoring, and Permit Attachment X-1 is the facility groundwater monitoring plan. Permit Modules XII is the facility's closure plan and Module XIII is the post closure care plan.

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THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, III, X, XII, XIII, and Permit Attachments III-1, III-2 and X-1. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of § 10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended.

APPROVED:

_____
Richard N. Burton
Director

DATE:_____

Permit Highlights: This permit includes six permit modules and three permit attachments which are, in general, based on information submitted in the permit application. Permit Module I contains general permit conditions. Permit Module II is the facility's operations and maintenance manual. Permit Module III consists of the project design report and project specifications. Permit Attachment III-1 is the construction quality assurance plan. Permit Attachment III-2 is the design drawings. Permit Module X contains regulatory conditions with regard to groundwater monitoring, and Permit Attachment X-1 is the facility groundwater-monitoring plan. Permit Module XII is the facility's closure plan and Module XIII is the post closure care plan. The liner design of the facility incorporates a composite liner consisting of 2 feet of clay overlaid by a 60-mil synthetic flexible membrane liner (FML). There is also a provision for a trial use of alternate daily cover, which is a geotextile material. The groundwater-monitoring network for this facility includes two (2) upgradient (background) wells and six (6) downgradient monitoring wells. The permittee shall sample and analyze all monitoring wells at least semiannually. Section I.H. of permit module I contains dates and details of amendments to this permit.

Permit Amendment: This permit is amended in accordance with a request for a minor amendment dated September 8, 2000. Final submission of required documentation was received on December 5, 2001. The request regards the incorporation of leachate recirculation as an option for leachate management at the facility. The amendment necessitates modifications of the facility design report and operations manual. The design report is modified to update the evaluation of the amount of leachate head on the liner. Appendix D is added to the operations material to incorporate and specify the leachate recirculation methodology to be used for leachate recirculation at the landfill. This amendment is documented in greater detail in Permit Module I, Section I.H.6.

THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, III, X, XII, XIII, and Permit Attachments III-1, III-2 and X-1. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

12-1-2001

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PERMIT MODULES AND PERMIT ATTACHMENTS[1]

REFERENCE LIST

PERMIT MODULE I -- GENERAL PERMIT CONDITIONS

PERMIT MODULE II[2] -- OPERATIONS

PERMIT MODULE III -- DESIGN AND CONSTRUCTION

PERMIT ATTACHMENT III-1 -- CONSTRUCTION QUALITY ASSURANCE PLAN

PERMIT ATTACHMENT III-2 -- DESIGN DRAWINGS

PERMIT MODULE X -- GROUNDWATER MONITORING - FINAL DETECTION

PERMIT ATTACHMENT X-1 -- GROUNDWATER MONITORING PROGRAM

PERMIT MODULES XII AND XIII[3] -- CLOSURE AND POST-CLOSURE CARE

NOTES:

1. Should information contained in any permit module that consists of documents submitted by the permittee, conflict with the any requirement or condition contained in the permit modules I, X, XI, or the VR 672-20-10, the regulatory/permit module requirement or condition shall prevail (unless an appropriate variance has been granted). The Department is not responsible for spelling, typographical, or syntax errors in modules based on information submitted by the permittee. As permit attachments are typically extracts from submitted information, they may contain references to calculations or other supporting information which is omitted from the permit document. However, all information submitted in support of the permit application may be found in Department files.

2. The Emergency/Contingency Plan (Appendix B of Permit Module II), may be revised with Department approval.

3. The Closure Plan (contained in Permit Module XII), may be revised. The amended plan shall be placed in the operating record. An alternate final cover design must be approved by the Department.

PERMIT MODULE I

GENERAL PERMIT CONDITIONS

I.A. EFFECT OF PERMIT

The permittee is allowed to dispose solid waste on-site in accordance with the conditions of this permit. Any disposal of solid waste not authorized by this permit is prohibited. Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under Sections 10.1-1402(18), 10.1-1402(19), or 10.1-1402(21) of the Virginia Waste Management Act (Chapter 14, Title 10.1, Code of Virginia (1950), as amended); or any other law or regulation for protection of public health or the environment. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby. For purposes of this permit, terms used herein shall have the same meaning as those in the Virginia Waste Management Act, and Part I and other pertinent parts of the Virginia Solid Waste Management Regulations (VR 672-20-10), unless this permit specifically provides otherwise; where terms are not defined in the regulations or the permit, the meaning associated with such terms shall be defined by the generally accepted scientific or industrial meaning of the term or a standard dictionary reference. "Director" means the Director of the Department of Environmental Quality, or his designated or authorized representative.

I.B. DUTIES AND REQUIREMENTS

The permittee shall comply with all conditions of this permit and VR 672-20-10. The effect of this permit is detailed in §7.7, VR 672-20-10, and it shall be the duty of the permittee to insure the applicable requirements are met. Additionally, the permittee is subject to the recording and reporting requirements detailed in §7.9, VR 672-20-10. The facility will be designed and constructed per the requirements of Permit Module III, as applicable, operated and maintained per Permit Module II, closed and maintained in post-closure per Permit Module XII and XIII, and subject to a groundwater monitoring program per Permit Module X. In addition to these requirements, the following additional conditions are invoked per §7.1, VR 672-20-10, and shall be complied with:

I.B.1. Noncompliance may be authorized by a schedule of compliance [§§ 7.7.C and 7.7.G, VR 672-20-10]. Any other permit noncompliance constitutes a violation of Virginia Waste Management Act and is grounds for enforcement action, or for permit revocation, revocation and reissuance, or modification [§§ 7.12 and 7.14, VR 672-20-10].

I.B.2 The permittee shall comply with the requirements of this permit and any provision of RCRA Subtitle D (Title 40, Code of Federal Regulations, Section 258) requirements. This permit may not act as a shield against compliance with any part of RCRA, Subtitle D, or any other applicable federal or state regulation.

I.B.3. In an enforcement action, it shall not be a defense for the permittee that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

I.B.4. In the event of noncompliance with this permit, the permittee shall take all reasonable steps to minimize releases of solid wastes or waste constituents to the environment and shall carry out measures to prevent significant adverse impacts on human health or the environment.

I.B.5. The permittee shall at all times properly operate and maintain all units (and related appurtenances) which are installed or used by the permittee to achieve compliance with the operations manual and the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing, and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary equipment only when necessary to achieve compliance with the conditions of this permit.

I.B.6. The permittee shall furnish to the Director, within a reasonable time, any relevant information which the Director may request to determine compliance with this permit, regulations, or the Act. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit by the date specified in the request.

I.B.7. The permittee shall allow the Director, or an authorized representative, upon the presentation of appropriate credentials, to:

I.B.7.a. Enter at reasonable times upon the permitted facility where a regulated unit or activity is located or conducted, or where records must be kept under the conditions of this permit;

I.B.7.b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

I.B.7.c. Inspect at reasonable times any unit, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

I.B.7.d. Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by Virginia Waste Management Act, any substances or parameters at any location within his control.

I.B.8. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample to be analyzed must be the appropriate method from the latest edition of Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA Publication SW-846.

I.B.9. This permit is not transferable to any person, unless approved by the Director. The Director may require modification or revocation and reissuance of the permit pursuant to § 7.7.F, VR 672-20-10. Before transferring ownership or operation of the facility during its operational life, the permittee shall notify the new owner or operator in writing of the requirements of Parts V and VII, of the Virginia Solid Waste Management Regulations, the Financial Assurance Regulations (VR 672-20-1) and this permit.

I.C. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The permittee shall maintain the following documents at the facility, or readily accessible to Department representatives, until post-closure is complete and certified by a professional engineer, and shall maintain amendments, revisions, and modification to these documents:

I.C.1. Design Plans.

I.C.2. Operations Manual.

I.C.3. Closure and Post-Closure Plan.

I.C.4. Groundwater Monitoring Plan.

I.C.5. All other documents/records required:

I.C.5.a. Monitoring records from leachate, gas, and groundwater monitoring.

I.C.5.b. Inspection records as required from construction/installation, operational, closure, post-closure inspection requirements.

I.C.5.c. Personnel training records.

I.C.5.d. Daily operational records (i.e., solid waste received and processed, fill area records, records of special wastes accepted, a logbook which is a daily narrative account of the activities at the landfill).

I.D. DOCUMENTS TO BE SUBMITTED

In addition to the documents/records/reports to be submitted per the requirements of this permit or VR 672-20-10, the permittee shall also submit the following documents to the Director according to indicated schedules:

I.D.1. Prior to facility operation, and prior to expansion into each new phase, the permittee shall submit all required certification documents per §7.7.A, VR 672-20-10, and:

I.D.1.a. Authorizations from the DEQ-Water Division to discharge leachate and waste-water to an approved sewerage system and treatment works.

I.D.1.b. Certification from the design engineer (whom must be licensed to practice in Virginia) that the construction of the facility has been completed in accordance with the approved plans and specifications and is ready to begin operation.

I.D.1.c. Certification from the CQA officer (whom must be licensed to practice in Virginia) that the approved CQA plan has been successfully carried out and that the constructed unit meets all applicable requirements including, but not limited to, the requirements of §5.1.B.18, VR 672-20-10. A certification will be needed for each lined phase of development. (Note that the design engineer and the CQA officer must not be the same individual.)

I.D.1.b. Report and supporting documents resulting from quality control/quality assurance activities performed during construction and installation of the liner/drainage systems, including the installation contractor's written acceptance of the surfaces to be lined, synthetic liner manufacturer and installer warranties, field/laboratory test results of the permeability of the clay liner and the drainage media overlying the liner, and representative copies (sufficient to demonstrate responsible control) of the accumulated inspection schedules resulting from the professional engineer's oversight of the construction.

I.D.2. The as-built plans of all new groundwater monitoring wells shall be submitted as these wells are installed. Information to be included on the as-built plans shall include, but is not limited to, the total depth of the well, the surveyed elevations of the top of casing and ground surface (or apron), and the length and location of the screened interval and annular space seal. All dimensions are to be shown on well construction schematics.

I.D.3. Prior to construction, the permittee shall submit to the Department of Environmental Quality, Waste Division, documentation which demonstrates compliance with applicable stormwater regulations concerning construction activities.

I.D.4. In accordance with Section I.F.1, the permittee must submit a report assessing the effectiveness of the geotextile daily cover. The report must demonstrate that the material is as effective as 6 inches of soil in controlling disease vectors, fires, blowing litter, erosion, infiltration, and nuisances.

I.E. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DIRECTOR

All reports, notifications, or other submissions which are required by this permit to be sent or given to the Director should be sent by certified mail to:

Director
Virginia Department of Environmental Quality
Waste Division
P.O. Box 10009
Richmond, VA 23240-0009

I.F. SITE SPECIFIC CONDITIONS

The provisions of this section are in addition to the permit conditions and regulatory requirements and are specifically developed for this facility. The permittee shall comply with all conditions of this section, as follows:

I.F.1. As specified in §5.1.C.2.c, VR 672-20-10, the Department of Environmental Quality, Waste Division allows the use alternate daily cover, subject to approval by the Director. The geotextile daily cover must meet or exceed the minimum specifications established in the design report (see Module III). Prior to implementing the use of alternate daily cover, the permittee must develop a contingency plan which addresses conditions under which soil is required instead of the geotextile daily cover, with provisions for an ample supply of soil (at least three days supply) in proximity to the working face and the necessary equipment to apply the soil to the working face. The report required by Section I.D.4, of this permit must be submitted for review and approval in accordance with the time-frame established in Section I.G.1, of this permit.

I.G. COMPLIANCE SCHEDULE

The permittee shall report to the Director in writing compliance with the requirements contained in the following compliance schedule.

I.G.1. Six months after the facility begins operation, the permittee shall submit to the Department of Environmental Quality, Waste Division, the report required by Section I.D.4, of this permit evaluating the performance of the geotextile daily cover.

develop a contingency plan which addresses conditions under which soil is required instead of the geotextile daily cover, with provisions for an ample supply of soil (at least three days supply) in proximity to the working face and the necessary equipment to apply the soil to the working face. The report required by Section I.D.4, of this permit must be submitted for review and approval in accordance with the time-frame established in Section I.G.1, of this permit.

I.G. COMPLIANCE SCHEDULE

The permittee shall report to the Director in writing compliance with the requirements contained in the following compliance schedule.

I.G.1 Six months after the facility begins operation, the permittee shall submit to the Department of Environmental Quality, Waste Division, the report required by Section I.D.4, of this permit evaluating the performance of the geotextile daily cover.

Post-it™ Fax Note 7671 | Date 11/2/94 | # of pages 1
To Henry Mu[illegible] | From Bob Jones
Co./Dept. Tayewell Co | Co. JET
Phone # | Phone #
Fax (703) 98[illegible]-3521 | Fax #

Raleigh, Summers, and Wyoming. Accordingly, the facility's Operations and Maintenance Manual has been revised to reflect this new service area. Other changes to the manual include updating the facility's landfill development timetable and personnel description.

I.H.5.b. The facility's Safety Plan has been revised to update the emergency contact list.

I.H.5.c. The facility's Design Report has been modified to update the material balance for phases I, II, III, and IV. The daily waste volume will rise from 100 tons (200 cy) to 300 tons (420 cy) a day. Through the use of alternate daily cover, the volume of the waste will increase from 3,281,530 cy to 3,662,068 cy. Because of the increase in the daily waste stream the facility's life expectancy has been revised to account for a decreased life span, from 60 years to 29 years.

I.H.6. This permit is amended in accordance with a request for a minor amendment dated September 8, 2000. Final submission of required documentation was received on December 5, 2001. The request regards the incorporation of leachate recirculation as an option for leachate management at the facility. The amendment necessitates modifications of the facility design report and operations manual. The design report is modified to update the evaluation of the amount of leachate head on the liner. The documents amended include the following:

I.H.6.a. Appendix D is added to the operations and maintenance manual to incorporate and specify the leachate recirculation methodology to be used for leachate recirculation at the landfill.

I.H.6.b. Section V.A on page 13 of the Operations and Maintenance Manual is revised to address leachate recirculation as an option for leachate management.

I.H.6.c. Pages 13, 22, 23, 25, 26, 32, and 33 of the Design Report have been revised to address design considerations relative to the incorporation of leachate recirculation as an option for leachate management.

12-1-2001

1-29 Sandy Henry 87

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
Fax (804) 698-4500 TDD (804) 698-4021
http://www.deq.state.va.us

Dennis H. Treacy
Director

(804) 698-4000
1-800-592-5482

December 21, 2000

Mr. Richard Farthing
Tazewell County Administrator
315 School Street
Tazewell, Virginia 24651

RE: Tazewell County Sanitary LF, Permit # 564
Barium Issues at Former MW-2

Dear Mr. Farthing:

This letter acknowledges the receipt and review of the November 7, 2000 letter from Environmental Monitoring, Incorporated (EMI) regarding the issue of Barium at former MW-2. Although the Department has yet to receive appropriate documentation, the Department is aware that former monitoring wells MW-2 and MW-7 have been replaced by two new wells in separate geotechnical events this fall. As a result, the Department concurs with the facility's request to wait to review the first round of groundwater sampling data from each of the new monitoring wells (November 2000) before a review of monitoring system compliance/requirements is undertaken. As noted by the Department in previous correspondence to the County, Barium has shown (5/99 event) an exceedance above the non-parametric UPL at former MW-2 thus triggering the need for the facility to provide an Alternate Source Demonstration (ASD) or advance to an Assessment monitoring program. The need to complete either or these two actions may not necessarily be alleviated by the results of the November 2000.

If you have further questions regarding the information to be discussed, please feel free to contact me (804) 698-4283 or gxchriste@deq.state.va.us.

With regards,

Geoff Christe
Environmental Engineer Senior

WP00-1442

cc: Mr. Howard Freeland, DEQ-CO
Mr. Dallas Sizemore, DEQ-SW Regional Office
Mr. Randy Porter, EMI, Coeburn, Virginia
Mr. Ronald Mullennex, Marshall Miller Associates, Bluefield, Virginia

9/5 Sandy - virginia
Sandy
Treasurer

COMMONWEALTH of VIRGINIA

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY
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Dennis H. Treacy
Director

(804) 698-4000
1-800-592-5482

August 15, 2000

Mr. Sandy Etter
Environmental Control Director
County of Tazewell
315 School Street
Box 2
Tazewell, Virginia 24651

Re: Minor Amendment of Permit No. 564
Tazewell County Sanitary Landfill
Tazewell County, Virginia

Dear Mr. Etter:

The Office of Waste Permitting has completed processing the minor amendment request dated June 2, 2000 that you submitted on behalf of Tazewell County for the referenced facility. As you know, the amendment primarily regards increasing the facility's service area and waste acceptance rate. Changes to the permit relative to the minor amendment are as follows: (1) the design report has been modified to update the material balance for phases I, II, III and IV for an increased daily waste acceptance rate from approximately 100 tons per day, to approximately 300 tons per day, and the general facility information has been updated to reflect the increased service area and disposal rate; (2) the operations and maintenance manual has been modified to reflect the increased service area and disposal rate, personnel description, and landfill development timetable, and, (3) the safety manual has been modified to update the emergency contact list. Please find enclosed the revised pages of Permit #564 that have been modified as a result of these requests. These include the following:

- A new and updated Permit Module I;
- Revised sections of the Design Report including pages 6 and 8;
- Revised sections of the Operations and Maintenance Manual including pages 1, 3, 4 and 5; and,
- Revised sections of the Safety Manual, including pages 5 and 6.

Please incorporate this revised document into all copies of the permit. Also retain a copy of this letter to document the approved modification. If you have any questions regarding this letter please contact Mr. Don Brunson at (804) 698-4239.

Sincerely,

Leslie A. Romanchik
Director
Office of Waste Permitting

Attachments

cc: Dallas Sizemore, SWRO, DEQ
Paul Farrell, OWP, DEQ (w/o attachments)
Don Brunson, OWP DEQ (w/o attachments)
Artie Kappel, OWP, DEQ (w/o attachments)

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

James S. Gilmore, III
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John Paul Woodley, Jr.
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Dennis H. Treacy
Director

(804) 698-4000
1-800-592-5482

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 564

Facility Name: Tazewell County Sanitary Landfill

Facility Type: Sanitary Landfill **Latitude:** 37:11:06 North

Site Location: Tazewell County **Longitude:** 81:26:39 West

Location Description: The facility is located near Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing closed landfill on the parcel (Permit 116/488). The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional areas for ancillary features.

Background: Tazewell County is the Permittee and the Owner/Operator of the solid waste disposal facility. The facility is to serve as a solid waste disposal site for the Virginia Counties of Tazewell, Bland, Buchanan, Dickenson, Giles, Montgomery, Russell, Pulaski, Smythe, and Wythe, and the West Virginia Counties of Monroe, Logan, McDowell, Mercer, Raleigh, and Summers, and refuse haulers having a valid permit issued by Tazewell County. The facility is authorized to receive non-hazardous municipal solid waste as specified in Permit Module II "Operations". The landfill receives approximately 300 tons (i.e., 420 cubic yards) refuse per day. Phases 1,2,3 and 4 have an ultimate capacity of about 3.8 million cubic yards and has an expected life of about 29 years. This permit was originally issued on March 2, 1994. Subsequent permit amendments are as outlined in Section I.H of Permit Module I.

Permit Highlights: This permit includes six permit modules and three permit attachments which are, in general, based on information submitted in the permit application. Permit Module I contains general permit conditions. Permit Module II is the facility's operations and maintenance manual. Permit Module III consists of the project design report and project specifications. Permit Attachment III-1 is the construction quality assurance plan. Permit Attachment III-2 is the design drawings. Permit Module X contains regulatory conditions with regard to groundwater monitoring, and Permit Attachment X-1 is the facility groundwater-monitoring plan. Permit Module XII is the facility's closure plan and Module XIII is the post closure care plan. The liner design of the facility incorporates a composite liner consisting of 2 feet of clay overlaid by a 60-mil synthetic flexible membrane liner (FML). There is also a provision for a trial use of alternate daily cover, which is a geotextile material. The groundwater-monitoring network for this facility includes two (2) upgradient (background) wells and six (6) downgradient monitoring wells. The permittee shall sample and analyze all monitoring wells at least semiannually. Section I.H. of permit module I contains dates and details of amendments to this permit.

Permit Amendment: This permit is amended in accordance with a request for a minor amendment dated June 6, 2000. The request regards modifications of the design report, operations manual and safety manual. The design report is modified to update the material balance for phases I, II, III and IV for an increased daily waste volume and the general facility information is updated to show an increased service area as well as a reduced facility life expectancy; from 60 to 29 years. The operations and maintenance manual are modified to show an updated service area, personnel description, and landfill development timetable. The safety manual is modified to update the emergency contact list. This amendment is documented in greater detail in Permit Module I, Section I.H.5.

THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, III, X, XII, XIII, and Permit Attachments III-1, III-2 and X-1. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein-described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board.
Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of § 10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended.

Issued:	March 2, 1994
Amendment I:	December 7, 1994
Amendment II:	April 19, 1995
Amendment III:	December 28, 1995
Amendment IV:	March 2, 1998

APPROVED:

Jessie A Romanchik

for Dennis H. Treacy

DATE: August 15, 2000
Amendment V (Minor)

DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF PERMITTING MANAGEMENT
629 EAST MAIN STREET
RICHMOND, VA 23219
FAX - (804) 698-4383

FAX TRANSMITTAL SHEET

DATE: 7-28-98
TIME: 12:05
TO: Henry Murray / Sandy Ethor
COMPANY: Tazewell County
FAX #: 540-988-4246 / 988-6003

FROM:

DONALD BRUNSON
ENVIRONMENTAL ENGINEER SENIOR
(804) 698-4239

REMARKS:

Here ye go! Good luck!

5 pages including transmittal sheet

COMMONWEALTH of VIRGINIA

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY
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http://www.deq.state.va.us

Dennis H. Treacy
Director

(804) 698-4000
1-800-592-5482

July 28, 1998

Mr. C. Richard Farthing
County Administrator
Tazewell County Board of Supervisors
Administration Building
315 School Street
Tazewell, Virginia 24651

RE: Tazewell County Sanitary Landfill
Certificate of Operation for Phase 2
Permit # 564
Tazewell County, Virginia

Dear Mr. Farthing:

This correspondence is in response to the letter of completion from Mr. Joseph W. Sulesky, P.E., of Almes & Associates, Inc., submitted on behalf Tazewell County for the referenced facility. Based on the visual inspection conducted by the Department on Friday, June 26, 1998, and the certification signed and stamped by Mr. Sulesky, Quality Assurance Engineer, dated July 22, 1998, and the certification signed by Mr. Henry Murray, P.E., Design Engineer, Tazewell County Planner/Engineer, and dated July 22, 1998, you are now authorized to operate Phase 2, as indicated on the as built (record) drawings[1] of the Tazewell County Sanitary Landfill in accordance with Permit No. 564, issued to Tazewell County.

This Certificate to Operate is provided with the condition that the items identified during the inspection that need completion, as noted on the attached checklist, be completed as indicated and scheduled. As discussed during the inspection, staking the limits of the northeast perimeter of the cell, and repairing erosion damage to the drainage layer must be competed prior to placement of waste in that area, or within 30 days minimum. Also, the excavation area just north of that perimeter needs to be graded and\or stabilized within 90 days.

[1] Construction Quality Assurance Monitoring Services and Certification Documentation, Volumes I and II, Phase II Construction, Tazewell County Sanitary Landfill, Tazewell County Board of Supervisors, prepared by Almes & Associates, Inc., and dated June 1998.

Thank you for your cooperation in the operation of this facility. Please do not hesitate to call me at (804) 698-4214 if you have any questions.

Sincerely,

Paul Farrell
Environmental Engineer Consultant
Office of Waste Permitting

Attachment

cc: Henry Murray, P.E., Tazewell County
Sandy Etter, Tazewell County
Joseph W. Sulesky, P.E., Almes & Associates, Inc.
Dallas Sizemore, DEQ, SWRO
Linda Stull, DEQ, SWRO
Paul Farrell, DEQ, OWP

SECTION VA REGS	ITEM	COMPLETE (Y/N)	PERCENT COMPLETE	PROJECTED COMPLETION	REMARKS
5.1.B.1	ACCESS CONTROL (locking gate?)	Y			locking gate
	Fencing	NA			
	Chain-link	NA			
	Farm Fence	Y			
	Guard Service	N			
5.1.B.2	ACCESS ROAD DESIGN/CONSTRUCTION				
	Access roadway	Y			
	Stone perimeter road	Y			
5.1.B.3	SHELTER AND SANITARY FACILITIES	Y			
	Scale house building	Y			
	Admin & maintenance building	Y			Nice new building
	Sanitary facilities	Y			
5.1.B.4	AESTHETICS				
	Additional Screening	NA			None needed due to remote location of site.
	Additional Landscaping	NA			
5.1.B.5	SITE COMMUNICATION				
	Ground telephone communication	Y			
	Interior radio communication	Y			
5.1.B.6	STORM WATER CONTROL				
	Sedimentation Basin	Y			Existing, no new sed basins assoc. w/ Phase 2.
	Seeding of ditches, slopes & bare areas	N			Grade, seed and stabilize area northeast of cell

SECTION VA REGS	ITEM	COMPLETE (Y/N)	PERCENT COMPLETE	PROJECTED COMPLETION	REMARKS
5.1.B.11	LEACHATE MANAGEMENT				
	8 inche HDPE Liner Penetration	Y			Existing
	Gravity system	Y			Existing
	Leachate storage	Y			Existing leachate storage tank.
5.1.B.16	BENCHMARKS	Y			
5.1.C.3	ATTENDANT ON DUTY	Y			
5.1.C.7	GAS MANAGEMENT PLAN	Y			No new probes installed in assoc. w/ Phase 2.
5.1.C.11	STORMWATER CONTROL SYSTEM	Y			No new basins assoc. w/ Phase 2.
5.1.D	GROUNDWATER MONITORING				
	Monitoring well installation	NA			No new wells installed in assoc. w/ Phase II.
	Pre-operational monitoring	NA			
2.10.D	FINANCIAL ASSURANCE	Y			Estimate has been submitted
VA Regs	DISCLOSURE STATEMENT	Y			
VA Regs	OPERATION CERTIFICATION	Y			
	CELL CONSTRUCTION				Completed per QA/QC P.E. Certification
	Phase II (4.9 acres)	Y			
	Base grades	Y			
	2 foot clay liner (1×10^{-7})	Y			
	60 mil HDPE geomembrane	Y			
	non woven Geotextile (14oz)	Y			
	18 inch drainange layer (3×10^{-2})	Y			
	geonet composite on slopes covered with 18 inches soil	Y			
	Built up access road into cell	Y			
	Stake limits of waste/liner edge	N			Stake northeast permimeter within 30 days.

COMMONWEALTH of VIRGINIA

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
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http://www.deq.state.va.us

Dennis H. Treacy
Director

(804) 698-4000
1-800-592-5482

July 28, 1998

Mr. C. Richard Farthing
County Administrator
Tazewell County Board of Supervisors
Administration Building
315 School Street
Tazewell, Virginia 24651

RE: Tazewell County Sanitary Landfill
Certificate of Operation for Phase 2
Permit # 564
Tazewell County, Virginia

Dear Mr. Farthing:

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[1] Construction Quality Assurance Monitoring Services and Certification Documentation, Volumes I and II, Phase II Construction, Tazewell County Sanitary Landfill, Tazewell County Board of Supervisors, prepared by Almes & Associates, Inc., and dated June 1998.

Thank you for your cooperation in the operation of this facility. Please do not hesitate to call me at (804) 698-4214 if you have any questions.

Sincerely,

Paul Farrell
Environmental Engineer Consultant
Office of Waste Permitting

Attachment

cc: Henry Murray, P.E., Tazewell County
Sandy Etter, Tazewell County
Joseph W. Sulesky, P.E., Almes & Associates. Inc.
Dallas Sizemore, DEQ, SWRO
Linda Stull, DEQ, SWRO
Paul Farrell, DEQ, OWP

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	Chain-link	NA			
	Farm Fence	Y			
	Guard Service	N			
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	Access roadway	Y			
	Stone perimeter road	Y			
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	Scale house building	Y			
	Admin & maintenance building	Y			Nice new building
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	Additional Landscaping	NA			
5.1.B.5	SITE COMMUNICATION				
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	Interior radio communication	Y			
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5.1.C.7	GAS MANAGEMENT PLAN	Y			No new probes installed in assoc. w/ Phase 2.
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	Pre-operational monitoring	NA			
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	Base grades	Y			
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	18 inch drainange layer (3 x 10^{-2})	Y			
	geonet composite on slopes covered with 18 inches soil	Y			
	Built up access road into cell	Y			
	Stake limits of waste/liner edge	N			Stake northeast permimeter within 30 days.

EMI
PROFESSIONAL SERVICES
ENVIRONMENTAL MONITORING, INCORPORATED
ENVIRONMENTAL CONSULTANTS ▲ ANALYTICAL LABORATORIES
P.O. BOX 1477 ▲ COEBURN, VIRGINIA 24230 ▲ 540/395-3661

November 8, 1996

VA Department of Environmental Quality
P.O. Box 10009
Richmond, VA 23240-0009

ATTN: Mr. Shawn Davis

RE: Request for Permit Modification Tazewell County Landfill
Tazewell, Virginia, Permit No. 564
EMI Project No. 388.12

Dear Mr. Davis:

This letter is intended to introduce a request for permit modification on the above referenced permit in Tazewell, Virginia. As we have discussed by telephone we understand this request to be considered a minor modification affecting the groundwater sampling plan for the facility. The request only concerns a change in the sampling method and does not affect the analysis schedule, method for data interpretation or reporting. The facility intends to install dedicated teflon and stainless steel bladder pumps. This is a change from the permit conditions indicating the use of portable non-dedicated pumps or bailers.

Please find the enclosed pages revised from the original approved permit which are pertinent to the request for modification. The revised pages are Table of Contents pages iii through iv and page numbers 15 through 24 of Permit Attachment X-1 "Groundwater Monitoring Plan" prepared by Marshall Miller and Associates. The revised pages are identified with the same page numbers as those to be replaced and are marked with the revision date (Revision 11/96).

Groundwater monitoring at the Tazewell County Landfill has indicated a high turbidity and solids level in a number of the wells monitored. The current procedure which utilizes bailers to purge and sample the wells is proposed to be replaced by what is considered to be a more suitable method for these conditions. The new method will utilize dedicated bladder pumps capable of very low flow rates. It is our opinion the proposed method will reduce the potential influence from the turbidity and solids in the low producing wells. In order to achieve the maximum benefit from this pump system under the conditions existing at the facility we also propose to use the pumps to provide a low flow, low purge volume technique. By pumping water from the well casing at low flow rates between 100 and 500 ml/min we hope to minimize turbulence

in the well and formation. Because of the sites sensitive nature concerning metals concentrations we believe this technique to be best suited to the subject wells. By minimizing the volume of water necessary to be pumped from the well prior to collecting a representative sample we also reduce the potential impact of solids on the sample. This technique has been used successfully under similar conditions to provide representative qualitative samples of formation water. By pumping at low flow rates from the upper section of the screened interval the method allows for consistent removal of only the water surrounding the pump and between the pump and fresh formation water. This minimizes the total volume of purge waters requiring handling and disposal at the surface. Studies have indicated representative groundwater is available for collection as soon as the field parameters pH, ORP, Conductivity and Temperature have stabilized. The details of this method are given in the content of the revised pages submitted as attachment to this letter. In order to keep the sampling method consistent between all wells at the facility it is proposed to adopt this methodology for all wells requiring detection monitoring activities at this facility. This will also allow for further comparison of the results from the two sampling methods on the upgradient wells and the better producing wells at the subject site. We expect to experience no significant change in the water quality analysis from these wells. If there is a change in the quality indicated by the low producing and high turbidity wells we expect to see this change indicate lower metals concentrations. The proposed modification is expected to yield a more reliable and representative sample for groundwater quality at this facility.

Respectfully submitted,

ENVIRONMENTAL MONITORING, INC.

R. J. Porter, Chemist
President

enclosures

cc: Henry Murray, Tazewell County
Sandy Etter, Tazewell County

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Peter W. Schmidt
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

January 2, 1996

Mr. C. Richard Farthing
County Administrator
Tazewell County
315 School Street
Box 2
Tazewell, Virginia 24651

Summary of Amendments are on page I-6

Dear Mr. Farthing:

The Office of Waste Resource Management received a minor amendment request dated October 23, 1995. Please find enclosed the pages of Permit #564 that have been modified as a result of this request. Please incorporate these pages into all copies of the permit. The Director of DEQ or his designated representative has approved the minor amendment effective December 28, 1995. The details and conditions of the approval are outlined in section I.H.3 of permit module I.

If you have any questions, or desire any additional information, please do not hesitate to contact me at (804) 698-4239.

Sincerely,

Donald H. Brunson III
Environmental Engineer Senior
Office of Permitting Management

Enclosure

c: Henry Murray, P.E., Tazewell County (w/ enclosure)
Sandy Etter, Tazewell County (w/ enclosure)
Dallas Sizemore, DEQ, SWRO (w/ enclosure)
E. Paul Farrell, Jr., DEQ (w/o enclosure)

tazamnd3.mem

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 564

Peter W. Schmidt
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

Facility Name: Tazewell County Sanitary Landfill

Facility Type: Sanitary Landfill **Latitude:** 37:11:06 North

Site Location: Tazewell County **Longitude:** 81:26:39 West

Location Description: The facility is located near Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing landfill on the parcel (Permit 116/488) which is to be closed once the new landfill area is ready for operation. The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional areas for ancillary features.

Background: Tazewell County is the Permittee and the Owner/Operator of the solid waste disposal facility. The facility is to serve as a solid waste disposal site for Tazewell County, Towns of Tazewell, Bluefield, Richlands, Cedar Bluff, and Pocahontas, and refuse haulers having a valid permit issued by Tazewell County. The facility is authorized to receive non-hazardous municipal solid waste as specified in Permit Module II "Operations". The landfill receives approximately 100 tons (i.e., 200 cubic yards) refuse per day. Phases 1,2,3, and 4 have a ultimate capacity of about 3.8 million cubic yards and has an expected life of about 60 years. This permit was originally issued on March 2, 1994. Subsequent permit amendments are as outlined in Section I.H of Permit Module I.

Page I-6

Permit Highlights: This permit includes six permit modules and three permit attachments which are, in general, based on information submitted in the permit application. Permit Module I contains general permit conditions. Permit Module II is the facility's operations and maintenance manual. Permit Module III consists of the project design report and project specifications. Permit Attachment III-1 is the construction quality assurance plan. Permit Attachment III-2 is the design drawings. Permit Module X contains regulatory conditions with regard to groundwater monitoring, and Permit Attachment X-1 is the facility groundwater monitoring plan. Permit Module XII is the facility's closure plan and Module XIII is the post closure care plan. The liner design of

the facility incorporates a composite liner consisting of 2 feet of clay overlayed by a 60 mil synthetic flexible membrane liner (FML). There is also a provision for a trial use of alternate daily cover which is a geotextile material. The groundwater monitoring network for this facility includes two (2) upgradient (background) wells and six (6) downgradient monitoring wells. The permittee shall sample and analyze all monitoring wells at least semiannually. Section I.H. of permit module I contains dates and details of amendments to this permit.

THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, III, X, XII, XIII, and Permit Attachments III-1, III-2 and X-1. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of § 10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended.

Issued:	March 2, 1994
Amendment I:	December 7, 1994
Amendment II:	April 19, 1995

APPROVED:

Peter W. Schmidt
Director

DATE: 12/28/95
(Amendment III)

I.H.2 This permit is amended (Amendment 2) per minor permit amendment request dated March 20, 1995, [§7.14, VR 672-20-10]. The minor modification is to revise the Practical Quantitation Limit (PQL) specified for analyses of volatile organic constituents. The revised replacement pages have been inserted into Permit Attachment X-I, Groundwater Monitoring Plan.

I.H.3 This permit is amended (Amendment 3) per minor permit amendment request dated October 23, 1995, [§7.14, VR 672-20-10]. The modification is to reduce the number and spacing of gas monitoring probes as classified in Section G-2 of Appendix 7.4. The County's justification for the reduction in gas monitoring wells is (1) the remote location of the landfill and (2) lack of inhabited structures within 1000 feet of the facility boundary. In the event these conditions change the gas monitoring plan will be so modified as agreed upon by the Department to consider said change. The revised replacement pages, page 16 of the operations manual and page 34 of the design report, are to be inserted into Permit Modules II and III respectively, and revised design drawings 15 and 16 are to be inserted into Permit Attachment III-2.

frequency will be increased as described in the Response paragraph of this section. Refer to the Gas Management Plan, Drawing No.16, for the locations of on-site structures and gas detection probes.

Gas detection probes will be placed around the waste disposal unit boundary to the west, north, and east and adjacent to the on-site structures. No probes are porposed along the southern boundary. Potential horizontal gas migration to the south will vent to the atmoshphere within the facility property boundary vial the hollow south of the fill area.

Probe installation as shown on drawings 15 and 16 are located such that two monitoring probes are along the northern property line approximately 1040 feet apart; two probes are along the western edge of the waste area, approximately 950 feet apart; and one probe is located along the eastern propertly line.

If additional deelopment occurs within 1,000 feet of the facility boundary, intermediate probes will be installed between the probes to narrow the spacing to a maximum of 250 feet.

The gas detection probes will extend a minmum of 5 feet into the soil, backfilled with 1" clean store for a depth of 4 feet, and extending upward 5 feet above ground connected to an inverted "U" section.

VI.B.2 PROCEDURE

Equipment: A portable combustible gas monitor, measuring the concentration of explosive gases in units of percent of lower explosive limit(LEL) of menthane from 0 to100 percent LEL shall initially be used to

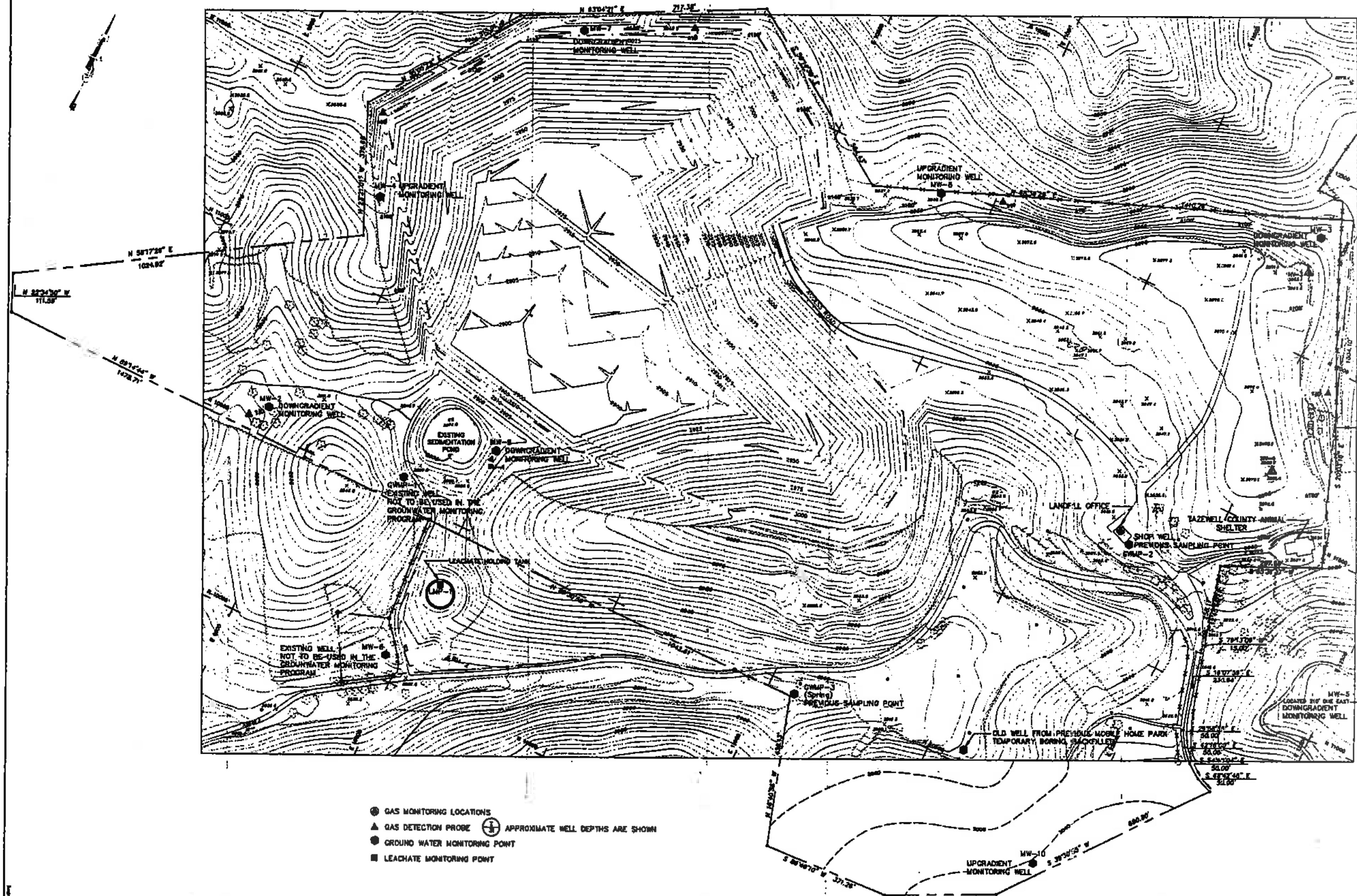
locations of on-site structures and gas detection probes.

Gas detection probes will be placed around the waste disposal unit boundary to the west, north, and east. No probes are porposed along the southern boundary. Potential horizontal gas migration to the south will vent to the atmoshphere within the facility property boundary via the hollow south of the fill area.

Probe installation as shown on drawings 15 and 16 are located such that two monitoring probes are along the northern property line approximately 1040 feet apart; two probes are along the western edge of the waste area, approximately 950 feet apart; and one probe is located along the eastern property line.

If additional development occurs within 1,000 feet of the facility boundary, intermediate probes will be installed between the probes to narrow the spacing to a maximum of 250 feet.

The gas detection probes will extend a minmum of 5 feet into the soil, backfilled with 1" clean store for a depth of 4 feet, and extending upward 5 feet above ground connected to an inverted "U" section.



DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP
	REVISED NUMBER GAS DETECTION PROBES																

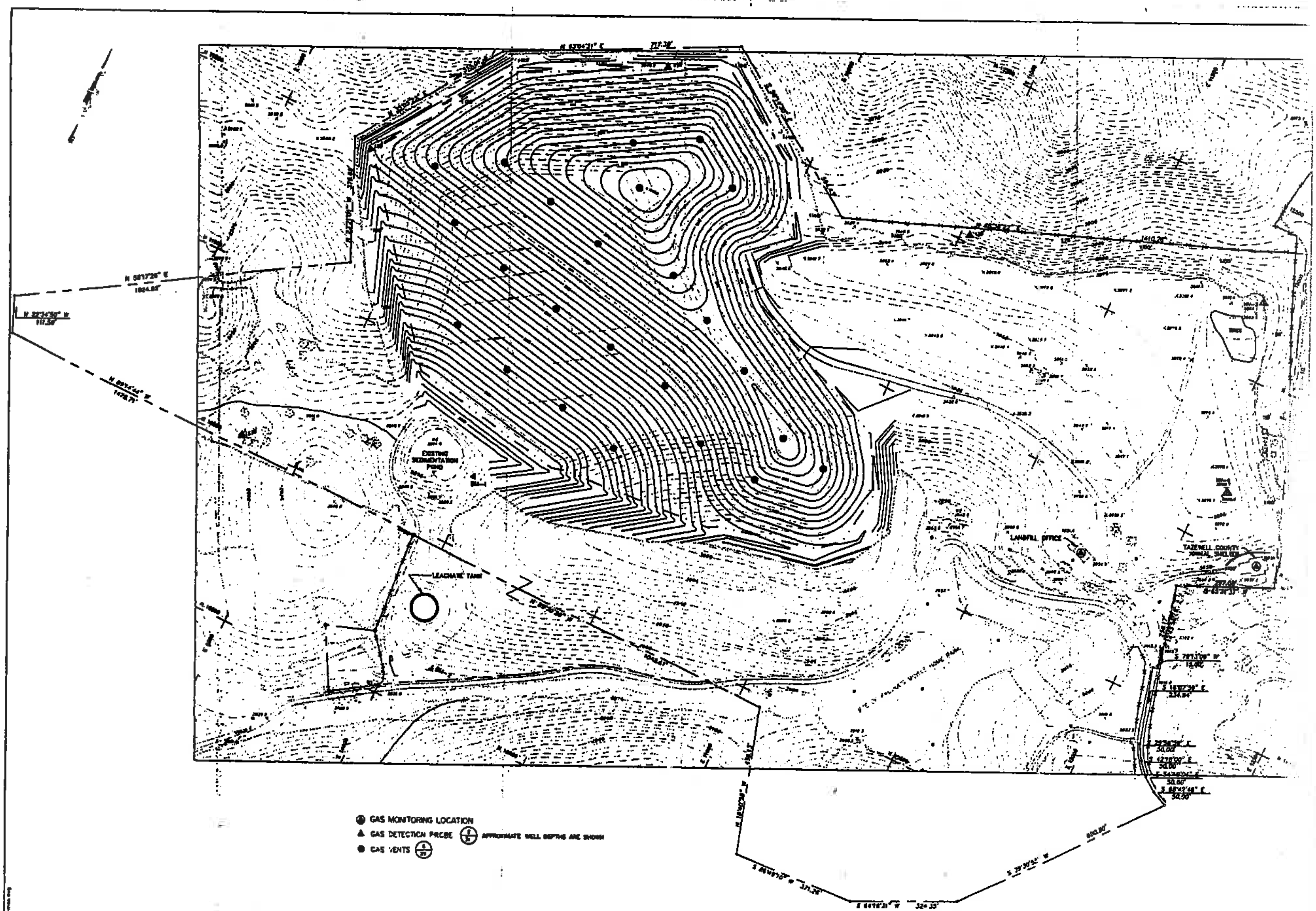
SCALE: 1" = 100'

PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

SITE MONITORING PLAN

DRAWING NO. 15



SCALE	1" = 100'
PROJECT NO.	189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

GAS MANAGEMENT PLAN

DRAWING NO. 16

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Peter W. Schmidt
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

June 23, 1995

Mr. Henry Murray
County Engineer
Tazewell County
315 School Street, Box 2
Tazewell, Virginia 24651

SUBJECT: Statistical Evaluation of Groundwater Analysis Results for First Detection Monitoring Event, Tazewell County Sanitary Landfill, Permit #564.

Dear Mr. Murray:

The Department is in receipt of your groundwater consultant's (Marshall Miller & Associates) report dated June 9, 1995. The report presented a demonstration related to the causes of apparent statistical differences for few metals namely cadmium, beryllium and zinc in monitoring wells MW-7 and MW-9 as indicated in an earlier report dated April 1995. The Department has reviewed the report and has approved the demonstration. The owner or operator of the above referenced facility may continue final detection monitoring.

If you or your consultants have any questions, please don't hesitate to call me at (804)-527-5008.

Sincerely,

Golam Mustafa

Golam Mustafa, PH. D.
Environmental Engineer Consultant

CC: Mr. Howard Freeland - DEQ - Waste Division
Mr. Mike Overstreet, Southwest Regional Office, Abingdon
Mr. Ronald H. Mullennex, Marshall Miller & Associates
Bluefield Virginia Industrial Park
P.O. Box 840
Bluefield, VA 24605

Post-It™ brand fax transmittal memo 7671 | # of pages ▸

To Mark Smith	From H. Murray
Co. MMA	Co. Fay. Co!
Dept.	Phone #
Fax #	Fax #

5/24 copy: Henry M
Sandy E
07

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

APR 21 1995

TAZEWELL COUNTY
BOARD OF SUPERVISORS
RECEIVED
APR 24 1995
TAZEWELL, VA 24651

Peter W. Schmidt
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

Mr. C. Richard Farthing
County Administrator
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

RE: Tazewell County Sanitary Landfill, Permit No. 564
Groundwater Monitoring Program - Background Data

Dear Mr. Farthing:

This letter is to confirm the Department's concurrence with the use of the Practical Quantitation Limits outlined in the second minor amendment approved on April 20, 1995, when interpreting the background data generated for the referenced facility.

The previously generated data provided method detection limits and not practical quantitation limits which depressed the background data significantly. Currently, the Department allows for use of Practical Quantitation Limits higher than those specified in the facility permit, thus necessitating the need for the minor permit amendment. It is our understanding that the results of the statistics will be submitted by April 28, 1995.

Should you have question concerning this matter, please contact me at 9804) 527-5116.

Sincerely,

Shawn E. Davis

Shawn E. Davis
Environmental Engineer Senior

cc: James R. Burns, Marshall Miller & Associates
Dallas Sizemore, DEQ
Howard Freeland, DEQ
Golam Mustafa, DEQ

5/24 copy: Henry M
Sandy E

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Peter W. Schmidt
Director

APR 20 1995

TAZEWELL COUNTY
BOARD OF SUPERVISORS
RECEIVED
APR 24 1995
TAZEWELL, VA 24651

P.O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

Mr. C. Richard Farthing
County Administrator
Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

RE: Tazewell County Sanitary Landfill, Permit #564
Permit Amendment - Groundwater Monitoring Program

Dear Mr. Farthing:

The Department has received a request from your consultant, Marshall Miller & Associates, for a minor amendment to the subject permit. The minor amendment is approved. Please find attached a revised Module I and copies of the revised permit pages for inclusion in your permit. The Department has updated its copy of the permit and provided notice to the regional office, via this correspondence, of the amendment.

Should you have any questions concerning this matter, please contact Shawn Davis of my staff at (804) 371-2972.

Sincerely,

Hassan Vakili

Hassan Vakili
Director, Waste Operations

Attachments

cc: Ron Mullinex, Marshall Miller & Associates
Dallas Sizemore, DEQ
Howard Freeland, DEQ
Don Brunson, DEQ

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 564

Peter W. Schmidt
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

Facility Name: Tazewell County Sanitary Landfill

Facility Type: Sanitary Landfill **Latitude:** 37:11:06 North

Site Location: Tazewell County **Longitude:** 81:26:39 West

Location Description: The facility is located near Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing landfill on the parcel (Permit 116/488) which is to be closed once the new landfill area is ready for operation. The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional areas for ancillary features.

Background: Tazewell County is the Permittee and the Owner/Operator of the solid waste disposal facility. The facility is to serve as a solid waste disposal site for Tazewell County, Towns of Tazewell, Bluefield, Richlands, Cedar Bluff, and Pocahontas, and refuse haulers having a valid permit issued by Tazewell County. The facility is authorized to receive non-hazardous municipal solid waste as specified in Permit Module II "Operations". The landfill receives approximately 100 tons (i.e., 200 cubic yards) refuse per day. Phases 1,2,3, and 4 have a ultimate capacity of about 3.8 million cubic yards and has an expected life of about 60 years. This permit was originally issued on March 2, 1994. Subsequent permit amendments are as outlined in Section I.H of Permit Module I.

Permit Highlights: This permit includes six permit modules and three permit attachments which are, in general, based on information submitted in the permit application. Permit Module I contains general permit conditions. Permit Module II is the facility's operations and maintenance manual. Permit Module III consists of the project design report and project specifications. Permit Attachment III-1 is the construction quality assurance plan. Permit Attachment III-2 is the design drawings. Permit Module X contains regulatory conditions with regard to groundwater monitoring, and Permit Attachment X-1 is the facility groundwater monitoring plan. Permit Module XII is the facility's closure plan and Module XIII is the post closure care plan. The liner design of

629 East Main Street, Richmond, Virginia 23219 ~ Fax (804) 762-4500 ~ TDD (804) 762-4021

the facility incorporates a composite liner consisting of 2 feet of clay overlayed by a 60 mil synthetic flexible membrane liner (FML). There is also a provision for a trial use of alternate daily cover which is a geotextile material. The groundwater monitoring network for this facility includes two (2) upgradient (background) wells and six (6) downgradient monitoring wells. The permittee shall sample and analyze all monitoring wells at least semiannually. Section I.H. of permit module I contains dates and details of amendments to this permit.

THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, III, X, XII, XIII, and Permit Attachments III-1, III-2 and X-1. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of § 10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended.

Issued: March 2, 1994
Amendment I: December 7, 1994

APPROVED:

Hassan Vakil
For Peter W. Schmidt
Director

DATE: 4-19-95
(Amendment II)

I.H.2 This permit is amended (Amendment 2) per minor permit amendment request dated March 20, 1995, [§7.14, VR 672-20-10]. The minor modification is to revise the Practical Quantitation Limit (PQL) specified for analyses of volatile organic constituents. The revised replacement pages have been inserted into Permit Attachment X-I, Groundwater Monitoring Plan.

JOYCE
ENGINEERING, INC.

Joyce Engineering, Inc.
701 Mercer Street
P.O. Box 1886
Princeton, West Virginia 24740
Tel (304) 487-6107
Fax (304) 487-1630

January 17, 1995

Henry Murray, P.E.
County Engineer
Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, VA 24651

RE: TAZEWELL COUNTY SANITARY LANDFILL

Dear Henry:

I am writing as a follow-up to our meeting yesterday at the Tazewell County Sanitary Landfill. As we discussed at the meeting and as I discussed with Philip Bailey by phone, Bid Items 2 and 3 include excavation and placement of material, whether it be controlled fill or stockpile placement. Bid Item 5 includes excavation and placement of the soil liner material. Bid Item 14 includes excavation and placement of the protective cushion soil. The excavation of material for Bid Items 5 and 14 should be paid under these Bid Items and not included in the quantities of Bid Items 2 and 3. Including the quantities of Bid Items 5 and 14 with Items 2 and 3 will result in paying for this excavation twice.

I hope this clarifies the issue. Joyce Engineering, Inc. feels this project is complete, has been approved by the Virginia Department of Environmental Quality and is operational. We request that further discrepancies or claims made by the contractor be resolved by the County and contractor unless you feel it is absolutely necessary to involve Joyce Engineering, Inc.

We have enjoyed working for the County in obtaining its Solid Waste Facility permit and providing services throughout construction. Please call if you have any questions.

Sincerely,
Joyce Engineering, Inc.

Joseph W. Sulesky, P.E.

JS:esc

c: Jeff Sample, G.I.T.
L. E. Joyce, Jr., P.E.
Linda Walker

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

OFFICE OF WASTE RESOURCE MANAGEMENT

Peter W. Schmidt
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

December 13, 1994

Mr. C. Richard Farthing
County Administrator
Tazewell County
315 School Street
Box 2
Tazewell, Virginia 24651

Dear Mr. Farthing:

The Office of Waste Resource Management received a minor amendment request dated November 18, 1994. Please find enclosed the pages of Permit #564 that have been modified as a result of this request. Please incorporate these pages into all copies of the permit. Mr. Hassan Vakili, Acting Director of the DEQ Waste Division, has approved the minor amendment effective December 2, 1994. The details and conditions of the approval are outlined in section I.H. of permit module I.

If you have any questions, or desire any additional information, please do not hesitate to contact me at (804) 527-5109.

Sincerely,

Donald H. Brunson III
Environmental Engineer Senior

Enclosure

c: Henry Murray, P.E., Tazewell County (w/ enclosure)
Sandy Etter, Tazewell County (w/ enclosure)
T.L. Henderson, DEQ, RRO (w/ enclosure)
E. Paul Farrell, Jr., DEQ (w/o enclosure)
Olin Willis, DEQ Abingdon (w/ enclosure)
Ulysses Brown, DEQ (w/ enclosure)

#SW94-0432R

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 564

Peter W. Schmidt
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

Facility Name: Tazewell County Sanitary Landfill

Facility Type: Sanitary Landfill **Latitude:** 37:11:06 North

Site Location: Tazewell County **Longitude:** 81:26:39 West

Location Description: The facility is located near Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing landfill on the parcel (Permit 116/488) which is to be closed once the new landfill area is ready for operation. The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional areas for ancillary features.

Background: Tazewell County is the Permittee and the Owner/Operator of the solid waste disposal facility. The facility is to serve as a solid waste disposal site for Tazewell County, Towns of Tazewell, Bluefield, Richlands, Cedar Bluff, and Pocohontas, and refuse haulers having a valid permit issued by Tazewell County. The facility is authorized to receive non-hazardous municipal solid waste as specified in Permit Module II "Operations". The landfill receives approximately 100 tons (i.e., 200 cubic yards) refuse per day. Phases 1,2,3, and 4 have a ultimate capacity of about 3.8 million cubic yards and has an expected life of about 60 years. This permit was originally issued on March 2, 1994, and has been amended to allow for changes as outlined in Section I.H. of permit module I.

Permit Highlights: This permit includes six permit modules and three permit attachments which are, in general, based on information submitted in the permit application. Permit Module I contains general permit conditions. Permit Module II is the facility's operations and maintenance manual. Permit Module III consists of the project design report and project specifications. Permit Attachment III-1 is the construction quality assurance plan. Permit Attachment III-2 is the design drawings. Permit Module X contains regulatory conditions with regard to groundwater monitoring, and Permit Attachment X-1 is the facility groundwater monitoring plan. Permit Modules XII is the

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facility's closure plan and Module XIII is the post closure care plan. The liner design of the facility incorporates a composite liner consisting of 2 feet of clay overlain by a 60 mil synthetic flexible membrane liner (FML). There is also a provision for a trial use of alternate daily cover which is a geotextile material. The groundwater monitoring network for this facility includes two (2) upgradient (background) wells and six (6) downgradient monitoring wells. The permittee shall sample and analyze all monitoring wells at least semiannually. Section I.H. of permit module I contains dates and details of amendments to this permit.

THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, III, X, XII, XIII, and Permit Attachments III-1, III-2 and X-1. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of § 10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended.

Issued: March 2, 1994

APPROVED:

Hassan Vakili
For Peter W. Schmidt
Director

DATE: 12/7/94
(Amendment I)

PERMIT MODULES AND PERMIT ATTACHMENTS[1]

REFERENCE LIST

PERMIT MODULE I -- GENERAL PERMIT CONDITIONS AND AMENDMENTS

PERMIT MODULE II[2] -- OPERATIONS

PERMIT MODULE III -- DESIGN AND CONSTRUCTION

PERMIT ATTACHMENT III-1 -- CONSTRUCTION QUALITY ASSURANCE PLAN

PERMIT ATTACHMENT III-2 -- DESIGN DRAWINGS

PERMIT MODULE X -- GROUNDWATER MONITORING - FINAL DETECTION

PERMIT ATTACHMENT X-1 -- GROUNDWATER MONITORING PROGRAM

PERMIT MODULES XII AND XIII[3] -- CLOSURE AND POST-CLOSURE CARE

NOTES:

1. Should information contained in any permit module that consists of documents submitted by the permittee, conflict with the any requirement or condition contained in the permit modules I, X, or the VR 672-20-10, the regulatory/permit module requirement or condition shall prevail (unless an appropriate variance has been granted). The Department is not responsible for spelling, typographical, or syntax errors in modules based on information submitted by the permittee. As permit attachments are typically extracts from submitted information, they may contain references to calculations or other supporting information which is omitted from the permit document. However, all information submitted in support of the permit application may be found in Department files.

2. The Emergency/Contingency Plan (Appendix B of Permit Module II), may be revised with Department approval.

3. The Closure Plan (contained in Permit Module XII), may be revised. The amended plan shall be placed in the operating record. An alternate final cover design must be approved by the Department.

develop a contingency plan which addresses conditions under which soil is required instead of the geotextile daily cover, with provisions for an ample supply of soil (at least three days supply) in proximity to the working face and the necessary equipment to apply the soil to the working face. The report required by Section I.D.4, of this permit must be submitted for review and approval in accordance with the time-frame established in Section I.G.1, of this permit.

I.G. COMPLIANCE SCHEDULE

The permittee shall report to the Director in writing compliance with the requirements contained in the following compliance schedule.

I.G.1. Six months after the facility begins operation, the permittee shall submit to the Department of Environmental Quality, Waste Division, the report required by Section I.D.4, of this permit evaluating the performance of the geotextile daily cover.

I.H. PERMIT AMENDMENTS

I.H.1. This permit is amended (Amendment 1) per minor permit amendment request dated November 18, 1994, [§7.14, VR 672-20-10]. The minor modifications are as follows:

I.H.1.a. § 8.4, VR 672-20-10 allows for the approval of alternate burial of tires without cutting or splitting provided the method will assure that tires will not emerge from the facility. The permittee desires to hand place the tires directly on the drainage layer prior to the deposition of waste. As the tires are placed flat on the un-yielding drainage layer only at the bottom of the cell it is not likely that they will emerge. Approval is conditional in that this alternate method of burial is only allowed on the relatively flat base grade of the cell, and not on the steeper side slopes. Further, prior to placement in subsequent cells, a written report on the effectiveness of this method of burial shall be submitted prior to the acceptance of waste.

I.H.1.b. The permittee proposes to use woven HDPE fabric with two LDPE ply membranes to cover the drainage layer of new cells to prevent the intrusion of storm water into the leachate collection system. The run-off from the fabric will be directed to storm water appurtenances.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 564

Peter W. Schmidt
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

Facility Name: Tazewell County Sanitary Landfill

Facility Type: Sanitary Landfill **Latitude:** 37:11:06 North

Site Location: Tazewell County **Longitude:** 81:26:39 West

Location Description: The facility is located near Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing landfill on the parcel (Permit 116/488) which is to be closed once the new landfill area is ready for operation. The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional areas for ancillary features.

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facility's closure plan and Module XIII is the post closure care plan. The liner design of the facility incorporates a composite liner consisting of 2 feet of clay overlain by a 60 mil synthetic flexible membrane liner (FML). There is also a provision for a trial use of alternate daily cover which is a geotextile material. The groundwater monitoring network for this facility includes two (2) upgradient (background) wells and six (6) downgradient monitoring wells. The permittee shall sample and analyze all monitoring wells at least semiannually. Section I.H. of permit module I contains dates and details of amendments to this permit.

THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, III, X, XII, XIII, and Permit Attachments III-1, III-2 and X-1. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of § 10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended.

Issued: March 2, 1994

APPROVED:

Hassan Vakili
For Peter W. Schmidt
Director

DATE: 12/7/94
(Amendment I)

PERMIT MODULES AND PERMIT ATTACHMENTS[1]

REFERENCE LIST

PERMIT MODULE I -- GENERAL PERMIT CONDITIONS AND AMENDMENTS

PERMIT MODULE II[2] -- OPERATIONS

PERMIT MODULE III -- DESIGN AND CONSTRUCTION

PERMIT ATTACHMENT III-1 -- CONSTRUCTION QUALITY ASSURANCE PLAN

PERMIT ATTACHMENT III-2 -- DESIGN DRAWINGS

PERMIT MODULE X -- GROUNDWATER MONITORING - FINAL DETECTION

PERMIT ATTACHMENT X-1 -- GROUNDWATER MONITORING PROGRAM

PERMIT MODULES XII AND XIII[3] -- CLOSURE AND POST-CLOSURE CARE

NOTES:

1. Should information contained in any permit module that consists of documents submitted by the permittee, conflict with the any requirement or condition contained in the permit modules I, X, or the VR 672-20-10, the regulatory/permit module requirement or condition shall prevail (unless an appropriate variance has been granted). The Department is not responsible for spelling, typographical, or syntax errors in modules based on information submitted by the permittee. As permit attachments are typically extracts from submitted information, they may contain references to calculations or other supporting information which is omitted from the permit document. However, all information submitted in support of the permit application may be found in Department files.

2. The Emergency/Contingency Plan (Appendix B of Permit Module II), may be revised with Department approval.

3. The Closure Plan (contained in Permit Module XII), may be revised. The amended plan shall be placed in the operating record. An alternate final cover design must be approved by the Department.

develop a contingency plan which addresses conditions under which soil is required instead of the geotextile daily cover, with provisions for an ample supply of soil (at least three days supply) in proximity to the working face and the necessary equipment to apply the soil to the working face. The report required by Section I.D.4, of this permit must be submitted for review and approval in accordance with the time-frame established in Section I.G.1, of this permit.

I.G. COMPLIANCE SCHEDULE

The permittee shall report to the Director in writing compliance with the requirements contained in the following compliance schedule.

I.G.1. Six months after the facility begins operation, the permittee shall submit to the Department of Environmental Quality, Waste Division, the report required by Section I.D.4, of this permit evaluating the performance of the geotextile daily cover.

I.H. PERMIT AMENDMENTS

I.H.1. This permit is amended (Amendment 1) per minor permit amendment request dated November 18, 1994, [§7.14, VR 672-20-10]. The minor modifications are as follows:

I.H.1.a. § 8.4, VR 672-20-10 allows for the approval of alternate burial of tires without cutting or splitting provided the method will assure that tires will not emerge from the facility. The permittee desires to hand place the tires directly on the drainage layer prior to the deposition of waste. As the tires are placed flat on the un-yielding drainage layer only at the bottom of the cell it is not likely that they will emerge. Approval is conditional in that this alternate method of burial is only allowed on the relatively flat base grade of the cell, and not on the steeper side slopes. Further, prior to placement in subsequent cells, a written report on the effectiveness of this method of burial shall be submitted prior to the acceptance of waste.

I.H.1.b. The permittee proposes to use woven HDPE fabric with two LDPE ply membranes to cover the drainage layer of new cells to prevent the intrusion of storm water into the leachate collection system. The run-off from the fabric will be directed to storm water appurtenances.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

OFFICE OF WASTE RESOURCE MANAGEMENT

Peter W. Schmidt
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

November 18, 1994

Mr. C. Richard Farthing
County Administrator
Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

RE: Tazewell County Sanitary Landfill - Permit #564 - Authorization to Operate

Dear Mr. Farthing:

This letter is written upon review of the completion letter signed by Mr. Robert M. Jones, P.E., of Joyce Engineering, Inc., dated November 3, 1994, and the certification documents submitted in accordance with the Virginia Solid Waste Management Regulations, VR 672-20-10, and conditions of Permit No. 564 (See Attachment I). Based upon our receipt of the documents listed in Attachment I, and the site inspection performed on November 9, 1994, authorization is hereby given for Tazewell County to begin operation of the Tazewell County Sanitary Landfill in accordance with Permit No. 564 and within the designated fill area (Phase I).

If there are any questions, please contact Don Brunson, Environmental Engineer Senior, at (804) 527-5109.

Sincerely,

Donald H. Brunson, III
Environmental Engineer Senior

Attachment
cc: Henry Murray, P.E., Tazewell County
Sandy Etter, Tazewell County
Rober M. Jones, P.E., Joyce Engineering, Inc.
E. Paul Farrell, Jr., DEQ
Ulysses Brown, DEQ
T.L. Henderson, DEQ, RRO

ATTACHMENT I

1. A letter dated September 13, 1994, signed by Mr. Jim Spencer, Administrator of the Tazewell County Public Service Authority authorizing the discharge of leachate from the Tazewell County Sanitary Landfill to the County sewerage system, in accordance with permit condition I.D.1.a.

2. A letter to the Director from Mr. Robert M. Jones, P.E., of Joyce Engineering Inc., dated November 3, 1994, certifying that the construction of the facility has been completed in accordance with approved plans and specifications and is ready to begin operation, in accordance with permit condition I.D.1.b.

3. Certification(s) from third party CQA officer(s) in accordance with permit condition I.D.1.c, as follows:

   a. letter dated October 24, 1994 from Thomas A. Gray, P.E., of (GAI) Consultants, for the cohesive soil liner;

   b. letter dated September 21, 1994 from Andrew W. Cecil, P.E. - C.L.S., of Cecil Engineering Co., P.C., certifying that the thickness of the soil liner is in accordance with the specification, (i.e., 2 feet thick); and,

   c. Final Report for Certification of Phase 1 Geosynthetic Construction - Prepared by Golder Construction Services, Inc., dated October 17, 1994, and signed and certified by Timothy L. Martin, P.E.

4. Report and supporting documents resulting from QC/QA activities performed during construction and installation of the liner/drainage systems in accordance with permit condition I.D.1.b, as follows:

   a. installation contractors written acceptance of surfaces to be lined, prepared by Environmental Design and Construction, Inc., and signed by Richard West; and,

   b. letter dated October 24, 1994 from Thomas A. Gray, P.E., of (GAI) Consultants, certifying the laboratory permeabilities of the shelby tube samples of constructed liner, and the permeability of the drainage media utilized in the leachate collection layer.

JOYCE
ENGINEERING, INC.

Joyce Engineering, Inc.
701 Mercer Street
P.O. Box 1886
Princeton, West Virginia 24740
Tel (304) 487-6107
Fax (304) 487-1630

November 11, 1994

Mr. Henry Murray, P.E.
County Engineer
County of Tazewell
315 School Street, Box 2
Tazewell, Virginia 24651

RE: TAZEWELL COUNTY SANITARY LANDFILL
PHASE I LANDFILL CONSTRUCTION

Dear Henry:

We have received the September 9, 1994 letter from Jeffrey C. Sample of GIT to Sandy Etter requesting an increase of $44,500.00 for delays and work related to unanticipated rock in the Phase I area. After reviewing this letter, we feel that the cost for exposing rock may be reasonable. The two weeks extension and related cost, however, does not seem to be substantiated by the explanation given.

As I recall, the synthetic liner installer commented upon arrival at the site that he was not held up by a delay at the Tazewell site. Rather, he had been delayed at his previous project and his arrival date of September 26, 1994 was the earliest he could possibly have come to the Tazewell site.

I also recall Larry Kirkland of GIT stating that the rock issue was not causing his crew any delays and that he would notify Sandy Etter if the situation changed.

To my knowledge no delays were the result of the rock in the northwest corner of the site, and any change order requesting additional payment for such delays will not, with the current information be recommended by Joyce Engineering, Inc.

Sincerely,
Joyce Engineering, Inc.

Joseph Sulesky, P.E.
Project Manager

jjt

COPY

SAM

I. CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT ..Tazewell County Sanitary Landfill Phase 1 Construction

DATE OF ISSUANCE .November 9, 1994.....

OWNER .Tazewell County, Virginia.....

OWNER's Contract No. .....

CONTRACTOR Ground Improvements..... ENGINEER .Joyce Engineering, Inc.....
Techniques, Inc.

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

TO ..Tazewell County, Virginia.....
OWNER

And To .Ground Improvement Techniques, Inc.....
CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

November 8, 1994
DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within 7 days of the above date of Substantial Completion.

From the date of Substantial Completion the responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees shall be as follows:

RESPONSIBILITIES:

OWNER: _____

_____

_____

CONTRACTOR: _____

_____

_____

The following documents are attached to and made a part of this Certificate:

1. Punch list of items to be addressed by Contractor.

[For items to be attached see definition of Substantial Completion as supplemented and other specifically noted conditions precedent to achieving Substantial Completion as required by Contract Documents.]

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to complete the Work in accordance with the Contract Documents.

Executed by ENGINEER on Nov. 9, 1994

Joyce Engineering, Inc.
ENGINEER

By: Joseph W. Sulesky
(Authorized Signature)

CONTRACTOR accepts this Certificate of Substantial Completion on 11-9, 1994

Ground Improvement Techniques, Inc.
CONTRACTOR

By: Larry R. Kirkland

OWNER accepts this Certificate of Substantial Completion on 11-9, 1994

Tazewell County, Virginia
OWNER

By: Henry C. Munn
(Authorized Signature)

TAZEWELL COUNTY SANITARY LANDFILL
PHASE I CONSTRUCTION
NOVEMBER 8, 1994

The following is the punch list developed as a result of the walk through by Sandy Etter, Larry Kirkland, Marty Niverth and Joe Sulesky. This list is included as an attachment to the Certificate of Substantial Completion.

1. Installation of valves for the stormwater line at Manhole No. 1.

2. Additional touch-up seeding and mulching.

3. Provide Tazewell County Landfill with a cap for the lower junction box within the cell.

4. In the 36" culvert, located in the southwest corner, provide a non-shrink grout seal at the downstream end section joint where separation from the culvert has occurred.

5. Extend diversion berm on west slope to northern end of cell.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

JUL 1 1 1994

Peter W. Schmidt
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

Mr. Henry Murray
Planner/Engineer
Tazewell County
315 School Street, Box 2
Tazewell, Virginia 24651

Subject: Alternate Daily Cover
Synthetic Geomembrane
Tazewell County Sanitary Landfill
Permit #116

Dear Mr. Murray:

The Department has approved of experimental use of synthetic materials such as geomembranes as daily cover for a six month period as a demonstration that the material is a good substitute for soil daily cover. The approval of alternate daily cover (ADC) is site specific and based on the operation of the landfill and the performance of the material at the site. A variance is not required for approval of ADC.

The County of Tazewell must develop a Contingency Plan that states that an ample supply of soil (at least three day's supply) is available, the soil's proximity to the working face, that the necessary equipment is present, and under what conditions soil is required instead of the synthetic material. The Contingency Plan must remain in place during the demonstration period. It is understood that soil intermediate cover will be placed at least weekly and as needed.

At the end of the six month period, a report must be submitted to the Department that discusses the effectiveness of the material, under what conditions the Contingency Plan had to be implemented, and whether or not permanent use of the material is warranted. The report must contain discussion on the effectiveness of controlling animals and vectors, limiting erosion and precipitation infiltration, minimizing fires and nuisances as stated in the request. A decision will be made at that time by the Department whether or not to approve the material for daily cover. The Regional Consultant will be requested to provide a recommendation.

If the geomembrane material is demonstrated to be a good substitution for soil daily cover after a six month demonstration period, then the Director will approve that use. Please advise the Department on the type of synthetic geomembrane material that will be used as ADC.

If you have any questions, please contact me at (804) 527-5117.

Sincerely,

Howard R. Freeland

Howard R. Freeland, CPG
Environmental Program Manager

CC: Norm Auldridge
Olin Willis
TN# SW94-202R

Henry Murray

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

OFFICE OF WASTE RESOURCE MANAGEMENT

MAR 1 0 1994

RECEIVED
MAR 16 1994
TAZEWELL COUNTY
BOARD OF SUPERVISORS

(on file in Co. Admin Office)

Mr. LaVern Bechtel
County Administrator
Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

RE: Tazewell County Sanitary Landfill
Issuance of Permit #564

Dear Mr. Bechtel:

Enclosed is Permit #564 for the Tazewell County Sanitary Landfill. The public participation period ended on February 28, 1994. Comments were received which required minor changes to the draft permit. The applicant and all persons who commented during the public participation period have been sent a response to their comments. This response also indicated the applicable changes to the draft permit. Otherwise, only incidental editing occurred.

Please note that it is the responsibility of Tazewell County to obtain any other permits or authorizations that may be necessary. If there are any questions, please contact Don Brunson, Environmental Engineer Senior, at (804) 527-5109.

Sincerely,

Hassan Vakili
Acting Office Director

HV:DHB:dhb/tazmams.fin
Enclosure
cc: E. Paul Farrell, Jr., DEQ (w/o enclosure)
Ulysses Brown, DEQ (w/ enclosure)
Norman Auldridge, DEQ, RRO (w/ enclosure)
Robert M. Jones, P.E., Joyce Engineering, Inc., (w/ enclosure)
Donald Brunson, DEQ (w/o enclosure)

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
WASTE DIVISION

SOLID WASTE FACILITY PERMIT
PERMIT NUMBER 564

Facility Name: Tazewell County Sanitary Landfill

Facility Type: Sanitary Landfill **Latitude:** 37:11:06 North

Site Location: Tazewell County **Longitude:** 81:26:39 West

Location Description: The facility is located near Springville, between the Towns of Tazewell and Bluefield, about one-half mile north of Routes 19 and 460, on County Route 649 in Tazewell County, Virginia. The landfill area consists of 126 acres, more or less. There is an existing landfill on the parcel (Permit 116/488) which is to be closed once the new landfill area is ready for operation. The actual new lined disposal area will be approximately 34 acres when all four phases are developed, with additional areas for ancillary features.

Background: Tazewell County is the Permittee and the Owner/Operator of the solid waste disposal facility. The facility is to serve as a solid waste disposal site for Tazewell County, Towns of Tazewell, Bluefield, Richlands, Cedar Bluff, and Pocohontas, and refuse haulers having a valid permit issued by Tazewell County. The facility is authorized to receive non-hazardous municipal solid waste as specified in Permit Module II "Operations". The landfill receives approximately 100 tons (i.e., 200 cubic yards) refuse per day. Phases 1,2,3, and 4 have a ultimate capacity of about 3.8 million cubic yards and has an expected life of about 60 years.

Permit Highlights: This permit includes six permit modules and three permit attachments which are, in general, based on information submitted in the permit application. Permit Module I contains general permit conditions. Permit Module II is the facility's operations and maintenance manual. Permit Module III consists of the project design report and project specifications. Permit Attachment III-1 is the construction quality assurance plan. Permit Attachment III-2 is the design drawings. Permit Module X contains regulatory conditions with regard to groundwater monitoring, and Permit Attachment X-1 is the facility groundwater monitoring plan. Permit Modules XII is the facility's closure plan and Module XIII is the post closure care plan. The liner design of

the facility incorporates a composite liner consisting of 2 feet of clay overlain by a 60 mil synthetic flexible membrane liner (FML). There is also a provision for a trial use of alternate daily cover which is a geotextile material. The groundwater monitoring network for this facility includes two (2) upgradient (background) wells and six (6) downgradient monitoring wells. The permittee shall sample and analyze all monitoring wells at least semiannually.

THIS IS TO CERTIFY THAT:

The Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

is hereby granted a permit to construct, operate, and maintain the facility as described in the attached Permit Modules I, II, III, X, XII, XIII, and Permit Attachments III-1, III-2 and X-1. These Permit Modules and Permit Attachments are as referenced hereinafter and are incorporated into and become a part of this permit.

The herein described activity is to be established, modified, constructed, installed, operated, used, maintained, and closed in accordance with the terms and conditions of this permit and the plans, specifications, and reports submitted and cited in the permit. The facility shall comply with all regulations of the Virginia Waste Management Board.

Failure to comply with the terms and conditions of this permit shall constitute grounds for the revocation or suspension of this permit and for the initiation of necessary enforcement actions.

The permit is issued in accordance with the provisions of § 10.1-1408.1.A, Chapter 14, Title 10.1, Code of Virginia (1950) as amended.

APPROVED:

William L. Woodfin, Jr.
Deputy Director for Operations

DATE: 3/2/94

Copy to BOS
Harry Murray
Sandy Etter
file Orig

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

OFFICE OF WASTE RESOURCE MANAGEMENT

MAR 1 1994

RECEIVED
MAR 9 1994
TAZEWELL COUNTY
BOARD OF SUPERVISORS

Ronald H. Mullennex, C.P.G.,C.G.W.P.
Senior Vice President
Marshall Miller & Associates
Bluefield Virginia Industrial Park
P.O. Box 848
Bluefield, Virginia 24605-0848

Re: Comments on Draft Permit for the Proposed Tazewell County Sanitary Landfill, Permit # 564

Dear Mr. Mullennex:

This letter is intended to respond to the comments that you voiced at the public hearing for the proposed above referenced facility. Module X, "Final Detection Monitoring" of the draft permit has been modified to take into account your comments. The changes are as follows:

- The first sentence of X.C.2.a, has been modified to read: "Background groundwater quality for each monitoring constituent shall be based on data gathered over the background establishment period as set forth in Attachment X-1."

- Section X.G.2., has been modified to read: "Background shall be established in accordance with Permit Condition X.C.2 by collecting a minimum of four independent samples for the constituents specified in Permit Condition X.C.1 at each monitoring well (background and downgradient) within the first six months after permit issuance [§ 5.1.D.5.c.(1), VR 672-22-10]."

- The last sentence of section X.H.1, has been modified to read: "The data must include the method detection limit for all constituents for each monitoring event, all computations, calculated means, and variances [§ 7.1., VR 672-20-10].

I hope that these changes are as we have previously agreed. A new copy of Module X is enclosed for your information. Please note the changes therein. When the permit is finalized, we will forward a copy of the entire permit to you if you so desire.

If you have any other questions or desire additional information please advise.

Sincerely,

Donald H. Brunson, III
Environmental Engineer Sr.

Enclosure

cc: LaVern Bechtel, Tazewell County Administrator
E. Paul Farrell, Jr., DEQ
Shawn Davis, DEQ

Feb 18, 1998
2:00 PM

Public Hearing period will extend
until 5:PM
Feb 28, 1998

Public Hearing officer Barry Wright PE
Project Engineer Don Brunson

Ron Mullenax - 1st Speaker
re: Section

X-H-1

(1) Requirement for submittal of data
for "T" test not consistent w/ other parts
of the permit

(2) Background data will be drawn from
8 sets and not 4 as stated in the permit

— Larry Bechtel - 2nd Speaker
2:12 PM Hearing Closed

Copies: BOS
Henry Murray
Sandy Etter
Orig to Vern

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Richard N. Burton
Director

P. O. Box 10009
Richmond, Virginia 23240-0009
(804) 762-4000

William L. Woodfin, Jr.
Deputy for
Operations

January 14, 1994

Mr. La Vern Bechtel
County Administrator
Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651

RE: Tazewell County Sanitary Landfill
Draft Permit

Dear Mr. Bechtel:

Enclosed is the draft permit as processed from the application submitted for the Tazewell County Sanitary Landfill. Advertisements on the draft permit availability for public review and comment and the notice of the public hearing will occur on January 19, 1994. As you are aware, the public hearing is scheduled for Friday, February 18, 1994, at 2:00 P.M. in the County Administration Building Juvenile Courtroom.

If there are any questions, please contact Donald Brunson, Environmental Engineer Senior, at (804) 527-5109.

Sincerely,

James C. Adams
Director, Waste Division

JCA:DHB:dhb/tazmems.dft
Enclosure
cc: Berry Wright, Jr., P.E. DEQ
E. Paul Farrell, Jr., DEQ
Donald Brunson, DEQ (w/ enclosure)
Norman Auldridge, DEQ RRO (w/ enclosure)

I. SERVICE INFORMATION

This sanitary landfill facility will serve Tazewell County, Virginia. The County comprises about 522 square miles and includes the incorporated Towns of Tazewell, Bluefield, Richlands, Cedar Bluff, and Pocahontas. Some waste hauling is provided by small companies. The only major haulers in the area are Southwest Sanitation, Inc. and Lusk Disposal.

The facility is a sanitary landfill. The following is a list of wastes that are considered acceptable for disposal:

- Agricultural Waste;
- Ash;
- Commercial Waste;
- Compost;
- Construction Waste;
- Debris;
- Demolition Waste;
- Discarded Material;
- Garbage;
- Household Waste;
- Industrial Waste (Non-Hazardous);
- Inert Waste;
- Institutional waste except anatomical waste from health care facilities or infectious waste as specified in the Waste Management Board's Regulations Governing Infectious Waste;
- Municipal Solid Waste;
- Putrescible Waste;

II. PERSONNEL

The Tazewell County Board of Supervisors is the owner of the facility, and is, therefore, ultimately responsible for its proper operation and environmental impact. The Environmental Control Department is the Board's agent in carrying out this responsibility.

The facility currently employs 6 people. A landfill manager will be responsible for the day-to-day operation of the site. Three equipment operators are employed. These operators are responsible for the placement and compaction of the waste at the working face, as well as the placement of daily and intermediate cover. Other site maintenance of roads, erosion control structures, etc. will also be performed by these persons. One office person is employed. This person is responsible for weighing the waste received and recording appropriate information such as amount, weight, hauler, etc. One mechanic/operator is employed.

The landfill manager shall be certified in accordance with Statute 22.1, Title 54.1, Code of Virginia and VR 674-01-02. Said certified landfill manager shall demonstrate proficiency in understanding and applying the solid waste regulations VR-672-20-10.

III. SITE PREPARATION

A. SPECIFICATIONS

The technical specifications for the various parts of this facility are appended to this manual in a separate section.

B. QUALITY CONTROL

During the course of construction, the owner will retain the services of independent companies to document some of the construction items. For instance, the base excavation for each cell will be surveyed before the placement of the clay liner and leachate collection system. The construction area will be surveyed again prior to the placement of the primary liner and leachate collection system. An independent testing company will also be retained by the owner to perform quality assurance testing of the liner system. Other as-built conditions will be documented by construction representatives also retained by the owner.

C. TIMETABLES

The following table summarizes the proposed timetable of development for this facility.

The Specifications and the Construction Quality Assurance Plan provides details of construction and materials.

Phase-Cell	Life (months)	Begin Use
1	45	Nov ~~June~~ 1994 - March 1998
2	60	March 1998 - March 2003
3	72	March 2003 - March 2009
4	543	March 2009 - June 2054

17 Yrs (60 yr

IV. OPERATIONAL CONDITIONS

A. SITE ACCESS

1. HOURS OF OPERATION

The hours of operation shall be Monday through Saturday from 8 a.m. to 4 p.m., excluding holidays. The holidays observed by the County will be:

New Years Day	Columbus Day
Presidents Day	Veterans Day
Memorial Day	Thanksgiving Day and Day After
July 4	Christmas Day
Labor Day	

The waste will be observed at the time of delivery to the working face. Unacceptable waste will be refused by the workers. The deliverer and/or generator will be required to remove the waste from the facility.

2. TRAFFIC ROUTING

Traffic will be routed from the entrance gate to the landfill by one main access road. Other facility roads will be gated to prevent traffic from straying from the main access road. Appropriate signage will also be provided to instruct the user. The main access road will be the only traffic route regardless of weather conditions.

The distance from the entrance should allow fugitive mud to be discarded from vehicles as they exit the facility. Water will be sprayed onto the road areas as needed to minimize fugitive dust.

Traffic Routing

This additional increase in tonnage will not require any additional/ extra expansions or additions to the internal road system (infra-structure). This anticipated 160 additional tons per day should be transported by approximately four extra walking floor trailers and approximately five roll off compaction containers per day. Currently all small loads are directed to the convenience areas to limit congestion and improve safety conditions on the site.

OPERATIOI
MAINTEN.

EMERGENCY TELEPHONE NUMBERS

Person to Notify in Any Emergency:

County Administrator	(703) 988-7541
Landfill Site Environmental Control Department Head	(703) 988-4003

Accidents:

Ambulance

Tazewell County Rescue Squad	(703) 988-5970

Hospitals

Tazewell Community Hospital	(703) 988-2506
Bluefield Regional Medical Center	(304) 327-1100

Fire:

Fire Department

Town of Tazewell Volunteer Fire Department	(703) 988-4141

Power

Appalachian Power Company	(703) 988-5561

Police:

Sheriff's Department - Tazewell County	(703) 988-5966
State Police - Wytheville, Virginia	(800) 553-3144

County, State, and Federal Agencies:

Virginia State Health Department - Tazewell	(703) 988-5585
Virginia Department of Environmental Quality - Richmond	(804) 786-3563
Virginia Department of Environmental Quality - Roanoke	(703) 563-3555
Bureau of Solid Waste Management	(804) 255-2667
Hazardous Waste Violations - Toll Free	(800) 552-2075

Virginia Department of Environmental Quality (State Water Control Board) - Richmond	(804) 367-0056
Nation Response Center - Toll Free	(800) 424-8802
Virginia Department of Emergency Services	(800) 468-8892

in the area. The liner systems will be discussed in detail in later sections of this report. Sectional views of the liner system are included on the detail sheets.

TABLE 1
MATERIAL BALANCE FOR PHASES I, II, III, AND IV

Total volume of waste and cover	3,854,000 cy
Waste density, compacted at 1,000 lbs/cu yd	37.0 lb/cu ft
Waste stream	200 cy/day
Waste volume, compacted	200 cy/day
Daily & intermediate cover, 10:1 ratio	20 cy/day
Total daily volume	220 cy/day
Volume of waste	3,281,530 cy
Site life	60 years
Material gained by excavation	1,227,356 cy
Material loss by filling	77,606 cy
Required daily cover	375,000 cy
Final cover, SF x 3.5 ft/27 cf/cy	197,470 cy
Excess material available	605,490 cy

Soil cover shall be obtained from the site and adjacent property owned by Tazewell County.

Alternate daily cover is proposed to be used to reduce the amount of soil material required for daily cover. The Specification Section 14100, Geotextile Daily Cover, includes the technical requirements. Use of the alternate daily cover will reduce the daily cover requirements by 318,530 cubic yards and thereby increase the volume of solid waste by 318,530 cubic yards to 3,600,060 cubic yards. The landfill site life would increase by 5.2 years to 65.2 years if alternate daily cover was utilized over the life of the landfill.

II.B. GENERAL FACILITY INFORMATION

This Part B Application project is Tazewell County Sanitary Landfill located near Springville in Tazewell County, Virginia. The facility has been designed by Joyce Engineering, Inc. of Princeton, West Virginia, a firm registered to practice professional civil engineering in the Commonwealth of Virginia. Owner, Permittee, and Operation of the facility will be Tazewell County. The landfill property consists of 126 acres more or less. The tract of land owned by Tazewell County is shown on the Existing Site Conditions and Master Site Plan.

This sanitary landfill will service Tazewell County, Towns of Bluefield, Pocahontas, Richlands, Cedar Bluff, and Tazewell and refuse removers authorized by Tazewell County. The existing sanitary landfill receives 100 tons (i.e., 200 cubic yards) of municipal, sanitary solid waste per day. Transportation of the refuse to the landfill will be by car and truck.

Phases 1, 2, 3, and 4 have a combined capacity of 3,281,530 cubic yards. The landfill site covers 34 acres and has an expected life at current waste volume of about 60 years.

II.C. SITE ACCESS

Access to the municipal, sanitary landfill is by an existing entrance access road from Virginia Secondary Route 649. Access will be controlled by natural barriers, fencing, and a lockable gate at the entrance. The gate to the landfill will be closed and locked during all non-operating hours to prevent entry and illegal disposal of wastes.

Existing service/access roads within the facility are as shown on the plans. Desirable design criteria for the interior roads are a maximum grade of 10 percent and a minimum two-way road width of 24 feet. Side slopes of road fills will be a maximum of 2:1 on the section of the road not built upon waste fill. Side slopes of the road on top of waste shall be a maximum of 4:1.

Inorganics

	Analyte	SDW MCL (µg/l)	Analytical Method	PQL (µg/l)
1	Antimony (Sb)	6	7041	5
2	Arsenic (As)	50	7060	5
3	Barium (Ba)	2,000	6010	3
4	Beryllium (Be)	4	6010	1
5	Cadmium (Cd)	5	7131	1
6	Chromium (Cr)	100	6010	25
7	Cobalt (Co)	--	6010	10
8	Copper (Cu)	1,300*	6010	12
9	Lead (Pb)	15*	7421	5
10	Nickel (Ni)	100	6010	34
11	Selenium (Se)	50	7740	5
12	Silver (Ag)	--	6010	10
13	Thallium (Th)	2	7841	2
14	Vanadium (V)	--	6010	10
15	Zinc (Zn)	--	6010	4

**Action Level*

Organics

	Analyte	CAS Number	SDW MCL (µg/l)	Analytical Method	PQL (µg/l)
16	Acetone	67-64-1	--	8260	10
17	Acrylonitrile	107-13-1	--	8030	50
18	Benzene	71-43-2	5	8260	5
19	Bromochloromethane	74-97-5	--	8260	5
20	Bromodichloromethane	75-27-4	100	8260	5
21	Bromoform	75-25-2	100	8260	5
22	Carbon disulfide	75-15-0	--	8260	10
23	Carbon tetrachloride	56-23-5	5	8260	5
24	Chlorobenzene	108-90-7	--	8260	5
25	Chloroethane	75-00-3	--	8260	10
26	Chloroform	67-66-3	100	8260	5
27	Dibromochloromethane	124-48-1	--	8260	5
28	1, 2 Dibromo - 3 - chloropropane	96-12-8	0.2	8011	0.1
29	1, 2 Dibromoethane	106-93-4	0.05	8011	0.1
30	o - Dichlorobenzene	95-50-1	600	8260	10
31	p - Dichlorobenzene	106-46-7	75	8260	10
32	trans - 1 - 4 - Dichloro - 2 - butene	110-57-6	--	8260	10
33	1,1 Dichloroethane	75-34-3	--	8260	5
34	1,2 Dichloroethane	107-06-2	5	8260	5
35	1,1 Dichloroethylene	75-35-4	7	8260	5
36	cis - 1,2 Dichloroethylene	156-59-2	70	8260	5

Organics
(continued)

	Analyte	CAS Number	SDW MCL (µg/l)	Analytical Method	PQL (µg/l)
37	trans - 1, 2 Dichloroethylene	156-60-5	100	8260	5
38	1,2 Dichloropropane	78-87-5	5	8260	5
39	cis - 1,3 Dichloropropene	10061-01-5	--	8260	10
40	trans - 1,3 Dichloropropene	10061-02-6	--	8260	10
41	Ethylbenzene	100-41-4	700	8260	10
42	2 - Hexanone	591-78-6	--	8260	10
43	Methyl bromide	74-83-9	--	8260	10
44	Methyl chloride	74-87-3	--	8260	10
45	Methylene bromide (Dibromomethane)	74-95-3	--	8260	10
46	Methylene chloride (Dichloromethane)	75-09-2	5	8260	5
47	Methyl ethyl ketone (2 Butanone)	78-93-3	--	8260	10
48	Methyl iodide	74-88-4	--	8260	10
49	4 - Methyl - 2 - pentanone	108-10-1	--	8260	10
50	Styrene	100-42-5	100	8260	10
51	1,1,1,2 - Tetrachloroethane	630-20-6	--	8260	5
52	1,1,2,2 Tetrachloroethane	79-34-5	--	8260	5
53	Tetrachloroethylene	127-18-4	5	8260	5
54	Toluene	108-88-3	1,000	8260	5
55	1,1,1 Trichloroethane	71-55-6	200	8260	5
56	1,1,2 Trichloroethane	79-00-5	5	8260	5
57	Trichloroethylene	79-01-6	5	8260	5
58	Trichloroflouromethane	75-69-4	--	8260	5
59	1, 2, 3 Trichloropropane	96-18-14	--	8260	10
60	Vinyl acetate	108-05-4	--	8260	10
61	Vinyl chloride	75-01-4	2	8021	2
62	Xylenes	1330-20-7	10,000	8260	5

Quality Assurance and Quality Control

A trip blank sample, prepared in the laboratory by filling an appropriate sample container with deionized, carbon free water will accompany the sampling kit, and remain in the sample cooler during the sampling activities. The trip blank will be analyzed for the above listed parameters to assure the integrity of the samples during transport. Any detection of the analytes will suggest cross contamination of the samples during sample transport.

The laboratory conducting the analytical services will comply with all QA/QC procedures outlined in US EPA-SW846. Specific elements of the analytical laboratory's QA/QC plan will include:

AN ORDINANCE TO SET FEES FOR THE DISPOSAL
OF SOLID WASTE INTO THE LANDFILL OF
TAZEWELL COUNTY, VIRGINIA

Upon proper motion, the Tazewell County Board of Supervisors does hereby adopt the following County Ordinance pursuant to Sections 15.1-504, 15.1-510 and 15.1-510.01 of the Code of Virginia, as amended.

NOW, THEREFORE BE IT ORDAINED that:

A. Pursuant to sections 15.1-504, 15.1-510 and 15.1-510.1 of Virginia, the following tipping fees shall be charged at the landfill of Tazewell County for the disposal of Solid Waste:

1. For solid waste disposal at the landfill other than tires: $30.00/ton or $15.00/per compacted cubic yard

2. For disposal at the transfer sites other than tires: $35.00/ton or $17.50/per compacted cubic yard

3. For tires at either the landfill or transfer site:
   a. any tire up to and including 18" tires/$2.00 each tire
   b. truck, commercial or farm tire from 19" to 22"/ $7.00 each tire
   c. farm, industrial, commercial tires from 22" and up/ $10.00 each tire or 15¢/lb whichever is greater

B. Residents of Tazewell County who display a Tazewell County decal on their vehicle's windshield may deposit solid waste generated form their individual households into the landfill and or collection sites of Tazewell County without charge. All commercial enterprises, businesses, industries, manufacturing concerns, and private haulers of solid waste any of which generating more than six (6) bags per week shall be charged the above fees for the disposal of solid waste into the landfill or collection sites of Tazewell County. Commercial enterprises required to pay a fee under this ordinance shall include motels, mobile home parks, trailer parks, apartments and other entities that provide trash pick-up and disposal service for their customers, tenants, as well as commercial haulers of residential waste and, or commercial waste (municipal haulers for towns located within the County are excepted).

C. Part year residents who do not display a Tazewell County decal on their windshields and individuals or entities who are not residents of the County but who own land or businesses in the County and who generate less than seven (7) bags per week may obtain a yearly landfill permit and must present the part year resident landfill permit before disposing their individual household refuse at the Landfill or transfer station. Such part year landfill permit shall be purchased from the Treasurer of Tazewell County at a cost of $10.00 per permit.

D. Except as provided above, landfill and transfer station sites will accept only landfill permit coupons which may be obtained in advance from the County Treasurer's office. The landfill and transfer

station sites will not accept cash, checks or any other negotiable currency other than the landfill permit coupons.

E. This ordinance shall repeal any other ordinance now in effect in Tazewell County, Virginia, which is in conflict with the ordinance, only to the extent that the provisions of said ordinance, are in conflict herewith and the remaining provisions of said ordinance shall remain in full force and effect, as if readopted herewith absent those parts of such ordinances as are in conflict with this ordinance.

F. The sections and provisions of this ordinance are severable such that if any section, or provision of any section, hereof shall be deemed unconstitutional, unlawful or invalid provisions thereof.

G. This ordinance is adopted pursuant to the authority vested in the County of Tazewell, Virginia, and the Board of Supervisors thereof, by Sections 15.1-510, 15.1-510 and 15.1-510-1 of the Code of Virginia, (1950), as amended.

H. This ordinance shall become effective immediately upon adoption.

Adopted this 14th day of August, 1989.

_____
Chairman of the Board

ATTESTED BY:

_____
LaVern Bechtel
County Administrator

PERMIT MODULES AND PERMIT ATTACHMENTS[1]

REFERENCE LIST

PERMIT MODULE I -- GENERAL PERMIT CONDITIONS

PERMIT MODULE II[2] -- OPERATIONS

PERMIT MODULE III -- DESIGN AND CONSTRUCTION

PERMIT ATTACHMENT III-1 -- CONSTRUCTION QUALITY ASSURANCE PLAN

PERMIT ATTACHMENT III-2 -- DESIGN DRAWINGS

PERMIT MODULE X -- GROUNDWATER MONITORING - FINAL DETECTION

PERMIT ATTACHMENT X-1 -- GROUNDWATER MONITORING PROGRAM

PERMIT MODULES XII AND XIII[3] -- CLOSURE AND POST-CLOSURE CARE

NOTES:

1. Should information contained in any permit module that consists of documents submitted by the permittee, conflict with the any requirement or condition contained in the permit modules I, X, or 9 VAC 20-80-10 et. seq. (VR 672-20-10), the regulatory/permit module requirement or condition shall prevail (unless an appropriate variance has been granted). The Department is not responsible for spelling, typographical, or syntax errors in modules based on information submitted by the permittee. As permit attachments are typically extracts from submitted information, they may contain references to calculations or other supporting information which is omitted from the permit document. However, all information submitted in support of the permit application may be found in Department files.

2. The Emergency/Contingency Plan (Appendix B of Permit Module II) may be revised with Department approval.

3. The Closure Plan (contained in Permit Module XII) may be revised. The amended plan shall be placed in the operating record. An alternate final cover design must be approved by the Department

PERMIT MODULE I

GENERAL PERMIT CONDITIONS

I.A. EFFECT OF PERMIT

The permittee is allowed to dispose solid waste on-site in accordance with the conditions of this permit. Any disposal of solid waste not authorized by this permit is prohibited. Compliance with the terms of this permit does not constitute a defense to any order issued or any action brought under Sections 10.1-1402(18), 10.1-1402(19), or 10.1-1402(21) of the Virginia Waste Management Act (Chapter 14, Title 10.1, Code of Virginia (1950), as amended); or any other law or regulation for protection of public health or the environment. The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby. For purposes of this permit, terms used herein shall have the same meaning as those in the Virginia Waste Management Act, and Part I and other pertinent parts of the Virginia Solid Waste Management Regulations, 9 VAC 20-80-10 et. seq. (VR 672-20-10), unless this permit specifically provides otherwise; where terms are not defined in the regulations or the permit, the meaning associated with such terms shall be defined by the generally accepted scientific or industrial meaning of the term or a standard dictionary reference. "Director" means the Director of the Department of Environmental Quality, or his designated or authorized representative.

I.B. DUTIES AND REQUIREMENTS

The permittee shall comply with all conditions of this permit and 9 VAC 20-80-10 et. seq. (VR 672-20-10). The effect of this permit is detailed in 9 VAC 20-80-550, and it shall be the duty of the permittee to insure the applicable requirements are met. Additionally, the permittee is subject to the recording and reporting requirements detailed in 9 VAC 20-80-570. The facility will be designed and constructed per the requirements of Permit Module III, operated and maintained per Permit Module II, closed and maintained in post-closure per Permit Module XII and XIII, and subject to a groundwater monitoring program per Permit Module X. In addition to these requirements, the following additional conditions are invoked per 9 VAC 20-80-490, and shall be complied with:

I.B.1. Noncompliance may be authorized by a schedule of compliance, 9 VAC 20-80-550.C. and 9 VAC 20-80-550.G., (§§ 7.7.C and 7.7.G, VR 672-20-10). Any other permit noncompliance constitutes a violation of Virginia Waste Management Act and is grounds for enforcement action, or for permit revocation, revocation and reissuance, or modification, 9 VAC 20-80-600 and 9 VAC 20-80-620 (§§ 7.12 and 7.14, VR 672-20-10).

I.B.2 The permittee shall comply with the requirements of this permit and any provision of RCRA Subtitle D (Title 40, Code of Federal Regulations, Section 258) requirements as they become applicable upon their effective date. This permit may not act as a shield against compliance with any part of RCRA or any other applicable federal regulation, state regulation or state law.

I.B.3. In an enforcement action, it shall not be a defense for the permittee that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

I.B.4. In the event of noncompliance with this permit, the permittee shall take all reasonable steps to minimize releases of solid wastes or waste constituents to the environment and shall carry out measures to prevent significant adverse impacts on human health or the environment.

I.B.5. The permittee shall at all times properly operate and maintain all units (and related appurtenances) which are installed or used by the permittee to achieve compliance with the operations manual and the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing, and training, and adequate laboratory and process controls, including appropriate quality assurance/quality control procedures. This provision requires the operation of back-up or auxiliary equipment only when necessary to achieve compliance with the conditions of this permit.

I.B.6. The permittee shall furnish to the Director, within a reasonable time, any relevant information that the Director may request to determine compliance with this permit, regulations, or the Act. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit by the date specified in the request.

I.B.7. The permittee shall allow the Director, or an authorized representative, upon the presentation of appropriate credentials, to:

I.B.7.a. Enter at reasonable times upon the permitted facility where a regulated unit or activity is located or conducted, or where records must be kept under the conditions of this permit;

I.B.7.b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

I.B.7.c. Inspect at reasonable times any unit, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

I.B.7.d. Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by Virginia Waste Management Act, any substances or parameters at any location within his control.

I.B.8. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The method used to obtain a representative sample to be analyzed must be the appropriate method from the latest edition of Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, EPA Publication SW-846.

I.B.9. This permit is not transferable to any person, unless approved by the Director. The Director may require modification or revocation and reissuance of the permit pursuant to 9 VAC 20-80-550.F (§ 7.7.F, VR 672-20-10). Before transferring ownership or operation of the facility during its operational life, the permittee shall notify the new owner or operator in writing of the requirements of Parts V and VII, of the Virginia Solid Waste Management Regulations, the Financial Assurance Regulations, 9 VAC 20-70-10 et. seq. (VR 672-20-1) and this permit.

I.C. DOCUMENTS TO BE MAINTAINED AT THE FACILITY

The permittee shall maintain the following documents at the facility, or readily accessible to Department representatives, until post-closure is complete and certified by a professional engineer, and shall maintain amendments, revisions, and modification to these documents:

I.C.1. Design Plans.

I.C.2. Operations Manual.

I.C.3. Closure and Post-Closure Plan.

I.C.4. Groundwater Monitoring Plan.

I.C.5. All other documents/records required:

I.C.5.a. Monitoring records from leachate, gas, and groundwater monitoring.

I.C.5.b. Inspection records as required from construction/installation, operational, closure, and post-closure inspection requirements.

I.C.5.c. Personnel training records.

I.C.5.d. Daily operational records (i.e., solid waste received and processed, fill area records, records of special wastes accepted, a logbook which is a daily narrative account of the activities at the landfill).

I.D. DOCUMENTS TO BE SUBMITTED

In addition to the documents/records/reports to be submitted per the requirements of this permit or 9 VAC 20-80-10 et seq. (VR 672-20-10), the permittee shall also submit the following documents to the Director according to indicated schedules:

I.D.1. Prior to facility operation, and prior to expansion into each new phase, the permittee shall submit all required certification documents per 9 VAC 20-80-550.A (§7.7.A, VR 672-20-10), and:

I.D.1.a. Authorizations from the DEQ-Water Division to discharge leachate and wastewater to an approved sewerage system and treatment works.

I.D.1.b. Certification from the design engineer (whom must be licensed to practice in Virginia) that the construction of the facility has been completed in accordance with the approved plans and specifications and is ready to begin operation.

I.D.1.c. Certification from the CQA officer (whom must be licensed to practice in Virginia) that the approved CQA plan has been successfully carried out and that the constructed unit meets all applicable requirements including, but not limited to, the requirements of 9 VAC 20-80-250.B.18 (§5.1.B.18, VR 672-20-10). A certification will be needed for each lined phase of development. (Note that the design engineer and the CQA officer must not be the same individual.)

I.D.1.d. Report and supporting documents resulting from quality control/quality assurance activities performed during construction and installation of the liner/drainage systems, including the installation contractor's written acceptance of the surfaces to be lined, synthetic liner manufacturer and installer warranties, field/laboratory test results of the permeability of the clay liner and the drainage media overlying the liner, and representative copies (sufficient to demonstrate responsible control) of the accumulated inspection schedules resulting from the professional engineer's oversight of the construction.

I.D.2. The as-built plans of all new groundwater monitoring wells shall be submitted as these wells are installed. Information to be included on the as-built plans shall include, but is not limited to, the total depth of the well, the surveyed elevations of the top of casing and ground surface (or apron), and the length and location of the screened interval and annular space seal. All dimensions are to be shown on well construction schematics.

I.D.3. Prior to construction, the permittee shall submit to the Department of Environmental Quality, Waste Division, documentation that demonstrates compliance with applicable stormwater regulations concerning construction activities.

I.D.4. In accordance with Section I.F.1, the permittee must submit a report assessing the effectiveness of the geotextile daily cover. The report must demonstrate that the material is as effective as 6 inches of soil in controlling disease vectors, fires, blowing litter, erosion, infiltration, and nuisances.

I.E. REPORTS, NOTIFICATIONS, AND SUBMISSIONS TO THE DIRECTOR

All reports, notifications, or other submissions which are required by this permit to be sent or given to the Director should be sent by certified mail to:

Director
Virginia Department of Environmental Quality
Office of Waste Resources Management
P.O. Box 10009
Richmond, VA 23240 – 0009

&

Virginia Department of Environmental Quality
Solid Waste Compliance
Southwest Regional Office
355 Deadmore Street
Abingdon, Virginia 24212

Permit Amendments

I.F. SITE SPECIFIC CONDITIONS

The provisions of this section are in addition to the permit conditions and regulatory requirements and are specifically developed for this facility. The permittee shall comply with all conditions of this section, as follows:

I.F.1. As specified in 9 VAC 20-80-250.C.2.c (§5.1.C.2.c, VR 672-20-10), the Department of Environmental Quality, Waste Division allows the use alternate daily cover, subject to approval by the Director. The geotextile daily cover must meet or exceed the minimum specifications established in the design report (see Module III). Prior to implementing the use of alternate daily cover, the permittee must develop a contingency plan which addresses conditions under which soil is required instead of the geotextile daily cover, with provisions for an ample supply of soil (at least three days supply) in proximity to the working face and the necessary equipment to apply the soil to the working face. The report required by Section I.D.4, of this permit must be submitted for review and approval in accordance with the time frame established in Section I.G.1, of this permit.

I.G. COMPLIANCE SCHEDULE

The permittee shall report to the Director in writing compliance with the requirements contained in the following compliance schedule if or when applicable.

I.H. PERMIT AMENDMENTS

I.H.1. This permit is amended (Amendment 1) per minor permit amendment request dated November 18, 1994 (9 VAC 20-80-620) [§7.14, VR 672-20-10]. The minor modifications are as follows:

I.H.1.a. 9 VAC 20-80-670 (§8.4, VR 672-20-10) allows for the approval of alternate burial of tires without cutting or splitting provided the method will assure that tires will not emerge from the facility. The permittee desires to hand place the tires directly on the drainage layer prior to the deposition of waste. As the tires are placed flat on the un-yielding drainage layer only at the bottom of the cell it is not likely that they will emerge. Approval is conditional in that this alternate method of burial is only allowed on the relatively flat base grade of the cell, and not on the steeper side slopes. Further, prior to placement in subsequent cells, a written report on the effectiveness of this method of burial shall be submitted prior to the acceptance of waste.

I.H.1.b. The permittee proposes to use woven HDPE fabric with two LDPE ply membranes to cover the drainage layer of new cells to prevent the intrusion of storm water into the leachate collection system. The run-off from the fabric will be directed to storm water appurtenances.

I.H.2 This permit is amended (Amendment 2) per minor permit amendment request dated March 20, 1995 (9 VAC 20-80-620) [§7.14, VR 672-20-10]. The minor modification is to revise the Practical Quantitation Limit (PQL) specified for analyses of volatile organic constituents. The revised replacement pages have been inserted into Permit Attachment X-I, Groundwater Monitoring Plan.

I.H.3 This permit is amended (Amendment 3) per minor permit amendment request dated October 23, 1995 (9 VAC 20-80-620) [§7.14, VR 672-20-10]. The modification is to reduce the number and spacing of gas monitoring probes as classified in Section G-2 of Appendix 7.4. The County's justification for the reduction in gas monitoring wells is (1) the remote location of the landfill and (2) lack of inhabited structures within 1000 feet of the facility boundary. In the event these conditions change the gas-monitoring plan will be so modified as agreed upon by the Department to consider said change. The revised replacement pages, page 16 of the operations manual and page 34 of the design report, are to be inserted into Permit Modules II and III respectively, and revised design drawings 15 and 16 are to be inserted into Permit Attachment III-2.

I.H.4. This permit is amended (Amendment 4) per minor permit amendment request dated November 14, 1996 (9 VAC 20-80-620) [§7.14, VR 672-20-10]. The modification is to change the groundwater sampling methods. The facility intends to install dedicated teflon and stainless steel bladder pumps for sampling which is a change from the permit conditions indicating the use of portable non-dedicated pumps or bailers. The revised replacement pages, iii, iv, 15 through 24 are to be inserted into Permit Attachment X-1

I.H.5. This permit is amended (Amendment 5) per minor amendment request dated June 2, 2000 (9 VAC 20-80-620). The minor modifications are as follows:

I.H.5.a. Whereas the facility was initially permitted to accept approximately 100 tons of refuse per day from Tazewell County, the permit is hereby amended to allow the facility to accept approximately 300 tons per day from the Virginia Counties of Bland, Buchanan, Dickenson, Giles, Montgomery, Pulaski, Russell, Smith, Wythe and the West Virginia Counties of Monroe, Logan, McDowell, Mercer,

Raleigh, Summers, and Wyoming. Accordingly, the facility's Operations and Maintenance Manual has been revised to reflect this new service area. Other changes to the manual include updating the facility's landfill development timetable and personnel description.

I.H.5.b. The facility's Safety Plan has been revised to update the emergency contact list.

I.H.5.c. The facility's Design Report has been modified to update the material balance for phases I, II, III, and IV. The daily waste volume will rise from 100 tons (200 cy) to 300 tons (420 cy) a day. Through the use of alternate daily cover, the volume of the waste will increase from 3,281,530 cy to 3,662,068 cy. Because of the increase in the daily waste stream the facility's life expectancy has been revised to account for a decreased life span, from 60 years to 29 years.

SERVICE INFORMATION

This sanitary landfill facility will serve Tazewell County, Virginia as well as the Virginia counties of Bland, Buchanan, Dickenson, Giles, Montgomery, Russell, Pulaski, Smythe, and Wythe, and the West Virginia counties of Monroe, Logan, McDowell, Mercer, Raleigh and Summers.

The facility is a sanitary landfill. The following is a list of wastes that are considered acceptable for disposal:

- Agricultural Waste;
- Ash;
- Commercial Waste;
- Compost;
- Construction Waste;
- Debris;
- Demolition Waste;
- Discarded Material;
- Garbage;
- Household Waste; .
- Industrial Waste (Non-Hazardous);
- Inert Waste;
- Institutional waste except anatomical waste from health care facilities or infectious waste as specified in the Waste Management Board's Regulations Governing Infectious Waste;
- Municipal Solid Waste;
- Putrescible Waste;

II PERSONNEL

The Tazewell County Board of Supervisors is the owner of the facility, and is, therefore, ultimately responsible for its proper operation and environmental impact. The Environmental Control Department is the Board's agent in carrying out this responsibility.

The facility currently employs 10 full-time and 2 part-time personnel. A landfill manager will be responsible for the day-to-day operation of the site. Five equipment operators are employed. These operators are responsible for the placement and compaction of the waste at the working face, as well as the placement of daily and intermediate cover. Other site maintenance of roads, erosion control structures, etc. will also be performed by these persons. Two office personnel are employed. The employees are responsible for weighing the waste received and recording appropriate information such as amount, weight, hauler, etc. One mechanic/operator is employed. There may be a need to hire an additional full-time and part-time employee after receiving additional waste. At this time the need for additional personnel is not anticipated.

The landfill manager shall be certified in accordance with Statute 22.1, Title 54.1, Code of Virginia and VR 674-01-02. Said certified landfill manager shall demonstrate proficiency in understanding and applying the solid waste regulations VR-672-20-1 0.

III. SITE PREPARATION

A. SPECIFICATIONS

The technical specifications for the various parts of this facility are appended to this facility are appended to this manual in a separate section.

B. QUALITY CONTROL

During the course of construction, the owner will retain the services of independent companies to document some of the construction items. For instance, the base excavation for each cell will be surveyed before the placement of the clay liner and leachate collection system. The construction area will be surveyed again prior to the placement of the primary liner and leachate collection system. An independent testing company will also be retained by the owner to perform quality assurance testing of the liner system. Other as-built conditions will be documented by construction representatives also retained by the owner.

C. TIMETABLES

The following table summarizes the proposed timetable/waste acceptance ratio of development for this facility. Increased recycling rates may extend the useful life of this facility by reduction of the waste flow.

The Specifications and the Construction Quality Assurance Plan provides details of construction and materials.

Phase-Cell	Life (months)	Begin Use
1	44	Nov. 1994 - June 1998
2	24	June 1998 - June 2001
3	24	June 2001 - June 2003
4	204	June 2003 - June 2018
Total	296	

IV. OPERATIONAL CONDITIONS

A. SITE ACCESS

1. HOURS OF OPERATION

The hours of operation shall be Monday through Saturday from 8 a.m. to 4 p.m., excluding holidays. The holidays observed by the County will be:

New Years Day	Columbus Day
Presidents Day	Veterans Day
Memorial Day	Thanksgiving Day and Day After
July 4	Labor Day
Christmas Day	

The waste will be observed at the time of delivery to the working face. Unacceptable waste will be refused by the workers. The deliverer and/or generator will be required to remove the waste from the facility.

2. TRAFFIC ROUTING

Traffic will be routed from the entrance gate to the landfill by one main access road. Other facility roads will be gated to prevent traffic from straying from the main access road. Appropriate signage will also be provided to instruct the user. The main access road will be the only traffic route regardless of weather conditions.

The distance from the entrance should allow fugitive mud to be discarded from vehicles as they exit the facility. Water will be sprayed onto the road areas as needed to minimize fugitive dust. This additional increase in tonnage will not require any additional/ extra expansions or additions to the internal road system (infra-structure). Currently all small loads are directed to the convenience areas to limit congestion and improve safety conditions on the site.

PERMIT MODULE II

OPERATIONS

JOYCE ENGINEERING, INC.

701 MERCER STREET
PRINCETON, WEST VIRGINIA 24740

(304) 487-6107

OPERATIONS AND MAINTENANCE MANUAL
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL, VIRGINIA

JULY 15, 1992

REVISED OCTOBER 15, 1992
(PER COMPLETENESS REVIEW)

REVISED NOVEMBER 18, 1993
(PER FIRST TECHNICAL REVIEW COMMENTS)

REVISED JANUARY 12, 1994
(PER SECOND TECHNICAL REVIEW COMMENTS)

PREPARED FOR:

TAZEWELL COUNTY BOARD OF SUPERVISORS
ADMINISTRATION BUILDING
315 SCHOOL STREET, BOX 2
TAZEWELL, VIRGINIA 24651
(703) 988-7541

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LIST OF APPENDICES

I. SERVICE INFORMATION

This sanitary landfill facility will serve Tazewell County, Virginia. The County comprises about 522 square miles and includes the incorporated Towns of Tazewell, Bluefield, Richlands, Cedar Bluff, and Pocahontas. Some waste hauling is provided by small companies. The only major haulers in the area are Southwest Sanitation, Inc. and Lusk Disposal.

The facility is a sanitary landfill. The following is a list of wastes that are considered acceptable for disposal:

- Agricultural Waste;
- Ash;
- Commercial Waste;
- Compost;
- Construction Waste;
- Debris;
- Demolition Waste;
- Discarded Material;
- Garbage;
- Household Waste;
- Industrial Waste (Non-Hazardous);
- Inert Waste;
- Institutional waste except anatomical waste from health care facilities or infectious waste as specified in the Waste Management Board's Regulations Governing Infectious Waste;
- Municipal Solid Waste;
- Putrescible Waste;

- Refuse;
- Residential Waste;
- Rubbish;
- Scrap Metal;
- Sludge in accordance with VR-672-20-10, Section 5.1.C.16.t.;
- Trash;
- White goods; and
- Non-Regulated hazardous Waste by Specific Approval only.

This facility will not accept the following waste:

- Free liquids;
- Regulated Hazardous wastes;
- Solid wastes, residues, or soils containing more than 1.0 ppb (parts per billion) of dioxins;
- Solid wastes, residues, or soils containing 50.0 ppb (parts per billion) or more of PBC's;
- Unstabilized sewage sludge or sludges that have not been dewatered;
- Pesticide containers that have not been triple rinsed and crushed;
- Drums that are not empty, properly cleaned, and opened;
- Waste oil that has not been adequately adsorbed through site cleanup; and
- Contaminated soil that is not classified as hazardous waste.

Should the County receive a request for the disposal of special waste, the generator or hauler will request in writing a permit from the Department of Environmental Quality. When the permit is received, the Environmental Control Department will accept the special waste under the permit.

II. PERSONNEL

The Tazewell County Board of Supervisors is the owner of the facility, and is, therefore, ultimately responsible for its proper operation and environmental impact. The Environmental Control Department is the Board's agent in carrying out this responsibility.

The facility currently employs 6 people. A landfill manager will be responsible for the day-to-day operation of the site. Three equipment operators are employed. These operators are responsible for the placement and compaction of the waste at the working face, as well as the placement of daily and intermediate cover. Other site maintenance of roads, erosion control structures, etc. will also be performed by these persons. One office person is employed. This person is responsible for weighing the waste received and recording appropriate information such as amount, weight, hauler, etc. One mechanic/operator is employed.

The landfill manager shall be certified in accordance with Statute 22.1, Title 54.1, Code of Virginia and VR 674-01-02. Said certified landfill manager shall demonstrate proficiency in understanding and applying the solid waste regulations VR-672-20-10.

III. SITE PREPARATION

A. SPECIFICATIONS

The technical specifications for the various parts of this facility are appended to this manual in a separate section.

B. QUALITY CONTROL

During the course of construction, the owner will retain the services of independent companies to document some of the construction items. For instance, the base excavation for each cell will be surveyed before the placement of the clay liner and leachate collection system. The construction area will be surveyed again prior to the placement of the primary liner and leachate collection system. An independent testing company will also be retained by the owner to perform quality assurance testing of the liner system. Other as-built conditions will be documented by construction representatives also retained by the owner.

C. TIMETABLES

The following table summarizes the proposed timetable of development for this facility.

The Specifications and the Construction Quality Assurance Plan provides details of construction and materials.

Phase-Cell	Life (months)	yrs	Begin Use
1	45	3.75	June 1994 - March 1998
2	60	5.0	March 1998 - March 2003
3	72	6.0	March 2003 - March 2009
4	543	45.25	March 2009 - June 2054
		60 yrs	

IV. OPERATIONAL CONDITIONS

A. SITE ACCESS

1. HOURS OF OPERATION

The hours of operation shall be Monday through Saturday from 8 a.m. to 4 p.m., excluding holidays. The holidays observed by the County will be:

New Years Day	Columbus Day
Presidents Day	Veterans Day
Memorial Day	Thanksgiving Day and Day After
July 4	Christmas Day
Labor Day	

The waste will be observed at the time of delivery to the working face. Unacceptable waste will be refused by the workers. The deliverer and/or generator will be required to remove the waste from the facility.

2. TRAFFIC ROUTING

Traffic will be routed from the entrance gate to the landfill by one main access road. Other facility roads will be gated to prevent traffic from straying from the main access road. Appropriate signage will also be provided to instruct the user. The main access road will be the only traffic route regardless of weather conditions.

The distance from the entrance should allow fugitive mud to be discarded from vehicles as they exit the facility. Water will be sprayed onto the road areas as needed to minimize fugitive dust.

3. INCLEMENT WEATHER

During inclement weather conditions, landfill personnel will maintain all facility roads to be sure they are passable. This would include spraying the road surface with water during windy, dry weather, and scraping the road surface during wet or cold weather (i.e. mud, ice, and snow). This work would be performed with the heavy equipment at the landfill. No special area will be maintained for inclement weather operations.

B. WASTE HANDLING

1. TYPES OF WASTE

As indicated in Section I (SERVICE INFORMATION), this facility will accept only non-hazardous waste that is acceptable for disposal in a sanitary landfill. Section I lists these wastes as well as unacceptable wastes. Regulated hazardous waste will not be accepted for disposal.

2. LITTER CONTROL

As the waste is delivered to the disposal area, prompt compaction will be the first method to control blowing litter. Temporary fences will be constructed as needed to intercept blowing litter. Litter which may not be contained will be picked up weekly by landfill personnel or other County personnel.

3. DUST, ODOR, AND VECTOR CONTROL

As indicated previously, roads will be sprayed with water to mitigate dust during dry and windy weather. To control odor and vectors, cover will be placed daily. At the end of each working day, at least 6 inches of soil will be placed over the waste disposed of that day. If an area does not receive another lift of waste within 30 days, an additional 6 inches of soil will be placed. Erosion of the soil cover due to wind and water will be corrected as soon as possible.

An alternate daily cover is proposed to be used to reduce the amount of soil material required for daily cover. The Specification Section 14100, Geotextile Daily Cover, includes the technical requirements. The use of an alternate daily cover reduces the daily cover requirements and increases the volume of solid waste that can be landfilled.

4. OPEN BURNING

Open burning of land clearing debris will be permitted only in an area having a minimum 50-foot fire break completely surrounding it. The fire break will be cleared to bare soil. Open burning will not be permitted on areas that have received or are currently receiving solid waste.

The area designed for open burning may change in the future to avoid conflict with the landfill development.

An open burning permit has been obtained from the Virignia Department of Environmental Quality.

5. PLACEMENT OF WASTE IN STATE WATERS

Placement of solid waste in State waters is prohibited. The facility operation will also prevent deposited waste from entering State waters.

6. SALVAGING

Salvaging will be permitted only in an area designated by the landfill manager. The salvage area will be located near the main access road, but will not be located so as to cause a nuisance or conflict with the landfill operation.

7. FILLING OPERATION

The method of filling will be by the area method. Specific lined areas will be prepared, ranging in size from about 3 to 6 acres. Adjacent areas will be used as a source of daily and intermediate soil cover.

The daily cell will be no greater than 10 feet thick (including the 6-inches daily cover). Using an average daily tonnage of 100 tons, and an in-place density of 0.5 tons per cubic yard, the daily volume usage is 200 cubic yards. On the basis of the maximum thickness, the surface area of the daily cell should be about 540 square feet. Using the shape of a square, the daily cell should have plan dimensions of 20 to 25 feet square. Some deviation from these dimensions should be expected due to spacial constraints, cell development, etc.

8. DAILY CLEANUP

Daily cleanup will be concentrated mainly on what is needed for the continued efficient operation of the heavy equipment. This would

include the removal of soil or trash from the equipment undercarriage, etc. so that operation will not be hindered.

All waste deposited during the day will be properly covered at the end of the day to prevent blowing litter and vector intrusion during the night.

9. HANDLING OF SPECIAL WASTE

Small animal carcasses will be placed within the fill as delivered and will be promptly covered with trash being delivered to the facility. All animal carcasses will be covered by the end of the day.

Water and waste water treatment sludges approved for disposal will be worked into the daily cell at a maximum ratio of one ton of sludge per five tons of solid waste per day. All sludges will be covered by the end of the day.

Incinerator and air pollution control residues that are approved for disposal will be disposed of at the same rate as the sludges. All ashes and residues will be covered by the end of the day.

C. EQUIPMENT

The following list summarizes the number and types of equipment available at the landfill.

Equipment	Number
Front-End Loader 973	1
D7H Dozer	1
861B Compactor	1
Terex Haul Back Truck	1

Substitute equipment will be provided by the following businesses in the event a piece of equipment becomes unavailable for 24 hours or more:

Company:	Carter Machinery Co., Inc.
Contact:	Dick Mitchell
Address:	Route 52 North, Bluefield, West Virginia 24701
Telephone:	(304) 325-5411

D. COMPACTION AND COVER

1. COMPACTION

The waste delivered to the facility will be spread in layers about 2 to 3 feet thick and will be compacted by a self-propelled compactor. At least 4 to 6 passes in orthogonal directions will be made prior to the placement of another layer.

2. LIFTS

The total thickness of the day's lift of waste will not exceed 10 feet (including daily cover). Section B.7 describes the size of the daily cell. The slope of the daily cell will not exceed 33 percent (3h-1v).

3. DAILY COVER

By the end of the day, the solid waste that has been deposited and compacted will be covered with a minimum of 6 inches of soil. At least 2 to 3 passes of heavy equipment will be made over the area to provide some compaction of the soil. An alternate daily cover is proposed to be used to reduce the amount of soil material required for daily cover. The

Specification Section 14100, Geotextile Daily Cover, includes the technical requirements. The use of an alternate daily cover reduces the daily cover requirements and increases the volume of solid waste that can be landfilled.

4. INTERMEDIATE COVER

Intermediate cover will consist of 6 inches of soil. This will be applied whenever another lift of waste will not be placed for more than 30 days. Also, intermediate cover will be applied to areas which exhibit erosion, cracking, or settlement. The need for intermediate cover in this case will be evaluated by the landfill manager on a weekly basis.

5. FINAL COVER

The final cover will be applied to appropriate portions of the landfill when any of the following conditions exist:

a. An additional lift of solid waste will not be applied within one year;
b. Within 90 days after any area of the landfill achieves final elevation; and
c. Within 90 days of when an entire landfill permit is terminated for any reason.

6. VEGETATIVE COVER

Vegetative cover will be applied to areas that have received final cover. The vegetative cover will be grasses that are locally available and locally common. No special landscaping for buffer, screening, or

aesthetics is planned. Planting schedules will be in general compliance with common practice in the area and as outlined in Section 02480 of the Technical Specifications.

7. STOCKPILES

At least 3 days worth of soil for daily cover must be stockpiled and ready for use at all times. As indicated previously, the daily cell should have a surface area of about 540 square feet. Six inches of daily cover for 3 days would amount to about 30 cubic yards of soil to be stockpiled. The location of the stockpile will vary based on landfill development and location of the working face. The landfill manager will locate the stockpile to minimize interference with the daily traffic of the facility and to provide the least haul distance possible.

E. SAFETY

1. SAFETY AND EMERGENCY PLAN

A safety and emergency plan for the site has been developed and is appended to this manual. This plan describes general safety guidelines for day-to-day operations as well as emergency procedures.

2. COMMUNICATIONS SYSTEM

Three mobile radio units will be provided for site employees. The office at the entrance of the landfill will be equipped with a mobile base station. Telephones will be provided at the landfill office for communication outside of the facility.

3. INSPECTION PLAN

Inspections will be performed by the landfill manager to assure proper operation and compliance with regulations. Daily inspections will be performed for road conditions, daily cover conditions, and blowing litter. Periodic inspections will be performed for the safety equipment, erosion and sediment control structures, the leachate collection and holding tank, and manholes. Monthly inspections will be performed for the vegetation conditions and the site monitoring devices. The following inspection schedule has been prepared to aid operating personnel in conducting routine inspection functions at the landfill site. It identifies items to be inspected and inspection frequencies.

V. CONTROL AND MONITORING OF LIQUIDS AND GAS

A. LEACHATE

Leachate from each cell will be piped to a manhole just otside the limits of the lined area. From the manhole, leachate will be piped to the existing collection and holding tank prior to pumping and hauling to a disposal facility. The existing leachate collection and holding tank provides for a 93-day storage capacity based on the maximum average daily leachate production. The existing leachate collection and holding tank has a storage capacity to provide adequate flow equalization and surge capacity at least equal to the maximum expected protection of leachate for a seven day period for the life of the facility. See Design Report, Section V.A.1. and appendix "D" for details on Leachate Recirculation. (Note that no recirculation will be implemented with waste heights less than 30 feet.)

3. INSPECTION PLAN

Inspections will be performed by the landfill manager to assure proper operation and compliance with regulations. Daily inspections will be performed for road conditions, daily cover conditions, and blowing litter. Periodic inspections will be performed for the safety equipment, erosion and sediment control structures, the leachate collection and holding tank, and manholes. Monthly inspections will be performed for the vegetation conditions and the site monitoring devices. The following inspection schedule has been prepared to aid operating personnel in conducting routine inspection fuctions at the landfill site. It identifies items to be inspected and inspection frequencies.

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Pumping and hauling of the leachate will be performed as needed to assure the availability of adequate storage capacity within the leachate holding tank.

TAZEWELL COUNTY SANTIARY LANDFILL
LANDFILL INSPECTION SCHEDULE

SYSTEM	COMPONENTS	FREQUENCY	TYPE OF INSPECTION
Leachate	Cleanouts	Monthly	Visual
Management	Leachate Laterals	As Necessary	--
Facilities	Leachate Trunkline	Biannual	Visual (TV Monitor)
	Leachate Collection and Storage Tank	Monthly	Visual
	Leachate Loading Area	Monthly	Visual
Monitoring System	Monitoring Wells	Monthly/Quarterly	Visual/Mechanical
	Observation Wells	Monthly	Visual
	Bench Marks	Monthly/Annual	Visual/Instrument
Operating Equipment	Loader	Daily/Weekly/Monthly	Visual/Mechanical
	Dozer	Daily/Weekly/Monthly	Visual/Mechanical
	Compactor	Daily/Weekly/Monthly	Visual/Mechanical
	Forklift	Daily/Weekly/Monthly	Visual/Mechanical
	Portable Pump	Monthly	Visual/Mechanical
Erosion & Sedimentation	Rock Lined Channels	Monthly/Storm Event	Visual
Control Facilities	Ditches	Monthly/Storm Event	Visual
	Culverts	Monthly/Storm Event	Visual
	Sedimentation Basin	Monthly	Visual
	Overflow Spillway	Monthly	Visual
	Discharge/Outlet	Monthly	Visual
	Slopes	Monthly/Storm Event	Visual
Safety/Security Devices	Gate (Access)	Daily	Visual
	Fire Extinguisher	Monthly	Visual
	First Aid Kits	Monthly	Visual
	Communications	Daily	Mechanical

B. GAS MANAGEMENT SYSTEM

• GENERAL

The landfill will be developed in four phases in an open ended hollow west of the previously developed area. The first three phases expand the footprint of the lined area, while the fourth consists of a vertical expansion over the first three phases. The entire lined area will be closed with a synthetic cap at the end of the project's 60-year life. Until the closure cap is complete, landfill gas will be passively released to the atmosphere via migration through the cover soils. Once the closure cap is complete, landfill gas will be passively released to the atmosphere through the use of gas vents constructed through the closure cap and connected to a gas collection layer incorporated into the cap.

GAS MONITORING PROGRAM

• GENERAL

Gas monitoring at the Tazewell County Sanitary Landfill will be performed during the active life of the landfill and throughout the closure and post-closure maintenance periods. At a minimum, quarterly monitoring of explosive gases will be performed at all gas detection probes and in the scalehouse, maintenance building, and Tazewell County Animal Shelter. No other structures are located within 1,000 feet of the waste area at this time; however, if additional construction should occur, monitoring will begin in those structures. The monitoring frequency will be increased as described in the Response paragraph of this section. Refer to the Gas Management Plan, Drawing No. 16, for the

locations of on-site structures and gas detection probes. See Drawing No. 31 for construction details of the gas detection probes.

Gas detection probes will be placed around the waste disposal unit boundary to the west, north, and east and adjacent to the on-site structures. No probes are proposed along the southern boundary. Potential horizontal gas migration to the south will vent to the atmosphere within the facility property boundary via the hollow south of the fill area. The probes will be installed in phases coinciding with development of the landfill. Probe installation will begin in the east around previously filled areas and progress to the west as the landfill is developed westward. The probe spacing will be a maximum of 500 feet initially; however, if additional development occurs within 1,000 feet of the facility boundary, intermediate probes will be installed between the new structure and the landfill to narrow the spacing to a maximum of 250 feet.

The gas detection probes will extend to a depth at least equal to the maximum depth of waste within 1,000 feet of the monitoring point. At least three probes will be installed in each well bore to monitor shallow, intermediate, and deep layers within the gas detection probe. The actual spacing of the probes within the well bore will be established after review of the drilling log to identify potential preferential pathways. Review of existing data reveals variable subsurface conditions with sandy zones interspersed with clayey layers, and fractured rock underlying portions of the site.

Revised 12-5-95

locations of on-site structures and gas detection probes.

Gas detection probes will be placed around the waste disposal unit boundary to the west, north, and east. No probes are porposed along the southern boundary. Potential horizontal gas migration to the south will vent to the atmoshphere within the facility property boundary via the hollow south of the fill area.

Probe installation as shown on drawings 15 and 16 are located such that two monitoring probes are along the northern property line approximately 1040 feet apart; two probes are along the western edge of the waste area, approximately 950 feet apart; and one probe is located along the eastern property line.

If additional development occurs within 1,000 feet of the facility boundary, intermediate probes will be installed between the probes to narrow the spacing to a maximum of 250 feet.

The gas detection probes will extend a minmum of 5 feet into the soil, backfilled with 1" clean store for a depth of 4 feet, and extending upward 5 feet above ground connected to an inverted "U" section.

- **PROCEDURE**

Equipment: A portable combustible gas monitor, measuring the concentration of explosive gases in units of percent of lower explosive limit (LEL) of methane from 0 to 100 percent LEL shall initially be used to perform the gas monitoring. The gas monitor shall be calibrated to methane using the manufacturer's calibration kit and procedure before the monitoring activities begin (see below). If another type of gas monitor is proposed, it must be approved by Tazewell County prior to its use. The operator will record the date, time, location, sampling personnel, temperature, barometric pressure, and general weather conditions at the time of sampling, in addition to the concentration of explosive gases. The records will be maintained in the Landfill Operating Record.

On-site Structures: Gas monitoring in the on-site structures will attempt to identify the "worst case" concentrations. Monitoring will be performed at the earliest possible time after the structure has been unused (e.g., a morning after a weekend or holiday). The monitoring locations will be in corners along floors and ceilings, at cracks in the floor, and at any areas likely to accumulate gas. Gas monitoring will also be performed in any confined space requiring the entry of personnel for maintenance or inspection prior to entry by personnel in accordance with OSHA regulations.

Gas detection probes: Gas monitoring in the detection probes will consist of attaching the probe to each tubing located within the probe and recording both the initial concentration and steady state concentration.

Calibration Procedure: The calibration procedure shall be as prescribed by the manufacturer. The following procedure applies to an Industrial Scientific Model LD222 Combustible Gas Monitor, which shall be used initially for the gas monitoring at the Tazewell County Sanitary Landfill. If other instruments are used at a later date, the calibration procedure shall be supplied to the County prior to monitoring and shall be kept on file with the Operation Plan and submitted to VDEQ.

Before calibrating the LD222, switch on the instrument and allow the sensor to warm up for 15 minutes. In clean air, adjust the zero potentiometer (through the hole labeled "z") to obtain a 000 readout. Refer to Figure 2 on the following page for control locations.

Use the calibration cup (P/N 1700-6933) to apply 50 percent LEL calibration gas to the instrument. Refer to Figure 3 on the following page. The gas used for calibration should, if possible, be the same gas that is to be measured when the instrument is in use. The rate of gas flow should be 0.5 (± .05) liters per minute. Use the span potentiometer (through the hole labeled "s") to set the readout to 50 percent. Variations in the flow rate will cause inaccurate calibration of the instrument. Remove the test gas and wait for approximately one minute for the gas to completely disperse. Check that the instrument readout returns to 000. Place the potentiometer access cover in its operating position and tighten the knurled collar.

If the instrument cannot be calibrated, the span potentiometer may be at such a low setting that the instrument cannot respond properly. Turn the span potentiometer approximately 15 turns counterclockwise and then repeat the

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FAX # (304) 487-1630

JOB COMBUSTIBLE GAS MONITOR

JOB NO. _____ SHEET NO. _____ OF _____

CALCULATED BY _____ DATE _____

CHECKED BY _____ DATE _____

SUBJECT _____ SCALE _____

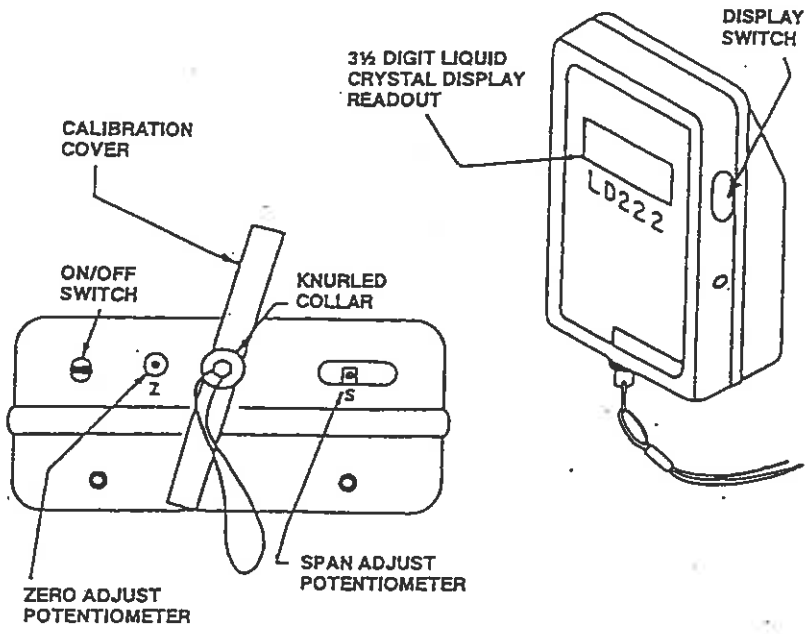

Figure 2.
Location of Instrument Controls and Adjustments

REPRODUCED FROM INDUSTRIAL SCIENTIFIC MODEL LD222 LEL COMBUSTIBLE GAS MONITOR

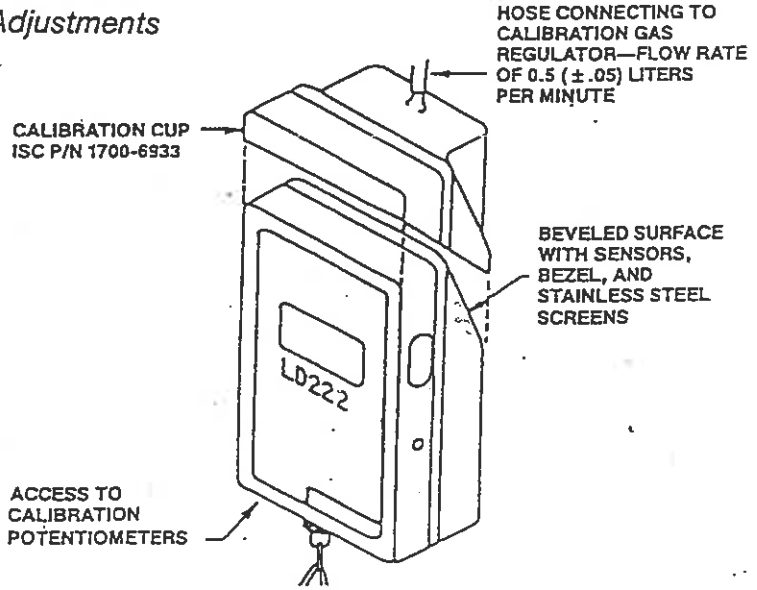

Figure 3.
Calibration of Industrial Scientific Corp. 200 Series Instrument

calibration procedure described above. Note that the calibration procedure calls for the adjustment of the zero potentiometer first. The span potentiometer should not be readjusted until the zero potentiometer is properly set.

- **RESPONSE TO DETECTED COMBUSTIBLE GASES**

The regulatory action level for combustible gas monitoring in the gas detection probes at the facility boundary shall be 100 percent LEL and 25 percent LEL in on-site structures. Readings exceeding the regulatory action levels shall be reported to Tazewell County within 24 hours. The County will notify the Virginia Department of Environmental Quality (VDEQ) in writing within 5 working days of detection and indicate what has been done or is planned to be done to resolve the problem. Within 60 days of detection, the County will develop a remediation plan for the methane gas releases and submit it to the Director for approval. The plan will specify a gas control system that will be constructed as soon as practicable.

The County will also use "monitoring action levels" of one-half of the regulatory levels. If the gas readings exceed the monitoring action levels, the monitoring frequency will be increased to monthly until three consecutive readings below those levels are recorded. If the monitoring action level is exceeded in the on-site structures or adjacent probes, options will be evaluated to reduce the current levels and to prevent a further increase in gas levels in the structures.

GAS VENTING SYSTEM

- **DESCRIPTION**

Once the landfill is closed with a synthetic cap, landfill gas will be collected beneath the cap and conveyed to a passive gas venting system. A six-inch gas collection layer constructed of fine aggregate with a permeability of at least 1 x 10^{-3} cm/sec will be constructed beneath the secondary infiltration/gas barrier layer. (Refer to Drawing No. 31 for the cap cross-section.) The gas collector layer will convey landfill gas horizontally to gas vents.

The gas vents will consist of three-foot diameter stone columns surrounding a 6-inch diameter perforated pipe. Short sections of perforated PVC within the collection zone will connect to the vertical perforated pipe. The vertical perforated pipe will penetrate the synthetic liner and passively vent the gas to the atmosphere. (Refer to Drawings No. 16 and No. 29 for the vent locations and detail.) The bottom of the column will be a minimum of 10 feet above the leachate collection layer. The gas vent columns will be built progressively as the landfill is expanded vertically.

- **PEAK FLOW**

The projected maximum gas flow is estimated to be 530 to 950 standard cubic feet per minute (scf/m). The calculation is as follows:

Total Waste Volume = 4,000,000 cubic yards (cy)
Assume landfill gas generation (LFG) rate =
70 - 125 scf of LFG per cy of waste per year
Peak flow = (4,000,000 cy) x (70 to 125 scf/cy/yr)
= 280,000,000 to 500,000,000 scf/yr
= 533 to 951 scf/min.

- **GAS RECOVERY**

After the gas venting system is operational, a field test and evaluation will be performed to determine the feasibility of gas collection and utilization. Based on an 80 percent recovery of the estimated peak flow, the estimated gas volume available for recovery is 425 to 760 scf/min. Detailed plans will be developed for the installation of collection flaring and/or blower/burner facilities no later than 180 days prior to installation. The plans shall be submitted to the Department of Environmental Quality for review and approval.

C. GROUNDWATER

The Groundwater Monitoring Program is defined in the report prepared by Marshall Miller & Associates titled "Hydrogeologic Evaluation and Ground Water Monitoring Plan, Tazewell County Landfill, Tazewell County, Virginia, July, 1993" and the addendum entitled "Addendum to Hydrogeologic Evaluation and Ground Water Monitoring Plan, Tazewell County Landfill, Tazewell County, Virginia, September, 1993".

VI. RECORDS

Scales record the weight of waste received at the landfill. Information recorded include waste source, general waste type, amount of waste in tons, and hauler. This information will be used for filing purposes as well as being available for review by regulatory personnel.

APPENDIX A

SAFETY PROGRAM

JOYCE ENGINEERING, INC.

701 MERCER STREET
PRINCETON, WEST VIRGINIA 24740

(304) 487-6107

SAFETY
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL, VIRGINIA

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PREPARED FOR:

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SAFETY

A. GENERAL

Solid waste disposal facilities have historically had relatively high accident frequencies. However, through the implementation of a good safety and training program, accidents can be held to a minimum. This program should include:

(1) Identification of dangers.

(2) Assessment as to degree of danger.

(3) Procedures for correcting dangerous situations.

(4) Actions to be taken in case of accidents.

B. SITE USER SAFETY

Danger always exists when you have pedestrians, trucks, cars and heavy equipment present in one place.

Landfill employees should make sure that users of the facility know and follow the safety rules that apply to dumping. These rules are:

- Only adults should be allowed to leave their vehicle to unload (children should remain inside the vehicle).
- The adults should remain near their vehicle.
- Wastes should be unloaded in areas designated by landfill employees.
- Unauthorized scavenging will not be permitted.
- Turn-off engine, remove keys, and set parking brake.

C. FIRE PROTECTION

All landfill equipment shall be equipped with a fully charged fire extinguisher. All operations personnel should notify the landfill office at the first sight of any fire. He should then follow instructions from the landfill office. Depending on the size of the fire, the landfill office will either notify the fire department or choose to extinguish it themselves. The landfill office and maintenance building shall also have fully charged fire extinguishers.

Other fire protection procedures include:

- No burning of wastes shall be allowed at the site.
- If a collection truck arrives with a load that is suspected of being on fire, it will be directed to a safe, secluded area away from the filling site, where it will be dumped and extinguished.
- If a fire occurs in the fill area, it should be dug out, spread on non-filled areas and extinguished immediately. Fire department equipment and personnel should be present to spray water on the machine doing the excavation and on the burning waste.

D. LANDFILL GASES

The decomposition of solid wastes can produce two potentially dangerous gases, methane and hydrogen sulfide. Both gases are highly explosive and can cause asphyxiation.

Some safety precautions that should be taken in and around manholes and other areas where gas may accumulate are:

- Torches should never be used in these areas.
- No smoking should be allowed.
- Any lights or tools to be used in manholes must be non-sparking and safety approved.
- If any doubt occurs as to the safety of a manhole atmosphere — **DO NOT ENTER!**
- Never enter a manhole without someone else present.

E. RELEASES TO THE ENVIRONMENT

In case of releases of waste constituents to the air, soil, or water at the facility, personnel shall take whatever action is deemed appropriate and safe to stop or mitigate the release and then notify the proper authorities.

F. FIRST AID

Prompt and proper attention can prevent a minor or serious injury from becoming life threatening. Therefore, there should be at least one person at the landfill who is trained and certified in first aid. In addition, there should be well stocked first aid kits available. In case of a serious injury, the qualified person should administer first aid while another employee contacts the rescue squad. At least one member of the on-site people should have first-aid training.

G. EQUIPMENT SAFETY AND TRAINING

Each piece of heavy equipment has its own unique characteristics. Therefore, it is very important that each operator receive thorough safety training on his respective machine.

If the equipment operator does not feel it is safe to perform a given task, he should not attempt it. He should take his safety concerns to the foreman. At no time should an operator of heavy machines take chances with faulty or defective equipment; they should park it and report to the Foreman. It is, however, the operator's responsibility to make all checks and tests. The foreman should be notified of any leaks, broken or missing parts, or any other dangerous situations concerning the equipment. These should also be noted on the Equipment Maintenance Schedule.

The following pages outline safety precautions and instructions for each operator of heavy equipment.

EMERGENCY TELEPHONE NUMBERS

Person to Notify in Any Emergency:

County Administrator	(703) 988-7541
Landfill Site Environmental Control Department Head	(703) 988-4003

Accidents:

Ambulance

Tazewell County Rescue Squad	(703) 988-5970

Hospitals

Tazewell Community Hospital	(703) 988-2506
Bluefield Regional Medical Center	(304) 327-1100

Fire:

Fire Department

Town of Tazewell Volunteer Fire Department	(703) 988-4141

Power

Appalachian Power Company	(703) 988-5561

Police:

Sheriff's Department - Tazewell County	(703) 988-5966
State Police - Wytheville, Virginia	(800) 553-3144

County, State, and Federal Agencies:

Virginia State Health Department - Tazewell	(703) 988-5585
Virginia Department of Environmental Quality - Richmond	(804) 786-3563
Virginia Department of Environmental Quality - Roanoke	(703) 563-3555
Bureau of Solid Waste Management	(804) 255-2667
Hazardous Waste Violations - Toll Free	(800) 552-2075

Virginia Department of Environmental Quality (State Water Control Board) - Richmond	(804) 367-0056
Nation Response Center - Toll Free	(800) 424-8802
Virginia Department of Emergency Services	(800) 468-8892

EQUIPMENT SAFETY GUIDE
(For Truck Driver)

PRE-OPERATION CHECKS AND SAFETY PRECAUTIONS

1. Check Wheels and Tires

   Visually check tires for bulges, cuts, irregularities, abnormal wear and that they are correctly inflated. Look for missing lugs.

2. Check Hydraulic System

   Check tank, gauge, pumps, hoses and lines for leaks. Fill as needed.

3. Check Cooling System

   Lights, horn, windows, mirrors, windshield wipers, and signaling devices must be in working order.

4. Check Cooling System

   Never pour coolant into the radiator if the engine is too hot, wait for engine to cool, and leave machine idling while adding coolant.

5. Check Engine Oil

   Be sure all plugs, filter caps and other fittings are secure and not leaking. Add oil as needed.

6. Check Air System

   A. Drain water from the air reservoir tank daily. If truck has automatic bleeders, check for proper functioning during shift.
   B. When charging the tank, do not exceed the specified pressure limit.
   C. Be sure all connections are tight.

7. Check Fire Extinguishers

   Be sure you have a fully charged fire extinguisher on your machine at all times. Must be of sufficient size. Be sure to know location of all fire extinguisher.

SAFETY PRECAUTIONS FOR MOUNTING AND STARTING TRUCK

1. Before mounting--walk around truck

   Be sure there is no one on, near or under the truck.

2. Mount Truck

   A. Use handrails, ladders and/or steps; be alert for slippery conditions.
   B. Be especially careful when mounting in muddy weather and with wet or greasy hands.
   C. Keep windows as clean as possible.

3. Check--before starting engine

   A. Check all controls to be sure they are in park or neutral before starting.
   B. Floor should be free of debris. Foot pedals, levers, and knobs should be as free as practicable of grease and oil.

4. Start Engine

   A. Do not crank an electric starter for more than 30 seconds. Allow time for cooling before you start again.
   B. In cold weather, when starting fluid has to be used, remember the fluid is highly flammable.

5. Check--after starting engine

   A. Observe gauges, instruments, and warning lights to insure that they are operable and their readings are within operating range.
   B. Check foot and parking brakes.
   C. Turn wheels to right and left to check steering controls. Improper steering action can also indicate tire trouble.
   D. Listen for unusual noises from the transmission or drive train.

SAFETY PRECAUTIONS FOR SHIFTING AND BRAKING

1. Down shifting to aid in braking

   A. Always stop the vehicle and run the engine at low idle speed to shift from a forward speed into reverse or from reverse to forward.
   B. Always anticipate grade and select proper gear range accordingly.
   C. Always apply Jacob's brake and/or foot brakes to reduce speed before entering sharp turns, fill areas, and on downgrades.
   D. Always leave the shift lever in neutral position and parking brakes engaged when stopped with engine running.

2. Braking

A. Brake firmly in one application. Do not pump brakes.
B. Never depend on the parking brake to stop the vehicle. Use the parking brake only for parking (An emergency may justify using this brake to help slow the truck).
C. Use Jacob's brake in lieu of foot brakes whenever possible (Use foot brake as needed).

SAFETY PRECAUTIONS FOR LOADING, HAULING, AND DUMPING

1. Loading

A. Be alert for other vehicles and personnel on foot.
B. While truck ahead is being loaded, wait at a safe distance and prepare for positioning under loader. Give right-of-way to loaded vehicles.
C. When safe to drive under bucket either pulling in or backing in, follow the signals of the bucket operator or spotter. Never allow truck cab to pass under a raised loader bucket.
D. Stop vehicle on as level ground as possible for loading.
E. When positioned for loading shift into neutral, apply appropriate brake to hold truck stationary.
F. Never leave or enter cab while truck is being loaded.

2. Hauling and Dumping

A. Be cautious, especially during the first trip. Check the brakes and road conditions.
B. Keep cab doors closed while driving.
C. Always drive at a safe speed, one suited to road and weather conditions.
D. Before starting up or down grade, select the gear range that will give you full control under the conditions. Never coast in neutral!
E. Before backing up, assure yourself that the area is clear, by making use of your rear view mirrors. If not sure, get out and look.
F. Be sure back-up lights and back-up alarm are operating.
G. Give right of-way to loaded trucks on haul roads and in borrow pits.
H. When dumping, be cautious of spoil bank and overhead power wires.
I. Be cautious of ditches, holes and soft places. If necessary to cross such obstacles, approach at an angle, one wheel first, and then proceed slowly.

PARKING AND SHUTDOWN SAFETY PRECAUTIONS

1. Park

   A. Select level ground whenever possible.
   B. If parking on a slope cannot be avoided, position truck at right angles to incline and apply brakes and block wheels.
   C. Use service brake to stop truck, then set parking brake.

2. Shutdown

   A. Allow engine to idle a few minutes to cool down and then stop the engine.
   B. Never, for any reason, leave the truck unattended while the engine is running.

3. Fueling the Truck

   A. Shut engine off and be cautious while fueling truck. Look for fire hazards.
   B. Do not smoke while fueling.
   C. Be Sure nozzle is in filler before starting fuel flow.
   D. Replace caps securely.

EQUIPMENT SAFETY GUIDE
(For Dozer Operator)

PRE-OPERATION CHECKS AND SAFETY PRECAUTIONS

1. Check guards, canopies, and all other protective devices

   Be sure they are in place and secure. Make sure all bolts are tight.

2. Visually check for leaks in fuel lines, lubrication, and hydraulic systems

   Check steering, brakes, gauges, blade controls and hoses.

3. Check blade and tracks

   Look for cracks and broken or missing parts and bolts.

4. Check levels of coolant, fuel, hydraulic fluid, and lubricating fluid

   Add if necessary. However, do not add coolant to hot engine; wait for engine to cool.

5. Check steps, grab rails, and operator's compartment

   Watch for excess accumulation of oil, grease, mud, or loose articles.

6. Check fire extinguisher

   Be sure fire extinguisher is charged and of sufficient size.

SAFETY PRECAUTIONS FOR MOUNTING AND STARTING DOZER

1. Walk around dozer (before mounting)

   Be sure there is no one on, under, or around the machine.

2. Mount dozer

   A. Be aware of any slipping hazards. Use handrails, ladders, or steps (where applicable). Do not use controls as handholds when entering.
   B. Adjust seat for the most comfortable position. Fasten seat belt.
   C. Check windows. Keep windows as clean as possible.

3. Check controls

   A. Transmission controls must be in neutral. Transmission safety lever must be in locked position.
   B. Blade should be in down position. Blade control must be in neutral position.
   C. Be sure that doors are fastened and that there are no loose objects in the operator's compartment.

4. Start engine

   A. After starting engine, check all gauges, etc. to see that they are within operating range.
   B. Do not crank for more then 30 seconds. Allow time for starter to cool before cranking again.
   C. In cool weather, if starting fluid is used, remember, it is highly flammable.

SAFETY PRECAUTIONS FOR OPERATIONAL CHECK

1. After starting-check gauges, instruments, and warning lights

   Be sure they are operational and their readings are within operating range.

2. Check steering mechanism

   Steer right, and then left-while moving slowly.

3. Test brakes

4. Test clutch or neutral position on power shift transmissions. Test engine speed control.

   Be sure machine speed and direction can be controlled.

5. Check engine and gear compartments

   A. Listen, while moving slowly to detect any unusual noises.
   B. Be sure the engine is operating normally before starting dozing operations.

6. Check back-up signal

   Be sure it is working. Do not operate without it.

SAFETY PRECAUTIONS FOR OPERATING THE DOZER

1. Tramming the dozer

   A. Never coast or free wheel downgrade in neutral.
   B. Do not brake while on grades by shifting gears, use the foot brake. Gear down before getting on steep grades.
   C. Operate at speed which insures you have complete control at all times.

2. Undercutting and pushing dirt

   A. When undercutting high banks and highwalls, the whole mass can become unstable and cave in.
   B. Do not get too close to edge of spoil bank. Push one load to edge of bank and use second load to push the first load over.
   C. Be aware if other workers are in the area.
   D. Only carry authorized passengers in a safe location. Don't risk having them fall off.

3. Working garbage

   A. Don't push waste piles until you are sure no one is behind them.
   B. Be careful when pushing piles so that falling objects don't strike other equipment or persons.
   C. Move slowly over bulky items to prevent tipping. Try to approach bulky items from an angle.
   D. Don't crush sealed or unknown containers. Check contents to prevent possible fires or explosions. If unsure of contents, set the container aside and call local or state authorities.

4. Falling trees

   A. The tractor should be equipped with proper overhead protection (Roll-Over Protective Structure) cab. Use extreme caution when pushing over a tree with a dead top.
   B. Never allow a tractor to climb up on the root structure while the tree is falling.
   C. Avoid operating your equipment too close to an overhang or a deep ditch. Be aware of caving edges, falling rocks and slides.

5. Towing

   When using a cable to hitch the tractor to a load, move forward and take up slack slowly. Do not jerk. Do not kink cable. Keep cable taut.

PARKING AND SHUTDOWN PRECAUTIONS

1. Parking

   A. Always park on level ground when possible. Lower all attachments to the ground.
   B. Make sure the tracks are on a firm footing and there is no danger of sliding.
   C. Always set parking brake and put transmission in neutral when parking temporarily with engine running. If tractor is equipped with a transmission lock — engage it.

2. Shutdown

   A. Lower attachments to ground and put control lever in neutral.
   B. Freeze down should be avoided. When possible, park on hard surface.
   C. Place transmission controls in parking position and engage transmission lock.
   D. Set parking brake.
   E. Allow engine to idle for gradual cooling down; then stop engine.
   F. Block tracks if machine is stopped on a steep grade.
   G. Use extreme care when dismounting machine. **DON'T JUMP OFF!** Use grab irons and handrails. Face machine when getting off.

3. Refueling

   A. Shut off engine and watch for fire hazards. Do not smoke while fueling.
   B. Be sure nozzle is in filler before starting fuel flow.
   C. Replace caps securely.

SAFETY GUIDE
(For Mechanics, Welders, etc.)

CUTTING AND WELDING SAFETY PRECAUTIONS

1. Welding

   A. Wear welding shield or goggles. Be sure lens are clean and free of cracks.
   B. Wear protective clothing and gloves.
   C. Check all leads from welding machines. Be sure connections are secure.
   D. Before starting to weld, clear area of fire hazards such as rags, grease, oil, paper,etc. Also, have fire extinguisher available.
   E. Check area for fire before leaving.

2. Cutting

   A. Be sure gas cylinders are properly secured and the gauges, regulators, and hoses are in good repair.
   B. Cylinders must have safety cap over valves when not in use or when being transported.
   C. Be sure work area is free of grease, oil, rags, paper, etc. before cutting. Also, have fire extinguisher available.
   D. All torches should have flash back arresters.
   E. When each job is completed, all hoses, regulators and torches should be stored in an orderly fashion so as to protect them from damage.
   F. Be sure gas cylinders do not come in contact with welding electrodes or heat sources.
   G. Check area for fire or warm spots before leaving area.
   H. Always wear a cutting shield or goggles.

SAFETY PRECAUTIONS WHILE REPAIRING EQUIPMENT

1. Blocking equipment

   When working under equipment, be sure it is blocked properly by using chocks, safety stands, or blocking where necessary.

2. Repairing equipment

A. Wear gloves and handling cables.
B. When using hand operated power tools, be sure tools have quick release trigger mechanism.
C. When using air operated hand tools, be sure of safe hose connections.
D. Do not use defective tools, such as broken handles, chipped screwdrivers, burred chisels, punches, hammers, axes, etc.
E. Be sure sledge hammer handles, bars, and long leverage wrenches are in safe condition before use.
F. Arrange to have safe footing before using pry bars, large wrenches, or sledge hammers.
G. After repairs, be sure all guards are replaced and safety devices installed.
H. Sound alarm signal before starting any part of machine in motion.
I. Wear safety glasses or goggles any time you hammer, chip, grind, or any other time there may be a chance of foreign material entering your eyes.

EQUIPMENT SAFETY GUIDE
(For Grader Operator)

PRE-OPERATIONAL CHECKS AND SAFETY PRECAUTIONS

1. Check wheels and tires

   Look for cuts, irregularities, bulges, abnormal wear, and visual inflation checks on tires.

2. Check hydraulic systems

   Check steering, brakes, gauges, blade controls, and hoses or lines. Fill as needed.

3. Check general conditions

   Check guards, shields, windows, mirrors, back-up alarm, and lights (where applicable).

4. Check cooling system gauge

   Never pour coolant into the radiator if the engine is hot; wait for engine to cool.

5. Check engine oil

   Be sure all plugs, filter caps, and other fittings are secure and not leaking. Fill as needed.

6. Check fire extinguisher

   Should have fully charged fire extinguisher available at all times. Must be of sufficient size.

7. Check work area (roads, etc.)

   Watch out for slippery or soft spots. Be very cautious if snow or ice is present. Use chains if necessary.

SAFETY PRECAUTIONS FOR OPERATING THE GRADER

1. Starter grader (set park brake before starting)

    A. After starting engine, check gauges and instruments to see if they are working.
    B. In cold weather, if starting fluid has to be used, remember fluid is highly flammable.
    C. Do not crank starter for more than 30 seconds. Let it cool down before cranking again.

2. Operator grader

    A. Check to see that the machine is clear of men and equipment before moving.
    B. Be sure that the brakes and steering mechanisms are working properly.
    C. Do not operate the grader where there is a danger of it tipping over.
    D. Operate machine while seated and use seat belt.
    E. Use extreme caution when working edge of roadway. Edges can give way and tip machine over.
    F. Operate machine at a safe speed.
    G. When traveling on highway, keep blade at an angle with the flow of traffic, not against it.
    H. Keep transmission in gear when going downgrade. Never coast in neutral.

2. Park grader

    A. Park on level ground when possible. Lock park brake, lower blade to ground.
    B. When dismounting, be careful of slippery conditions on stepping points and on the ground.

4. Refueling

    A. Shut off engine and watch for fire hazards. Do not smoke while fueling.
    B. Be sure nozzle is in filler before starting fuel flow.
    C. Replace caps securely.

EQUIPMENT SAFETY GUIDE
(For Track Type Loader Operator)

PRE-OPERATIONAL CHECKS AND SAFETY PRECAUTIONS

1. Check guards, canopies, and other protective devices

   Be sure they are in place and secure. Be sure all bolts are tight.

2. Visually check for leaks in fuel lines, lubrication and hydraulic systems

   Check steering, brakes, gauges, bucket controls and hoses.

3. Check bucket and tracks

   Look for cracks and broken or missing parts or bolts.

4. Check levels of coolant, fuel, hydraulic fluid, and lubrication oil

   Add if necessary. However, do not add coolant to hot engine; wait for engine to cool. Add coolant with engine idling.

5. Check steps, grab rails, and operator's compartment

   Check for excess accumulation of oil, grease, and mud. Watch for slipping hazards. Move or secure any loose items in cab.

6. Check fire extinguisher

   Be sure fire extinguisher is charged and of sufficient size.

SAFETY PRECAUTIONS FOR MOUNTING AND STARTING LOADER

1. Walk around loader (before mounting)

   Be sure there is no one on, under, or around the machine.

2. Mount machine

   A. Use handrails, ladders, and/or steps (where applicable). Be alert for slippery conditions. Do not use controls as handholds when entering operator's compartment.

   B. Adjust seat for best position for you and fasten seat belt.

3. Check all controls

   A. Be sure all controls are in neutral and in locked position. Also, make sure bucket is on ground before starting.
   B. Foot pedals, levers, and knobs should be as free as practicable of grease, mud, and oil.
   C. Be sure windshields and windows are clean.
   D. Be sure doors are fastened and that there are no loose objects in operator's compartment.

4. Start engine

   A. After starting engine, check gauges, instruments, and warning lights to insure that they are operable and their readings are within operating range.
   B. Check instruments frequently and listen for unusual noises from the transmission, engine or final drives.
   C. In cold weather, if starting fluid has to be used, remember fluid is highly flammable.

SAFETY PRECAUTIONS FOR OPERATIONAL CHECK

1. Check backup signal

   Sound alarm signal before moving machine and be aware of the location of other equipment or people within your working area.

2. Test brakes

3. Check bucket controls

   Operate bucket and equipment controls through a complete cycle and check for faults before starting normal operations.

4. Check steering

   Check out controls in a safe area while moving slowly. Steer machine both right and left to be sure the steering is operating properly.

SAFETY PRECAUTIONS FOR OPERATING THE LOADER

1. Operator loader

   A. Keep the bucket or attachment low so it doesn't block your vision when traveling. However, the bucket or attachment should not be used as a brake except in an emergency.
   B. Do not operate the machine where there is a danger of tipping over.
   C. When loading, try to keep the machine on level ground. Start and stop smoothly when carrying a load.

D. Use extreme caution when working edge of roadway. Stay back from edge of banks. They can cave in or the machine can lose its footing and slide over the edge.
E. When dumping into trucks, be careful not to hit the truck with loader or bucket. Never move a load over truck cabs or above the heads of other workers.
F. Keep machine in gear when traveling downgrade. Never coast in neutral.
G. Operate straight up and down slopes whenever possible.
H. When using cables to move a load or equipment, be sure cables are of adequate size and free of flaws. Keep cable taut. Move slowly when taking up slack.
I. The machine should never be used as a battering ram. Besides damaging an expensive piece of equipment, an injury could occur.

2. Undercutting

A. When undercutting, keep an eye on the highway and watch out for overhanging trees or falling rocks.
B. Be sure to have overhead protection (Roll-Over Protective Structure cab or canopy, hard hat, etc.).

3. Working garbage

A. Only carry authorized passengers in a safe location. Don't risk having them fall off.
B. Don't push waste piles until you are sure no one is behind them.
C. Be careful when pushing piles so that falling objects don't strike other equipment or persons.
D. Move slowly over bulky items to prevent tipping. Try to approach bulky items from an angle.
E. Don't crush sealed or unknown containers. Check contents to prevent possible fires or explosions. If unsure of contents, set aside and call local or state authorities.

4. Falling trees

A. The tractor should be equipped with proper overhead protection (Roll-Over Protection Structure cab). Use extreme caution when pushing over a tree with a dead top.
B. Never allow a tractor to climb up on the root structure while the tree is falling.
C. Avoid operating your equipment too close to an overhang or a deep ditch. Be aware of caving edges, falling rocks, and slides.

5. Towing

When using a cable to hitch the tractor to a load, move forward and take up slack slowly. Do not jerk. Do not kink cable. Keep cable taut.

PARKING AND SHUTDOWN PRECAUTIONS

1. Park and shutdown

   A. Park on level ground when possible. Make sure the machine is parked on a firm footing to prevent it from tipping.
   B. Do not leave machine before setting parking brake.
   C. Lower the bucket or other attachments "flat" to the ground. Place all controls in parking position.
   D. Freeze down should be avoided by parking on hard surface when possible.
   E. Allow engine to idle for gradual cooling down; then stop engine.
   F. Use extreme care when you dismount the machine. Be careful of slippery conditions. **DON'T JUMP OFF!** Use grab irons and handrails. Face machine when getting off.

3. Fueling

   A. Shut off engine and watch out for fire hazards. Do not smoke when fueling.
   B. Be sure nozzle is in filler before starting fuel flow.
   C. Replace caps securely.

EQUIPMENT SAFETY GUIDE
(For Spreader Compactor)

GENERAL

1. Do not operate machine unless you have read and understood the instructions in the Operator's Guide. Improper operation is dangerous and could result in injury or death.

2. Do not step on the cleaner bar when the machine is moving.

3. Climb on and off the machine only where steps and/or grab irons are provided. Use both hands and face the machine, when mounting and dismounting. Never jump off a machine.

SAFETY

1. Clean steps, grab irons, and operator's platform.

2. Install anti-pivot link before working in center pivot area.

3. Report needed repairs immediately.

4. Read and understand all safety precautions and warnings before operating this machine.

5. Wear a hard hat, protective glasses, and other protective equipment as required by job conditions.

6. Do not wear loose clothing or jewelry that catch on controls or other parts of the machine.

7. Make sure clearance flags, lights, and other required warnings are on the machine when roading.

8. Do not smoke while refueling or when near the batteries.

9. Know the hand signals and who gives them. Accept signals from one person only.

10. Road machine in forward only, not in reverse.

11. Keep machine, especially deck and steps, free of foreign material. Secure all loose items such as lunch boxes, tools, etc.

12. Know your stopping distance at any given speed. Regulate travel speed accordingly. Do not coast.

13. Machine bounce affects steering control. Slow down on rough roads.

PREPARING TO OPERATE

1. Clear personnel from machine area.

2. Test all controls while moving slowly in an open area before starting work.

3. Inspect condition of seat belt. Replace if damaged or worn.

4. Adjust seat so that full brake pedal travel can be obtained with operator's back against seat back.

5. Clear obstacles from path of machine. Beware of hazards such as wires and ditches.

6. Be sure all brakes are operating properly.

7. Make certain protective guards and covers are secured in place.

8. Make sure vehicle is equipped with proper lighting system as required by conditions.

9. Test steering response for left and right steering.

10. Inspect machine for potential fire hazards.

11. Clean windows. Secure doors and windows in either open or shut position.

12. Adjust rear view mirrors for best vision.

13. Fasten seat belt securely.

14. Check for proper operation of all protective devices such as lights, backup alarm, horn, etc.

15. Always have a fire extinguisher on hand and know how to use it. Inspect as recommended.

MOUNTING AND DISMOUNTING

1. Do not try to climb onto the machine while carrying tools or supplies. Use hand line to pull up equipment onto the platform.

2. Never get on or off a moving machine.

3. Always lower all equipment before dismounting.

4. The door on the right side of the cab serves as an emergency exit, if left hand door is blocked for any reason.

5. If the machine is equipped with a cab, enter through the left hand cab door only.

STARTING

1. Do not start the machine or move any of the controls if there is a warning tag hanging on the controls.

2. Move all implement controls to HOLD or NEUTRAL before starting the engine.

3. Make sure no one is working on, underneath, or close to the machine before starting the engine or beginning to move.

4. Shift transmission control lever to neutral and engage parking brake before starting the engine.

5. Start and run the engine only in a well ventilated area.

OPERATING

1. Operate controls only while seated.

2. Do not allow riders on vehicle or implements unless additional seat, seat belt, and roll-over protection are provided.

3. The operator must satisfy himself that no one will be endangered before moving the machine.

4. Report needed repairs noted during operation, immediately.

5. Stay a safe distance from the edge of cliffs, overhangs, and slide areas.

6. Keep machine under control — do not try to work machine over capacity.

7. Be careful to avoid tipping when working on hills, banks, or slopes, and when crossing ditches, ridges, or other obstructions.

8. Connect trailing equipment to a drawbar or hitch only.

9. Personnel should not be between the machine and tailing equipment while maneuvering to connect. Block tongue or hitch or trailing equipment to align it with the drawbar or hitch.

10. Be sure hitch points and tow cable are adequate.

11. If your machine begins to side, stop on a grade, immediately dispose of the load and turn the machine downhill.

12. If the machine begins to tip forward, lower blade quickly to restore backhoe.

13. Stop the machine frequently at night — walk around and inspect the machine — stay alert.

14. Reduce travel speed and use less steering angle to avoid tipping when working on hills, banks, or slopes.

15. Work up and down slopes whenever possible rather than sideways.

PARKING THE MACHINE

1. Park on level surface. If it is necessary to park on a grade, block wheels securely.

2. Move transmission control level to NEUTRAL. Engage transmission control lock. Apply brake.

3. Lower all equipment to the ground and apply slight down pressure.

4. Turn off and remove starter key.

5. When parking the machine for an extended period (overnight, etc.), turn off and remove the disconnect switch key. Lock all doors and compartments to minimize vandalism and theft.

APPENDIX B

EMERGENCY PLAN

JOYCE ENGINEERING, INC.

701 MERCER STREET
PRINCETON, WEST VIRGINIA 24740

(304) 487-6107

EMERGENCY PLAN
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL, VIRGINIA

JULY 15, 1992

REVISED OCTOBER 15, 1992
(PER COMPLETENESS REVIEW)

REVISED NOVEMBER 18, 1993
(PER FIRST TECHNICAL REVIEW COMMENTS)

REVISED JANUARY 12, 1994
(PER SECOND TECHNICAL REVIEW COMMENTS)

PREPARED FOR:

TAZEWELL COUNTY BOARD OF SUPERVISORS
ADMINISTRATION BUILDING
315 SCHOOL STREET, BOX 2
TAZEWELL, VIRGINIA 24651
(703) 988-7541

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EMERGENCY PLAN

Fires, explosions, and other unplanned releases of waste or waste constituents are always possibilities at solid waste disposal facilities. This Emergency Plan has been compiled to minimize hazards to personnel and the environment, and to outline actions to be taken in the event of such occurrences.

I. FIRE CONTROL PLAN

An uncontrolled, non-permitted fire could create an extensive emergency situation at the landfill site. Several measures will be taken to minimize the possibility of tires and to aid in gaining control of a fire should one occur. The operator first observing the fire should first radio the landfill office to report the size of any fire and request backup.

Fire extinguishers will be located on each piece of equipment on site. Equipment operators will be trained in the use of these extinguishers. Fire extinguishers will be used for small, localized fires. A stockpile of soil of about 14 cubic yards will be maintained near the working face to be utilized for extinguishing small surface fires which may be too large to control with the fire extinguishers carried on the landfill equipment.

Emergency equipment will be called in the case of fires too large to be extinguished with fire extinguishers or soil as described above. In addition, water contained in the leachate holding tank and sedimentation pond will serve as emergency reservoirs to aid local firefighters in the extinguishing of larger fires.

Each incoming load of waste will be examined upon arrival by the site operator for any evidence of fire such as flames, smoke, or the odor of burning material. If evidence of fire exists, the Emergency Coordinator will be notified that a fire exists at the landfill site. Then, the landfill operator will perform an evaluation of the situation to determine whether the fire can be extinguished using a fire extinguisher, or if any other equipment will be needed. If necessary, the local fire department will be called upon to render assistance in extinguishing flames. The Emergency Coordinator will act as incident commander in such a situation with backup from the fire crew.

Other measures will be taken should a fire occur in waste already placed in the disposal area. If possible, the waste will be removed or segregated from other waste in the disposal area. Following segregation, the situation will again be evaluated to determine whether or not additional assistance will be necessary from off-site emergency personnel and handled as described above.

II. ARRANGEMENTS WITH EMERGENCY PERSONNEL

Arrangements are in existence with the local police department, fire department, and rescue squads to respond to the site, if necessary. Copies are maintained with the local police department, fire department, hospitals, and other emergency personnel who may be called upon to respond in emergency situations.

III. EMERGENCY COORDINATOR

The following is a list of the emergency contacts, the first listed being our primary coordinator and the second listed being his alternate:

J. S. "Sandy" Etter
Department Head
Environmental Control Department
County of Tazewell
Administration Building
315 School Street
Tazewell, Virginia 24651
(703) 988-4003

Quinto Faligiana
Environmental Control Department
County of Tazewell
Administrator Building
315 School Street
Tazewell, Virginia 24651
(703) 988-7541

Four of the employees at the site have advanced training in hazardous materials and the other two have basic training in hazardous materials. In addition, one employee has emergency medical training (EMT).

IV. EMERGENCY EQUIPMENT

Below is a list of emergency equipment which will be available:

- Fire extinguishers used on equipment and in structures; and
- Heavy equipment such as front-end loader, dozer, and tank truck.

V. PLAN DISSEMINATION

The Emergency Plan will be furnished to the local police department and fire department of jurisdiction, nearby hospital, and the office of the Emergency Coordinator.

VI. PLAN AMENDMENTS

The Emergency Plan shall be periodically updated as conditions warrant. It will be amended as appropriate if:

1. The facility permit is amended resulting in circumstances which materially increase the potential for fire, explosions, or releases to the environmental, or which change the responses necessary in an emergency;

2. If the plan fails to function adequately in an emergency situation; and
3. The Emergency Coordinator for the County changes or the list of equipment changes.

VII. EMERGENCY TELEPHONE NUMBERS

Person to Notify in Any Emergency:

County Administrator	(703) 988-7541
Landfill Site	
Environmental Control Department Head	(703) 988-4003

Accidents:

Ambulance

Tazewell County Rescue Squad	(703) 988-5970

Hospitals

Tazewell Community Hospital	(703) 988-2506
Bluefield Regional Medical Center	(304) 327-1100

Fire:

Fire Department

Town of Tazewell Volunteer Fire Department	(703) 988-4141

Power

Appalachian Power Company	(703) 988-5561

Police:

Sheriff's Department - Tazewell County	(703) 988-5966
State Police - Wytheville, Virginia	(800) 553-3144

County, State, and Federal Agencies:

Virginia State Health Department - Tazewell	(703) 988-5585
Virginia Department of Environmental Quality - Richmond	(804) 786-3563
Virginia Department of Environmental Quality - Roanoke	(703) 563-3555
Bureau of Solid Waste Management	(804) 255-2667
Hazardous Waste Violations - Toll Free	(800) 552-2075
Virginia Department of Environmental Quality (State Water Control Board) - Richmond	(804) 367-0056

Nation Response Center - Toll Free	(800) 424-8802
Virginia Department of Emergency Services	(800) 468-8892

VIII. SPILL PREVENTION, CONTROL, AND COUNTERMEASURES PLAN

When a leachate spill occurs, contact the Emergency Coordinator in Section III. The existing leachate collection and holding tank is a bolted steel structure with an inner tank to hold the leachate and an outer tank constructed to contain any leakage or rupture of the inner tank. A permanent drain pipe has been constructed to provide for the filling of tanker-trucks for hauling. All tanks and pipelines are subject to periodic inspections. Absorbent booms, absorbent blankets, fiber pearl absorbent and absorbent pads maybe used for spill countermeasures. All loading and unloading is supervised by contract and/or county personnel.

PERMIT MODULE III

DESIGN AND CONSTRUCTION

JOYCE ENGINEERING, INC.

701 MERCER STREET
PRINCETON, WEST VIRGINIA 24740

(304) 487-6107

DESIGN REPORT
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL, VIRGINIA

JULY 15, 1992

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I. GENERAL

This report is a detailed description of the design features and plans for Tazewell County's municipal, sanitary landfill located between the Towns of Tazewell and Bluefield in Tazewell County, Virginia. Discussion of the site conditions, anticipated waste stream, liner design, leachate collection and removal systems, and other pertinent information is included to provide the Virginia Department of Waste Management with the data necessary to approve the Part B Application to permit this facility to continue to accept municipal, sanitary solid waste under the Virginia Solid Waste Management Regulations. Calculations and equations used in the design of this facility are included in the Appendices. The design plans are intended to be an inseparable part of this report.

The design, narratives, and drawings have been prepared in accordance with the Solid Waste Management Regulations (SWMR) VR 672-20-10, Sections 5.1, 7.2.D., and 7.4. The Design Report was prepared following the format for Submission Instruction No. 2. Chapters and Sections within this report are numbered and titled identical to the Submission Instructions to facilitate review by the Virginia Department of Environmental Quality.

Tazewell is the Permittee and the Owner-Operator of the solid waste facility. This municipal, sanitary landfill will primarily serve as solid waste disposal site for Tazewell County, Towns of Tazewell, Bluefield, Richlands, Cedar Bluff, and Pocahontas, and refuse removers having a valid permit issued by Tazewell County.

Tazewell County Sanitary Landfill located 0.5 mile north of Routes 19 and 460 on County Route 649, in Tazewell County, Virginia (Figure 1: Vicinity Map).

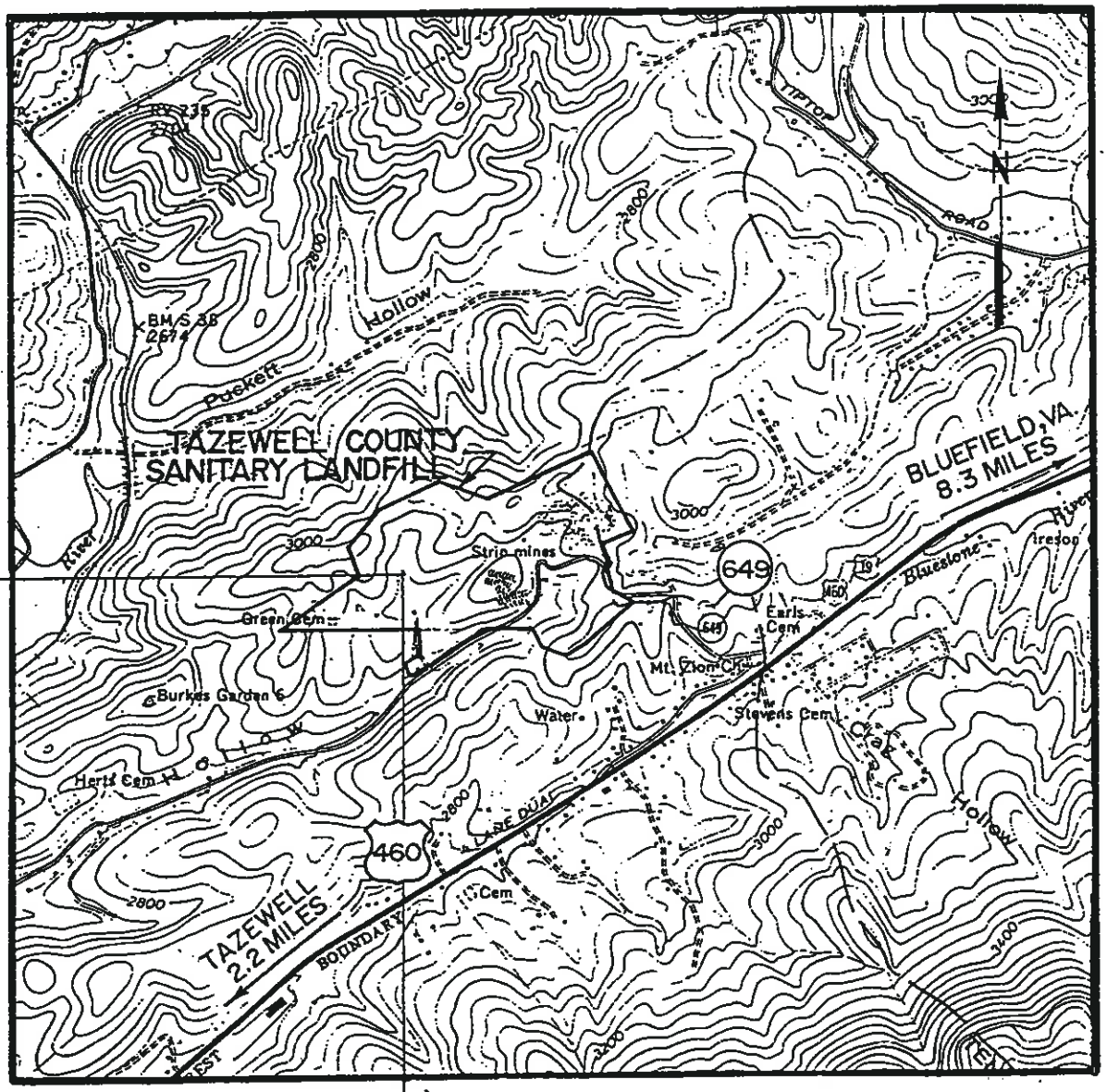


FIGURE 2: VICINITY MAP

JOYCE ENGINEERING INC.

RLS & Company has performed geohydrologic and geotechnical work for Joyce Engineering, Inc. at the Tazewell County Sanitary Landfill. Joyce Engineering, Inc. prepared the Part A Application for this site and originally submitted said Part A to the Virginia Department of Waste Management in the spring of 1989. Additional information, data, and exhibits were furnished by subsequent exchange of correspondence. The Part A Application was deemed complete and was approved by Mr. Kevin L. Greene, C.P.G. in a letter dated January 4, 1991. Information from the Part A submission has been included within this narrative and in the design plans. The engineering design was performed by Joyce Engineering, Inc. of Princeton, West Virginia. Joyce Engineering, Inc. is registered to practice professional engineering in the Commonwealth of Virginia. All engineering designs have been prepared by or under the guidance of a licensed Professional Engineer registered to practice professional engineering in the Commonwealth of Virginia.

II. SITE LAYOUT

II.A. GENERAL SITE PLANS

II.A.1. EXISTING SITE CONDITIONS

The near vicinity map shows the proposed new landfill and the area to be used as the County deems or may deem appropriate. Phases 1, 2, 3, and 4 will be developed under this application. The location of the existing landfill is indicated on the plans. The location of proposed Phases 1, 2, 3, and 4 applied for under this application is also shown. The Existing Site Conditions Map shows the permitted boundary and the area affected by landfilling.

Access to the disposal area is controlled by a barrier gate across the entrance. Entrance to the landfill, both new and existing sites, will be permitted only by passing the scale area.

The bedrock as determined under the Part A report has been shown on the bedrock contour map.

The site is partially tree covered and is generally bordered by woods. Areas that will not be used for landfill operations will remain as undisturbed as possible.

The following are in response to the siting requirements outlined in Kevin Green's memo dated April 15, 1993, to Hassan Vakili in similar numerical order:

1. Airport Safety: There are no airport facilities located within the 10,000/5,000 feet buffer. There are no landfill facilities located within 5 miles of an airport runway.
2. Floodplains: This landfill facility is located high in the mountains at the head of the drainage divide between the Tennessee and New Rivers; therefore, this landfill facility is not affected by floodplains.
3. Unstable Areas: The proposed landfill site does not contain any geologically unstable soils, sink holes, caverns, or underground mines.
4. Wetlands: The proposed landfill facilities will not be located in wetlands.
5. Fault Areas: The proposed landfill facilities are not within 200 feet of a Holocene Fault.
6. Seismic Impact Zones: An engineering evaluation of the stability requirements considering seismic conditions is in Appendix H.
7. Buffer Requirements: The proposed landfill facility is not within 1,000 feet of an interstate highway. The existing leachate holding tank is within 500 feet of the Virginia Department of Transportation Route 649. The area to be landfilled is not within 500 feet of Virginia Department of Transportation Route 649. There are no parks, hospitals, schools, etc. within 200 feet of the proposed landfill facility.

8. Groundwater Monitoring: The applicant has the ability to monitor groundwater in accordance with the appropriate groundwater requirements of Section 5.1.D. of VR 672-20-10.
9. Site Characteristics: There are no outstanding site characteristics which will prohibit the development of this site for proposed landfill purposes.

II.A.2. BASE GRADE PLAN

Since the elevation of groundwater is well below existing ground, depth to groundwater is not a limiting design constraint for this site. Being on a major divide between the Tennessee and New River drainage systems, base grades are influenced by bedrock elevation. Base grades will require some weathered shale to be removed. Excavation shall be by large dozers with rippers. If additional excavation is required, then drilling, and blasting will be done. Bedrock shall be over excavated and backfilled with a minimum of 1 foot of earth material prior to placement of the composite liner. Excavation will include clearing, grubbing, and grading to provide a uniform base for the liner system. Base grades have been designed to provide a minimum of two percent (2%) slope for leachate drainage. The survey baseline is included on the Base Grade sheets for engineering control of the project.

II.A.3. ENGINEERING MODIFICATION PLANS

Engineering modification plans show the elevation at which the waste will be placed which includes the liners and the leachate collection and removal system. The landfill waste area is greater than 50 feet from the permit boundary and no regularly flowing or intermittent streams are

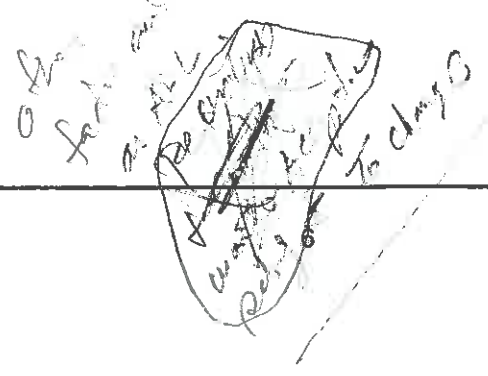
in the area. The liner systems will be discussed in detail in later sections of this report. Sectional views of the liner system are included on the detail sheets.

TABLE 1
MATERIAL BALANCE FOR PHASES I, II, III, AND IV

Total volume of waste and cover	3,854,000 cy
Waste density, compacted at 1,000 lbs/cu yd	37.0 lb/cu ft
Waste stream	200 cy/day
Waste volume, compacted	200 cy/day
Daily & intermediate cover, 10:1 ratio	20 cy/day
Total daily volume	220 cy/day
Volume of waste	3,281,530 cy
Site life	60 years
Material gained by excavation	1,227,356 cy
Material loss by filling	77,606 cy
Required daily cover	375,000 cy
Final cover, SF x 3.5 ft/27 cf/cy	197,470 cy
Excess material available	605,490 cy

Soil cover shall be obtained from the site and adjacent property owned by Tazewell County.

Alternate daily cover is proposed to be used to reduce the amount of soil material required for daily cover. The Specification Section 14100, Geotextile Daily Cover, includes the technical requirements. Use of the alternate daily cover will reduce the daily cover requirements by 318,530 cubic yards and thereby increase the volume of solid waste by 318,530 cubic yards to 3,600,060 cubic yards. The landfill site life would increase by 5.2 years to 65.2 years if alternate daily cover was utilized over the life of the landfill.



II.A.4. PHASING PLANS

The phasing plan shows the progression of the landfill construction in plan view. A composite liner was installed for Phase I, Part 1 in the spring-summer of 1994 in accordance with the Virginia Department of Environmental Quality's Regulations and permit approval. Filling will progress with Phase 1 and continuing Phase 4 as shown in the Plans.

II.A.5. CROSS SECTIONS

Cross Sections are shown in relationship to the baseline generally at 500-feet intervals. The sections show the existing ground , the proposed base grade, bedrock, and the final grade. Since bedrock elevation is well above the groundwater elevation, no groundwater elevations are shown. The Cross Sections show final exterior slopes maintaining a maximum slope of 25 percent (4:1) or flatter. Top slopes will be a minimum of 3 percent.

The cross sections show interior slopes between parts at a maximum slope of 25 percent (4:1) or flatter. Longitudinal cross sections have been provided at 500-foot intervals to show a view perpendicular to the Cross Sections.

II.A.6. FLOOD PLAIN

The proposed solid waste landfill site is located near the head of major drainage divides between the Tennessee and New River Systems. The landfill site is more than 50 feet from any surface stream. This facility is located in an area not subject to base floods.

II.B. GENERAL FACILITY INFORMATION

This Part B Application project is Tazewell County Sanitary Landfill located near Springville in Tazewell County, Virginia. The facility has been designed by Joyce Engineering, Inc. of Princeton, West Virginia, a firm registered to practice professional civil engineering in the Commonwealth of Virginia. Owner, Permittee, and Operation of the facility will be Tazewell County. The landfill property consists of 126 acres more or less. The tract of land owned by Tazewell County is shown on the Existing Site Conditions and Master Site Plan.

This sanitary landfill will service Tazewell County, Towns of Bluefield, Pocahontas, Richlands, Cedar Bluff, and Tazewell and refuse removers authorized by Tazewell County. The existing sanitary landfill receives 100 tons (i.e., 200 cubic yards) of municipal, sanitary solid waste per day. Transportation of the refuse to the landfill will be by car and truck.

Phases 1, 2, 3, and 4 have a combined capacity of 3,281,530 cubic yards. The landfill site covers 34 acres and has an expected life at current waste volume of about 60 years.

II.C. SITE ACCESS

Access to the municipal, sanitary landfill is by an existing entrance access road from Virginia Secondary Route 649. Access will be controlled by natural barriers, fencing, and a lockable gate at the entrance. The gate to the landfill will be closed and locked during all non-operating hours to prevent entry and illegal disposal of wastes.

Existing service/access roads within the facility are as shown on the plans. Desirable design criteria for the interior roads are a maximum grade of 10 percent and a minimum two-way road width of 24 feet. Side slopes of road fills will be a maximum of 2:1 on the section of the road not built upon waste fill. Side slopes of the road on top of waste shall be a maximum of 4:1.

The minimum subbase depth of roads shall be 12 inches of compacted soil with a minimum stone depth for permanent roads of 12 inches. The base course shall consist of 9 inches of Virginia Department of Transportation No. 3 topped by 3 inches of Virginia Department of Transportation No. 57 for wearing course. Base course and wearing course shall be constructed to be crowned in the middle or sloped to one side to promote positive drainage. These roads shall be maintained to provide all weather access for vehicles using the landfill. Proper maintenance shall include removal of deposited mud, regrading, and recompacting existing stone, and the addition of stone where needed.

Access to the landfill working face will be by use of temporary ramps. A ramp will be necessary for each lift of each phase. These temporary ramps will be located by the landfill operator and constructed to provide all weather access for vehicles using the landfill. A ramp from the permanent road will provide access for the upper portion of the landfill. Said ramp road will be built and maintained on previously filled wastes.

II.D. UTILITIES

Basic sanitary facilities, heating, lighting, and communications are currently available at the landfill site and shall be maintained.

II.E. AESTHETICS

A minimum 50-foot fire break shall be maintained along the property boundary. Visual evidence of the operation should not be different from the existing operation and should not be a concern for local residents or commercial establishments.

Noise attenuation will be obtained by proper maintenance of equipment, selective clearing of areas to be utilized.

Long-term use of the closed facility is planned as an open dormant meadowland.

II.F. LOCATION OF CELLS

Disposal method to be used will be the area method. The cut and fill limits are shown on the Base Grade Plan and Cross Sections. Excavation and liner installation will commence on Phase 1 according to the Base Grade Plan. The working area will then move west to Phase 2 which will be excavated and lined to the grades shown on the plans. The working area will then move to Phase 3 and then to Phase 4. The liner for each new area shall be joined with the preceding liner. Landfilling will extend no further than the lined area. No waste shall be placed closer than 50 feet to the site boundary. A 50-foot fire break shall be constructed and maintained around disposal areas and from all tree lines.

No severe weather disposal area is specified or needed. Proper maintenance of access roads will allow passing of hauling vehicles in inclement weather. Judgment by the landfill operator will determine the necessity and location of seasonally severe weather areas per each lift or phase.

The maximum seasonal groundwater elevation and bedrock elevation have been determined during the Part A investigation. The maximum bedrock elevations have been indicated on the Bedrock Contour Map. The amount of excavation and depth to bedrock are the limiting design constraints for the site.

II.G. BENCHMARKS

Benchmarks are shown on the Existing Site Conditions and Master Site Plan. The baseline shall be field surveyed prior to construction. In the event that the benchmarks are disturbed, new benchmarks shall be established and so noted on the plans.

II.H. BORROW AND STOCKPILE AREA

Borrow areas for soil exist on-site on property owned by Tazewell County. Refer to Borrow/Stockpile Map for location. Material for daily, intermediate, and final cover, as well as for road, berm, and structural fill will come from on-site sources. Designated stockpile areas will vary from time to time and must be left to the discretion of the landfill operator. Liner, stone, drainage layer, and other specified materials required for the construction and/or operation of the landfill will be brought in on an as-needed basis.

III. SITE PREPARATION

III.A. SITE CONDITIONS

The Part A Application has been prepared by Joyce Engineering, Inc. Groundwater elevations have been determined to be located well below the bedrock. Seismic refractions have been performed to define groundwater elevations.

III.B. PLANS AND DISCUSSION

Initial site preparation consists of installing necessary erosion and sediment control measures, clearing and grubbing of the project area. Construction shall be in accordance with the Specifications listed in Section III.C. and included in Appendix A. Work shall be in accordance with the "Standard General Conditions of the Construction Contract", NSPE Document 1910-8, latest edition. Work shall also be in accordance with the Construction Quality Assurance Plan attached as an appendix to the Operations Manual.

Survey benchmarks are provided for construction control. All construction shall be located from these benchmarks. If the points are lost or destroyed or require relocation, new points shall be established by professionally qualified personnel. Field measurements shall also be performed by qualified personnel.

Any unforeseen subsurface or latent physical conditions that differ from the plans or geotechnical report shall be reported to the Owner and Engineer. Such unforeseen or differing conditions may warrant further investigations and testing to ensure compliance with the landfill construction design.

Copies of all Specifications, Drawings, Addenda, Modifications, Shop Drawings, and Samples shall be kept at the site. Any changes made during construction shall be noted on the records and shall be made available to the Engineer and Owner. Revised records shall be delivered to the Engineer upon completion of the work. Photographs shall be used to document progression of the work in conjunction with the progress records and record drawings.

Sampling and testing procedures shall be in accordance with the Specifications.

III.C. SPECIFICATIONS

Specifications are included in Appendix A for the construction and operation of the landfill. The Specifications consist of the following:

DIVISION 1 - GENERAL REQUIREMENTS

Section 01010	Summary of Work
Section 01050	Licenses and Permits
Section 01060	Regulatory Requirements
Section 01070	Lines and Grades
Section 01150	Measurement and Payment
Section 01152	Application for Payment

Section 01153	Change Order Procedures
Section 01200	Project Meetings
Section 01310	Construction Schedules
Section 01340	Shop Drawings, Product Data
Section 01370	Schedule of Values
Section 01400	Quality Control Testing
Section 01500	Construction Facilities and Temporary Controls
Section 01568	Erosion and Sediment Control
Section 01570	Traffic Regulation
Section 01700	Contract Closeout
Section 01710	Cleaning
Section 01720	Project Record Documents

DIVISION 2 - SITEWORK

Section 02100	Site Preparation
Section 02200	Earthwork
Section 02201	Soil Cap Material
Section 02202	Liner Placement
Section 02202A	Cap Placement
Section 02203	Drainage Medium
Section 02207	Protective Liner Cushion
Section 02208	Protective Cap Cushion
Section 02209	Cap Vegetative Layer
Section 02221	Trenching and Backfilling
Section 02285	Compacted Soil Layer
Section 02286	Cap Infiltration Layer
Section 02410	Leachate Collection System
Section 02420	Surface Run-off Collection System
Section 02480	Revegetation
Section 02500	Paving and Surfacing

Section 02601	Manholes and Cleanouts
Section 02610	Pipe, Fittings, and Appurtenances
Section 02733	Leachate Valves

DIVISION 3 - CONCRETE

Section 03100	Concrete Formwork
Section 03200	Concrete Reinforcement
Section 03300	Cast-in-Place Concrete

DIVISION 13 - SPECIAL CONSTRUCTION

Section 13301	Geonet Drainage Medium
Section 13302	Double-sided Geotextile/Geonet Composite Drainage Layer
Section 13303	Smooth HDPE Synthetic Membrane
Section 13304	Textured HDPE Synthetic Membrane
Section 13306	Smooth VLDPE 40 Mil Synthetic Membrane
Section 13307	Textured VLDPE 40 Mil Synthetic Membrane
Section 13308	Geotextiles

DIVISION 14 - DAILY OPERATION

Section 14100	Geotextile Daily Cover

IV. LINER DESIGN

IV.A. LINER SYSTEM

IV.A.1. DESCRIPTION

The liner system to be used will be a composite liner of 60 mil high density polyethylene (HDPE) synthetic geomembrane and 24-inch thick

$1x10^{-7}$cm/sec compacted soil liner. The installation of the geomembrane liner shall be let for competitive bidding and/or negotiated contract. Typical large suppliers of synthetic liners are as follows:

PRODUCT NAME (Smooth)	PRODUCT NAME (Textured or Roughened)	MANUFACTURER
Guneline HD	Gundline HD	Gundle Lining Systems
Enviroseal HDPE	Friction Seal HD	National Seal Company
Poly-Flex	Poly-Flex Roughened	Poly-American, Inc.
Hyper-Flex	Friction Flex	SLT North America, Inc.

Other liner manufacturers' products can be utilized provided they meet the Specifications and are compatible with other components. Liner thickness shall be 60 mil. The liner Specifications are included in Appendix A.

IV.A.2. LOCATION RELATIVE TO HIGH WATER TABLE

Due to the site characteristics, the maximum seasonal groundwater elevation within the soil overburden is not a controlling factor. Groundwater elevation is well below bedrock at this site.

IV.A.3. LINER THICKNESS

The thickness of the synthetic flexible membrane liner shall be 60 mil and the compacted soil liner shall be 2 feet of compacted soil having a permeability of less than $1x10^{-10}$cm/sec. The synthetic liner shall be in intimate contact with the compacted soil liner underneath.

IV.A.4. LINER STRENGTH REQUIREMENTS

Minimum strength requirements for the synthetic flexible membrane liner are:

a.	Internal external pressure gradient		
	i.	Tensile strength-sliding: Flexible Membrane Liner	1,658 lb/lf
	ii.	Stability of protection layer on FML Design Ratio	1.6
	iii.	Lateral stress on liner	1,340 lb/sf
b.	Stresses		
	i.	Settlement strain	4.6%<13% allowable
	ii.	Compressive stress	7,260 lb/sf
	iii.	Wind uplift Use 1-80 lb. sandbag per	5.7 sf
c.	Climatic conditions		No effect
	d.	Installation stresses	
	i.	For bottom	28.7 lb/ft
	ii.	For side slopes	47.5 lb/ft
e.	Operating stresses		3,423 lb/sqft

The calculations used to determine the minimum strength requirements are included in Appendix B.

IV.A.5. STRENGTH DEMONSTRATION

The minimum strengths of the following (smooth) HDPE 60 mil liners are:

	GUNDLINE HDPE	ENVIROSEAL HDPE	POLY-FLEX*	HYPER-FLEX**
Tensile Strength at Yield	1,680 lb/ft	1,584 lb/ft	1,800 lb/ft	2,160 lb/ft
Elongation at Yield	13%		13%	15%
Strain at Yield		13%		
Low Temperature/Brittleness	-112°F	-103°F	-94°F	-120°F
Maximum Temp. w/no changes in strength	240°F		248°F	
Compressive Strength	Noncompressible	Noncompressible	Noncompressible	Noncompressible

The minimum strengths of the following (textured or roughened) HDPE 60 mil liners are:

	GUNDLINE HDT*	FRICTION SEAL HD	POLY-FLEX* (Roughened)	FRICTION FLEX**
Tensile strength at yield	1,512 lb/ft	1,584 lb/ft	1,560 lb/ft	2,160 lb/ft
Elongation at yield	13%	13%	13%	15%
Low temperature/brittleness	-112°F	-103°F	-94°F	-120°F

* Typical Values represent average lot property values
** Nominal Values

IV.A.6. INSTALLATION

Installation procedures and quality control for HDPE Synthetic Membrane Liners are covered in Specification Section 13303 (smooth) and Section 13304 (textured) of Appendix B. Work shall also be in accordance with the Quality Assurance/Quality Control Plan attached as an appendix to the Operations Manual.

IV.A.7. COVERAGE

The liner will cover all areas to be filled with solid waste in accordance with the plans. Prior to the filling, the area lined will be distinctly marked and landfilling will not be allowed outside the designated area.

IV.A.8. PREVENTION OF EXPOSURE

No section of the liner will be exposed to sunlight for more than 30 days including staging time. The synthetic liner shall be installed in sections and covered to prevent exposure. Sand bags will be used to weight down liner during installation. The 30-day limit on exposure will not affect the characteristics of the liner.

IV.A.9. LINER BEDDING

The bedding below the composite liner consists of earth material compacted to 95 percent proctor. Bedrock encountered shall be over excavated and backfilled with a minimum of 1 foot of compacted earth material prior to composite liner placement.

The synthetic liner shall be protected by placement of a 14-ounce per square yard non-woven geotextile on the bottom and by the placement of a geonet/geotextile composite on the side slopes. The minimum drainage layer and protective cushion on top of the synthetic liner shall be 18 inches. This geotextile and/or geonet/geotextile composite and protective cushion is more than sufficient to prevent rupture during installation and operation based on the maximum operational stresses determined in
Section IV.A.4.

The bedding below the liner will be native soils. Where bedrock is removed by excavation, a compacted soil subbase shall be placed to provide a minimum of 12 inches between the top of bedrock and the compacted soil liner. This bedding on structural fills will be constructed from materials on-site. Bedding material shall be placed and compacted in accordance with the Specifications. Any areas not passing the compaction standards will be removed and competent material will be brought in and compacted to acceptable standards.

IV.B. LINER FOUNDATION

IV.B.1. DESIGN DESCRIPTION

The liner foundation consists of native soil material above the bedrock. These soils have been documented in the approved Part A Application. Boring locations have been shown on the plans and cross-sections. Boring logs have been duplicated and made a part of the Part B Application plans. Where bedrock is removed by excavation, a compacted soil subbase shall be placed to provide a minimum of 12 inches between the top of bedrock and the compacted soil liner.

Bearing capacity of the underlying shale has been determined to be 144,000 psf. With the maximum compressive load of 7,437 psf, the design ratio over the design value is 3.8 and over the absolute capacity is 19.4. With the maximum operational load of 12,960 pounds per square foot, the design ratio over design value is 2.2 and over absolute capacity is 11.1.

IV.B.2. SUBSURFACE EXPLORATION DATA

The description of the subsurface exploration, boring data, and testing results are included in the Part A report prepared by RLS & Company for Joyce Engineering, Inc. Boring locations have been shown on the plans and cross-sections. Boring logs have been duplicated and made a part of the Part B Application plans.

IV.B.3. LABORATORY DATA

Laboratory data from the subsurface exploration is included in the Part A report prepared by RLS & Company for Joyce Engineering, Inc.

IV.B.4. ENGINEERING ANALYSIS

IV.B.4.a. SETTLEMENT POTENTIAL

Settlement potential has been estimated considering immediate settlement, primary consolidation, and secondary consolidation. Since the existing subsoil has in place dry densities ranging from 87 pcf to 106 pcf, immediate settlement and secondary consolidation can be neglected. the primary consolidation was computed to be 0.23 feet; this negligible amount can be neglected.

Primary consolidation can be calculated as shown in Appendix B using the height of overburden, the void ratio of the in-situ soil, effective stresses in the soil, and the Compression Index. The Compression Index was determined by an empirical equation per Bowles. The primary consolidation was calculated as 0.23 feet. Thus, the settlement potential of the liner foundation can be assumed to be negligible.

Site conditions encountered during the subsurface exploration program are expected to adequately support landfill construction without significant differential settlement. No manmade features or events that may result in a subsequent failure of containment structures are present on-site. The proposed tract of land does not contain any geologically unstable soils, sink holes, caverns, or underground mines.

IV.B.4.b. BEARING CAPACITY AND STABILITY

Bearing capacity of the underlying soil has been determined to be 105,575 psf. With the maximum compressive

load of 7,260 psf, design ratio is 14.5. With the maximum operational load of 12,960 pounds per square foot, design ratio is 8.1.

IV.B.4.c. BOTTOM HEAVE OR BLOW-OUT

Conditions necessary for bottom heave are not present at this site. The water table will be sufficiently below bedrock and the composite liner system so as not to exert hydrostatic.

IV.B.4.d. CONSTRUCTION AND OPERATIONAL LOADINGS

Maximum construction loading on the foundation is determined to be 12,960 psf from a pan (Caterpillar 627). Maximum operation loadings on the foundation is determined to be 3,421 psf from a 65 ton pan.

IV.B.5. INSTALLATION PROCEDURES

The liner bedding shall be native material compacted to 95 percent standard proctor. The surface shall be free of all rocks, stones, sticks, roots, sharp objects, and debris of any kind. If necessary, the surface shall be groomed by hand to insure the absence of these items. The surface should provide a firm, unyielding foundation for the liner system with no sudden, sharp, or abrupt changes or break in grade. No standing water or excessive moisture shall be allowed.

IV.B.6. INSTALLATION INSPECTIONS

The liner installation Contractor shall inspect the foundation surface per the Specifications and shall certify in writing that the surface is acceptable before commencing work.

V. LIQUIDS MANAGEMENT SYSTEMS

V.A. LEACHATE COLLECTION AND CONTROL SYSTEMS (LCRS)

V.A.1. PEAK FLOW

Peak flow has been evaluated using the LF HELP computer modeling program. This program simulates the actual field conditions and calculates the water balance considering surface run-off, evapotranspiration, and material permeability. Refer to LF HELP simulations, Appendix C.

Fifteen LF HELP models were run for the Tazewell County Sanitary Landfill. They are as follows:

1. Open landfill, bare liner;
2. Open landfill, one lift of waste;
3. Open landfill, two lifts of waste;
4. Open landfill, three lifts of waste;
5. Open landfill, four lifts of waste;
6. Closed landfill, synthetic cap, 15 years;
7. Closed landfill, synthetic cap, 15 - 30 years;
8. Closed temporary cap, 15 years;
9. Closed temporary, cap 5 years;
10. Open landfill, one lift over Phase 1;
11. Open landfill, two lifts over Phase 1;
12. Open landfill, three lifts over Phase 1;

IV.B.6. INSTALLATION INSPECTIONS

The liner installation Contractor shall inspect the foundation surface per the Specifications and shall certify in writing that the surface is acceptable before commencing work.

V. LIQUIDS MANAGEMENT SYSTEMS

V.A. LEACHATE COLLECTION AND CONTROL SYSTEMS (LCRS)

V.A.1 PEAK FLOW

Peak flow has been evaluated using the LF HELP computer modeling program. This program simulates the actual field conditions and calculates the water balance considering surface run-off, evapotranspiration, and material permeability.

Sixteen LF HELP models were run for the Tazewell County Sanitary Landfill. They are as follows:

1. Open landfill, bare liner;
2. Open landfill, one life of waste;
3. Open landfill, two lifts of waste;
4. Open landfill, three lifts of waste;
5. Open landfill, four lifts of waste;
6. Closed landfill, synthetic cap, 15 years;
7. Closed landfill, synthetic cap, 15-30 years;
8. Closed temporary cap, 15 years;
9. Closed temporary cap, 5 years;
10. Open landfill, one lift over Phase 1;
11. Open landfill, two lifts over Phase 2;
12. Open landfill, three lifts over Phase 1;

13. Open landfill, four lifts over Phase 1;

14. Closed landfill, 15 7ears; and

15. Closed landfill, 15 – 30 years; and

16. Leachate Recirculation.

Climatological data from Charleston, West Virginia, with supplemental rainfall data from Bluefield, West Virginia, and Lynchburg, Virginia, were used to execute the program.

Landfill help models were performed to simulate what might happen over portions of the design area. The results were used to expand over the remaining parts of the site.

Maximum annual leachate production as illustrated in Summary Sheet is 263. 158 Cubic feet per year. Therefore, the maximum average daily production of leachate is calculated by the maximum annual production of leachate divided by 365 days per year.

$$\frac{263.158 cf/yr}{365} = 720.98 \text{ cf/day}$$

720.98 cf/day x 7.48 gal/cf = 5,393 gpd

use 721 cubic feet per day or 5,393 gallons per day

A double walled leachate collection tank with a minimum capacity of 500,000 gallons storage was constructed in the summer/fall of 1993. Volume provides for sufficient storage for both the new and the existing sites. This tank provides for a 93 day storage based on the maximum average daily production. The existing leachate collection and holding tank has a storage capacity to provide adequate flow equalization and surge capacity at least equal to the maximum expected protection of leachate for a seven day period for the life of the facility. It is anticipated that his volume provides for sufficient storage for both the new and the existing sites. A leachate cut-off trench is currently being installed (fall 1993) along a portion of the existing landfill area. Attempts to measure the leachate flow rate during November 1993 have been unsuccessful due to the lack of leachate.

13. Open landfill, four lifts over Phase 1;

14. Closed landfill,15 years; and

15. Closed landfill, 15 - 30 years.

Climatological data from Charleston, West Virginia, with supplemental rainfall data from Bluefield, West Virginia, was used to execute the program.

Landfill help models were performed to simulate what might happen over portions of the design area. The results were used to expand over the remaining parts of the site. This is illustrated in the leachate production estimate sheets supplied in Appendix C.

Maximum annual leachate production as illustrated in Summary Sheet is 263,158 cubic feet per year. Therefore, the maximum average daily production of leachate is calculated by the maximum annual production of leachate divided by 365 days per year.

$$\frac{263.158 \text{ cf/yr}}{365} = 720.98 \text{ cf/day}$$

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The LC System computer program, prepared by U.S. Environmental Protection Agency, July 1990, was utilized to provide assistance in the evaluation of the leachate collection system design. It serves as a checklist for the completeness of design and compliance required by the Resource Conservation Recovery Act (RCRA) and in the Hazardous and Solid Waste Amendments of 1986. The LC System is designed to evaluate four aspects of a leachate collection system that are represented by the Leachate Head, Pipe Strength, Storm Capacity, and Clogging Modules. The Summary Report is in Appendix B.

V.A.2. SYSTEM DESIGN

V.A.2.a. GRADING

The Leachate Collection and Removal System (LCRS) specified for Tazewell County Sanitary Landfill consist of 18 inches of stone above the primary FML on all areas. The Leachate Collection and Removal System (LCRS) specified for the bottom slopes consist of 12 additional inches of drainage stone in the collection trench. Minimum bottom slope is 2 percent to provide drainage of leachate to the leachate collection pipes.

The LCRS will be graded down slope at a minimum of 2 percent to drain the leachate by gravity to the trunkline as shown on the Leachate Collection System Plan.

V.A.2.b. PIPE NETWORK

The pipe network is shown on the Leachate Collection System Plan. All pipes in the LCRS are 6 inch, Schedule 80 PVC unless otherwise noted. HDPE pipe may be used for the LCRS provided the calculations are submitted and approved by the

Virginia Department of Environmental Quality. Maximum horizontal spacing between collectors is 140 feet. According to the LC System "Summary Report", the calculations for leachate head, based on the assumption that all collection pipes in the leachate collection layer are of uniform slope, size, and spacing, indicates that this design passes the Agency criteria of maintaining a leachate depth of 1 foot. The calculations indicate a leachate head of 8" with 100% leachate recirculation varying from 10.6 inches to 2.34 inches.

V.A.2.c PIPING STRENGTH

According to the LC System, "Summary Report", the design consideration of flexible pipe requires that it have a deflection of less than 5%. The design for this site has 0.29 percent worst-case deflection

V.A.2.d SIZING

The LC Systems Program requires piping to be sized to drain the runoff from a 25-year, 24-hour duration design storm to less than one foot of head within four days. The drainage time for this site and leachate collection systems has been calculated to be two days and four hours without recirculation.

The leachate collection and removal pipes are designed with cleanouts at the ends of the line to allow monitoring and backflushing of the system. Where penetration of the liner occurs, a manhole has been designed to provide access to allow monitoring and backflushing of the system.

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The LF HELP model indicates that the maximum expected leachate head on the liner is 9.1 inches.

V.A.2.c. PIPING STRENGTH

According to the LC System, "Summary Report", the design consideration of flexible pipe requires that it have a deflection of less than 5 percent". The design for this site has 0.29 percent worst case deflection.

V.A.2.d. SIZING

The LC Systems Program requires piping to be sized to drain the runoff from a 25-year, 24-hour duration design storm to less than one foot of head within four days. The drainage time for this site and leachate collection systems has been calculated to be two days and four hours.

The leachate collection and removal pipes are designed with cleanouts at the ends of the line to allow monitoring and backflushing of the system. Where penetration of the liner occurs, a manhole has been designed to provide access to allow monitoring and backflushing of the system.

V.A.2.e. DRAINAGE MEDIA

A protective cushion at least 6-inches thick shall be placed above the 12-inch drainage layer. Qualifying stone shall be Virginia Department of Transportation size No. 7 through 10. These VDOT sizes assures voids sufficient to produce permeabilities of $1x10^{-2}$cm/sec or greater.

A 6 ounce per square yard non-woven needle punched geotextile material shall be placed between the 12 inch drainage layer and the 6 inch protective cushion to provide for a filter.

V.A.2.f. LEACHATE MONITORING SYSTEM

The liner system consists of a 2 foot compacted soil liner overlain by a synthetic geomembrane 60 mil HDPE liner. This conforms to EPA Subtitle D requirements and to Virginia regulations. Therefore, no leachate monitoring system is required under the liner system. Leachate quality and quantity can be monitored at the manhole locations and at the entrance and exit to the existing leachate holding tank.

V.A.3. MAXIMUM LEACHATE HEAD

Leachate depth (H maximum) on the liner system has been calculated based on the LF HELP simulations. This maximum head can be verified by using the LF HELP model as included in Appendix G. The maximum leachate head is 9.1 inches for the spacing length of 140 feet at 2 percent slope scenario. This is less than the maximum allowable head of 12 inches per Virginia Department of Waste Management Regulations. As fill thickness increases, the head on the liner system decreases.

V.A.2.e. DRAINAGE MEDIA

A protective cushion at least 6-inches thick shall be placed above the 12-inch drainage layer. Qualifying stone shall be Virginia Department of Transportation size No. 7 through 10. These VDOT sizes assure voids sufficient to produce perm abilities of 1 x 10-2cm/sec or greater.

A 6-ounce per square yard non-woven needle punched geotextile material shall be placed between the 12-inch drainage layer and the 6-inch protective cushion to provide for a filter.

V.A.2.1. LEACHATE MONITORING SYSTEM

The liner system consists of a 2 foot compacted soil liner overlain by a synthetic geomembrane 60 mil HDPE liner. This conforms to EPA Subtitle D requirements and to Virginia regulations. Therefore, no leachate monitoring system is required under the liner system. Leachate quality and quantity can be monitored at the manhole locations and at the entrance and exit to the existing leachate holding tank.

V.A.3. MAXIMUM LEACHATE HEAD

Leachate depth (H maximum) on the liner system has been calculated based on LF HELP simulations. Without leachate recirculation, the maximum leachate head on the base liner is 9.1 inches with an assumed minimum pipe lateral spacing of 140 feet and a minimum liner slope of 2 percent. This is less than the allowable head of 12 inches specified in the Virginia Solid Waste Management Regulations. As fill height increases, the leachate head on the liner decreases. With 100% leachate recirculation the maximum head varies from 10.6 inches with 30 feet of waste to 2.34 inches with 100 feet of waste.

The leachate collection system must be able to control storm water during the initial construction of the landfill. The proposed leachate collection system passes the EPA requirement of "draining to less than 1 foot of head within 4 days after a 25-Year design storm with a 24-hour duration". LC System program indicated for the time for drainage in the worse case scenarios to be two days and four hours.

V.A.4. CHEMICAL RESISTANCE

The LCRS components are Schedule 80 PVC and clean, open graded stone. PVC has been extensively tested and is resistant to a wide range of chemicals including acids, alkalis, salts, alcohols, aminos, oils, and other hydrocarbons (Source: Uni-Bell Handbook of PVC Pipe Design and Construction, Uni-Bell Plastic Pipe Association, Dallas, Texas). Limestone or other carbonate stone subject to hydraulic degrading shall not be used in the LCRS system. Other gravels are inert to the leachate. HDPE's chemical resistance is superior to most lining material. HDPE is resistant to a wide angle of chemicals including acids, alkalis, salts, alcohols, aminos, oils, and other hydrocarbons. The expected constituents in the leachate should not affect the liner system components.

V.A.5. LCRS STRENGTH

V.A.5.a. COMPRESSIVE STRENGTH

The maximum compressive loading during the operation of the facility is anticipated to less than 10,000 psf. The PVC pipe

has been previously shown in Section V.A.2.c to be sufficient strength to accept expected loads. The loading of 10,000 psf or 69.4 psi is significantly less than typically allowable bearing pressures of 2,000 psi for gravel.

V.A.5.b. TENSILE STRENGTH - SLIDING

The LCRS is under no significant tensile stress from the static loading. Refer to calculations for Section IV.A.4.

V.A.5.c. OPERATING STRESSES

The maximum operating loading was found earlier in Section IV.A.4.e. to be 3,423 psf. With the ultimate compressive strength of geonet in excess of 22,000 psf, the Design Ration is at least 6.4.

V.A.6. CLOGGING

A 6-ounce per square yard non-woven needle punched geotextile material shall be placed between the 12 inch drainage layer and the 6 inch protective cushion to privde for a filter.

LC System Program reports "there appears to be no problems with clogging or piping in the current system design".

Cleanouts have been provided at the end of the LCRS pipe to provide surface access to enable mechanical or hydrualical cleaning of the leachate pipes.

V.A.7. INSTALLATION

Installation shall be in accordance with Specifications 01070, 01400, 02100, 02200, 02202, 02203, 02207, 02208, 02209, 02221, 02410, 02610, 13301 or 13302, 13303 or 13304, 13306, 13307, 13308, 13309, and 13310.

The Construction Quality Assurance Plan in the appendix of the Operations Manual addresses the earth materials, geosynthetics, piping, and other structures in the landfill situation.

V.B. RUN-ON CONTROL SYSTEM

Description of the Run-Off Control System

Storm Water conveyance channels and diversion ditches have been located and designed to intercept the upland runoff from the drainage areas adjacent to the active portions of the landfill and divert runoff to the existing sedimentation control pond.

V.B.1. PEAK FLOW

The Rational Method, along with the Virginia Erosion and Sediment Control Handbook, was used to determine peak flows in various drainage areas on-site. The site was divided into individual drainage areas to efficiently size stormwater conveyance channels and diversion ditches. A 25-year, 24-hour storm event was used as the design basis. Ditch linings are based on the Virginia Erosion and Sediment Control Handbook criteria. A 25-year storm event was used to size the access road culverts. Drainage areas and time of concentration paths have been shown on the Phasing Plans in the Drawings. Detailed calculations are found in Appendix D.

V.B.2. DESIGN AND PERFORMANCE

The run-on control system consists of upland stormwater conveyance channels and diversion ditches located above the area to be developed as a solid waste landfill site. These run-off/run-on control ditches are shown in the Phasing Plans.

V.B.3. CONSTRUCTION

The run-off/run-on ditches are to be constructed according to Specification Section 02221. The construction inspection program will include documentation of the dimensions of ditches (length, width, depth), and slopes of each ditch.

V.C. RUN-OFF CONTROL SYSTEM

Description of the Run-Off Control System

Stormwater conveyance channels have been located on the perimeter and designed to intercept and divert the run-off from the final regraded areas to the sedimentation control pond. Stormwater running off intermediate cover and unused portions of the landfill shall be diverted and managed as stormwater.

V.C.1. PEAK FLOW

Peak flow has been determined using the Rational Method, the Virginia Erosion and Sediment Control Handbook, and the Virginia Department of Transportation Drainage Manual. A 25-year, 24-hour storm event was used as the design basis.

Run-off is to be collected into the stormwater conveyance channels and directed to existing sedimentation pond at the location shown on the plans.

V.C.2. DESIGN AND PERFORMANCE

Run-off from the landfill is to be directed via stormwater conveyance channels to the existing sedimentation pond, allowing sediment to settle out before discharge. The sedimentation control pond is existing.

Details of the existing sedimentation pond, emergency spillway, entrance channel, and riser and anchor details are included in the drawings. The existing sedimentation pond has been modelled using the SEDCAD +(TM), Version 2.15. The model is based on a SCS Type 2 storm event. Rainfall depth equals 6 inches for a 24-hour duration. The storm has been routed through the existing sedimentation pond. The existing sedimentation pond is sufficient to pass the projected storm event. For calculations, refer to Appendix D & E.

V.C.3. CONSTRUCTION

Construction and construction management of the run-on and run-off ditches shall be in accordance with the construction details contained on the drawings and the Virginia Erosion and Sediment Control Handbook (latest edition).

V.D. LEAKAGE MONITORING SYSTEM

The liner system consists of a 2-foot compacted soil liner overlain by a synthetic geomembrane 60 mil HDPE liner. This conforms to EPA Subtitle D requirements and to Virginia regulations. Therefore, no leachate monitoring

system is required under the liner system. Leachate quality and quantity can be monitored at the manhole locations and at the entrance and exit to the existing leachate holding tank. Groundwater monitoring wells are located downgradient to indicate if a leachate leaking problem occurs.

The monitoring parameters and frequencies which will be used in testing leachate generated by the landfill will be determined by the operator of the Bluefield Wastewater Treatment Plant and/or the Tazewell Wastewater Treatment Plant. In addition, the leachate will be characterized in accordance with the Virginia Hazardous Waste Management Regulations (VR 672-10-1). Should the leachate be characterized as hazardous waste, the leachate will be managed in accordance with all applicable regulations and transported to an approved hazardous waste management facility.

V.E. COLLECTION AND HOLDING UNITS

SURFACE RUN-OFF PONDS

The existing sedimentation pond has been discussed in Section V.C.2. Plan view of the basins and details is included in the drawings.

LEACHATE COLLECTION

A 500,000 gallon leachate holding tank has been constructed in the summer/fall of 1993 on this site. The simulated HELP models indicate a maximum annual leachate production of 263,158 cubic feet. This equates to a maximum annual leachate production of 1,968,558 gallons which is a maximum of 5,393 gallons per day based on worse case scenario. This tank provides for a 93 day storage based on the maximum average daily production. This tank allows sufficient leachate storage to provide for flow equalization and surge capacity to collect and

system is required under the liner system. Leachate quality and quantity can be monitored at the manhole locations and at the entrance and exit to the existing leachate holding tank. Groundwater monitoring wells are located downgradient to indicate if a leachate leaking problem occurs.

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LEACHATE COLLECTION

A 500,000-gallon leachate holding tank has been constructed in the summer/fall of 1993 on this site. The simulated HELP models indicate a maximum annual leachate production of 263,158 cubic feet. This equates to a maximum annual leachate production of 1,968,558 gallons, which is a maximum of 5,393 gallons per day based on completion of Phase IV without recirculation. This tank provides for a 93-day storage based on the maximum average daily production. This tank allows sufficient leachate storage to provide for flow equalization and surge capacity to collect and hold leachate for disposal. The planned disposal method is to transport by tank truck to Bluefield Wastewater treatment Plant and/or Tazewell Wastewater Treatment Plant. The storage capacity is much greater when leachate recirculation is employed.

VI. GAS MANAGEMENT SYSTEM

VI.A. GENERAL

The landfill will be developed in four phases in an open-ended hollow west of the previously developed area. The first three phases expand the footprint of the lined area, while the fourth consists of a vertical expansion over the first three phases. The entire lined area will be closed with a synthetic cap at the end of the project's 60-year life. Until the closure cap is complete, landfill gas will be passively released to the atmosphere via migration through the cover soils. Once the closure cap is complete, landfill ill be passively released to the atmosphere through the use of gas vents constructed through the closure cap and connected to a gas collection layer incorporated into the cap.

V.I.B. GAS MONITORING PROGRAM

VI.B.1. GENERAL

Gas monitoring at the Tazewell County Sanitary Landfill will be performed during the active life of the landfill and throughout the closure and post-closure maintenance periods. At a minimum, quarterly monitoring of explosive gases will be performed at all gas detection robes and in the scale house, maintenance building, and Tazewell County animal Shelter. No other structures are located within 1,000 feet of the waste area at this time; however, if additional construction should occur, monitoring will begin in those structures. The monitoring

hold leachate for disposal. The planned disposal method is to transport by tank truck to Bluefield Wastewater Treatment Plant and/or Tazewell Wastewater Treatment Plant.

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VI.B. GAS MONITORING PROGRAM

VI.B.1 GENERAL

Gas monitoring at the Tazewell County Sanitary Landfill will be performed during the active life of the landfill and throughout the closure and post-closure maintenance periods. At a minimum, quarterly monitoring of explosive gases will be performed at all gas detection probes and in the scalehouse, maintenance building, and Tazewell County Animal Shelter. No other structures are located within 1,000 feet of the waste area at this time; however, if additional construction should occur, monitoring will begin in those structures. The monitoring

frequency will be increased as described in the Response paragraph of this section. Refer to the Gas Management Plan, Drawing No. 16, for the locations of on-site structures and gas detection probes. See Drawing No. 31 for construction details of the gas detection probes.

Gas detection probes will be placed around the waste disposal unit boundary to the west, north, and east and adjacent to the on-site structures. No probes are proposed along the southern boundary. Potential horizontal gas migration to the south will vent to the atmosphere within the facility property boundary via the hollow south of the fill area. The probes will be installed in phases coinciding with development of the landfill. Probe installation will begin in the east around previously filled areas and progress to the west as the landfill is developed westward. The probe spacing will be a maximum of 500 feet initially; however, if additional development occurs within 1,000 feet of the facility boundary, intermediate probes will be installed between the new structure and the landfill to narrow the spacing to a maximum of 250 feet.

The gas detection probes will extend to a depth at least equal to the maximum depth of waste within 1,000 feet of the monitoring point. At least three probes will be installed in each well bore to monitor shallow, intermediate, and deep layers within the gas detection probe. The actual spacing of the probes within the well bore will be established after review of the drilling log to identify potential preferential pathways. Review of existing data reveals variable subsurface conditions with sandy zones interspersed with clayey layers, and fractured rock underlying portions of the site.

See Next Page
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VI.B.2. PROCEDURE

Equipment: A portable combustible gas monitor, measuring the concentration of explosive gases in units of percent of lower explosive limit (LEL) of methane from 0 to 100 percent LEL shall initially be used to

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Probe installation as shown on drawings 15 and 16 are located such that two monitoring probes are along the northern property line approximately 1040 feet apart; two probes are along the western edge of the waste area, approximately 950 feet apart; and one probe is located along the eastern propertly line.

If additional deelopment occurs within 1,000 feet of the facility boundary, intermediate probes will be installed between the probes to narrow the spacing to a maximum of 250 feet.

The gas detection probes will extend a minmum of 5 feet into the soil, backfilled with 1" clean store for a depth of 4 feet, and extending upward 5 feet above ground connected to an inverted "U" section.

VI.B.2 PROCEDURE

Equipment: A portable combustible gas monitor, measuring the concentration of explosive gases in units of percent of lower explosive limit(LEL) of menthane from 0 to100 percent LEL shall initially be used to

perform the gas monitoring. The gas monitor shall be calibrated to methane using the manufacturer's calibration kit and procedure before the monitoring activities begin (see below). If another type of gas monitor is proposed, it must be approved by Tazewell County prior to its use. The operator will record the date, time, location, sampling personnel, temperature, barometric pressure, and general weather conditions at the time of sampling, in addition to the concentration of explosive gases. The records will be maintained in the Landfill Operating Record.

On-site Structures: Gas monitoring in the on-site structures will attempt to identify the "worst case" concentrations. Monitoring will be performed at the earliest possible time after the structure has been unused (e.g., a morning after a weekend or holiday). The monitoring locations will be in corners along floors and ceilings, at cracks in the floor, and at any areas likely to accumulate gas. Gas monitoring will also be performed in any confined space requiring the entry of personnel for maintenance or inspection prior to entry by personnel in accordance with OSHA regulations.

Gas detection probes: Gas monitoring in the detection probes will consist of attaching the probe to each tubing located within the probe and recording both the initial concentration and steady state concentration.

Calibration Procedure: The calibration procedure shall be as prescribed by the manufacturer. The following procedure applies to an Industrial Scientific Model LD222 Combustible Gas Monitor, which shall be used initially for the gas monitoring at the Tazewell County Sanitary Landfill. If other instruments are used at a later date, the calibration procedure shall be supplied to the County prior to monitoring and shall be kept on file with the Operation Plan and submitted to VDEQ.

Before calibrating the LD222, switch on the instrument and allow the sensor to warm up for 15 minutes. In clean air, adjust the zero potentiometer (through the hole labeled "z") to obtain a 000 readout. Refer Figure 2 on the following page for control locations.

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Before calibrating the LD222, switch on the instrument and allow the sensor to warm up for 15 minutes. In clean air, adjust the zero potentiometer (through the hole labeled "z") to obtain a 000 readout. Refer Figure 2 on page 37 for control locations.

Use the calibration cup (P/N 1700-6933) to apply 50% LEL calibration gas to the instrument. Refer to Figure 3 on the following page. The gas used for calibration should, if possible, be the same gas that is to be measured when the instrument is in use. The rate of gas flow should be 0.5 (± .05) liters per minute. Use the span potentiometer (through the hole labeled "s") to set the readout to 50 percent. Variations in the flow rate will cause inaccurate calibration of the instrument. Remove the test gas and wait for approximately one minute for the gas to completely disperse. Check that the instrument readout returns to 000. Place the potentiometer access cover in its operating position and tighten the knurled collar.

If the instrument cannot be calibrated,the span potentiometer may be at such a low setting that the instrument cannot respond properly. Turn the span potentiometer approximately 15 turns counterclockwise and then repeat the calibration procedure described above. Note that the calibration procedure calls for the adjustment of the zero potentiometer first. The span potentiometer should not be readjusted until the zero potentiometer is properly set."

VI.B.3. RESPONSE TO DETECTED COMBUSTIBLE GASES

The regulatory action level for combustible gas monitoring in the gas detection probes at the facility boundary shall be 100 percent LEL and 25 percent LEL in on-site structures. Readings exceeding the regulatory action levels shall be reported to Tazewell County within 24 hours. The County will notify the Virginia Department of Environmental Quality (VDEQ) in writing within 5 working days of detection and indicate what has been done or is planned to be done to resolve the problem. Within 60 days of detection, the County will develop a remediation plan for the methane gas releases and submit it to the Director for approval. The plan will specify a gas control system that will be constructed as soon as practicable.

Joyce Engineering, Inc.
701 Mercer Street
P.O. Box 1886
Princeton, WV 24740
(304) 487-8107
FAX # (304) 487-1630

JOB COMBUSTIBLE GAS MONITOR
JOB NO. _____ SHEET NO. ____ OF ____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SUBJECT _____ SCALE _____

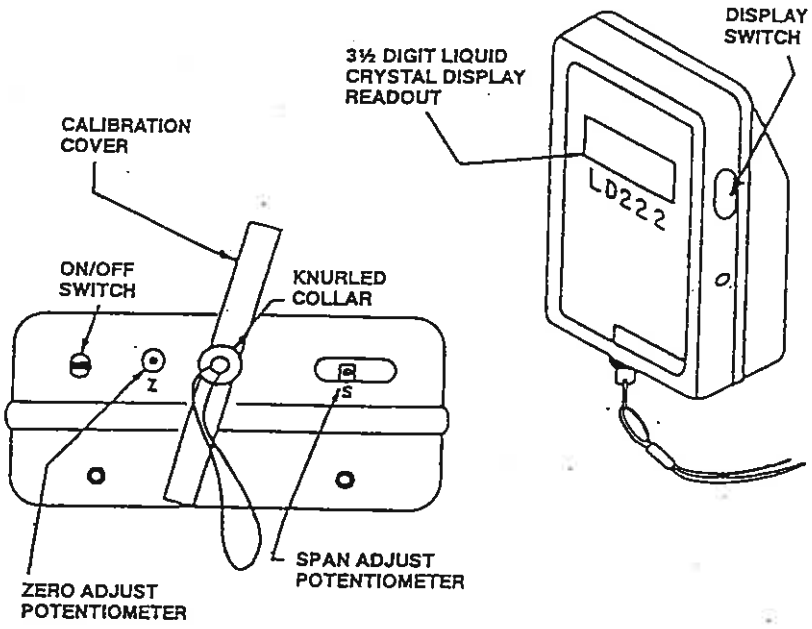


Figure 2.
Location of Instrument Controls and Adjustments

REPRODUCED FROM: INDUSTRIAL SCIENTIFIC MODEL LD222 LEL COMBUSTIBLE GAS MONITOR

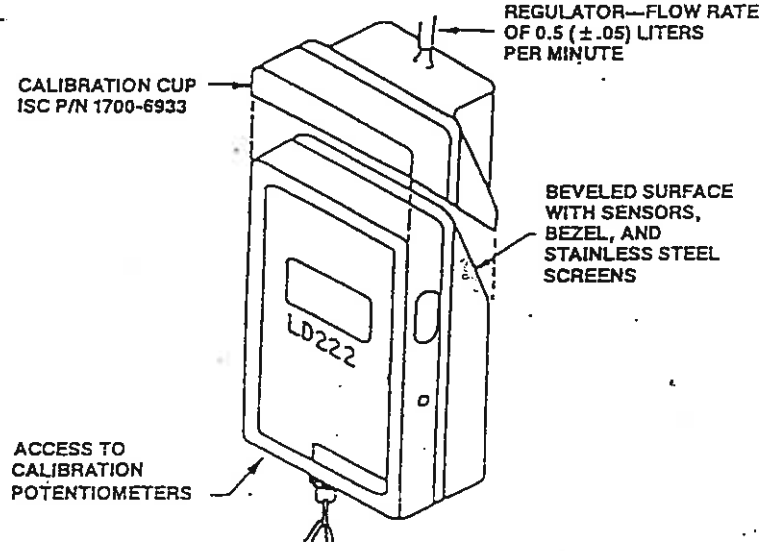


Figure 3.
Calibration of Industrial Scientific Corp. 200 Series Instrument

The County will also use "monitoring action levels" of one-half of the regulatory levels. If the gas readings exceed the monitoring action levels, the monitoring frequency will be increased to monthly until three consecutive readings below those levels are recorded. If the monitoring action level is exceeded in the on-site structures or adjacent probes, options will be evaluated to reduce the current levels and to prevent a further increase in gas levels in the structures.

VI.C. GAS VENTING SYSTEM

VI.C.1. DESCRIPTION

Once the landfill is closed with a synthetic cap, landfill gas will be collected beneath the cap and conveyed to a passive gas venting system. A six-inch gas collection layer constructed of fine aggregate with a permeability of at least $1x10^{-3}$ cm/sec will be constructed beneath the secondary infiltration/gas barrier layer. (Refer to Drawing No. 31 for the cap cross-section). The gas collector layer will convey landfill gas horizontally to gas vents.

The gas vents will consist of three-foot diameter stone columns surrounding a 6-inch diameter perforated pipe. Short sections of perforated PVC within the collection zone will connect to the vertical perforated pipe. The vertical perforated pipe will penetrate the synthetic liner and passively vent the gas to the atmosphere. (Refer to Drawings No. 16 and No. 29 for the vent locations and detail). The bottom of the column will be a minimum of 10 feet above the leachate collection layer. The gas vent columns will be built progressively as the landfill is expanded vertically.

VI.C.2. PEAK FLOW

The projected maximum gas flow is estimated to be 530 to 950 standard cubic feet per minute (scf/m). The calculation is as follows:

Total Waste Volume = 4,000,000 cubic yards (cy)
Assume landfill gas generation (LFG) rate =
70 - 125 scf of LFG per cy of waste per year
Peak flow = (4,000,000 cy) x (70 to 125 scf/cy/yr)
= 280,000,000 to 500,000,000 scf/yr
= 533 to 951 scf/min.

VI.C.3. GAS RECOVERY

After the gas venting system is operational, a field test and evaluation will be performed to determine the feasibility of gas collection and utilization. Based on an 80 percent recovery of the estimated peak flow, the estimated gas volume available for recovery is 425 to 760 scf/min. Detailed plans will be developed for the installation of collection flaring and/or blower/burner facilities no later than 180 days prior to installation. The plans shall be submitted to the Department of Environmental Quality for review and approval.

VII. GROUNDWATER MONITORING SYSTEM

Due to site conditions at this site, a variance has been requested for this part of the Part B Design. A variance was granted on December 20, 1990. The County has since engaged Marshall Miller & Associates to complete a report entitled "Hydrologic Evaluation and Groundwater Monitoring Plan", Tazewell County Landfill,

Tazewell County, Virginia, dated July, 1993, and the "Addendum to Hydrogeologic Evaluation and Groundwater Monitoring Plan, Tazewell County Landfill, Tazewell County, Virginia, dated September, 1993". The groundwater monitoring program is included in the referenced report dated July 1993.

VIII. CELL DESIGN

VIII.A. FILLING

Filling is to follow the phases as discussed in Section II.A.4. Maximum height of intermediate lifts is to be 10 feet, with the preferred lift height of 8 feet. Lift heights will be maximized to conserve soil required for daily cover. Landfill compaction equipment can operate at greater lift heights but lifts above 8 to 10 feet create substantial stress on the equipment. In general, the fill operations should start at the high end of the working area. With 100 tons per day as the expected waste stream and 1,000 pounds per cubic yard as the compaction rate, the waste volume required is 1,040 cubic yards. The working face will need to be approximately 50 feet wide. If the lift height is maintained at 10 feet, cover will require 20 cubic yards per day of space, then waste and cover will require 220 cubic yards per day of space. Advance will be approximately 10 feet per day. For information on volume calculations, see Appendix F of the Design Manual.

VIII.B. FINAL CONTOURS

Final contours are as shown on the drawings. The maximum depth of fill is 170 feet. The fill depth is within the structural capacities of the foundation, liner, and leachate collection systems. Closure of the filled facility will be in accordance with the Closure Plan to be submitted 180 days prior to closure and the details shown on the plan sheets.

VIII.C FINAL SLOPES

The final slopes of the landfill are to be within the limits set in VR 672-20-10. Top slopes shall be at least 2 percent to allow sufficient drainage. The side slopes of the landfill shall be 25 percent (4:1) maximum. This configuration was chosen for slope stability, run-off control, and maximizing volume to be landfilled.

Appendix D

APPENDIX "D"

LEACHATE RECIRCULATION

APPENDIX "D"

TABLE OF CONTENTS

Leachate Recirculation Plan

A. General

Leachate from the disposal cells will be collected in the eight-inch diameter collection and removal pipes. The leachate will flow through these collection lines to a manhole and then to the leachate storage tank for holding prior to pumping and hauling to a disposal facility or reintroduction into the waste mass. The leachate storage tank has a capacity of approximately 500,000 gallons.

A leachate recirculation system has been developed for reintroduction of leachate into the landfill mass as an alternative management technique. As described above, the leachate collected by the liner system will be directed by graded slope to a leachate removal pipe and drained to the leachate storage tank by gravity. From there the leachate will be hauled (or pumped) to the leachate recirculation piping system where it can be reintroduced to the landfill system.

Pumping, off-site hauling and disposal and recirculation of the leachate will be performed as needed to assure the availability of adequate storage capacity within the leachate tank.

B. Leachate Management- Pump and Haul

Occasionally, the leachate collected from the landfill may be hauled from the landfill by tanker truck and taken to a wastewater treatment facility (currently the Tazewell County P.S.A. Treatment Plant at Falls Mills, Virginia, and Richland Sewage Treatment Plant at Richlands, Virginia) for disposal. As highlighted in Table 1, the maximum 7-day storage value for lateral drainage collected and recirculated for 30 feet of waste at 100 percent is 140,230 gallons. The leachate storage tank's working capacity far exceeds this requirement.

C. Leachate Management- Recirculation

1. General

A leachate recirculation system has been provided to allow for the reintroduction of leachate into the landfill mass as an alternative management technique. The reintroduction of leachate will help to accelerate the stabilization of the landfill with respect to gas production and settlement.

The leachate will be pumped and/ or hauled from the leachate storage tank and introduced into the recirculation piping. The recirculation piping system will allow the leachate to be reintroduced at various depths of the fill for infiltration and /or evaporation.

2. **Leachate Recirculation System**

The leachate recirculation system will incorporate a combination of two principle methods, which are as follows:

Horizontal/ Vertical Injection - Leachate will be dispersed/ injected into the waste mass via perforated 8" pipes surrounded by cut- tires forming a trench/ channel. The leachate will be either pumped from the leachate tank and/or hauled by tanker truck. The leachate will gravity flow through the pipes and disperse via the perforations.

Leachate introduction will be avoided when winds are in excess of 15 mph and the ground is frozen. Also, leachate recirculation should initially occur at intervals of no less than 72 hours to allow the leachate to absorb into the waste. After the landfill operator gains greater experience in the leachate recirculation process, the 72 hour interval may be gradually reduced, if warranted.

Trench Fill – An excavated trench will be filled with leachate (either by piping and/ or tanker truck), which will quickly dissipate into the mass. This trench will be recharged to maintain a constant level.

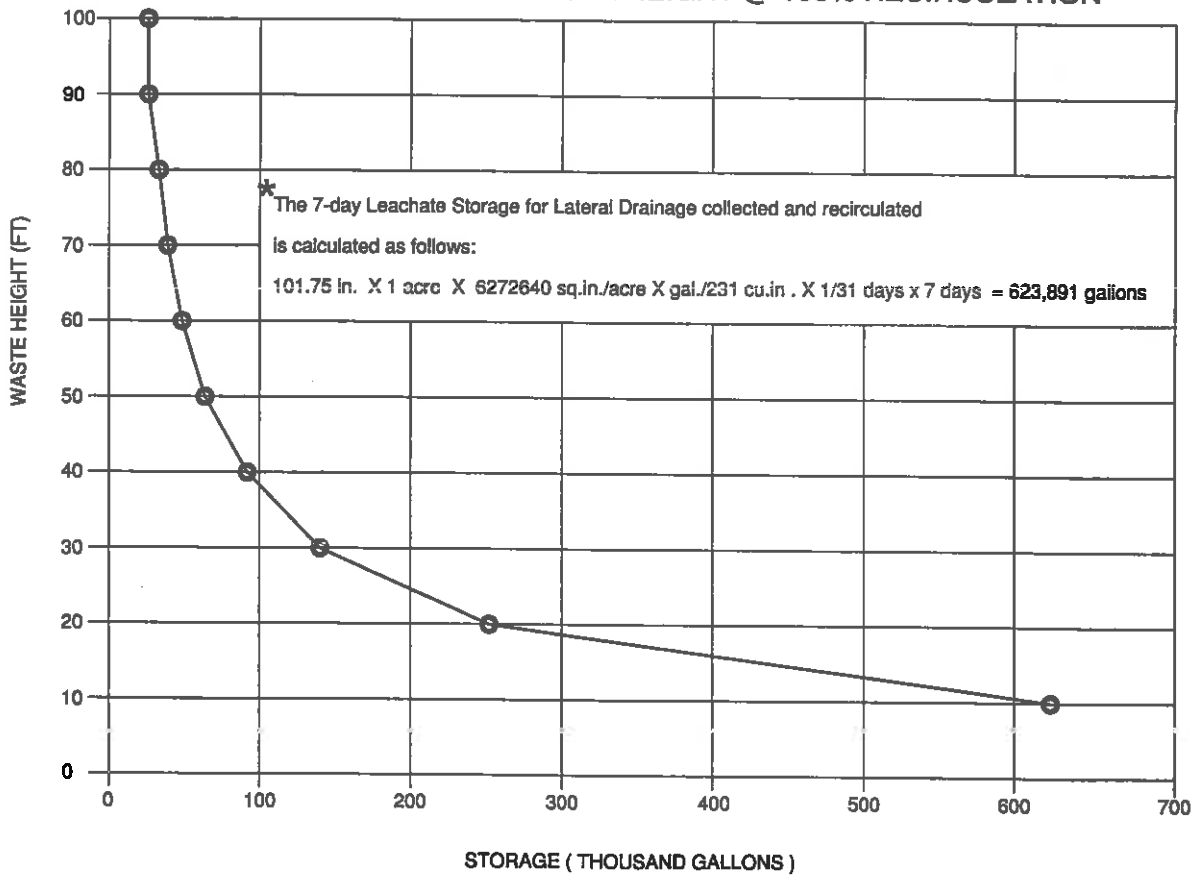
3. **Maximum Volume To Be Recirculated**

Based on the HELP Model analysis that was developed for this site, and in order to ensure that the maximum head on the liner system remains below 12 inches, no leachate will be introduced into the first 30 feet of waste. At 30 feet of waste, the maximum head on the liner is estimated to be 10.6 inches. Up to 100 percent of the leachate collected may be introduced into the first 30 feet of waste and subsequent lifts thereafter. No recirculation will take place during a rainfall event or 24 hours directly after any rainfall event of .5 inches or greater.

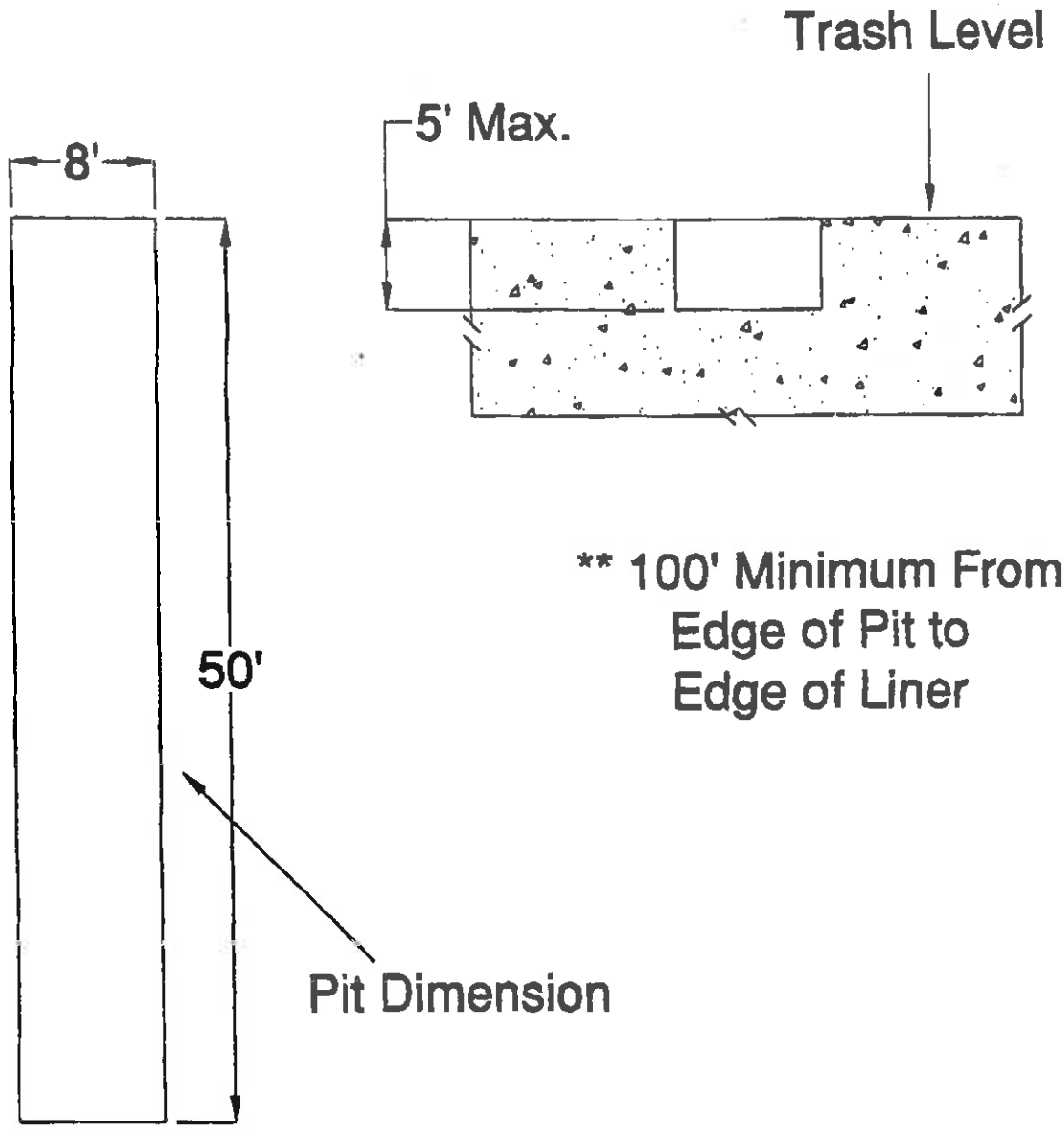
TABLE 1

WASTE HEIGHT (FT)	RECIRCULATION PERCENTAGE (%)	MAXIMUM HEAD ON LINER (IN) (IN)	CORRESPONDING MONTH-LATERAL DRAINAGE RECIRCULATION (IN)	7-DAY LEACHATE STORAGE FOR LATERAL DRAINAGE RECIRCULATION (GAL)
10	100	36.2	101.75	623,891 *
20	100	15.5	41.09	251,948
30	100	10.6	22.89	140,230
40	100	7.17	14.96	91,729
50	100	5.04	10.37	63,585
60	100	4.07	7.88	48,318
70	100	3.59	6.3	38,629
80	100	2.99	5.33.	32,682
90	100	2.382	4.212	25,826
100	100	2.34	4.14	25,385

STORAGE VALUES VS. WASTE HEIGHT @ 100% RECIRCULATION

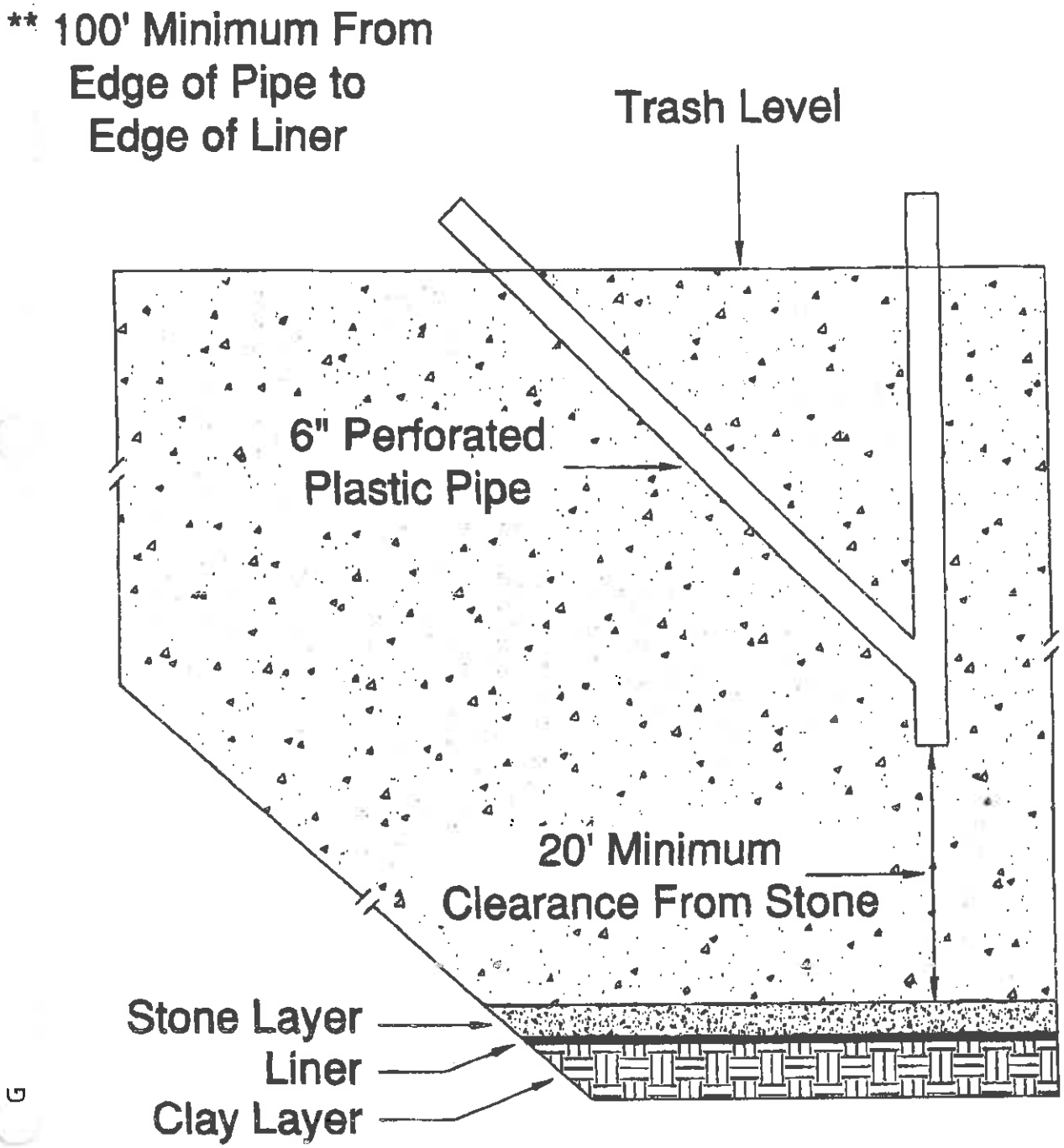


Typical Installation Of Leachate Dispersion Pits



** 100' Minimum From Edge of Pit to Edge of Liner

Typical Installation Of Leachate Dispersion Well



Appendix G

APPENDIX G

LEACHATE ANALYSES

OLVER INCORPORATED
Consulting Engineers · Environmental Laboratories
1116 South Main Street Blacksburg, Virginia 24060

Client Sheet No.: 9206264
Job No.: 30066
Date: July 14, 1992
Date Received: 6/25/92
Client: Tazewell County Board of Supervisors
Source: Tazewell County, Virginia
Shipping Information: Delivered to Olver Incorporated by Board Personnel

Sample No.: 56490
Time Collected: 11:30 a.m.
Date Collected: 6/25/92
Description: Landfill Leachate

Analysis	Result		MDL	
pH	7.50		N/A	
Conductivity	2,750	µmhos/cm	1	µmho/cm
BOD_5	>1,240	mg/L*	2	mg/L
Chemical Oxygen Demand	2,490	mg/L	250	mg/L
Chloride	338	mg/L	5	mg/L
Chlorine Demand	443	mg/L	N/A	
Ammonia as N	57	mg/L	1	mg/L
Nitrate/Nitrite as N	0.3	mg/L	0.1	mg/L
Total Kjeldahl Nitrogen	68	mg/L	1	mg/L

MDL = Minimum Detection Limit
N/A = Not Applicable
ND = Not Detectable

* As noted above, the biochemical oxygen demand (BOD_5) result is >1,245 mg/L. This sample h greater biochemical oxygen demand than anticipated. The dilution range used by the technician fo analysis did not encompass the actual dilution needed. Since the analysis requires five day incubation before the final results are known, and the analysis must be initiated within 48 hou sampling, reanalysis was not feasible.

All tests according to Standard Methods for the Examination of Water and Wastewater, 17th Edition, Test Metho Evaluating Solid Waste (Physical/Chemical), 3rd Edition, and Methods for the Chemical Analysis of Water and Wastes.

By: _____
David W. Griffiths, Ph.D.
President

LAB ANALYSIS DATA

On July 22, 1992 Danny Ganoe took a grab sample of rav leachate and pond leachate at the Tazevell County Landfill. These samples vere analyzed at the Claypool Hill Sever Treatment Plant on July 24, 1992, with the following results:

RAW

BOD_5 - 3600 mg/l
TSS - 1360 mg/l
VSS - 400 mg/l

POND

BOD_5 - 265 mg/l
TSS - 200 mg/l
VSS - 56 mg/l

According to McGrav-Hill series in water resources and environmental engineering copyright 1985 by McGrav-Hill Inc., the BOD_5 for leachate is from 2,000 to 30,000 mg/l with 10,000 mg/l typical.

The following are typical analysis for municipal wastewater:

	Strong	Medium	Weak
TSS (mg/l)	350	220	100
VSS	275	165	180
BOD_5	400	220	110

From these results it can be seen that the pond leachate is slightly stronger than medium municipal sever. These results can be misleading due to the sample taken from the pond was at a depth of 5 feet.

RECOMMENDATIONS

(1) Install a tank at the pump station beside the plant. The leachate can then be fed at a controlled rate.

(2) All leachate pumped from the pond should be taken from the top surface.

(3) Lab analysis will be run to insure proper treatment of the leachate.

(4) If the lab results shov that the concentration of the leachate is stronger, ve may have to slov down the feed rate.

(5) A sludge analysis will need to be run periodically to keep a check on the effect the leachate has on the sludge.

PERMIT ATTACHMENT III-1

CONSTRUCTION QUALITY ASSURANCE PLAN

JOYCE ENGINEERING, INC.

701 MERCER STREET
PRINCETON, WEST VIRGINIA 24740

(304) 487-6107

CONSTRUCTION QUALITY ASSURANCE PLAN

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL, VIRGINIA

JULY 15, 1992

REVISED OCTOBER 15, 1992
(PER COMPLETENESS REVIEW)

REVISED NOVEMBER 18, 1993
(PER FIRST TECHNICAL REVIEW COMMENTS)

REVISED JANUARY 12, 1994
(PER SECOND TECHNICAL REVIEW COMMENTS)

PREPARED FOR:

TAZEWELL COUNTY BOARD OF SUPERVISORS
ADMINISTRATION BUILDING
315 SCHOOL STREET, BOX 2
TAZEWELL, VIRGINIA 24651
(703) 988-7541

Appendix C

APPENDIX C

CONSTRUCTION QUALITY ASSURANCE PLAN

TABLE OF CONTENTS

A. INTRODUCTION

1.0 Purpose

This plan addresses the construction quality assurance (CQA) procedures and requirements to be employed during construction of Tazewell County Sanitary Landfill.

The plan covers earth materials, geosynthetics, and piping and other structures. The plan is intended to supplement, but not supersede, the project plans and specifications. Where a conflict arises, the contract documents or approved plans and specifications will govern.

The plan stresses careful documentation during the entire quality assurance process, from the selection of materials through the protection from deleterious environmental conditions.

All parties involved in the project should receive a copy of this plan from the Owner, Project Manager or Engineer. They should also be given any other CQA documents specially prepared for or relevant to the project.

The overall goals of this program are to assure that proper construction techniques and procedures are used and to verify that the materials used meet the specifications. Additionally, the program will identify and define problems that may occur during construction and correct those problems before the construction is complete. At the completion of the work, the program requires certification reports indicating that the facility has been constructed in accordance with design standards and specifications. It is the responsibility of the certifying engineer(s) to prepare these reports.

2.0 Definitions

The following definitions are applicable to this plan:

2.1 Quality Control

Definition (ASTM D3740): - a planned system of activities, or the use of such a system, whose purpose is to provide a level of quality that meets the needs of users. The objective of quality control is to provide stable quality that is safe, adequate, dependable, and economic. The overall system involves integrating the quality factors of several related steps including: the proper specification of what is wanted, production to meet the full intent of the specification, inspection to determine whether the resulting material, product, service, etc. is in accordance with the specifications, and review of usage to determine necessary revisions of specifications.

In practice, Quality Control refers to those procedures, criteria, and tests employed and paid for by the Contractor(s) to confirm that the work satisfies the Contractor's standards and is in compliance with the project plans and specifications. This plan does not address quality control procedures, criteria, and/or tests.

2.2 Quality Assurance

Definition (ASTM D3740): - a planned system of activities whose purpose is to provide assurance that the overall quality control program is in fact being effectively implemented. The system involves a continuing evaluation of the adequacy and effectiveness of the overall quality control program with a view to having corrective measures initiated where necessary. For a specific material, product, service, etc., this involves verifications, audits, and the evaluation of the quality factors that affect the specification, production, inspection, and use of the product, service, system, or environment.

In practice, Quality Assurance refers to those procedures, criteria, and tests required and paid for by the Owner to confirm that the work performed by the Contractor(s) is in compliance with the project plans and specifications and any additional requirements of this plan.

3.0 Parties

3.1.a. Owner

The Owner is responsible for the facility in this plan. The Owner shall also contract and manage the Earthwork Contractor(s). For this project, the Owner is the Tazewell County Board of Supervisors.

3.1.b. Operator

The operator of the facility is responsible for daily operations of the landfill and reports directly to the Owner. For this project, the operator is the Tazewell County Board of Supervisors.

3.2 Project Manager

The Project Manager is the official representative of the Owner; in this plan, the term "Project Manager" shall apply equally to "Construction Coordinator", i.e., the individual in charge of the project. For this project, the Project Manager will be Joseph W. Sulesky, E.I.T. of Joyce Engineering, Inc. or his designated representative.

3.3 Designer

The Designer, or Engineer, is responsible for preparation of the design drawings, plans and specifications of the project and for preparation of this CQA Plan. The Engineer is also responsible for the interpretation of those documents and for resolution of technical matters that arise during construction. The Designer will subcontract and manage the Soils CQA Consultant, Geosynthetic CQA Consultant, and the Geosynthetic CQA Laboratory. For this project, the Designer is Joyce Engineering, Inc. of Princeton, West Virginia. The project manager is Joseph W. Sulesky, E.I.T.

3.4 Construction Representative

The Construction Representative is a representative of the Designer who is physically on-site during construction. The Construction Representative reports to the Project Manager and the Designer.

3.5 Soils CQA Consultant

The Soils CQA Consultant is a party, independent from the Owner, Designer, and Earthwork Contractor(s), that is responsible for observing, testing and documenting activities related to the quality assurance of the earthworks at the site. He also provides laboratory testing of soils and other earth materials for material evaluation and verification purposes. He is also responsible for issuing a certification report, sealed by a Registered Professional Engineer.

3.6 Geosynthetic CQA Consultant

The Geosynthetic CQA Consultant is a party, independent from the Owner, Designer, Manufacturer, and Installer, that is responsible for observing and documenting activities related to the quality assurance of the production and installation of the geosynthetic components of the lining system, e.g., geomembranes, geotextiles, geogrids, and geonets. He is also responsible for issuing a certification report, sealed by a Registered Professional Engineer. He is also responsible for directing the laboratory testing of the geosynthetics.

3.7 Geosynthetic CQA Laboratory

The Geosynthetic CQA Laboratory is a party, independent from the Owner, Designer, Manufacturer, and Installer, responsible for conducting tests on samples of geosynthetics taken from the site.

3.8 Earthwork Contractor(s)

The Earthwork Contractor is responsible for the construction of soil berms and embankments, preparation of the supporting soil on which all construction is to be installed, for construction of the clay liner, subbase, and closure cap layers, and for placing earth and granular materials (if any) over the installed geosynthetic lining system and for contracting the geosynthetic manufacturer and installer. For the contract, the earthwork contractor shall be announced later.

3.9 Geomembrane Manufacturer

The Geomembrane Manufacturer is responsible for the production of geomembrane rolls from resin.

3.10 Geomembrane Installer(s)

The Geomembrane Installer is responsible for field handling, sorting, placing, seaming, loading (against wind), and other aspects of the geosynthetics installation, including the geomembranes, geotextiles, geogrids, and geonets. The Installer is also responsible for transportation of these materials to the site.

3.11 Surveyor

The Surveyor is responsible for establishing and maintaining lines and grades and temporary benchmarks throughout all relevant areas of the construction site.

4.0 Communications and Meetings

Frequent and open communications are a necessary and essential component of this plan in order to achieve a high degree of coordination, cooperation, and quality in the finished product and to minimize or avoid delays. It is one goal of this plan to resolve problems at the lowest possible level of authority while maintaining thorough documentation, informing all responsible parties, and obtaining approvals as necessary or appropriate. Documentation requirements are addressed in the separate sections of this plan.

4.1 Meetings

A series of meetings will be held before, during, and after construction to facilitate planning, progress reports and problem resolution. Minutes are to be kept of all meetings as directed by the Project Manager. The meetings shall be as follows unless otherwise directed by the Owner:

- Preconstruction Meeting to be attended by all parties including subcontractors and significant suppliers not identified in paragraph 3.0 above.

- Daily Progress Meetings to be held each morning as directed by the Project Manager and to be attended by representatives of all parties actively involved in the construction on that day. Topics of discussion shall include, but not be limited to, progress reports, observations, test results, upcoming events, work areas on site,materials handling and staging, problems encountered, and solutions planned and/or achieved. These are the primary problem solving meetings.

- Weekly Progress Meetings to be held as directed by the Project Manager and to be attended by the Owner's Project Manager, the Designer's Project Manager and/or Project Engineer, the Construction Representative, and representatives of parties actively involved in the construction as designated by the Project Manager.

- Post-Construction Resolution Meeting to be attended by all parties including subcontractors and significant suppliers not identified in paragraph 3.0 above. A teleconference is acceptable for those parties who have already demobilized and for whom attendance would be impractical.

B. EARTH MATERIALS

1.0 Introduction

This section of the plan describes construction quality assurance (CQA) procedures for the installation of the earth material components of liner, drainage and final cover systems for municipal solid waste landfills and surface impoundments. This section does not address geomembranes, geotextiles, piping, or other structures; these items are covered in other sections.

2.0 Scope

2.1 General

The work addressed under this section shall facilitate proper construction of all earth material components of lined municipal solid waste disposal cells and surface impoundments. All work shall be constructed to the lines, grades, and dimensions indicated on the project plans, in accordance with the project specifications, or as required by the Owner or his representative.

2.2 Personnel Qualifications

Prior to commencement of the work, all organizations responsible for any portion of the construction shall provide the Project Manager and Engineer with the following information, as a minimum:

- Corporate Information:
  - brief historical background; and
  - proof of insurance certificates.
- Professional capabilities:
  - summary of corporate capabilities; and
  - summary of experience with similar projects.
- Personnel:
  - lines of authority for project personnel;
  - personnel responsibilities; and
  - resumes of personnel to be involved.

3.0 Earth Materials CQA Testing

3.1 General

Assurance that construction for the waste disposal cell or surface impoundment has been done in accordance with the project plans and specifications shall be accomplished by the judicious use of CQA testing and visual observations. Specifically, CQA testing shall be conducted in two categories:

- Pre-construction testing and
- Construction testing.

CQA testing within these categories shall consist of the following:

- Material Evaluation and Verification;
- Construction Quality Evaluation; and
- Special Testing.

3.2 Material Evaluation/Verification Testing

Pre-construction material evaluations shall be performed on samples from potential sources to ascertain their acceptability as construction materials. Construction testing shall be performed during the course of the work to verify material compliance with the specifications.

Criteria to be used for determination of acceptability of materials for use during construction shall be as defined in the project specifications, State Department of Transportation specifications, and/or as detailed in this plan. All evaluation tests are to be performed in a geotechnical laboratory which has been approved for use by the Owner or his representative. Test reports will verify compliance with or state deviation from applicable ASTM standards as outlined below.

3.2.1 Tests for Granular Materials

The following tests shall be performed as appropriate and non-test methods (designated by an asterisk) utilized as appropriate to evaluate granular (sand and gravel) materials (See Table 1 for testing frequency). The appropriateness of a given test or non-test method shall be discussed with the Designer before implementing that test or method.

Test or Method	ASTM Standard No.	Planned Use	
		Drainage Layer	Road Base/ Riprap
• Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate	C88-83		X
• Materials Finer Than 75-um (No. 200) Sieve in Mineral Aggregates by Washing	C117-87	X	X
• Degradation of Small/Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine, Resistance to	C131-89 C536-89		X
• Sieve Analysis of Fine and Coarse Aggregates	C136-84a	X	X
• Clay Lumps and Friable Particles in Aggregates	C142-78	X	
• Reducing Field Samples of Aggregate to Testing Size*	C702-87	X	X
• Sampling Aggregates*	D75-87	X	X
• Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures, Laboratory Determination of	D2216-80	X	
• Classification of Soils for Engineering Purposes*	D2487-85	X	
• Insoluble Residue in Carbonate Aggregate	D3042-86	X	

*Non-test methods to supplement test methods as required.

3.2.2 Tests for Fine-Grained Soils

The following tests shall be performed as appropriate and non-test methods (designated by an asterisk) utilized as appropriate to evaluate fine-grained (silt and clay) soils (See Table 1 for testing frequency). The appropriateness of a given test or non-test method shall be discussed with the Designer before implementing that test or method.

Test or Method	ASTM Standard No.	Planned Use	
		Liner/ Cover	Controlled Filled
• Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants*	D421-85	X	X
• Particle-Size Analysis of Soils	D422-63	X	X
• Moisture Density Relations of Soils and Soil-Aggregate Mixtures	D698-78 or D1557-78	X	X
• Specific Gravity of Soils	D854-83	X	
• Amount of Material in Soils Finer than the No. 200 Sieve	D1140-54	X	X
• Soil Investigation and Sampling*	D1452-80	X	X
• Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures, Laboratory Determination of	D2216-80	X	X
• Wet Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants*	D2217-85	X	X
• Classification of Soils for * Engineering Purposes*	D2487-85	X	X
• Description and Identification of Soils (Visual-Manual Procedure)*	D2488-84	X	X
• Preserving and Transporting Soil Samples*	D4220-89	X	X
• Liquid Limit, Plastic Limit, and Plasticity Index of Soils	D4318-84	X	X

*Non-test methods to supplement test methods as required.

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12-6-96

To facilitate the CQA program, the following definitions apply:

- A layer is defined as a compacted stratum composed of several lifts constructed without construction joints.
- A lift is defined as that segment of a layer composed of soils having a compacted thickness of six inches or less.

3.2.3 Hydraulic Conductivity Evaluations

Hydraulic conductivity evaluations shall be conducted on all materials proposed for use in the construction of clay liners, infiltration barriers, seepage barriers, drainage layers, leachate collection/detection zones and so forth.

The following tests shall be performed to provide data and documentation for these evaluations (see Table 1 for testing frequency):

Test or Method	ASTM Standard No.	Material Type	
		Granular	Fine-Grained
• Moisture Density Relations of Soils and Soil-Aggregate Mixtures (Standard Proctor or Modified Proctor, as specified)	D698-78 or D1557-78		X
• Permeability of Granular Soils (Constant Head)	D2434-68	X	
• Permeability of Fine-grained Soils Using a Rigid-Wall, Double-Ring Permeameter	N.A.		X
• Permeability of Fine-grained Soils Using a Flexible-Wall Permeameter With Back Pressure Saturation	D5084-90		X
• Field Measurement of Hydraulic Conductivity of Porous Materials Using the Two-Stage Borehole Procedure	TBA		X

3.2.3.1 Clay Soils for Liner and Cap Construction

After sampling clay soils from the designated borrow area (s), the soils laboratory shall perform classification and moisture-density (Standard Proctor, minimum 5 points) tests at the frequency designated in Table 1 on each soil type as designed by the Unified Soil Classification System (USCS). Similar soil types may be grouped for moisture density testing. Once these tests are complete, a determination shall be made as to the similarity of soil types and the one or two most promising sources of clay material. Volume estimates of each source shall be made on the basis of an adequate number of auger borings or test pits to assure that 125 percent of the Engineer's estimate of volume required is available from each recommended source. The test results, volume estimates, and recommendation regarding promising sources shall then be forwarded to the Engineer for review and approval for further testing.

For each approved source, the following tests and evaluations shall be performed:

1. Run additional compaction tests using Modified Proctor and "Reduced Proctor" compaction efforts as needed (minimum 5 points each). "Reduced Proctor" may employ Standard or Modified Proctor procedures with a systematic reduction in compactive effort to provide a third moisture-density relationship yielding hydraulic conductivities within the acceptable range.

2. Plot the family of moisture-density curves on a single plot.

3. For each point on every compaction curve, run a saturated hydraulic conductivity test. Use of a rigid-wall, double-ring permeameter is recommended to expedite the process (namely, utilization of the Proctor mold); however, the test must be run a sufficient length of time to assure that rate of inflow and outflow are equal and the measured k value is reproducible within 20 percent over three consecutive time intervals.

4. Plot the hydraulic conductivity results against molding water content and draw a horizontal line through the maximum allowed k value designated in the specification.

5. Return the plot of the family of moisture-density curves and highlight or otherwise identify those points which yielded acceptable k values.

6. On the moisture-density plot, designate an "Acceptable Zone" which is interpolated from the k values and bounded by the zero air voids curve for the appropriate specific gravity.

Tabulated summaries of the test results, copies of representative data and calculation sheets, and copies of all plots shall be submitted to the Engineer for review and approval. Once approved, the plots of "Acceptable Zones" will form the basis for acceptance or rejection of liner compaction in the field along with documented evidence of satisfactory clod destruction and lift bonding.

3.2.3.2 Test Fill for Clay Liner Construction

For each approved source of clay, a test fill shall be constructed to simulate the compacted clay component of the composite liner system. The test fill shall have minimum dimensions of 60 feet by 100 feet by 2 feet thick. It shall be constructed using the same equipment (and preferably the same personnel) as to be used during construction, and employing all of the specified requirements regarding subgrade preparation, soil excavation, processing, moisture conditioning, hauling, placement, compaction, and construction quality testing. Prior to construction of the composite liner, test fill shall be constructed to establish the optimum (or most likely) soil conditions and construction methods under the prevailing conditions, with approval required from the Designer or his representative.

All aspects of the test fill construction shall be documented by the Soils CQA Consultant (e.g. lift thickness, moisture condition, number of passes, bentonite mixing, clod destruction, scarification, protection from freezing and desiccation, etc.) in order to establish optimum specification tolerance for actual liner construction. Upon completion of the test fill, a minimum of five two-stage borehole

permeability tests will be performed to verify that the design criteria for soil liner permeability have been met. At each test location, samples shall be obtained for field and laboratory testing to include, at a minimum, in -place moisture and density, percent fines, plasticity, and permeability (on an "undisturbed" shelby tube sample).

All test data and field notes form the test fill shall be submitted to the Designer for review.

The above requirements for in-situ test are not applicable to the secondary infiltration/gas barrier $1x10^{-5}$cm/sec material.

3.3 Construction Quality Evaluation Testing

Construction quality evaluation shall be performed on all components of the construction. These evaluations shall be performed at the frequencies shown in Table 1. Criteria to be used for determination of acceptability of the construction work shall be as identified in the project specifications and/or as detailed in this plan.

Construction evaluation testing shall consist of visual observations of the work, in-place density/moisture content checks, investigations into the adequacy of layer bonding and clod destruction, surveys of as-built conditions and elevation and thickness monitoring, and special testing. Evaluation of the construction work shall include the following:

- Observations and documentation of the water content, clod size and other physical properties of the soil during processing, placement and compaction;
- Observation and documentation of compacted lifts prepared to accept and bond to subsequent lifts;
- Observation and documentation of the thickness of lifts as loosely placed and as compacted;
- Observation and documentation of the action of the compaction and heavy hauling equipment on the construction surface (sheepsfoot penetration, pumping, cracking, etc.); and
- Observation and documentation of the effectiveness of procedures used to prevent desiccation and/or freezing of completed lifts and layers. Refer to Paragraph 4.1.1 of Section C, Geosynthetics.

Determinations of in-place moisture and density shall be performed in accordance with the following methods and at the frequencies designated in Table 1.

Test	ASTM Standard No.
• Density of Soil In Place by the Sand Cone Method	D1556-82
• Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)	D2922-81
• Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)	D3017-88
• Determination of Water (Moisture) Content of Soil by Direct Heating Method	D4959-89

The in-place density test method shall cause minimal delay to the placement of subsequent lifts; therefore, the nuclear method is preferred unless construction sequencing is such that fill placement is not interrupted by sand cone testing. An acceptable test for soils used in structural or "controlled fill" applications (i.e. embankments, berms, backfill, etc.) will be defined as one which meets or exceeds the specified minimum density within the specified moisture range. An acceptable test for clay soils used in liner construction or similar applications will be defined as one which plots on the appropriate moisture-density plot within the "Acceptable Zone."

If there is any question as to the classification of the tested soil, and hence the appropriateness of a given moisture-density plot, a "one-point" Standard Proctor compaction test (performed at a water content less than optimum) shall be run in the field for comparison with the available plots. The optimum moisture content and maximum dry density extrapolated from the one-point test result must fall on or near the plotted line of optimums for the classification of a clay soil to be confirmed. For controlled fill, the reference maximum dry density can be adjusted to accommodate the one-point data.

Questions concerning the accuracy of any single test shall be addressed by retesting in that or another location. Periodic checks using the sand cone method shall be performed to verify nuclear density results (one (1) per twenty (20) nuclear density tests or a minimum of one per day). Wherever a conflict exists, sand cone results shall be preferred over nuclear density results.

Evaluation of lift bonding in clay liner and similar applications shall be done by using test pits to make visual observations. Alternatively, x-ray

inspection of Shelby tubes pushed through the clay layer will be considered by the Engineer upon the recommendation of the Soils CQA Consultant. All test pits shall be excavated in a manner acceptable to the Owner or his representative. All test pits excavated by backhoe shall utilize a bucket width no greater than 1.5 feet. Depths of the test pits shall be no greater than one (1) foot. All pits shall be backfilled and compacted to achieve moisture and density within the "acceptable zone". Compaction shall be achieved via the use of hand compaction equipment or other methods approved by the Engineer. All repaired test pits shall be tested to confirm acceptable moisture and density.

3.4 Special Testing

Construction evaluation involving special testing shall be conducted at the direction of the Owner or his representative. Criteria to be used for the determination of acceptability shall be as established by the Owner or his representative.

The following tests shall be performed as required to provide data for the evaluation:

Test	ASTM Standard No.
• Compressive Strength, Unconfined of Cohesive Soil	D2166-85
• One-Dimensional Consolidation Properties of Soils	D2435-80
• Strength, Triaxial Compression	
Consolidated Undrained (CU)	D4767-88
Unconsolidated Undrained (UU)	D2850-87

Refer also to the following references for test procedures:

a) U.S. Army Corps of Engineers (WES), 1970, "Laboratory Soils Testing", Engineering Manual EM-1110-2-1906.

b) Lambe, T. W., 1951 "Soil Testing for Engineers", Wiley, New York, NY

c) Head, K. H., 1986 "Manual of Soil Laboratory Testing, Volume 3", Wiley, New York, NY

3.5 Repair of Clay Liner Perforations

All clay liner perforations shall be made in accordance with the testing methods and frequencies identified in paragraph 3.3 and Table 1. Unless otherwise noted, all perforations of the clay liner will be backfilled with a 1:1 cement/bentonite slurry grout (small perforations) or a moist clay-bentonite mixture (large perforations). The mixture will be poured or compacted in place with a tamping rod, Modified or Standard Proctor hammer as specified, or hand tamper, depending on the size of the perforation. This shall include, but not be limited to, the following:

- Nuclear density test probe locations;
- Shelby tube sampling locations;
- Sand cone test locations; and
- Test pit locations.

4.0 Documentation/Certification

4.1 General

The Owner's representatives will document all activities associated with the construction of the project. Such documentation will include, as a minimum, daily reports of construction activities, weekly summary reports and a summary technical report on the construction project. Forms and formats for reporting and documentation of specific material installations, tests, and so forth will be discussed and agreed upon at the pre-construction meeting. In addition to the requirements outlined herein, documentation and reporting will meet all requirements of the project specifications and those of federal, state, and local regulatory agencies.

4.2 Construction Monitoring

Construction of all cell components, impoundments and appurtenant structures will be monitored and documented by a full-time Construction Representative working under the direction of the Engineer. All construction testing will be performed and documented by an independent testing laboratory working under the direction of the Construction Representative. The Construction Representative will be responsible for preparing all daily and weekly reports.

Written daily reports shall include a record of observations, test data sheets, identification of problems encountered during construction, corrective measures taken, personnel and equipment on site, and hours worked.

Weekly summary reports shall also report problems identified during the reporting period and corrective measures taken, if any. Overall progress shall also be documented.

4.3 Certification

The Engineer shall prepare a certification report addressing each major item identified above for each phase of construction. Certification reports required by regulatory agencies will also be prepared and submitted as required. Subconsultants and testing laboratories shall also prepare certification reports for their respective areas of responsibility.

Certification will include assessments of the contractors compliance with the plans and specifications and physical sampling and testing. The certification report will also include:

- Record drawings
- Scale drawings depicting the locations of construction testing when appropriate; and
- Statements pertaining to the extent of construction, i.e., depths, plan dimensions, elevations and thickness, with special attention to changes from the design plans.

The summary technical report will provide an evaluation of the construction project. The report will certify the results of the various field tests and laboratory tests performed and assess whether or not the constructed project is in compliance with the plans and specifications.

C. GEOSYNTHETICS

1.0 Introduction

This section of the plan addresses the quality assurance of the installation of geomembranes and other geosynthetic products used in the solid waste landfill and/or surface impoundments. All geosynthetic components of lining and cover systems used in solid waste disposal facilities are addressed in this section, including geomembranes, geotextiles, geogrids, and geonets. Excellent quality control and careful documentation are required in the production and installation of all of these geosynthetic materials.

This section is devoted to quality assurance, not to quality control. A separate geosynthetic quality control manual shall be submitted by the Geomembrane Manufacturer and Installer to the Designer prior to the preconstruction meeting for approval. This section does not address earth materials, piping, or other structures; these items are covered in other sections.

2.0 Scope

2.1 General

The work addressed under this section shall facilitate proper construction of all geosynthetic components of the lined solid waste landfill and surface impoundments. All work shall be constructed to the lines, grades, and dimensions indicated on the project drawings, in accordance with the project specifications, or as required by the Owner or his representative.

Inspectors shall issue a written daily report of activities. These reports shall include, as a minimum, observations and test results as well as problems encountered and solutions achieved. Construction reports summarizing significant events, as well as addressing all problems encountered and their solutions, shall be issued weekly to the owner's Construction Representative and to the Designer. The format of these reports shall be established at the pre-construction meeting.

3.0 HIGH DENSITY POLYETHYLENE GEOMEMBRANE MANUFACTURE, FABRICATION, AND DELIVERY

3.1 High Density Polyethylene Geomembrane Manufacturing

The geomembrane shall be manufactured from a medium or high density polyethylene resin. Only one type of resin (one manufacturer, one resin classification) shall be used to manufacture geomembrane for this project. In addition, all geomembrane used for this project shall be from

the same batch unless otherwise approved by the manager and the installer or manufacturer agrees to pay for any additional conformance testing required.

3.1.1 Raw Material

The raw material will be first quality polyethylene resin containing no more than 2 percent clean recycled polymer by weight, and meeting the following specifications:

- Specific Gravity (ASTM D1505): $\geq$ 0.930 (without carbon black);
- Melt Index (ASTM D1238-82 (190/2.16): 0.1 - 0.3; and
- Notched Constant Tensile Load (NCTL)(GRI-GM5): Ductile/Brittle Transition Time: >200 hr.

Quality Control (QC) testing will be carried out by the Manufacturer at a minimum frequency of one test for every 40,000 ft^2 of material to demonstrate that the product meets this specification. At the Owner's discretion, additional testing may be carried out for purposes of conformance by the CQA Laboratory, and paid for by the Owner. If the results of the Manufacturer's QC Laboratory and the CQA Laboratory testing differ, the testing will be repeated by the CQA Laboratory, and the Manufacturer will be allowed to monitor this testing. The results of this latter series of tests will prevail, provided that the applicable test methods have been followed.

Prior to the installation of any geomembrane material, the Manufacturer will provide the Designer, Project Manager and the Geosynthetics CQA Consultant with the following information:

- the origin (resin Supplier's name and resin production plant), identification (brand name, number) and production date of the resin;
- a copy of the quality control certificates issued by the Resin Supplier;
- reports on the tests conducted by the Manufacturer to verify the quality of the resin used to manufacture the geomembrane rolls assigned to the project. At a minimum, these tests should include specific gravity (ASTM D1505), and melt index (ASTM D1238-82 ,190/2.16); and

- a statement that no reclaimed polymer is added to the resin (however, the use of polymer recycled during the manufacturing process may be permitted if done with appropriate cleanliness and if recycled polymer does not exceed 2 percent by weight).

The Geosynthetics CQA Consultant will review these documents and report any discrepancies with the above requirements to the Construction Representative.

3.2 Manufacturing Plant Audit

3.2.1 Scope

The Geosynthetics CQA Consultants shall perform an audit of the manufacturing and quality control procedures used by the Manufacturer specifically for the manufacturer of the HDPE geomembrane to be used for the installation at the Owner's facility. The Manufacturer shall give the Geosynthetics CQA Consultant at least 48 hours notice of the start of production of geomembrane for this project. QC tests shall be performed as the geomembrane is manufactured.

3.2.2 Manufacturing Process

In general, the Manufacturer shall make available to the Geosynthetics CQA Consultant procedures used to manufacture the HDPE geomembranes. This does not include divulging trade secrets which are not commonly known as basic manufacturing processes used to manufacture HDPE geomembranes. However, if the process is critical to the integrity of the material, the procedures shall be made available to the Geosynthetics CQA Consultant.

In addition, if the Geosynthetics CQA Consultant discovers a procedure or technique which is being performed by the Manufacturer that is determined critical to the manufacturing process, the procedure or technique will be included in the manufacturing procedures.

The Geosynthetics CQA Consultant shall monitor production and testing of geomembrane material allocated for this project. If material for this project has already been manufactured, the Geosynthetics CQA Consultant shall monitor select runs of the same geomembrane product to verify that manufacturing controls are in place. The Manufacturer shall provide QC certificates to the

Geosynthetics CQA Consultant prior to the loading and shipping of geomembranes to the site. The Geosynthetics CQA Consultant shall immediately review the QC certificates and notify the Manufacturer in writing which geomembrane rolls are approved for shipping. If possible, the Geosynthetics CQA Consultant shall monitor the loading of the geomembrane for shipping.

3.2.3 Quality Control

The Manufacturer shall make available to the Owner and Geosynthetics CQA Consultant quality control manuals which outline all quality control procedures which will be implemented for the manufacture of the HDPE geomembranes.

The Geosynthetics CQA Consultant shall verify that during select runs of material, all quality control procedures are performed.

3.3 Manufacturing

3.3.1 Submittals

Prior to the installation, the Manufacturer will provide the Project Manager and the Geosynthetics CQA Consultant with the following:

- A properties sheet including, at a minimum, all specified properties, measured using test methods indicated in the specifications;
- a list of quantities and descriptions of materials other than the base polymer which comprise the geomembrane;
- the sampling procedure and results of testing; and
- a certification that property values given in the properties sheet are minimum or maximum values and are guaranteed by the Manufacturer.

The Geosynthetics CQA Consultant will verify that:

- the property values certified by the Manufacturer meet all of the specifications; and

- the measurements of properties by the Manufacturer are properly documented, the test methods used are acceptable, and the geomembrane meets the Manufacturer's and Project Specifications.

3.3.2 Rolls

Prior to shipment, the Manufacturer will provide the Project Manager and the Geosynthetics CQA Consultant with a quality control certificate for each roll of geomembrane provided. The quality control certificate will be signed by a responsible party employed by the Manufacturer, preferably the QC Laboratory Manager. The quality control certificate will include:

- roll numbers and identification; and

- sampling procedures and results of quality control tests. As a minimum, results will be given for thickness and thickness variation, tensile strength and elongation at yield and break, NCTL ductile/brittle transition time, carbon black content and dispersion, specific gravity, and trapezoidal tear resistance (both initial and residual), evaluated in accordance with the methods indicated in the specifications or equivalent methods approved by the Designer and Geosynthetics CQA Consultant.

The Geosynthetics CQA Consultant will:

- verify that the quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls related to it; and

- review the quality control certificates and verify that the certified roll properties meet the specifications.

3.3.3 Conformance Testing

3.3.3.1 In-Plant Material Conformance Test Sampling (if applicable)

The expressed purpose of In-plant Material Conformance Test Sampling is to verify that geomembrane material which is designated for the owner's project is confirmed as meeting the project specifications prior to shipment to the site.

The Manufacturer will make available all necessary personnel and equipment to assist the Geosynthetics CQA Consultant in retrieving conformance samples of the geomembrane material.

The Geosynthetics CQA Consultant shall send to the CQA Laboratory conformance samples for testing as outlined in Section 3.3.4.

The Geosynthetics CQA Consultant shall report any nonconformance of sampling procedures as outlined in Section 3.3.6 to the Construction Representative.

3.3.3.2 On-Site Material Conformance Test Sampling

Upon delivery of the rolls of geomembrane to the site, the Geosynthetics CQA Consultant will ensure that samples are removed at the specified frequency and forwarded to the CQA Laboratory for testing to ensure conformance to both the design specifications and the list of guaranteed properties.

3.3.4 Tests

At a minimum, tests to determine the following characteristics will be performed on geomembranes:

- specific gravity;
- carbon black content and dispersion;
- thickness (measured with calipers, at several random locations on the sample);
- tensile characteristics (yield strength, elongation at yield, break strength, elongation at break); and
- notched constant tensile load (NCTL): ductile/brittle transition time.

3.3.5 Test Procedures

The following test procedures will be complied with:

- specific gravity: (ASTM D1505);
- carbon black content: (ASTM D 1603);
- carbon black dispersion: (ASTM D2663 (B));
- thickness: smooth material (ASTM D374C), textured material (ASTM D 1593 pointed probe);
- tensile strength: (ASTM D638) with no requirement for sample conditioning time; and
- notched constant tensile load (GRI-GM5).

3.3.6 Sampling Procedures

Samples will be taken across the entire width of the roll and will not include the first outer wrap (field conformance testing only). Unless otherwise specified, samples will be 1 foot long by the roll width. The Geosynthetics CQA Consultant will mark the roll direction on the samples with an arrow.

Unless otherwise specified, samples will be taken at a rate of one per batch or one per 100,000 ft^2, which ever is the most frequent.

3.3.7 Test Results

The Geosynthetics CQA Consultant will examine all results from laboratory conformance testing and will report any nonconformance to the Construction Representative.

3.3.7.1 Procedures in the Case of a Conformance Test Failure

The following procedure will apply whenever a sample fails a conformance test that is conducted by the CQA Laboratory:

- The Manufacturer will replace the roll of geomembrane that is in nonconformance with the specifications with a roll that meets specifications.

- The Installer will remove conformance samples for testing by the CQA Laboratory from the next numbered rolls on each side of the failed roll. These two samples must both conform to specifications. If either of these samples fail, every roll of geomembrane on site and every roll delivered subsequently must be tested by the CQA Laboratory for conformance to the specifications. This additional conformance testing will be at the expense of the Manufacturer.

The Geosynthetics CQA Consultant will document actions taken in conjunction with conformance test failures.

3.4 Delivery

3.4.1 Transportation and Handling

Transportation of the geomembrane is the responsibility of the Manufacturer, Installer, or other party as agreed upon. All handling on-site is the responsibility of the Installer. The Installer is responsible for the submittal of shipping manifests and all other relevant documents to the Geosynthetics CQA Consultant. The Geosynthetics CQA Consultant will verify that:

- handling equipment used on the site is adequate and does not pose any risk of damage to the geomembrane;
- the Installer's personnel handle the geomembranes with care; and
- trailer beds are free of nails and other items which could damage the geomembrane.

Upon delivery at the site, the Installer and the Geosynthetics CQA Consultant will conduct a surface observation of all rolls or factory panels for defects and for damage. This examination will be conducted without unrolling rolls or unfolding factory panels unless defects or damages are found or suspected. The Geosynthetics CQA Consultant will indicate to the Construction Representative:

- rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws; and
- rolls which include minor repairable flaws.

3.4.2 Storage

The Installer will be responsible for the storage of the geomembrane on-site. The Owner will provide storage space in a location (or several locations) such that on-site transportation and handling are minimized. Storage space should be protected from theft, vandalism, passage of vehicles, etc.

The Geosynthetics CQA Consultant will verify that storage space selected is not in an area of low elevation and that cribbing techniques have been utilized which will help ensure that the materials will not be sitting in ponded water in the event of rainfall.

4.0 HIGH DENSITY POLYETHYLENE GEOMEMBRANE INSTALLATION

4.1 Earthwork

4.1.1 Surface Preparation

The Earthwork Contractor will be responsible for preparing the supporting soil according to the specifications.

The Geosynthetics CQA Consultant will verify that:

- a qualified land surveyor has verified all lines and grades;
- a qualified geotechnical engineer, normally the Soils CQA Consultant has verified that the supporting soils meet the density specification and provides a firm foundation;
- the surface of the subgrade has been prepared and has been certified as acceptable to the Installer. In general, the surface should be free of irregularities, sticks, roots, large quantities of loose soil, and abrupt changes in grade which may cause damage to the geomembrane and require its repair after deployment;
- the surface of the supporting soil does not contain rocks which may be damaging to the geomembrane; and
- there is no area excessively softened by high water content.

The Installer will certify in writing that the surface on which the geomembrane will be installed is acceptable. The certificate of acceptance will be given by the Installer to the Geosynthetics CQA Consultant prior to commencement of geomembrane installation in the area under consideration. The Geosynthetics CQA Consultant will be given a copy of this certificate by the Construction Representative.

After the supporting soil has been accepted by the Installer, it will be the Installer's responsibility to indicate to the Geosynthetics CQA Consultant any change in the supporting soil condition that may require repair work. If the Geosynthetics CQA Consultant concurs with the Installer, then the Geosynthetics CQA Consultant shall notify the Construction Representative who will ensure that the supporting soil is repaired.

In general, at any time before and during the geomembrane installation, the Geosynthetics CQA Consultant shall indicate to the Construction Representative locations which may not provide adequate support to the geomembrane.

Special care shall be taken to avoid desiccation cracking of the clay liner. To that end:

- The Designer shall specify maximum allowable crack depth and width and should describe the procedure for repairing cracks;

- The Earthwork Contractor shall prepare a list of precautions to be taken against cracking and shall provide copies to the Project Manager, the Designer, the Construction Representative, and the Soils CQA Consultant;

- The Designer shall inform the Construction Representative, the Installer, and the Geosynthetics CQA Consultant of these specifications and precautions; and

- Immediately prior to installation of the geomembrane liner, the clay surface shall be observed by the Installer and the Construction Representative. The decision to repair cracks, if any shall be made by the Construction Representative.

4.1.2 Anchorage System

Anchor trenches will be excavated by the Earthwork Contractor (unless otherwise specified) to the lines and widths shown on the design drawings, prior to geomembrane placement. The Geosynthetics CQA Consultant will verify that anchor trenches have been constructed according to the design drawings.

If the anchor trench is excavated in a clay liner, no more than the amount of trench required for the geomembrane to be anchored in one day shall be excavated (unless otherwise specified). This will help minimize the potential for desiccation of the clay liner in the anchor trench.

Slightly rounded corners will be provided in trenches where the geomembrane contacts the trench so as to avoid sharp bends in the geomembrane. No loose soil will be allowed to underlie the geomembrane in the trenches.

The Installer shall provide sufficient ballast in the anchor trench to ensure that the geomembrane and other associated geosynthetic materials do not slide down the slope prior to the backfilling of the anchor trench.

Water shall not be allowed to stand in the anchor trench. Responsibility for dewatering of the anchor trench shall be as agreed upon in the contract or at the preconstruction meeting. The anchor trench shall be backfilled and compacted by the Earthwork Contractor or the Installer, as outlined in the specifications. Care shall be taken when backfilling the trenches to prevent any damage to the geosynthetics. The Geosynthetics CQA Consultant shall observe the backfilling operation and advise the Construction Representative of any problems.

4.2 Geomembrane Placement

4.2.1 Field Panel Identification

A field panel is the unit area of geomembrane which is to be seamed in the field, i.e., a field panel is a roll or a portion of roll cut in the field.

It will be the responsibility of the Geosynthetics CQA Consultant to ensure that each field panel is given an "identification code" (number or letter-number) consistent with the layout plan. This identification code will be agreed upon by the Project Manager,

the Construction Representative, Installer, and Geosynthetics CQA Consultant. This field panel identification code should be as simple and logical as possible. (Note: Roll numbers established in the manufacturing plant are usually cumbersome and are not related to location in the field.) It will be the responsibility of the Installer to ensure that each field panel placed is marked with the original roll number. The roll number will be marked at a location agreed upon by the Project Manager, Construction Representative, Installer, and Geosynthetics CQA Consultant.

The Geosynthetics CQA Consultant will establish a table or chart showing correspondence between roll numbers, factory panels, and field panel identification codes. The field panel identification code will be used for all CQA records.

4.2.2 Field Panel Placement

4.2.2.1 Location

The Geosynthetics CQA Consultant will verify that field panels are installed at the location indicated in the Installer's layout plan, as approved or modified.

4.2.2.2 Compensation for Material Expansion and Contraction

The Installer will be responsible for calculations of the required amount of compensation which must be installed. Such calculations shall be shown to the Geosynthetics CQA Consultant and Construction Representative. The Installer will be responsible for ensuring that sufficient HDPE geomembrane is installed to compensate for contraction of the material during anticipated lower temperatures and to prevent expansion and excessive wrinkling at possible higher covering temperatures.

4.2.2.3 Installation Schedule

Field panels will be placed one at a time, and each field panel will be seamed immediately after its placement (in order to minimize the number of unseamed field panels exposed to wind).

It is usually beneficial to "shingle" overlaps in the downslope direction to facilitate drainage in the event of precipitation. It is also beneficial to proceed in the direction

of prevailing winds. Scheduling decisions must be made during installation, in accordance with varying conditions. In any event, the Installer will be fully responsible for the decision made regarding placement procedures.

The Geosynthetics CQA Consultant will evaluate every change in the schedule proposed by the Installer and advise the Construction Representative on the acceptability of that change. The Geosynthetics CQA Consultant will verify that the condition of the supporting soil has not changed detrimentally during installation.

The Geosynthetics CQA Consultant will record the identification code, location, and date of installation of each field panel.

4.2.2.4 Weather Conditions

Geomembrane placement will not proceed at geomembrane temperatures below 40°F unless otherwise authorized. Geomembrane placement will not be done during any precipitation, in an area of ponded water, or during excessive winds.

The Geosynthetics CQA Consultant will verify that the above conditions are fulfilled. Additionally, the Geosynthetics CQA Consultant will verify that the supporting soil has not been damaged by weather conditions.

The Geosynthetics CQA Consultant will inform the Construction Representative if the above conditions are not fulfilled.

4.2.2.5 Method of Placement

The Geosynthetics CQA Consultant will verify that:

- any equipment used does not damage the geomembrane by handling, trafficking, excessive heat, leakage of hydrocarbons or other means;

- the prepared surface underlying the geomembrane has not deteriorated since previous acceptance, and is still acceptable immediately prior to geomembrane placement;

- any geosynthetic elements immediately underlying the geomembrane are of acceptable cleanliness and are free of debris;

- all personnel working on the geomembrane do not smoke, wear damaging shoes, or engage in other activities which could damage the geomembrane;

- the method used to unroll the panels does not cause scratches or crimps in the geomembrane and does not damage the supporting soil;

- the method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels);

- adequate temporary loading and/or anchoring (e.g., sand bags, tires), not likely to damage the geomembrane, has been placed to prevent uplift by wind (in case of high winds, a maximum spacing of 60 feet between each consecutive row of sand bags or tires shall be used to prevent uplift of the HDPE geomembrane by wind; the loading should be continuous along the edges of panels to minimize the risk of wind flow under the panels); and

- direct contact of equipment with the geomembrane is minimized; i.e., the geomembrane is protected by geotextiles, extra geomembrane, or other suitable materials, in areas where excessive traffic may be expected.

The Geosynthetics CQA Consultant will inform the Construction Representative if the above conditions are not fulfilled.

4.2.2.6 Damage

The Geosynthetics CQA Consultant will visually examine each panel, after placement and prior to seaming, for damage. The Geosynthetics CQA Consultant will advise the Construction Representative which panels, or portions of panels, should be rejected, repaired, or accepted. Damaged panels or portions of damaged panels which have been rejected will be marked, and their removal from

the work area recorded by the Geosynthetics CQA Consultant. Repairs will be made according to procedures described in Section 4.6.3.

As a minimum, the Geosynthetics CQA Consultant will ensure:

- each panel is placed in such a manner that it is unlikely to be damaged; and
- any tears, punctures, holes, thin spots, etc., are marked for repair or the panel is rejected.

4.3 Field Seaming

4.3.1 Seam Layout

The Installer will provide the Project Manager, Construction Representative, and the Geosynthetics CQA Consultant with a seam layout drawing, i.e., a drawing of the facility to be lined showing all expected seams. The Geosynthetics CQA Consultant will review the seam layout drawing and verify that it is consistent with the accepted state-of-practice and this CQA Plan. No panels may be seamed in the field without the Geosynthetics CQA Consultant's approval. In addition, no panels not specifically shown on the seam layout drawing may be used without the Construction Representative's prior approval.

In general, seams should be oriented parallel to the line of maximum slope, i.e., oriented with, not across, the slope. In corners and other geometrically complex locations, the number of seams should be minimized. No base seam or tee seam will be less than 5 feet from the toe of slopes, or areas of potential stress concentrations, unless otherwise authorized.

A seam numbering system compatible with the panel numbering system will be agreed upon at the Resolution and/or Pre-Construction Meeting.

4.3.2 Requirements of Personnel

All personnel performing seaming operations will be qualified by experience. Seaming personnel must have seamed at least 2,000 feet of HDPE geomembrane seams using the same type of seaming apparatus to be used on this project. At least one seamer will have experience seaming a minimum of 20,000 feet of

HDPE geomembrane seams using the same type of seaming apparatus to be used on this site-specific geomembrane. The most experienced seamer, the "master seamer", will provide direct supervision over less experienced seamers.

The Installer will provide the Construction Representative and the Geosynthetics CQA Consultant with a list of proposed seaming personnel and their experience records. This document will be reviewed and approved by the Project Manager, Construction Representative, and the Geosynthetics CQA Consultant.

4.3.3 Seaming Equipment and Products

Approved methods for field seaming are extrusion seaming and fusion seaming. Proposed alternate methods will be documented and submitted to the Designer or to his representative for approval. Only apparatus that has been specifically approved by make and model will be used. The Installer will use appropriate measuring equipment to ensure that accurate temperatures are being achieved.

The Project Manager and Construction Representative will submit all documentation to the Geosynthetics CQA Consultant for his concurrence.

4.3.3.1 Extrusion Process

The extrusion-seaming apparatus will be equipped with gauges giving the relevant temperatures of the apparatus such as the temperatures of the extrudate, nozzle, and preheat.

The Installer will provide documentation regarding the extrudate to the Construction Representative and the Geosynthetics CQA Consultant, and will verify that the extrudate is compatible with the specifications, and in any event is comprised of the same resin as the geomembrane sheeting.

The Geosynthetics CQA Consultant will log apparatus temperatures, extrudate temperatures, ambient temperatures, and geomembrane temperatures at appropriate intervals.

The Geosynthetics CQA Consultant will verify that:

- the Installer maintains on-site the number of spare operable seaming machines decided at the Resolution Meeting;
- equipment used for seaming will not likely to damage the geomembrane;
- abrading is performed perpendicular to the seam and is completed no more than one hour prior to seaming;
- abrading of the seam area must not extend more than 0.25 percent of either side of the extrusion weld;
- the depth of the abrasion must not exceed 10 percent of the nominal material thickness;
- the extruder is purged prior to beginning a seam until all heat-degraded extrudate has been removed from the barrel;
- the electric generator is placed on a smooth base such that no damage occurs to the geomembrane;
- a smooth insulating plate or fabric is placed beneath the hot seaming apparatus after usage; and
- the geomembrane is protected from damage in heavily trafficked areas.

4.3.3.2 Fusion Process

The fusion-seaming equipment must be automated vehicular-mounted devices. The fusion-seaming machines will be equipped with gauges giving the applicable temperatures. Pressure and speed settings will be verified by the Installer prior to each seaming period.

The Geosynthetics CQA Consultant will log ambient and geomembrane temperatures, seaming apparatus temperatures, and speeds.

The Geosynthetics CQA Consultant will also verify that:

- the Installer maintains on-site the number of spare operable seaming machines decided at the Resolution Meeting;
- equipment used for seaming does not damage the geomembrane;
- for tee seam intersections, any flap on the cross seam is cut back to the edge of the outer track of the seam prior to seaming;
- the electric generator is placed on a smooth base such that no damage occurs to the geomembrane;
- a smooth insulating plate or fabric is placed beneath the hot seaming apparatus after usage;
- the geomembrane is protected from damage in heavily-trafficked areas; and
- build-up of moisture between the sheets is prevented (a movable protective layer may be used as required directly below each overlap of geomembrane that is to be seamed to accomplish this).

4.3.4 Seam Preparation

The Geosynthetics CQA Consultant will verify that:

- prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material;
- if seam overlap grinding is required, the process is completed according to the Manufacturer's, and in a way that does not damage the geomembrane;
- seams are aligned with the fewest possible number of wrinkles and "fishmouths".

4.3.5 Weather Conditions for Seaming

The following protocols will be observed during seaming:

- Unless authorized in writing by the Project Manager, no seaming will be attempted at ambient temperatures below 40°F or above 104°F.

- Below a geomembrane temperature of 50°F, pre-heating may be required.

- In all cases, the geomembrane in the seaming area will be dry and protected from wind.

- Ambient temperatures will be measured 2 inches above the geomembrane surface with a thermocouple.

If the Installer wishes to use methods which may allow seaming at ambient temperatures below 40°F or above 104°F, the Installer will demonstrate and certify that such methods produce seams which are entirely equivalent to seams produced at geomembrane temperatures above 40°F and below 104°F, and that the overall quality and durability of the geomembrane is not adversely affected.

In addition, an addendum to the contract between the Owner and the Installer is required which specifically states that the seaming procedure does not cause any physical or chemical modification to the geomembrane that will generate any short or long-term damage to the geomembrane. Then, the temperatures in the above quality assurance procedure will be modified accordingly.

The Geosynthetics CQA Consultant will verify that these weather conditions are fulfilled and will advise the Construction Representative if they are not. The Construction Representative and Project Manager will then decide if the installation will be stopped or postponed.

4.3.6 Overlapping and Temporary Bonding

The Geosynthetics CQA Consultant will verify that:

- the panels of geomembrane have a finished overlap, sufficient to allow peel tests to be performed on the seam;

- no solvent or adhesive is used unless the product is approved in writing by the Owner (samples will be submitted to the Owner for testing and evaluation); and

- the procedure used to temporarily bond adjacent panels together does not damage the geomembrane (in particular, the temperature of hot air at the nozzle of any spot seaming apparatus is controlled such that the geomembrane is not damaged. "Damage" includes a loss in durability).

The Geosynthetics CQA Consultant will log all appropriate temperatures and conditions, and will log and report to the Construction Representative any non-compliance.

4.3.7 Trial Seams

Trial seams will be made on fragment pieces of HDPE geomembrane to verify that seaming conditions are adequate. In general, trial seams will be conducted as follows:

	Fusion Welding	Extrusion Welding
Equipment	Before each welding period (every shift)	Before each welding period (every shift)
Technicians	Before first welding period (one per day)	Before each welding period (every shift)

A welding period or shift shall not exceed five hours. A trial seam will also be made in the event that the ambient temperature varies more than 20°F since the last passing trial seam. Trial seams will be made under the same conditions as actual seams. If any seaming apparatus is turned off for any reason, regardless of the length of time, a new passing trial seam must be completed for that specific seaming apparatus.

The trial seam sample will be at least 3 feet long by 1 foot wide with the sample centered lengthwise. Seam overlap will be as indicated in Section 4.3.6.

Four specimens, each 2 inches wide, and a minimum of 6 inches. long will be cut from the trial seam sample by the Installer. Two specimens will be tested in shear and two in peel using a calibrated field tensiometer, and they should meet project specifications. If any specimen fails, the entire operation should be repeated. If the

additional specimen fails, the seaming apparatus and seamer will not be accepted and will not be used for seaming until the deficiencies are corrected and two consecutive successful full trial seams are achieved.

The Geosynthetics CQA Consultant will observe all trial seam procedures. The remainder of the successful trial seam sample will be assigned a number and marked accordingly by the Geosynthetics CQA Consultant, who will also log the date, hour, ambient temperature, number of seaming unit, name of seamer, and pass or fail description. The remainder of the sample will be cut into three pieces, one to be retained in the Owner's archives (if required), one to be tested by the CQA Laboratory, and one to be tested on-site.

After completion of the above-described tests, the remaining portion of the trial seam sample can be discarded. Alternatively, if agreed upon between the parties involved and documented by the Geosynthetics CQA Consultant in his daily report, the geosynthetics CQA laboratory portion of the trial seam sample may be subjected to destructive testing as indicated in Section 4.5.6. If a trial seam sample fails a test conducted by the CQA Laboratory, then a destructive test seam sample will be taken from each of the seams completed by the seamer during the shift related to the considered trial seam. These samples will be forwarded to the CQA Laboratory and, if they do not meet the criteria outlined in Section 4.5.8, the procedure indicated in Section 4.5.9 will apply. The conditions of this paragraph will be considered as met for a given seam if a destructive seam test sample has already been taken.

4.3.8 General Seaming Procedure

Unless otherwise specified, the general seaming procedure used by the Installer will be as follows:

- For fusion seaming, a movable protective layer of plastic may be required to be placed directly below each overlap of geomembrane that is to be seamed. This is to help prevent any moisture build-up between the sheets to be seamed.

- If required, a firm substrate will be provided by using a flat board, metal platen, or other similar hard surface placed directly under the seam overlap.

- Fishmouths or wrinkles at the seam overlaps will be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles will be seamed and any portion where the overlap is inadequate will then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 inches beyond the cut in all directions. If approved by the Construction Representative, fishmouths or wrinkles may be repaired in the field by the Installer.

- If seaming operations are carried out at night, adequate illumination will be provided.

- Seaming will extend to the outside edge of panels to be placed in the anchor trench.

The Geosynthetics CQA Consultant will verify that the above seaming procedures are followed, and will inform the Construction Representative if they are not.

4.4 Nondestructive Seam Continuity Testing

4.4.1 Concept

The Installer will nondestructively test all field seams over their full length using a vacuum test unit, air pressure test (for double fusion seams only), or other approved method. Vacuum testing and air pressure testing are described in Sections 4.4.3 and 4.4.4, respectively). The purpose of nondestructive tests is to check the continuity of seams. It does not provide any information on seam strength. Continuity testing will be carried out as the seaming work progresses, not at the completion of all field seaming. Nondestructive testing will not be permitted before sunrise or after sunset unless there is, in the opinion of the Geosynthetics CQA Consultant, adequate illumination.

The Geosynthetics CQA Consultant will:

- observe all continuity testing;

- record location, date, test unit number, name of tester, and outcome of all testing; and

- inform the Installer and Construction Representative of any required repairs.

The Installer will complete any required repairs in accordance with Section 4.6.

The Geosynthetics CQA Consultant will:

- observe the repair and re-testing of the repair;
- mark on the geomembrane that the repair has been made; and
- document the results.

The following procedures will apply to segments of seams that cannot be nondestructively tested:

- All such seam segments will be cap-stripped with the same geomembrane.
- If the seam is accessible to testing equipment prior to final installation, the seam will be nondestructively tested prior to final installation.
- The seaming and cap-stripping operations will be observed by the Geosynthetics CQA Consultant and Installer for uniformity and completeness.
- Alternatively, the Project Manager may direct the Geosynthetics CQA Consultant to arrange for a electrical leak survey of the final installation (e.g. sumps, etc.).

The seam number, date of observation, name of tester, and outcome of the test shall be recorded by the Geosynthetics CQA Consultant.

4.4.2 Submittals

Prior to any nondestructive testing, the Installer shall submit to the Owner and Geosynthetics CQA Consultant calibration certificates for all pressure gauges to be used during vacuum and air pressure testing.

4.4.3 Vacuum Testing

4.4.3.1 Trial Vacuum Test

Prior to vacuum testing each day, the technician who will be performing the vacuum testing shall conduct a trial vacuum test. The test shall be supervised by the Installer's Superintendent or his designated representative. The Geosynthetics CQA Consultant shall provide the extrusion seam sample to the Installer for vacuum testing. The seam sample shall be approximately 3 feet long by 1 foot wide (it is suggested that trial seam samples be used to conduct this test). If desired, the Geosynthetics CQA Consultant can make holes of various sizes in the sample next to the seam to simulate a hole which could potentially be found during actual vacuum testing. The technician shall perform the vacuum test procedure outlined in Section 4.4.3.2. If the vacuum testing equipment does not perform adequately, the equipment may not be used until it is repaired and passes a trial vacuum test. If the technician fails to locate a hole that has been placed in the seam sample by the Geosynthetics CQA Consultant, the technician shall not be allowed to perform vacuum testing.

4.4.3.2 Vacuum Testing Procedure

The equipment will be comprised of the following:

- a vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole, valve assembly, and a vacuum gauge;
- a vacuum tank and pump assembly equipped with a pressure controller and pipe connections;
- a pressure/vacuum hose with fittings and connections;
- an approved applicator; and
- a soapy solution that does not cause environmental stress cracking in the geomembrane.

The following procedure will be followed:

if vacuum testing a fusion seam, the flap must be cut off with an approved cutter prior to exposing the seam for testing;

- energize the vacuum pump and reduce the tank pressure to approximately 5 gauge;
- with a soapy solution, wet a strip of geomembrane which is 6 inches wider and longer than the vacuum box;
- place the box over the wetted area;
- close the bleed valve and open the vacuum valve;
- ensure that a leak-tight seal is created;
- examine the geomembrane seam through the viewing window for the presence of soap bubbles for a period of not less than 15 seconds;
- if no bubbles or foam appear after 15 seconds, close the vacuum valve and open the bleed valve. Before moving the box over the next adjoining area, place a mark (with an approved marker) on the geomembrane at the leading edge of the viewing window, then move the box over the next adjoining area so that the last mark on the geomembrane is at the rear of the viewing window, and repeat the process; and
- all areas where soap bubbles appear will be marked and repaired in accordance with Section 4.6.3.

4.4.4 Air Pressure Testing (For Double Fusion Seam Only)

The following procedures are applicable to those processes which produce a double seam with an central channel.

The equipment will be comprised of the following:

- an air pump equipped with a pressure gauge capable of generating and sustaining a pressure between 25 and 30 psi and mounted on a cushion to protect the geomembrane;

- a hose with fittings and connections; and
- a sharp hollow needle, or other approved pressure-feed device.

The following procedures will be followed:

- seal both ends of the seam to be tested;
- insert the needle or other approved pressure-feed device into the channel created by the fusion seam;
- insert a protective cushion between the air pump and the geomembrane;
- energize the air pump to a pressure between 25 and 30 psi and maintain the pressure for approximately 2 minutes to allow the temperature of the air in the channel to stabilize;
- close the valve and verify that the pressure is between 25 and 30 psi and observe the pressure for a minimum of 5 minutes;
- if loss of pressure exceeds 3 psi or if the pressure does not stabilize, locate the faulty area and repair it in accordance with Section 4.6.3.
- to verify that there is airflow through the entire channel, observe the air pressure gauge for a decrease in pressure when the installer's technician remove the seal at the end of the channel away from the air pump. If it is found that there is a blockage in the channel, the entire seam must be capped and nondestructively tested; and
- remove the needle or other approved pressure-feed device and seal the hole.

4.5 Destructive Testing

4.5.1 Concept

Destructive seam tests will be performed at selected locations. The purpose of these tests is to evaluate seam strength. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

4.52 Location and Frequency

The Geosynthetics CQA Consultant will select locations where seam samples will be cut out for laboratory testing. These locations will be established as follows:

- A minimum frequency of one test per seam (seams over 50 feet long) or one sample every 500 feet of seam, whichever provides the greater number of samples.
- A maximum frequency will be agreed upon by the Installer, Construction Representative, Project Manager, and Geosynthetics CQA Consultant at the Resolution and/or Pre-Construction meeting.
- Test locations will be determined during seaming at the Geosynthetics CQA Consultant's discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset seams, or any other potential cause of imperfect seaming.

The installer will not be informed in advance of the locations where the seam samples will be taken.

4.5.3 Sampling Procedure

Samples will be cut by the Installer as the seaming progresses in order to have laboratory test results before the geomembrane is covered by another material. The Geosynthetics CQA Consultant will:

- observe sample cutting;
- assign a number to each sample, and mark it accordingly;
- record the reason for taking the sample at this location (e.g., statistical routine, suspicious feature of the geomembrane).

All holes in the geomembrane resulting from destructive seam sampling will be immediately repaired in accordance with repair procedures described in Section 4.6.3. The continuity of the new seams in the repaired area will be testing according to Section 4.4.3.2.

4.5.4 Size of Samples

At a given sampling location, two types of samples will be taken by the Installer.

First, two specimens for field testing should be taken. Each of these specimens will be 1 inch wide by 8 inches long, with the seam centered across the width. The distance between these two specimens will be 48 inches. If both specimens pass the field test described in Section 4.5.5, a sample for laboratory testing will be taken.

The sample for laboratory testing will be located between the two specimens for field testing. The destructive sample will be 12 inches wide by 48 inches long with the seam centered lengthwise. The sample will be cut into three parts and distributed as follows:

- one portion, measuring 12 inches x 18 inches, to the Installer for laboratory testing;
- one portion, measuring 12 in. x 12 in., to the Owner for archive storage; and
- One portion, measuring 12 inches x 18 inches, for CQA Laboratory testing.

Final determination of the sample sizes will be made at the Pre-Construction Meeting.

4.5.5 Field Testing

The two 1 inch wide specimens mentioned in Section 4.5.4 will be tested in the field, by calibrated gauged tensiometer, one in peel for adhesion and one in shear for shear strength. If any field test sample fails to pass the criteria of Section 4.5.8 and the specifications, then the procedures outlined in Section 4.5.9 will be followed.

The Geosynthetics CQA Consultant will witness all field tests and mark all samples and portions with their number. The Geosynthetics CQA Consultant will also log the date and time, geomembrane temperature, number of seaming unit, name of technician, seaming apparatus temperatures and speeds, pass or fail description, and attach a copy to each sample portion.

4.5.6 Construction Quality Assurance Laboratory Testing

Destructive test samples will be packaged and shipped, if necessary, by the Geosynthetics CQA Consultant in a manner which will not damage the test sample. The Construction Representative will verify that packaging and shipping conditions are acceptable. The Construction

Representative will be responsible for storing the archive samples. This procedure will be fully outlined at the Resolution Meeting. Test samples will be tested by CQA Laboratory.

Testing will follow ASTM D4437 as modified in NSF 54 Appendix A and with no requirements for sample conditioning time. The minimum acceptable values to be obtained in these tests are those indicated in the specifications. At least five specimens will be tested from the samples (e.g., peel, shear, peel, shear, etc.).

The CQA Laboratory will provide test results no more than 24 hours after they receive the samples. The Geosynthetics CQA Consultant will review laboratory test results as soon as they become available, and make appropriate recommendations to the Construction Representative.

If the two specimens meet the project specification, the sample qualifies for testing in the laboratory; if it fails, the seam shall be repaired in accordance with 4.5.9.

4.5.7 Installer's Laboratory Testing

The Installer's laboratory test results will be presented to the Construction Representative and the Geosynthetics CQA Consultant for comments.

4.5.8. Destructive Sample Pass/Fail Criteria

The peel criteria apply to both tracks of double track seams. Four out of five specimens from a destructive seam sample must meet the peel requirements and five out of five specimens must meet the shear requirements to be acceptable.

The following Pass/Fail criteria govern the acceptance of individual specimens from a seam sample.

Peel Test	Fusion Welding	Extrusion Welding
Strength	70 percent of the specified material yield strength	60 percent of the specified material yield strength
% Separation	10 percent or less	10 percent or less

Shear Test	Criteria
Strength	90 percent of the specified material yield strength
Percent Elongation	100 percent or greater
Location of Failure	Outside the weld area

Shear elongation is based on a 1 inch gauge length between each edge of the seam and the nearer grip, i.e., the grip separation is 2 inches plus the width of the seam. Therefore, 100 percent shear elongation is a crosshead displacement of 1 inch

4.5.9 Procedures for Destructive Test Failure

The following procedures will apply whenever a sample fails a destructive test, whether that test is conducted by the CQA Laboratory, the Installer's laboratory, or by tensiometer. The Installer has two options:

- Reconstruct the seam between any two passed destructive seam test locations.

- Trace the seaming path to an intermediate location (at 10 feet - minimum from the point of the failed test in each direction) and take a small sample for an additional field test at each location. If these additional samples pass tensiometer testing, then full destructive laboratory samples should be taken. If these destructive laboratory samples pass the tests, then the seam should be reconstructed between these locations by capping. If either sample fails, then the process is repeated to establish the zone in which the seam should be reconstructed.

  If a fusion-type seam fails destructive testing and the Installer chooses to cap the seam, the only acceptable capping method is as described in Section 4.6.3. Applying topping (bead of extrudate) is not an approved method of capping seams.

  All acceptable seams must be bounded by two locations from which destructive samples passing laboratory tests have been taken. In cases exceeding 150 feet of

reconstructed seam, a sample will be taken from the zone in which the seam has been reconstructed. This sample must pass destructive testing or the procedure outlined in this section must be repeated.

The Geosynthetics CQA Consultant will document all actions taken in conjunction with destructive test failures.

4.6 Defects and Repairs

4.6.1 Identification

All seams and non-seam areas of the geomembrane will be examined by the Installer and the Geosynthetics CQA Consultant for identification of defects, penetrating stones, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane will be clean at the time of examination. The geomembrane surface will be swept or washed by the Installer if the amount of dust or mud inhibits examination.

4.6.2 Evaluation

Each suspect location, both in seam and non-seam areas, will be nondestructively tested using the methods described in Section 4.4.3. Each location which fails the nondestructive testing will be marked by the

Geosynthetics CQA Consultant and repaired by the Installer. Work will not proceed with any materials which will cover locations which have been repaired until laboratory results with passing values are available.

4.6.3 Repair Procedures

Any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, will be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure will be agreed upon between the Project Manager, Construction Representative, Installer, and Geosynthetics CQA Consultant. The procedures available include:

- patching, used to repair all penetrating holes, tears, undispersed raw materials, and contamination by foreign matter;

- spot seaming, used to repair small scratches, or other minor, localized flaws; and

- capping, used to repair large lengths of failed seams.

In addition, the following provisions will be satisfied:

- surfaces of the geomembrane which are to be repaired will be abraded no more than one hour prior to the repair;

- all surfaces must be clean and dry at the time of the repair;

- all seaming equipment used in repairing procedures must be approved;

- the repair procedures, materials, and techniques will be approved in advance of the specific repair by the Construction Representative, Geosynthetics CQA Consultant, and Installer;

- patches or caps will extend at least 6 in. beyond the edge of the defect, and all corners of patches will be rounded with a radius of at least 3 inches; and

- the geomembrane below large caps should be appropriately cut to avoid water or gas collection between the two sheets.

4.6.4 Verification of Repairs

Each repair will be logged. Each repair will be nondestructively tested using the methods described in Section 4.4.3. Repairs which pass the nondestructive test will be considered acceptable. Large caps may be of sufficient extent to require destructive testing, at the discretion of the Geosynthetics CQA Consultant. Failed tests will require the repair to be redone and retested until a passing test results. The Geosynthetics CQA Consultant should observe all nondestructive testing of repairs and will record the date of the repair and test outcome.

4.6.5 Large Wrinkles

When seaming of the geomembrane is completed (or when seaming of a large area of the geomembrane is completed) and prior to placing overlying materials, the Geosynthetics CQA Consultant will observe the geomembrane wrinkles. The Geosynthetics CQA Consultant will indicate to the Construction Representative which wrinkles should be cut and reseamed by the Installer. The seam thus produced will be tested like any other seam.

4.6.6 Bridging of Geomembrane

Bridging of the geomembrane shall be considered unacceptable. Compensating material will be installed at these locations.

4.7 Backfilling of Anchor Trench

Anchor trenches will be adequately drained to prevent ponding or softening of the adjacent soils while the trench is open. Anchor trenches will be backfilled and compacted by the Earthwork Contractor or the Installer, as outlined in the specifications or bid documents. Care will be taken when backfilling the trenches to prevent any damage to the geosynthetics. The Geosynthetics CQA Consultant will observe the backfilling operation and advise the Construction Representative of any problems.

4.8 Lining System Acceptance

The Installer will retain all responsibility for the geosynthetics in the landfill cell until acceptance by the Owner.

The geosynthetics will be accepted by the Owner when:

- the installation is finished;
- verification of the adequacy of all seams and repairs, including associated testing, is complete;
- Installer's representative furnishes the Project Manager with certification that the HDPE geomembrane was installed in accordance with the Manufacturer's recommendations as well as the plans and specifications;
- all documentation of installation is completed, including the Geosynthetics CQA Consultant's final report;

- certification, including record drawing(s), are prepared by a Professional Engineer and have been received by the Project Manager; and

- the post-construction resolution meeting has been held and all follow-up required by the Owner is complete.

The Geosynthetics CQA Consultant will verify that installation has proceeded in accordance with the CQA Plan for the project, except as noted to the Project Manager.

4.9 Materials in Contact with the HDPE Geomembrane

The CQA procedures indicated in this section are only intended to ensure that the installation of these materials does not damage the geomembrane. Additional CQA procedures may be necessary to ensure that systems built with these materials will be constructed in such a way as to enable proper performance.

4.9.1 Soils

The Geosynthetics CQA Consultant shall verify that the specifications are consistent with the state of the art such as:

- Placement of soils on the geomembrane shall not proceed at an ambient temperature below 40°F nor above 104°F unless otherwise specified;

- A geotextile or other cushion approved by the designer may be installed between angular aggregate and the geomembrane;

- Equipment used for placing soil shall not be driven directly on the geomembrane;

- A minimum thickness of 1 foot of soil is specified between a light dozer (such as a wide pad caterpillar D-3 or lighter) and the geomembrane;

- A minimum thickness of 3 feet of soil is specified between ribber-tired vehicles and the geomembrane;

- In heavily trafficked areas such as access ramps, soil thickness should be at least 3 ft.;

The Geosynthetics CQA Consultant shall:

- Measure soil thickness and verify that the required thicknesses are present (or, if applicable, verify that required measurements have been completed by the Soils CQA Consultant, if any); and

- Verify that placement of soil is done in such a manner that geomembrane damage is unlikely.

The Geosynthetics CQA Consultant shall inform the Construction Representative if the above conditions are not fulfilled.

4.10 Sumps and Appurtenances

The Geosynthetics CQA Consultant shall review the specifications and verify the use of geosynthetic layers between structures and geomembranes.

The Geosynthetics CQA Consultant shall verify that:

- installation of the geomembrane in sump and appurtenance areas, and connection of geomembrane to sumps and appurtenances have been made according to specifications;

- Extreme care is taken while welding around appurtenances since neither non-destructive nor destructive testing may be feasible in these areas; and

- The geomembrane has not been visibly damaged while making connections to sumps and appurtenances.

The Geosynthetics CQA Consultant shall inform the Construction Representative if the above conditions are not fulfilled.

5.0 GEOTEXTILES AND GEOGRIDS

5.1 Design

A copy of the geotextile and geogrid drawings and specifications prepared by the Designer shall be given to the Geosynthetic CQA Consultant. The Geosynthetics CQA Consultant shall review these and verify that they are conceptually consistent with the state of practice, and are clear and complete.

5.2 Manufacturing

The geotextile manufacturer and the geogrid manufacturer will provide the Project Manager with a list of guaranteed "minimum average roll value" properties (as defined by the ASTM), for the type of geotextile or geogrid to be delivered. The geotextile manufacturer and the geogrid manufacturer shall also provide the Project Manager and the Designer with a written certification signed by an officer or Quality Control Manager that the materials delivered have "minimum average roll values" which meet or exceed all property values guaranteed for that type of geotextile or geogrid.

The Geosynthetics CQA Consultant shall examine all manufacturer certifications to ensure that the property values listed on the certifications meet or exceed those specified for the particular type of geotextile or geogrid. Any deviations shall be reported to the Construction Representative.

The geogrids must be installed in a single piece in the downslope direction. The geogrids must, therefore, be manufactured in a single piece, at least as long as the slope (plus 7 feet for sampling).

5.3 Labelling

The geotextile manufacturer and the geogrid manufacturer shall identify all rolls of geotextile and geogrid with the following:

- Manufacturer's name;
- Product identification;
- Lot number;
- Roll number;
- Roll weight; and
- Roll dimensions.

Additionally, if any special handling of the geotextile is required, it shall be so marked on the top surface of the geotextile, e.g., "This Side Up" or "This Side Against Geonet".

The Geosynthetics CQA Consultant shall examine rolls upon delivery and any deviation from the above requirements shall be reported to the Construction Representative.

5.4 Shipment and Storage

5.4.1 Geotextile

During shipment and storage, the geotextile shall be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions. To that effect, geotextile rolls shall be shipped and stored in relatively opaque and watertight wrappings.

Geotextiles shall not be exposed to precipitation prior to being installed. Wrappings protecting geotextile rolls shall be removed less than one hour prior to unrolling the geotextile. After the wrapping has been removed, a geotextile shall not be exposed to sunlight for more than 15 days, unless otherwise specified and guaranteed by the geotextile manufacturer.

The Geosynthetics CQA Consultant shall observe rolls upon delivery at the site and any deviation from the above requirements shall be reported to the Construction Representative. Any damaged rolls shall be rejected and replaced at no cost to the Owner.

5.4.2 Geogrid

During shipment and storage, the geogrid shall be protected from mud, dirt, cutting or any other damaging or deleterious conditions.

The Geosynthetics CQA Consultant shall observe rolls upon delivery at the site and any deviation from the above requirements shall be reported to the Construction Representative.

5.5 Conformance Testing

5.5.1 Tests

Upon delivery of the rolls of geotextiles and geogrids, the Geosynthetics CQA Consultant shall ensure that samples are removed and forwarded to the CQA Laboratory for testing to ensure conformance to both the design specifications and the list of guaranteed properties.

NOTE: All geotextiles used for this project shall be from the same lot unless otherwise approved by the project manager and the manufacturer or supplier agrees to pay for any additional conformance testing required.

As a minimum, the following tests shall be performed on geotextiles:

- Mass per unit area;
- Grab strength;
- Tear strength;
- Burst strength;
- Puncture strength;
- Thickness;
- Wide strip tensile test if the geotextile is expected to undergo significant tensile loadings; and
- Permittivity and apparent opening size (only if the geotextile is to be used as a filter).

As a minimum, the following tests shall be performed on geogrids:

- Mass per unit area;
- Measurement of spacing between strands;
- Wide strip tensile strength; and
- Node strength.

5.5.2 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first outer wrap. Unless otherwise specified, samples shall be 3 feet long by the roll width. The Geosynthetics CQA Consultant shall mark the machine direction on the samples with an arrow.

Unless otherwise specified, samples shall be taken at a rate of one per lot or one per 100,000 ft^2, whichever is the greater frequency.

5.5.3 Test Results

The Geosynthetics CQA Consultant shall examine all results from laboratory conformance testing and shall report any nonconformance to the Construction Representative.

5.5.4 Conformance Test Failure

The following procedure will apply whenever a sample fails a conformance test that is conducted by the CQA Laboratory:

- The Manufacturer will replace the roll of geotextile or geogrid that is in nonconformance with the specifications of a roll that meets specifications.

- The Installer will remove conformance samples for testing by the CQA Laboratory from the closest numerical roll on both sides of the failed roll. These two samples must conform to the specifications. If either of these samples fail, the 2 numerically closest untested rolls on both sides of the failed sample will be tested by the CQA Laboratory. These four samples must conform to the specifications. If any of these samples fail, every roll of geotextile or geogrid on site and every subsequently-delivered roll that is from the same supplier must be tested by the CQA Laboratory for conformance to the specifications. This additional conformance testing will be at the expense of the Manufacturer.

The Geosynthetics CQA Consultant will document actions taken in conjunction with conformance test failures.

5.6 Handling and Placement

The Installer shall handle all geotextiles and geogrids in such a manner as to ensure they are not damaged in any way, and the following shall be complied with:

- On slopes, the geotextiles and the geogrids shall be securely anchored in the anchor trench and rolled down the slope in such a manner as to continually keep the geotextile or the geogrid sheet in tension.

- In the presence of wind, all geotextiles and geogrids shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with earth cover material.

- Geotextiles shall be cut using an approved geotextile cutter only. Geogrids shall be cut using scissors only. If in place, special care must be taken to protect other materials from damage which could be caused by the cutting of the geotextiles or the geogrids.

- The Installer shall take any necessary precautions to prevent damage to underlying layers during placement of the geotextile or the geogrid.

In addition, the following applies to geotextiles only:

- During placement of geotextiles, care shall be taken not to entrap in the geotextile stones, excessive dust, or moisture that could damage the geomembrane, generate clogging of drains or filters, or hamper subsequent seaming.

- A visual examination of the geotextile shall be carried out over the entire surface, after installation, to ensure that no potentially harmful foreign objects, such as needles, are present. In addition, the Geosynthetic CQA Consultant may undertake a sweep of the entire geotextile surface using a metal detector, to note the presence of any such items, for their removal.

- If white colored geotextile is used, precautions shall be taken against sunburn and "snowblindness" of personnel and against UV degradation.

The Geosynthetic CQA Consultant shall note any noncompliance and report it to the Construction Representative.

5.7 Seams and Overlaps

5.7.1 Geotextiles

On slopes steeper than 10(H) to 1(V), all geotextiles shall be continuously sewn (i.e., spot sewing is not allowed) unless it can be demonstrated to the Designer and the Project Manager that over lapping alone or other means of joining sheets is equivalent in performance. Geotextiles shall be overlapped 6 inches prior to seaming. No horizontal seams shall be allowed on side slopes (i.e., seams shall be along, not across, the slope), except as part of a patch. On bottoms and slopes shallower than 10(H) to 1(V), geotextiles can be either seamed as indicated above, or overlapped (overlapping requires an increase in the overlap to 12 inches). Thermal bonding will not be permitted. The Installer shall pay particular attention at seams to ensure that no earth cover material could be inadvertently inserted beneath the geotextile. Any sewing shall be done using polymeric thread with chemical resistance properties equal to or exceeding those of the geotextile.

5.7.2 Geogrids

The geogrids, where used, shall be placed in continuous pieces downslope. No lateral joining is required. Edge to edge placement will be sufficient.

5.8 Repair

5.8.1 Geotextiles

Any holes or tears in the geotextile shall be repaired as follows:

- On Slopes: A patch made from the same geotextile shall be double seamed into place (with each seam 1/4 in. to 3/4 in. apart and no closer than 1 in. from any edge). Should any tear exceed 10 percent of the width of the roll, that roll shall be removed from the slope and replaced.

- Non-slopes: A patch made from the same geotextile shall be spot-seamed in place with a minimum of 24 in. overlap in all directions.

Care shall be taken to remove any soil or other material which may have penetrated the torn geotextile. The Geosynthetic CQA Consultant shall observe any repair, note any noncompliance with the above requirements and report them to the Construction Representative.

5.8.2 Geogrid

Any damaged roll of geogrid shall be discarded. No repairs will be allowed.

5.9 Placement of Soil Materials

The Installer shall place all soil materials located on top of a geotextile or a geogrid in such a manner as to ensure:

- No damage to the geotextile or geogrid;

- Minimal slippage of the geotextile or geogrid on underlying layers; and

- No excess tensile stresses in the geotextile.

Unless otherwise specified by the Designer, all lifts of soil material shall be in conformance with the guidelines given in Paragraph 4.9.1. Any noncompliance shall be noted by the Geosynthetics CQA Consultant and reported to the Construction Representative.

If portions of the geotextile or the geogrid are exposed, the Geosynthetics CQA Consultant shall periodically place two (or more, at his discretion) marks on the geotextile or the geogrid 10 feet apart along the slope and measure the elongation of the geotextile or the geogrid during the placement of soil. This elongation shall be related by the Geosynthetics CQA Consultant to the tensile stress in the geotextile or the geogrid.

6.0 GEONETS

6.1 Design

A copy of the geonet drawings and specifications prepared by the Designer shall be given to the Geosynthetics CQA Consultant. The Geosynthetics CQA Consultant shall review these and verify that they are conceptually consistent with the state of practice.

6.2 Manufacturing

The geonet manufacturer shall provide the Project Manager, the Designer, the Construction Representative, and the Geosynthetics CQA Consultant with a list of guaranteed properties for the type of geonet to be supplied. The geonet manufacturer shall provide the Project Manager and the Geosynthetics CQA Consultant with a written certification signed by an officer or the Quality Control Manager that the geonets actually delivered have properties which meet or exceed the guaranteed properties.

The Geosynthetics CQA Consultant shall examine all manufacturer's certifications to ensure that the property values listed on the certifications meet or exceed those specified. Any deviations shall be reported to the Construction Representative.

6.3 Labelling

The geonet manufacturer shall identify all rolls of geonets with the following:

- Manufacturer's name;
- Product identification;
- Lot number;
- Roll number; and
- Roll dimensions.

The Geosynthetics CQA Consultant shall examine rolls upon delivery and any deviation from the above requirements shall be reported to the Construction Representative.

6.4 Shipment and Storage

Geonet cleanliness is essential to their performance and geonet rolls should be wrapped in polyethylene sheets or otherwise protected against dust and dirt during shipping and storage. The wrapping should be removed less than one hour before placement. The Geosynthetics CQA Consultant shall verify that geonets are free of dirt and dust just before installation. The Geosynthetics CQA Consultant shall report the outcome of this verification to the Construction Representative; and if the geonets are judged dirty or dusty, they shall be washed by the Installer prior to installation. Washing operations shall be observed by the Geosynthetics CQA Consultant and improper washing operations shall be reported to the Construction Representative.

6.5 Conformance Testing

6.5.1 Tests

Upon delivery of the rolls of geonets, the Geosynthetics CQA Consultant shall ensure that samples are removed and forwarded to the CQA Laboratory for testing, at the frequency indicated in Paragraph 6.5.2, to ensure conformance to both the design specifications and the list of guaranteed properties.

As a minimum, the following tests shall be performed:

- Polymer specific gravity;
- Mass per unit area; and
- Thickness.

6.5.2 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first outer warp. Unless otherwise specified, samples shall be 3 feet long by the roll width. The Geosynthetics CQA Consultant shall mark the machine direction on the samples with an arrow.Unless otherwise specified, samples shall be taken at a rate of one per lot or one per 100,000 ft^2, whichever is the greater frequency.

6.5.3 Test Results

The Geosynthetics CQA Consultant shall examine all results from laboratory conformance testing and shall report any nonconformance to the Construction Representative.

6.5.4 Conformance Test Failure

The following procedure will apply whenever a sample fails a conformance test that is conducted by the CQA Laboratory:

- The Manufacturer will replace the roll of geonet that is in nonconformance with the specifications of a roll that meets specifications.

- The Installer will remove conformance samples for testing by the CQA Laboratory from the closest numerical roll on both sides of the failed roll. These two samples must conform to the specifications. If either of these samples fail, the 2 numerically closest untested rolls on both sides of the failed sample will be tested by the CQA Laboratory. These four samples must conform to the specifications. If any of these samples fail, every roll of geotextile on site and every subsequently-delivered roll that is from the same supplier must be tested by the CQA Laboratory for conformance to the specifications. This additional conformance testing will be at the expense of the Manufacturer. The Geosynthetics CQA Consultant will document actions taken in conjunction with conformance test failures.

6.6 Handling and Placement

The Installer shall handle all geonets in such a manner as to ensure the geonets are not damaged in any way, and the following shall be complied with:

- On slopes, the geonets shall be secured in the anchor trench and then rolled down the slope in such a manner as to continually keep the geonet sheet in tension. If necessary, the geonet shall be positioned by hand after being unrolled to minimize wrinkles. Geonets can be placed in the horizontal direction (i.e., across the slope) in some special locations (e.g., at the toe of a slope, if an extra layer of geonet is required, this extra layer of geonet can be placed in the horizontal direction). Such locations shall be identified by the Designer in the design drawings.

- In the presence of wind, all geonets shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with cover material.

- Unless otherwise specified, geonets shall not be welded to geomembranes.

- Geonets shall only be cut using scissors.

- The Installer shall take any necessary precautions to prevent damage to underlying layers during placement of the geonet.

- During placement of geonets, care shall be taken not to entrap in the geonet dirt or excessive dust that could cause clogging of the drainage system, and/or stones that could damage the adjacent geomembrane. If dirt or excessive dust is entrapped in the geonet, it should be hosed clean prior to placement of the next material on top of it. In this regard, care should be taken with the handling of sandbags, to prevent rupture or damage of the sandbag.

- Care should be taken not to leave tools in the geonet.

The Geosynthetics CQA Consultant shall note any noncompliance and report it to the Construction Representative.

6.7 Stacking and Joining

When several layers of geonets are stacked, care should be taken to prevent strands from one layer from penetrating the channels of the next layer, thereby significantly reducing the transmissivity. This cannot happen if stacked geonets are placed in the same direction. A stacked geonet shall never be laid in perpendicular directions to the underlying geonet (unless otherwise specified by the Designer).

Adjacent geonets shall be joined according to construction drawings and specifications. As a minimum, the following requirements shall be met:

- Adjacent rolls shall be overlapped by at least 4 innhes;

- These overlaps shall be secured by spot welding or tying;

- Tying can be achieved by strings, plastic fasteners, or polymer braid. Tying devices shall be white or yellow for easy inspection. Metallic devises are not allowed;

- Spot welding or tying shall be every 5 feet along the slope, every 2 feet across the slope, and every 6 inches in the anchor trench; and

- When more than one layer of geonet is installed, joints shall be staggered.

The Geosynthetics CQA Consultant shall note any non-compliance and report it to the Construction Representative.

6.8 Repair

Any holes or tears in the geonet shall be repaired by placing a patch extending 2 feet beyond the edges of the hole or tear. The patch shall be secured to the original geonet by spot welding or tying every 6 inches Tying devices shall be as indicated in Paragraph 6.7. If the hole or tear width across the roll is more than 50 percent the width of the roll, the damaged area shall be cut out and the two portions of the geonet shall be joined as indicated in Paragraph 6.7.

The Geosynthetics CQA Consultant shall observe any repair, note any noncompliance with the above requirements and report them to the Construction Representative.

6.9 Placement of Soil Materials

Although soil should never be placed in contact with geonets, the Installer shall ensure that all soil materials such as primary clay liner and earth cover, are placed in such a manner as to ensure:

- The geonet and underlying lining materials are not damaged;
- Minimal slippage of the geonet on underlying layers occurs; and
- No excess tensile stresses occur in the geonet.

Unless otherwise specified by the Designer, all lifts of soil material shall be in conformance with the guidelines given in Paragraph 4.9.1. Any noncompliance shall be noted by the Geosynthetics CQA Consultant and reported to the Construction Representative.

If portions of the geonet are exposed, the Geosynthetics CQA Consultant shall periodically place marks on the geonet and the underlying geomembrane and measure the elongation of the geonet during the placement of soil.

7.0 Documentation

7.1 Daily Reports

Each of the Geosynthetics CQA Monitors shall compete a daily report and/or logs on prescribed forms, outlining all of his monitoring activities

for that day. The precise areas, panel numbers, seams completed and approved, and measures taken to protect unfinished areas overnight should be identified. Failed seams or other panel areas requiring remedial action must be identified with regard to nature of action, required repair, and precise location. Repairs completed must also be identified. Any problems or concerns with regard to operations on site should also be noted. This report must be completed at the end of each monitor's shift, prior to leaving the site, and submitted to the Construction Representative.

The Geosynthetics CQA Consultant shall review the daily reports submitted by the Geosynthetics CQA Monitors, and incorporate a summary of their reports into his own daily report. Any matters requiring action by the Project Manager should be highlighted. This report must be completed daily, summarizing the previous day's activities, and a copy submitted to the Construction Representative, Project Manager, and Designer at the beginning of the day following the report date.

7.2 Destructive Test Reports

The destructive test reports from all sources should be collated by the Geosynthetics CQA Consultant. This includes field tests, Installer's laboratory tests, and CQA Laboratory tests. A summary list of test results should be prepared by the Geosynthetics CQA Consultant on an ongoing basis, and submitted with the periodic progress reports.

7.3 Progress Reports

Progress Reports shall be prepared by the Geosynthetics CQA Consultant and submitted to the Construction Representative and Project Manager. This report should include: an overview of progress to date; an outline of any changes made to the plans, drawings, or specifications; any problems or deficiencies in operations at the site, and an outline of any action taken to remedy the situation(s); a summary of weather conditions; and a brief description of activities anticipated for the next reporting period. All Destructive Test Reports for the period should be appended to each Progress Report.

7.4 As-Built Drawing

An As-Built drawing should be prepared by the Geosynthetics CQA Consultant. The As-Built drawing should include the following information for geomembranes:

- Dimensions of all geomembrane field panels;

- Location, as close as possible, of each panel relative to the surveyors plan (furnished by the owner);

- Identification of all seams and panels with appropriate numbers or "identification codes";

- Location of all patches and repairs; and

- Location of all destructive test samples.

The As-Built drawing shall address each layer of geomembrane; and if necessary, another drawing shall identify problems or unusual conditions of the geotextile or geonet layers. In addition, applicable cross-sections shall show layouts of geonets, geotextiles or geogrids which are unusual or differ from the design drawings.

7.5 Final Certification Report

A Final Certification Report shall be prepared by the Geosynthetics CQA Consultant and submitted upon completion of the work. This report shall include all reports prepared by the Geosynthetic CQA Consultant personnel, summarize the activities of the project, and document all aspects of the quality assurance program performed. The Final Certification Report shall include as a minimum the following information:

- Personnel involved with the project;

- Scope of work;

- Outline of project;

- Quality assurance methods;

- Test results (destructive and non-destructive, including laboratory tests);

- Certification sealed and signed by a registered professional engineer; and

- "As-built" drawing, sealed and signed by a registered professional engineer.

D. PIPING

1.0 Introduction

This section of the plan addresses the quality assurance of the installation of all pipes and manholes used on the project including leachate collection pipes, leachate transmission pipes, and corrugated metal pipes.

2.0 Scope

The work addressed under this section shall facilitate proper construction of all piping installed in or outside the disposal cells on the project. All work shall be constructed to the liners, grades, and dimensions indicated on the project plans, in accordance with the project specifications, or as required by the Owner or his representative. Inspectors shall issue a written daily report of activities. These reports shall include, as a minimum, observations and test results as well as problems encountered and solutions achieved. Construction reports summarizing significant events, as well as addressing all problems encountered and their solutions, shall be issued weekly to the owner's Project Manger and to the Designer. The format of these reports hall be established at the pre-construction meeting.

3.0 Manufacturing and Delivery of Materials

3.1 Pipe, Fittings, and Manholes

It is a requirement of the contract that prior to delivery of materials, the contractor shall submit detailed or shop drawings and manufacturer's specifications of all materials to be furnished for the project. These drawings and specifications shall be reviewed by the Designer to determine if the materials meet the requirements of the contract specifications.

The submittals will be either approved or rejected. Rejection will require a resubmission of the information.

3.2 Delivery

Upon delivery, the Engineer shall inspect all pipes, fittings, and other appurtenances for conformity with the specifications and proper storage. The Engineer may prescribe corrective repairs or may reject the material as deemed necessary.

joint drippings, extrusions, or from foreign matter of any kind, each section of line between manholes, or for longer distances if allowed before backfilling, shall be maintained completely full of water for a period of not less than 30 minutes to allow for absorption of water by the sewer. By use of pre-installed riser sections of pipes at manholes if necessary, or by plumbers plugs and riser, a column of water shall then be maintained at least four feet above the uppermost top section of pipe under test for lines with grades of one percent or less and to one inch above the crown of the upper end of the pipe, for grade between one to five percent, and as the Designers direct, for greater grades. In case the water table in the trench at the time of the test is above the highest invert of the sewer section under test, the column of water above specified shall be accordingly increased.

4.1.3.3 Air Test

Air test shall be performed on all leachate transmission lines with slope greater than five percent as shown below.

Make air test when pipe is clean. Plug line at each manhole with pneumatic balls. Introduce low pressure air into plugged line until internal air pressure reaches 4.0 psig greater than average back pressure of any groundwater pressure that may submerge the pipe. Allow at least two minutes for air temperature to stabilize before readings are taken and timing started.

Portion being tested shall pass if it does not lose air at a rate to cause pressure to drop from 3.6 to 3.0 psig (greater than average back pressure of any ground waste that may submerge the pipe) in less time than listed below:

Pipe Diameter In Inches	Minimum Allowable Minutes 3.6 - 3.0 psig Pressure
8 or less	4.0

In lieu of standard exfiltration test, Contractor may make air tests on lines.

4.0 Installation of Pipes and Manholes

4.1 Testing

Testing shall be done on sections of pipeline as determined adequate and ready for testing by the Engineer.

4.1.1 Examination of Materials

All pipes, fittings, manholes, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and the deficiency shall be corrected or the material shall be rejected and replaced as deemed necessary by the Engineer.

4.1.2 Alignment and Gradient

The alignment of the pipe shall be surveyed by an engineer or surveyor licensed.

Alignment and gradient of gravity leachate pipes flowing between manholes will also be checked by the Owner's inspector by sighting from one manhole to a strong light held at the next manhole. Should alignment vary horizontally more than 1/4 inch the diameter of the pipe or sags and high points be found in the slope, the contractor shall locate and correct the defective joints to the satisfaction of the engineer.

4.1.3 Leak Testing of Leachate Transmission Lines

4.1.3.1 Infiltration Test

Infiltration test shall be performed only when the line is sufficiently below the water table to provide a minimum of four feet of head above the top of the pipe at the highest elevation being tested. A weir shall be installed in the lower end of the section being tested and measurement of the depth of flow over the weir recorded at 15-minute intervals for one hour.

4.1.3.2 Exfiltration Test

Exfiltration test shall be performed after replacement of broken or cracked pipe, repair of defective joints and verification of the pipe installation for line and grade and after cleaning and conditioning the pipe free from deposits,

4.1.3.4 Infiltration - Exfiltration Test

Infiltration - exfiltration test shall be made by the contractor immediately upon completion of the first run of pipe between two manholes, under the direction of the Engineer. The remainder of the sewer installation may be tested as the work progresses or upon completion of the project at the option of the Contractor.

4.1.3.5 Leakage

Leakage shall not exceed 200 gallons per day per mile of pipe per inch of pipe diameter.

Acceptance of line shall not be made until test requirements have been met. Contractor shall locate and repair defects until leakage is within permitted allowance.

4.1.4 Corrugated Metal Pipes and Appurtenances

In addition to checking line and grade as described in Section 4.1.2, all corrugated metal pipes and appurtenances will be visually inspected by the Engineer for defects, damage, and tightness of joints before backfilling. All deficiencies will be corrected to the satisfaction of the Engineer.

4.1.5 Pipe Bedding and Backfill

The gradation and compaction of pipe bedding will be tested to verify compliance with contract specifications by the soils quality assurance consultant in accordance with the applicable parts of Section B, Earth Materials, of this plan.

Table I

Jeff Fantell

TABLE 1
TESTING FREQUENCY SUMMARY
EARTH MATERIALS CQA TESTING

JOYCE ENGINEERING, INC.

TEST	FREQUENCY		
	Preconstruction	Material Verification	Construction Quality
Paragraph 3.2			
3.2.1 Granular Materials (May substitute quarry certificate of compliance with Engineer's approval)			
ASTM C88-83 Sulfate Soundness	1 per source (as needed)		
ASTM C117-87 Percent Finer than No. 200 Sieve	1 per source	1/500 yd^3 placed/source (minimum 2 per layer)	
ASTM C131-89/C535-89 LA Abrasion	1 per source (as needed)		
ASTM C136-84A Sieve Analysis	1 per source	1/500 yd^3 placed/source (minimum 2 per layer)	
ASTM C142-78 Clay Lumps & Friable Particles	1 per source (as needed)		
ASTM D2216-80 Water Content	1 per source		
ASTM D3042-86 Insoluble Residue (Carbonate Agg.)	1 per source (as needed)		
3.2.2 Fine-Grained Soils			
ASTM D422-63 Particle-Size Analysis	1/5000 yd^3/soil type	As needed	
ASTM D698-78 Standard Proctor Compaction	1/5000 yd^3/soil type (2 of 3 tests may be one-point check tests)	1/2000 yd^3 placed (one-point check test)	
ASTM D854-83 Specific Gravity	1/5000 yd^3/soil type	As needed	
ASTM D1140-54 Percent Finer than No. 200 Sieve	"	1/2000 yd^3 placed	
ASTM D2216-80 Water Content	"	"	
ASTM D4318-84 Atterberg Limit	1/5000 yd^3/soil type	1/2000 yd^3 yd placed	

TABLE 1
TESTING FREQUENCY SUMMARY
EARTH MATERIALS CQA TESTING

JOYCE ENGINEERING, INC.

TEST	FREQUENCY		
	Preconstruction	Material Verification	Construction Quality
3.2.3 Hydraulic Conductivity			
a) Granular Materials			
ASTM D2434-68 Permeability (Constant Head)	3 per source		
b) Fine-Grained Soils			
ASTM D698-78/D1557-78 Moisture Density Relations	2 per approved source (1 Modified Proctor, 1 "Reduced Proctor")		
Permeability of Fine-grained Soils (Rigid Wall)	Minimum of 15 per approved source (Fewer tests may be acceptable during source screening with Engineer's approval)	As needed	As needed
Permeability of Fine-grained Soils (Flexible Wall)	May substitute for rigid wall tests	"	"
Field measurement of Hydraulic Conductivity using the Two-Stage Borehold Procedure	Mininum of 5 tests per test fill		
Paragraph 3.3			
ASTM D1556-82 Sand Cone Density Test			1 per 20 nuclear density tests (minimum 1 per day) or substitute for nuclear density tests
ASTM D2922-81 Nuclear Density Test			1/10000 ft^2/lift (minimum 3 per lift)
ASTM D3017-88 Water Content (Nuclear Method)			1/10000 ft^2/lift (minimum 3 per lift)

TABLE 1
TESTING FREQUENCY SUMMARY
EARTH MATERIALS CQA TESTING

JOYCE ENGINEERING, INC.

	FREQUENCY		
TEST	**Preconstruction**	**Material Verification**	**Construction Quality**
ASTM D4959-89 Water Content (Direct Heating Method)			1 per 20 nuclear moisture tests (minimum 1 per day) or substitute for nuclear moisture test
Visual Observations			Full time
Lift Bond and Clod Size	Full-time visual during test fill construction. Minimum of 4 test pits per test fill		Full time visual, test pits every 5000 ft^2/foot thickness
Elevation and Thickness Monitoring			100-foot grid or every 200 feet of linear construction

NOTE: Testing frequencies may be relaxed for non-critical earth material components at the discretion of the Engineer.

APPENDIX A

GEOMEMBRANE SPECIFICATIONS - 60 MIL MATERIAL

PROPERTY		TEST METHOD	CRITERIA
Specific Gravity		ASTM D1505	≥0.940
Melt Index		ASTM D1238 190/2.16	0.1 - 1.1 g/10 min.
Thickness	smooth material	ASTM D374C	mean ≥0.060 mil
	textured material	ASTM D1593 pointed probe	minimum 0.054 mil
Yield Strength	smooth material	ASTM D638 IV	126 ppi
	textured material		113 ppi
Yield Elongation		ASTM D638 IV	13 %
Break Strength	smooth material	ASTM D638 IV	240 ppi
	textured material		31 ppi
Break Elongation	smooth material	ASTM D638 IV	630 %
	textured material		90 %
Tear Resistance	smooth material	ASTM D1004C	45 lb
	textured material		40 lb
Carbon Black Content		ASTM D1603	2 - 3 %
Carbon Black Dispersion		ASTM D2663 b	A1,A2,B1

APPENDIX B

GEOMEMBRANE SEAM TEST ACCEPTANCE CRITERIA

PEEL TEST	FUSION WELDING	EXTRUSION WELDING
Strength	70% of the specified material yield strength	60% of the specified material yield strength
Separation	10% or less	10% or less

SHEAR TEST	CRITERIA
Strength	90% of the specified material yield strength
Elongation	100% or greater
Location of Failure	outside the weld area

Shear elongation is based on a 1 in. gauge length between each edge of the seam and the nearer grip, i.e. the grip separation is 2 in. plus the width of the seam. Therefore, 100% shear elongation is a crosshead displacement of 1 in.

PERMIT ATTACHMENT III-2

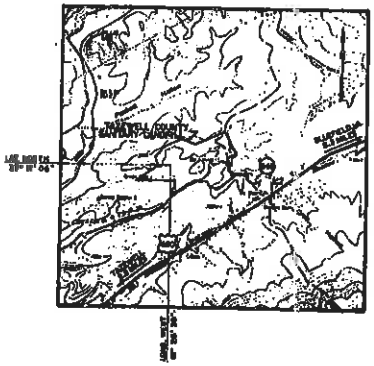
DESIGN DRAWINGS

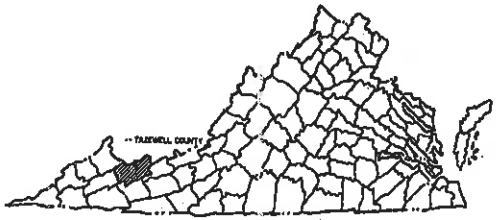
TAZEWELL COUNTY SANITARY LANDFILL

LIST OF DRAWINGS

Drawing No.	
1	EXISTING SITE CONDITIONS AND MASTER SITE PLAN
2	BEDROCK CONTOURS
3	BASE GRADING PLAN
4	ENGINEERING MODIFICATIONS PLAN
5	SYNTHETIC LINER LAYOUT
6	PHASE 1 ENGINEERING MODIFICATIONS PLAN
7	PHASE 2 ENGINEERING MODIFICATIONS PLAN
8	PHASE 3 ENGINEERING MODIFICATIONS PLAN
9	PHASE 4 ENGINEERING MODIFICATIONS PLAN
10	FINAL GRADING PLAN
11	CROSS SECTION LOCATIONS
12	CROSS SECTIONS
13	CROSS SECTIONS
14	BORROW/STOCKPILE MAP
15	SITE MONITORING PLAN
16	GAS MANAGEMENT PLAN
17	EROSION AND SEDIMENT CONTROL
18	LEACHATE COLLECTION SYSTEM
19	LEACHATE LINE PROFILES
20	LEACHATE LINE PROFILES
21	LEACHATE LINE PROFILES
22	LEACHATE LINE PROFILES
23	LEACHATE LINE PROFILES
24	LEACHATE LINE PROFILES
25	LEACHATE LINE PROFILES
26	LEACHATE TANK PLAN (RECORD DRAWING)
27	LEACHATE TANK PLAN AND PROFILE (RECORD DRAWING)
28	TANK CONSTRUCTION DETAILS (RECORD DRAWING)
29	DETAILS
30	DETAILS
31	DETAILS
32	DETAILS
33	LOCATIONS OF BORINGS AND SEISMIC LINES
34	SOIL BORING LOGS
35	SOIL BORING LOGS
36	SOIL BORING LOGS

TAZEWELL COUNTY
SANITARY LANDFILL





VIRGINIA

TAZEWELL COUNTY VIRGINIA
THE FUTURE IS BUILT UPON OUR HERITAGE
DECEMBER 20, 1799

LEGEND

PROPERTY LINE	
LIMITS OF LINER	
PROPOSED FILL AREA	
EXISTING FILL AREA	
BENCHMARKS	▲
WATERWAY	
STORMWATER CONVEYANCE	
LEACHATE LINE (NON-PERFORATED)	
LEACHATE LINE (PERFORATED)	
LEACHATE LINE (EXISTING)	
LEACHATE LINE CLEANOUT	
MANHOLE	
TEXTURED LINER	
DRAINAGE DIVIDE	
SILT FENCE	
RIPRAP	

DRAWING INDEX

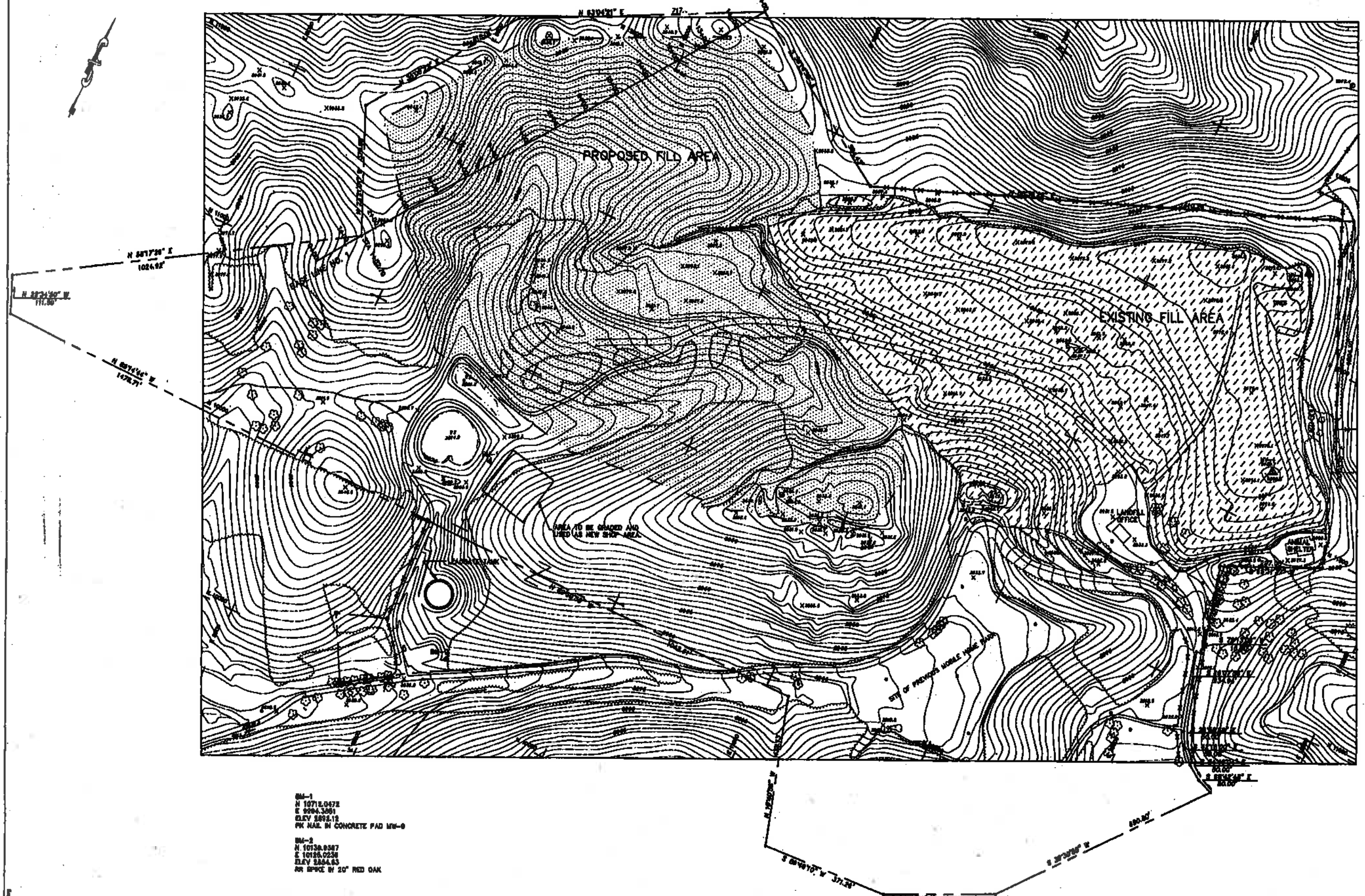
PREPARED FOR:

Tazewell County Board of Supervisors
Administration Building
315 School Street, Box 2
Tazewell, VA 24651-1398

PREPARED BY:

JOYCE

Princeton, WV



BM-1
N 10712.0472
E 9994.3951
ELEV 2692.12
PK NAIL IN CONCRETE PAD MW-9

BM-2
N 10130.9387
E 10126.0238
ELEV 2A54.63
RR SPIKE IN 20" RED OAK

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED
DRAWN
CHECKED
APPROVED
DATE

JOYCE

SCALE: 1" = 100'

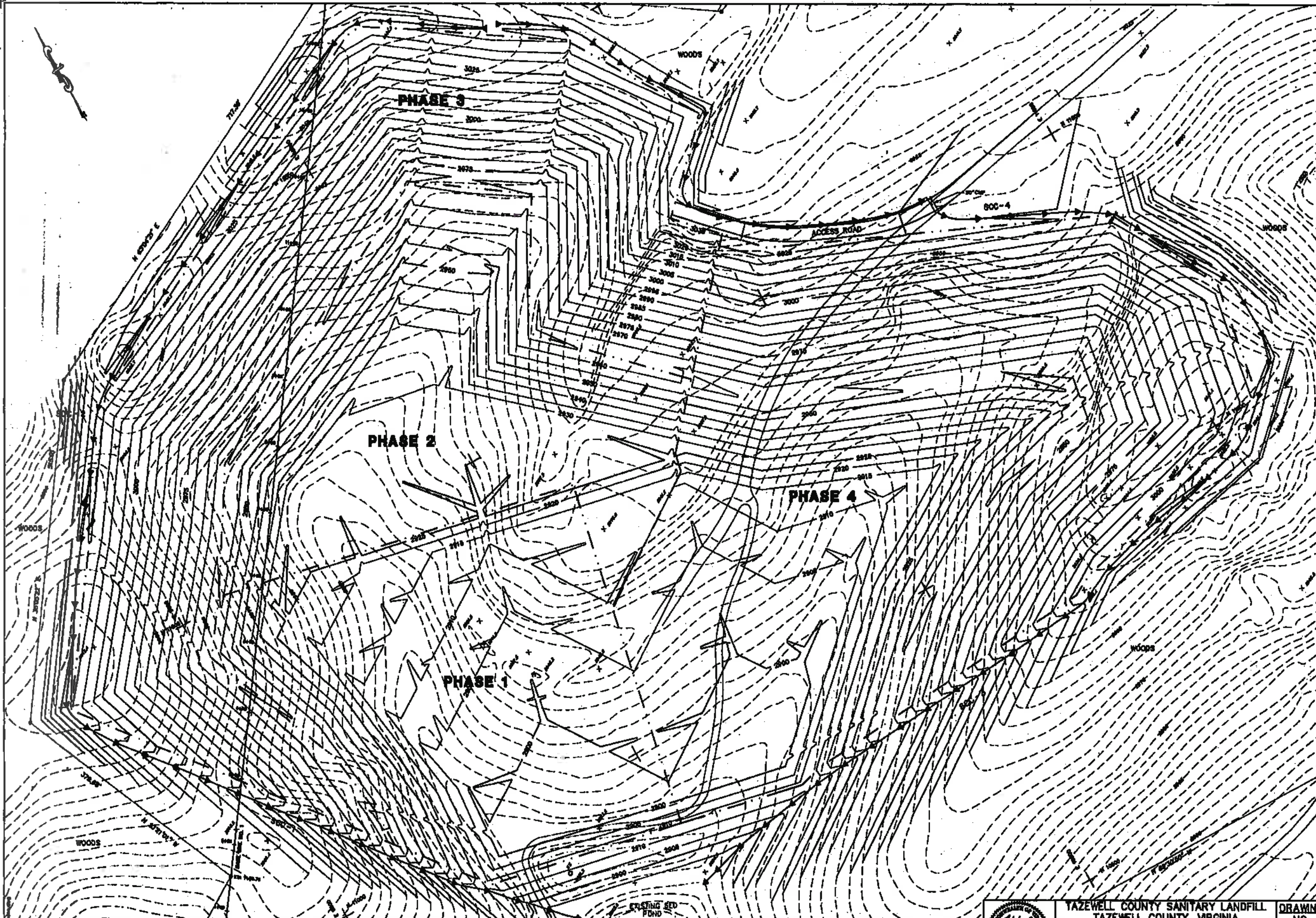
PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

EXISTING SITE CONDITIONS
AND MASTER SITE PLAN

DRAWING NO. 1

JOYCE	SCALE 1" = 100'	PROJECT NO. 189.06	TAZEWELL COUNTY SANITARY LANDFILL TAZEWELL COUNTY, VIRGINIA BEDROCK CONTOURS	DRAWING NO. 2



DESIGNED	
DRAWN	
CHECKED	
APPROVED	
DATE	11-3-93

JOYCE

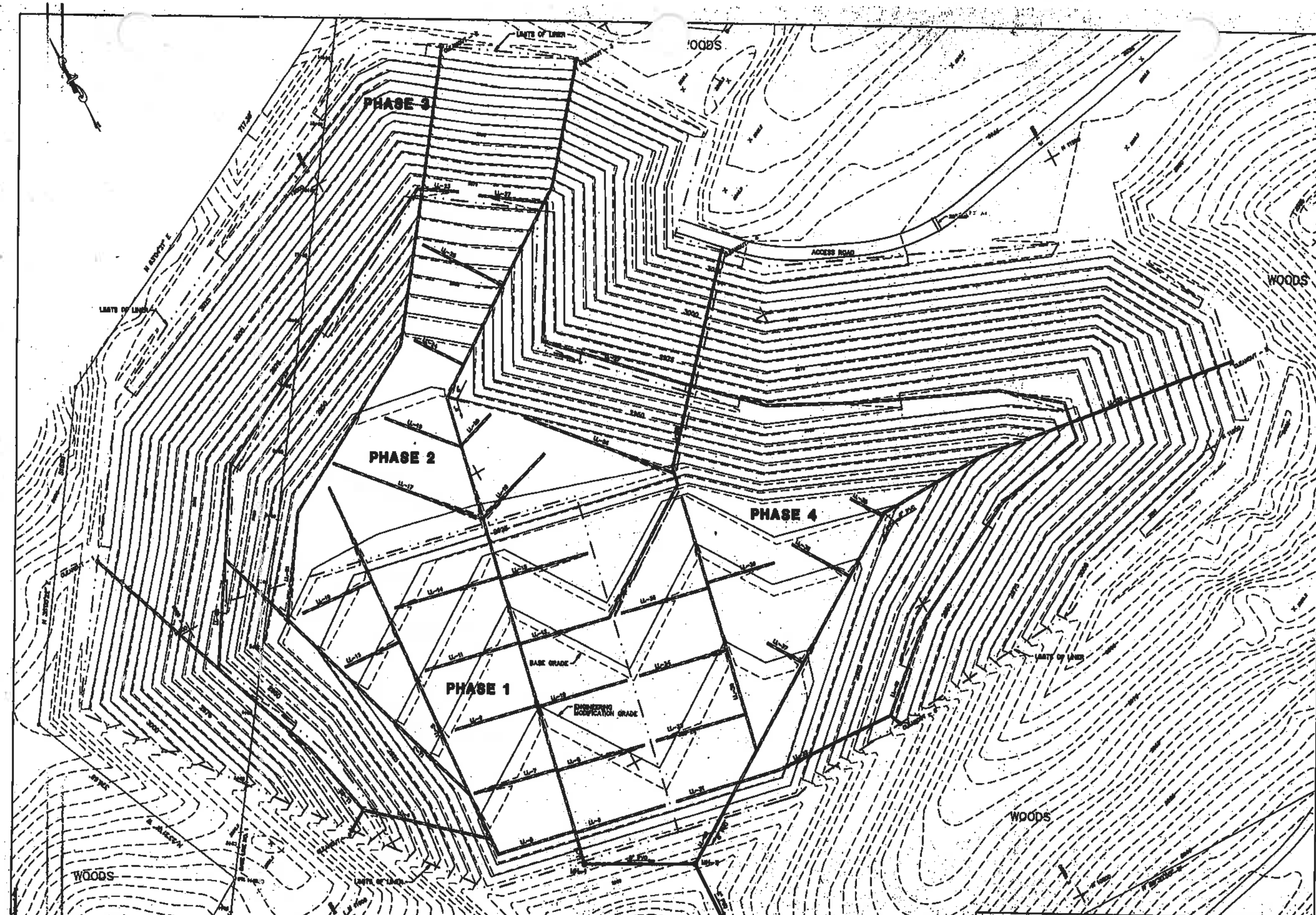
SCALE: 1" = 50'

PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

BASE GRADING PLAN

DRAWING NO. 3



ALL LEACHATE LINES ARE 6" PVC, SDR 35 UNLESS OTHERWISE SHOWN

JOYCE

SCALE: 1" = 50'

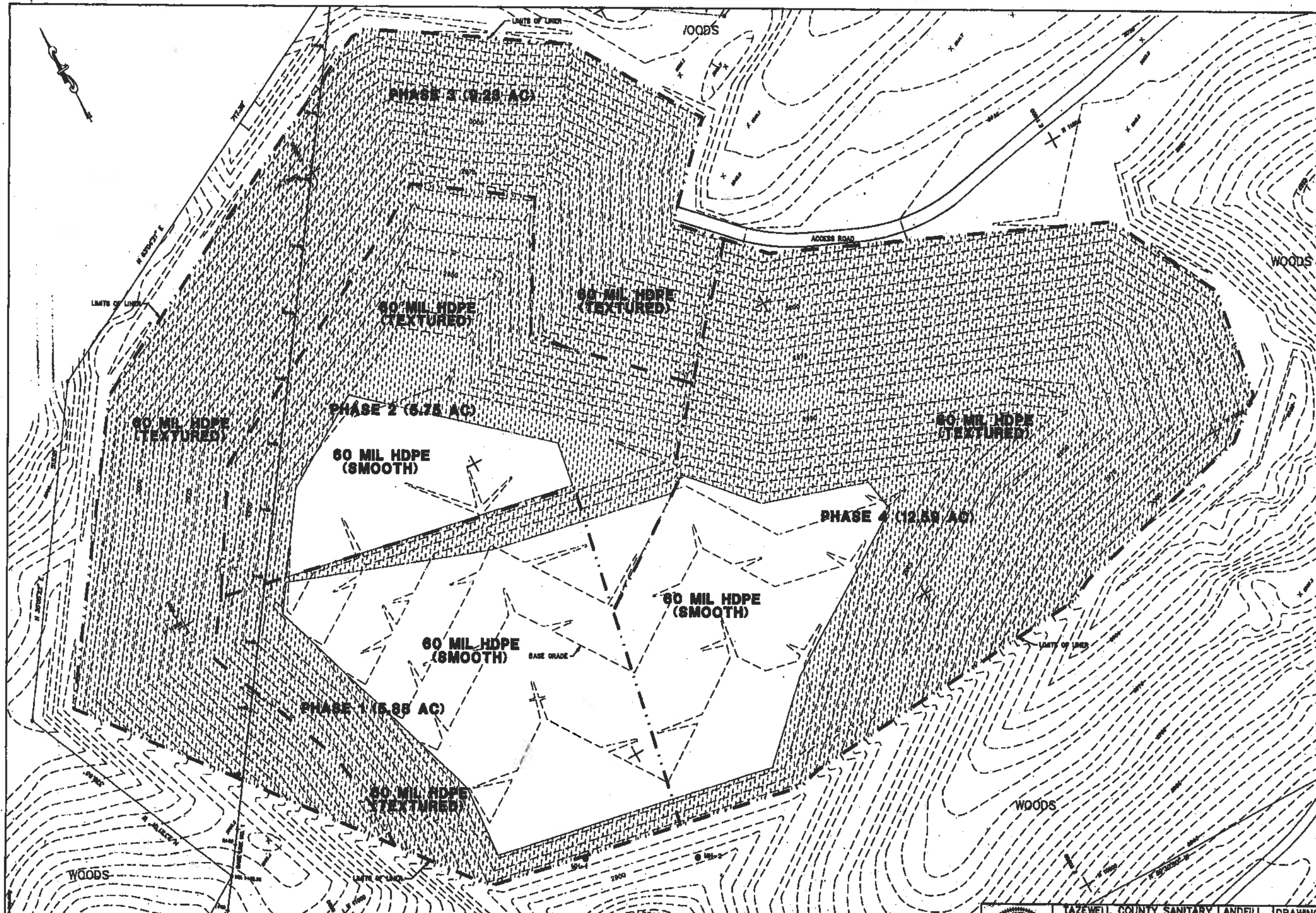
PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

ENGINEERING MODIFICATIONS PLAN

DRAWING NO. 4

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP

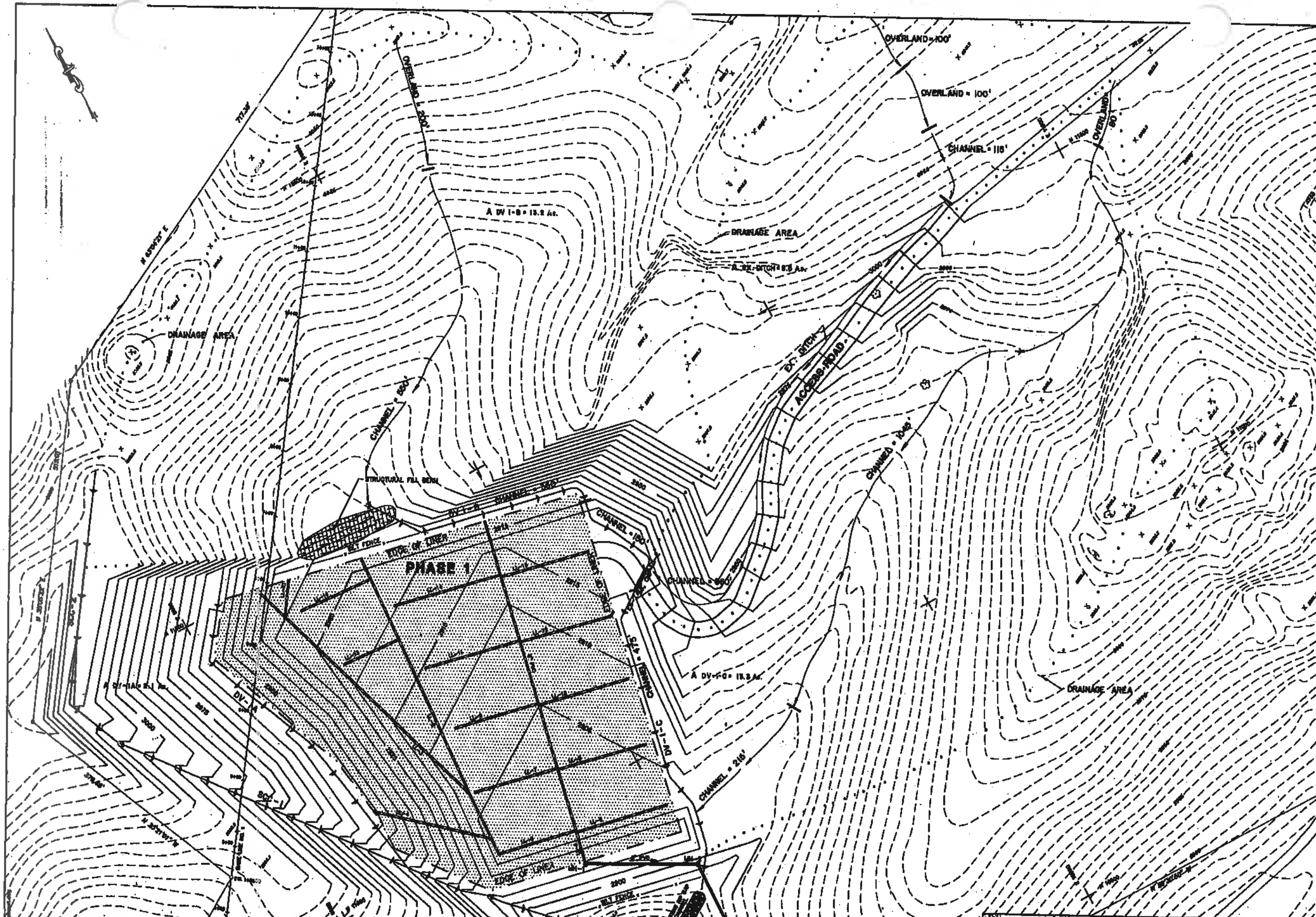


JOYCE	SCALE 1" = 50'	PROJECT NO. 189.08	DRAWING NO. 5

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

SYNTHETIC LINER LAYOUT

DATE | REVISIONS AND RECORD OF ISSUE



DESIGNED	
DRAWN	
CHECKED	
APPROVED	
DATE	11-3-94

DATE | REVISIONS AND RECORD OF ISSUE | NO | BY | CK'D | APP

JOYCE

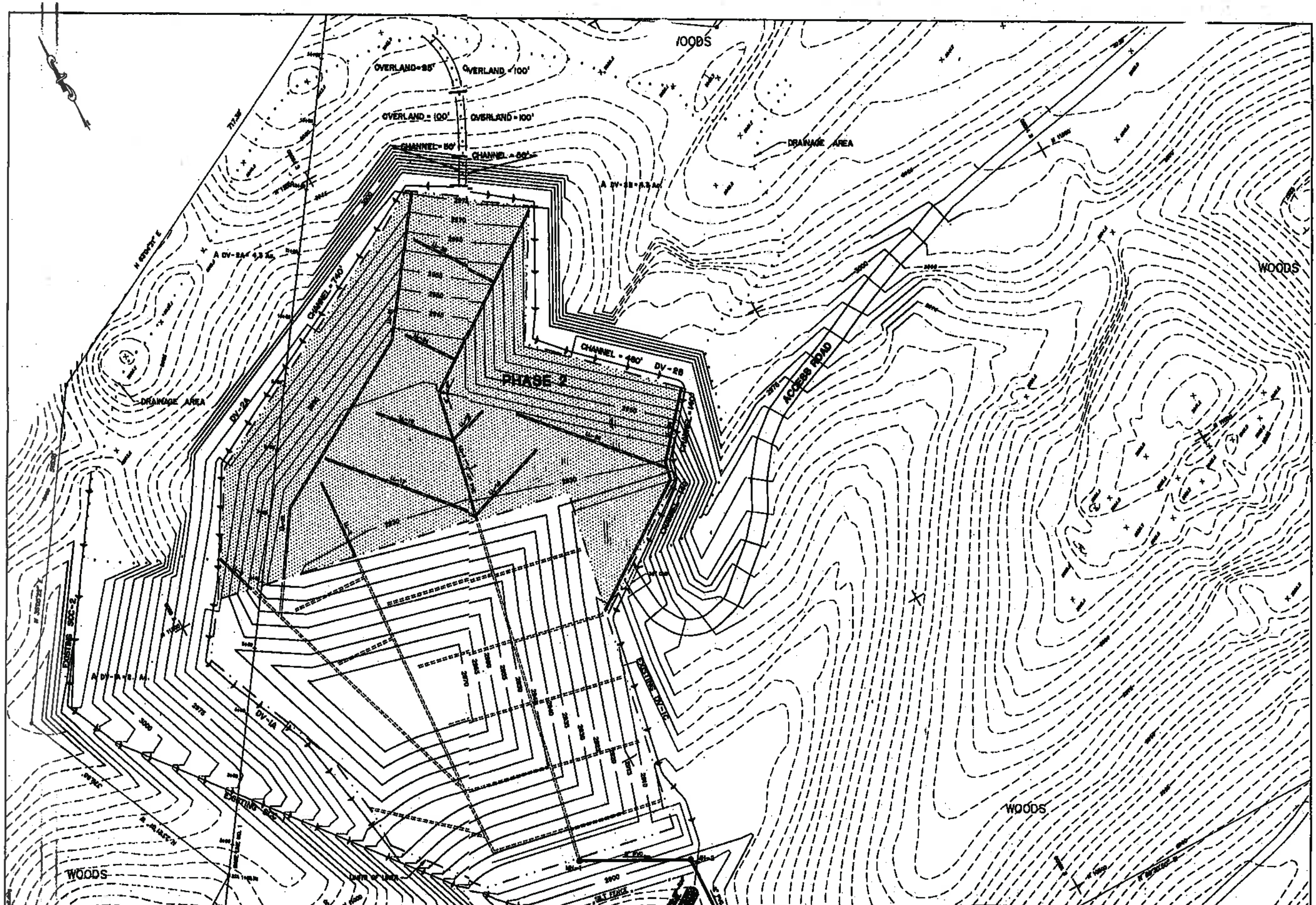
SCALE: 1" = 50'

PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

PHASE 1
ENGINEERING MODIFICATIONS PLAN

DRAWING NO. 6



ALL LEACHATE LINES ARE 6" PVC, SCH 80 UNLESS OTHERWISE SHOWN

DATE	REVISIONS AND RECORD OF ISSUE	DATE	REVISIONS AND RECORD OF ISSUE	DATE	REVISIONS AND RECORD OF ISSUE

DESIGNED / DRAWN / CHECKED / APPROVED / DATE

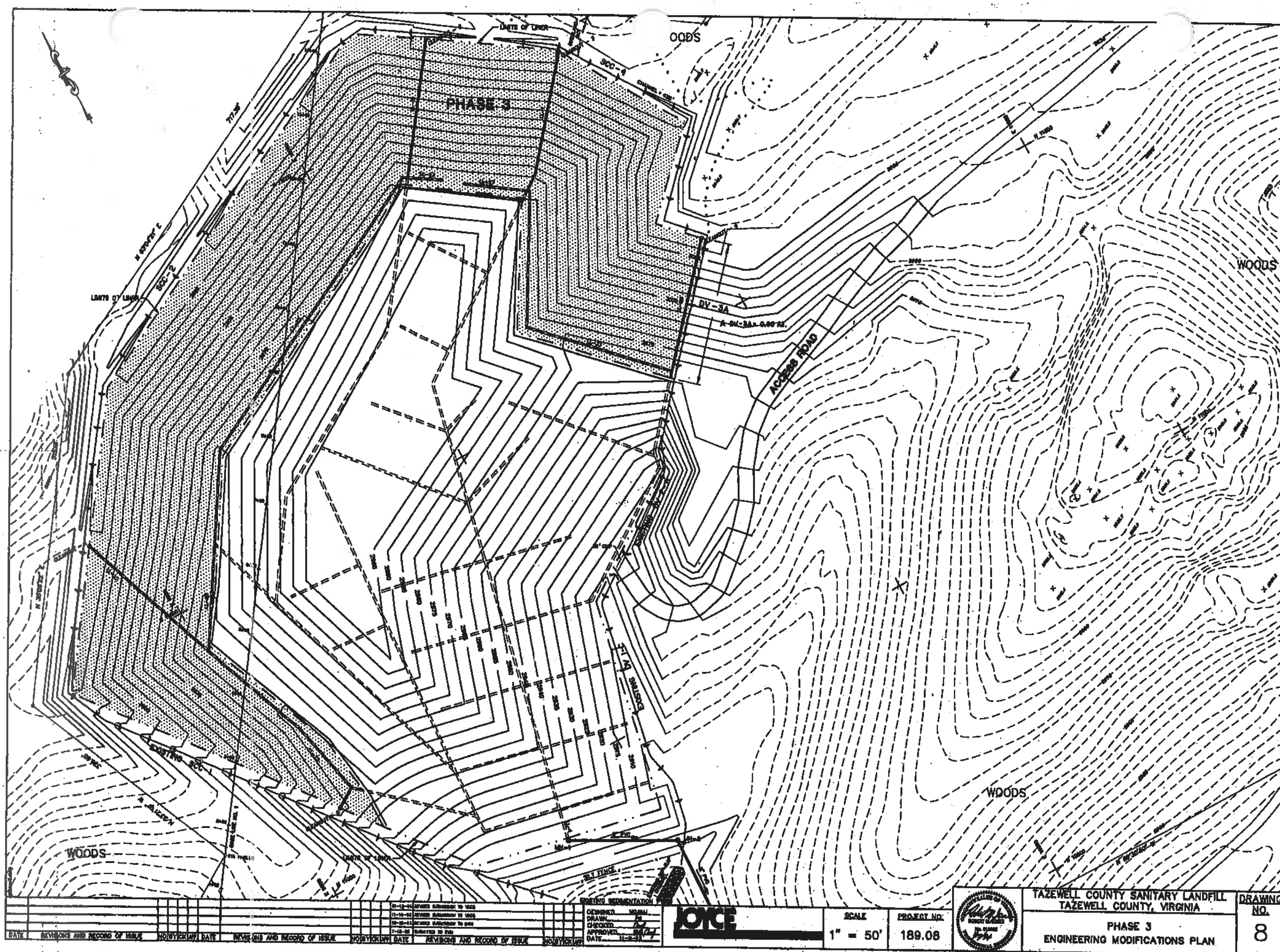
JOYCE

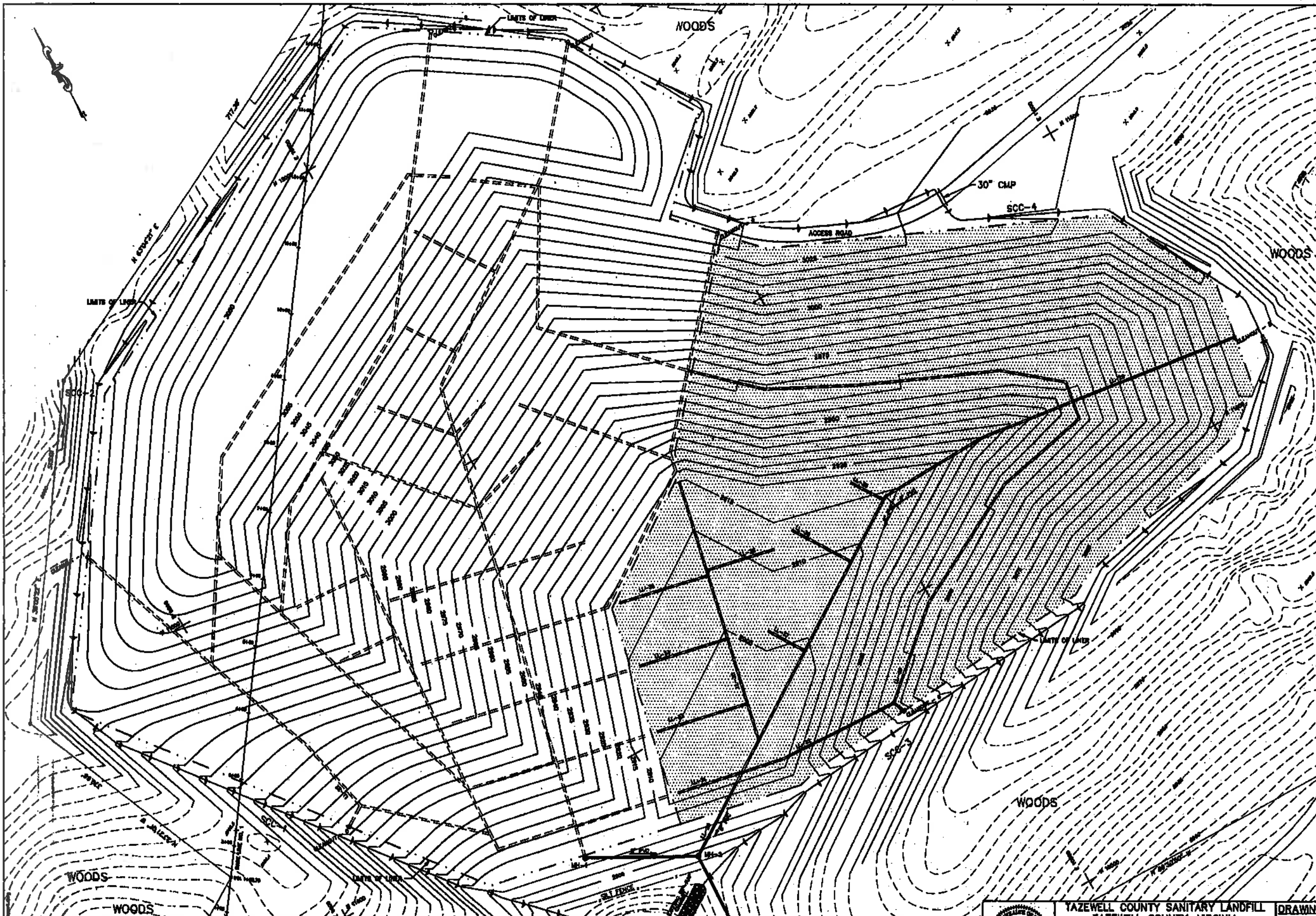
SCALE	PROJECT NO.
1" = 50'	189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

PHASE 2
ENGINEERING MODIFICATIONS PLAN

DRAWING NO. 7


PHASE 3
WOODS
WOODS
WOODS
WOODS
ACCESS ROAD
DV-3A
SCC-2
EXISTING SCC
LIMITS OF LINER
JOYCE
SCALE
1" = 50'
PROJECT NO.
189.08
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA
PHASE 3
ENGINEERING MODIFICATIONS PLAN
DRAWING NO.
8
DATE
REVISIONS AND RECORD OF ISSUE



DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP

EXISTING SEDIMENTATION POND

DESIGNED: MG/BM
DRAWN: PE
CHECKED: RM
APPROVED: RM/DK
DATE: 11-2-93

JOYCE

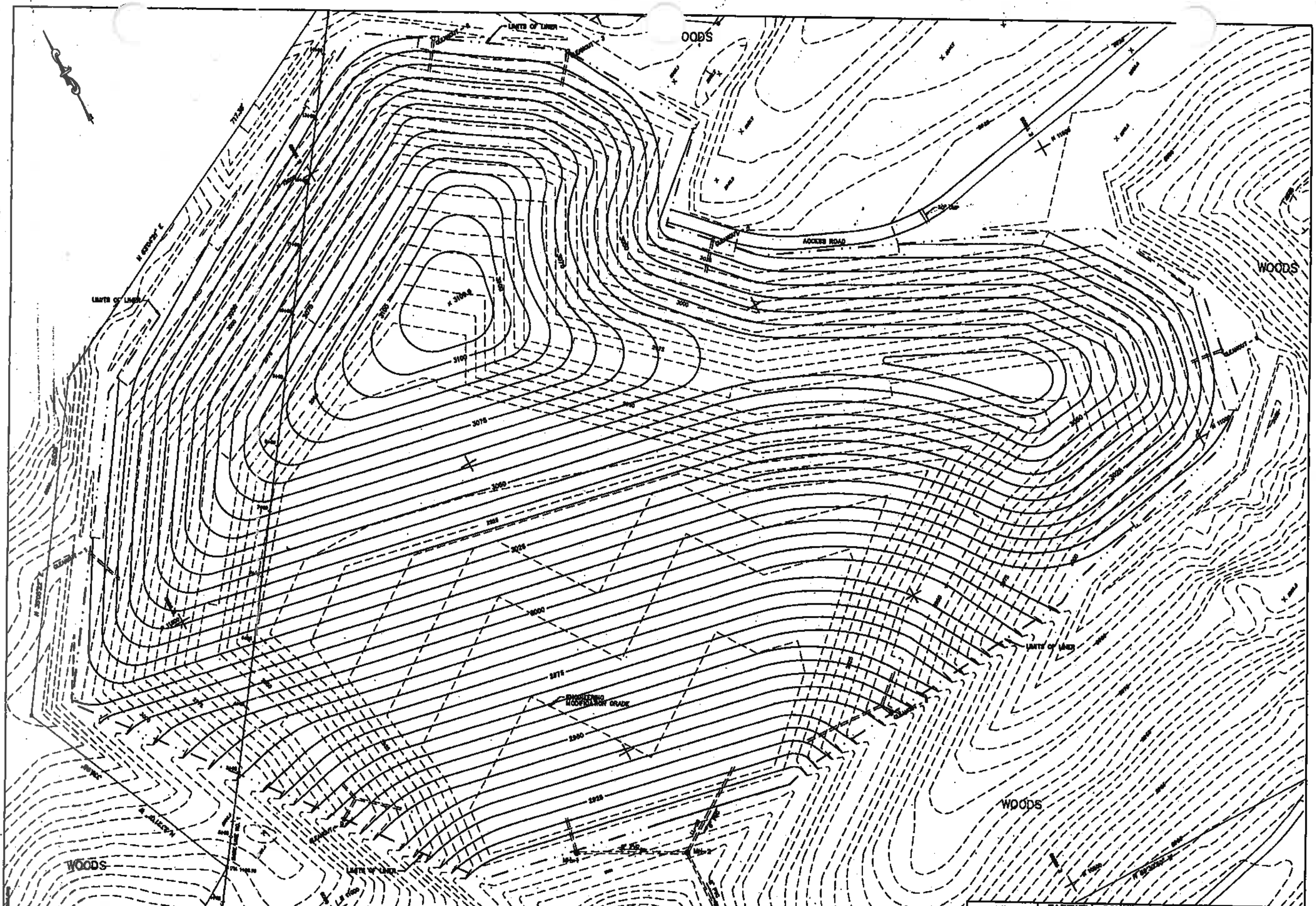
SCALE: 1" = 50'

PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

PHASE 4
ENGINEERING MODIFICATIONS PLAN

DRAWING NO. 9



EXISTING SEDIMENTATION POND

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

DESIGNED
DRAWN
CHECKED
APPROVED
DATE

JOYCE

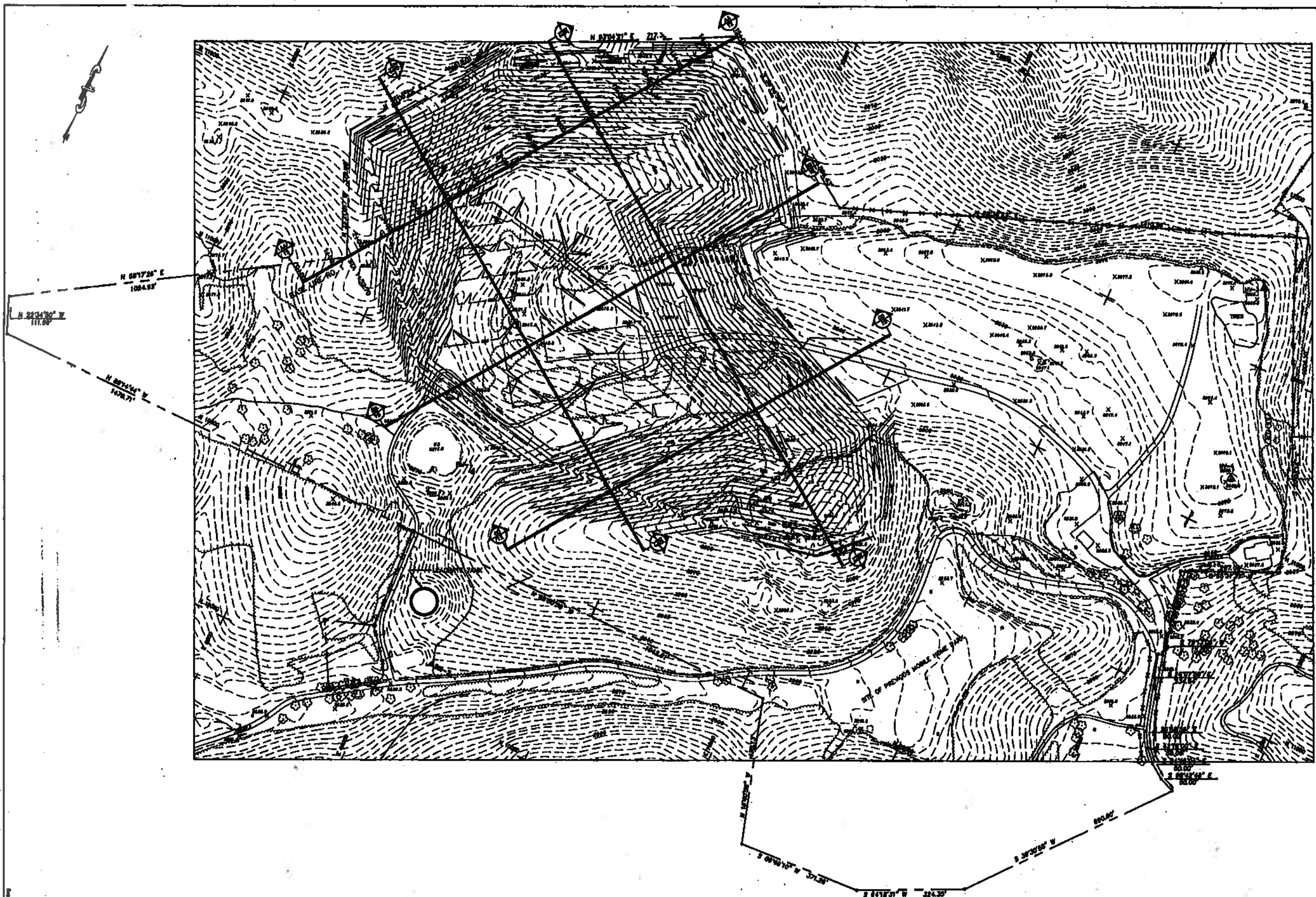
SCALE: 1" = 50'

PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

FINAL GRADING PLAN

DRAWING NO. 10



DESIGNED	DRAWN	CHECKED	APPROVED	DATE

JOYCE

SCALE 1" = 100'

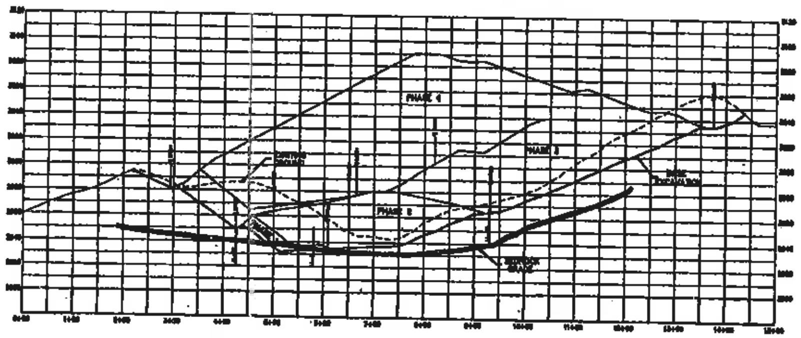
PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

CROSS SECTION LOCATIONS

DRAWING NO. 11

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP



BASE LINE NO. 1
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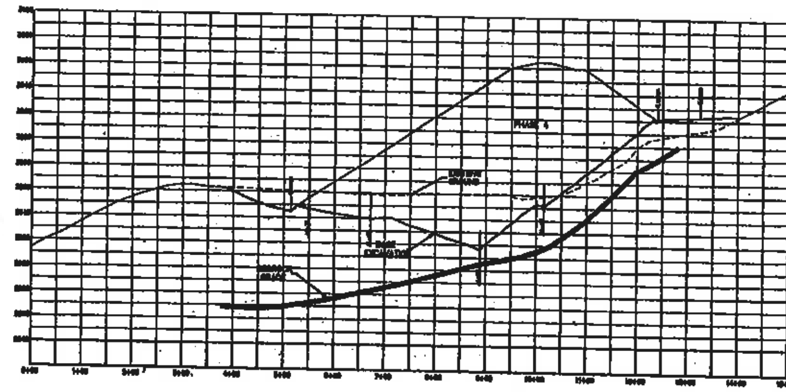
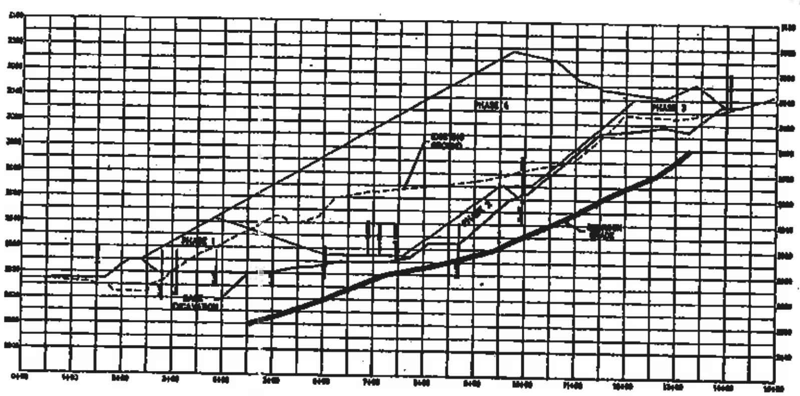


BASE LINE 1000' OFFSET
CC



BASE LINE 500' OFFSET
BB

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

JOYCE

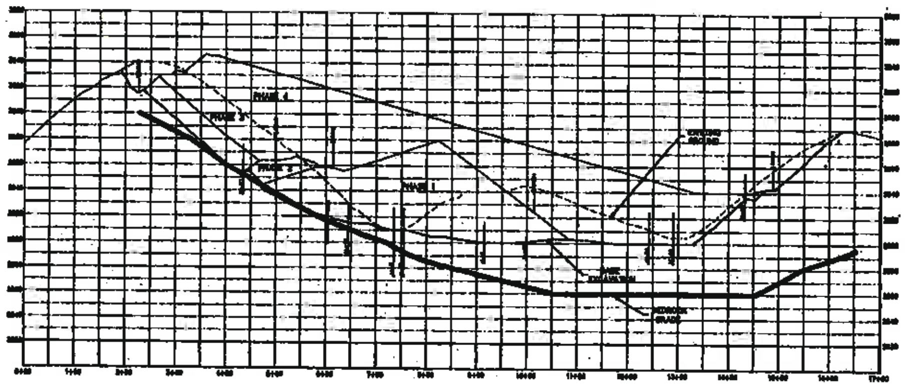
SCALE
H: 1"=100'
V: 1"=40'

PROJECT NO.
189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

CROSS-SECTIONS

DRAWING NO.
12



500' PERPENDICULAR OFFSET
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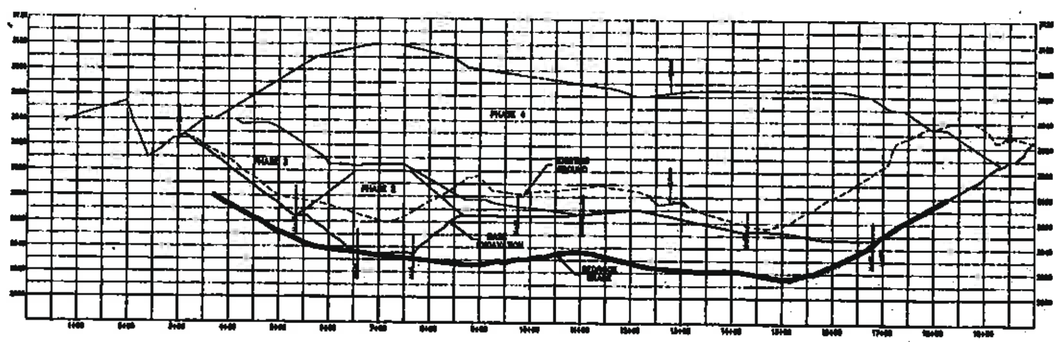


1000' PERPENDICULAR OFFSET
EE

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED / DRAWN / CHECKED / APPROVED / DATE

JOYCE

SCALE
H: 1"=100'
V: 1"=40'

PROJECT NO.
189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

CROSS-SECTIONS

DRAWING NO.
13

NOTE: SOME EXCAVATED MATERIALS TO BE USED IN THE CLOSURE OF THE EXISTING SITE

SILT FENCE

ADDITIONAL MATERIALS WHICH REQUIRE STOCKPILING WILL BE PLACED ON DISPOSED WASTE AS A TEMPORARY CAP AND USED LATER AS DAILY COVER

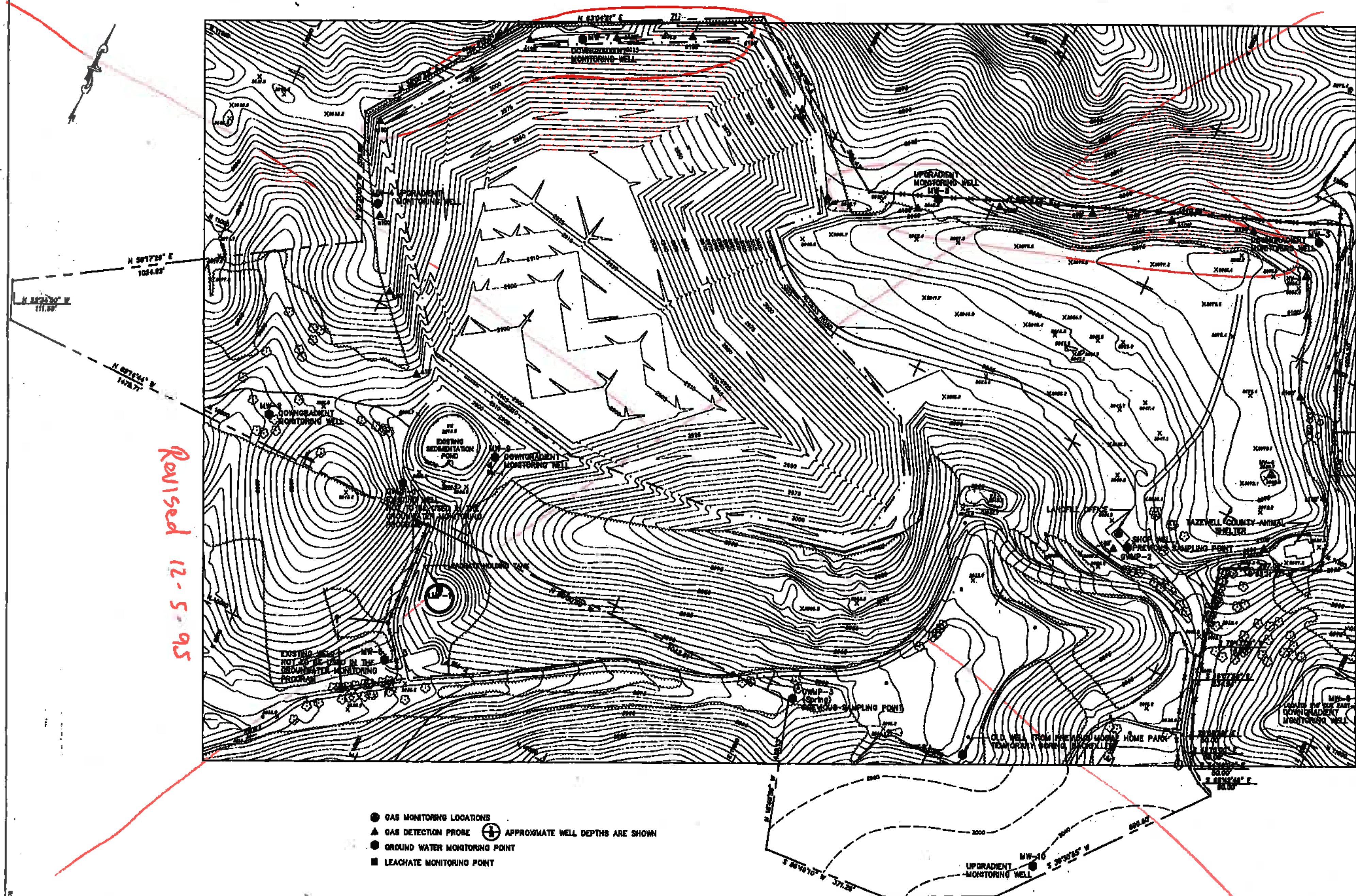
ADDITIONAL BORROW/STOCKPILE AREA ON ADJOINING HOLDINGS OF TAZEWELL COUNTY BOARD OF SUPERVISORS

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED / DRAWN / CHECKED / APPROVED / DATE

JOYCE

SCALE	PROJECT NO.		TAZEWELL COUNTY SANITARY LANDFILL TAZEWELL COUNTY, VIRGINIA	DRAWING NO.
1" = 100'	189.08		BORROW / STOCKPILE MAP	14



Revised 12-5-95

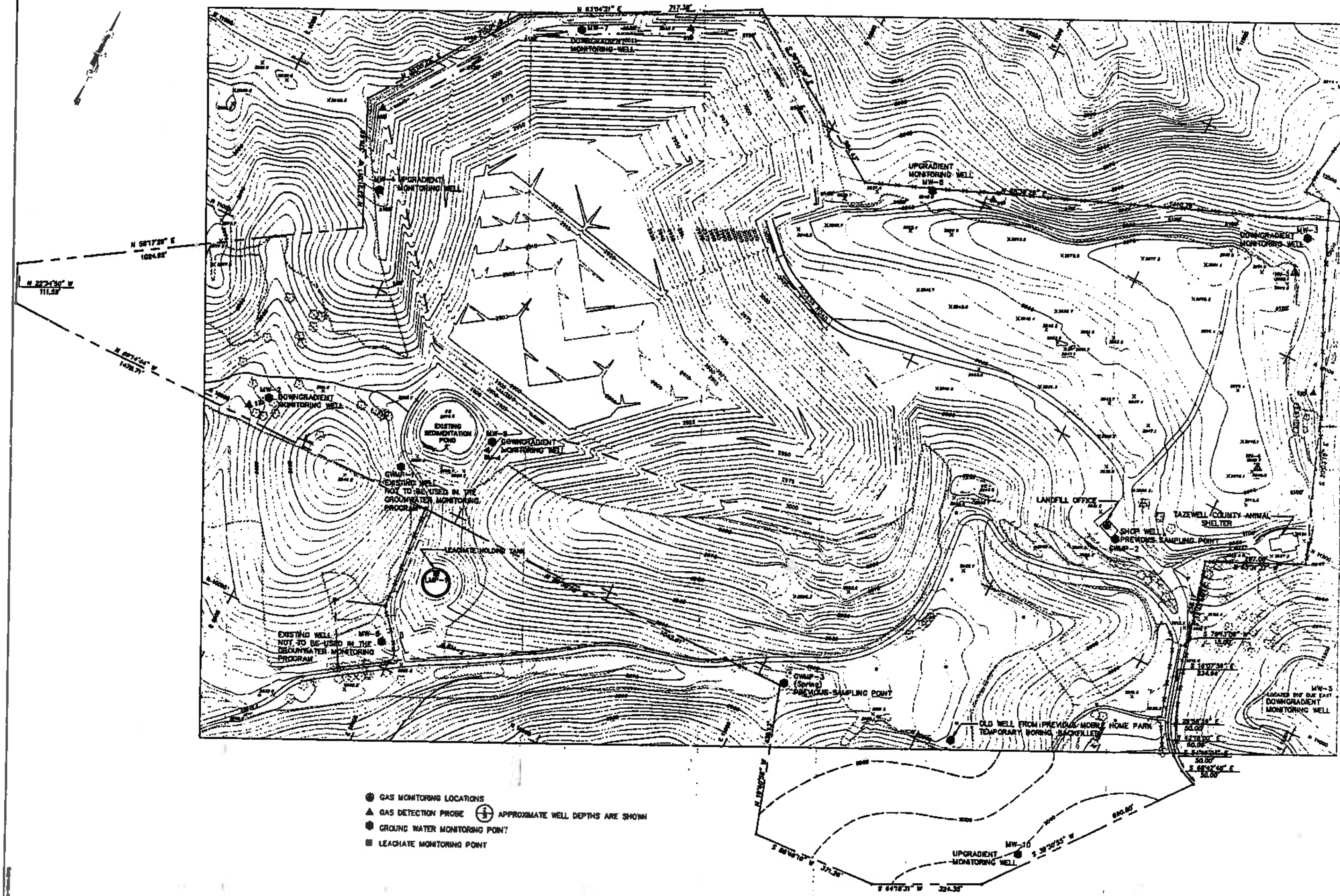
SCALE	1" = 100'
PROJECT NO.	189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

SITE MONITORING PLAN

DRAWING NO. 15

DATE | REVISIONS AND RECORD OF ISSUE | NO | BY | CK | APP | DATE



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	REVISED (ADDED) GAS DETECTION PROBES																

DESIGNED MC/HH
DRAWN PB/DB
CHECKED
APPROVED
DATE 11-10-93

SCALE 1" = 100'

PROJECT NO. 189.08

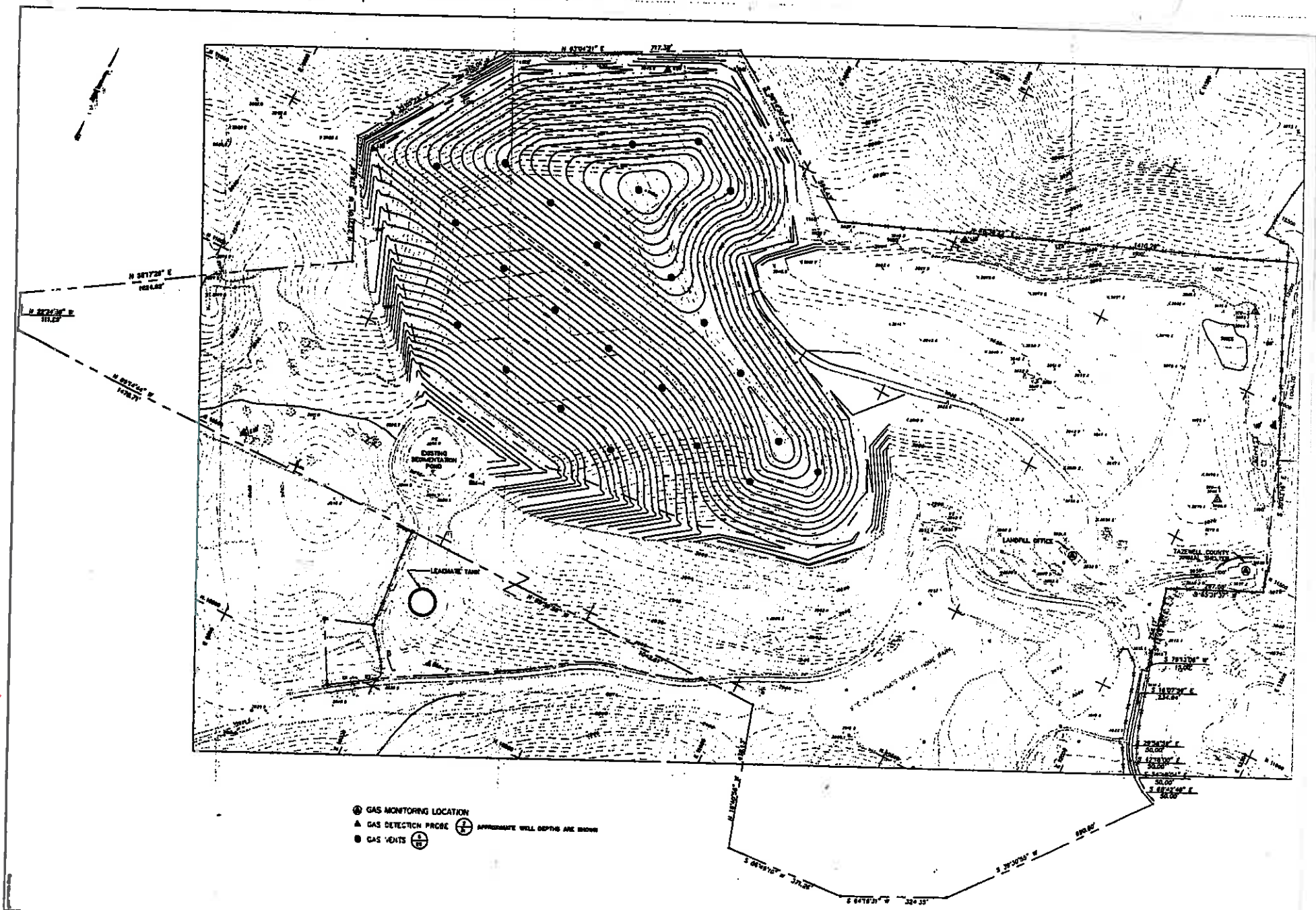
HENRY C. MURRAY No. 11299 PROFESSIONAL ENGINEER

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

SITE MONITORING PLAN

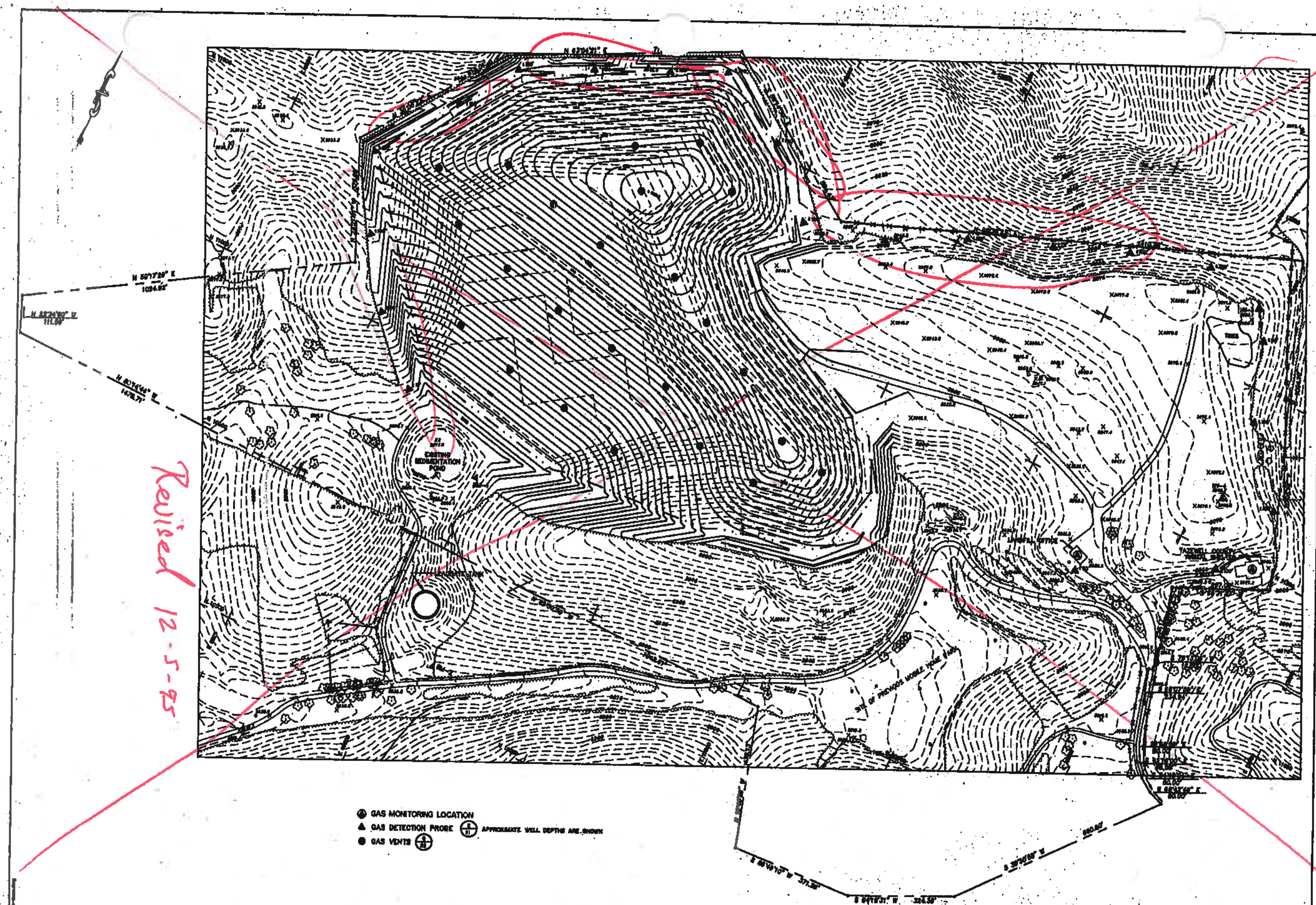
DRAWING NO. 15

Correct 12-5-95



SCALE 1" = 100'	PROJECT NO. 189.08	TAZEWELL COUNTY SANITARY LANDFILL TAZEWELL COUNTY, VIRGINIA GAS MANAGEMENT PLAN	DRAWING NO. 16

Correct 12-5-95



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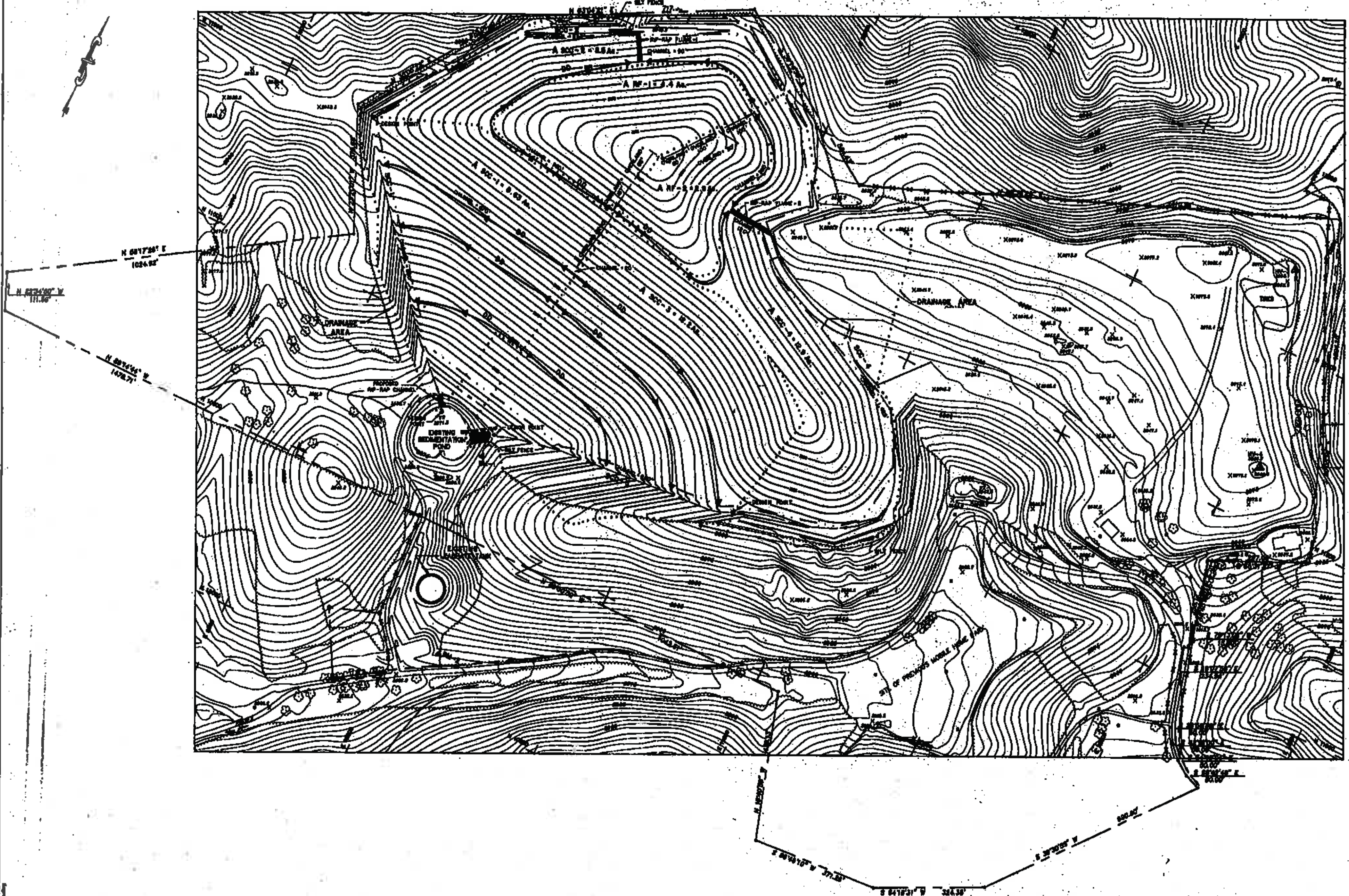
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

GAS MANAGEMENT PLAN

JOYCE

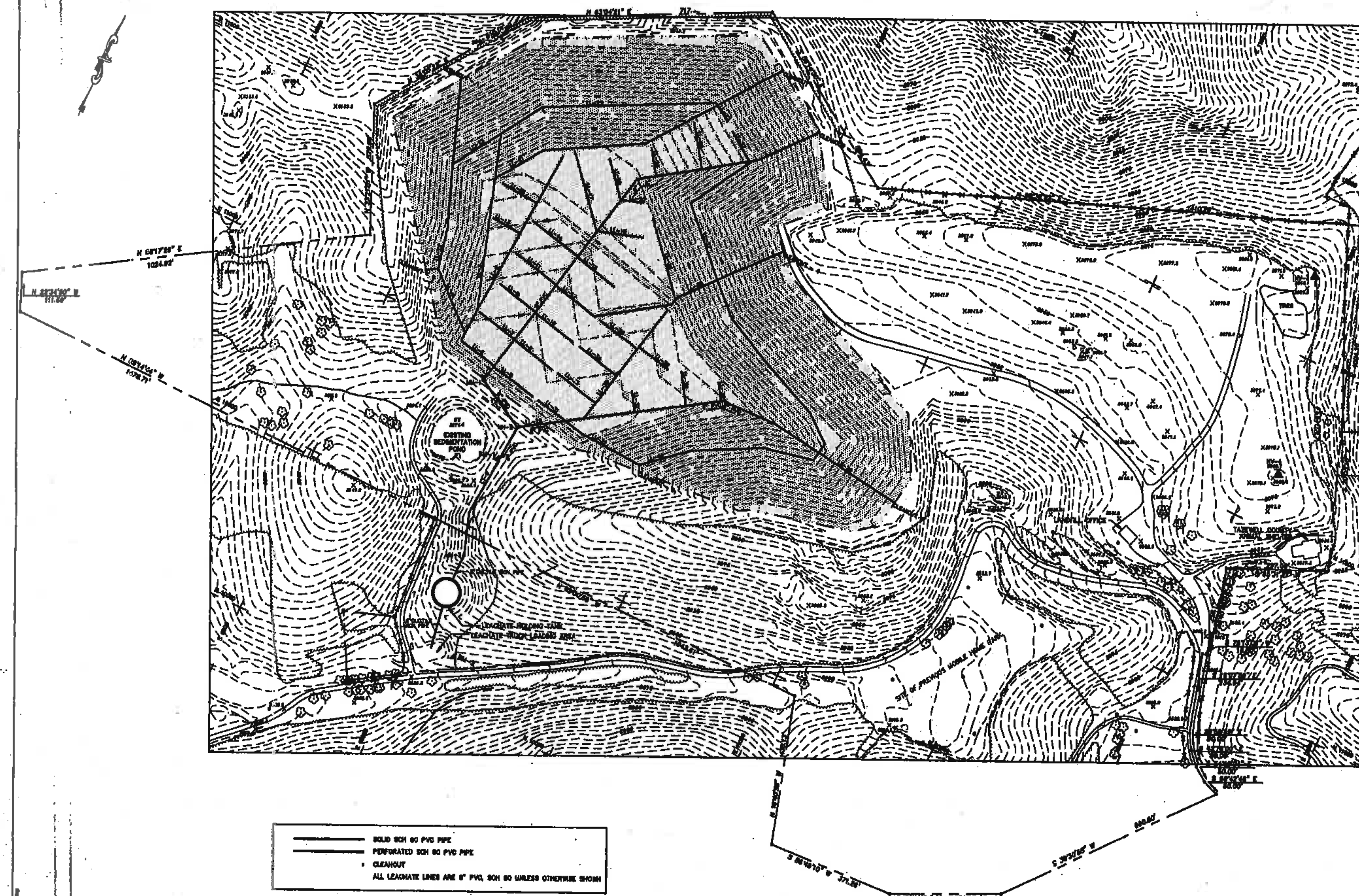


TAZEWELL COUNTY SANITARY LANDFILL TAZEWELL COUNTY, VIRGINIA	DRAWING NO. 17		
EROSION AND SEDIMENT CONTROL			
SCALE 1" = 100'	PROJECT NO. 189.08		

DATE | REVISIONS AND RECORD OF ISSUE | NO. | BY | CK | APP | DATE | REVISIONS AND RECORD OF ISSUE | NO. | BY | CK | APP | DATE | REVISIONS AND RECORD OF ISSUE

DESIGNED / DRAWN / CHECKED / APPROVED / DATE

JOYCE



——	SOLID SCH 80 PVC PIPE
——	PERFORATED SCH 80 PVC PIPE
•	CLEANOUT
	ALL LEACHATE LINES ARE 8" PVC, SCH 80 UNLESS OTHERWISE SHOWN

JOYCE

SCALE: 1" = 100'

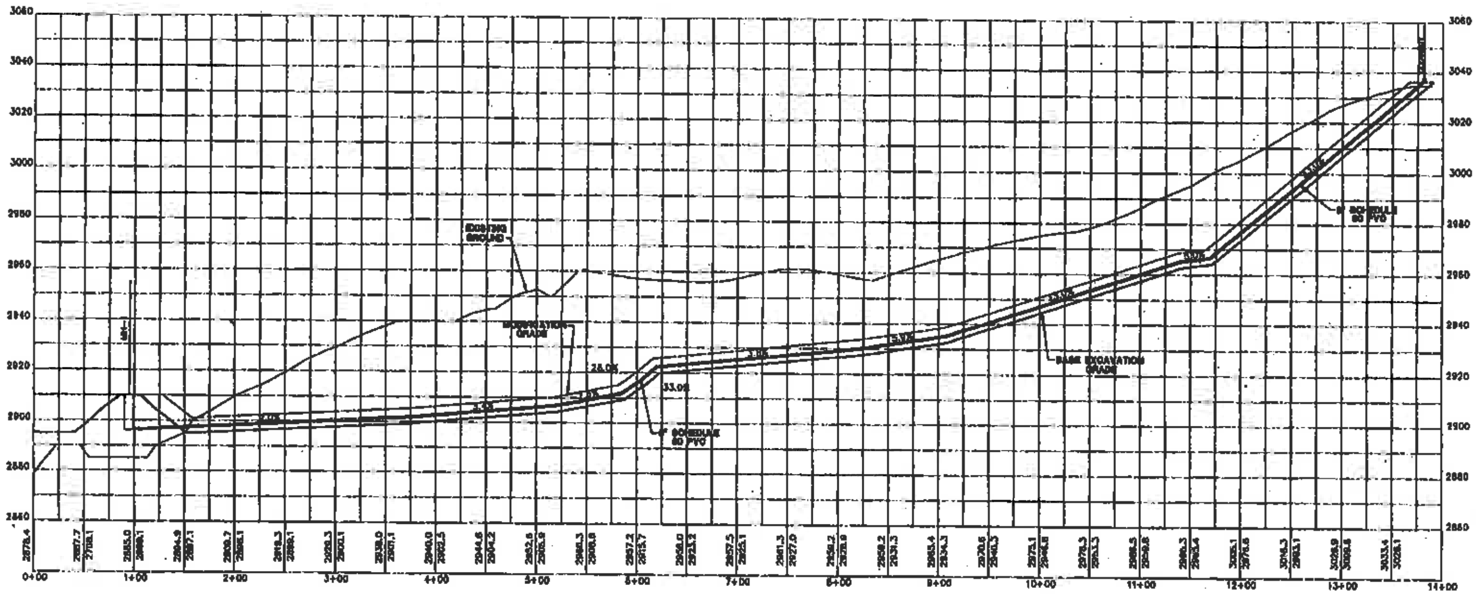
PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

LEACHATE COLLECTION SYSTEM

DRAWING NO. 18

DATE | REVISIONS AND RECORD OF ISSUE



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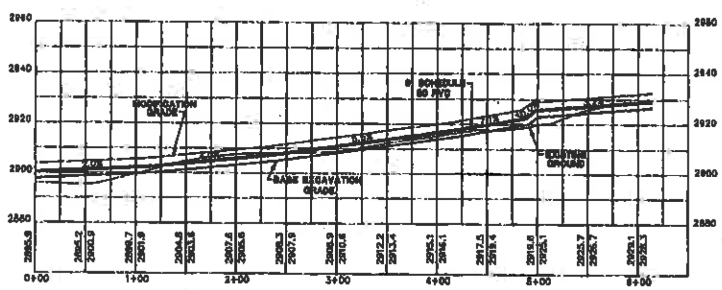
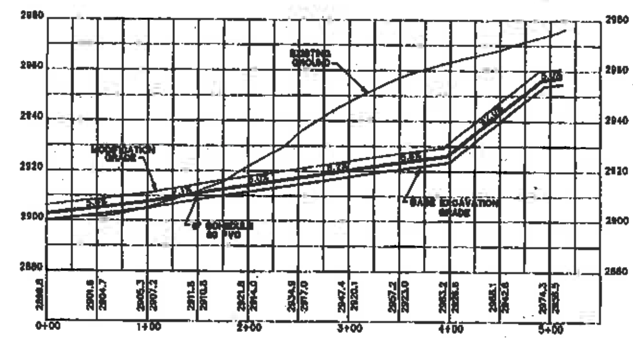


LL-2



LL-3

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED
DRAWN
CHECKED
APPROVED
DATE

JOYCE

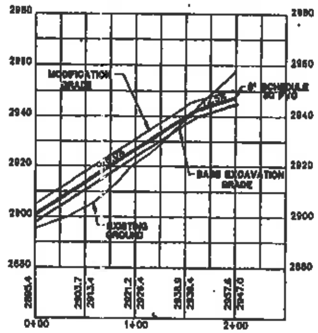
SCALE: AS SHOWN

PROJECT NO. 189.08

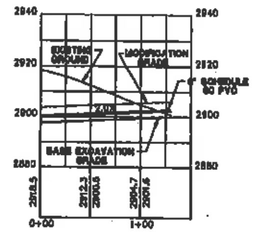
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

LEACHATE LINE PROFILES

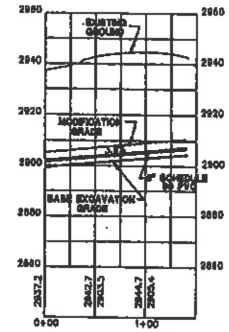
DRAWING NO. 19



LL-4

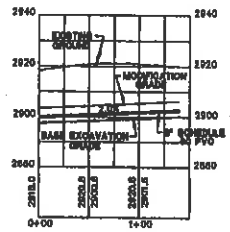


LL-7

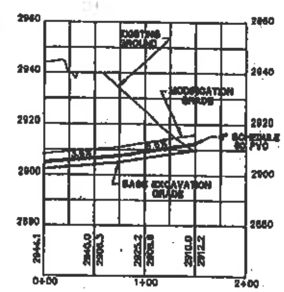


LL-10

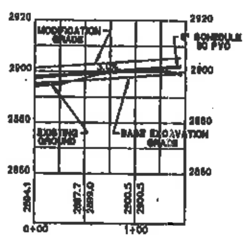
LL-5



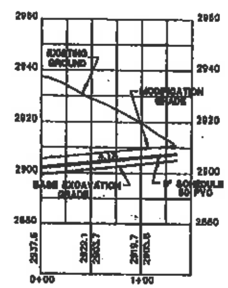
LL-8



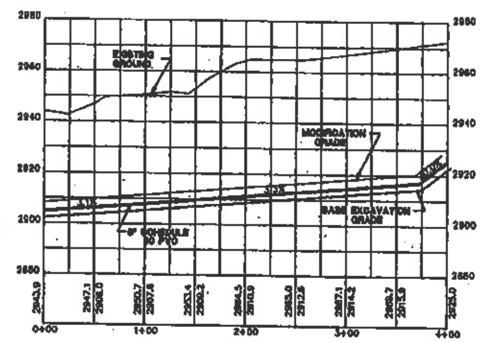
LL-11



LL-6



LL-9



LL-12

DATE	REVISIONS AND RECORD OF ISSUE
[illegible]	[illegible] SUBMISSION TO VDWM
[illegible]	REVISED SUBMISSION TO VDWM
[illegible]	REVISED SUBMISSION TO DWM
[illegible]	SUBMITTED TO DWM

DESIGNED / DRAWN / CHECKED / APPROVED / DATE July 1999

JOYCE

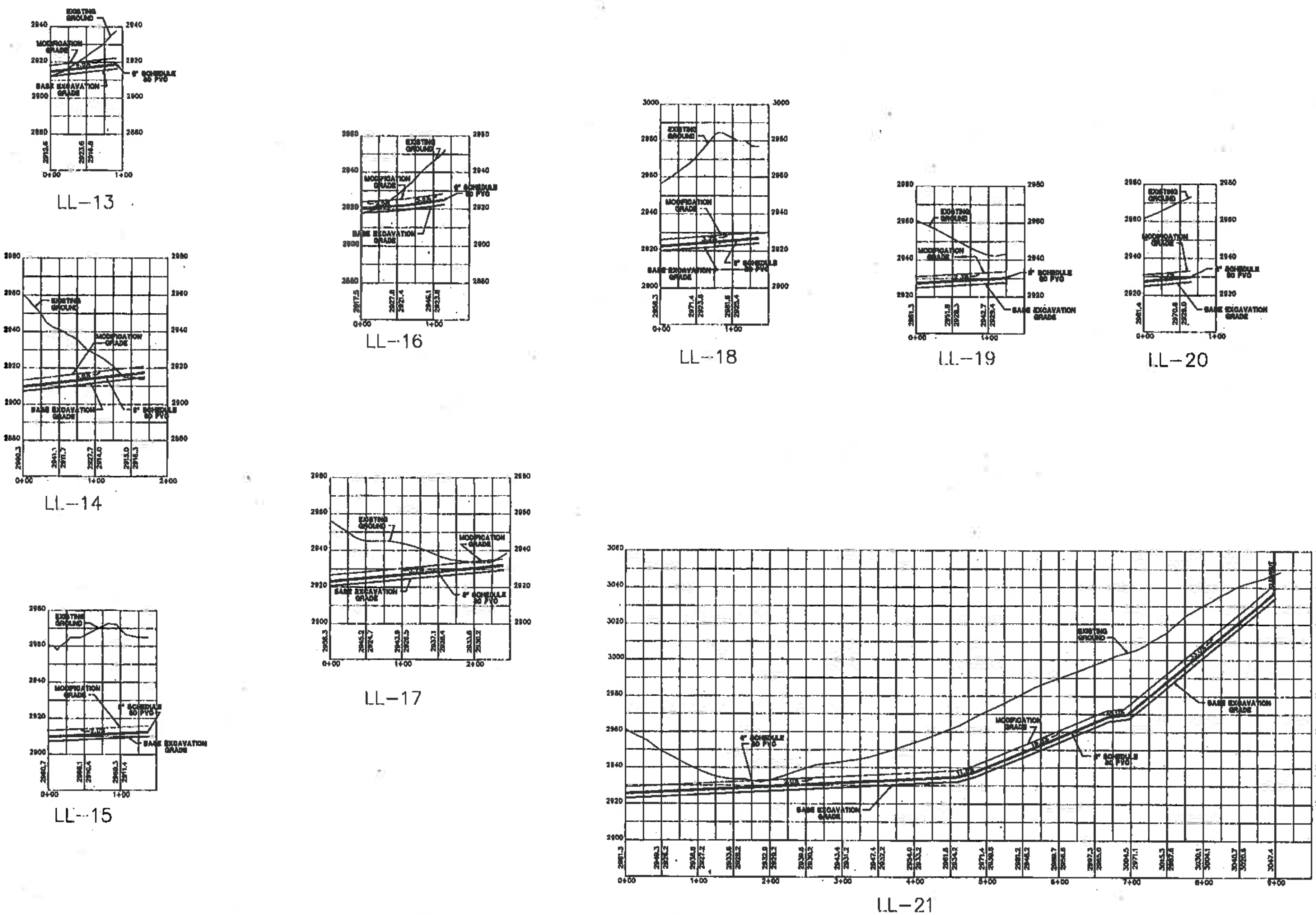
SCALE: AS SHOWN

PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

LEACHATE LINE PROFILES

DRAWING NO. 20



TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

LEACHATE LINE PROFILES

DRAWING NO. 21

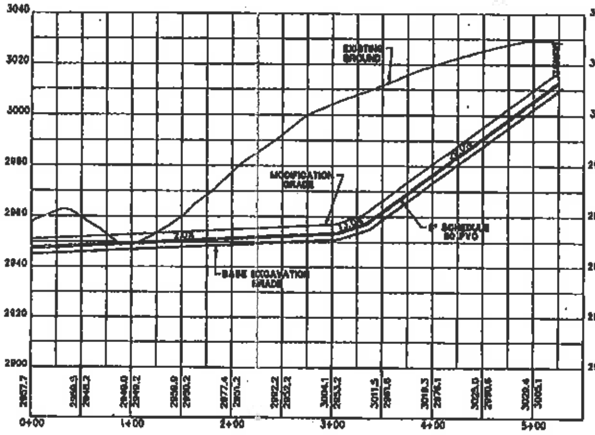
SCALE AS SHOWN

PROJECT NO. 189.08

JOYCE

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APPR

DESIGNED
DRAWN
CHECKED
APPROVED
DATE



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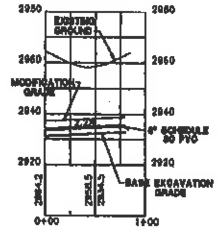
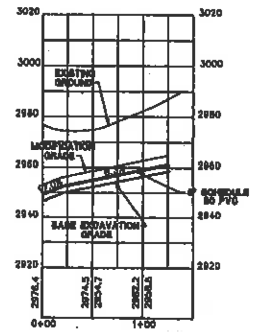
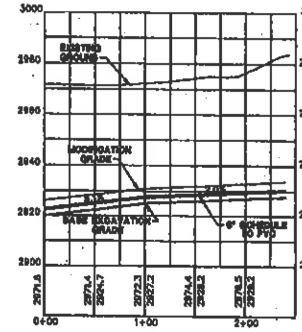


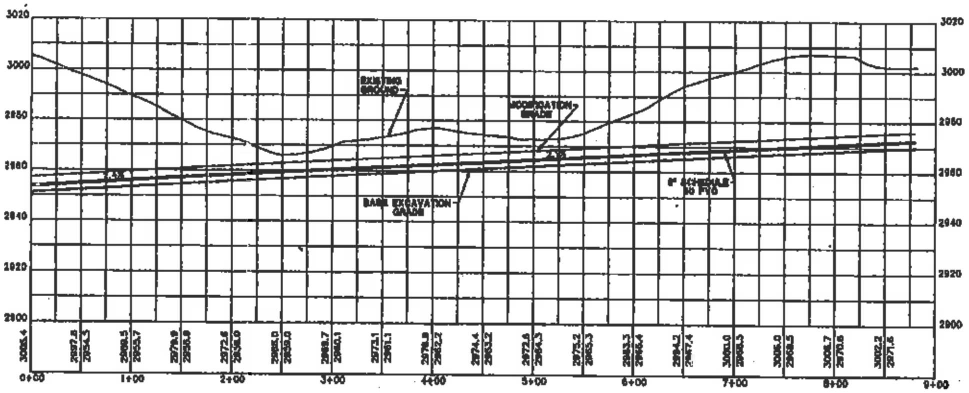
LL-24



LL-25.



LL-26



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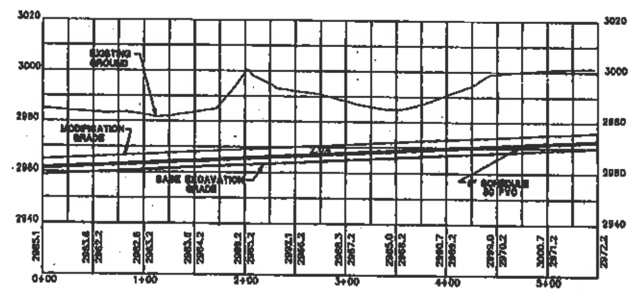


LL-27.

JOYCE

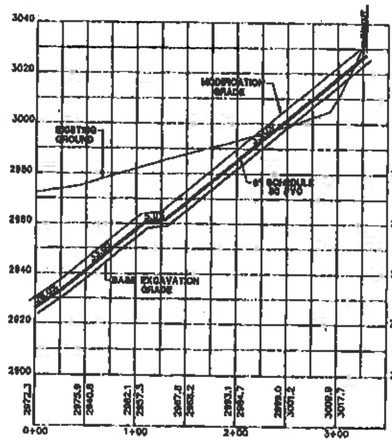
SCALE: AS SHOWN

PROJECT NO. 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

LEACHATE LINE PROFILES

DRAWING NO. 22



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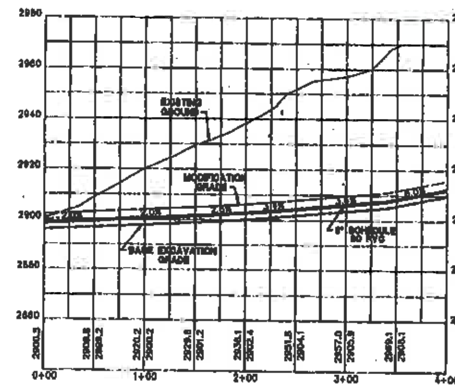

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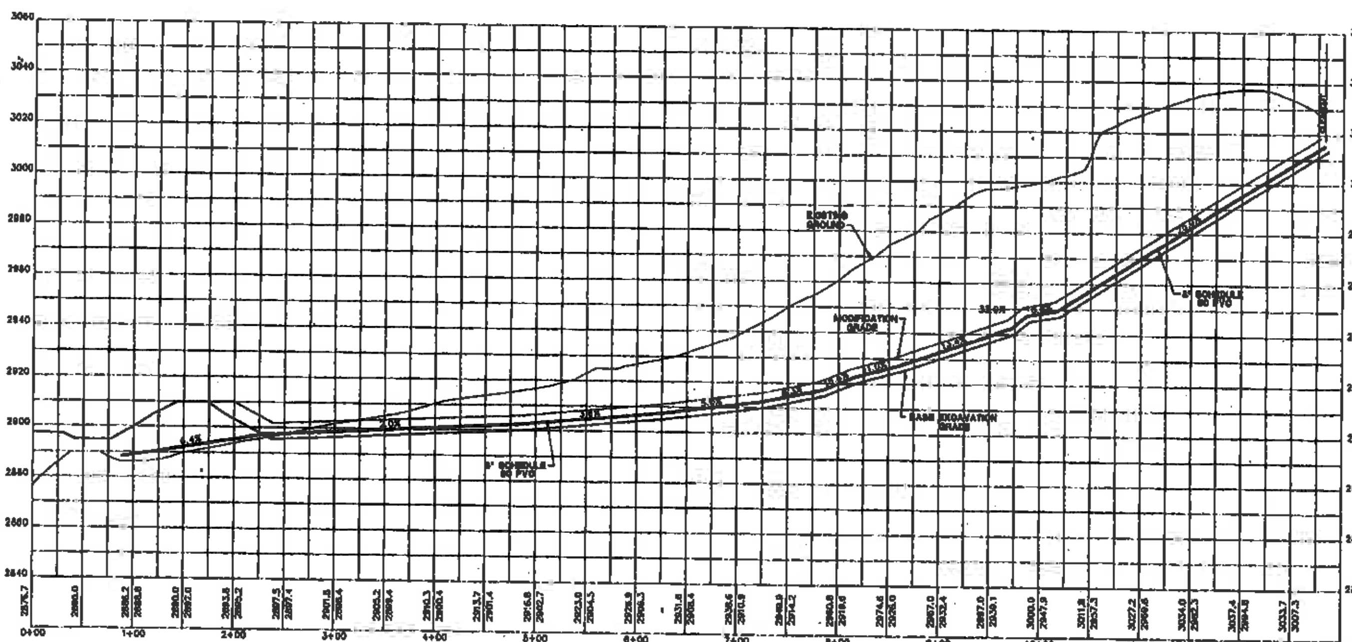


LL-29

JOYCE

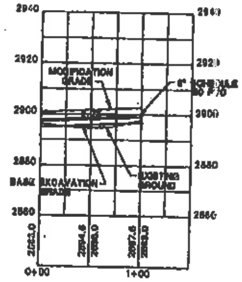
SCALE: AS SHOWN

PROJECT NO. 189.08

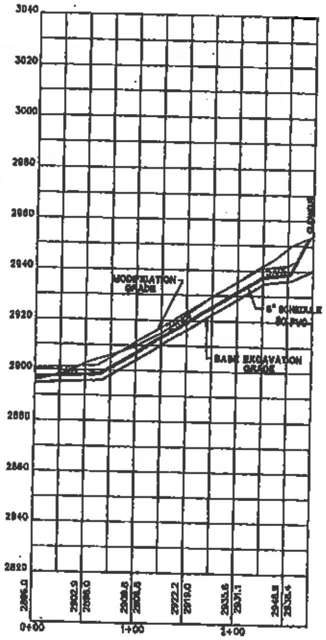
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

LEACHATE LINE PROFILES

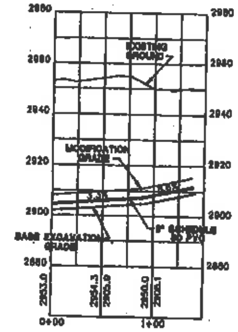
DRAWING NO. 23



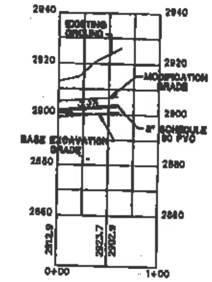
LL-31



LL-32

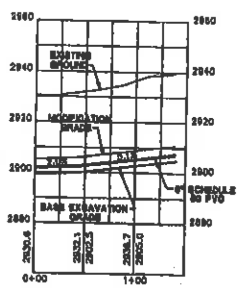


LL-35



LL-37

LL-33



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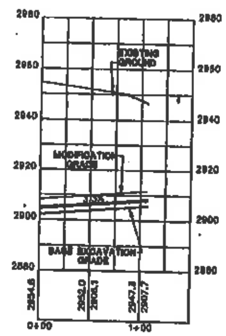
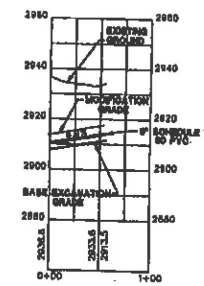


LL-36

LL-38



LL-39

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE

DESIGNED / DRAWN / CHECKED / APPROVED / DATE

JOYCE

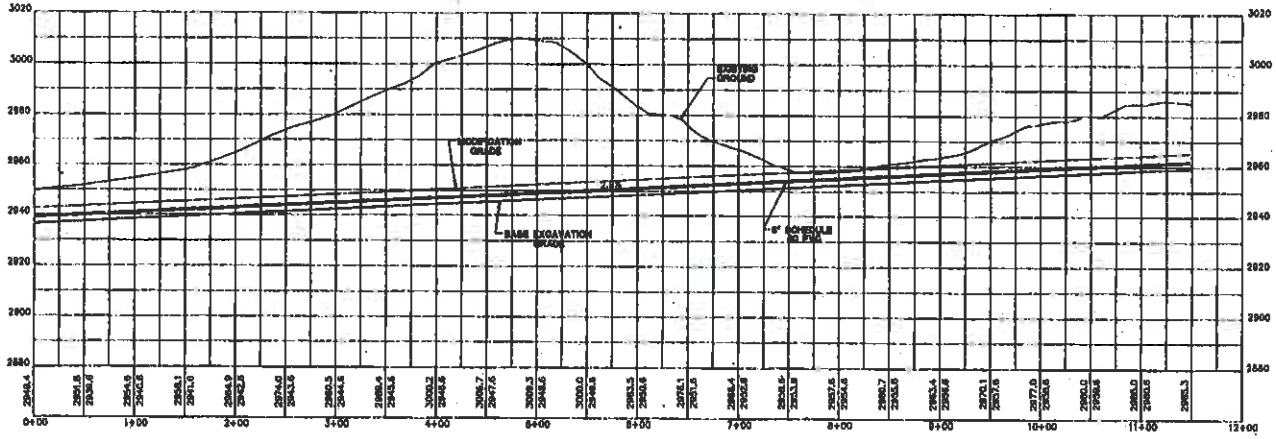
SCALE: AS SHOWN

PROJECT NO. 169.08

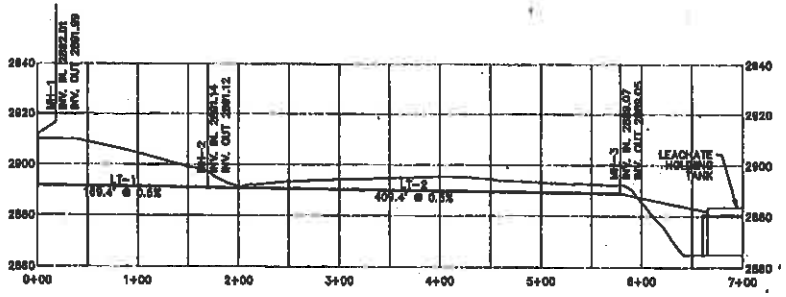
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

LEACHATE LINE PROFILES

DRAWING NO. 24



LL--40



LT--1 & LT--2

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APR DATE
	01-02-01 Revised Submission to VDEQ				
	11-15-00 REVISED SUBMISSION TO VDEQ				
	10-15-99 REVISED Submission TO DEQ				
	3-15-99 SUBMITTED TO DEQ				

DESIGNED
DRAWN
CHECKED
APPROVED
DATE

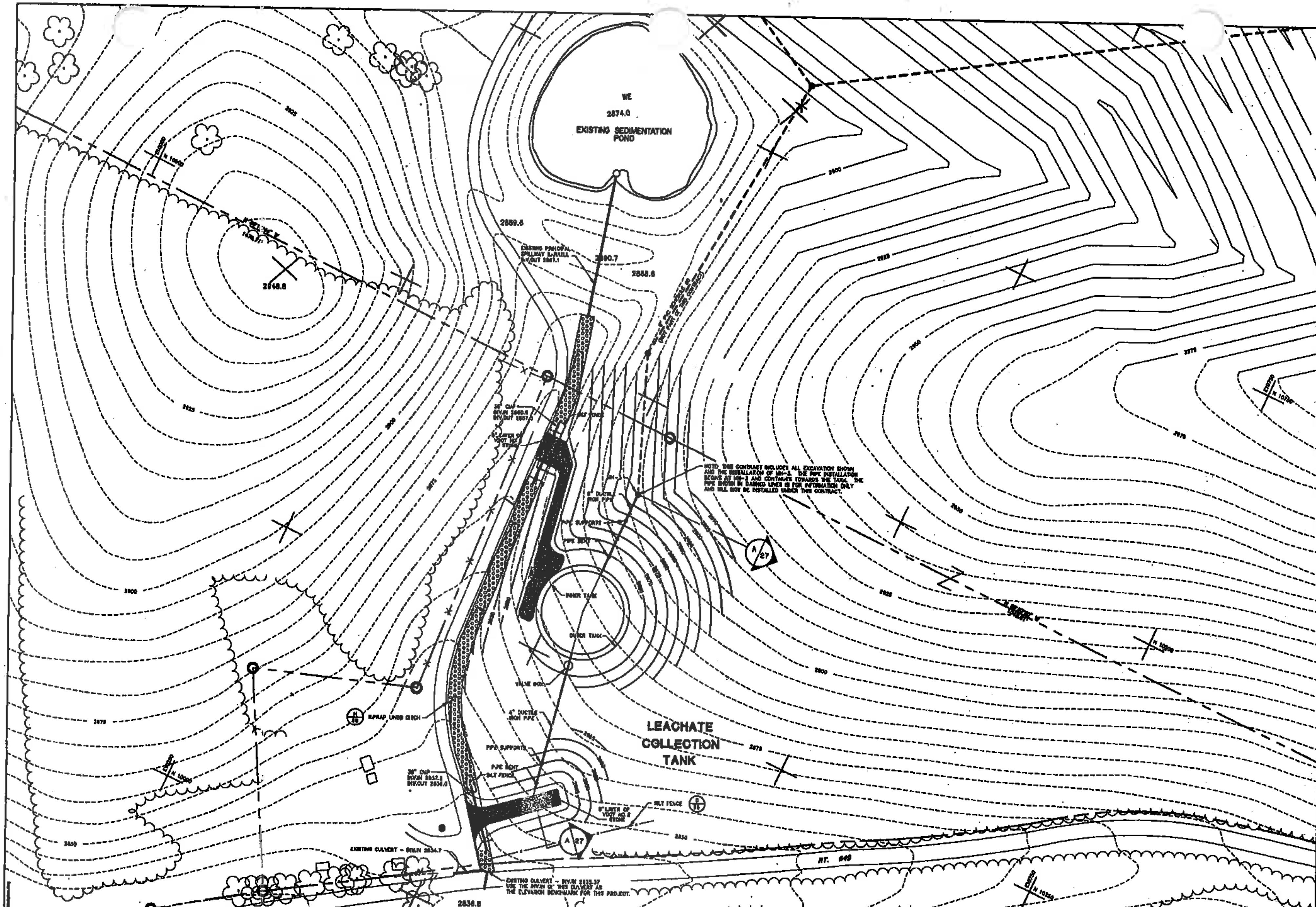
JOYCE

SCALE	PROJECT NO.
AS SHOWN	189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

LEACHATE LINE PROFILES

DRAWING NO. 25



DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP
													SUBMISSION TO VDOE				
													SUBMISSION TO VDOE				
													TANK CONSTRUCTION PLANS				

DESIGNED
DRAWN
CHECKED
APPROVED
DATE

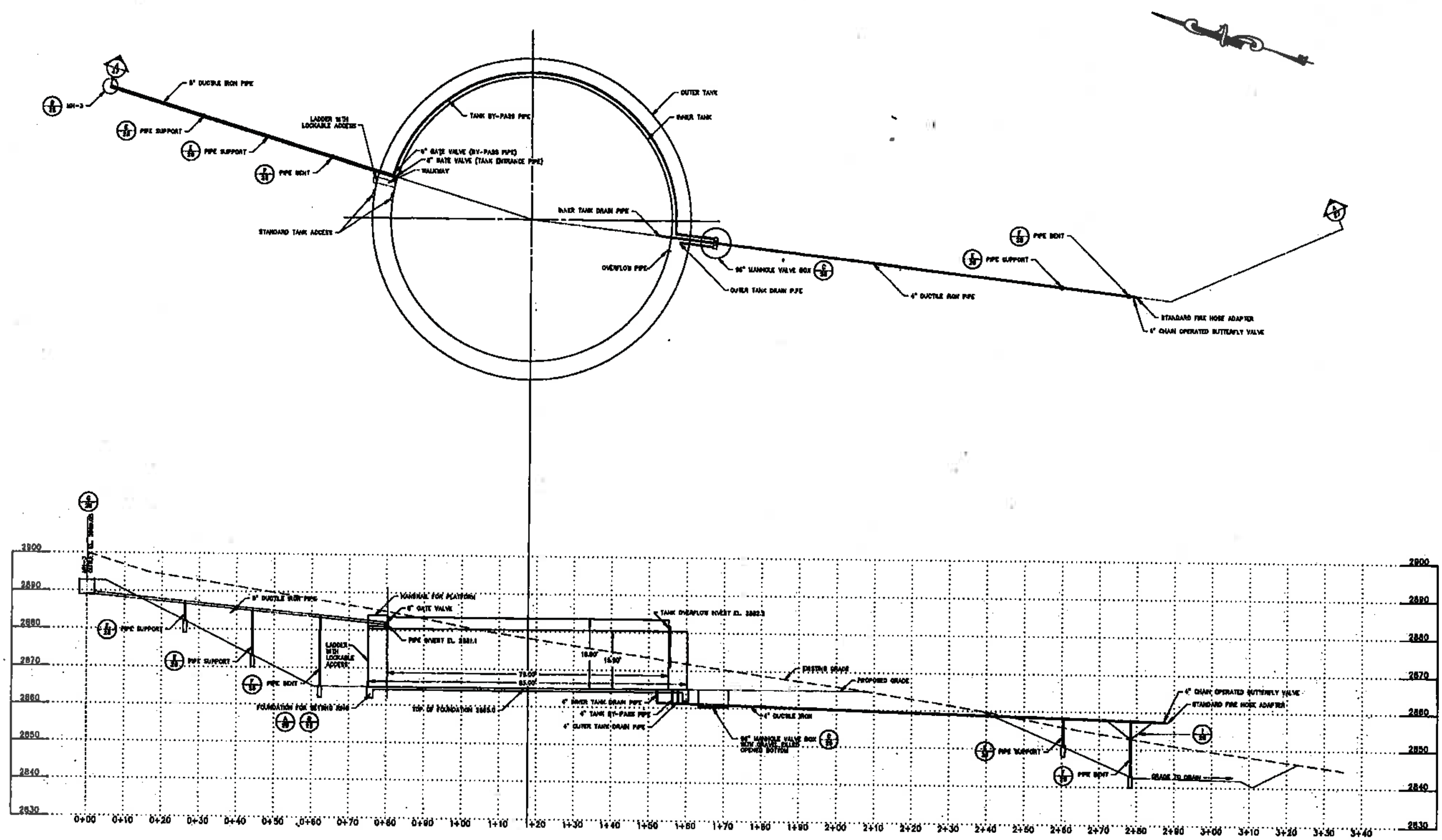
JOYCE

SCALE	PROJECT NO.
1"=30'	189.20

TAZEWELL CO. SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

LEACHATE TANK PLAN
(RECORD DRAWING)

DRAWING NO. 26



SECTION A–A

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	AP

DESIGNED
DRAWN
CHECKED
APPROVED
DATE

JOYCE

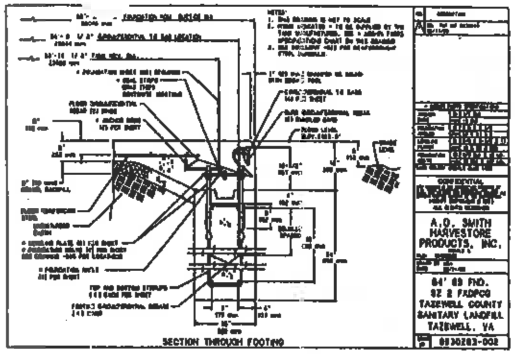
SCALE: 1"=10'

PROJECT NO. 189.10

TAZEWELL CO. SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

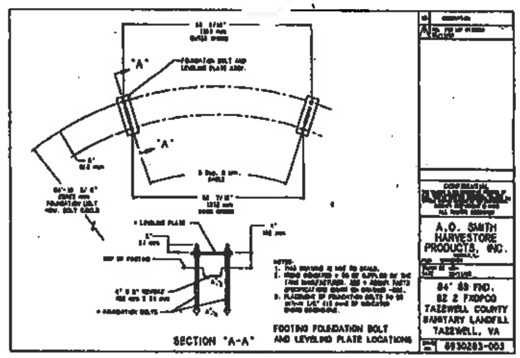
LEACHATE TANK PLAN & PROFILE
(RECORD DRAWING)

DRAWING NO. 27



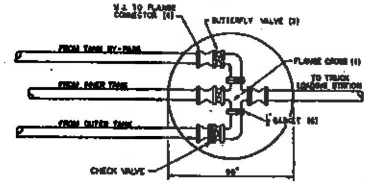
FOUNDATION FOR SETTING RING

(A)



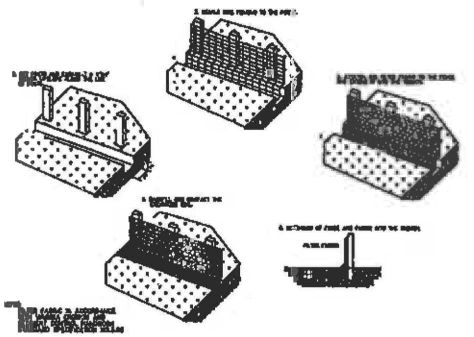
FOUNDATION FOR SETTING RING

(B)



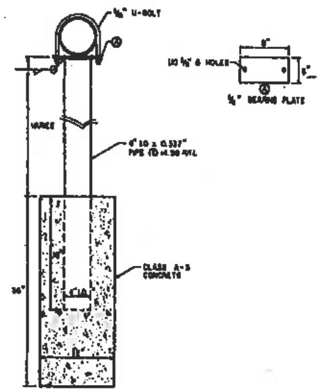
VALVE BOX DETAIL

(C)



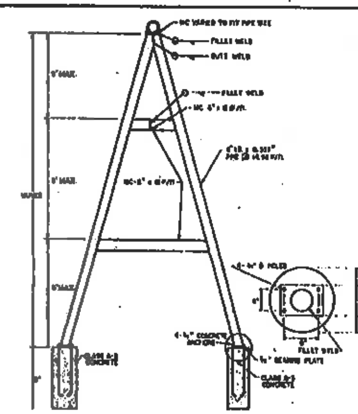
CONSTRUCTION OF A SILT FENCE

(D)



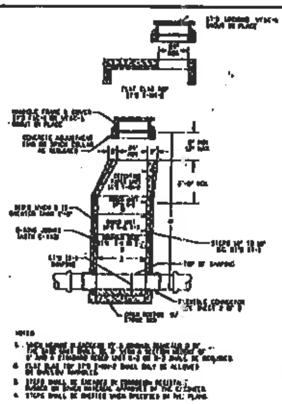
PIPE SUPPORT DETAIL

(E)



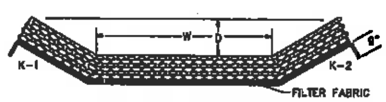
PIPE BENT DETAIL

(F)



PRECAST CONCRETE MANHOLE

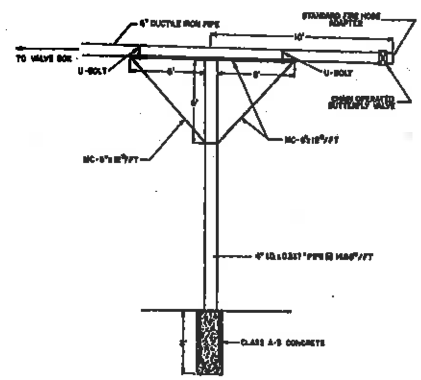
(G)



DITCH PARAMETERS
W = 4 FT
D = 2 FT
K-1 = 2:1
K-2 = 2:1
RIPRAP = CLASS AI
DEPTH OF RIPRAP = 2 FT

RIPRAP LINED DITCH

(H)



(I)

DATE	REVISIONS AND RECORD OF ISSUE
[illegible]	Revised Submission to VDEQ
[illegible]	SUBMISSION TO VDEQ
[illegible]	TANK CONSTRUCTION PLANS

DESIGNED
DRAWN CADD
CHECKED
APPROVED
DATE

JOYCE

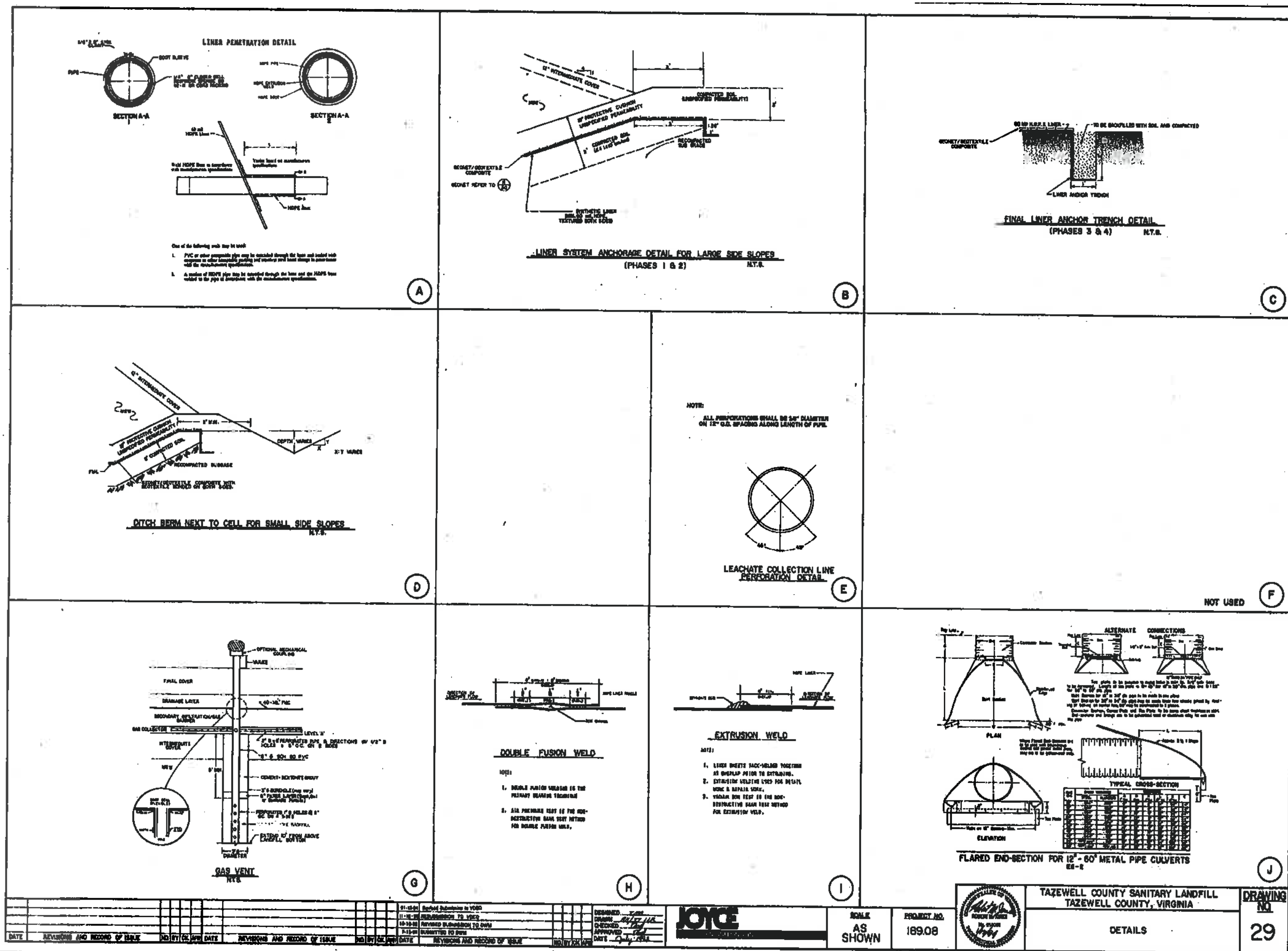
SCALE: NTS

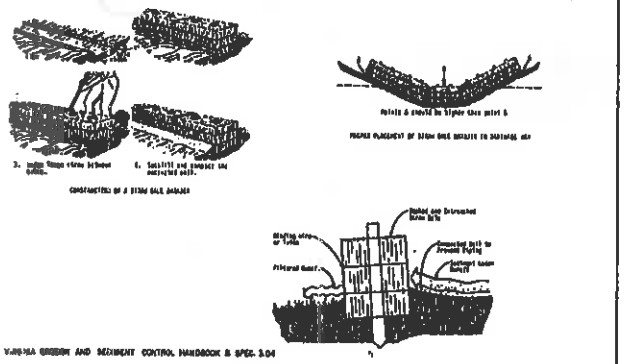
PROJECT NO. 189.20

TAZEWELL CO. SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

TANK CONSTRUCTION DETAILS
(RECORD DRAWING)

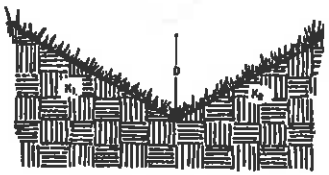
DRAWING NO. 28


LINER PENETRATION DETAIL
SECTION A-A
A
LINER SYSTEM ANCHORAGE DETAIL FOR LARGE SIDE SLOPES
(PHASES 1 & 2)
N.T.S.
B
FINAL LINER ANCHOR TRENCH DETAIL
(PHASES 3 & 4)
N.T.S.
C
DITCH BERM NEXT TO CELL FOR SMALL SIDE SLOPES
N.T.S.
D
LEACHATE COLLECTION LINE
PERFORATION DETAIL
E
NOT USED
F
GAS VENT
N.T.S.
G
DOUBLE FUSION WELD
H
EXTRUSION WELD
I
FLARED END-SECTION FOR 12" - 60" METAL PIPE CULVERTS
J
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA
DETAILS
SCALE
AS SHOWN
PROJECT NO.
189.08
DRAWING NO.
29
JOYCE
REVISIONS AND RECORD OF ISSUE



VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK & SPEC. 3.04

(K)

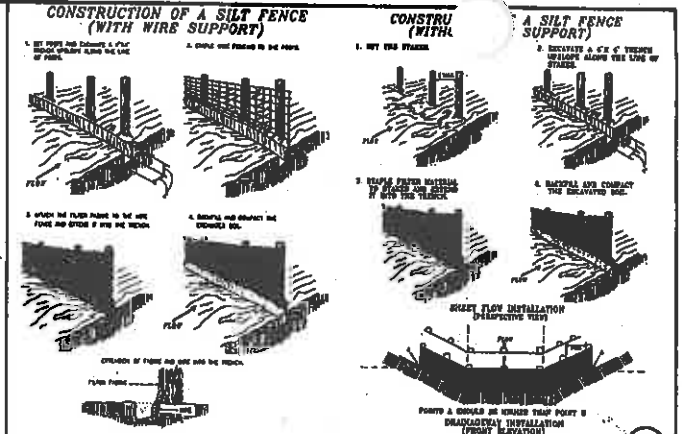


Typical Grass-Lined Ditch

TYPICAL RIP-RIP LINED TRAPEZOIDAL DITCH

PER VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK

(L)



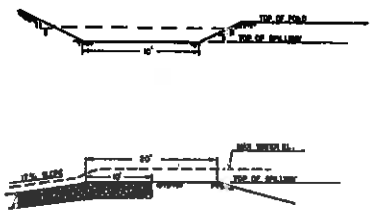
CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)

SHEET FLOW INSTALLATION (PERSPECTIVE VIEW)

DRAINAGEWAY INSTALLATION (FRONT ELEVATION)

VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK & SPEC. 3.05

(M)



EMERGENCY SPILLWAY DETAIL

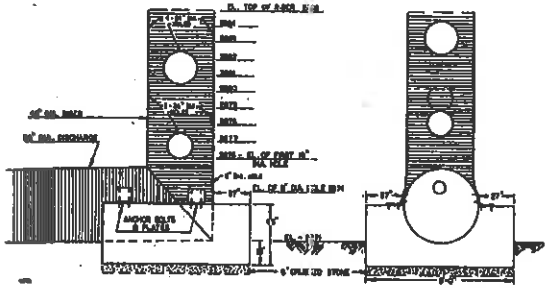
(N)

ENTRANCE CHANNEL DETAIL

(O)

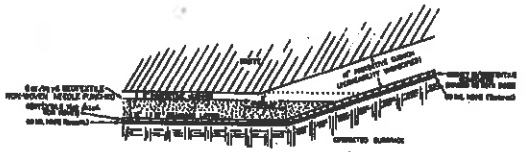
NOT USED

(P)



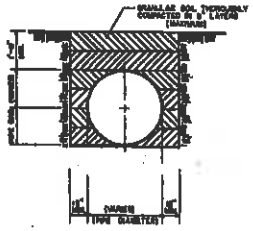
RISER & ANCHOR DETAIL

(Q)



LINER BOTTOM / SLOPE INTERFACE
N.T.S.

(R)



PIPE BEDDING DETAIL
NTS

(S)

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK.	APP.
01-12-04	Revised Submission to VDEQ				
11-12-03	REVISED SUBMISSION TO VDEQ				
10-16-03	REVISED SUBMISSION TO DMV				
1-16-03	SUBMITTED TO DMV				

DESIGNED
DRAWN
CHECKED
APPROVED
DATE

JOYCE

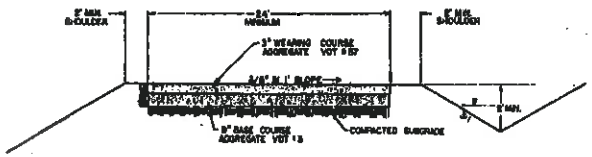
SCALE: AS SHOWN

PROJECT NO.: 169.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

DETAILS

DRAWING NO. 30

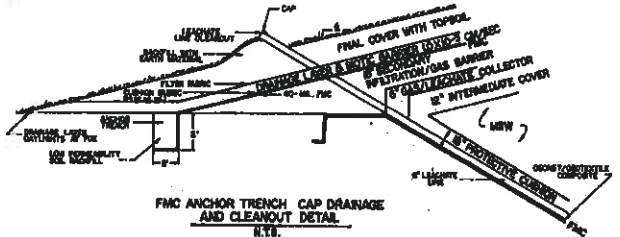


TYPICAL ACCESS ROAD DETAIL
N.T.S.

T

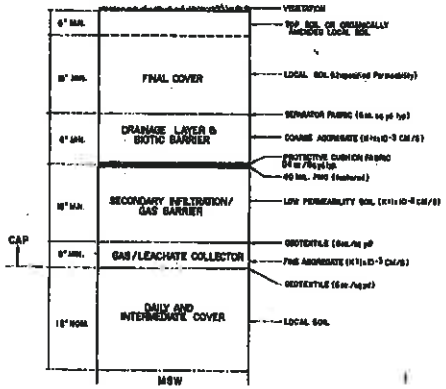
NOT USED

U



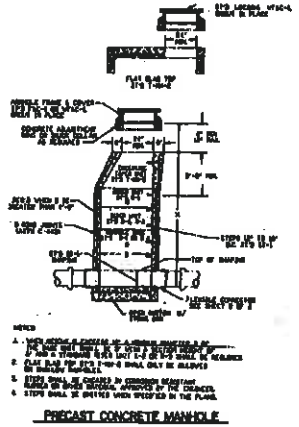
FMC ANCHOR TRENCH CAP DRAINAGE AND CLEANOUT DETAIL
N.T.S.

V



TYPICAL CAP CROSS-SECTION
N.T.S.

W

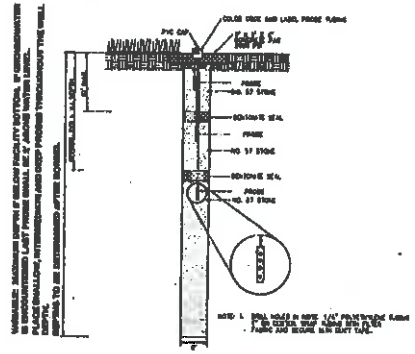


PRECAST CONCRETE MANHOLE

X

NOT USED

Y



GAS DETECTION PROBE

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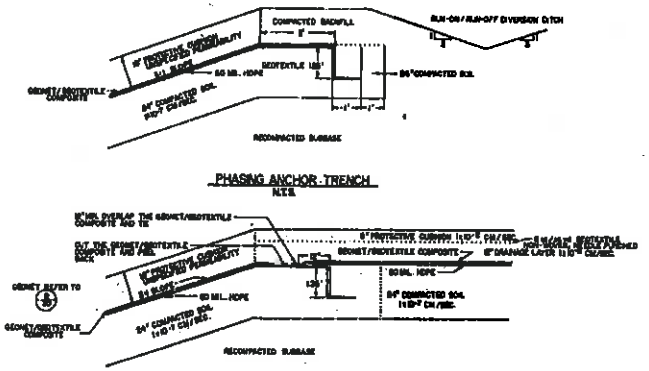
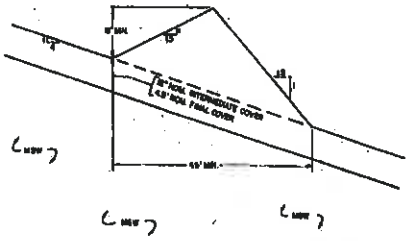


PHASING ANCHOR TRENCH
N.T.S.

LINER PHASING WELD DETAIL
N.T.S.

AA



DIVERSION DIKE
N.T.S.

If the channel slope is less than or equal to 5%, vegetate channel and no other stabilization is required.

If the channel slope is greater than 5%, the channel shall be stabilized in accordance with STD & SPEC 3.17, Stormwater Conveyance Channel, of the Virginia Erosion and Sediment Control Handbook, latest edition.

BB

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CHK'D
8-10-21	Revised Submission to VDEQ			
12-10-21	REVISED SUBMISSION TO VDEQ			
2-11-22	REVISED SUBMISSION TO VDEQ			
7-11-22	SUBMITTED TO VDEQ			

DESIGNED: TMC/BMJ
DRAWN: LH
CHECKED: BMJ/TMC
APPROVED: BMJ
DATE: 11-15-21

JOYCE

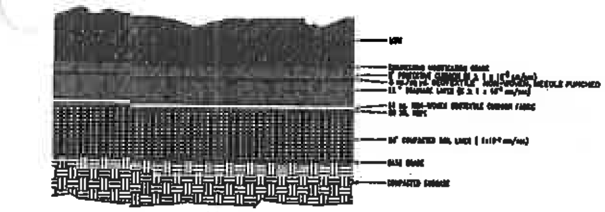
SCALE: AS SHOWN

PROJECT NO.: 189.08

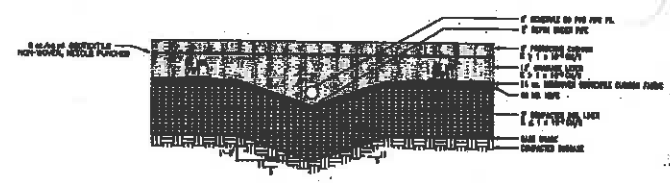
TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

DETAILS

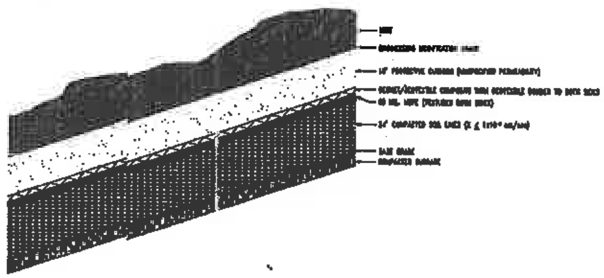
DRAWING NO.: 31



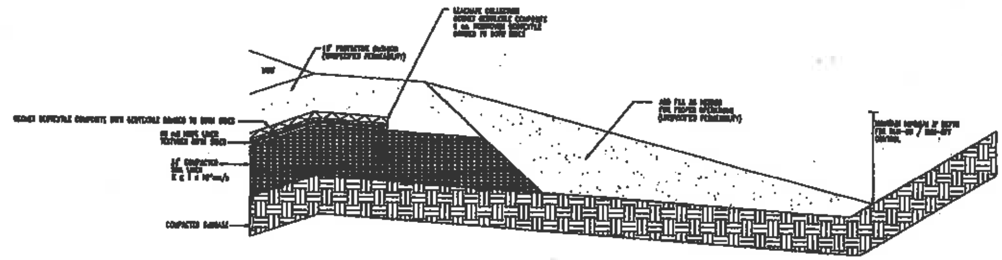
COMPOSITE LINER DETAIL-CELL BOTTOM (A)



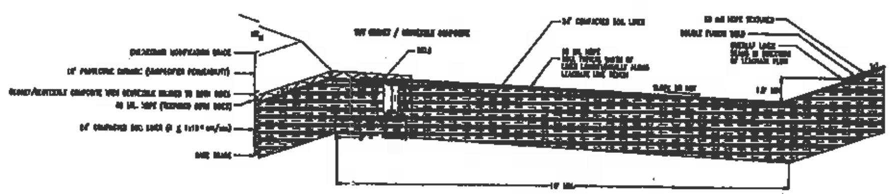
LEACHATE COLLECTION TRENCH DETAIL FOR CELL BOTTOM (B)



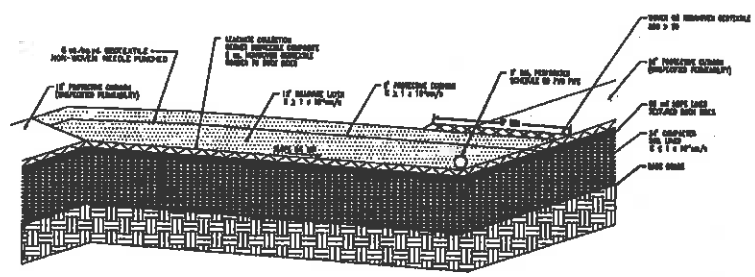
LINER DETAIL - SIDE SLOPES (C)



INTERMEDIATE ANCHOR AT LEACHATE LINE BENCH (D)

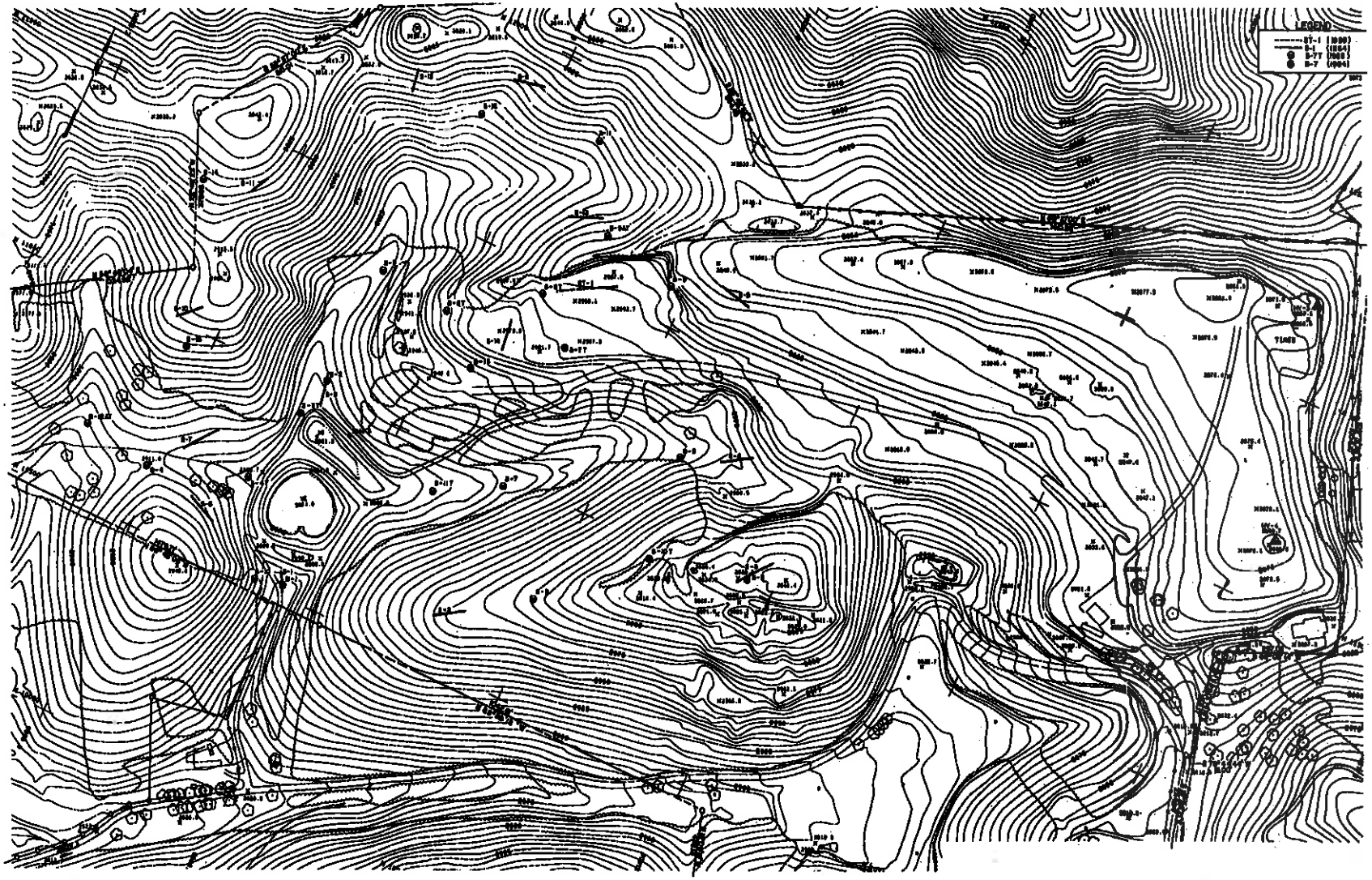


LINER TIE-IN DETAIL ON LEACHATE LINE BENCHES (E)



LEACHATE LINE BENCH LINER DETAIL (F)

DATE	REVISIONS AND RECORD OF ISSUE	DESIGNED / DRAWN / CHECKED / APPROVED / DATE	JOYCE	SCALE AS SHOWN	PROJECT NO. 189.08	TAZEWELL COUNTY SANITARY LANDFILL TAZEWELL COUNTY, VIRGINIA — DETAILS	DRAWING NO. 32



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			9-13-04	Revised Submission to VDEQ				
			6/15/05	RESUBMITTAL TO VDEQ				
			10-15-05	REVISED SUBMISSION TO DEQ				
			2-28-06	SUBMITTAL TO DEQ				

ORIGINATED
DRAWN
CHECKED
APPROVED
DATE

Princeton, W.V.

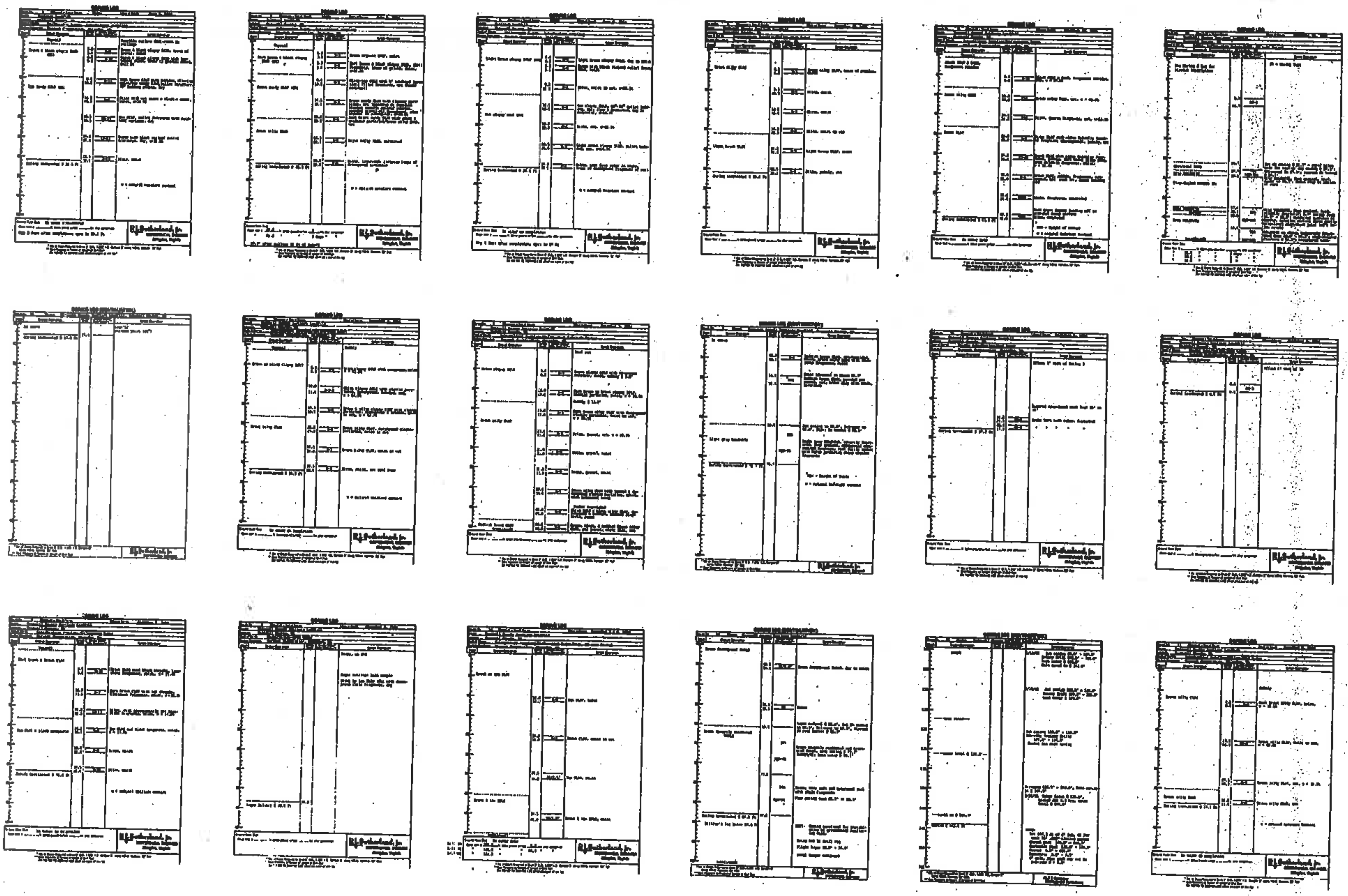
SCALE: 1" = 100'

PROJECT NO.: 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

LOCATIONS OF BORINGS & SEISMIC LINES

DRAWING NO. 33



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DESIGNED
DRAWN
CHECKED
APPROVED
DATE

JOYCE

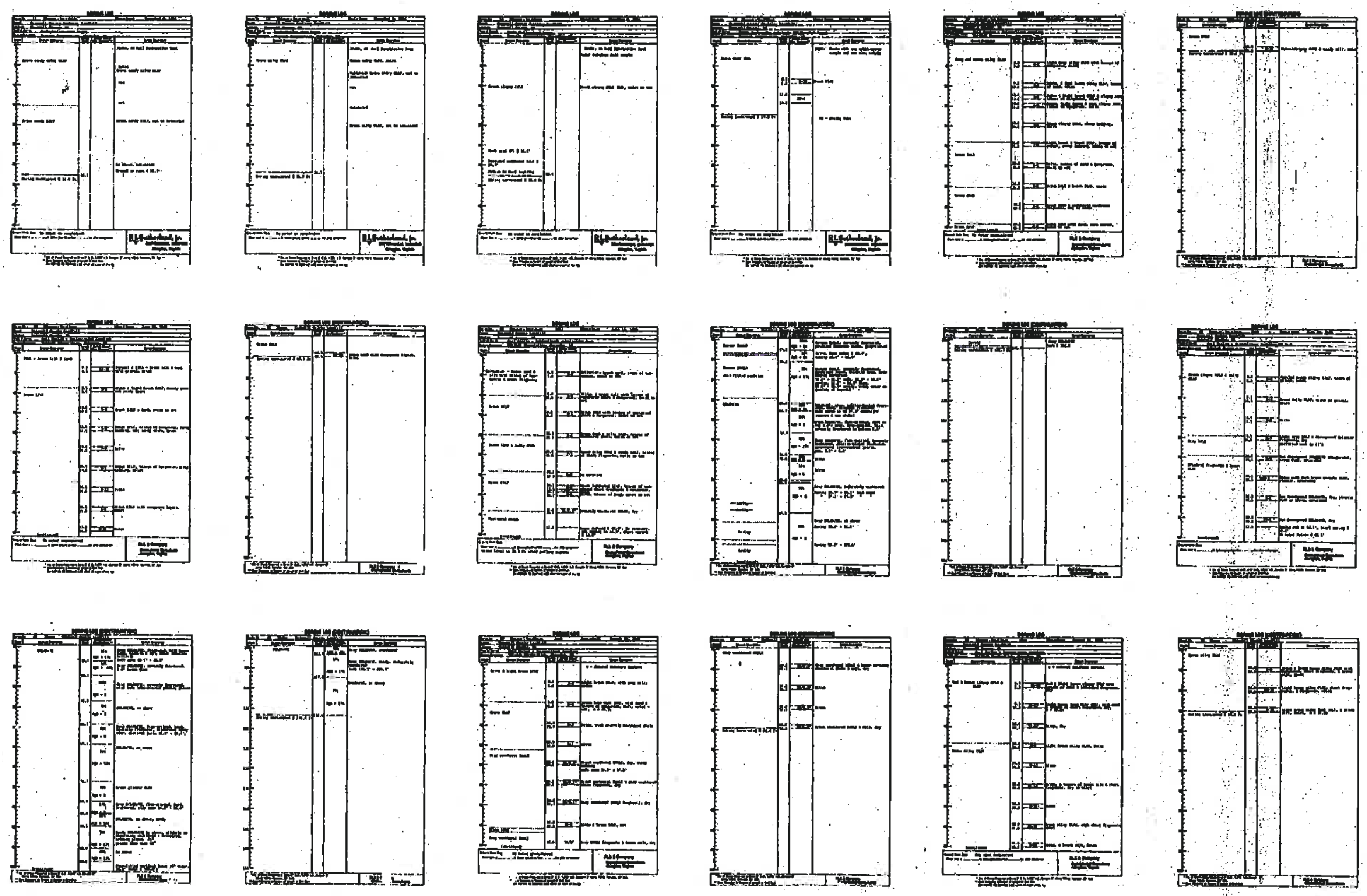
SCALE
N.T.S.

PROJECT NO.
189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

SOIL BORING LOGS

DRAWING NO.
34



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												[illegible]	Revised Submission to VDEQ				
												[illegible]	RESUBMISSION TO VDEQ				
												[illegible]	REVISED SUBMISSION TO DWM				
												[illegible]	SUBMITTED TO DWM				

DESIGNED ___
DRAWN ___
CHECKED ___
APPROVED ___
DATE ___

JOYCE

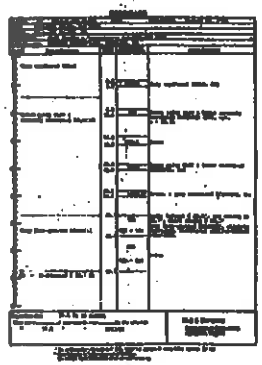
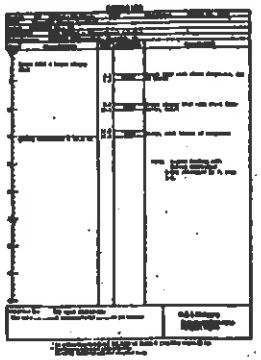
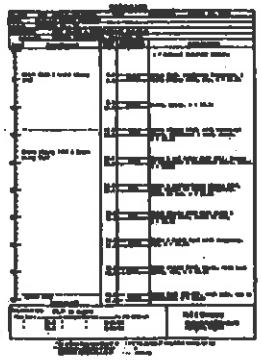
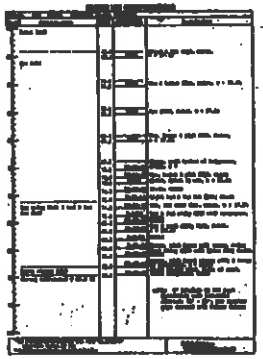
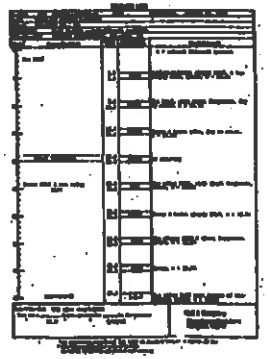
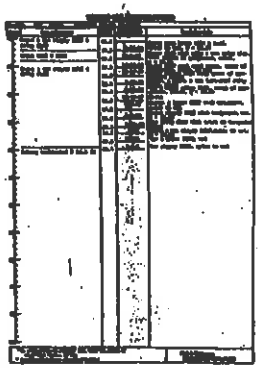
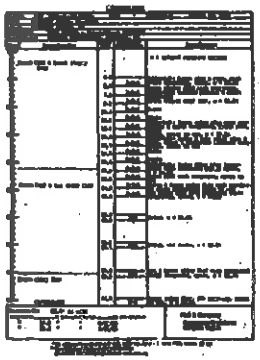
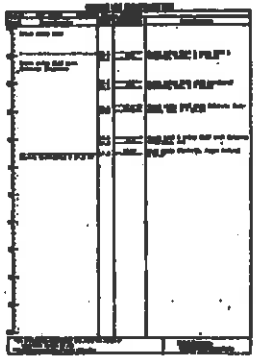
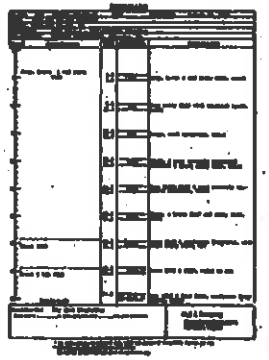
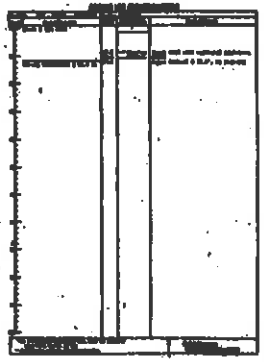
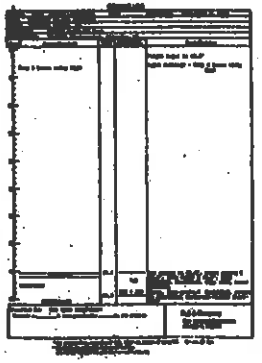
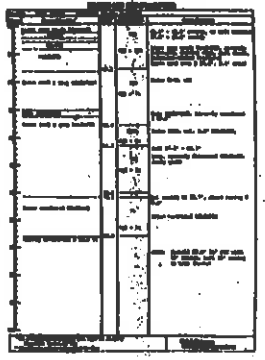
SCALE: N.T.S.

PROJECT NO.: 189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

SOIL BORING LOGS

DRAWING NO. 35

	N.T.S.	189.08	TAZEWELL COUNTY SANITARY LANDFILL TAZEWELL COUNTY, VIRGINIA SOIL BORING LOGS	DRAWING NO. 36

PERMIT MODULES XII AND XIII

CLOSURE AND POST-CLOSURE CARE

Att: Henry Murray

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
Fax (804) 698-4500 TDD (804) 698-4021
http://www.deq.state.va.us

Dennis H. Treacy
Director

(804) 698-4000
1-800-592-5482

August 30, 1999

SUBJECT: Approval of closure and post-closure plans

Dear Landfill Owner or Operator:

Section 10.1-1410.2 of the Code of Virginia was amended during the 1999 session of the General Assembly to require closure plans for solid waste landfills to be approved. Therefore, effective July 1, 1999, prior to closure of any solid waste landfill or of any portion of a landfill, the closure plan for that facility must be reviewed and approved by the Department of Environmental Quality (DEQ).

In accordance with 9 VAC 20-80-560.A of the Virginia Solid Waste Management Regulations (VSWMR, 9 VAC 20-80-10, et seq.), the Department must be notified of the intention to close a facility at least 180 days prior to the anticipated date of closing. In order to allow adequate time for review and approval, a closure plan that is consistent with the requirements of VSWMR must be submitted to the Department along with the notice of intent to close (180 days prior to the anticipated date of closing) for those landfills that are nearing final closure. For landfills that intend to close a portion of the facility but will continue to accept waste, the closure plan should be submitted for approval at least 180 days prior to the beginning closure activities.

No closure plan need be submitted either if all portions of a landfill are included in a solid waste management facility permit that contains all of the elements required by 9 VAC 20-80-520 of VSWMR, or if the closure plan has been previously reviewed and formally approved by the Department.

Closure plans must be submitted for all landfills whose closure plans have not been approved previously by the Department. If a landfill has a permit consistent with 9 VAC 20-80-520 of VSWMR that pertains to only part of the landfill, the closure plan for the excluded area may be addressed either by amending the permit or by submitting a stand-alone closure plan for the landfill unit that does not have an approved closure plan.

Please be reminded that the requirements in Part V of VSWMR require the submission of a request to use an alternate final cover design at least 180 days prior to the beginning of closure activities.

If you have any questions regarding this matter, please contact me, at 804-698-4214, or John Godfrey at 804-698-4258.

Sincerely,

E. Paul Farrell, Jr.
Environmental Engineer Consultant

Joe -
Any Action
needed?
Thanks
Sally

TABLE OF CONTENTS

VII. CLOSURE AND POST-CLOSURE

This Closure Plan is provided in response to Section 2.4.B.3., VR 672-20-10. A final, detailed Closure Plan will be submitted to the Department of Environmental Quality at least 180 days prior to final closure of the facility.

A. CLOSURE ACTIVITIES

The facility will be closed in accordance with the requirements of Part V of the Virginia Solid Waste Management Regulations (VR 672-20-10).

1. CLOSURE PLAN TIME FRAMES

As updated, final Closure Plan will be submitted to the Department of Environmental Quality at least 180 days prior to final closure of the facility. Closure of the facility will be completed in accordance with the approved Closure Plan and within 6 months after receiving the final volumes of waste.

2. CLOSURE PERFORMANCE STANDARD

Closure of the facility will be conducted in a manner that minimizes the need for further maintenance and controls, minimizes or eliminates to

the extent necessary to protect human health and the environment, the post-closure escape of uncontrolled leachate, surface runoff, or waste decomposition products to the groundwater, surface water, or decomposition gas migration to the atmosphere.

a. POST-CLOSURE MAINTENANCE

Post-closure maintenance and monitoring shall be performed at the Tazewell County Sanitary Landfill for a period of 30 years after final closure, unless modified by a Variance, or for as long as leachate is generated, whichever is later. This monitoring will include periodic sampling of groundwater, methane testing and visual monitoring system. Whenever possible, maintenance indicated by the monitoring program will be initialized within 24 hours and no later than 30 days by all available personnel, equipment, and resources. Necessary resources for the performance of maintenance will be available from the County. Performance of unusual or extreme maintenance resulting from calamities or vandalism shall be conducted according to emergency contract service procedures established by the County.

b. CONTROL OF WASTE DECOMPOSITION PRODUCTS

A geomembrane and soil cover will be constructed that minimizes infiltration of rainfall into the waste cell. A migration zone beneath this final cover will convey lateral leachate movement to the leachate collection system. The leachate collection system will convey the leachate to the existing leachate

holding tank for later removal. This migration zone will also convey landfill gas migration to the gas removal vents constructed to penetrate the final cover. Unless altered by a modification or amendment to this Closure Plan, the gas will be passively released into the atmosphere. By prevention of infiltration, the final cover will immediately reduce the quantity of leachate generated at the facility. This is expected to control the escape of leachate into the groundwater. Groundwater monitoring wells located around the perimeters of the closed area will provide monitoring points for determining the presence of contamination in the groundwater moving from the site. Monitoring and appropriate remedial/corrective actions, will be performed according to Section 5.1.D. and 5.7, VR 672-20-10.

c. CONTROL OF SURFACE RUNOFF

A drainage zone above the final cover will convey surface infiltration to perimeter diversion ditching. Above the drainage zone, a layer of soil and vegetative cover will control erosion of the covering system. Surface runoff from the areas will enter diversion ditching. Diversion ditching will convey infiltration and surface runoff to silt ponds designed for removal of sediment prior to discharge into the receiving water of the State. All erosion/sediment control structures have been designed to carry the peak flows from a 25-year, 24-hour storm event.

d. INVENTORY REMOVAL AND DISPOSAL

All solid waste remaining will be disposed at the site prior to final closure. No solid waste will be removed from the site.

e. CLOSURE OF DISPOSAL UNITS

Waste that has been deposited in the disposal areas of the Tazewell County Sanitary Landfill will remain in place after closure. As described in Section 1.A.2 above, closure of the facility will be accomplished by construction of a final cover system over the waste disposal areas.

(1) CLOSURE OF SURFACE IMPOUNDMENTS

No surface waste impoundments as described in Section 6.6.B., VR 672-20-10, will be closed by this plan.

(2) CAP DESIGN

The closure cap, meeting the requirements of VR 672-20-10, will be constructed as described in the following sections. Supporting cap stability calculations have been performed and are found in Appendix H of the Design Report.

(a) CAP LAYERS

- Leachate and Landfill Gas Collector - A layer consisting of 6 inches of fine aggregate having a coefficient of permeability of no less than $1x10^{-2}$cm/sec will be placed above a 6-ounce filter fabric (geotextile) placed directly over the existing intermediate cover. A leveling course of local soil will be placed on the existing

intermediate cover as needed to provide a uniform base for construction of the final cap. This 6-inch layer will act as a migration zone for lateral movement of leachate and landfill gas. A 6-ounce filter fabric will separate the migration zone from the overlying infiltration barrier (see below).

- Infiltration Barrier - A composite infiltration barrier consisting of a textured 40 mil flexible membrane cap (FMC) will be installed above 18 inches of locally available, low permeability soil compacted to achieve its minimum hydraulic conductivity as determined by laboratory testing (less than $1x10^{-5}$cm/sec preferred). This layer will be directly above the leachate/gas collector.
- Drainage Layer and Biotic Barrier - A layer consisting of 6 inches of coarse aggregate having a coefficient of permeability no less than $1x10^{-2}$cm/sec will be placed above the infiltration barrier. This layer will facilitate drainage away from the infiltration barrier and into the primary drainage ditches. It will also serve as a physical barrier to burrowing animals. A 14-ounce cushion fabric will be installed between the drainage layer and the underlying FMC to protect the FMC from puncture.

- Soil and Vegetative Cover - A layer consisting of 18 inches of local soil with unspecified permeability will be placed on top of the 6-ounce filter fabric. A layer of topsoil or organically amended local soil will be placed above the 18 inches of inorganic soil. This layer of topsoil will be at least 6 inches in thickness. The topsoil and local soil cover will not be compacted to a high degree in order to promote vegetative growth. Soil tests will be conducted prior to seeding operations to determine the proper seeding and fertilizer mixtures needed for proper vegetative growth.

(b) VEGETATION

After placement of the final cover, the closed area will be seeded with a vegetative cover. Seeding will be applied in accordance with the Virginia Erosion and Sediment Control Handbook and recommendations from the extension office in the County in which the facility is located.

Seeding, as outlined in the Technical Specifications, mulch, and erosion netting will be applied immediately to disturbed areas to control erosion or to protect these areas with temporary mulch until the next suitable time for seeding. By seeding the closed areas with good competent vegetation mixes in a timely manner and constructing final slopes no greater than 25 percent, potential erosion problems

will be minimized. Prior to seeding operations, the final topsoil layer will be analyzed to determine the amount, if any, of soil amendments necessary. These amendments will be applied as part of the seeding plan. Erosion netting will be used to protect mulch and new growth until a mature stand of vegetation is established. The vegetative cover will be inspected monthly and an assessment of the vegetative cover will be made.

If the inspections indicate that vegetative cover is sparse or non-existent, revegetation of the affected area will be performed within a reasonable period of time.

(c) MAINTENANCE NEEDS

Good competent stands of vegetation will alleviate erosion and sediment problems. Prudent construction and operational practices will alleviate potential settling and leachate seeps.

If any problems are discovered, they will be corrected as soon as possible to help protect the environment and minimize impacts to public health.

Drainage material used in the cap drainage layer will consist of 6 inches of coarse aggregate stone with a permeability no less than 1×10^{-3} cm/sec.

(d) DRAINAGE AND EROSION

Drainage and erosion will be controlled by a combination of drainage layers incorporated in the final cover, drainage ditches, silt ponds, vegetation and construction practices to enhance the operation and maintenance of this system. Construction and design will be in accordance with the applicable section of the Virginia Department of Transportation Drainage Manual, and Virginia Erosion and Sediment Control Handbook.

(e) DRAINAGE MATERIALS

Drainage material used in the cap drainage layer will consist of 6 inches of coarse aggregate stone with a permeability no less than $1x10^{-3}$cm/sec.

(f) FINAL COVER DRAINAGE

Drainage calculations for the final cover can be found in the Appendix Design Manual. Drainage will be controlled by perimeter ditches containing the entire closed area. These ditches will receive infiltration and runoff from the final cap and will discharge into the silt ponds. The design storm for all calculations was a 25-year, 24-hour rainfall event.

3. SETTLEMENT, SUBSIDENCE, AND DISPLACEMENT

Non-uniform subsidence of a small to moderate magnitude (10 feet or less) is expected at the facility due to consolidation of decaying waste. This type of consolidation could result in compression of the final cover and tensile stresses in cap layers that could lead to cover separation. For this reason, a flexible membrane cap (FMC) is included in the cap as the primary infiltration barrier. A 40 mil FMC is proposed, with a linear low density polyethylene or a fabric-reinforced hypalon material likely to be specified. Compression of the cover may cause localized areas of heaving or folding, but periodic monitoring and maintenance of the cover system will be provided to maintain continued function of the final cover to minimize infiltration.

The closure cap will include a leachate and landfill gas collection layer beneath the cap. This layer will be tied into the leachate collection layer of the composite liner system to ensure that any laterally migrating leachate will be properly collected and removed. See Detail V, Drawing No. 31. Monthly inspections of the final cover will be performed to observe any substantial displacement of the cap as discussed above. Should any substantial displacement of the cap be observed, repairs will be initiated. The intended purpose of the closure cap is to minimize infiltration. This function is not expected to deteriorate significantly over the post-closure period.

4. SOIL BALANCE AND BORROW AREAS

Soils needed for final closure will be obtained from on-site. The Design Report demonstrates the soils balance for the landfill.

5. FREEZE/THAW EFFECTS

Based on a published map of frost depths throughout the United States, the anticipated maximum depth of freeze/thaw effects on the site is 10 to 12 inches. Since at least 24 inches of final cover soil is proposed, which will not be relied upon to reduce infiltration, the effects of freeze/thaw cycles on the closure cap should not be determental to its function.

6. SCHEDULE FOR CLOSURE

An updated, final Closure Plan will be submitted to the Department of Environmental Quality at least 180 days prior to beginning closure. Closure activities will be completed in accordance with the approved Closure Plan and within 6 months after receiving the final volumes of waste.

7. POSTING AND BAITING

At least one sign will be posted at the entrance to the facility notifying all persons of the facility closing. Additionally, a notice prohibiting further receipt of waste materials will be posted at the entrance to the facility. The site will be secured through the use of gates equipped with locks, fencing, and natural barriers.

8. NOTIFICATION

Upon completion of closure, the Tazewell County Clerk of the Circuit Court will be provided with a survey plot proposed by a registered land surveyor indicating the location and dimensions of landfill disposal

area monitoring well locations and restrictions on further disturbance of the site. A notation will be recorded on the deed to the facility property to notify any potential purchaser of the property that the land has been used to manage solid waste. A copy of the deed notation as recorded will be forwarded to the Department of Environmental Quality for their records.

9. CERTIFICATION

Upon completion of the closure of the site, a certificate of closure will be forwarded to the Virginia Department of Environmental Quality. This certification will state that the site was closed in accordance with the approved Closure Plan outlined in the Permit and Regulations.

B. POST-CLOSURE PLAN

1. CONTACT

Questions and problems which may occur during the post-closure period will be handled by the Tazewell County Environmental Control Department.

Contact Person: J.S. "Sandy" Etter, Department Head
Environmental Control Department
Owner: Tazewell County
Address: Administration Building
315 School Street, Box 2
Tazewell, Virginia 24651
Phone Number: (703) 988-7541

2. SECURITY

Access to the site will be controlled by use of barrier and gates at roads to the property. Throughout the active life of the expansion, barriers, and gates will be erected to control access to and from the property and active disposal cells. These access control devices will be maintained throughout the closure and post-closure period and inspected as part of the monthly inspection program.

All barrier and gates will be clearly marked with signs stating the name of the facility and that solid waste was disposed on this site.

No solid waste will be left exposed after completion of the landfill closure. Therefore, no problems should arise to wildlife or the environment and, as stated above, through proper access control, no problems should arise to affect the public health and safety.

C. MONITORING PLAN

Monitoring of such items as groundwater, surface water, leachate collection, gas migration, and vector control will be performed in accordance with applicable regulations and during scheduled site inspections.

1. HYDROGEOLOGIC REPORT

The hydrogeologic report for the site is included in the Part A Application already on file at the Department of Environmental Quality.

2. GROUNDWATER MONITORING

Groundwater monitoring activities at the site will continue throughout the post-closure period for the site.

After the 30-year post-closure period for the site is over, if the statistical analysis of the groundwater does not indicate any degradation to the quality of the groundwater, a request will be made to terminate the groundwater monitoring program at the site. However, upon receipt of permission to terminate the groundwater monitoring program, all groundwater monitoring wells will remain open so that future monitoring can be resumed, if so desired.

3. SURFACE WATER MONITORING

Surface water monitoring and control will continue at the site throughout the post-closure period. Surface water diversion ditches and the silt ponds will remain at the site to control surface water runoff and erosion. At the end of the 30-year post-closure period, a final determination of a suitable vegetative cover will be made at the site. If a good stand of vigorous vegetation is present at the site, a request will be made to the Virginia Department of Environmental Quality to remove the sedimentation structures.

The pond embankment will be excavated, the below ground pond areas filled, and the discharge structures removed. The area around the ponds will be graded to facilitate the continued surface water runoff and eliminate the possibility of ponding. Straw bales will be placed in the bottom of the drainageways and seeding will be done to minimize the potential for erosion and subsequent downstream sedimentation.

Surface water monitoring will be conducted at all discharge points from the property in accordance with VPDES General Permit for stormwater discharges associated with industrial activity.

4. LEACHATE AND LANDFILL GAS MANAGEMENT

Leachate management will continue throughout the post-closure period of the site. Inspections will be made monthly to ensure the safe operation of the facility and to maintain the collection and storage systems throughout the life of the site and post-closure period. Site inspections will be performed to detect any problems from leachate seeps. Any surface seeps will be addressed by excavating and repairing the final cover in the areas of the seeps. Visual inspections shall be conducted in the near vicinity of the seeps to determine if additional control or remedial action such as surface water diversions or leachate interceptor drains and/or cut-off trenches are necessary to eliminate the problem.

The migration zone installed beneath the final cover will convey landfill gas to the passive venting system where the gas will be released to the atmosphere. Monitoring probes and all other monitoring points outlined in Section V.B., Gas Monitoring System of this Operations and Maintenance Manual, will continue to be monitored on a quarterly basis. Any problems discovered during monitoring will be corrected as promptly as possible. Should the monitoring reveal any buildings on site with a methane gas level of 1.25 percent or any property line have a level of 5.0 percent, a collection system will be designed for adequate reduction of methane gas to the atmosphere.

5. MAINTENANCE PLAN

The site will be maintained throughout the post-closure period. If during site inspections problems are found, remedial action will be taken to correct the problem by the fastest means available. The work will be scheduled to correct the problem dependent upon the severity of the

problem, but will be started within 30 days of the discovery of the problem area.

Maintenance work may entail such items as fence or gate repair, adding additional fill material and regrading to repair settled areas, revegetation, flushing and cleaning leachate system lines, and repairs to erosion control structures.

6. TRAINING

Personnel responsible for performing site inspections and maintaining the site will be competent individuals trained in the skills necessary to perform their job. Personnel will continue to receive training as new programs become available.

The landfill manager shall be certified in accordance with Statute 22.1, Title 54.1, Code of Virginia, and VR 674-01-02. Said certified landfill manager shall demonstrate proficiency in understanding and applying the solid waste regualtions VR-672-20-10.

Groundwater and surface water monitoring will be performed by a qualified firm and laboratory analysis will be performed by a certified laboratory.

If major problems arise, competent engineering and construction firms will be brought in to assess and recommend ways to alleviate problems.

7. POST-CLOSURE LAND USE

The primary land use for the site after the closure of the landfill will be for open dormant meadowland.

D. INSPECTION PLAN

Inspection programs will be conducted throughout the post-closure period for the site. These inspections will occur monthly unless problem areas are detected. If problems arise, the inspections will be made more frequently and the interval will depend upon the severity of the problem. The potential effect to the public and environment will be a factor in determining the inspection interval.

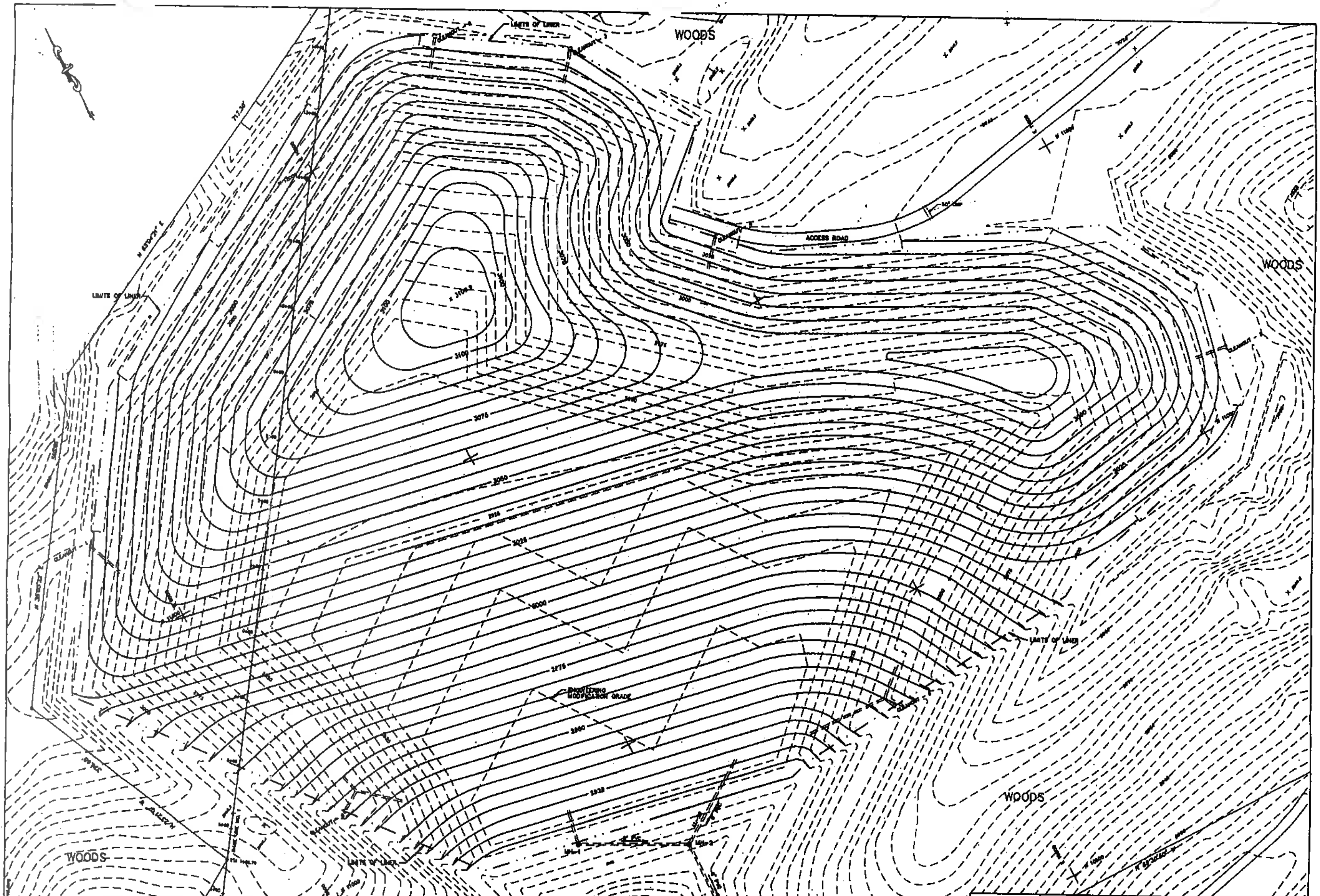
Areas to be included in the monthly inspection will be as follows:

- Access and security control;
- Erosion/sediment damage;
- Final cover settlement, subsidence and displacement;
- Vegetative cover;
- Integrity of surface water drainageways and impoundments;
- Integrity and adequacy of leachate collection and detection systems;
- Groundwater monitoring system;
- Integrity of site benchmarks; and
- Gas migration.

Landfill inspection schedule will be part of Section IV.E.3. Copies of the inspection reports will be kept by Tazewell County.

E. FINANCIAL ASSURANCE

Since the facility is owned and operated by Tazewell County, the Financial Assurance Regulations of Solid Waste Facilities (VR 672-20-1) are not applicable.



DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

DESIGNED / DRAWN / CHECKED / APPROVED / DATE

JOYCE

SCALE	PROJECT NO.
1" = 50'	189.08

TAZEWELL COUNTY SANITARY LANDFILL
TAZEWELL COUNTY, VIRGINIA

FINAL GRADING PLAN

DRAWING NO. 10

PERMIT MODULE X
FINAL DETECTION MONITORING

The Final Detection groundwater monitoring program shall be capable of determining the facility's impact on the quality of groundwater in the uppermost aquifer underlying the facility during the active life of the facility and during the post-closure care period [§ 5.1.D.2.a, VR 672-20-10].

The goal of Final Detection monitoring is to ensure the earliest possible detection of contaminant leakage from the regulated units. Final Detection monitoring requires detected leakage to be characterized and determines if further action is warranted. Final Detection monitoring entails the following:

1. Development of a list of groundwater quality monitoring constituents used to indicate a release from the regulated units.

2. Establishment of sampling and statistical analysis requirements to determine if a release has occurred.

3. Establishment of additional requirements if a statistically significant release occurs.

X.A. MODULE HIGHLIGHTS

This module describes the groundwater monitoring network and Final Detection groundwater sampling and analysis requirements to monitor the waste disposal units described in Module I. The uppermost aquifer underlying the facility is unconfined and resides in a sequence of interbedded dolomites and shales with occasional thin quartzose sandstone interbeds. The strata dip to the southeast at a typical magnitude of approximately 30 to 40 degrees. Regional strike is roughly N60E. Groundwater flow in the phreatic zone is generally along structual strike, indicating the degree of control on flow imposed by bedding planes in this steeply-dipping and interbedded strata. Intraformation faulting is not uncommon and the rock is typically moderately to highly fractured. Although the rock is fractured, a significant degree of bedding control is also anticipated in the vadose zone infiltration. Groundwater flow in the phreatic zone is from northeast to southwest, parallel to structural strike, except in the northwestern part of the site. In that local area, where the new expansion is planned, flow is influenced by a pronounced fracture zone. Groundwater flow converges toward this fracture zone, then moves northward along it to exit the site in the vicinity of MW-7.

The aquifer will be monitored by a network which includes two upgradient (background) monitoring wells and six (6) downgradient monitoring wells. Because groundwater flow is from the existing site toward the new disposal area, and since

the two units essentially coalesce, the facility is to be monitored as a single entity in which the existing and new disposal areas are monitored jointly by the same monitoring system as outlined in this permit.

Monitoring parameters include 15 inorganic constituents and 47 organic constituents. This module also describes conditions regarding statistical analysis and data evaluation, recordkeeping, and special requirements should an Assessment monitoring program become necessary.

X.B. WELL LOCATION, INSTALLATION AND CONSTRUCTION

The permittee shall maintain a groundwater monitoring system as specified below [§ 5.1.D.2.b, VR 672-20-10]:

X.B.1. The permittee shall install and maintain groundwater monitoring wells at the locations specified on the map in Permit Module III (Site Monitoring Plan Sheet, Sheet 15) from the Part B Application and in conformance with Permit Attachment X-1 (Groundwater Monitoring Program) as shown below [§ 5.1.D.3, VR 672-20-10]. Monitoring wells which failed to yield adequate groundwater for sampling and analysis will be replaced with monitoring wells which yield adequate groundwater for sampling and analysis.

Monitoring Wells

Upgradient Wells

MW-4
MW-10

Downgradient Wells

MW-2
MW-3
MW-5
MW-7
MW-8
MW-9

X.B.2. The permittee shall construct and maintain the monitoring wells identified in Permit Condition X.B.1, in accordance with the methodology, plans and specifications presented in Permit Attachment X-1 [§ 5.1.D.3.c, VR 672-20-10].

Module X Requirements

Summary of Wells &
As-Built Info.

X.B.3. All wells which require abandonment shall be plugged and abandoned in accordance with Permit Attachment X-1 (Well Abandonment). Well abandonment methods and certification shall be submitted to the Director within at least 90 days from the date the wells are removed from the monitoring program [§ 7.3.E.1.i and 7.1, VR 672-20-10].

X.B.4. The permittee shall submit to the Director within at least 90 days from the date of the installation, all additional well boring logs, and as-built plans which record the total depth of the well, the surveyed location and elevations of the top of casing and ground surface (or apron), and the length and locations of the screened interval, filter pack, and annular space seal. All dimensions are to be shown on well construction schematics [§§ 5.1.D.3.d, and 7.1, VR 672-20-10].

X.C. MONITORING PARAMETERS AND CONSTITUENTS

X.C.1. The permittee shall monitor the wells described in Permit Condition X.B for the following constituents [§ 5.1.D.5.c.(1), VR 672-20-10]:

Inorganic Constituents
Antimony (Total)
Arsenic (Total)
Barium (Total)
Beryllium (Total)
Cadmium (Total)
Chromium (Total)
Cobalt (Total)
Copper (Total)
Lead (Total)
Nickel (Total)
Selenium (Total)
Silver (Total)
Thallium (Total)
Vanadium (Total)
Zinc (Total)

Organic Constituents
Acetone
Acrylonitrile
Benzene
Bromochloromethane
Bromodichloromethane
Bromoform; Tribromomethane
Carbon Disulfide
Carbon tetrachloride

Chlorobenzene
Chloroethane, Ethyl chloride
Chloroform; Trichloromethane
Dibromochlormethane; Chlorodibromomethane
1,2-Dibromo-3-chlorpropane; DBCP
1,2-Dibromoethane; Ethylene dibromide; EDB
o-Dichlorobenzene; 1,2-Dichlorobenzene
p-Dichlorobenzene, 1,4-Dichlorobenzene
trans-1,4-Dichloro-2-butene
1,1-Dichlorethane; Ethylidene chloride
1,2-Dichlorethane; Ethylene dichloride
1,1-Dichloroethylene; 1,1-dichloroethene; Vinyl Chloride
cis-1,2-Dichloroethylene, cis-1,2-dichloroethene
trans-1,2-Dichloroethylene; trans-1,2-Dichloroethene
1,2-Dichloropropane; Propylene dichloride
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethylbenzene
2-Hexanone; Methyl butyl ketone
Methyl bromide; Bromomethane
Methyl chloride; Chloromethane
Methylene bromide; Dibromomethane
Methylene chloride; Dichloromethane
Methyl ethyl keton; MEK, 2-Butanone
Methyl iodide; Iodomethane
4-Methyl-2-pentanone; Methyl isobutyl ketone
Styrene
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachlorethane
Tetrachloroethylene; Tetrachloroethene; Perchloroethylene
Toluene
1,1-Trichloroethane; Methylchloroform
1,1,2-Trichloroethane
Trichloroethylene; Trichloroethene
Trichlorofluoromethane; CFC-11
1,2,3-Trichloropropane
Vinyl acetate
Vinyl chloride
Xylenes

X.C.2. By no later than six months (180 days) from the date of permit issuance, the permittee shall establish background values for all constituents in Permit Condition X.C.1 in accordance with the following procedures.

X.C.2.a. Background groundwater quality for each monitoring constituent shall be based on data from the first semiannual sampling of all the wells. A minimum of four independent samples from each well (upgradient and downgradient) shall be collected and analyzed for all constituents [§ 5.1.D.5.c.2, VR 672-20-10].

X.C.3. After the first semiannual sampling from permit issuance, the permittee shall sample each well (upgradient and downgradient) to obtain concentrations for the constituents in Permit Condition X.C.1 at least semiannually [§ 5.1.D.5.c.(2) VR 672-20-10]:

X.D. SAMPLING AND ANALYSIS PROCEDURES

The permittee shall use the following techniques and procedures when obtaining and analyzing samples from the groundwater monitoring wells described in Permit Condition X.B [§ 5.1.D.4.a, VR 672-20-10]:

X.D.1. Samples shall be collected using appropriate techniques and as described in Permit Attachment X-1 (Sampling and Analysis Plan).

X.D.2. Samples shall be preserved (and shipped) as appropriate and in accordance with the procedures specified in Permit Attachment X-1 (Sampling and Analysis Plan).

X.D.3. Samples shall be analyzed as appropriate and in accordance with the procedures specified in Permit Attachment X-1 (Sample Analytical Procedures).

X.D.4. Samples shall be tracked and controlled using appropriate chain-of-custody procedures and as specified in Permit Attachment X-1 (Sampling and Analysis Plan).

X.D.5. Samples shall undergo proper quality assurance and quality control (QA/QC) procedures and as specified in Permit Attachment X-1 (Sample Analytical Procedures).

X.E. ELEVATION OF THE GROUNDWATER SURFACE

The permittee shall determine the static elevation (to 0.01 foot accuracy) of the groundwater surface and total well depth at each monitoring well each time the ground water is sampled [§ 5.1.D.4.c, VR 672-20-10].

X.F. STATISTICAL PROCEDURES

X.F.1. When evaluating the monitoring results in accordance with Permit Condition X.H, the permittee shall:

X.F.1.a. Calculate the arithmetic mean and variance for each constituent specified in Permit Condition X.C.1.b., at each well monitored, and compare these results with the upgradient/background wells. The comparison shall consider individually, each of the wells in the monitoring system and shall use the statistical test described in Permit Attachment X-1 (Statistical Analysis for Detection Monitoring) to determine statistically significant increase over initial background [§ 5.1.D.5.c.(3), VR 672-20-10].

X.F.2. If the comparison for [§ 5.1.D.5.c.(3), VR 672-20-10]:

X.F.2.a. The upgradient/background well shows a statistically significant increase, the permittee shall submit this information in accordance with Permit Condition X.H.2.a or X.H.3.b;

X.F.2.b. The downgradient wells show a statistically significant increase, when compared to the upgradient/background wells, the permittee shall follow the requirements of Permit Condition X.I.

X.G. FINAL DETECTION MONITORING PROGRAM AND DATA EVALUATION

X.G.1. The permittee shall collect, preserve, and analyze samples pursuant to Permit Condition X.D.

X.G.2. Background shall be established in accordance with Permit Condition X.C.2 by collecting a minimum of four independent samples for the constituents specified in Permit Condition X.C.1 at each monitoring well (background and downgradient) during the first semiannual sampling event [§ 5.1.D.5.c.(1), VR 672-20-10].

X.G.3. After establishing background in accordance with Permit Condition X.C.2, and during the entire active life of the unit, including the closure and post-closure care periods, the permittee shall sample and analyze all monitoring wells at least semiannually [§ 5.1.D.5.c.(3), VR 672-20-10]. The permittee shall express the groundwater quality data from each monitoring well in a form necessary for the determination of statistically significant increases (i.e., means and variance) [§ 7.1., VR 672-20-10].

X.G.4. Groundwater elevations and total wells depths at each monitoring well shall be determined, to 0.01 foot accuracy, immediately prior to purging each time a sample is obtained. The permittee shall determine the

groundwater flow rate and direction in the uppermost aquifer each time groundwater is sampled. Groundwater elevations in wells which monitor the same waste management area shall be measured within a 24 hour period to avoid temporal variations in groundwater flow which could preclude accurate determination of groundwater flow rate and direction [§ 5.1.D.4.c, VR 672-20-10].

X.G.5. After establishing background in accordance with Permit Condition X.C.2, the permittee shall determine whether there is a statistically significant increase over the background values for each constituent identified in Permit Condition X.C.1. each time sampling is performed. In determining whether such an increase has occurred, the permittee must compare the measurements at each monitoring well specified in Permit Condition X.B.1, to the background value determined in accordance with X.C.2, in accordance with the statistical procedures specified in Permit Attachment X-1 (Statistical Analysis for Detection Monitoring) [§ 5.1.D.5.c.(3), VR 672-20-10].

X.G.6. The permittee shall perform the evaluations described in Permit Condition X.G.5 within 15 days following the receipt of the analytical results of that sampling event [§ 7.1, VR 672-20-10].

X.G.7. At least annually, the permittee shall evaluate the data on static groundwater surface elevations to determine whether the requirements for locating the monitoring wells continue to be satisfied. If the evaluation shows that § 5.1.D.3.a, VR 672-20-10 is no longer satisfied, the owner or operator shall immediately modify the number, location, or depth of the monitoring wells to bring the groundwater monitoring system into compliance with that requirement.

X.H. RECORDKEEPING AND REPORTING

X.H.1. The permittee shall retain all monitoring, testing, and analytical data obtained in accordance with Permit Conditions X.E and X.G throughout the active life of the facility, and the closure and post-closure care period [§ 5.1.D.8.a.1 and 5.1.D.8.b.(1), VR 672-20-10]. The data must include the method detection limit for all constituents for each monitoring event, all computations, calculated means, variance, t-statistic values, and t-test results [§ 7.1., VR 672-20-10].

X.H.2. Until background is established in accordance with Permit Condition X.C.2., the permittee shall report to the Director:

X.H.2.a. The analytical results required by Permit Conditions X.H.2 within 45 days of the completion of the semiannual sampling event or within 15 days following the receipt of the analytical results of the sampling event, whichever is sooner. [§§ 5.1.D.8.a.2.a and 7.1, VR 672-20-10]

X.H.2.b. The established background values and the computations necessary to determine background values within 15 days of this determination or within six months (180 days) and 45 days of permit issuance, whichever is sooner [§§ 7.1, VR 672-20-10].

X.H.2.c. The results of the initial evaluation of groundwater flow rate and direction, as required by Permit Condition X.G.4, within 15 days of completion of the evaluation or six months (180 days) and 45 days of permit issuance, whichever is sooner [§ 7.1, VR 672-20-10].

X.H.3. After establishing background in accordance with Permit Condition X.C.2, the permittee shall report to the Director on an annual basis no later than March 1 following each calendar year:

X.H.3.a. The concentrations of each constituent specified in Permit Condition X.C.1. for each monitoring well along with the statistical evaluations required by Permit Condition X.G.5. The permittee shall separately identify any significant differences from the initial background found in the upgradient wells [§ 5.1.D.8.a.2.b, VR 672-20-10].

X.H.3.b. The results of the annual evaluation of groundwater flow rate and direction as required under Permit Condition X.G.4, and the results of the annual evaluation of groundwater surface elevations as required under Permit Condition X.G.7, and the description of the response to these evaluations, where applicable [§ 5.1.D.8.a.2.c, VR 672-20-10].

X.I. SPECIAL REQUIREMENTS IF SIGNIFICANT INCREASES OCCUR IN VALUES FOR PARAMETERS OR CONSTITUENTS DURING MONITORING

If the permittee determines pursuant to Permit Condition X.G. that there is a statistically significant increase over the background values for any of the constituent identified in Permit Condition X.C.1., in accordance with statistical procedures specified in Permit Condition X.F, the permittee shall:

X.I.1. Within 14 days, notify the Director in writing that the facility may be affecting groundwater quality and that assessment monitoring will be

implemented. The notification must indicate which constituents have shown statistically significant increases [§ 5.1.D.5.c.(3).(a), VR 672-20-10].

X.I.2. Within 90 days, implement an Assessment Monitoring Program meeting the requirements of § 5.1.D.6, VR 672-20-10 except as provided for in Permit Condition X.I.3 [§ 5.1.D.5.c.(3).(b), VR 672-20-10].

X.I.3. The permittee may demonstrate that a source other than the landfill caused the contamination or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. A report documenting this demonstration shall be certified by a qualified groundwater scientist and approved by the Director. If a successful demonstration is made and approved, the permittee may continue detection monitoring as specified in this Permit Module. If, after 90 days, a successful demonstration is not made, the owner or operator shall initiate an assessment monitoring program as required in § 5.1.D.6, VR 672-20-10.

Permit Attachment X-1

GROUNDWATER MONITORING PLAN

Material submitted by the Applicant

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Introduction

On April 6, 1993, Marshall Miller & Associates (MM&A) submitted to Tazewell County and to the Virginia Department of Environmental Quality a report entitled "Hydrogeological Characterization of the Tazewell County Landfill Site, Tazewell County, Virginia". That report documented the results of hydrogeologic investigation on-going at that time and set forth the plans for ground water monitoring of the site, pending further investigation.

Since that time, additional exploratory drilling, monitoring well installation, and investigation has been conducted, providing further definition of the hydrogeologic regime at the site. The completion of such additional investigation allows finalization of the ground water monitoring plan, which was submitted in preliminary form previously. This addendum report presents the results of recent investigation, describes the intended ground water monitoring, sampling, and analysis plan, and describes the statistical evaluation of water quality data that will take place in conjunction with the ground water sampling and analysis program.

The overall site hydrogeology was described in detail in the previous submittal of April 6, 1993. The more recent investigative efforts have not resulted in a change in assessment of the geologic framework, hydrogeologic conceptualization, or definition of ground water flow directions in the vadose and phreatic zones. Evaluation of those parameters remains as presented in the previous report, to which the reader is referred. Supplemental discussion and documentation of investigative results are incorporated herein, to augment the prior submittal and to complete the description of the ground water monitoring plan. This current report incorporates the ground water monitoring plan and sampling and analysis plan in entirety, but reference is made to the April 6, 1993 report for further addressment of site geology and documentation of field data collected.

Field Investigation

A total of nine monitoring wells exist at the site, and a tenth, upgradient well is planned. Of the nine existing monitoring wells, eight were drilled and installed during the recent investigation. Two additional deep borings, in which water levels were

recorded for a period of time, were drilled in the area of the planned landfill expansion, and were later backfilled as documented in the previous report.

Drilling was conducted via air-rotary techniques, and a geologist was present to log and describe cuttings and water encountered, and to supervise field operations. Borehole conditions proved unsuitable for geophysical logging (due to borehole instability), but borehole video camera logs were conducted in many of the borings to further define downhole conditions. *Appendix A* documents geologist's logs of the borings, and *Appendix B* presents monitoring well construction diagrams. Water levels have been monitored in each of the wells since construction to the present, and hydrographs of the wells are incorporated in *Appendix C*. The following table summarizes well depths and water levels observed for selected dates.

Table 1

Summary of Monitoring Wells and Deep Borings

	Top Elevation		Top of Screen		Base of Screen		Water Level Elevation		
Well	TOC	GL	Depth	Elevation	Depth	Elevation	2/4/93	4/7/93	6/28/93
MW-1	2873.52	2872.18	124.0	2748.18	142.5	2729.68	Dry	2744.24	2739.62
MW-2	2898.67	2896.06	237.0	2659.06	261.0	2635.06	2648.31	2650.98	3663.15
MW-3	3043.81	3041.45	310.0	2731.45	328.0	2713.45	2820.20	2870.80	2834.89
MW-4	3000.62	2998.90	307.0	2691.90	330.0	2668.90	2696.90	2707.59	2696.12
MW-5	2928.63	2927.36	170.0	2757.36	192.0	2735.36	2855.66	2892.70	2862.53
MW-6	2843.00	2840.60	128.0	2712.60	152.0	2688.60	2779.10	2810.74	2792.85
MW-7	3028.31	3025.03	352.0	2673.03	376.0	2649.03	N/A	N/A	2670.01
MW-8	3051.46	3049.06	242.0	2807.06	267.0	2782.06	N/A	2889.10	2865.70
MW-9	2894.21	2891.71	215.0	2676.71	226.0	2615.71	N/A	N/A	2710.51
MW-10	To be drilled.								
BH-5	2907.84	2907.84	N/A	N/A	275.0		2678.34 on 12/4/92		
BH-6	2971.70	2971.70	N/A	N/A	327.0		2678.82 on 12/4/92		

Hydraulic conductivity estimation has been conducted in each monitoring well by means of slug testing. A pressure transducer and digital datalogger were utilized to record water level responses to instantaneous injection and/or withdrawal of a PVC slug of known displacement. *Appendix D* incorporates data generated from each hydraulic conductivity testing.

Discussion of Hydrogeology

As discussed in the previous report of April 6, 1993, the site is underlain by a sequence of interbedded dolomites and shales with occasional thin quartzose sandstone interbeds. The strata dip to the southeast at a typical magnitude of approximately 30 to 40 degrees. Regional strike is roughly N60E. Intraformation faulting is not uncommon, and the rock is typically moderately to highly fractured.

Results of investigation show that no appreciable ground water occurs in the shallow residuum and colluvium that mantles the bedrock surface. Rather, results show ground water to occur at depths of 45 to 360 feet beneath the surface beneath and in the vicinity of the site. The surface itself exhibits approximately 260 feet in total relief. Ground water flow in the phreatic zone is generally along structural strike, indicating the degree of control on flow imposed by bedding planes in this steeply-dipping and interbedded strata. Although the rock is fractured, a significant degree of bedding control is also anticipated in the vadose zone, as described in some detail in the April 6, 1993 report.

Review of well hydrographs in comparison with rainfall events demonstrates that the ground water regime as a whole is unconfined, and exhibits a rapid and substantial response to recharge from precipitation. The seasonal change in ground water levels is also substantial, due to the impact of evapotranspiration in decreasing recharge to the water table during the growing season.

As can be seen on the hydrographs in *Appendix C*, wells MW-3 and MW-5 respond most dramatically to heavy rainfall events, in terms of both response time and magnitude of response. As shown on *Maps 1* and *2*, these wells are situated in potentiometrically upgradient locations near the surface water divide at the eastern margin of the facility. (However, as demonstrated in the April 6, 1993 report, they are potentially downgradient of vadose percolation from the site.)

Wells situated farther downgradient show a somewhat more subdued response to heavy rainfall events than do wells MW-3 and MW-5, but most do exhibit a significant and rapid response. Exceptions are MW-2, which is screened in an apparent fault gouge horizon; and MW-4, an upgradient well exhibiting quite low hydraulic conductivity in slug testing response.

Seasonal and Temporal Water Table Fluctuation

The upper surface of the saturated zone, at seasonal high levels recorded in late March to early April, 1993, ranges from approximately 2650 to 2890 feet in elevation. By early June, 1993, levels had fallen approximately 15 to 20 feet in most wells, and by 35 feet in MW-3 and MW-5 (the two wells which respond most dramatically to discrete rainfall events). MW-2, however, continues to exhibit a slow, steady rise in water level, indicating that it is still responding to the springtime rise in water levels, with an appreciable lag time at this downgradient location screened in porous material.

Review of the hydrographs in *Appendix C* shows seasonal variations of generally approximately 20 feet, and up to 35 or 40 feet in wells MW-3 and MW-5. However, the direction of gradient remains the same throughout the year, and flow direction remains largely controlled by structural strike, except in the northwestern part of the site as will be further discussed below.

Hydraulic Conductivity and Effective Porosity

Analyses of instantaneous slug injection and withdrawal tests show hydraulic conductivity to vary greatly from point to point within the site. Slug test responses also exhibit, in some instances, characteristics indicative of fracture-controlled, non-radial flow. These characteristics and local variations in hydraulic conductivity are in keeping with conceptualization of the site as a fracture-dominated flow system.

As shown on the following table, the minimum and maximum ranges of hydraulic conductivity are from approximately 2.6×10^{-4} ft / day (MW-4) to 4 to 6 ft/day (MW-7, where solution-enhanced fissures are present). The more typical or "average" hydraulic conductivity is in the range of 0.001 to 0.2 ft/day (*see test data and analyses, Appendix D*).

Table 2
Summary of Hydraulic Conductivity Tests

Well	Type of Test	Method of Analysis	Hydraulic Conductivity (K, in ft/day)
MW-2	Slug Withdrawal	Hvorslev	0.094
		Bouwer and Rice	0.073
MW-3	Slug Withdrawal	Hvorslev	0.19 - 5.65*
		Bouwer and Rice	0.17 - 5.89*
MW-4	Slug Injection	Hvorslev	2.58×10^{-4}
		Cooper	6.22×10^{-5}
MW-5	Slug Injection	Hvorslev	9.276×10^{-4}
		Cooper	2.39×10^{-3}
MW-6	Slug Withdrawal	Hvorslev	0.127
		Bouwer and Rice	0.093
		Cooper	0.099
MW-7	Slug Withdrawal	Hvorslev	6.33
		Bouwer and Rice	4.13
MW-8	Slug Injection	Hvorslev	5.7×10^{-3}
MW-9	Slug Withdrawal	Hvorslev	1.63
		Bouwer and Rice	1.26

**Range represents different portions of the slug test response curve, in well and solutioned fractures present.*

Effective porosity is, of course, difficult to determine in the subject setting, but is certain to vary spatially within the site. Studies of effective porosity and specific yield in fractured carbonate rocks, as reported in the literature, are commonly in the range of approximately 1 to 6 percent, as shown below. It is expected that, due to the high degree of fracturing observed at the subject site, the aquifer's effective porosity is near the upper limit of the range, and may actually exceed these values to some extent. An effective porosity of 5 percent is utilized herein to estimate flow rates at the site.

Effective Porosities Reported in the Literature

Author	Rock Type	Location	Method	ne or Sy (%)
Giddings (1971)	Carbonates	Central PA	Ground Water Depletion	1.5
Meisler (1963)	Carbonate	Central PA	Ground Water Depletion	5
Meisler & Becher (1971)	Limestone	Central PA	Ground Water Depletion	2.7 - 6.2
Barnett, et. al. (1977)	Dolomite	W. Australia	Direct Measurements	0.6 - 3.2
Bocker (1984)	Dolomite	Hungary	Pumping Test	3
Monjole (1984)	Carbonates	Belgium	Geophysics	1 - 4

Flow Direction and Rate

As shown on *Map 2*, flow direction in the phreatic zone is from northeast to southwest, parallel to structural strike, except in the northwestern part of the site. In that local area, where the new expansion landfill is planned, flow is influenced by a pronounced fracture zone (identified as a lineament on remote sensing imagery). Potentiometric surface data from well MW-7 and borings BH-5 and BH-6 show ground water flow to converge toward this fracture zone, then move northward along it to exit the site in the vicinity of MW-7.

Hydraulic gradients are also variable within the site, as can be seen on *Map 2*. Prominent shale beds act as barriers to flow to direct it in an along-strike direction (except as noted above), and gradients across these shale barriers are quite steep. Gradients in outflow areas range from approximately 0.015 in the northwestern sector near MW-7, to 0.04 in the along-strike flow exiting the site to the west in the vicinity of wells MW-9 and MW-2.

Rate of flow, as a function of gradient, hydraulic conductivity, and effective porosity, is also variable from one point to another within the site. In the area where flow converges before exiting the site near wells MW-9 and MW-2, hydraulic conductivity is indicated by slug tests to be in the range of approximately 0.1 to 2 ft/day. Seepage velocity in this area is estimated at about 0.08 ft/day (29 ft/year) to 1.3 ft/day (470 ft/year):

$$V_x = K \frac{i}{n_e}$$
$$= \frac{(0.1)(0.04)}{0.05} = 0.08 \text{ ft / day or } 29 \text{ ft / year}$$

$$V_x = K \frac{i}{n_e}$$
$$= \frac{(1.6)(0.04)}{0.05} = 1.28 \text{ ft / day or } 467 \text{ ft / year}$$

where: V_x = seepage volocity
K = hydraulic conductivity = 0.1 ft / day to 1.6 ft / day
i = hydraulic gradient = 0.04
n_e = effective porosity, estimated at 0.05

In the flow convergence area near MW-7, gradient is less steep but hydraulic conductivity is greater than in the MW-2 area. Slug test analyses by two different methods show hydraulic conductivity in well MW-7 to be approximately 4 to 6 ft/day, yielding a computed flow rate of from 1.2 ft/day (440 ft/year) to 1.8 ft/day (660 ft/year).

$$V_x = K \frac{i}{n_e}$$
$$= \frac{(0.1)(0.04)}{0.05} = 1.2 \text{ ft / day or } 438 \text{ ft / year}$$

$$V_x = K \frac{i}{n_e}$$
$$= \frac{(6)(0.015)}{0.05} = 1.8 \text{ ft / day or } 657 \text{ ft / year}$$

Summary of Hydrogeologic Regime

The phreatic zone is situated approximately 200 to 360 feet beneath the surface of the site (deeper in areas of elevated topography, shallower in valley areas) and as little as about 45 feet beneath the surface in the narrow valley lying immediately south-southwest of the site.. The phreatic zone is unconfined, and is recharged by vadose percolation through fractures and along bedding planes. Recharge from heavy rainfall events reaches the water table quickly (within a day or two) and thence moves downgradient, along strike to the southwest in the southern part of the site; or northward along fractures in the northern part of the site.

The phreatic zone itself appears to exhibit a relatively high degree of diffuse flow and is mappable, making it a suitable horizon for monitoring. Flow rates within the phreatic zone are quite variable from one point to another, ranging from 0.2 to 0.4 ft/day as typical, but up to a few feet per day along specific, solution-enhanced fissures. Seasonal changes in ground water levels are dramatic, averaging about 15 to 20 feet higher in the early spring than in the seasonally dry period. In the eastern, upgradient part of the site, the seasonal variation is as great as about 35 to 40 feet. However, directions of hydraulic gradient remain constant seasonally.

Effects of Site Modification

Future site modification through closure of the existing disposal area and construction of a composite liner in the planned disposal area will result in a decrease of infiltration recharge to the bedrock water table. As described in the previous section, the water table currently displays a seasonal fluctuation range of approximately 15 to 20 feet over most of the site, and up to 35 feet in the more upgradient part of the site near its eastern boundary. As can be seen on the well hydrographs in *Appendix C*, infiltration recharge occurs quickly following intense precipitation events that occur during the period of dormant vegetation, and less so in association with rainfall events during the growing season.

Establishment of final cover and vegetation on the existing disposal area is expected to substantially reduce the rate and cumulative amount of vadose infiltration reaching the water table, so that temporal variations and, to some extent, seasonal variations will be less pronounced in the eastern, upgradient portion of the site. Installation of a composite liner in the planned disposal area, which occupies a downgradient portion of the site, will also result in some diminution of temporal variation, but is expected to be less substantial a change than in the upgradient area. The net result is expected to be a more stable water table with a general small decrease in magnitude of gradients, but no change in direction of gradients.

Ground Water Monitoring Program

The proposed ground water monitoring program consists of two upgradient, background wells and six downgradient wells. While the eastern and northern margins of the existing site could be monitored separately from the planned new facility, the western, southwestern, and northwestern margins of the existing site cannot be segregated for monitoring. Because ground water flow is from the existing site toward the planned new disposal area (*see Map 2*), and since the two units essentially coalesce, the facility is to be monitored as a single entity in which the existing and new disposal areas are monitored jointly in the same monitoring system. The monitoring program will commence under final detection monitoring parameters for all wells.

Well MW-4 and planned well MW-10 will serve as upgradient or background wells (*see Maps*). MW-4 is situated in dolomites of the Honaker Formation near the western site boundary, while MW-10 will be situated in the Copper Ridge Dolomite a short distance south of the site. Sample analyses results from these wells will be pooled to comprise the background water quality reference against which downgradient well samples will be compared. Well MW-10, located south of the site, is upgradient as shown by potentiometric surface mapping, and is also separated from the site by a small surface drainage feature. It is unquestionably isolated from any potential impact by the facility. The potentiometric surface in MW-4 is also upgradient of the facility and planned expansion area. As shown on *Map 2*, the potentiometric surface in MW-4 is approximately 26 feet higher than in MW-7, and about 10 to 15 feet higher than projected in temporary wells BH-5 and BH-6, which lie within the planned expansion area. MW-4 water level elevation is about 30 to 35 feet higher than that in MW-2 to the south. Thus, as regards saturated flow, MW-4 is demonstrated to lie upgradient of the facility and should incur no danger of impact by the facility by water moving within the saturated zone.

The subject site exhibits an unsaturated zone of appreciable thickness, as the water table underlies the planned expansion area by slightly more than 200 feet. As has been discussed in the April, 1993 submittal, bedding at the site dips to the southeast at approximately 40 degrees, and exerts substantial control upon infiltration and water movement in the vadose zone. To the extent that such control is complete, the screened horizon in MW-4 should be secure from any impact from the existing site. The well lies along-strike from the planned expansion area, and does not appear to be at substantial

risk from vadose flow from that area so long as bedding planes exert complete control upon vadose water movement, transporting it down the dip to the saturated horizon.

However, it must be acknowledged, given the relatively high degree of fracturing known to occur in strata on the site, that some potential could exist for vadose water movement in a direction other than down the dip of bedding planes. In such a scenario, it could be possible, but considered unlikely, that vadose flow could provide hydraulic intercommunication from the disposal area to the water table at a position slightly upgradient of MW-4, and thence to MW-4 via phreatic flow.

Because of the expected natural variability of ground water quality beneath the site, it is imperative that at least two background wells be employed in statistical evaluations of water quality. Because of the physical location of the existing disposal area, potential background well locations are quite limited. It is proposed that MW-4 be utilized as a representative background well until and unless results of future sampling should indicate that it may actually be susceptible to impact from the facility. The potentiometric position of the well will be reconfirmed with each semiannual sampling event, and statistical evaluation of water quality analyses results will allow periodic assessment of whether site impact may be occurring. In the event that such future evaluation shows that MW-4 is not capable of providing representative background water quality that has not been affected by leakage from the facility, the monitoring system will immediately be revised to bring it into compliance. In summary, wells MW-10 and MW-4 will be utilized as background wells in the monitoring program, unless it should become demonstrated through future sampling that MW-4 is actually susceptible to impact by the facility. At such time, a revision will be made to the monitoring system or program to bring it into compliance.

Wells MW-2, MW-3, MW-5, MW-7, MW-8, and MW-9 will be sampled as downgradient wells in accordance with the final detection monitoring schedule. As shown on *Map 2*, wells MW-2 and MW-9 are located in a zone of converging ground water flow near the western site boundary, near a suspected intraformational fault. a large portion of the ground water exiting the site passes through the area where MW-2 and MW-9 are located.

Well MW-7 is also located in an area of major flow convergence along the northwestern margin of the site (*see Map 2*). Wells MW-3, MW-5, and MW-8 are

situated radially around the existing waste disposal area, and are downgradient of that existing facility.

Wells MW-1 and MW-6 are located upgradient of the site, insofar as saturated flow is concerned. However, because of the dipping strata and depth to the saturated zone at the site, MW-1 and MW-6 lie downgradient of potential vadose flow from the surface. MW-1 "goes dry" as water levels seasonally decline. Both MW-1 and MW-6 are to be retained in the event of future usefulness, but are not planned for use in the detection monitoring program.

Monitoring of perched flow horizons encountered within the vadose zone is not planned. Available information and conceptualization of hydrogeologic conditions indicate that such flow is directed toward the regional water table within the confines of the site, where monitoring at or below the top of the saturated zone will occur.

Basic elevational and construction data for the monitoring wells to be utilized in the detection monitoring program are documented in *Appendix B* and are summarized below:

Table 3
Summary of Wells to be Utilized in Detection Monitoring Program

Well No.	Top of Casing Elevation	Ground Level Elevation	Top of Screen Depth	Top of Screen Elevation	Base of Screen Depth	Base of Screen Elevation	Water Level Elevation on 6/28/93
MW-2	2898.67	2896.06	237.0	2659.06	261.0	2635.06	2663.15
MW-3	3043.81	3041.45	310.0	2731.45	328.0	2713.45	2834.89
MW-4	3000.62	2998.90	307.0	2691.9	330.0	2668.90	2696.12
MW-5	2928.63	2927.36	170.0	2757.36	192.0	2735.36	2862.53
MW-7	3028.31	3025.03	352.0	2673.03	376.0	2649.03	2670.01
MW-8	3051.46	3049.06	242.0	2807.06	267.0	2782.06	2865.70
MW-9	2894.21	2891.71	215.0	2676.71	226.0	2665.71	2710.51
MW-10	To be drilled						

Wells to be retained in the event of future need, but not to be utilized in the detection monitoring program, are:

Well No.	Top of Casing Elevation	Ground Level Elevation	Top of Screen Depth	Top of Screen Elevation	Base of Screen Depth	Base of Screen Elevation	Water Level Elevation on 6/28/93
MW-1	2873.52	2872.18	124.0	2748.18	142.5	2729.68	2733.10
MW-6	2843.00	2840.60	128.0	2712.60	152.0	2688.60	2792.85

Well Abandonment

No further well abandonment, beyond the abandonment of exploratory borings previously conducted and documented in *Appendix B*, is foreseen at the site at this time. In the event that well abandonment should become necessary or desirable in the future, abandonment techniques will consist of pumping a mixture of expansive grout (one part sodium bentonite to ten parts Portland type 1 cement) within the monitoring well until the well, drill hole annulus, and potentially affected surrounding rock strata are effectively plugged. The protective well cover and surface well pad will be removed the casing will be cut off below ground level, and the entire area regraded and revegetated. The well abandonment procedure will occur within 60 days of notification from the Director that the monitoring well is no longer necessary for monitoring the ground water regime of the facility, unless approval for retention of unutilized wells is obtained. Certification of well abandonment procedures from qualified personnel will be submitted upon well abandonment.

No test pits exist to be backfilled at the present time. Should such be created in the future, abandonment will be accomplished by backfilling with suitable cohesive soil materials, compaction, and revegetation to prevent possible leachate migration.

Re-Evaluation of Ground Water Flow Rate and Direction

Static ground water potentiometric surface elevations will be determined at each monitoring well immediately prior to purging each time a sample is obtained. The rate and direction of ground water flow will be determined with each sampling event by reviewing and comparing elevations in the various wells to detect any significant changes from the gradient magnitudes and directions established in this report. This procedure will be performed by construction of a potentiometric map to define flow directions and lateral gradients, which will then be compared to monitoring well locations to determine

their appropriateness of location and depth. Hydraulic conductivity values already obtained and effective porosity values previously estimated will be utilized in conjunction with the re-evaluated gradient data to determine if significant changes in flow rate occur. It is anticipated that small variations in gradients will occur seasonally, as evidenced by water level monitoring previously conducted. However, the direction and general rate of flow remains essentially constant. In the event that changes in ground water rate and/or direction are found to have occurred such that the monitoring wells no longer are representative as per VSWMR § 5.1.D.3, the number, location, or depth of the monitoring wells will be immediately modified to bring the system into compliance.

In collection of ground water elevations, measurements will be taken within a period of time short enough to avoid temporal variations in ground water flow which could preclude accurate determination of flow rate and direction. Results of the evaluations of ground water surface elevations will be included in the annual report, along with a description of response to the evaluation, if applicable. The annual report will be submitted to the Director by March 1, following each calendar year, as further addressed below.

Record Keeping and Reporting

Records of water quality analyses and associated static water levels and associated evaluations (statistical analyses, flow rate and direction evaluation) will be maintained throughout the active life of the facility and the post-closure care period. During the first year when initial background water quality constituent concentrations are being established, the concentrations of each parameter for each monitoring well will be reported to the Director within 15 days after completion of analyses as per VSWMR § 5.1.D.8. During the facility's active life, an annual report will be submitted by March 1 following the end of each calendar year, documenting concentrations of each parameter in each monitoring well along with statistical evaluations of these parameters. That annual report will also include results of evaluation of ground water surface elevations (potentiometric mapping), and if applicable, a response to that evaluation.

Statistical evaluation of analytical parameters will be performed within 30 days subsequent to each semiannual sampling event, beginning with completion of the first year of such data collection. In the event that a statistically significant increase over background is determined for one or more of the Appendix 5.5, VSWMR constituents, the Director shall be notified within 14 days as to such occurrence, and source of the

statistically significant increase will be determined within 90 days. If it is determined that the increase resulted from a factor other than landfill impact, a report documenting such determination will be submitted to the Director and certified by a qualified ground water scientist. Upon approval by the Director in such event, the detection monitoring program will be continued.

Assessment Monitoring

In the event that demonstration of alternative causes for such increases cannot be made, an assessment monitoring program will be implemented within the 90-day time period from the time at which such increase was detected. The assessment monitoring program will determine the rate and extent of migration of solid waste constituents in the ground water, and the concentrations of such constituents in the ground water. Sampling and analysis of VSWMR Appendix 5.1 parameters will be conducted within 90 days of triggering of the assessment monitoring program, and will be performed annually thereafter so long as the assessment monitoring program remains in effect. Other procedures as set forth in VSWMR VR 672-20-10, § 5.1.D.6 will be followed with consideration for site-specific aspects such as geology, hydrogeology, nature of the solid waste constituents involved, locations of wells, and extent and rate of movement of contamination.

Sampling and Analysis Plan

The initial semiannual sampling event will incorporate sample collection and analyses of the parameters identified as Final Detection Monitoring parameters in Appendix 5.5 of the Virginia Solid Waste Management Regulations. It is also planned that characterization of major ionic constituents will be done in the initial sampling event for all of the wells intended for use in detection monitoring (MW-2, MW-3, MW-4, MW-5, MW-7, MW-8, MW-9, and MW-10). The major cations and anions to be analyzed are:

Cations	Anions
Na	Cl
K	HCO_3
Ca	CO_3
Mg	SO_4

Fe $NO_2 - NO_3$

Mn

Ionic characterization will be utilized in evaluation of similarity or heterogeneity of water quality across the site. After the initial characterization, further semiannual analyses will include only those parameters listed in the Final Detection Monitoring requirements (VSWMR, Appendix 5.5).

Sampling Frequency and General Discussion

In the first semiannual sampling period, additional samples for Appendix 5.5 parameters will be taken beyond the four independent samples required as a minimum in the VSWMR. These samples, which are intended to establish a water quality background data base, will be collected periodically over the first six months in order to create a background base reflective of seasonal and temporal changes that may occur in the ground water. After establishment of the background, one sample will be collected from each well during each semiannual sampling event.

The sampling schedule for establishment of background is planned as follows:

August, 1993	2 independent samples from each well
October, 1993	1 sample from each well
Late November/Early December, 1993	1 sample from each well
January, 1994	1 sample from each well
March, 1994	2 independent samples from each well
May, 1994	1 sample from each well

Following the May, 1994 sampling event, background water quality will be established on the basis of samples collected up to that time. Thereafter, one sample will be collected from each well semiannually and analyzed for each of the parameters listed in VSWMR Appendix 5.5. In each sampling event, the upgradient wells will be sampled before sampling of downgradient wells. Sampling order will be: MW-10, MW-4, MW-7, MW-8, MW-3, MW-5, MW-2, and MW-9.

Ground water elevation and total well depth in each well will be determined and recorded in each sampling event, prior to purging the well for sampling. This data will be used to determine ground water gradient direction each time sampling is conducted, to

insure that the wells continue to satisfy location requirements. If it is determined that location requirements are not satisfied, the number, location, and/or depths of wells will be immediately modified to bring the monitoring system into compliance with the requirements.

Field Documentation for Ground Water Sample Collection

A field log will be kept during each sampling event, wherein pertinent information regarding the event and each sampling point will be recorded. Standardized forms will be utilized to record information common to the sampling event and information specific to each well. Information common to each sampling event to be recorded will include:

Date
Name of collector(s)
Well sampling sequence
Climatic conditions
Static water level measurement method
Well purging method and equipment
Sample collection method and equipment
Sample filtering method and equipment*(if applicable)*
Types of sample containers used
Preservatives used
Temperature, pH, and conductivity equipment used

In addition to the above, a separate information form will be completed for each well during each sampling event. The information recorded specific to each well will include:

Reference point for measurements
Well condition/comments
Well identification
Elevation of reference point
Static water level depth from reference point
Well depth
Water column height
Total length of filter pack
Saturated length of filter pack
Purge volume to be removed for 3 well volumes
Purge volume actually removed, and comment if different from planned
Time purging is initiated
Time purging is completed
Measurements of temperature, pH, and conductivity taken during purging

Fe NO_2 - NO_3
Mn

Ionic characterization will be utilized in evaluation of similarity or heterogeneity of water quality across the site. After the initial characterization, further semiannual analyses will include only those parameters listed in the Final Detection Monitoring requirements (VSWMR, Appendix 5.5).

Sampling Frequency and General Discussion

In the first semiannual sampling period, additional samples for Appendix 5.5 parameters will be taken beyond the four independent samples required as a minimum in the VSWMR. These samples, which are intended to establish a water quality background data base, will be collected periodically over the first six months in order to create a background base reflective of seasonal and temporal changes that may occur in the ground water. After establishment of the background, one sample will be collected from each well during each semiannual sampling event.

The sampling schedule for establishment of background is planned as follows:

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January, 1994	1 sample from each well
March, 1994	2 independent samples from each well
May, 1994	1 sample from each well

Following the May, 1994 sampling event, background water quality will be established on the basis of samples collected up to that time. Thereafter, one sample will be collected from each well semiannually and analyzed for each of the parameters listed in VSWMR Appendix 5.5. In each sampling event, the upgradient wells will be sampled before sampling of downgradient wells. Sampling order will be: MW-10, MW-4, MW-7, MW-8, MW-3, MW-5, MW-2, and MW-9.

Ground water elevation and total well depth in each well will be determined and recorded in each sampling event, prior to purging the well for sampling. This data will be used to determine ground water gradient direction each time sampling is conducted, to

insure that the wells continue to satisfy location requirements. If it is determined that location requirements are not satisfied, the number, location, and/or depths of wells will be immediately modified to bring the monitoring system into compliance with the requirements.

PRE-SAMPLING ACTIVITIES

A materials and equipment check list should be consulted while preparing for the field event. Such items as personal protective equipment, sample collection equipment, decontamination equipment and materials, field measurement equipment, pre-cleaned sample containers appropriate for the expected analytical schedule, documents such as field note book and chain of custody forms, sample preservation materials etc. should be included on the list. The list should be as detailed as possible in order to preclude omission of necessary equipment and materials. A discussion between the project manager and the field team leader should address the objectives of the event and any site specific details which may be involved. The field team should be advised of any health hazards expected on the site and what procedures are to be used as protection from these hazards. Any previous qualitative data from the sampling points should be reviewed and the sampling schedule designed to allow for sampling of the least contaminated sites first and the most contaminated sites last.

Upon arrival on the project site the field team leader will record the time and date of arrival on the project in the field note book. Also recorded will be the names of each person present during the field activities. This list should be updated at each sampling location. Designation of the relative responsibilities of each individual should also be recorded in the field note book. Any notification of responsible officials on site should also be recorded at this time.

Specific activities for each separate sampling location will now be discussed. The first item of interest in arriving at a new sampling location is to check the site for specific health or safety hazards and to make the field team aware of these hazards and the procedures to be used to further protect from any hazards present. A page in the field log book should be identified for this site with the location date and time

of arrival and a listing of all persons present. Record weather conditions and approximate temperature. Identify the type of structure being sampled and the casing diameter for wells and any comments about its condition. Field sample to laboratory identifiers to be used should be recorded at this time if the sample identifications are to be blind to the laboratory. A list of the sample containers and their preservation method with a separate identification system for each should be recorded. A chart should be drawn in the field log book to record field sample data. This chart should be capable of recording each reading taken for the following at a minimum. The actual time of day, the time since purge began, the depth to top of water from top of inner casing, the pump rate or flow, pH, Conductivity, Temperature, Turbidity, ORP and any notations.

The sampling site should now be made ready for work to begin. For groundwater wells the area around the well head should be cleared of obstacles and made available to receive a poly apron. After preparing the site around the well head the poly apron approximately 20' by 20' should be placed around the well head with the well head penetrating the center of the sheet. The apron will provide extra protection for field equipment and a clean work area around the well head. All work with equipment and materials potentially contaminated or to be used inside the well should be handled in this area whenever possible.

The static water level elevation should now be measured and recorded. Prior to measurement, water levels should be allowed to recover for a minimum of 24 hours after well construction, well development, or well purging. The measurement of water level should be recorded to the nearest 0.01 foot. This can be accomplished by using an electronic water level indicator. Record the initial top of water depth prior to any other activity within the well. Because dedicated pumps are to be used at this facility, the total depth of the well will not be measured each event. Casings not marked to indicate the side of the casing to use for measurement should be measured using the side of the casing which is highest for the reference as a default since this is most likely the side used by the surveyor in recording the elevation of the casing. The equipment used to make these measurements should be decontaminated prior to each well. For sample collection points other than wells the flow from the source and a

detailed description of the source should be recorded in the field logbook.

Because the water standing in a well prior to sampling may not represent in-situ groundwater quality, stagnant water around the pump should be purged from the well prior to sampling. This field sampling plan will utilize dedicated bladder pumps for both purging and sampling the source. The dedicated pump is constructed of stainless steel and PTFE, and can be adjusted to achieve flow rates as low as 0.1l/min. The pumps will be placed just below the top of the well screen interval. The elevation of this interval should be retrieved from the well construction details prior to placing the pump. By using dedicated pump equipment there will be no need to decontaminate equipment between each well site with the exception of the water level indicator.

Calibration of all field analytical equipment should be performed and recorded in the field log book. Begin the purge process by slowly increasing the pump power until flow begins to issue from the discharge end of the PE tubing. Purged waters should be containerized on site if the well is suspected of being contaminated until the quality of the water can be determined by laboratory analysis and a determination as to the proper disposal of these waters can be made. A check of the total volume of water purged is made either by containing the total volume or by filling and refilling a known volume container with the purge waters. A record of this volume is made in the field log book. The discharge end of the tubing should be protected from contact with any other item or surface as this will be the sample collection point and contamination of this point should be prevented. The discharge end of the tubing should not be allowed to come into contact with purged waters contained on site but rather suspended above the container and the water surface. All field technicians handling any of the materials going into the well, sample containers or other sample collection equipment should be wearing disposable nitrile or latex gloves. The use of gloves serves a dual purpose by protecting the technician and preventing contamination of the samples and/or sampling equipment.

The purge rate for the well should not exceed the recovery rate of the well where possible. Ideally the water level in the well should not change during the purging process. Any specific location for which this method is not possible or is extremely impractical should be address separately and an alternate method specific

to the site approved by the project manager and attached to this plan. During the purge process a record of field activities is to be maintained in the field log book. The purging process should continue until field parameters at a minimum have maintained ± 0.1 pH, ± 3% for conductivity, ± 10 mv for ORP and ± 10% for turbidity for three successive readings. Initial readings should be obtained at five minute intervals by collecting a discrete sample from the pump discharge and analyzing this sample as quickly as possible after collection. The ORP probe and temperature probe are continuously emersed in fresh purge water by allowing the pump discharge to flow into an overflow container into the storage container with the overflow container holding the ORP and temperature probes. These two probes must be kept in the flow discharge and out of direct sunlight to maintain their relative accuracy. The pH, conductivity and turbidity are measured on the discrete samples. The frequency of sample collection can be reduced to 10 minutes if determined necessary by the field team leader.

Readings should be made prior to and after collection of the laboratory sample. The pump flow rate can be determined by measuring the flow volume in a know volume container over a known period of time between sample collection events for the field parameters. This measurement can be made from the flow from the overflow container holding the ORP and temperature probes. Samples collected for analysis should be collected directly from the tube discharge.

The purge process selected for this site is referred to as "Low-Flow Purging and Sampling". This method is not specifically addressed in SW-846, however, is published as an alternative method in EPA/540/S-95/504, December 1995. Typical flow rates from the wells for low-flow purging should be 0.1 to 0.5 liters per minute. These flow rates should serve to minimize turbulence in the well with effectively no drawdown of the water column until the field parameters have stabilized. By utilizing this method there will be no need to remove multiple well volumes of purge water from the well. By pumping at extremely low flow rates only the water immediately around the pump needs to be removed in order to sample representative groundwater. As soon as the field parameters have stabilized as previously referenced the laboratory sample will be collected.

SAMPLE COLLECTION

Monitoring well sampling should always progress from the well that is expected to be least contaminated to the well that is expected to be most contaminated, to minimize the potential for cross-contamination of samples. Samples should be collected and containerized according to the volatility of the target analytes. The preferred collection order is as follows:

1. Volatile organics (VOCs)
2. Purgeable hydrocarbons
3. Chlorinated hydrocarbons
4. Total metals
5. General chemistry parameters

The contents of the sampling device should be transferred to sample containers in a controlled manner that will minimize agitation and aeration. Sample containers should be pre-cleaned. The pump rate should be less than 0.1l/min. for collection of volatile organics and should always be less than or equal to the purge rate for collection of any samples for laboratory analysis. Groundwater samples should be collected as soon as possible after the well is purged. The pump line should be cleared at a rate of 0.1l/min. or less before collection of samples for volatiles and at a rate no faster than the purge rate if volatiles are not to be sampled. The pump should be operated in a continuous, non-pulsating manner so that they do not produce samples that are aerated in the return tube or upon discharge. During groundwater sampling, every effort should be made to minimize changes in the chemistry of the sample so that data representative of hazardous constituents that may be migrating to groundwater can be collected. A sample collection sheet should be prepared by the laboratory manager specifying the container type and method of preservation and the number and size of containers needed for the requested analysis. This sample collection sheet should be approved by the project manager prior to the field event. Samples should be collected directly from the discharge of the tubing and should contact nothing but the sample container from this point.

Sample bottles already containing sample preservative(s) should not be rinsed with the sample matrix prior to sample collection. An example of these types of containers are those used for collection of volatile organic compounds (VOC). VOC containers require special handling procedures. The container of choice for volatile organic compound analysis is the 40 ml teflon lined septum cap vial preferably constructed of amber glass. The flow rate for collection of VOCs should be less than 0.1l/min. if possible. The sample should be allowed to flow evenly down the sides of the vial causing minimal turbulence in the sample collected. The flow should be allowed to continue until the vial is completely full and the sample material is just ready to overflow with a slight reverse meniscus protruding above the container. The septum cap should then be placed carefully on the vial and screwed on. A slight volume of sample should be displaced by the cap at this time and the vial should contain zero head space and no entrapped gas bubbles. In some cases where there exists very high concentrations of dissolved gases, bubbles will appear in the vial later when the temperature of the sample changes. This occurrence may be unavoidable and should be properly noted by the laboratory upon receipt of the sample for analysis.

To prevent sample misidentification, the field team should affix a label to each sample container. Sample labels should be sufficiently durable to remain legible even when wet. Sample labels should contain, at a minimum, the following information:

* Sample identification
* Name of person collecting sample
* Date and time of collection
* Project number
* Type of preservative used and none indicated if none used

The chain-of-custody record should be completed immediately after each sample is collected to maintain accurate accountability for the sample. The chain-of-custody information and form are discussed later in this document.

As a rule of thumb all samples should be stored and transported at approximately 4 degrees Celsius. This is normally accomplished by placing the samples in a regular ice cooler with ice. After placing the samples in the refrigeration

device the temperature of the cooler should be recorded and noted in the field sample log. Upon receipt of the samples by the laboratory the temperature inside the cooler should again be documented and reported with the chain-of-custody forms. Most commercial shipping containers leak when the interior water level reaches the lid-body interface. As a result, the carrier may refuse to ship the container. For this reason, two polyethylene over pack bags are to be used when shipping. The first bag will contain the sample bottles, the second bag the ice needed to keep the samples at 4 degrees. If the bags are taped shut, the melt water will not reach the bottle labels or escape from the cooler. The shipping cooler should be sealed with custody seals when leaving the custody of the field team leader. Any indication of seal tampering should be noted by the receiving laboratory on the chain-of-custody form. Caution should be exercised in sealing the containers. Experience has shown that the seal may not always adhere to plastic coolers, and that the coolers may arrive at the destination without the appropriate seal. Taping over the seal with a transparent tape remedies this problem. A similar solution can be applied to container lids if the individual sample containers are elected to be sealed as well.

IN-SITU OR FIELD ANALYSIS

All field analytical equipment is to be calibrated prior to each use in accordance with the manufacturers instructions. Calibration results will be recorded in the field log book. The field thermometer should be capable of being traced back to a certified NBS or NIST thermometer. Physically or chemically unstable analytes should be measured in the field, rather than in the laboratory. This plan calls for the field analysis of pH, Conductivity, ORP, Temperature and Turbidity. A discrete sample is collected in a clean bottle in the same manner that a sample for laboratory analysis would be collected. The ORP and Temperature probe should remain in the overflow container to allow the probes to continue exposure to the purge water at all times. This overflow container should be shielded for thermal extremes such as wind and direct sunlight. It is possible during extremely low flow rate purges that water in this container will exhibit influence by ambient thermal conditions and this should be noted

and remedied if possible. Field analysis are not to be performed on the same sample containers collected for laboratory analysis. Field parameters are to be analyzed during the purge process, immediately prior to collection of laboratory samples and immediately after collection of laboratory samples. The field samples are collected at either five or ten minute intervals as discussed earlier and their results recorded in the field log book. Any other site conditions or analytical equipment functions not considered to be normal should be noted in the field log book. The time of day and the purge duration time should be recorded with each set of field analysis.

FIELD EQUIPMENT DECONTAMINATION PROCESS

When dedicated equipment is not used for sampling (or well purging) or when dedicated equipment is stored outside the well, the equipment should be cleaned prior to each use at each well.

The following cleaning procedure is for equipment used when organic constituents are of interest:

1. Wash equipment with non-phosphate laboratory grade detergent
2. Rinse equipment with municipal tap water
3. Rinse equipment with laboratory grade isopropanol
4. Rinse equipment with organic-free reagent water

The following cleaning procedure is for equipment used when inorganic constituents are of interest;

1. Wash equipment with non-phosphate laboratory grade detergent
2. Rinse equipment with municipal tap water
3. Rinse equipment with dilute (0.1N) hydrochloric acid
4. Rinse equipment with reagent water

When both organic and inorganic constituents are of interest then the inorganic cleaning should be performed first followed by the organic cleaning. In all cases, waste decontamination fluids should be containerized until a determination of the hazard status of the material can be determined and disposed of accordingly.

All equipment should be allowed to dry thoroughly in a dust-free environment. If the equipment is not to be used again immediately, it should be packaged and properly stored to protect it from dust and dirt. Equipment may be wrapped in aluminum foil and placed in a plastic bag. A label should be affixed to the outside of the wrapping summarizing the decontamination process and stating the date of decontamination. Decontaminated sampling equipment should not be placed on the ground or on contaminated surfaces prior to insertion in the well. A record of all decontamination procedures should be maintained in the field log book.

CHAIN-OF-CUSTODY

Proper chain-of-custody documentation will be maintained during sample collection and transfer. The chain-of-custody document will contain the following:

* Sample Identification
* Name and signature of sample collector
* Date and time of collection
* Sample type
* Number of containers
* Requested analytical parameters
* Signatures of persons involved in the chain-of-custody procedure, including dates of possession

Also, any remarks about the condition of sample containers will be noted on the chain-of-custody document.

Sample Analytical Procedures

The sample preparation and analysis methods specified for each analyte is presented in US EPA, SW846. Test methods for Evaluating Solid Waste - Physical/Chemical Methods and summarized in the Federal Register, Vol. 52, No. 131. The proposed analytical methods and practical quantifiable limits (PQL) are listed below:

Figure 3

Event Sample Collection

Project: _____

Date _____ Time _____

Well Sampling Sequence (Well I.D. in Order of Sampling) _____

Climatic Conditions: _____

Static Water Level Measurement method: _____

Well Purging Method and Equipment: _____

Sample Collection Method and Equipment: _____

Sample Filtering Method and Equipment: _____

Types of Sample Containers Used: _____

Preservatives Used: _____

Temp, pH and Conductivity Equipment Used: _____

Figure 4

Monitoring Well Sampling Collection

Project: _____

Well No. _____ Date _____ Time _____

Well Condition/Comments: _____

_____

Reference Point - Top of Well Casing: Elevation: _____

Total Depth to water	=	DW	= _____	(in feet)
Total Depth of Well	=	TD	= _____	(in feet)
Water Column Length	=	L_c (ft.) = (TD-DW)	= _____	(in feet)
Length of Filter Pack	=	L_f	= _____	(in feet)
Saturated Length of Filter Pack	=	L_s	= _____	(in feet)

Volume of water in well casing = V_c (gal.) = L_c (ft.) • 0.163 gal/ft. (2" I.D.)
= _____

Volume of water in filter pack = V_f (gal.) = L_s (ft.) • 0.522 gal/ft.
(6" Borehole diameter with 2" riser, 40% filter pack porosity)
= _____

Unit Well Volume = V_w (Gallons) = (V_c + V_f) = _____
Minimum Purge Volume (Gallons) = 3 • V_w = _____

Description of water before purging: _____
Time Purging Initiated: _____

Measurements collected during purging:

	Time	Temperature	pH	Conductivity	Purging Rate
1.	_____	_____	_____	_____	_____
2.	_____	_____	_____	_____	_____
3.	_____	_____	_____	_____	_____
4.	_____	_____	_____	_____	_____

Time Purging Completed: _____

Total volume of water purged: _____ Purged Dry? ____ Yes ____ No
Description of water after purging: _____

Measurements collected after purging:

Instrument Calibration: _____

Final four (4) replicate measurements of:

	Temperature	pH	Conductivity
1.			
2.			
3.			
4.			

Observations of Sample Appearance, Odor, etc.: _____

Sampler signatures with date/time of sampling: _____

Samples Collected:

Containers Used	Preservative	Volume	Parameters	Filtered	Iced	Laboratory Number

Figure 5

Monitoring Well Fact Summary

Project/Location: _____

Well I.D.: _____

Date Constructed: _____

	Depth	Elevation (msl)
Ground Level	N/A	
Top of Riser	N/A	
Top of Screen:		
Bottom of Screen:		
Top of Filter Pack:		
Base of Filter Pack:		
Representative Water Level		

Casing Radius (r_c): _____

Well Boring Radius (r_w): _____

Porosity of Filter Pack (n): _____

Volume/Foot of Well Casing (V_c / ft) _____ gals/ft.

Volume/Foot of Saturated Filter Pack (V_f / ft) _____ gals/ft.

Well Yield Information: _____

Comments/Other Information _____

Instrument calibration measurements, with date and time
Final measurement of pH, temperature, and conductivity
Date and time of sample collection
Comments or observations regarding sample appearance, odor, etc.

Static Water Level Measurements

A reference point will be established at each well, surveyed by a licensed surveyor as to elevation above mean sea level to the nearest 0.01 foot. Unless otherwise noted, the reference point will be the top of the PVC well riser, with cap removed. Static water level and total depth measurements will be made prior to any purging, utilizing the reference point as datum. Measurement will be made with a weighted measuring tape or electronic water level indicator, and will be recorded to the nearest 0.01 foot. The device used will be sufficiently sensitive that such measurement can be reliably obtained. The water level indicator probe and weights will be precleaned before being taken to the site, and will be wiped and rinsed with deionized or distilled water after use in each well. Measurements in the various wells will be made in as short a time period as is practical, and within the same calendar day in any event.

Well Evacuation

A minimum of three well volumes will be purged from each well prior to sampling, unless the well purges dry before three well volumes are obtained. A well volume is defined as the volume of water contained within the well casing and pore spaces of the filter pack. Procedure for calculation of the well volume is as follows:

1. For each well, the static water level and total depth of the well are measured (from the reference point), to determine the height of the water column.

2. The volume of water within the well casing is determined by multiplying the height of the water column in feet by a constant that is relative to the casing radius in feet [square of the casing radius (r^2) multiplied by π (3.1416)]. This figure represents the volume of water in the casing in units of cubic feet, which may be multiplied by the factor 7.48 to determine volume in gallons.

Example:

Where:

Casing radius (r_c) = 1" = 0.08'

Height of water column (L_c) = 20'

Vc = volume of water in casing

$$Vc = \pi \bullet r_c^2 \bullet L_c$$

$$= 3.1416 \bullet 0.08^2 \bullet 20 = 0.4 \text{ ft}^3$$

$$0.4 \text{ ft}^3 \bullet 7.48 \text{ gal/ft}^3 = 3 \text{ gallons}$$

3. Computation of the volume of water contained in the pore spaces of the saturated portion of the filter pack requires determination of saturated filter pack length and radius, casing radius, and filter pack porosity. Filter pack porosity is estimated at 40 percent of the total volume, based on laboratory determinations utilizing the same sand material that was used in well construction on the subject site.

   If the height of the standing water column is less than the length of the filter pack, then only the saturated length is utilized in volume determinations. If the height of the water column exceeds the filter pack length, then the entire length of the filter pack is used in volume computations.

   The volume of pore space of filter pack is determined by computation of total wellbore volume within that saturated filter packed interval, less volume of casing in the saturated filter pack interval, multiplied by the filter pack porosity. The total well volume is the sum of the casing volume in the saturated zone and the pore space of the filter pack in the saturated zone. This value is then multiplied by three to derive the desired purge volume for the well.

   Example:

   Where: Well boring radius (r_w) = 3" = 0.25'

   Casing radius (r_c) = 1" = 0.08'

   Height of water column (L_c) = 20'

   Saturated length of filter pack (L_f) = 10'

   Porosity of filter pack (n) = 40%

a. Volume of water in well casing (V_c):
$V_c = \pi \bullet r_c^2 \bullet L_c = (3.1416) \bullet (0.08^2) \bullet (20) = 0.4\ ft^3$
$= 0.4\ ft^3 \bullet 7.48\ gal/ft^3 = 3\ gallons$

b. Volume of water in filter pack (V_f):
$V_f = \left[(\pi \bullet r_w^2 \bullet L_f) - (V_c \text{ in saturated filter pack interval})\right] \bullet n$
$= \left[(3.1416 \bullet 0.25^2 \bullet 10) - (0.2\ ft^3)\right] \bullet 0.4 = 0.7\ ft^3$
$= 0.7\ ft^3 \bullet 7.48\ gal/ft^3 = 5.28\ gallons$

c. One well volume = $V_c + V_f$ = 3 gallons + 5.28 gallons = 8.28 gallons

d. Three well volumes = 8.28 • 3 = 24.84 gallons

At present, the wells are not equipped with dedicated pumps. Either a non-dedicated PVC bailer or a stainless steel and Teflon submersible pump (Redi-Flo 2, Grundfos Pumps Corporation) is used to purge the wells prior to sampling. The submersible pump is used where feasible, as dictated by depth to water and yield of the well, and a bailer is employed in instances where well depth and yield preclude pump usage. The purging method and equipment will be documented on the "Monitoring Well Sampling Collection" form for each well and sampling event (*see Figure 4*).

Where a PVC bailer is used for purging, the bailer will be equipped with a new length of polypropylene or polyethylene cord for use in each well. A large clean plastic bag spread over a box or pail will be used to prevent the bailer or cord from contacting the ground, and the sampling team will wear single-use, disposable surgical-type latex gloves during all operations in which objects are being placed into the well.

The bailer will be lowered gently into the water to minimize agitation of the water column during purging. If the well yield is sufficiently great that drawdown during purging is not extreme, then purging extraction shall begin at the water surface and gradually progress to greater depths as successive well volumes are removed. The maximum depth of extraction horizon in such case shall be the top of the screen (provided the water level is above the top of the screen). If well yield is low, such that the well "goes dry" during purging, extraction shall be from the top of the water column, throughout the process. Such a low yield well will be purged to dryness once and sampled upon recharge of the well.

The bailer will be disassembled and decontaminated prior to use in each well by the following methods:

- Organics: wash with nonphosphate detergent and rinse with tap water, distilled water, methanol, and pesticide-quality hexane, in that order.

- Inorganics: clean with nonphosphate detergent/soap mixture, rinse with dilute (0.1M) hydrochloric acid or nitric acid, rinse with tap water and finally Type II reagent grade water.

The submersible pump will be decontaminated prior to use and between wells. Decontamination will incorporate washing of the outside of the pump and tubing with a non-phosphate detergent/soap and rinsing thoroughly with deionized water. A non-phosphate detergent/soap and water mixture will be circulated through the pump interior and inside of the tubing, utilizing the pumping mechanism for circulation. Approximately three to four gallons of the soap-water mixture will be pumped through the pump and tubing. The equipment will be rinsed by pumping of a minimum of 10 gallons of deionized water through the pump and tubing, or until no evidence of the soap solution remains. As stated previously, the pump will be utilized only for purging of the wells, not for sample collection.

Temperature, pH, and conductivity probes and vessels will be decontaminated prior to use at each well and prior to every calibration, by rinsing with deionized/distilled water followed by wiping dry with a clean tissue. Evacuated water and wash/rinse fluids will be containerized during the operation and disposed of via the publicly-owned treatment system that will be processing leachate from the facility.

Sample Collection

A new disposable polyethylene bailer will be used to extract a sample at each well. The sample will be collected from a horizon near the top of the screen, or from the top of the water column where such is deeper than the top of screen. A large clean plastic bag draped over a box or pail will be used to prevent contact of the bailer cord with the ground.

The bailer will be lowered gently into the water, to minimize agitation of the water column. A bottom emptying device will be used to discharge from the bailer into the

sample container. Care will be taken to minimize agitation or aeration of the sample during discharge and transfer.

Samples for inorganic constituent analysis will be preserved utilizing an HNO_3 preservative pre-prepared by the analytical laboratory. No filtration will be applied to samples intended for organic constituent analysis or for total metals analysis. Samples will be packed in a cooler with ice immediately upon collection, and the cooler will be used for transport to the laboratory.

Step 1

Make ready, for each well to be sampled, all forms and labels, and the following equipment:

- PVC bottom-filling bailer for purging
- Submersible pump, Teflon tubing, control box and power generator for purging
- Polyethylene bottom-filling, disposable bailer for sampling (single use per well per monitoring event)
- Electronic water level meter with measurement accuracy of 0.01 foot
- Digital or analog pH meter to monitor purge water to within ± 1.0 standard units
- Digital or analog specific conductivity meter to monitor purge water to within ± 1.0 µMHOS with a minimum detection limit of 10 µMHOS
- Thermometer to monitor purge water to within ± 0.1° C
- One 1,000 ml polyethylene jar containing nitric acid (HNO_3) to bring pH <2 for total metals analysis.
- One 1,000 ml amber glass jar stabilized with HCl to a pH <2 for volatile organic compound analysis.
- One 1,000 ml amber glass jar with a Teflon lined lid stabilized with approximately 5 ml HCl to a pH < 2 for purgeable halocarbon analysis.
- One 1,000 ml amber glass jar with a Teflon lid, no preservative added for chlorinated hydrocarbon analysis.
- One 1,000 ml amber glass jar with a Teflon lined lid, no preservative added for general chemistry (Si, O_2, Cl, SO_4)
- One 1,000 ml amber glass jar with a Teflon lid preserved to a pH <2 with H_2SO_4, for nitrate-nitrite analysis.

All sample collection jars are to be laboratory cleansed and provided with the preservation techniques from the analytical laboratory.

- Prepare a 1 liter polyethylene rinse bottle filled with de-ionized carbon free water.
- Prepare a cooler with ice (or other cooling substance) with adequate protective packing for sample transport.
- Prepare a container for purge water containerization
- Gather adequate personal protective equipment (gloves, eye wear, etc.)

Step 2

Record well location and well number (refer to sampling sequence). Measure and record the depth to the static water level and to the bottom of the well to within the nearest 0.01 foot, as measured from the reference point.

Step 3

Calculate and record the static water volume within the well, and calculate and record the required purge volume (refer to example).

Step 4

During the initial bailer collection, gently lower the bailer to slightly below the static water level. Remove the bailer and inspect for LNAPL's (light non aqueous phase liquids). During the next bailer collection, lower the bailer to the well bottom, and gently raise and lower the bailer. Remove the bailer and inspect for the presence of DNAPL's (dense non aqueous phase liquids). If any immiscible layers are detected, record the observed thickness and containerize the sample in a 1,000 ml amber glass jar equipped with a Teflon lined lid. Continue purging the well and record pH, temperature and specific conductivity at approximately every static well volume. Containerize all water and properly manage for disposal through publicly-owned water treatment works. If after the three static well volumes have been purged and the pH, temperature, and specific conductivity have not stabilized to within ± 10 percent, purge an additional two well volumes, recording all values obtained.

Step 5

After the well is purged, a single-use disposable bailer will be utilized for sample collection. If the well exhibits slow recharge (or was purged empty) the sample will be obtained within 24 hours from the time of purging. The samples will be containerized in the pre-labeled jars in order of decreasing volatilization sensitivity: VOC; purgeable hydrocarbons; chlorinated hydrocarbons; total metals, and general chemistry. Samples to

be analyzed for VOC purgeable hydrocarbons and chlorinated hydrocarbons will be filled to zero headspace conditions and cooled immediately to ± 4°C. Samples to be analyzed for general chemistry parameters will be cooled to ± 4°C. Procedures to minimize de-volatilization of the samples, as described above, will be implemented (bottom emptying device).

Step 6

Non-disposable equipment utilized during either the purging or sampling activities will be hand washed with a non-phosphate detergent, rinsed with tap water, distilled water, methanol, and pesticide-quality hexane, in that order, and then washed with non-phosphate detergent/soap mixture, rinsed with dilute (0.1 M) nitric acid, tap water and finally Type II reagent grade water. The exception to this procedure will be that the submersible purging pump, where used, will be internally washed with the non-phosphate detergent and rinse as described previously. An equipment blank will be prepared for the non-dedicated equipment after it is cleansed (i.e. PVC bailer used for purging and purging pump, where applicable) by rinsing the equipment with deionized water and containerizing the rinsate in the appropriate sample containers. The "equipment blank" samples will be labeled as such, placed in the coolers with the collected ground water samples and analyzed for each constituent in the monitoring program.

Step 7

After sample collection each container will be labeled with:

Name of Facility
Monitoring Well I.D.
Date, Time, and name of Sample Collector
Preservation Method
Requested Analysis

Step 8

After sample collection, the sample jars will be placed in a cooler with adequate packing and ice to chill the samples to ± 4°C. If the cooler is not equipped with a shipping seal, each sample jar will sealed with a tamper proof seal, in order to insure the sample contents have not been altered.

Step 9

Proper Chain of Custody documentation will be maintained during sample collection and transfer. The Chain of Custody record will contain the following information:

Sample Number
Name and Signature of Sample Collection
Date and Time of Collection
Sample Type
Number of Containers
Analyses Requested
Signature of persons involved in the chain of possession, including dates of possession

Arrangements for sample transport will be made within 24 hours of sample collection, and should arrive at the receiving laboratory within 24 hours of sample collection.

Any observations concerning the integrity of the samples (broken jars, tampered shipping seals, etc.) will be communicated to the organization collecting the samples upon receipt at the laboratory.

Sample Analytical Procedures

The sample preparation and analysis methods specified for each analyte is presented in US EPA, SW846. Test methods for Evaluating Solid Waste - Physical/Chemical Methods and summarized in the Federal Register, Vol. 52, No. 131. The proposed analytical methods and practical quantifiable limits (PQL) are listed below:

Permit Limits

Inorganics

minimum containment level

Practical Quantifiable Limits

	Analyte	SDW MCL (µg/l)	Analytical Method	PQL (µg/l)
1	Antimony (Sb)	6	7041	5
2	Arsenic (As)	50	7060	5
3	Barium (Ba)	2,000	6010	3
4	Beryllium (Be)	4	6010	1
5	Cadmium (Cd)	5	7131	1
6	Chromium (Cr)	100	6010	25
7	Cobalt (Co)	--	6010	10
8	Copper (Cu)	1,300*	6010	12
9	Lead (Pb)	15*	7421	5
10	Nickel (Ni)	100	6010	34
11	Selenium (Se)	50	7740	5
12	Silver (Ag)	--	6010	10
13	Thallium (Th)	2	7841	2
14	Vanadium (V)	--	6010	10
15	Zinc (Zn)	--	6010	4

**Action Level*

Organics

	Analyte	CAS Number	SDW MCL (µg/l)	Analytical Method	PQL (µg/l)
16	Acetone	67-64-1	--	8260	1
17	Acrylonitrile	107-13-1	--	8030	5
18	Benzene	71-43-2	5	8260	1
19	Bromochloromethane	74-97-5	--	8260	1
20	Bromodichloromethane	75-27-4	--	8260	1
21	Bromoform	75-25-2	--	8260	1
22	Carbon disulfide	75-15-0	--	8260	1
23	Carbon tetrachloride	56-23-5	5	8260	1
24	Chlorobenzene	108-90-7	100	8260	1
25	Chloroethane	75-00-3	--	8260	1
26	Chloroform	67-66-3	--	8260	1
27	Dibromochloromethane	124-48-1	--	8260	1
28	1, 2 Dibromo - 3 - chloropropane	96-12-8	0.2	8011	0.1
29	1, 2 Dibromoethane	106-93-4	0.05	8011	0.1
30	o - Dichlorobenzene	95-50-1	600	8260	1
31	p - Dichlorobenzene	106-46-7	75	8260	1
32	trans - 1 - 4 - Dichloro - 2 - butene	110-57-6	--	8260	1
33	1,1 Dichloroethane	75-34-3	--	8260	1
34	1,2 Dichloroethane	107-06-2	5	8260	1
35	1,1 Dichloroethylene	75-35-4	7	8260	0.7
36	cis - 1,2 Dichloroethylene	156-59-2	70	8260	1

Organics
(continued)

	Analyte	CAS Number	SDW MCL (µg/l)	Analytical Method	PQL (µg/l)
37	trans - 1, 2 Dichloroethylene	156-60-5	100	8260	1
38	1,2 Dichloropropane	78-87-5	5	8260	1
39	cis - 1,3 Dichloropropene	10061-01-5	--	8260	1
40	trans - 1,3 Dichloropropene	10061-02-6	--	8260	1
41	Ethylbenzene	100-41-4	700	8260	1
42	2 - Hexanone	591-78-6	--	8260	1
43	Methyl bromide	74-83-9	--	8260	1
44	Methyl chloride	74-87-3	--	8260	1
45	Methylene bromide	74-95-3	--	8260	1
46	Methylene chloride	75-09-2	5	8260	1
47	Methyl ethyl ketone	78-93-3	--	8260	1
48	Methyl iodide	74-88-4	--	8260	1
49	4 - Methyl - 2 - pentanone	108-10-1	--	8260	1
50	Styrene	100-42-5	100	8260	1
51	1,1,1,2 - Tetrachloroethane	630-20-6	--	8260	1
52	1,1,2,2 Tetrachloroethane	79-34-5	--	8260	1
53	Tetrachloroethylene	127-18-4	5	8260	1
54	Toluene	108-88-3	1,000	8260	1
55	1,1,1 Trichloroethane	71-55-6	200	8260	1
56	1,1,2 Trichloroethane	79-00-5	5	8260	1
57	Trichloroethylene	79-01-6	5	8260	1
58	Trichloroflouromethane	75-69-4	--	8260	1
59	1, 2, 3 Trichloropropane	96-18-14	--	8260	1
60	Vinyl acetate	108-05-4	--	8260	1
61	Vinyl chloride	75-01-4	2	8260	1
62	Xylenes	1330-20-7	10,000	8260	1

Quality Assurance and Quality Control

A trip blank sample, prepared in the laboratory by filling the appropriate sample container (one of each type of container) with Type II reagent grade water, will accompany the sampling kit, and remain in the sample cooler during the sampling activities. The trip blanks will be analyzed for the above listed parameters to assure the integrity of the samples during transport. Any detection of the analytes will suggest cross contamination of the samples during sample transport.

The laboratory conducting the analytical services will comply with all QA/QC procedures outlined in US EPA-SW846. Specific elements of the analytical laboratory's QA/QC plan will include:

- analysis of a daily central sample consisting of method blanks, external control samples, surrogate recovery, and matrix spikes or duplicates;
- maintenance of internal Chain of Custody documentation on all samples received
- record the order in which the samples and blanks were analyzed
- will analyze EPA certified reference samples on a routine basis
- will maintain statistical process control records.

Proposed Statistical Analysis for Detection Monitoring

Introduction

Statistical analysis of water quality analytical data will be performed to establish background ground water quality in the upgradient and each of the downgradient monitoring wells, and to determine whether or not there is a statistically significant increase over background levels for any of the 62 parameters being monitored (parameters listed in VSWMR Appendix 5.5, final detection monitoring constituents).

During the first semiannual monitoring period, background conditions will be ascertained from ground water monitoring events in accordance with the following schedule:

August, 1993*	2 sampling events
October, 1993*	1 sampling event
November, 1993	1 sampling event
January, 1994	1 sampling event
March, 1994	2 sampling events
May, 1994**	1 sampling event

* *Prior to expected beginning of first semiannual period. Sampling schedule is intended to provide background reflective of seasonal variations.*

** *Occurs shortly after the expected first semiannual period, but well before date of second semiannual period when statistical comparisons are due. Inclusion of May sampling data is needed to create seasonally-representative background data base.*

Monitoring data from wells MW-4 and MW-10 (background wells) will be combined after the initial semiannual monitoring period (May, 1994) to represent the background concentrations per each analyte. Monitoring wells MW-2, MW-3, MW-5, MW-7, MW-8, and MW-9 will represent the detection monitoring wells, which could possibly be affected by landfill leachate impacted ground water. Background conditions will be compiled per analyte for each detection well. The number of observations from each individual well will equal 9 at the time of the statistical comparison analysis; a total of 16 observations will be combined to ascertain background conditions (8 from MW-4 and 8 from MW-10). The intrawell and interwell statistical comparative analysis will take place after the second semiannual monitoring results are received.

Test for Normality of Data

After the establishment of background conditions, subsequent to the next semi-annual sample collection period, the data will be graphically portrayed by plotting on probability paper (US EPA, 1989) or equivalent statistical computer software. If the plot of the data is concluded to be a straight line, the data will be assumed to be derived from a normal population distribution. As a confirmation of the data plots, the Shapiro-Wilk normality test will be performed for a sample size up to 50 and the Shapiro-Francia normality test will be performed for a sample size more than 50. If the data are not normally distributed, the appropriate non parametric method, as described below will be utilized.

Statistical Analysis

If normal distribution is evident, a Shewhart Control Chart methodology will be employed as the statistical analytical technique. After determination of background conditions, data from monitoring wells MW-4 and MW-10 will be combined for each individual analyte. The sample mean ($\bar{y}$) and sample standard deviation (s) will be computed from the pooled MW-4 and MW-10 monitoring data. The sample mean plus 1.96 standard deviations from the sample mean will indicate the upper control limit for each parameter. Each individual monitoring well observation will be compared to the upper control limits of the background conditions. Observations which fall above $\bar{y} + 1.96s$ will signal an outlier or "out of control" situation where the variation in analyte concentrations may be attributable to assignable causes other than random variation within the sampling and analytical process. The implementation of $\bar{y} + 1.96s$ will result in a 0.05 significance level in accordance with VSWMR performance standard. Updating of the control chart sample means and standard deviations will be undertaken after sampling periods 4, 8, 12, 20, and 32 following the after the initial monitoring period (US EPA, 1989).

Additionally, intrawell control charts will be constructed employing the same methodology. Individual monitoring well data per parameter will be plotted against upper control limits ($\overline{y} + 1.96s$). As with the interwell comparison to the established background conditions, an observation which exceeds $\overline{y} + 1.96s$ will signal a situation where the variation may be attributable to assignable causes other than random variation (outlier or "out of control" parameter requiring further investigation).

Subsequent to the initial semiannual determination of background conditions and establishment of upper control limits on the pooled hydraulically upgradient (or background) monitoring wells (MW-4, MW-10), and delineation of upper control limits on the individual monitoring wells, intrawell and interwell (versus background) comparisons will be made on each parameter semiannually.

If a reported analytical concentration in any downgradient monitoring well exceeds either the background or individual well control limits, an investigation will be undertaken as to the validity of the data and the statistical evaluation. If a cause for the observation cannot be assigned to other than random variations, the Virginia Department of Environmental Quality (VDEQ), Waste Division will be notified within 14 days of the finding as to what constituents and which wells reflect statistically significant changes from background levels. An effort may be made to demonstrate that a source other than the facility caused the contamination, or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in ground water quality. If such demonstration is made, a report documenting that demonstration will be certified by a qualified ground water scientist and submitted to the VDEQ, Waste Division for approval. If successful demonstration is made and approved, monitoring under Final Detection Monitoring practices will continue. If, after 90 days, such demonstration is not made, an assessment monitoring program will be initiated as documented previously herein (*see "Assessment Monitoring" under Ground Water Monitoring Program section*).

If, based upon the probability plot method and tests for determining normality, a departure from a normal distribution is evident, a distribution-free equivalent to the analysis of variance "F" test will be utilized for statistical analysis. A Kruskal-Wallis H test (one-way nonparametric analysis of variance) for comparing population probability distributions will be calculated for every parameter for which a normal distribution cannot be ascertained (US EPA, 1989). If individual well comparisons are indicated, the Type I error rate will be 0.01 for each individual comparison. The interchanging

between parametric (control chart) to nonparametric (Kruskal-Wallis) methods between wells will not be undertaken once a parameter has been shown to be non-normal. Notification and investigation in the event of a statistically significant increase will proceed as described above.

It is important to note that an observed increase will indicate a statistically significant, not practical significant indicator of potential ground water contamination. Within 90 days of the determination of a statistically significant increase in analyte concentration, a comprehensive assessment monitoring program will be implemented for the facility unless demonstration is made that the statistically significant increase resulted from some factor other than facility impact.

Outliers

Individual sample results will be scanned for outliers. The procedures for outlier detection and subsequent inclusion/deletion are summarized from US EPA (1989) and are as follows:

The outlier test statistic, Tn will be calculated from: $Tn = (Xn - \bar{y})/s$ where

Xn = the largest individual sample result
$\bar{y}$ = the sample mean
S = the sample standard deveation

The calculated Tn will be compared to the tabulated critical values of Tn (*Table 8, Appendix B, US EPA, 1989*). If the calculated Tn exceeds the tabulated value at the 0.05 significance level, the individual sample result will be considered an outlier. The following steps will be included following the identification of an outlier:

- If the value is the result of an undeterminable error but the true value cannot be ascertained, the outlier observation will be deleted and the reason for deleting the observation will be reported.
- If no error can be documented, the observation will be retained as an extreme value. Documentation will be included as appropriate for all outlier observations.

Data Detectability and Quantification Limits

In accordance with US EPA Guidelines (1989), data reported below the minimum detectable level will be adjusted by the appropriate method to be applied depending upon circumstances as follows:

- If 15 percent or fewer of the values are not detected, they will be replaced by the practical quantification limits, divided by two (MDL/2 or PQL/2) for that constituent prior to establishing the control limits.

- If more than 15 percent, but less than 50 percent, of the constituents are non-detects, then the data will be evaluated in non-parametric fashion (Kruskal-Wallis) as described above.

- If more than 50 percent of the data are non-detectable (and at least 10 percent are quantified) the Kruskal-Wallis H test (one-way non-parametric analysis of variance) will be undertaken as the statistical method.

- If less than 10 percent of the data are quantified, the Poison Prediction Limit EPA Addendum to Guidelines (1992) will be employed. If all the data are below the detection limits, no analysis will be undertaken.

Missing Data

If a sampling event results in a missing data value (either through laboratory omission, accessibility to the monitoring site, or extraneous circumstances), an attempt to re-sample for the missing data will be made as soon as practically possible. If the re-sampled data cannot be obtained during the generalized sampling schedule, the missing data will be replaced by the average value obtained from previous monitoring events for the missing data (US EPA, 1989).

Performance Standards

The statistical method used to evaluate the monitoring data will be appropriate for the distribution of the monitoring data (normal or non-normal).

Multiple well comparisons will be done at a Type I error rate of no less than 0.05 for each testing period (Kruskal-Wallis). If individual comparisons are indicated the Type I error will be 0.01 for each individual comparison.

If based on normally distributed data whereby a control chart is used, a Shewart type of control chart and associated parameter values will be protective of human health and

the environment. The parameters will be determined after considering the number of samples in the background data base, data distribution, and range of concentration values for each constituent.

The statistical methods will account for data below the detection limit. All practical quantification limits (PQL's) will be the lowest level of concentration that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.

Seasonality of Data

The statistical method will include procedures to correct for seasonal variability of the data as well as temporal correlation in the data, as illustrated in US EPA (1989). If seasonality of the data is evident from the control chart graphs of the individual well/analyte plots, the data will be revised and resubmitted corrected for seasonality as per the procedure described in section 7.2, US EPA (1989) and summarized as follows:

- The average monthly concentration per parameter will be compiled (i.e. mean concentrations for all analytes, etc.)
- Compile the grand mean of all observations
- The adjusted value, corrected for seasonability will be computed from:
  $Zij = yij - \bar{y}i + \bar{y}$

  where Zij = adjusted concentration
  $\bar{y}i$ = average concentration for month i over N years
  yij = observation form i' th month and j' th year
  $\bar{y}$ = grand mean of all observations

Data Recordation

The data to be retained will consist of original laboratory analyses sheets. Included on the original laboratory analytical report will be the observed concentration of each analyte, practicable quantifiable limits, analytical method, and surrogate recovery, where available.

A tabular spreadsheet will be utilized for data recordation and report submittal. An individual sheet will be used per monitoring well and will depict the reported sample results for each analyte. Photocopied laboratory analytical report sheets will be

submitted in conjunction with the tabular spreadsheets. An example of the data record sheets is included as *Figure 6*.

During the final detection monitoring, laboratory results will be submitted within 15 days of receipt of the laboratory analytical results. Semiannual reporting, inclusive of statistical analysis of monitoring data, will be submitted within 30 days after receipt of the laboratory analytical data.

Figure 6

Commonwealth of Virginia
Department of Environmental Quality
2111 North Hamilton Street
Richmond, Virginia 23230-1143

WATER MONITORING REPORT

Final Detection Monitoring

Facility Name _____ *Monitoring Point Designation No.* _____
Location of Facility _____ *Date of Sample Collection* _____ *Temp.* _____
Permit Number _____ *Sampling Depth* _____ *Depth of Water Level* _____

Parameters	Units	Standard Limits	Test Results	Date Sampled	Date Analyzed	Remarks

Laboratory Name & Address: _____ Sample Collected By: _____ (Individual)

Company: _____

Analyses Performed By: _____

Date of Analyses _____

*For Surface Water Samples Only

*Reports are due before the 15th day of April, July, November, and January

Supplemental Narratives

Drilling Activities

Drilling Activities

Drilling activities commenced at the Tazewell County Landfill site on November 11, 1992. All wells were drilled with an Ingersoll-Rand T-4 air rotary drilling rig utilizing rotary and downhole hammer methods with 6-inch, 8-inch, and 12-inch bit sizes. When using the downhole hammer, the only lubricant employed was "Enviro-Safe RD-N" distributed by Drillers Service, Inc. in Hickory, North Carolina. Prior to drilling of every well, all drill rods, bits, stabilizers, etc. were thoroughly decontaminated, as was the drill rig itself, utilizing high pressure, hot water applications.

During drilling of each well, a supervisory geologist was present to document the types of strata encountered, fractured zones, cavities and the occurrence of water. Samples of the cuttings were caught and described at five foot intervals (*see Appendix A for geologic logs of wells MW-7, MW-8, MW-9 and Boring BH-7 - logs of other borings are incorporated in submittal of April 6, 1993*).

Wells MW-2, MW-3, MW-4, MW-5, MW-8, BH-5, BH-6 and BH-7 were drilled with an 8-inch rotary tri-cone bit until bedrock was encountered, where 6⅝ inch black steel surface casing was set into bedrock with a bentonite toe emplaced to seal out surface water. After setting surface casing the holes were drilled to total depth with a downhole hammer and 6-inch bit. (The pilot borehole at MW-2 was later reamed to 8-inch size to total depth, to facilitate construction of the monitoring well).

Wells MW-7 and MW-9 were drilled with a 12 inch rotary tri-cone bit to bedrock where 8¼-inch I.D. black steel surface casing was set and a bentonite toe emplaced to seal out surface water. After setting surface casing, MW-7 and MW-9 were drilled on with an 8-inch rotary tri-cone bit to depths of 302 feet and 212 feet, respectively, where 6 ⅝-inch black steel casing was set and a bentonite toe emplaced. These two wells were then drilled to total depth using both 6 inch downhole hammer and 6 inch rotary tri-cone bit.

At the time of this report, a total of ten boreholes have been drilled. Seven of these have been constructed into permanent monitoring wells (MW-2, MW-3, MW-4, MW-5, MW-7, MW-8, MW-9). One hole (BH-7) was intended for a permanent monitoring well

but was abandoned due to extremely adverse borehole caving conditions and loss of circulation. After drilling the hole to a total depth of 400 feet, with loss of circulation and no returns of the drill cuttings, the hole could not be kept open long enough to properly construct a monitoring well. Two other wells, BH-5 and BH-6, were drilled for temporary monitoring and were subsequently backfilled with cement grout, as was BH-7. (*Refer to Appendix B of this report and Appendix D of April 6, 1993 report.*)

Monitoring Well Installation

Monitoring Well Installation

A total of eight new permanent groundwater monitoring wells were installed between November 11, 1992 and June 2, 1993. Seven of these were installed in boreholes drilled expressly for this purpose (MW-2 through MW-5, MW-7, MW-8 and MW-9), and one was installed in an existing well which had been previously used as a residential water supply well (MW-6). Water inflows were noted while drilling the new wells, and down-hole video logging was utilized to observe water flows and hole conditions such as fracturing and solution cavities. Water levels were monitored in the open wells prior to construction to help determine the appropriate depths to place the screens. Geophysical logs were utilized in the well converted to MW-6 and in MW-8 to determine water inflow zones.

The following is a general summary of techniques used in construction of all the monitoring wells. After determining where to set the screen, the hole was backfilled to the appropriate depth by emplacing bentonite through a 1½ inch PVC tremie pipe. A layer of sand was then placed to the appropriate depth through the tremie pipe. At this point, the tremie pipe was removed and 2-inch PVC screen and riser pipe were put into place. All 2-inch screens and risers utilized in construction of the wells were 10-feet lengths of schedule 40 PVC, flush joint (threaded) with O-ring seals at each joint. The screens and risers were pre-wrapped at the factory in sealed plastic sheaths that were removed from each joint as it was lowered into the borehole. All personnel involved in the construction wore clean disposable latex gloves. After the 2-inch screen and riser were in place the 1½ inch tremie pipe was then lowered to the appropriate depth and a sand pack was emplaced around the screen and to the appropriate horizon above the screen. An upper bentonite seal (bentonite pellets) was then emplaced through the 1½ inch tremie pipe. If no water was present at that position in the hole, potable water was added to the upper bentonite seal to hydrate it prior to grouting. After hydration of the upper bentonite seal, the hole was grouted to the surface by pumping cement grout through the tremie pipe, which was placed at the top of the upper bentonite seal and pulled up as the cement filled the hole (*refer to diagrams in Appendix D of the April 6, 1993 report and Appendix B of this report for specifications of each monitoring well*).

There were small variations on the above methodology as dictated by the hole conditions encountered in each well, as follows.

The borehole used to construct MW-2 was drilled in a highly disturbed zone of bedrock, which resulted in very unstable hole conditions. To facilitate well construction, the hole was reamed to an 8-inch diameter and 5-inch black steel casing was used to line the hole to the total depth of 277 feet. As the well was constructed, the 5-inch steel liner was pulled up and cut off in appropriate lengths to allow placement of the bentonite seals, sand pack, screen and riser, etc. The use of the 5-inch liner prevented the hole from collapsing during the various stages of well construction. All of the 5-inch liner was ultimately removed as the hole was grouted to surface.

In MW-3, the screen was set in a zone of fractures and/or solution cavities with a relatively strong water flow (estimated at 30 gpm). These conditions raised concerns about the ability to place a proper sand pack around the screen. To circumvent this problem, a pre-packed screen assembly was used, made by Timco Manufacturing and consisting of 4½ inch O.D. screened PVC with a 2-inch I.D. PVC screen inside. The annular space between the 2-inch and 4½ inch screens was packed with No. 2 sand (12-20 mesh), with threaded PVC end caps on the 4½ inch screen to hold the sand in place. The entire assembly was lowered into place connected to 2-inch PVC riser. At this point, a No. 4 gravel pack (4-10 mesh) was placed around the screen assembly and a layer of finer sand emplaced above this through 1½ inch tremie pipe, prior to adding the upper bentonite seal. The hole was then grouted to surface with bentonite/cement grout and cement grout (*see Appendix D of the original report and Appendix B of this report for construction diagram*).

MW-7, MW-8 and MW-9 were constructed using the same type pre-packed screen assembly as used in MW-3 as described above. The same procedures were used in placing the gravel pack and upper bentonite seal as well.

Borehole Abandonment

Two holes (BH-5 and BH-6) were drilled for temporary water level monitoring purposes and subsequently backfilled with cement grout from total depth to surface. Both of these holes "caved in" above the total depth of the hole after monitoring for several days. Prior to grouting, the drilling rig was moved back onto each hole and

cleaned out to total depth. Tremie pipe was then run to the bottom of the hole and cement grout was pumped into the hole through the tremie pipe, which was pulled up as the cement filled the hole.

Borehole BH-7 was originally drilled for construction of a permanent monitoring well. However, due to extreme hole conditions (hole caving and loss of circulation) the hole could not be kept open to construct a monitoring well, and was abandoned. After a new hole was drilled and successfully constructed into a monitoring well (MW-7), the rig was moved back onto BH-7 and the hole cleaned out to total depth. After several attempts, a tremie pipe was "washed" to the bottom of the hole and cement grout pumped through it. The tremie pipe was pulled out of the hole as the grout filled the borehole to surface (*refer to Appendix B for Construction Diagrams*).

Monitoring Well Yields

Monitoring Well Yields

Purging and sampling of monitoring wells MW-2, MW-3, MW-4 MW-5 and MW-6 was conducted on February 16 and 17, 1993. All wells were purged and sampled by bailing methods. Purging/development of MW-7, MW-8 and MW-9 was conducted on June 24 and June 28, 1993 by bailing methods.

Four of the wells (MW-3, MW-6, MW-7 and MW-9) were purged at rates of 0.166 to 0.333 gallons per minute with very little drawdown occurring. Specific capacities of these wells were calculated from drawdowns observed while purging.

Q = Rate of Flow (gpm)

s = Drawdown (ft)

qs = Specific Capacity (gpm / ft)

$$qs = \frac{Q}{s}$$

For MW-3:

$$qs = \frac{0.166 \text{ gpm}}{1.24 \text{ ft}}$$

$qs = 0.134$ gpm / ft

For MW-6:

$$qs = \frac{0.166 \text{ gpm}}{4.19 \text{ ft}}$$

$qs = 0.0396$ gpm / ft

For MW-7:

$$qs = \frac{0.211 \text{ gpm}}{0.52 \text{ ft}}$$

$qs = 0.406$ gpm / ft

For MW-9:

$$qs = \frac{0.333 \text{ gpm}}{3.0 \text{ ft}}$$

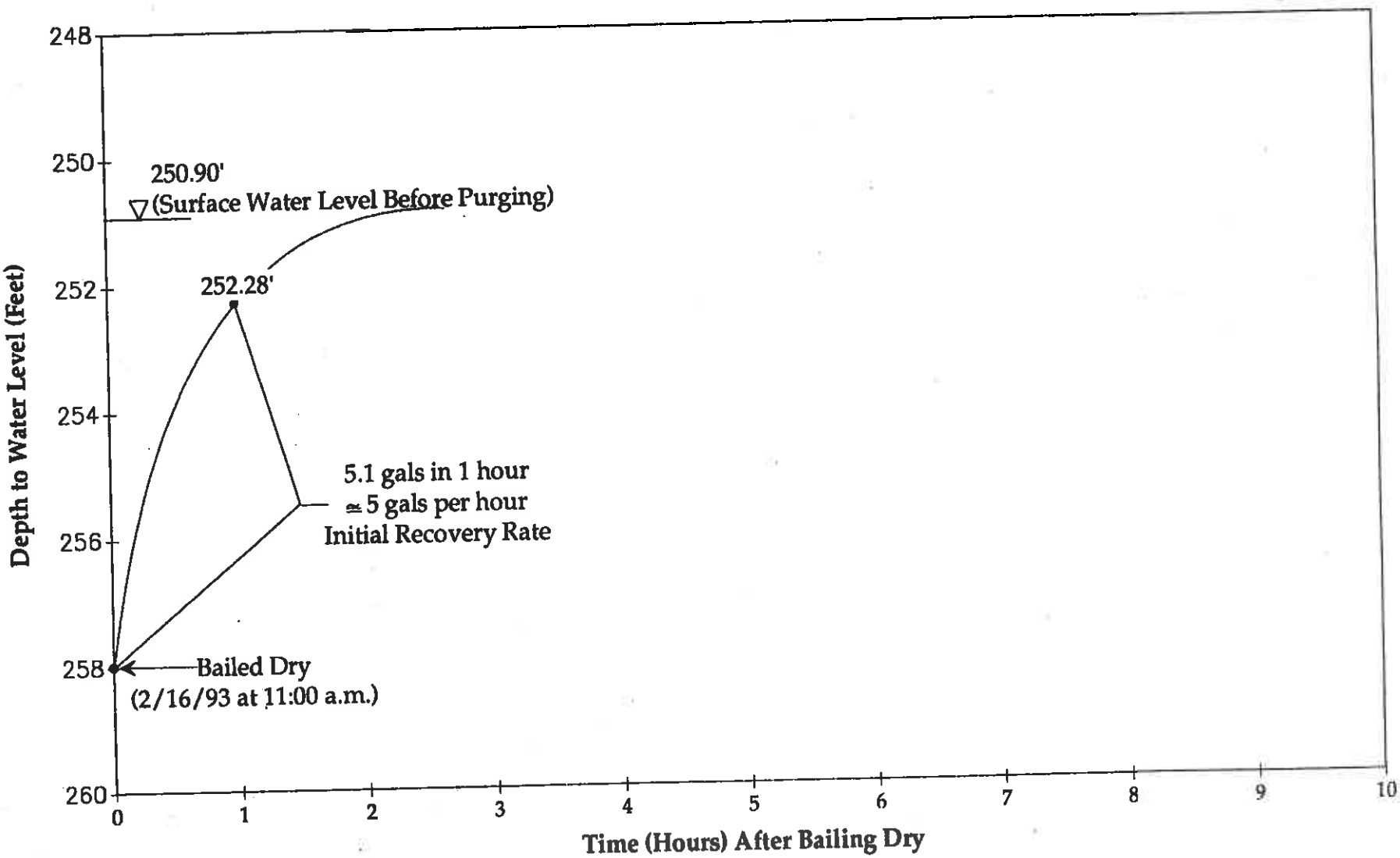
$qs = 0.111$ gpm / ft

Wells MW-2, MW-4, and MW-5 were bailed dry and allowed to recover until sufficient volume of water was present to sample. All three of these wells recovered sufficiently for sampling within 24 hours and were then sampled. Well MW-8 was bailed dry and the recovery monitored (*see attached graphs showing recovery rates*).

Tazewell County Landfill

MW-2

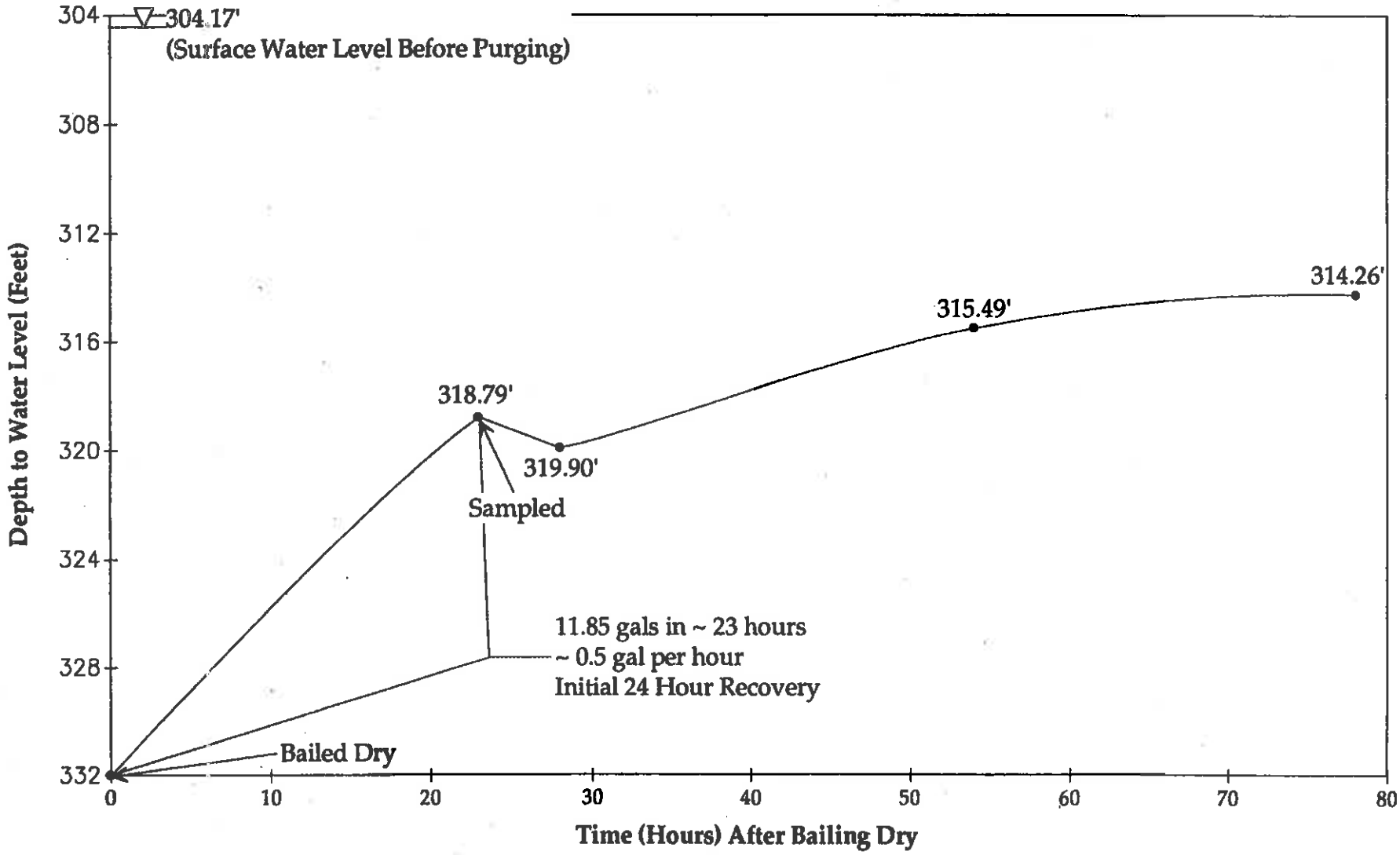
Recovery After Bailing Dry



Tazewell County Landfill

MW-4

Recovery After Bailing Dry

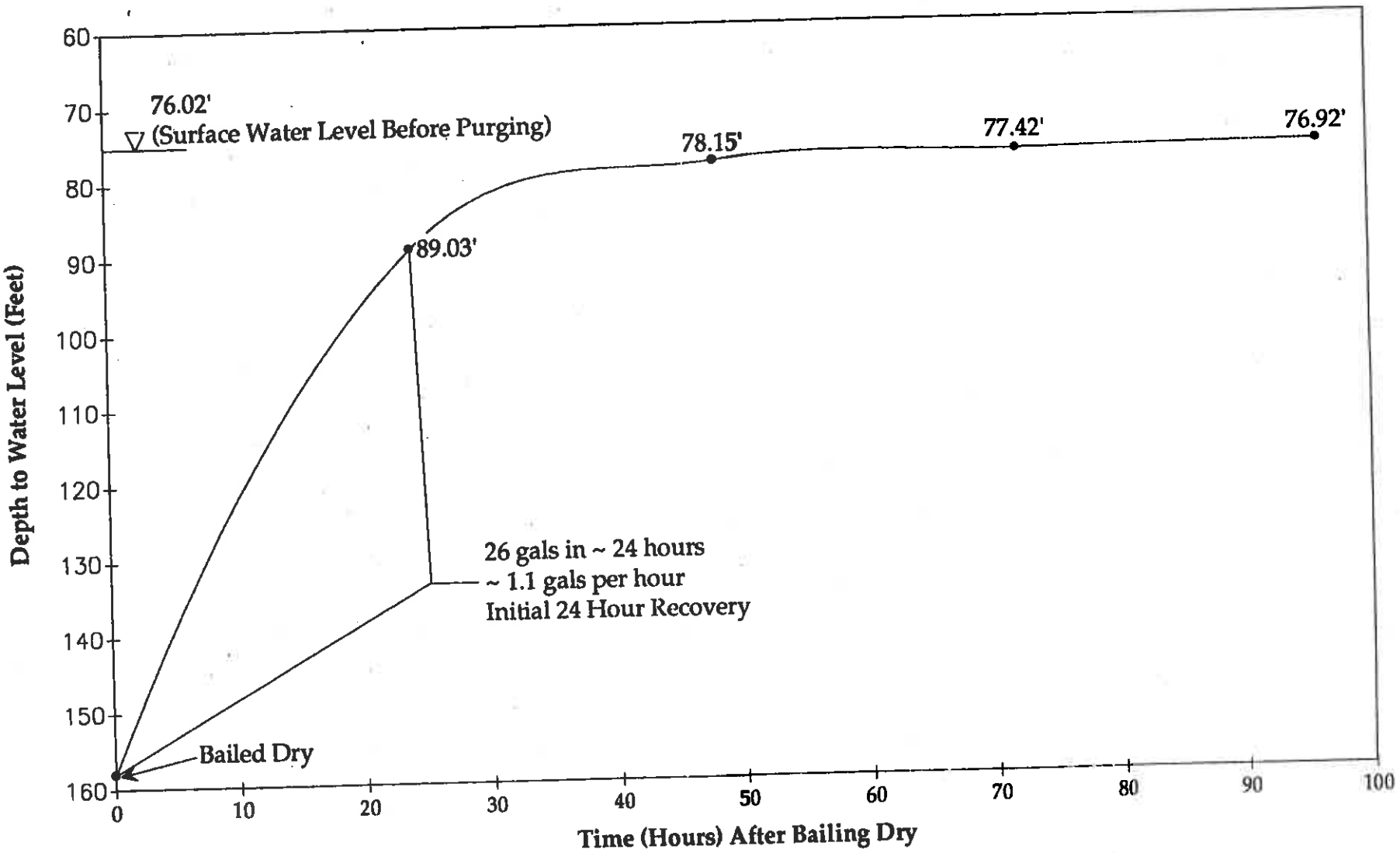


MARSHALL MILLER & ASSOCIATES

Tazewell County Landfill

MW-5

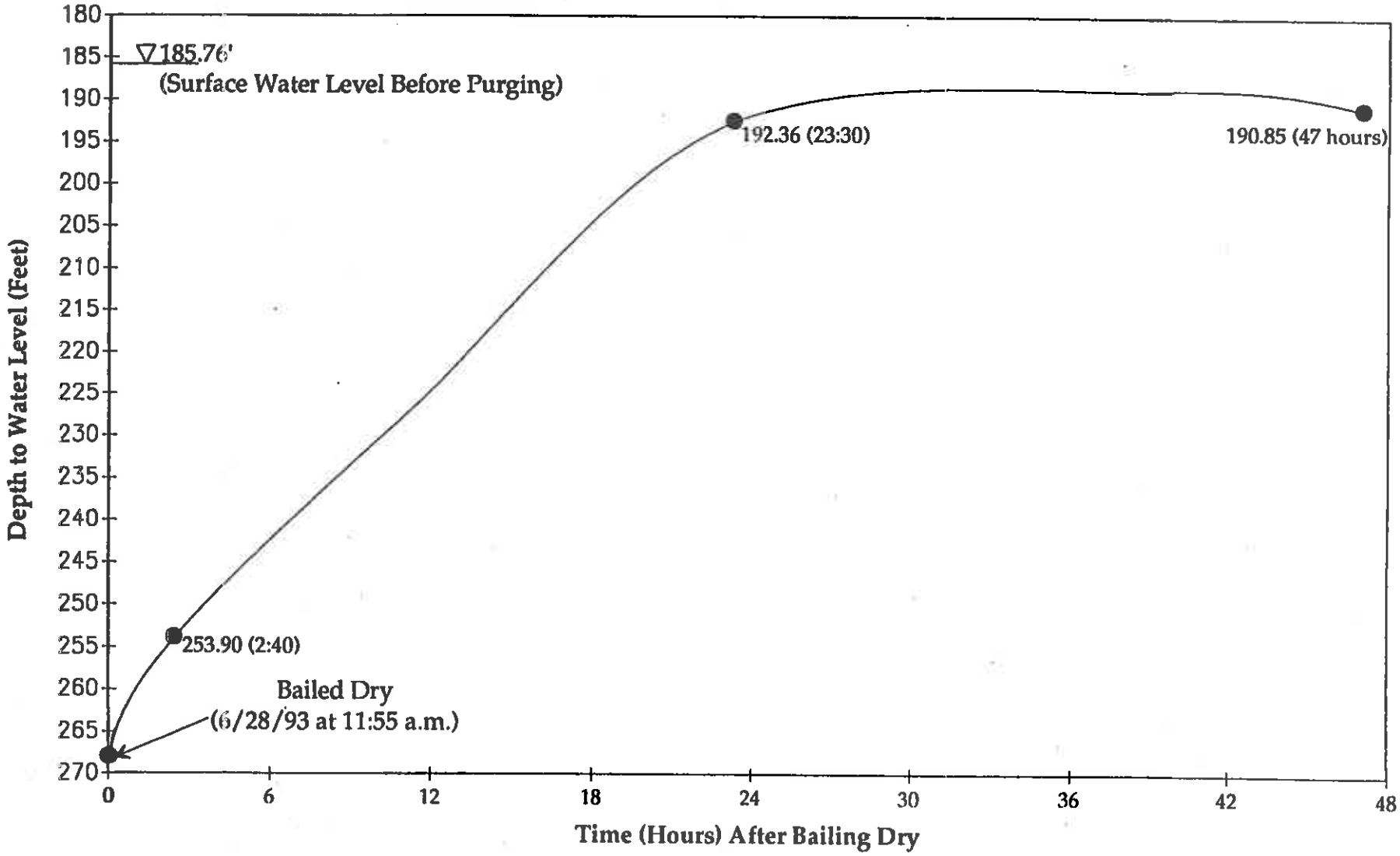
Recovery After Bailing Dry



Tazewel. .ounty Landfill

MW-8

Recovery After Bailing Dry



MARSHALL MILLER & ASSOCIATES

Hydraulic Conductivity Testing and Analysis

Hydraulic Conductivity Testing and Analysis

Monitoring wells MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8 and MW-9 were tested by either injection or withdrawal of a sand-filled PVC slug. Slug injection testing was conducted in every case, but where the well completely recovered within approximately two hours or less, a withdrawal test was also conducted and the withdrawal results were utilized for final analysis. Wells MW-4, MW-5, and MW-8, however, recovered at extremely slow rates, and withdrawal tests were not conducted in those three wells. (Injection tests on these three wells were allowed to run overnight, and analysis of the data indicated that complete recovery would take a matter of days).

Recoveries were measured via a pressure transducer emplaced in the well and calibrated prior to the test. Measurements of time and head were recorded utilizing a digital data logger. All equipment placed into the downhole environment was brush cleaned and rinsed with distilled water before and between usages, and placed on clean plastic liner surfaces in handling above ground. Operators wore disposable latex gloves in working with downhole equipment, re-gloving between applications.

Slug test data were analyzed utilizing multiple methods. The Hvorslev (1951) empirical method, which is generally suitable for both confined and unconfined conditions and is not affected by aquifer anisotropy, was used in each instance. The Bouwer and Rice (1976, 1989) method, which is most suitable in unconfined conditions, was utilized to analyze each well except MW-4, MW-5, and MW-8. Fully penetrating conditions were assumed in the analysis.

The Cooper, Bredehoeft, and Papadopulos (1967) method for confined aquifers with fully-penetrating wells was used to analyze MW-4, MW-5 and MW-6, which appear to be most distinctly confined in character. As discussed in the main body of this report, the ground water system at the site is unconfined as a whole, but may display localized "confined" characteristics at any given specific point due to the fact that flow paths are comprised of fractures and/or solution-enhanced fissures (rather than intergranular pore spaces).

Hydraulic conductivity estimates vary extremely from well to well, as might be expected in the presence of a high degree of fracture control on flow. Wells MW-4, MW-5, and MW-8 are screened in zones of comparatively sound rock, and exhibit hydraulic conductivity values in the range of approximately 10^{-4} to 10^{-3} feet per day. Wells MW-2 and MW-6 are perhaps most "typical" in degree of fracturing and exhibit hydraulic conductivities on the order of 0.08 to 0.1 feet per day. At the other extreme, MW-7 is screened in an open fractured/solution zone, and displays a hydraulic conductivity of 4 to 6 feet per day.

The test response of well MW-3, screened in a heavily-fractured and solutioned zone, shows considerable variation from the theoretical response and obviously exhibits characteristics which do not conform to the assumptions which underlie the slug test analyses methods. The curvilinear response (*see Appendix F of the April 6, 1993 report*) suggests possible impact by specific storage components. Detailed review of MW-3 response suggests an open cavity extending from the screened interval to a horizon above the water table, acting as a linear well extension which is fed by smaller fissures or fractures. The overall recovery response can be separated into three phases or stages that may be representative of progressively smaller, "tighter" fractures feeding flow to the well via the larger cavity which acts as an extension of the well. However, vertical flow components are apparently involved, and this and other violations of the basic analysis assumptions makes the derived hydraulic conductivity values difficult to rely upon. The three stages of recovery show hydraulic conductivities of approximately 5, 0.8, and 0.2 feet per day, respectively.

It must be emphasized that slug testing determines the hydraulic conductivity only at a specific point within the aquifer. The application of such testing at several points across the site, as conducted in this investigation, provides a good indication of the spatial variation that exists within the aquifer, and the results should be used in that context. Averaging of the various derived hydraulic conductivity values to produce a single "mean" value for application to the site in general would be misleading and out of context with site conditions. The aquifer displays considerable variation in hydraulic conductivity, and thus in flow velocities and water-rock contact time, from one point to another within the site.

Previous Ground Water Monitoring for Existing and Closed Areas of Facility

Description of Previous Ground Water Monitoring for Existing and Closed Areas of Facility

Previous monitoring of ground water quality at the existing site was conducted on a quarterly basis, analyzing for the nine parameters set forth in the Interim Detection Monitoring requirements of the Virginia Solid Waste Management regulations. The monitoring points included (*see Map 1 for locations*):

- MW-1, a properly-constructed monitoring well, but which is seasonally dry;
- Shop Well, a supply well located near the facility shop and scales;
- A spring located south of the disposal facility, east of new well MW-6;
- The former sediment pond, located west of the existing disposal area and just north of MW-1.

These stations were sampled on a quarterly basis through the first quarter, 1993. After that, sampling was discontinued in anticipation of the commencement of final detection monitoring of the newly-installed ground water monitoring system, in which the existing and planned facilities will be monitored as a unit. Interim parameter analyses results for the former quarterly sampling were provided to the VDEQ inspector for the facility, Mr. Olin Willis of the Abingdon, Virginia, Waste Division office. The results were not statistically evaluated.

Appendices

Appendix A

Company: Tazewell County Landfill
Project: Phase II Investigation MW Cons
Hole No.: BH-7
State: VA
County: Tazewell
Total Depth: 400.00

Start Date: / /
Finish Date: / /
Elevation: 3016.12
Logged By: M.S. Smith
Drilled By: MM&A-GT.
North: 0.00
East: 0.00

From	To	Thickness	Seam	Description
0' 0.00"	78' 0.00"	78' 0.00"		SUBSOIL, Dark brown to brown, occasionally red brown, with high clay content.
78' 0.00"	80' 0.00"	2' 0.00"		VOID, Void, lost circulation (Regained).
80' 0.00"	105' 0.00"	25' 0.00"		SUBSOIL
105' 0.00"	108' 0.00"	3' 0.00"		VOID, Void, dropped 3', slight amount water to slightly damp.
108' 0.00"	145' 0.00"	37' 0.00"		SUBSOIL, Brown to dark brown with occasional red brown, slightly sandy with high clay content. Poor returns.
145' 0.00"	157' 0.00"	12' 0.00"		VOID, Void, lost circulation. drilled to 154' with no returns. Run casing drive down with hammer to 157'. Drill out with 6" hammer.
157' 0.00"	167' 0.00"	10' 0.00"		DOLOMITE, Dolomite/clay mix-highly weathered.
167' 0.00"	175' 0.00"	8' 0.00"		DOLOMITE, Light gray to buff, micro crystaline with occasional slightly sandy texture, hard.
175' 0.00"	180' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, micro crystaline with occasional slightly sandy texture, hard.
180' 0.00"	185' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, micro crystaline with occasional slightly sandy texture, hard.
185' 0.00"	190' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, hard, moderately sandy with abundant slightly damp very fine cuttings.
190' 0.00"	195' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, hard, moderately sandy with abundant slightly damp very fine cuttings.
195' 0.00"	200' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, very hard, micro crystaline with siliceous interbedded, very fine cuttings.
200' 0.00"	205' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, very hard, micro crystaline with siliceous interbedded, very fine cuttings. (with fractured zone at 208-210' with large gravel size cuttings.)
205' 0.00"	210' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, very hard, micro crystaline siliceous, very fine powdery cutting.
210' 0.00"	215' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, very hard, micro crystaline siliceous, very fine powdery cutting.
215' 0.00"	220' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, very hard, micro crystaline siliceous, very fine powdery cutting.
220' 0.00"	225' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, very hard, micro crystaline siliceous, very fine powdery cutting. (with fractured zone 227-229').

From	To	Thickness	Seam	Description
225' 0.00"	230' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, very hard, micro crystaline siliceous, very fine powdery cutting.
230' 0.00"	235' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings.
235' 0.00"	240' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings. (w/fractured zone 247-250- very damp).
240' 0.00"	245' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings.
245' 0.00"	250' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings. (w/fractured zone 247-250', very damp).
250' 0.00"	255' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings. (dryer).
255' 0.00"	260' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings. (dry).
260' 0.00"	265' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings.
265' 0.00"	270' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings.
270' 0.00"	275' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings.
275' 0.00"	280' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings.
280' 0.00"	285' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings.
285' 0.00"	290' 0.00"	5' 0.00"		DOLOMITE, Gray to occasionally brown gray, with occasional reddish tint, hard, micro crystaline, siliceous, very fine cuttings.
290' 0.00"	295' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasionally gray brown, larger cuttings with brown, soil coating, very damp. 294-311' lost circulation, no returns, hole caving in, very tight.
295' 0.00"	300' 0.00"	5' 0.00"		DOLOMITE, No Return.

BH-7

From	To	Thickness	Seam	Description
300' 0.00"	305' 0.00"	5' 0.00"		DOLOMITE, No returns.
305' 0.00"	310' 0.00"	5' 0.00"		DOLOMITE, No returns. Hard rock drilling 311-316'.
310' 0.00"	315' 0.00"	5' 0.00"		DOLOMITE, No return. void/fractured/(soft?) 326-327'.
315' 0.00"	320' 0.00"	5' 0.00"		DOLOMITE, No return.
320' 0.00"	325' 0.00"	5' 0.00"		DOLOMITE, No return.
325' 0.00"	330' 0.00"	5' 0.00"		DOLOMITE, No returns.
330' 0.00"	335' 0.00"	5' 0.00"		DOLOMITE, No returns (solid).
335' 0.00"	340' 0.00"	5' 0.00"		DOLOMITE, No returns, fractured from 341-350'+
340' 0.00"	400' 0.00"	60' 0.00"		DOLOMITE, No Return. 341-350';highly fractured with caves. 350-400' fairly solid with occasional small fractured zone, very hard rock.
400' 0.00"	400' 0.00"	0' 0.00"		

Company: Tazewell County Landfill
Project: Phase II Investigation MW Cons
Hole No.: MW-7
State: VA
County: Tazewell
Total Depth: 400.00

Start Date: / /
Finish Date: / /
Elevation: 0.00
Logged By: M.S. Smith
Drilled By: MM&A-GT.
North: 0.00
East: 0.00

From	To	Thickness	Seam	Description
0' 0.00"	28' 0.00"	28' 0.00"		CASING, Soil
28' 0.00"	37' 0.00"	9' 0.00"		DOLOMITE, Light gray-buff, light brown, occasionally dark gray, slightly shaly, micro crystaline, hard, slightly silceous.
37' 0.00"	44' 0.00"	7' 0.00"		DOLOMITE, Light brown to buff, light brown, occasional dark gray, slightly shaley, micro crystaline, hard, slightly silceous.
44' 0.00"	64' 0.00"	20' 0.00"		VOID
64' 0.00"	70' 0.00"	6' 0.00"		DOLOMITE, Light brown to buff, light brown, occasional dark gray, slightly shaley, micro crystaline, hard, slightly silceous.
70' 0.00"	75' 0.00"	5' 0.00"		DOLOMITE, Light brown to buff, light brown, occasional dark gray, slightly shaley, micro crystaline, hard, slightly silceous.
75' 0.00"	80' 0.00"	5' 0.00"		DOLOMITE, Light brown to buff, light brown, occasional dark gray, slightly shaley, micro crystaline, hard, slightly silceous.
80' 0.00"	85' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional dark gray, hard, micro crystaline with occasional slightly siliceous.
85' 0.00"	90' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional dark gray, hard, micro crystaline with occasional slightly siliceous.
90' 0.00"	100' 0.00"	10' 0.00"		DOLOMITE, Light gray to gray, occasional dark gray, hard, micro crystaline with occasional slightly siliceous.
100' 0.00"	105' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional dark gray, hard, micro crystaline with occasional slightly siliceous.
105' 0.00"	110' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional dark gray, hard, micro crystaline with occasional slightly siliceous.
110' 0.00"	115' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional dark gray, hard, micro crystaline with occasional slightly siliceous.
115' 0.00"	129' 0.00"	14' 0.00"		DOLOMITE, Light gray to gray, occasional dark gray, hard, micro crystaline with occasional slightly siliceous. Highly fractured 115-129'.
129' 0.00"	135' 0.00"	6' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous.
135' 0.00"	140' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional

From	To	Thickness	Seam	Description
				siliceous.
140' 0.00"	145' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous.
145' 0.00"	150' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous. Fractured 147-148'.
150' 0.00"	155' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous.
155' 0.00"	160' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous.
160' 0.00"	165' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous.
165' 0.00"	170' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous.
170' 0.00"	175' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous.
175' 0.00"	180' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous. Fractured 175-176'.
180' 0.00"	185' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous.
185' 0.00"	190' 0.00"	5' 0.00"		DOLOMITE, Light gray to light gray brown - buff, very hard, micro crytalline to crystalline, occasional siliceous.
190' 0.00"	195' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional buff, very hard, slight siliceous, micro crystaline, occasional slight crystaline.
195' 0.00"	200' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional buff, very hard, slight siliceous, micro crystaline, occasional slight crystaline.
200' 0.00"	205' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional buff, very hard, slight siliceous, micro crystaline, occasional slight crystaline.
205' 0.00"	210' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional buff, very hard, slight siliceous, micro crystaline, occasional slight crystaline.
210' 0.00"	215' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional buff, very hard, slight siliceous, micro crystaline, occasional slight

From	To	Thickness	Seam	Description
				crystaline, (fractured/void 212-215'), slightly damp.
215' 0.00"	220' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray, occasional buff, very hard, slight siliceous, micro crystaline, occasional slight crystaline.
220' 0.00"	224' 0.00"	4' 0.00"		DOLOMITE, Light gray to gray, occasional buff, very hard, slight siliceous, micro crystaline, occasional slight crystaline.
224' 0.00"	233' 0.00"	9' 0.00"		DOLOMITE, Light gray to gray, occasional buff, very hard, slight siliceous, micro crystaline, occasional slight crystaline. (highly fractured w/mud seams- falling in-caving-[very damp]).
233' 0.00"	235' 0.00"	2' 0.00"		DOLOMITE, Light gray to gray, occasional buff, very hard, slight siliceous, micro crystaline, occasional slight crystaline.
235' 0.00"	240' 0.00"	5' 0.00"		DOLOMITE, Gray to occasional dark gray, hard, occasional slightly siliceous, micro crystaline with occasional crystaline, slightly to occasionaly moderately shaley.
240' 0.00"	245' 0.00"	5' 0.00"		DOLOMITE, Gray to occasional dark gray, hard, occasional slightly siliceous, micro crystaline with occasional crystaline, slightly to occasionaly moderately shaley.
245' 0.00"	250' 0.00"	5' 0.00"		DOLOMITE, Gray to occasional dark gray, hard, occasional slightly siliceous, micro crystaline with occasional crystaline, slightly to occasionaly moderately shaley.
250' 0.00"	255' 0.00"	5' 0.00"		DOLOMITE, Gray to occasional dark gray, hard, occasional slightly siliceous, micro crystaline with occasional crystaline, slightly to occasionaly moderately shaley.
255' 0.00"	260' 0.00"	5' 0.00"		DOLOMITE, Gray to occasional dark gray, hard, occasional slightly siliceous, micro crystaline with occasional crystaline, slightly to occasionaly moderately shaley.
260' 0.00"	265' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray to occasional dark gray, hard, moderate fizz (slightly more limey) occasionally slightly siliceous.
265' 0.00"	270' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray to occasional dark gray, hard, moderate fizz (slightly more limey) occasionally slightly siliceous. (Highly fractured with voids 270-290') - (Poor Returns).
270' 0.00"	275' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray to occasional dark gray, hard, moderate fizz (slightly more limey) occasionally slightly siliceous. (Highly fractured with voids 270-290') - (Poor Returns).
275' 0.00"	280' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray to occasional dark gray, hard, moderate fizz (slightly more limey) occasionally slightly siliceous. (Highly fractured with voids 270-290') - (Poor Returns).
280' 0.00"	285' 0.00"	5' 0.00"		DOLOMITE, Light gray to gray to occasional dark gray,

From		To		Thickness		Seam	Description
							hard, moderate fizz (slightly more limey) occasionally slightly siliceous. (Highly fractured with voids 270-290') - (Poor Returns).
285'	0.00"	290'	0.00"	5'	0.00"		DOLOMITE, Light gray to gray to occasional dark gray, hard, moderate fizz (slightly more limey) occasionally slightly siliceous. (Highly fractured with voids 270-290') - (Poor Returns).
290'	0.00"	295'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, slightly to moderately limey, slightly siliceous, crystaline, occasionally micro crystaline.
295'	0.00"	300'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, slightly to moderately limey, slightly siliceous, crystaline, occasionally micro crystaline.
300'	0.00"	305'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, slightly to moderately limey, slightly siliceous, crystaline, occasionally micro crystaline.
305'	0.00"	310'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, slightly to moderately limey, slightly siliceous, crystaline, occasionally micro crystaline.
310'	0.00"	315'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, slightly to moderately limey, slightly siliceous, crystaline, occasionally micro crystaline.
315'	0.00"	320'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, slightly to moderately limey, slightly siliceous, crystaline, occasionally micro crystaline.
320'	0.00"	325'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, slightly to moderately limey, slightly siliceous, crystaline, occasionally micro crystaline. (Voids 325-339').
325'	0.00"	330'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, slightly to moderately limey, slightly siliceous, crystaline, occasionally micro crystaline. (Voids 325-339').
330'	0.00"	335'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, slightly to moderately limey, slightly siliceous, crystaline, occasionally micro crystaline. (Voids 325-339').
335'	0.00"	340'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, slightly to moderately limey, slightly siliceous, crystaline, occasionally micro crystaline. (Voids 325-339').
340'	0.00"	345'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy.
345'	0.00"	350'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy.
350'	0.00"	355'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy.
355'	0.00"	360'	0.00"	5'	0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy.

From	To	Thickness	Seam	Description
360' 0.00"	365' 0.00"	5' 0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy. (slightly damp). Fractured 358-365'.
365' 0.00"	370' 0.00"	5' 0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy. (slightly more damp).
370' 0.00"	375' 0.00"	5' 0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy. (slightly more damp).
375' 0.00"	380' 0.00"	5' 0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy.
380' 0.00"	385' 0.00"	5' 0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy.
385' 0.00"	390' 0.00"	5' 0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy.
390' 0.00"	395' 0.00"	5' 0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy.
395' 0.00"	400' 0.00"	5' 0.00"		DOLOMITE, Dark gray to gray, crystaline to occasional micro crystaline, hard, occasionally slightly sandy.

GEOLOGICAL DESCRIPTION

COMPANY:	Tazewell County Landfill	**START DATE:**	/ /
PROJECT:	Phase II Invest. of MW Constr.	**FINISH DATE:**	/ /
HOLE NO:	MW-8	**ELEVATION:**	3048.21
STATE:	VA	**LOGGED BY:**	Mark Smith
COUNTY:	Tazewell	**DRILLED BY:**	MM&A Geotech.
TOTAL DEPTH:	327.00	**NORTH:**	0.00
		EAST:	0.00

FROM	TO	THICKNESS	SEAM	DESCRIPTION
0.00	35.00	35.00		TOP SOIL, soil, brown, clayey with sandy silty zones
35.00	63.00	28.00		DOLOMITE, light gray to occasional buff, very hard, microcyrstaline with occasional slightly sandy interbeds
63.00	65.00	2.00		VOID, very fractured, with brown clay (slightly sandy) filling
65.00	100.00	35.00		DOLOMITE, light gray to buff, hard, microcrystline with occassional crystlaine, occasional dark gray bands, slightly limey
100.00	102.00	2.00		VOID, with brown soil filling, slightly sandy, slightly damp (no loss of returns)
102.00	118.00	16.00		DOLOMITE, light gray to buff, very hard
118.00	123.00	5.00		VOID, slightly damp with brown sandy to clayey filling (good returns)
123.00	152.00	29.00		DOLOMITE, light gray, light brown to buff, very hard, siliceous, very fine powdery cutting
152.00	155.00	3.00		DOLOMITE, light gray, light brown to buff, very hard, siliceous, very fine powdery cutting
155.00	160.00	5.00		DOLOMITE, light gray, light brown to buff, very hard, siliceous, very fine powdery cutting
160.00	165.00	5.00		DOLOMITE, light gray, light brown to buff, very hard, siliceous, very fine powdery cutting
165.00	170.00	5.00		DOLOMITE, gray to dark.gray, occasional light gray with some buff, microcrystaline with occasional siliceous interbeds
170.00	180.00	10.00		DOLOMITE, gray to dark gr

FROM	TO	THICKNESS	SEAM	DESCRIPTION
				light gray with some buff, microcrystaline with occasional siliceous interbeds, very hard, fine powdery cuttings
180.00	190.00	10.00		DOLOMITE, gray to dark gray, occasional light gray with some buff, microcrystaline with occasional siliceous interbeds, very hard, fine powdery cuttings
190.00	195.00	5.00		DOLOMITE, light gray to buff, very fine powdery cuttings, very hard, siliceous, slightly limey
195.00	200.00	5.00		DOLOMITE, light gray to buff, very fine powdery cuttings, very hard, siliceous, slightly limey
200.00	205.00	5.00		DOLOMITE, light gray to buff, very fine powdery cuttings, very hard, siliceous, slightly limey
205.00	210.00	5.00		DOLOMITE, light gray to buff, very fine powdery cuttings, very hard, siliceous, slightly limey
210.00	215.00	5.00		DOLOMITE, light gray to buff, very fine powdery cuttings, very hard, siliceous, slightly limey
215.00	220.00	5.00		DOLOMITE, light gray to buff, very fine powdery cuttings, very hard, siliceous, slightly limey
220.00	225.00	5.00		DOLOMITE, light gray to buff, very fine powdery cuttings, very hard, siliceous, slightly limey
225.00	230.00	5.00		DOLOMITE, gray to light gray, occasional buff, hard, microcrystaline, occasionally silty, larger cuttings, more limey
230.00	235.00	5.00		DOLOMITE, gray to light gray, occasional buff, hard, microcrystaline, occasionally silty, larger cuttings, more limey
235.00	240.00	5.00		DOLOMITE, gray to light gray, occasional buff, hard, microcrystaline, occasionally silty, larger cuttings, more limey
240.00	245.00	5.00		DOLOMITE, gray to light gray, occasional buff, hard, microcrystaline, occasionally silty, larger cuttings, more

FROM	TO	THICKNESS	SEAM	DESCRIPTION
245.00	250.00	5.00		DOLOMITE, gray to light gray, occasional buff, hard, microcrystaline, occasionally silty, larger cuttings, more limey
250.00	255.00	5.00		DOLOMITE, gray to dark gray, occasional light gray, very hard, crystaline, occasional microcrystaline
255.00	260.00	5.00		DOLOMITE, gray to dark gray, occasional light gray, very hard, crystaline, occasional microcrystaline
260.00	265.00	5.00		DOLOMITE, gray to dark gray, moderately hard, microcrystaline with occasional crystaline, slightly silty, limey
265.00	270.00	5.00		DOLOMITE, gray to dark gray, moderately hard, microcrystaline with occasional crystaline, slightly silty, limey
270.00	275.00	5.00		DOLOMITE, gray to dark gray, moderately hard, microcrystaline with occasional crystaline, slightly silty, limey
275.00	280.00	5.00		DOLOMITE, gray to dark gray, moderately hard, microcrystaline with occasional crystaline, slightly silty, limey
280.00	285.00	5.00		DOLOMITE, gray to dark gray, moderately hard, microcrystaline with occasional crystaline, slightly silty, limey
285.00	290.00	5.00		DOLOMITE, gray to dark gray, moderately hard, microcrystaline with occasional crystaline, slightly silty, limey
290.00	295.00	5.00		DOLOMITE, gray to dark gray, moderately hard, microcrystaline with occasional crystaline, slightly silty, limey
295.00	300.00	5.00		DOLOMITE, gray to dark gray, moderately hard, microcrystaline with occasional crystaline, slightly silty, limey
300.00	305.00	5.00		DOLOMITE, gray to dark gray, hard, occasional very hard, crystaline, slightly
305.00	310.00	5.00		DOLOMITE,

FROM	TO	THICKNESS	SEAM	DESCRIPTION
				gray to dark gray, hard, occasional very hard, crystaline, slightly shaley DOLOMITE,
310.00	315.00	5.00		gray to dark gray, hard, occasional very hard, crystaline, slightly shaley DOLOMITE,
315.00	320.00	5.00		gray to dark gray, hard, occasional very hard, crystaline, slightly shaley DOLOMITE,
320.00	327.00	7.00		gray to dark gray, hard, occasional very hard, crystaline, slightly shaley

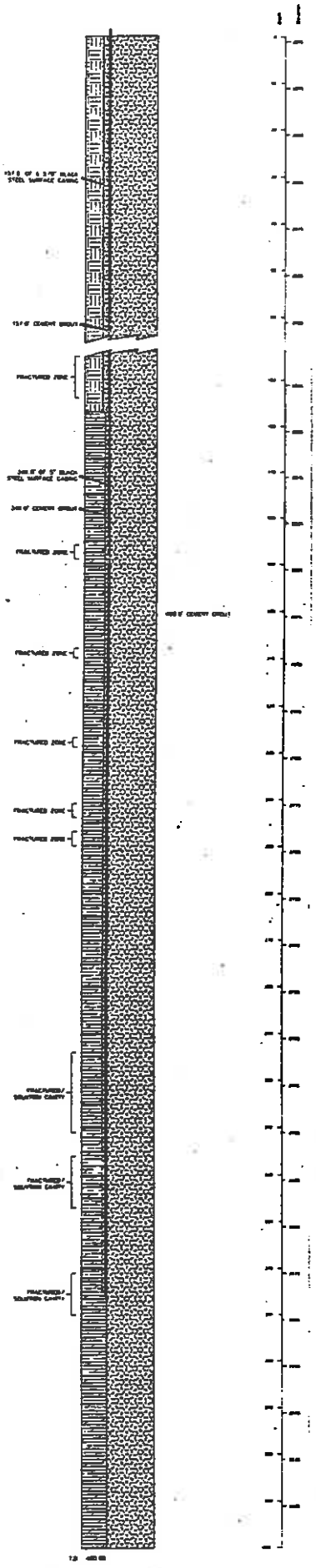
Company: Tazewell County Landfill
Project: Phase II Investigation MW Cons
Hole No.: MW-9
State: VA
County: Tazewell
Total Depth: 250.00

Start Date: / /
Finish Date: 04/28/00
Elevation: 2890.00
Logged By: M.S. Smith
Drilled By: MM&A-GT.
North: 0.00
East: 0.00

From	To	Thickness	Seam	Description
0' 0.00"	105' 0.00"	105' 0.00"		CASING, Soil-Brown to occasionally yellow brown to occasionally slightly red brown.
105' 0.00"	110' 0.00"	5' 0.00"		INTERBEDDED DOLOMITE AND SANDSTONE, Gray to occasionally buff, very hard, slightly to occasionally very limey, brown shale interbeds with occasionally slight weathered.
110' 0.00"	125' 0.00"	15' 0.00"		SHALE, Brown, soft, highly weathered, dolomite interbeds with limey coating.
125' 0.00"	140' 0.00"	15' 0.00"		DOLOMITE, Light gray brown to gray, very hard, micro crystaline with abundant very fine sandy, unconsolidated material. (Fault gouge?)
140' 0.00"	150' 0.00"	10' 0.00"		DOLOMITE, Light gray, very hard, micro crystaline with large (1/4") cuttings, slightly limey.
150' 0.00"	155' 0.00"	5' 0.00"		SHALE, Brown, soft, clay to highly weathered with occasionally small dolomite interbedded.
155' 0.00"	160' 0.00"	5' 0.00"		DOLOMITE, Light gray, buff, hard, micro crystaline, slightly limey with occasionally very dark gray black, very hard (manganese rich?) occasionally large gravels.
160' 0.00"	165' 0.00"	5' 0.00"		DOLOMITE, Light gray, buff, hard, micro crystaline with occasionally crystaline, fractured to cave from 162-165' with mud, very damp to wet large gravels in returns.
165' 0.00"	170' 0.00"	5' 0.00"		DOLOMITE, Light gray, buff, hard, micro crystaline with occasionally crystaline, fractured cave from 162-165' with mud, very damp to wet large gravels in returns.
170' 0.00"	175' 0.00"	5' 0.00"		DOLOMITE, Light gray, buff, hard, micro crystaline with occasionally crystaline.
175' 0.00"	180' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff to occasionally dark gray black, very hard, micro crystaline.
180' 0.00"	185' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff to occasionally dark gray black, very hard, micro crystaline.
185' 0.00"	190' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff to occasionally dark gray black, very hard, micro crystaline.
190' 0.00"	195' 0.00"	5' 0.00"		DOLOMITE, Light gray, buff, hard, micro crystaline, with occasionally dark gray, crystaline, slightly limey. (fractured zone [cave] from 191-193').
195' 0.00"	200' 0.00"	5' 0.00"		DOLOMITE, Light gray, buff, hard, micro crystaline, with occasionally dark gray, crystaline, slightly limey.
200' 0.00"	205' 0.00"	5' 0.00"		DOLOMITE, Light gray, buff, hard, micro crystaline, with

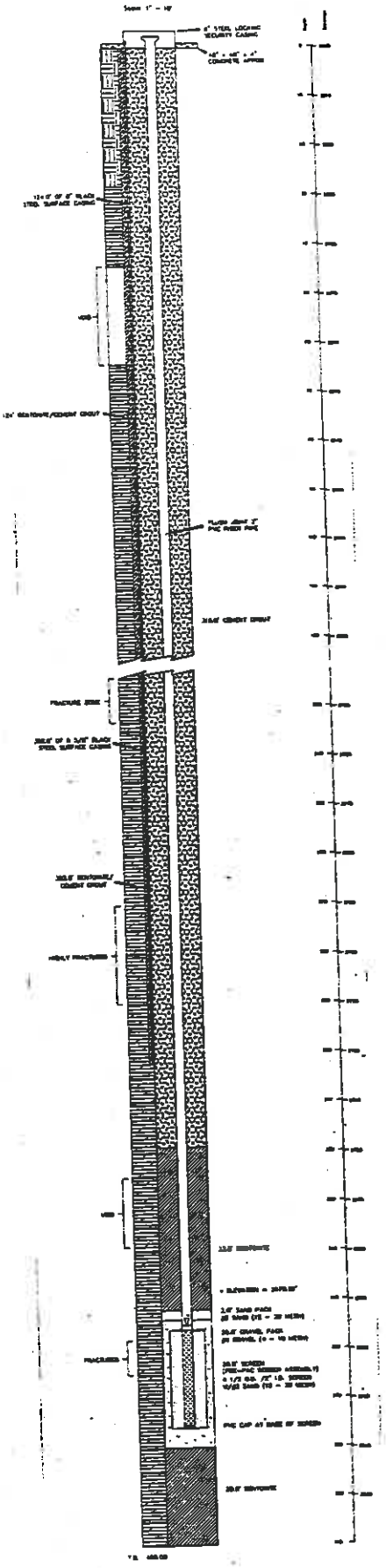
From	To	Thickness	Seam	Description
				occasionally dark gray, crystaline, slightly limey. (fractured zone 202-205') abundant large gravels in returns, damp.
205' 0.00"	210' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff with occasionally dark gray, very hard, micro crystaline with occasional crystaline, (fractured zone from 207-209), (poor returns),(wet).
210' 0.00"	215' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff with occasionally dark gray, very hard, micro crystaline with occasional crystaline, (poor returns),(wet).
215' 0.00"	220' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff with occasionally dark gray, very hard, micro crystaline with occasional crystaline,(fractured zone from 215-219'), (poor returns),(wet).
220' 0.00"	225' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff with occasionally dark gray, very hard, micro crystaline with occasional crystaline, (poor returns),(wet).
225' 0.00"	235' 0.00"	10' 0.00"		DOLOMITE, Light gray to buff, hard to moderately hard, crystaline, occasionally slightly mottled to irregular texture, (fractured zone 227-234 1/2).
235' 0.00"	240' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, hard to moderately hard, crystaline, occasionally slightly mottled to irregular texture.
240' 0.00"	245' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, hard to moderately hard, crystaline, occasionally slightly mottled to irregular texture.
245' 0.00"	250' 0.00"	5' 0.00"		DOLOMITE, Light gray to buff, hard to moderately hard, crystaline, occasionally slightly mottled to irregular texture.

Appendix B



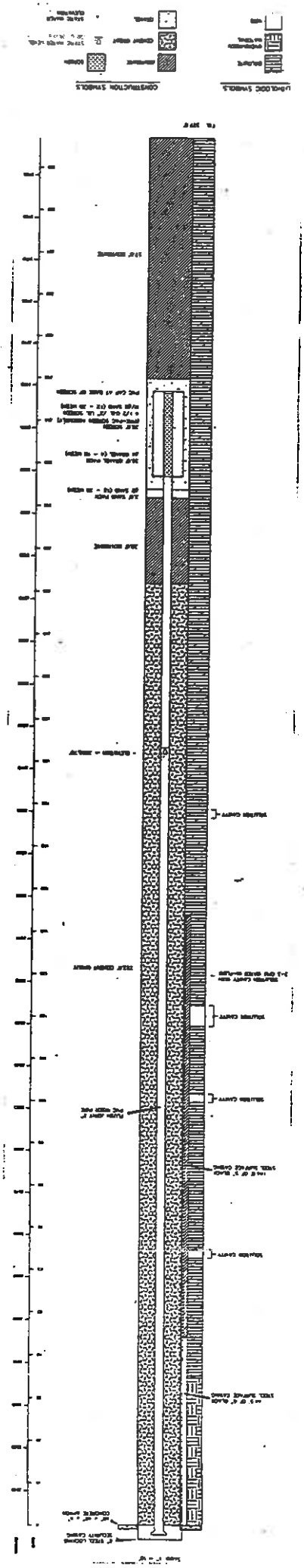
LITHOLOGIC SYMBOLS

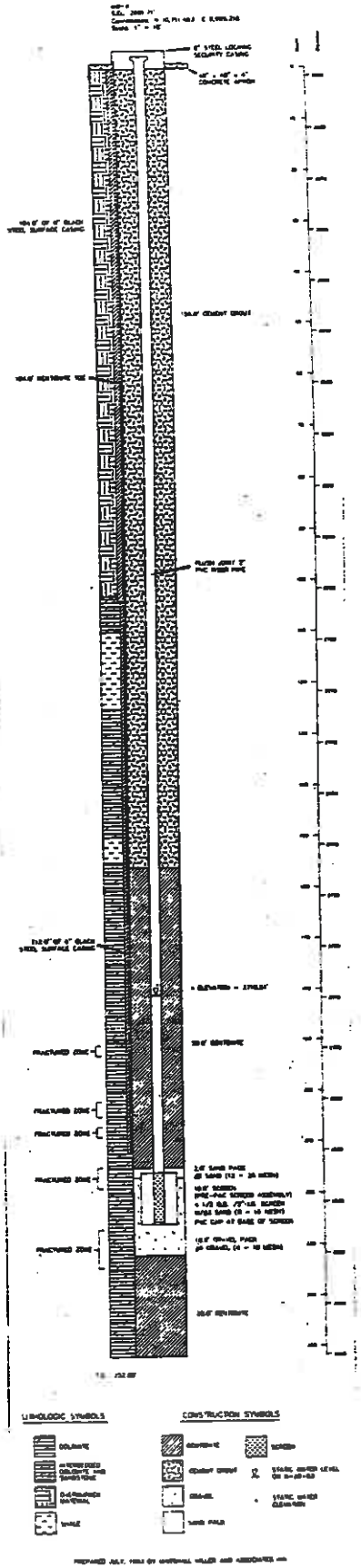
CONSTRUCTION SYMBOLS



LITHOLOGIC SYMBOLS

CONSTRUCTION SYMBOLS




LITHOLOGIC SYMBOLS
CONSTRUCTION SYMBOLS

Appendix C

Tazewell County Landfill

Water Level Readings

	MW-1 Top of Casing: 2873.52 Ground Level: 2872.18		MW-2 Top of Casing: 2898.67 Ground Level: 2896.06		MW-3 6" Annulus Top of Casing: 3043.81 Ground Level: 3041.45		MW-3 Screened Interval Top of Casing: 3043.81 Ground Level: 3041.45		MW-4 Top of Casing: 3000.62 Ground Level: 2998.90		MW-5 6" Annulus Top of Casing: 2928.63 Ground Level: 2927.36		MW-5 Screened Interval Top of Casing: 2928.63 Ground Level: 2927.36		MW-6 6" Annulus Top of Casing: 2843.00 Ground Level: 2840.60	
	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
11/13/92																
11/14/92																
11/15/92																
11/16/92																
11/17/92																
11/18/92																
11/19/92																
11/20/92																
11/21/92																
11/23/92																
11/24/92																
11/25/92																
11/30/92																
12/1/92																
12/2/92																
12/3/92																
12/4/92																
12/7/92																
12/8/92			246.11	2652.56												
12/9/92			246.11	2652.56												
12/10/92			246.61	2652.06												
12/11/92			246.61	2652.06												
12/14/92			246.61	2652.06												
12/16/92			246.61	2652.06												
12/18/92	dry		246.11	2652.56			222.36	2821.45								
12/19/92	dry		248.11	2650.56			222.36	2821.45								
1/4/93	dry		249.11	2649.56			208.36	2835.45								
1/5/93	--		249.11	2649.56	162.36	2881.45	219.86	2823.95								
1/6/93	--		249.11	2649.56	162.36	2881.45	217.36	2826.45								
1/7/93	dry (blowing air)		248.61	2650.06	162.36	2881.45	217.36	2826.45								
1/8/93			249.11	2649.56	162.36	2881.45	217.36	2826.45								
1/9/93									316.72	2683.90						
1/10/93									311.22	2689.40						
1/11/93									311.22	2689.40						
1/12/93			248.61	2650.06	165.36	2878.45	221.36	2822.45								
1/14/93			249.61	2649.06	163.36	2880.45	221.36	2822.45								
1/15/93			249.61	2649.06	163.36	2880.45	221.36	2822.45								
1/19/93			250.11	2648.56	158.36	2885.45	221.36	2822.45								
1/20/93					158.36	2885.45	222.36	2821.45								
1/22/93			250.11	2648.56	158.36	2885.45	221.86	2821.95								
1/25/93			250.11	2648.56	158.36	2885.45	224.36	2819.45								
1/26/93			250.11	2648.56	158.86	2884.95	222.36	2821.45	301.72	2698.90						
1/27/93			250.11	2648.56	158.36	2885.45	222.36	2821.45	302.22	2698.40	103.27	2825.36	112.27	2816.36		
1/28/93			250.11	2648.56	160.36	2883.45	222.86	2820.95	302.72	2697.90	72.77	2855.86	88.27	2840.36		
1/29/93			250.11	2648.56	160.86	2882.95	222.86	2820.95	302.72	2697.90	60.27	2868.36	78.27	2850.36		
1/30/93			250.11	2648.56	161.86	2881.95	222.86	2820.95	302.72	2697.90	57.27	2871.36	74.27	2854.36	54.90	2788.10
1/31/93			250.11	2648.56	161.36	2882.45	222.86	2820.95	302.97	2697.65	57.27	2871.36	72.27	2856.36	54.40	2788.60
2/1/93			250.36	2648.31	161.86	2881.95	222.86	2820.95	303.22	2697.40	56.77	2871.86	72.52	2856.11	54.40	2788.60
2/2/93			250.36	2648.31	162.36	2881.45	223.11	2820.70	303.47	2697.15	56.52	2872.11	72.52	2856.11	54.90	2788.10

MARSHALL MILLER & ASSOCIATES

MW-6 Screened Interval Top of Casing: 2843.00 Ground Level: 2840.60		MW-7 Screened Interval Top of Casing: 3027.78 Ground Level: 3025.03		MW-8 6" Annulus Top of Casing: 3051.46 Ground Level: 3049.06		MW-8 Screened Interval Top of Casing: 3051.46 Ground Level: 3049.06		MW-9 Screened Interval Top of Casing: 2894.21 Ground Level: 2891.71		BH-5-92 Open Hole Top of Casing: 2907.84 Ground Level:		BH-5-92 Open Hole Top of Casing: 2971.70 Ground Level:	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
										228.00	2679.84		
										227.50	2680.34		
										227.50	2680.34	292.88	2678.82
										227.50	2680.34	292.13	2679.57
										227.50	2680.34	291.38	2680.32
										227.50	2680.34	290.88	2680.82
										228.00	2679.84	291.88	2679.82
										228.00	2679.84	291.38	2680.32
										228.00	2679.84	291.38	2680.32
										228.50	2679.34	291.88	2679.82
										228.50	2679.34	292.38	2679.32
										228.50	2679.34	291.88	2679.82
										228.50	2679.34	292.38	2679.32
										229.00	2678.84	292.38	2679.32
										228.50	2679.34	291.88	2679.82
										229.00	2678.84	292.38	2679.32
										229.50	2678.34	292.88	2678.82
												Well Caved	
										230.00 +	2677.84	293.38	2678.32 **
										230.00 +	2677.84	293.38	2678.32 **
										230.00 +	2677.84	293.38	2678.32 **
										230.00 +	2677.84	293.38	2678.32 **
										230.00 +	2677.84	293.38	2678.32 **
										229.00	2678.84	293.38	2678.32 **
										228.50	2679.34	293.38	2678.32 **
										230.00 +	2677.84	293.38	2678.32 **
										230.00 +	2677.84	293.38	2678.32 **
										Well Caved			
										189.00	2718.84 *	293.38	2678.32 **
										189.00	2718.84 *		
										189.00	2718.84 *		
										185.00	2722.84 *		
										184.00	2723.84 *		
										184.50	2723.34 *		
										186.00	2721.84 *		
										187.50	2720.34 *		
										188.00	2719.84 *		
										188.00	2719.84 *		
										188.00	2719.84 *		
										187.50	2720.34 *		
64.40	2778.60												
64.65	2778.35												
64.40	2778.60												
63.90	2779.10												

Tazewell County Landfill

Water Level Readings

	MW-1		MW-2		MW-3 6" Annulus		MW-3 Screened Interval		MW-4		MW-5 6" Annulus		MW-5 Screened Interval		MW-6 6" Annulus	
	Top of Casing: 2873.52		Top of Casing: 2898.67		Top of Casing: 3043.81		Top of Casing: 3043.81		Top of Casing: 3000.62		Top of Casing: 2928.63		Top of Casing: 2928.63		Top of Casing: 2843.00	
	Ground Level: 2872.18		Ground Level: 2896.06		Ground Level: 3041.45		Ground Level: 3041.45		Ground Level: 2998.90		Ground Level: 2927.36		Ground Level: 2927.36		Ground Level: 2840.60	
	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
2/3/93			250.36	2648.31	162.36	2881.45	223.36	2820.45	303.72	2696.90	56.77	2871.86	72.77	2855.86	54.90	2788.10
2/4/93			250.36	2648.31	162.86	2880.95	223.61	2820.20	303.72	2696.90	56.77	2871.86	73.02	2855.61	55.15	2787.85
2/5/93			250.36	2648.31	162.86	2880.95	223.61	2820.20	303.47	2697.15	56.77	2871.86	73.27	2855.36		
2/6/93			250.36	2648.31	162.86	2880.95	223.86	2819.95	303.72	2696.90	57.50	2871.13	73.60	2855.03		
2/8/93			250.60	2648.07	160.50	2883.31	224.70	2819.11	303.90	2696.72	57.75	2870.88	74.25	2854.38		
2/9/93			250.60	2648.07	Grouted		224.50	2819.31	303.75	2696.87			74.30	2854.33		
2/11/93			250.76	2647.91			224.73	2819.08	303.52	2697.10			75.05	2853.58		
2/12/93			250.70	2647.97			224.77	2819.04	303.55	2697.07			75.15	2853.48		
2/13/93			250.85	2647.82			224.95	2818.86	N/A +				75.67	2852.96		
2/15/93			251.08	2647.59			225.03	2818.78 +	304.27	2696.35			76.02	2852.61 +		
2/16/93			250.90	2647.77 ★			225.80	2818.01 ★☆	304.17	2696.45 ★			78.99	2849.64 ★		
2/17/93			251.00	2647.67 ☆					316.79	2681.83 ☆			89.03	2839.60 ☆		
2/18/93			251.05	2647.62			226.12	2817.69	315.49	2685.13			78.15	2850.48		
2/19/93			251.12	2647.55			226.01	2817.80	314.26	2686.36			77.42	2851.21		
2/20/93			251.19	2647.48			225.90	2817.91	313.85	2686.77			76.92	2851.71		
2/22/93			251.20	2647.47			224.85	2818.96	313.75	2686.87			75.10	2853.53		
2/23/93			251.23	2647.44			222.96	2820.85	313.75	2686.87			71.54	2857.09		
2/24/93			251.40	2647.27			220.90	2822.91	313.80	2686.82			69.21	2859.42		
2/25/93			251.39	2647.28			219.10	2824.71	313.75	2686.87			66.49	2862.14		
2/26/93			251.37	2647.30			218.31	2825.50	313.68	2686.94			65.25	2863.38		
2/27/93			Lock Frozen				217.90	2825.91	313.78	2686.84			64.58	2864.05		
3/1/93			251.45	2647.22			217.83	2825.98	313.71	2686.91			64.59	2864.04		
3/2/93			251.42	2647.25			217.57	2826.24	313.62	2687.00			64.63	2864.00		
3/3/93			251.41	2647.26			217.50	2826.31	313.42	2687.20			64.49	2864.14		
3/4/93			251.40	2647.27			216.81	2827.00	313.26	2687.36			64.27	2864.36		
3/5/93			251.48	2647.19			211.64	2832.17	313.65	2686.97			60.94	2867.69		
3/6/93			251.55	2647.12			209.34	2834.47	313.78	2686.84			58.89	2869.74		
3/8/93			251.42	2647.25			204.25	2839.56	313.40	2687.22			57.25	2871.38		
3/9/93			251.44	2647.23			203.26	2840.55	313.42	2687.20			56.14	2872.49		
3/10/93			251.30	2647.37			202.13	2841.68	313.04	2687.58			55.36	2873.27		
3/11/93			251.31	2647.36			202.26	2841.55	313.04	2687.58			55.21	2873.42		
3/12/93			251.25	2647.42			202.14	2841.67	313.10	2687.52			55.38	2873.25		
3/13/93 - 3/17/93	(No readings due to weather, SNOW!!!!)															
3/18/93			250.82	2647.85			200.74	2843.07	312.62	2688.00			52.60	2876.03		
3/19/93			250.74	2647.93			200.61	2843.20	312.43	2688.19			52.15	2876.48		
3/20/93			250.64	2648.03			200.53	2843.28	312.18	2688.44			51.42	2877.21		
3/22/93			250.53	2648.14			198.46	2845.35	311.76	2688.86			49.67	2878.96		
3/23/93			250.55	2648.12			195.32	2848.49	311.12	2689.50			43.41	2885.22		
3/24/93			250.42	2648.25			183.46	2860.35	309.84	2690.78			36.46	2892.17		
3/25/93			250.21	2648.46			174.54	2869.27	307.81	2692.81			28.25	2900.38		
3/26/93			250.09	2648.58			169.37	2874.44	305.82	2694.80			27.64	2900.99		
3/29/93			249.73	2648.94			171.13	2872.68	300.67	2699.95			27.01	2901.62		
3/30/93	129.40	2744.12	249.36	2649.31			170.86	2872.95	296.02	2704.60			26.53	2902.10		
3/31/93	129.36	2744.16	249.09	2649.58			170.66	2873.15	294.08	2706.54			30.42	2898.21		
4/1/93	129.01	2744.51	248.86	2649.81			171.47	2872.34	293.32	2707.30			31.59	2897.04		
4/2/93	128.02	2745.50	248.42	2650.25			171.06	2872.75	292.86	2707.76			33.47	2895.16		
4/5/93	126.47	2747.05	248.08	2650.59			172.37	2871.44	292.31	2708.31			37.05	2891.58		
4/6/93	124.32	2749.20	247.86	2650.81			172.96	2870.85	292.84	2707.78			36.84	2891.79		
4/7/93	122.76	2750.76	247.69	2650.98			173.01	2870.80	293.03	2707.59			35.93	2892.70		

MARSHALL MILLER & ASSOCIATES

MW-6 Screened Interval Top of Casing: 2843.00 Ground Level: 2840.60		MW-7 Screened Interval Top of Casing: 3027.78 Ground Level: 3025.03		MW-8 6" Annulus Top of Casing: 3051.46 Ground Level: 3049.06		MW-8 Screened Interval Top of Casing: 3051.46 Ground Level: 3049.06		MW-9 Screened Interval Top of Casing: 2894.21 Ground Level: 2891.71		BH-6-92 Open Hole Top of Casing: 2907.84 Ground Level:		BH-6-92 Open Hole Top of Casing: 2971.70 Ground Level:	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
63.90	2779.10												
63.90	2779.10												
63.65	2779.35												
61.40	2781.60												
61.90	2781.10												
62.25	2780.75												
62.53	2780.47												
62.65	2780.35												
62.66	2780.34												
63.30	2779.70												
63.10	2779.90 ☆☆												
63.42	2779.58												
63.22	2779.78												
62.43	2780.57												
61.82	2781.18												
59.60	2783.40												
57.22	2785.78												
56.14	2786.86												
55.62	2787.38												
55.40	2787.60												
55.48	2787.52												
55.52	2787.48												
55.58	2787.42												
55.46	2787.54												
55.40	2787.60												
50.85	2792.15												
49.41	2793.59												
47.25	2795.75												
46.73	2796.27												
46.25	2796.75												
46.11	2796.89												
46.27	2796.73												
44.71	2798.29												
43.48	2799.52												
42.99	2800.01												
41.37	2801.63												
38.35	2804.65												
36.42	2806.58												
34.17	2808.83												
33.64	2809.36					96.60	2954.86	160.00	2891.46				
31.94	2811.06					96.76	2954.70	160.63	2890.83				
31.64	2811.36					97.72	2953.74	160.72	2890.74				
31.49	2811.51					98.42	2953.04	160.84	2890.62				
31.56	2811.44					99.49	2951.97	161.02	2890.44				
31.92	2811.08					100.02	2951.44	161.93	2889.53				
32.01	2810.99					102.94	2948.52	161.99	2889.47				
32.15	2810.85					104.33	2947.13	162.36	2889.10				
32.26	2810.74												

Tazewell County Landfill

Water Level Readings

	MW-1 Top of Casing: 2873.52 Ground Level: 2872.18		MW-2 Top of Casing: 2898.67 Ground Level: 2896.06		MW-3 6" Annulus Top of Casing: 3043.81 Ground Level: 3041.45		MW-3 Screened Interval Top of Casing: 3043.81 Ground Level: 3041.45		MW-4 Top of Casing: 3000.62 Ground Level: 2998.90		MW-5 6" Annulus Top of Casing: 2928.63 Ground Level: 2927.36		MW-5 Screened Interval Top of Casing: 2928.63 Ground Level: 2927.36		MW-6 6" Annulus Top of Casing: 2843.00 Ground Level: 2840.60	
	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
4/8/93	121.60	2751.92	247.41	2651.26			173.73	2870.08	293.62	2707.00			36.04	2892.59		
4/9/93	121.09	2752.43	247.08	2651.59			173.89	2869.92	294.56	2706.06			36.49	2892.14		
4/12/93	120.85	2753.47	246.56	2652.11			174.06	2869.75	295.45	2705.17			36.28	2892.35		
4/13/93	120.87	2753.45	246.32	2652.35			174.23	2869.58	295.29	2705.33			36.47	2892.16		
4/14/93	120.10	2753.42	245.91	2652.76			174.52	2869.29	295.15	2705.47			36.93	2891.70		
4/15/93	120.23	2753.29	245.81	2652.86			174.29	2869.52	295.43	2705.19			37.41	2891.22		
4/16/93	120.46	2753.06	245.23	2653.44			174.14	2869.67	295.33	2705.29			36.29	2892.34		
4/19/93	120.67	2752.85	244.73	2653.94			174.32	2869.49	295.93	2704.69			32.46	2896.17		
4/20/93	120.75	2752.77	244.51	2654.16			174.46	2869.35	296.42	2704.20			31.01	2897.62		
4/21/93	120.84	2752.68	244.36	2654.31			175.74	2868.07	296.66	2703.96			32.67	2895.96		
4/22/93	120.96	2752.56	244.09	2654.58			177.13	2866.68	297.01	2703.61			33.49	2895.14		
4/23/93	121.15	2752.37	243.91	2654.76			178.34	2865.47	297.46	2703.16			36.42	2892.21		
4/26/93	121.55	2751.97	243.33	2655.34			180.49	2863.32	298.36	2702.26			44.85	2883.78		
4/27/93	121.79	2751.73	242.86	2655.81			183.16	2860.65	299.01	2701.61			46.93	2881.70		
4/28/93	121.82	2751.70	242.47	2656.20			184.39	2859.42	299.37	2701.25			47.24	2881.39		
5/3/93	122.02	2751.50	241.74	2656.93			176.83	2866.98	300.00	2700.62			48.39	2880.24		
5/4/93	122.43	2751.09	241.45	2657.22			178.44	2865.37	300.01	2700.61			48.78	2879.85		
5/5/93	122.97	2750.55	241.32	2657.35			179.58	2864.23	300.33	2700.29			49.32	2879.31		
5/6/93	123.54	2749.98	241.18	2657.49			182.65	2861.16	300.58	2700.04			49.97	2878.66		
5/7/93	123.78	2749.74	240.96	2657.71			184.69	2859.12	300.94	2699.68			50.84	2877.79		
5/11/93	123.13	2750.39	239.95	2658.72			190.76	2853.05	301.26	2699.36			53.15	2875.48		
5/12/93	122.76	2750.76	239.88	2658.79			191.08	2852.73	301.25	2699.37			53.69	2874.94		
5/13/93	123.02	2750.50	239.82	2658.85			191.79	2852.02	301.30	2699.32			54.07	2874.56		
5/14/93	123.50	2750.02	239.70	2658.97			192.35	2851.46	301.33	2699.29			54.94	2873.69		
5/17/93	123.62	2749.90	238.97	2659.70			193.98	2849.83	301.86	2698.76			55.68	2872.95		
5/18/93	123.78	2749.74	238.85	2659.82			194.71	2849.10	301.98	2698.64			55.79	2872.85		
5/19/93	123.91	2749.61	238.76	2659.91			195.33	2848.48	301.84	2698.78			53.17	2875.46		
5/20/93	122.65	2750.87	238.64	2660.03			195.67	2848.14	301.92	2698.70			53.36	2875.27		
5/21/93	123.86	2749.66	238.57	2660.10			195.14	2848.67	302.16	2698.46			53.39	2875.24		
5/24/93	125.48	2748.04	238.29	2660.38			197.31	2846.50	302.44	2698.18			54.20	2874.43		
5/25/93	125.53	2747.99	238.16	2660.51			197.80	2846.01	302.39	2698.23			54.78	2873.85		
5/26/93	125.79	2747.73	238.08	2660.59			198.01	2845.80	302.27	2698.35			54.93	2873.70		
5/27/93	125.93	2747.59	237.98	2660.69			198.36	2845.45	302.12	2698.50			55.12	2873.51		
6/1/93	126.42	2747.10	237.40	2661.27			200.01	2843.80	303.01	2697.61			57.19	2871.44		
6/2/93	126.76	2746.76	237.31	2661.36			200.86	2842.95	303.17	2697.45			57.28	2871.35		
6/3/93	126.91	2746.61	237.18	2661.49			201.19	2842.62	303.28	2697.34			57.39	2871.24		
6/7/93	128.21	2745.31	236.91	2661.76			202.03	2841.78	303.91	2696.71			58.21	2870.42		
6/9/93	128.49	2745.03	236.81	2661.86			202.65	2841.16	303.99	2696.63			59.32	2869.31		
6/11/93	129.03	2744.49	236.56	2662.11			203.12	2840.69	304.19	2696.43			60.18	2868.45		
6/14/93	130.36	2743.16	236.29	2662.38			203.84	2839.97	304.80	2695.82			61.24	2867.39		
6/16/93	131.28	2742.24	236.17	2662.50			203.97	2839.84	305.04	2695.58			62.39	2866.24		
6/18/93	132.64	2740.88	236.04	2662.63			204.36	2839.45	305.26	2695.36			62.84	2865.79		
6/21/93	134.90	2738.62	233.94	2664.73			205.49	2838.32	305.39	2695.23			63.37	2865.26		
6/23/93	135.16	2738.36	235.72	2662.95			206.78	2837.03	305.48	2695.14			63.86	2864.77		
6/25/93	135.00	2738.52	235.61	2663.06			207.43	2836.38	305.57	2695.05			64.39	2864.24		
6/28/93	133.90	2739.62	235.52	2663.15			206.92	2836.89	304.50	2696.12			66.10	2862.53		

*BH-5 caved on 1/5/93. Water level measurements taken thereafter are not representative of the original - monitored water bearing horizon.

**BH-6 caved approximately at the static water level, at date between 12/4/92 and 12/8/92. Measurements from 12/8/92 may not be reflective of true aquifer water level.

★ Well Purged

☆ Well Sampled

+ Well Slug Tested

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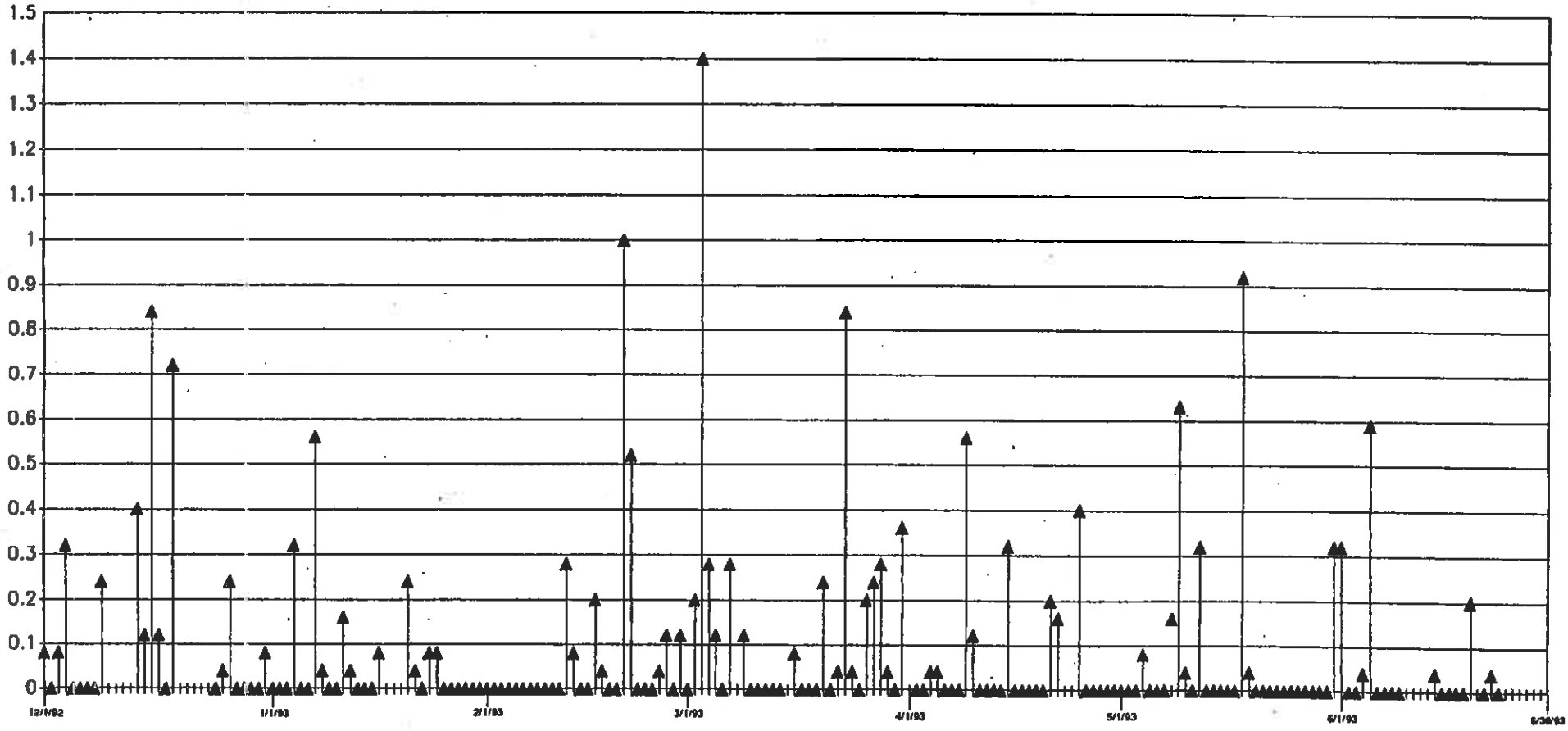
MW-6 Screened Interval Top of Casing: 2843.00 Ground Level: 2840.60		MW-7 Screened Interval Top of Casing: 3027.78 Ground Level: 3025.03		MW-8 6" Annulus Top of Casing: 3051.46 Ground Level: 3049.06		MW-8 Screened Interval Top of Casing: 3051.46 Ground Level: 3049.06		MW-9 Screened Interval Top of Casing: 2894.21 Ground Level: 2891.71		BH-5-92 Open Hole Top of Casing: 2907.84 Ground Level:		BH-6-92 Open Hole Top of Casing: 2971.70 Ground Level:	
Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation
32.30	2810.70			106.52	2944.94	162.77	2888.69						
31.47	2811.53			104.87	2946.59	163.11	2888.35						
30.62	2812.38			104.10	2947.36	163.03	2888.43						
30.74	2812.26			105.32	2946.14	163.04	2888.42						
30.67	2812.33			106.50	2944.96	162.88	2888.58						
31.24	2811.76			107.43	2944.03	162.46	2889.00						
30.67	2812.33			108.13	2943.33	162.42	2889.04						
30.83	2812.17			109.64	2941.82	163.14	2888.32						
31.34	2811.66			110.35	2941.11	163.48	2887.98						
31.48	2811.52			111.46	2940.00	163.76	2887.70						
31.69	2811.31			112.01	2939.45	164.02	2887.44						
32.11	2810.89			113.14	2938.32	164.17	2887.29						
32.37	2810.63			114.63	2936.83	164.76	2886.70						
32.84	2810.16	356.34	2671.44	115.30	2936.16	165.59	2885.87						
33.06	2809.94	356.16	2671.62	116.14	2935.32	165.43	2886.03						
34.01	2808.99	355.51	2672.27	119.39	2932.07	166.93	2884.53						
34.76	2808.24	355.19	2672.59	120.00	2931.46	166.96	2884.50						
35.04	2807.96	355.10	2672.68	121.21	2930.25	167.32	2884.14						
36.13	2806.87	354.97	2672.81	122.56	2928.90	167.56	2883.90						
36.78	2806.22	354.88	2672.90	123.43	2928.03	167.75	2883.71						
38.76	2804.24	354.90	2672.88										
38.02	2804.98	354.86	2672.92	126.34	2925.12	168.12	2883.34						
38.19	2804.81	354.74	2673.04	126.94	2924.52	169.36	2882.10						
38.67	2804.33	354.63	2673.15	128.80	2922.66	170.51	2880.95						
39.56	2803.44	354.51	2673.27	121.01	2930.45	171.59	2879.87						
39.78	2803.22	354.43	2673.35	129.40	2922.06	172.06	2879.40						
39.82	2803.18	354.36	2673.42	129.01	2922.45	172.16	2879.30						
38.76	2804.24	354.17	2673.61	128.32	2923.14	172.39	2879.07						
37.44	2805.56	354.19	2673.59	128.46	2923.00	172.54	2878.92						
37.97	2805.03	354.73	2673.05	129.55	2921.91	172.77	2878.69	179.85	2714.36				
38.36	2804.64	354.81	2672.97	129.64	2921.82	172.88	2878.58	179.97	2714.24				
38.91	2804.09	354.96	2672.82	129.56	2921.90	172.91	2878.55	180.14	2714.07				
39.29	2803.71	354.92	2672.86	129.43	2922.03	173.04	2878.42	181.01	2713.20				
41.61	2801.39	355.20	2672.58	135.30	2916.16	173.50	2877.96	180.86	2713.35				
41.94	2801.06	355.31	2672.47			174.16	2877.30	180.97	2713.24				
42.36	2800.64	355.64	2672.14			174.19	2877.27	181.34	2712.87				
43.87	2799.13	355.87	2671.91	140.26	2911.20	175.85	2875.61	181.76	2712.45				
44.15	2798.85	355.91	2671.87		3051.46	176.11	2875.35	182.17	2712.04				
44.39	2798.61	356.18	2671.60		3051.46	177.34	2874.12	182.22	2711.99				
45.07	2797.93	356.73	2671.05		3051.46	178.92	2872.54	182.39	2711.82				
45.47	2797.53	356.81	2670.97		3051.46	179.16	2872.30	182.51	2711.70				
46.12	2796.88	357.05	2670.73		3051.46	179.81	2871.65	182.77	2711.44				
47.39	2795.61	357.31	2670.47		3051.46	180.96	2870.50	183.01	2711.20				
48.11	2794.89	357.56	2670.22		3051.46	181.43	2870.03	183.26	2710.95				
48.94	2794.06	357.89	2669.89		3051.46	182.87	2868.59	183.94	2710.27				
50.15	2792.85	358.30	2669.48		3051.46	185.76	2865.70	183.70	2710.51				

Tazewell County Landfill
Stoney Ridge
(December 1992 through June 1993)



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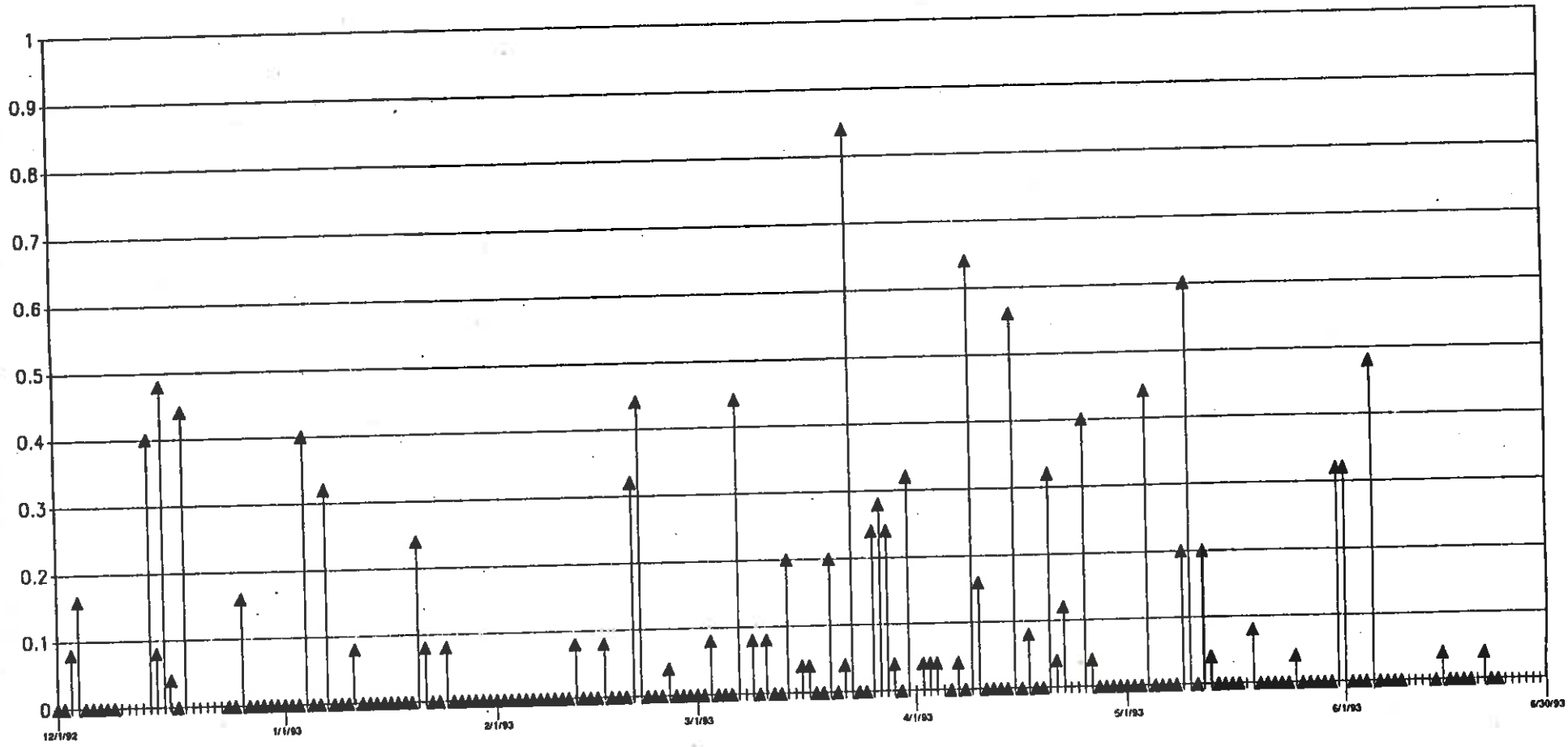
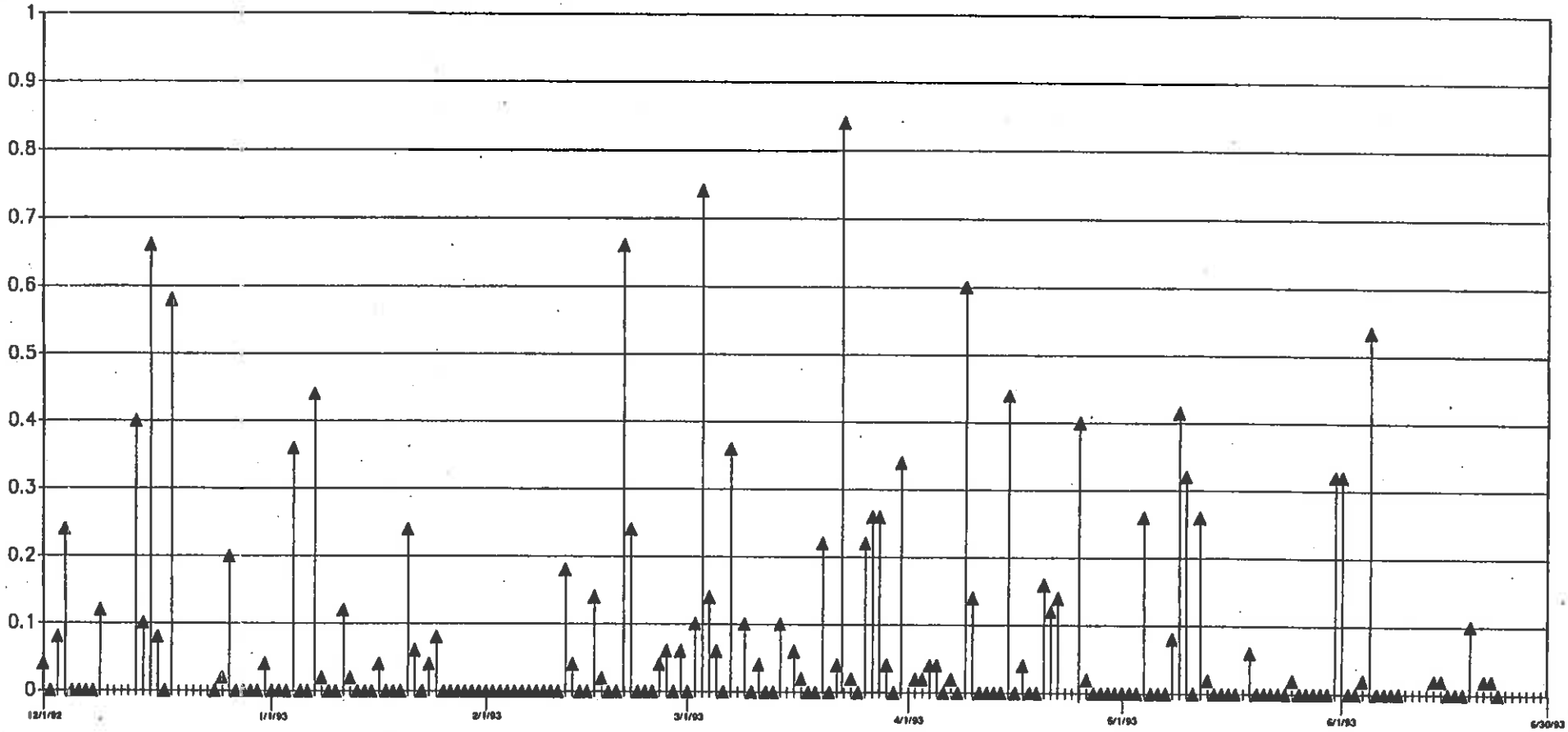
Tazewell County Landfill
Springville
(December 1992 through June 1993)

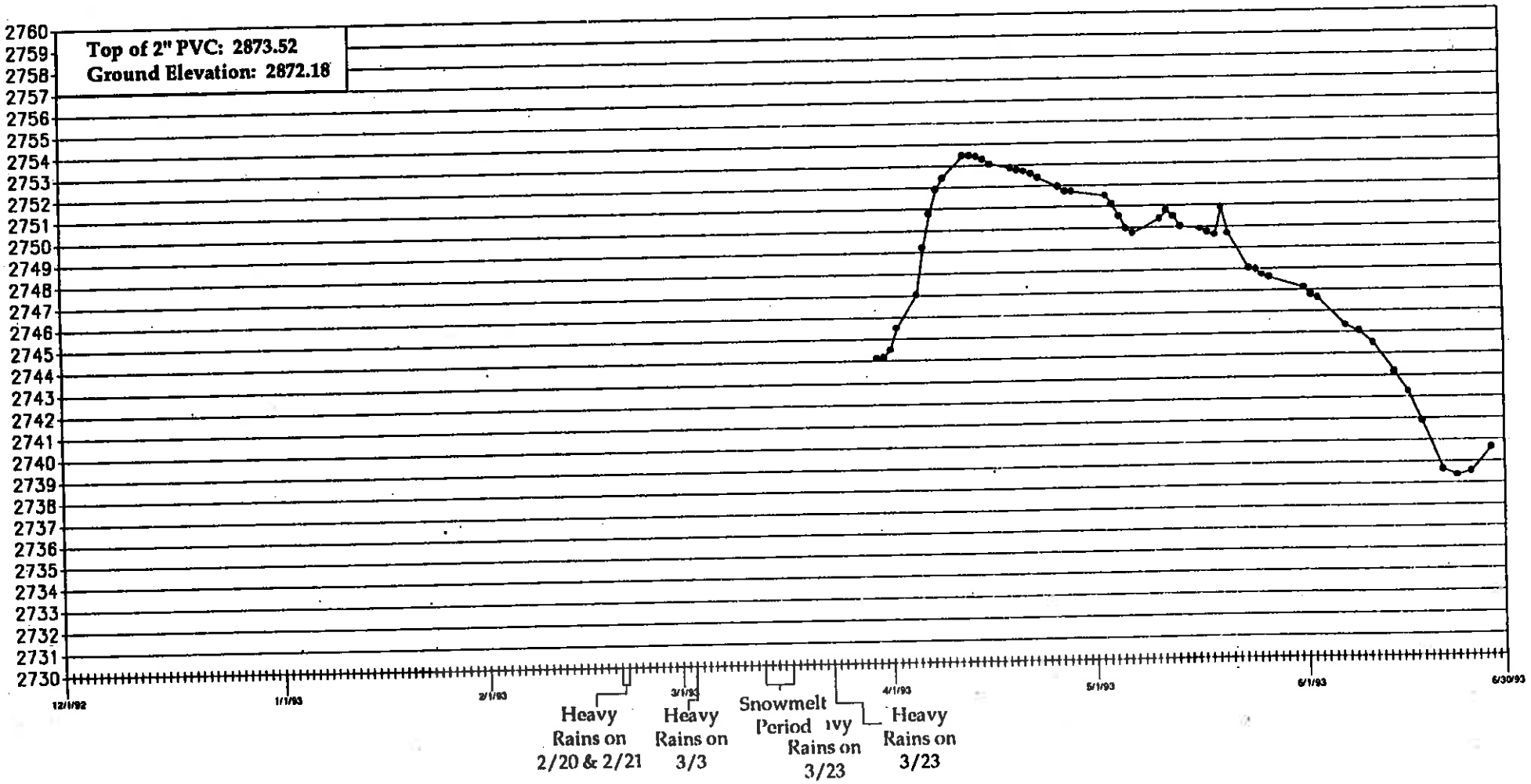


Tazewell County Landfill
Average Rainfall
(December 1992 through June 1993)

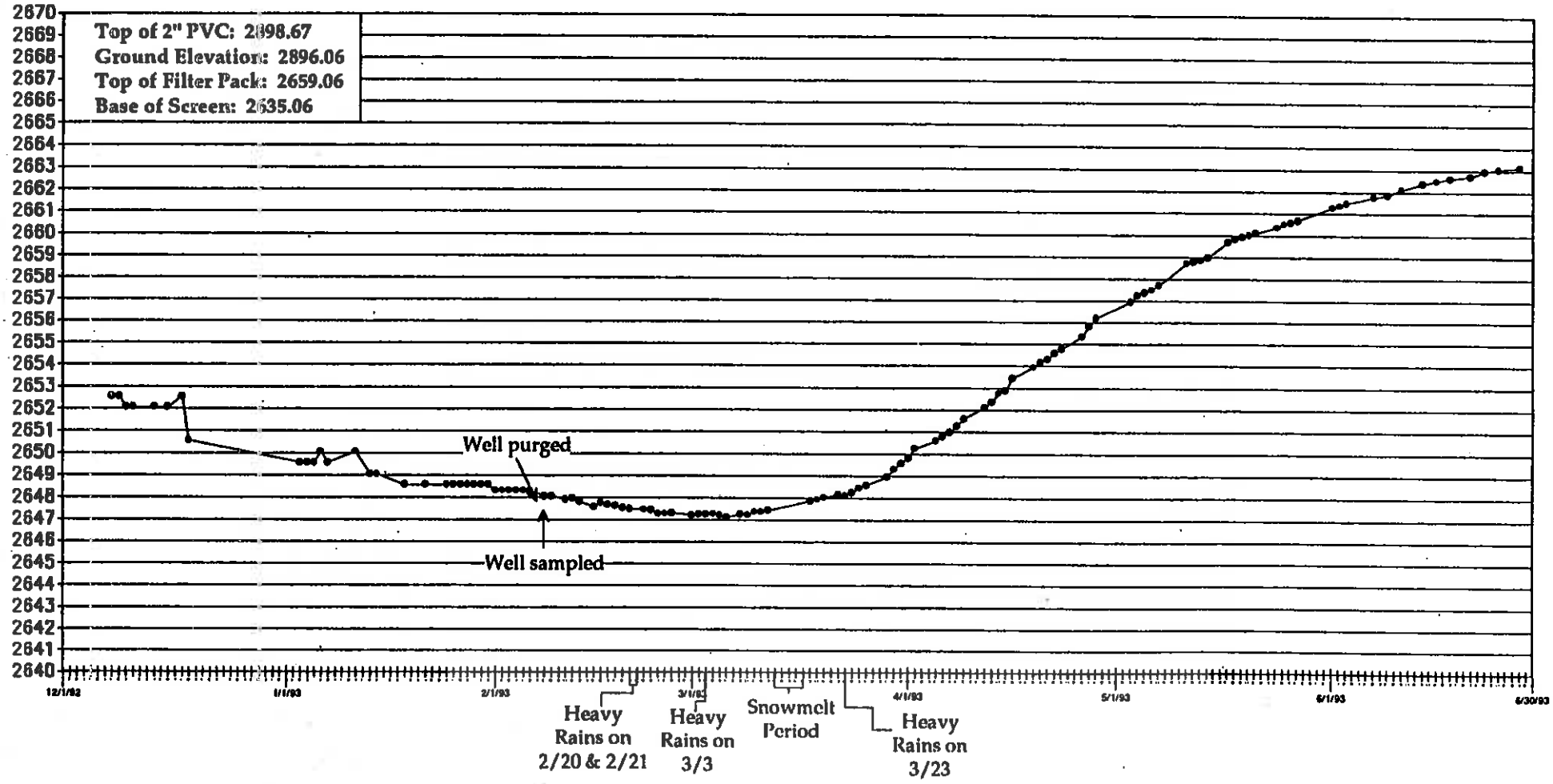


MARSHALL MILLER & ASSOCIATES

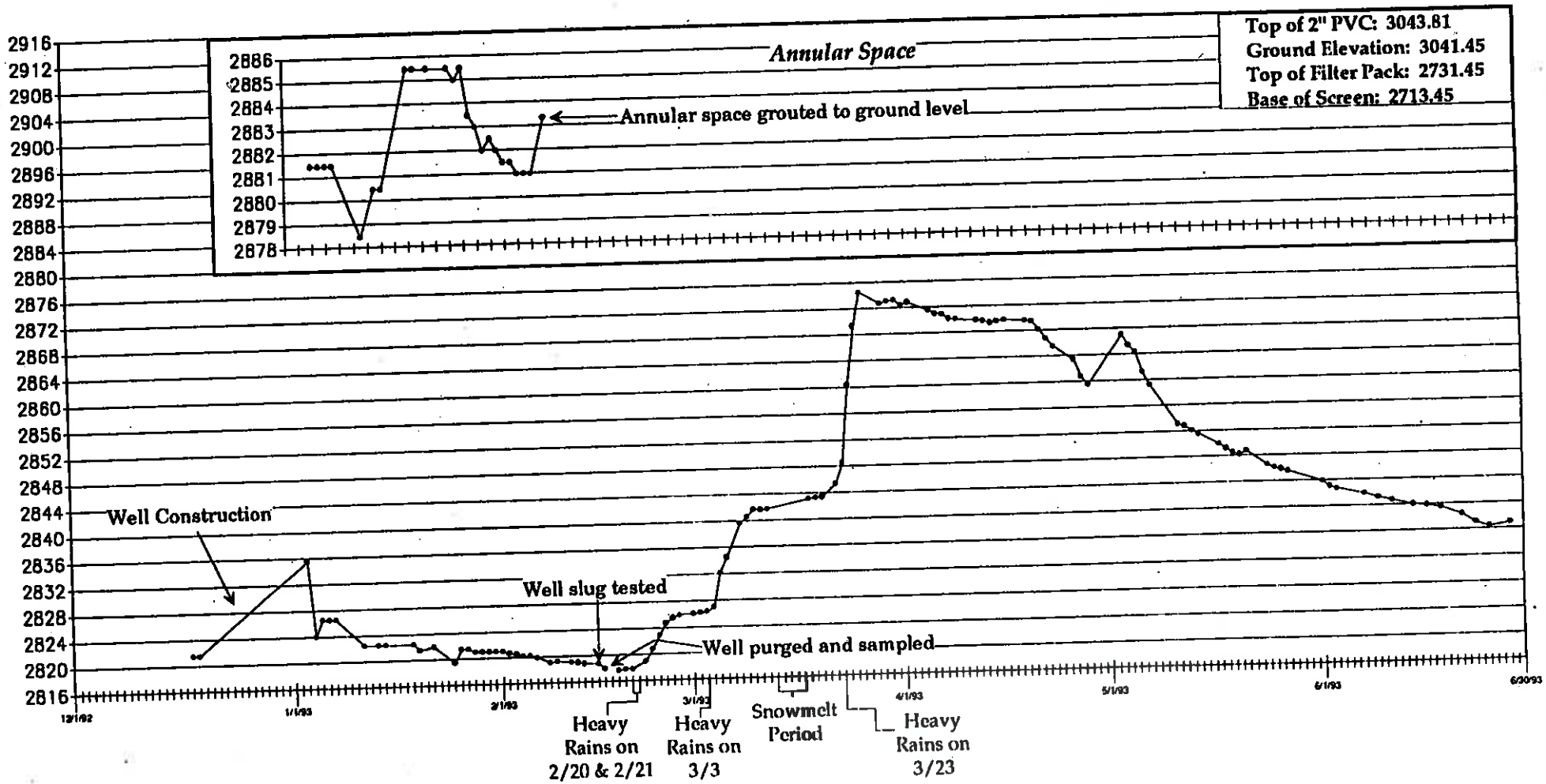
Tazewell County Landfill
MW-1



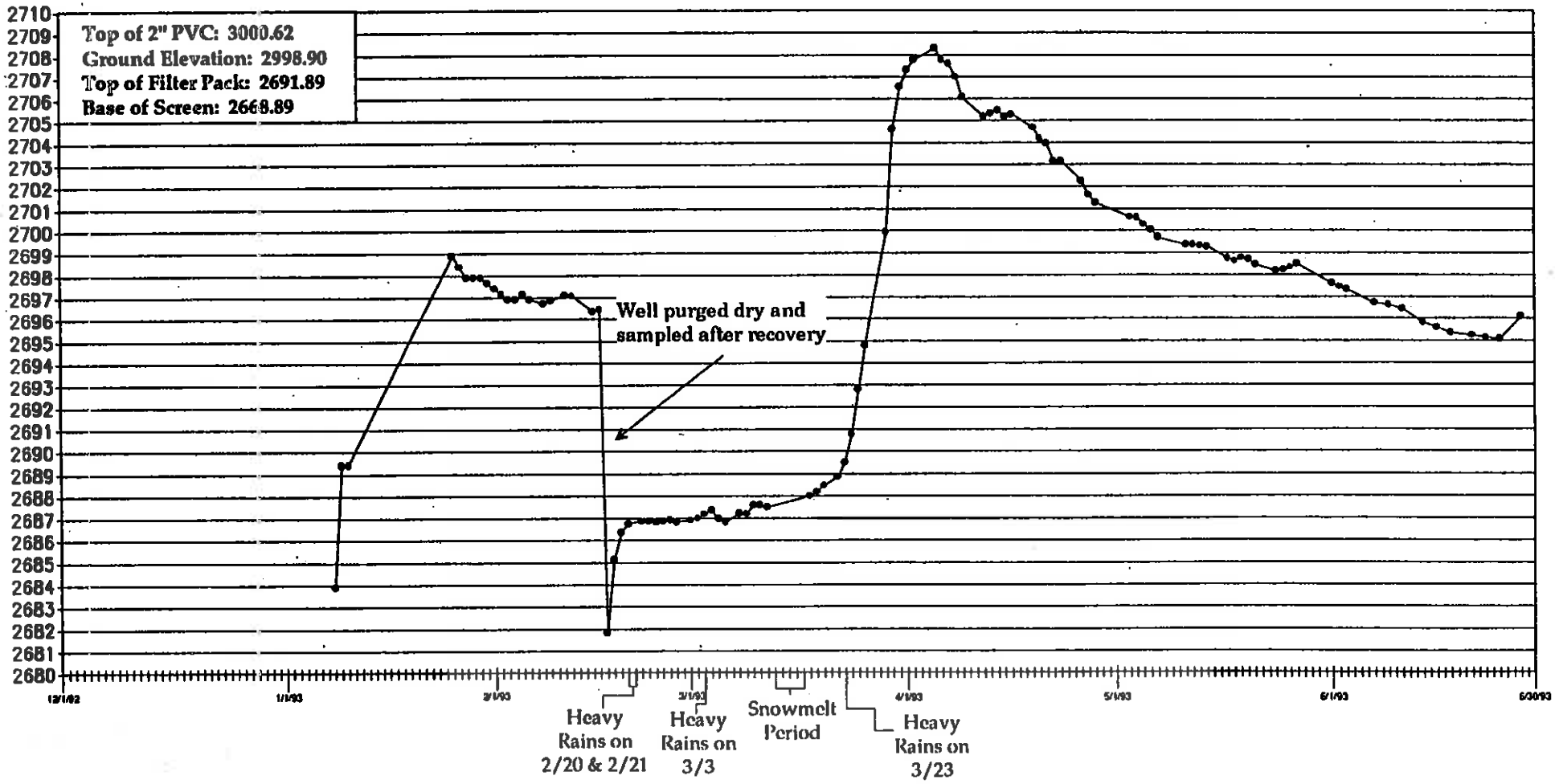
Tazewell County Landfill
MW-2



Tazewell County Landfill
MW-3

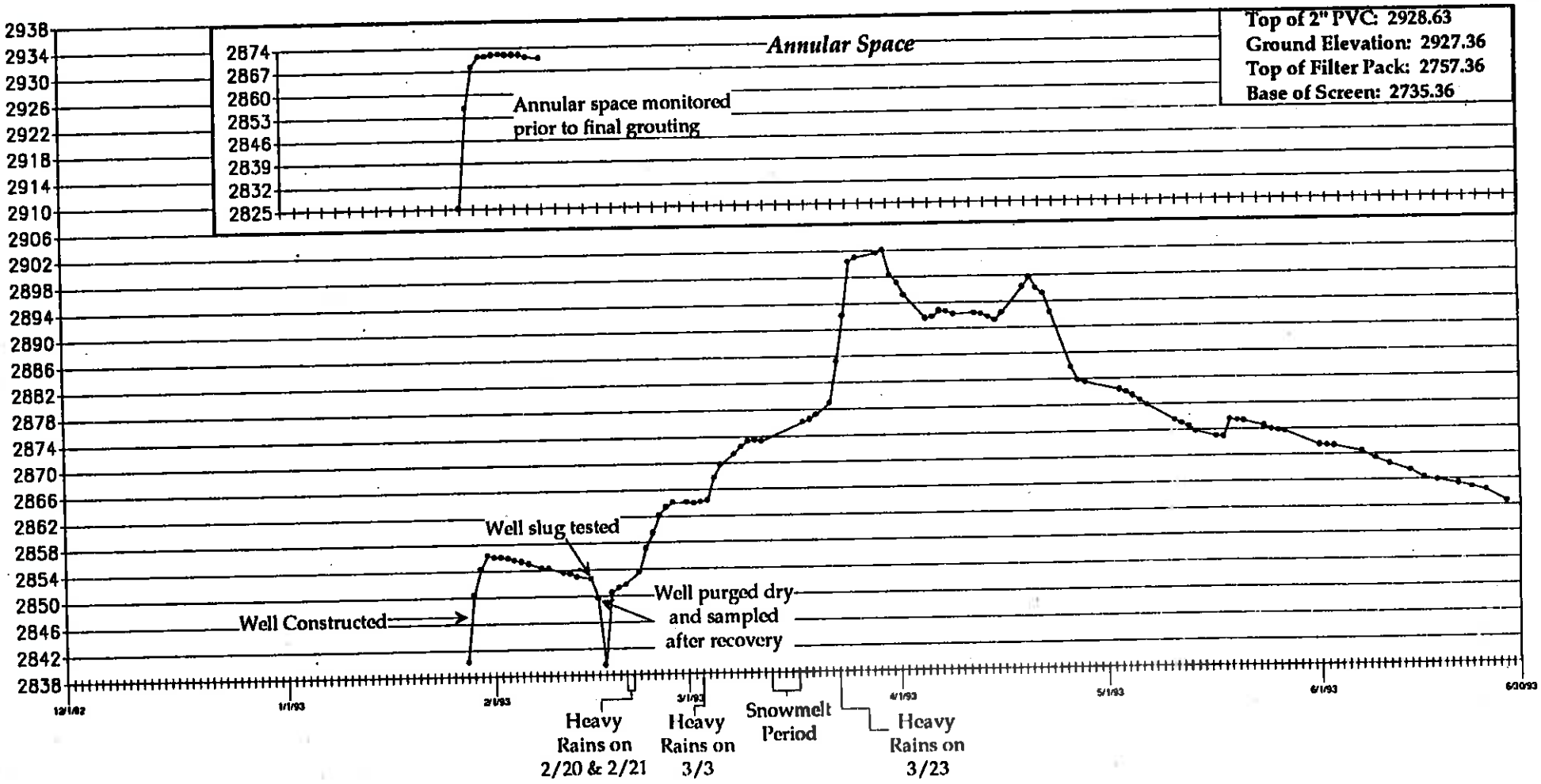


Tazewell County Landfill
MW-4

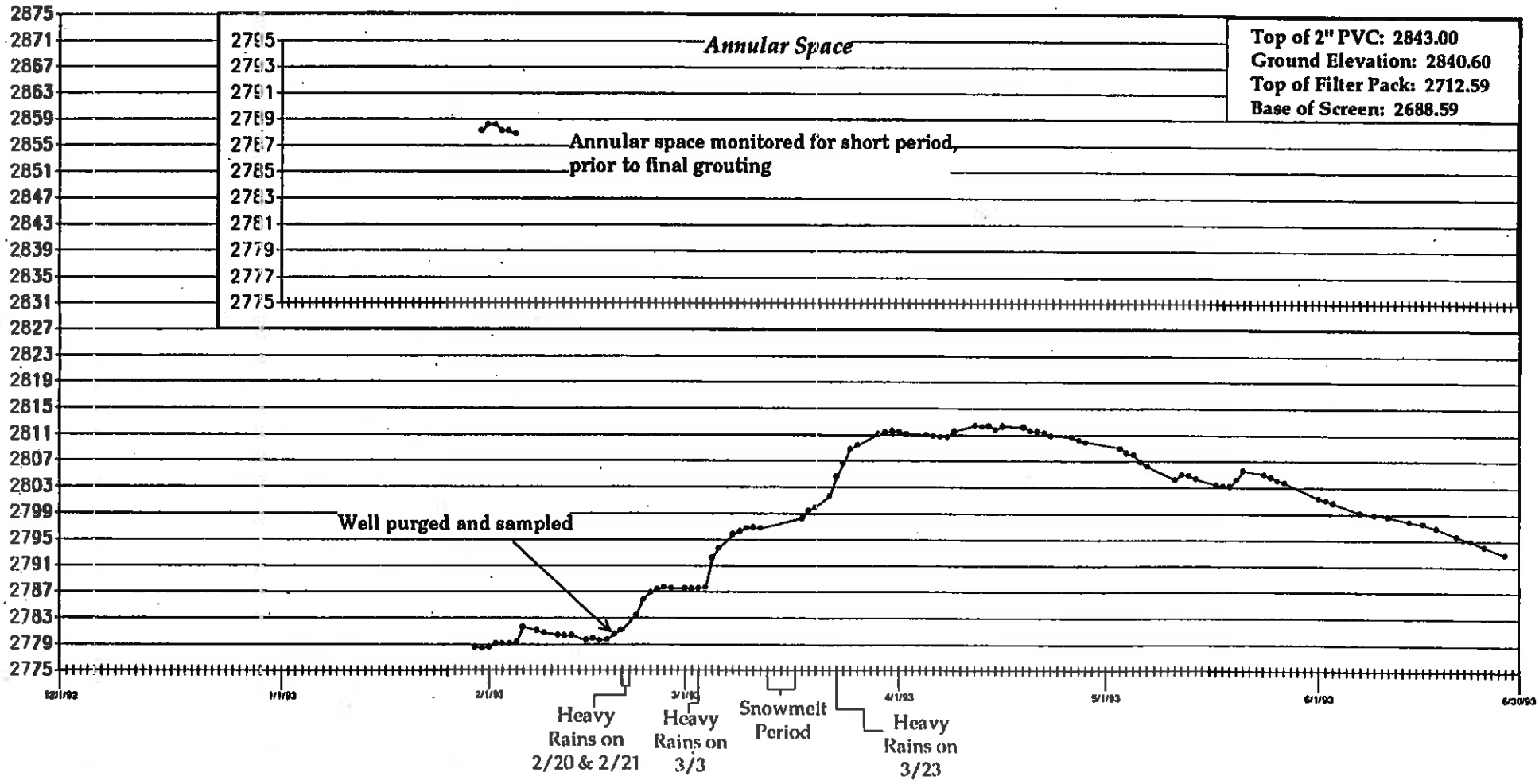


Tazewell County Landfill

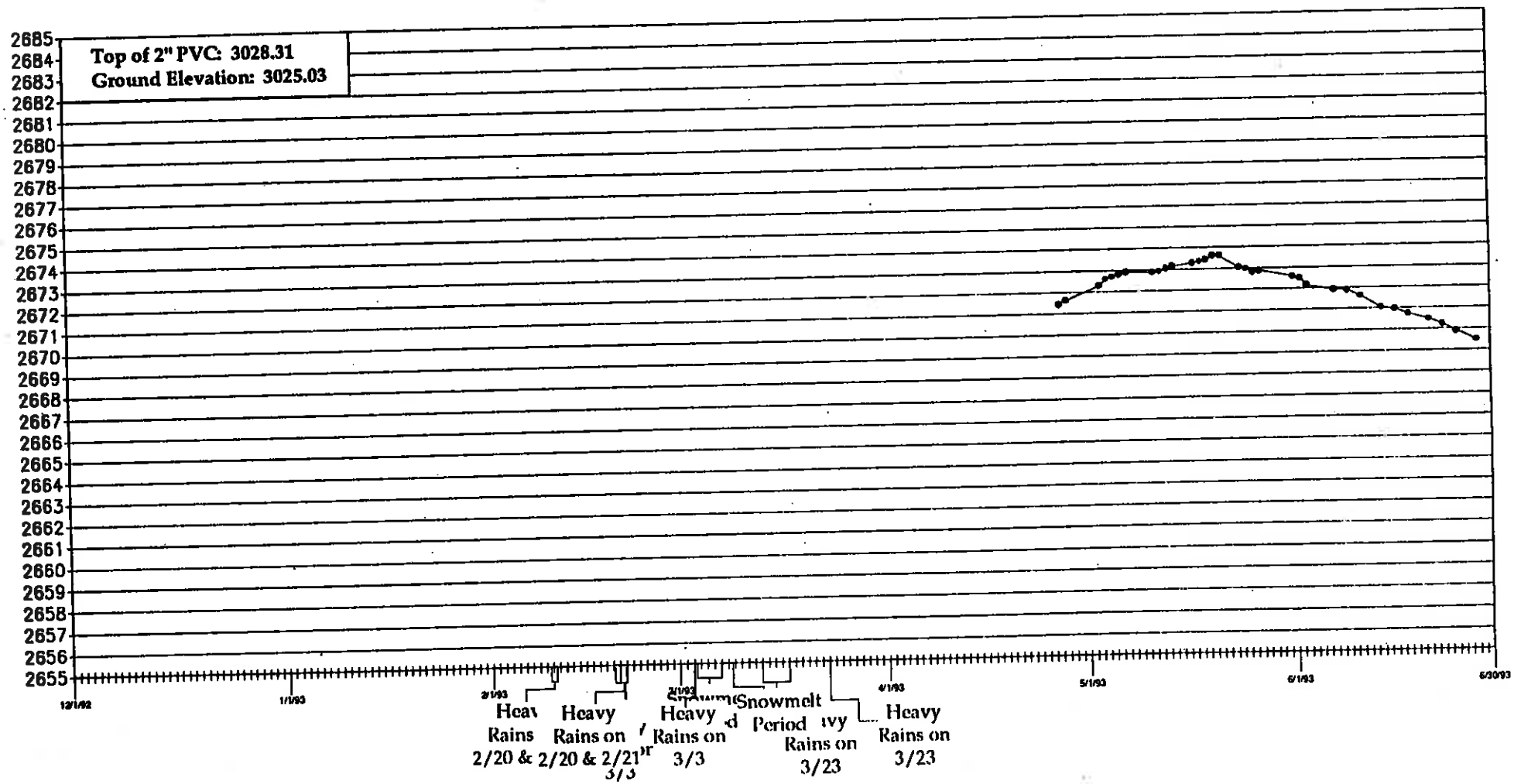
MW-5



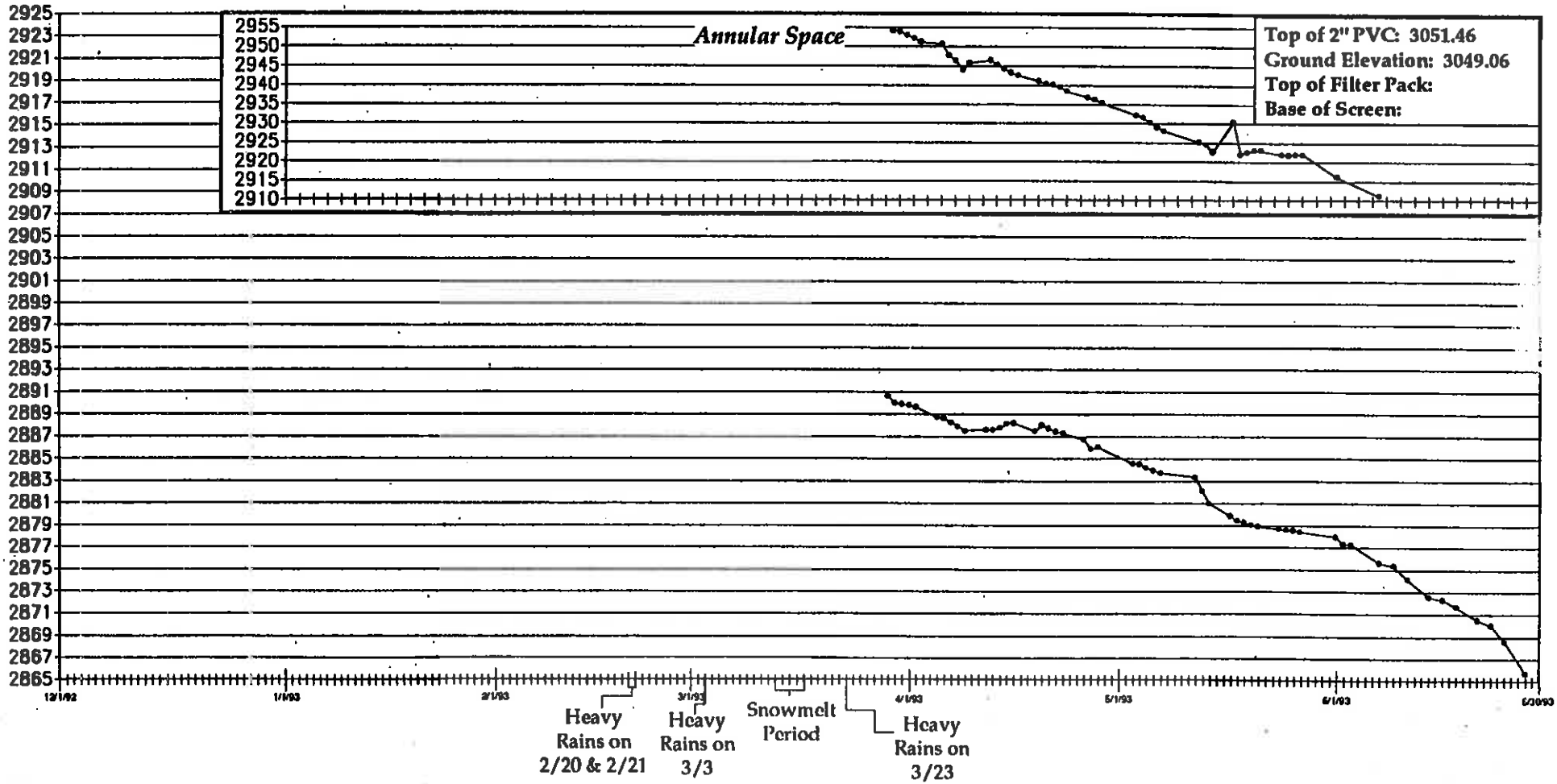
Tazewell County Landfill
MW-6



Tazewell County Landfill
MW-7



Tazewell County Landfill
MW-8



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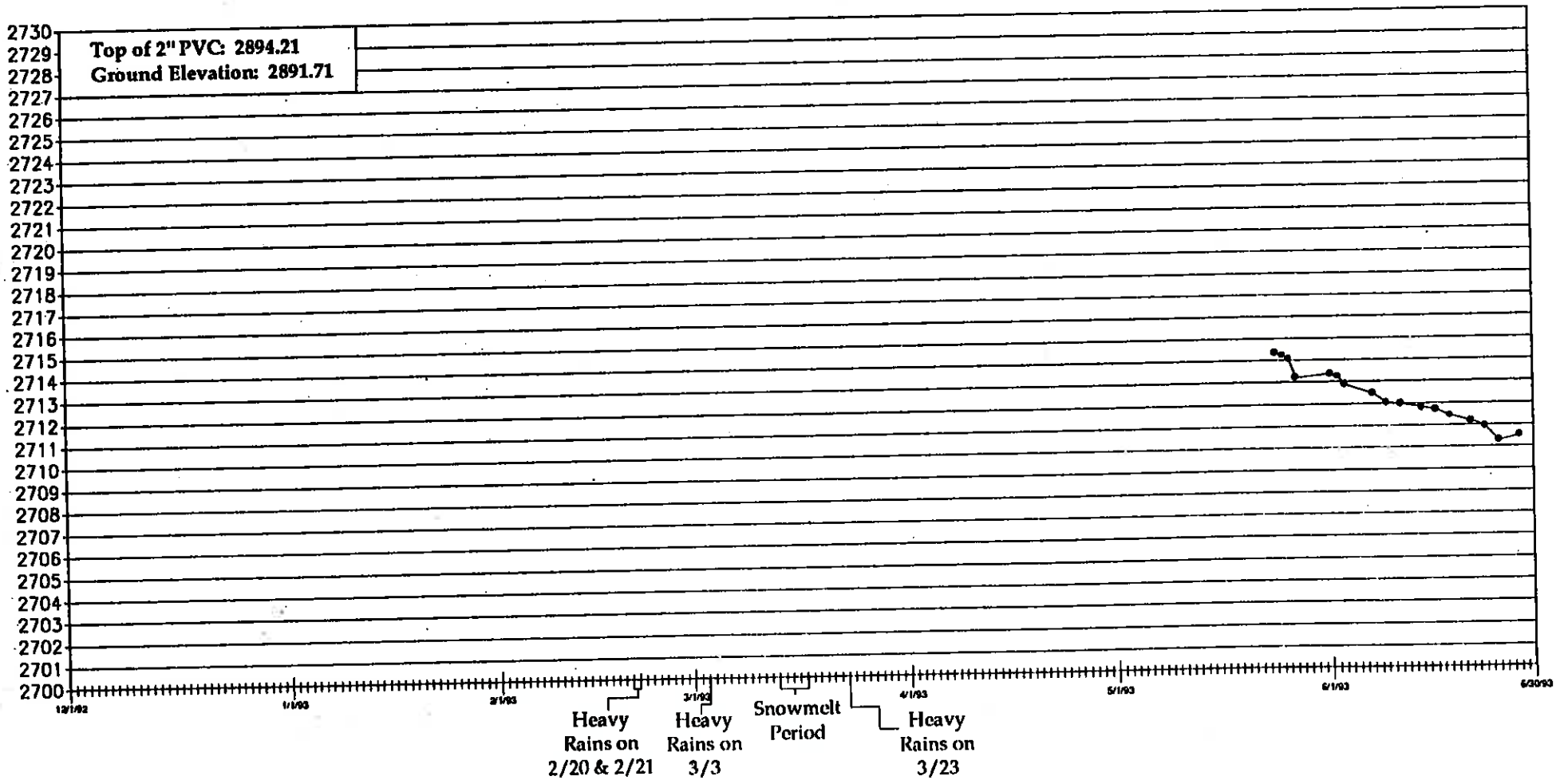
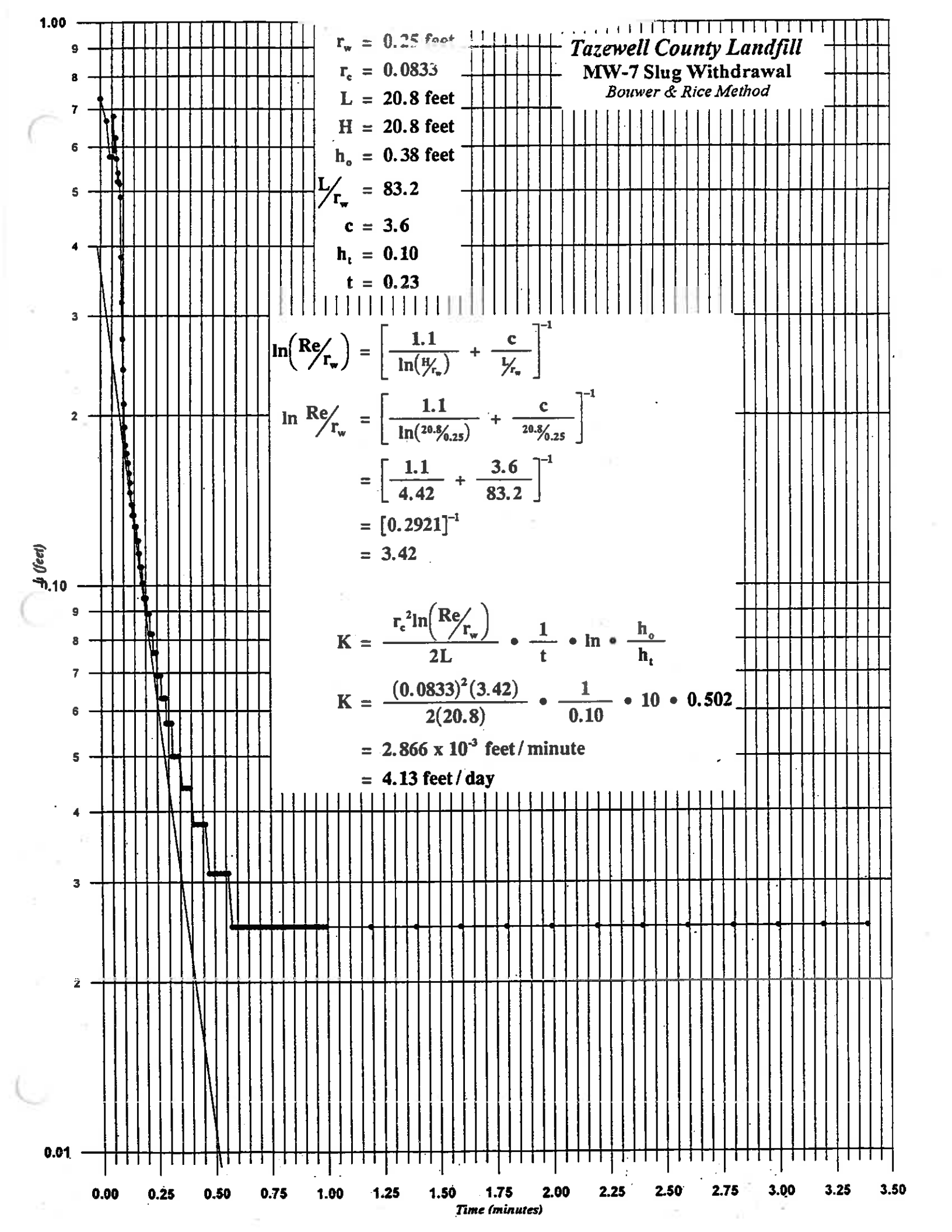
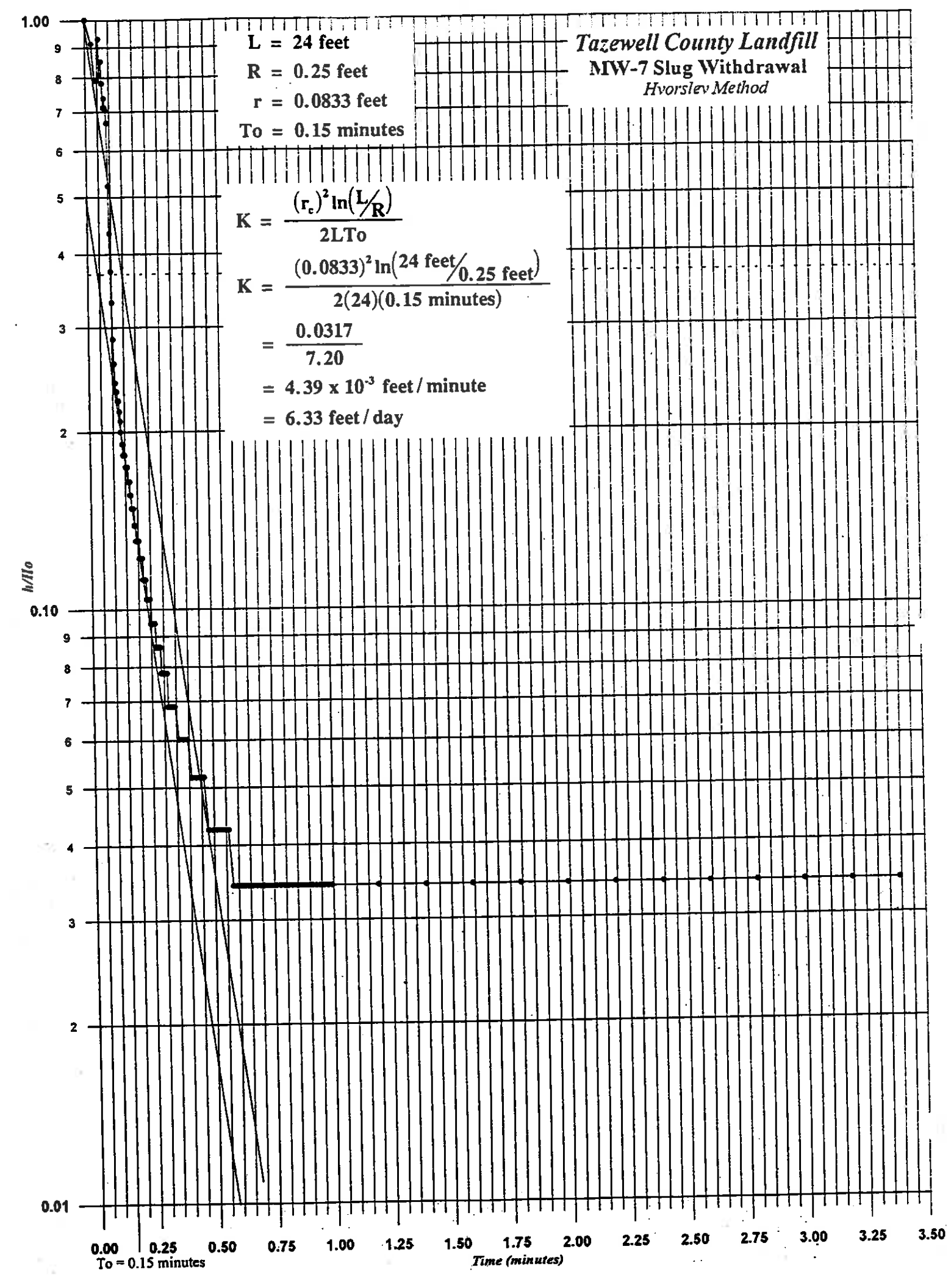
Tazewell County Landfill
MW-9



Appendix D


Tazewell County Landfill
MW-7 Slug Withdrawal
Bouwer & Rice Method
r_w = 0.25 feet
r_c = 0.0833
L = 20.8 feet
H = 20.8 feet
h_o = 0.38 feet
L/r_w = 83.2
c = 3.6
h_t = 0.10
t = 0.23
$\ln(Re/r_w) = \left[\frac{1.1}{\ln(H/r_w)} + \frac{c}{L/r_w}\right]^{-1}$
$\ln Re/r_w = \left[\frac{1.1}{\ln(20.8/0.25)} + \frac{c}{20.8/0.25}\right]^{-1}$
$= \left[\frac{1.1}{4.42} + \frac{3.6}{83.2}\right]^{-1}$
$= [0.2921]^{-1}$
$= 3.42$
$K = \frac{r_c^2 \ln(Re/r_w)}{2L} \bullet \frac{1}{t} \bullet \ln \bullet \frac{h_o}{h_t}$
$K = \frac{(0.0833)^2(3.42)}{2(20.8)} \bullet \frac{1}{0.10} \bullet 10 \bullet 0.502$
$= 2.866 \times 10^{-3}$ feet / minute
$= 4.13$ feet / day
h (feet)
1.00
9
8
7
6
5
4
3
2
.10
9
8
7
6
5
4
3
2
0.01
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
3.25
3.50
Time (minutes)


Tazewell County Landfill
MW-7 Slug Withdrawal
Hvorslev Method
L = 24 feet
R = 0.25 feet
r = 0.0833 feet
To = 0.15 minutes
$K = \frac{(r_c)^2 \ln(L/R)}{2LTo}$
$K = \frac{(0.0833)^2 \ln(24\ \text{feet}/0.25\ \text{feet})}{2(24)(0.15\ \text{minutes})}$
$= \frac{0.0317}{7.20}$
$= 4.39 \times 10^{-3}$ feet / minute
= 6.33 feet / day
h/Ho
1.00
0.10
0.01
0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
3.25
3.50
To = 0.15 minutes
Time (minutes)

MW-7
Background Test

SE1000C
Environmental Logger
6/29/93 17:43

Unit# 01814 Test 6
INPUT 1: Level (F) TOC

Reference:	0.00
Linearity:	0.12
Scale factor:	20.06
Offset:	-0.03
Delay mSEC:	50.00

Step 0 06/29 11:18:57

Elapsed Time	INPUT 1
0.0000	-0.0310
0.0033	-0.0310
0.0066	-0.0310
0.0100	-0.0310
0.0133	-0.0310
0.0166	-0.0310
0.0200	-0.0310
0.0233	-0.0310
0.0266	-0.0310
0.0300	-0.0310
0.0333	-0.0310
0.0366	-0.0310
0.0400	-0.0310
0.0433	-0.0310
0.0466	-0.0310
0.0500	-0.0310
0.0533	-0.0310
0.0566	-0.0310
0.0600	-0.0310
0.0633	-0.0310
0.0666	-0.0310
0.0700	-0.0310
0.0733	-0.0310

0.0766	-0.0310
0.0800	-0.0310
0.0833	-0.0310
0.0866	-0.0310
0.0900	-0.0310
0.0933	-0.0310
0.0966	-0.0310
0.1000	-0.0310
0.1033	-0.0310
0.1066	-0.0310
0.1100	-0.0310
0.1133	-0.0310
0.1166	-0.0310
0.1200	-0.0310
0.1233	-0.0310
0.1266	-0.0310
0.1300	-0.0310
0.1333	-0.0310
0.1366	-0.0310
0.1400	-0.0310
0.1433	-0.0310
0.1466	-0.0310
0.1500	-0.0310
0.1533	-0.0310
0.1566	-0.0310
0.1600	-0.0310
0.1633	-0.0310
0.1666	-0.0310
0.1700	-0.0310
0.1733	-0.0310
0.1766	-0.0310
0.1800	-0.0310
0.1833	-0.0310
0.1866	-0.0310
0.1900	-0.0310
0.1933	-0.0310
0.1966	-0.0310
0.2000	-0.0310
0.2033	-0.0310
0.2066	-0.0310
0.2100	-0.0310
0.2133	-0.0310
0.2166	-0.0310

0.2200	-0.0310
0.2233	-0.0310
0.2266	-0.0310
0.2300	-0.0310
0.2333	-0.0310
0.2366	-0.0310
0.2400	-0.0310
0.2433	-0.0310
0.2466	-0.0310
0.2500	-0.0310
0.2533	-0.0310
0.2566	-0.0310
0.2600	-0.0310
0.2633	-0.0310
0.2666	-0.0310
0.2700	-0.0310
0.2733	-0.0310
0.2766	-0.0310
0.2800	-0.0310
0.2833	-0.0310
0.2866	-0.0310
0.2900	-0.0310
0.2933	-0.0310
0.2966	-0.0310
0.3000	-0.0310
0.3033	-0.0310
0.3066	-0.0310
0.3100	-0.0310
0.3133	-0.0310
0.3166	-0.0310
0.3200	-0.0310
0.3233	-0.0310
0.3266	-0.0310
0.3300	-0.0310
0.3333	-0.0310
0.3500	-0.0310
0.3666	-0.0310
0.3833	-0.0310
0.4000	-0.0310
0.4166	-0.0310
0.4333	-0.0310
0.4500	-0.0310
0.4666	-0.0310

0.4833	-0.0310
0.5000	-0.0310
0.5166	-0.0310
0.5333	-0.0310
0.5500	-0.0310
0.5666	-0.0310
0.5833	-0.0310
0.6000	-0.0310
0.6166	-0.0310
0.6333	-0.0310
0.6500	-0.0310
0.6666	-0.0310
0.6833	-0.0310
0.7000	-0.0310
0.7166	-0.0310
0.7333	-0.0310
0.7500	-0.0310
0.7666	-0.0310
0.7833	-0.0310
0.8000	-0.0310
0.8166	-0.0310
0.8333	-0.0310
0.8500	-0.0310
0.8666	-0.0310
0.8833	-0.0310
0.9000	-0.0310
0.9166	-0.0310
0.9333	-0.0310
0.9500	-0.0310
0.9666	-0.0310
0.9833	-0.0310
1.0000	-0.0310
1.2000	-0.0310
1.4000	-0.0310
1.6000	-0.0310
1.8000	-0.0310
2.0000	-0.0310
2.2000	-0.0310
2.4000	-0.0250
2.6000	-0.0250
2.8000	-0.0250
3.0000	-0.0250
3.2000	-0.0250

3.4000	-0.0250
3.6000	-0.0250
3.8000	-0.0250
4.0000	-0.0250
4.2000	-0.0250
4.4000	-0.0250
4.6000	-0.0250
4.8000	-0.0250
5.0000	-0.0250
5.2000	-0.0250
5.4000	-0.0250
5.6000	-0.0250
5.8000	-0.0250
6.0000	-0.0250
6.2000	-0.0250
6.4000	-0.0250
6.6000	-0.0250
6.8000	-0.0250
7.0000	-0.0250
7.2000	-0.0250
7.4000	-0.0250
7.6000	-0.0250
7.8000	-0.0250
8.0000	-0.0190
8.2000	-0.0250
8.4000	-0.0250
8.6000	-0.0250
8.8000	-0.0250
9.0000	-0.0250
9.2000	-0.0250
9.4000	-0.0250
9.6000	-0.0250
9.8000	-0.0250
10.0000	-0.0250
12.0000	-0.0190
14.0000	-0.0120
16.0000	-0.0120
18.0000	-0.0120
20.0000	-0.0120
22.0000	-0.0120
24.0000	-0.0060
26.0000	-0.0060
28.0000	-0.0120

Tazewell County Landfill
MW-7
Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.00	0.730	1.000
0.00	0.108	0.148
0.01	0.343	0.470
0.01	0.476	0.652
0.01	0.749	1.026
0.02	0.971	1.330
0.02	1.245	1.705
0.02	1.340	1.836
0.03	1.397	1.914
0.03	1.194	1.636
0.03	1.181	1.618
0.04	1.029	1.410
0.04	0.857	1.174
0.04	0.565	0.774
0.05	0.431	0.590
0.05	0.304	0.416
0.06	0.216	0.296
0.06	0.203	0.278
0.07	0.184	0.252
0.07	0.171	0.234
0.07	0.171	0.234
0.08	0.165	0.226
0.08	0.165	0.226
0.08	0.158	0.216
0.09	0.152	0.208
0.09	0.146	0.200
0.09	0.139	0.190
0.10	0.139	0.190
0.10	0.139	0.190
0.10	0.139	0.190
0.11	0.133	0.182
0.11	0.133	0.182
0.11	0.127	0.174
0.12	0.120	0.164
0.12	0.120	0.164
0.12	0.120	0.164
0.13	0.114	0.156
0.13	0.114	0.156
0.13	0.114	0.156
0.14	0.114	0.156
0.14	0.108	0.148
0.14	0.108	0.148
0.15	0.108	0.148

Tazewell County Landfill

MW-7

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.15	0.108	0.148
0.15	0.101	0.138
0.16	0.101	0.138
0.16	0.101	0.138
0.16	0.101	0.138
0.17	0.095	0.130
0.17	0.095	0.130
0.17	0.095	0.130
0.18	0.095	0.130
0.18	0.095	0.130
0.18	0.095	0.130
0.19	0.089	0.122
0.19	0.089	0.122
0.19	0.089	0.122
0.20	0.089	0.122
0.20	0.089	0.122
0.20	0.082	0.112
0.21	0.082	0.112
0.21	0.082	0.112
0.21	0.082	0.112
0.22	0.082	0.112
0.22	0.082	0.112
0.22	0.082	0.112
0.23	0.076	0.104
0.23	0.076	0.104
0.23	0.076	0.104
0.24	0.076	0.104
0.24	0.076	0.104
0.24	0.076	0.104
0.25	0.076	0.104
0.25	0.076	0.104
0.25	0.076	0.104
0.26	0.069	0.095
0.26	0.069	0.095
0.26	0.069	0.095
0.27	0.069	0.095
0.27	0.069	0.095
0.27	0.069	0.095
0.28	0.069	0.095
0.28	0.069	0.095
0.28	0.069	0.095
0.29	0.069	0.095
0.29	0.069	0.095

Tazewell County Landfill

MW-7

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.29	0.063	0.086
0.30	0.063	0.086
0.30	0.063	0.086
0.30	0.063	0.086
0.31	0.063	0.086
0.31	0.063	0.086
0.31	0.063	0.086
0.32	0.063	0.086
0.32	0.063	0.086
0.32	0.063	0.086
0.34	0.057	0.078
0.36	0.057	0.078
0.37	0.057	0.078
0.39	0.057	0.078
0.41	0.050	0.068
0.42	0.050	0.068
0.44	0.050	0.068
0.46	0.050	0.068
0.47	0.050	0.068
0.49	0.050	0.068
0.51	0.050	0.068
0.52	0.050	0.068
0.54	0.050	0.068
0.56	0.044	0.060
0.57	0.044	0.060
0.59	0.044	0.060
0.61	0.044	0.060
0.62	0.044	0.060
0.64	0.044	0.060
0.66	0.044	0.060
0.67	0.044	0.060
0.69	0.044	0.060
0.71	0.044	0.060
0.72	0.044	0.060
0.74	0.044	0.060
0.76	0.044	0.060
0.77	0.044	0.060
0.79	0.044	0.060
0.81	0.044	0.060
0.82	0.044	0.060
0.84	0.044	0.060
0.86	0.044	0.060
0.87	0.044	0.060

Tazewell County Landfill

MW-7

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.89	0.044	0.060
0.91	0.044	0.060
0.92	0.038	0.052
0.94	0.038	0.052
0.96	0.038	0.052
0.97	0.038	0.052
0.99	0.038	0.052
1.19	0.038	0.052
1.39	0.038	0.052
1.59	0.031	0.042
1.79	0.031	0.042
1.99	0.031	0.042
2.19	0.031	0.042
2.39	0.031	0.042
2.59	0.025	0.034
2.79	0.025	0.034
2.99	0.025	0.034
3.19	0.025	0.034
3.39	0.025	0.034
3.59	0.025	0.034
3.79	0.025	0.034
3.99	0.025	0.034
4.19	0.025	0.034
4.39	0.019	0.026
4.59	0.019	0.026
4.79	0.019	0.026
4.99	0.019	0.026
5.19	0.019	0.026
5.39	0.019	0.026
5.59	0.019	0.026
5.79	0.019	0.026
5.99	0.019	0.026
6.19	0.019	0.026
6.39	0.019	0.026
6.59	0.019	0.026
6.79	0.019	0.026
6.99	0.019	0.026
7.19	0.019	0.026
7.39	0.019	0.026
7.59	0.019	0.026
7.79	0.019	0.026
7.99	0.019	0.026
8.19	0.019	0.026

Tazewell County Landfill

MW-7

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
8.39	0.019	0.026
8.59	0.019	0.026
8.79	0.019	0.026
8.99	0.019	0.026
9.19	0.019	0.026
9.39	0.019	0.026
9.59	0.019	0.026
9.79	0.012	0.016
9.99	0.019	0.026
11.99	0.012	0.016
13.99	0.012	0.016
15.99	0.012	0.016
17.99	0.006	0.008
19.99	0.006	0.008
21.99	0.006	0.008
23.99	0.006	0.008
25.99	0.006	0.008
27.99	0.006	0.008
29.99	0.006	0.008
31.99	0.006	0.008
33.99	0.006	0.008
35.99	0.006	0.008

MW-7
Slug Injection Test

SE1000C
Environmental Logger
6/29/93 17:40

Unit# 01814 Test 7
INPUT 1: Level (F) TOC

Reference:	0.00
Linearity:	0.12
Scale factor:	20.06
Offset:	-0.03
Delay mSEC:	50.00

Step 0 06/29 12:15:40

Elapsed Time	INPUT 1
0.0000	0.0000
0.0033	0.0000
0.0066	0.0000
0.0100	-0.0060
0.0133	-0.1080
0.0166	-0.3430
0.0200	-0.4760
0.0233	-0.7490
0.0266	-0.9710
0.0300	-1.2450
0.0333	-1.3400
0.0366	-1.3970
0.0400	-1.1940
0.0433	-1.1810
0.0466	-1.0290
0.0500	-0.8570
0.0533	-0.5650
0.0566	-0.4310
0.0600	-0.3040
0.0633	0.0250
0.0666	-0.1770
0.0700	-0.2160
0.0733	-0.2030

0.0766	-0.1840
0.0800	-0.1710
0.0833	-0.1710
0.0866	-0.1650
0.0900	-0.1650
0.0933	-0.1580
0.0966	-0.1520
0.1000	-0.1460
0.1033	-0.1390
0.1066	-0.1390
0.1100	-0.1390
0.1133	-0.1390
0.1166	-0.1330
0.1200	-0.1330
0.1233	-0.1270
0.1266	-0.1200
0.1300	-0.1200
0.1333	-0.1200
0.1366	-0.1140
0.1400	-0.1140
0.1433	-0.1140
0.1466	-0.1140
0.1500	-0.1080
0.1533	-0.1080
0.1566	-0.1080
0.1600	-0.1080
0.1633	-0.1010
0.1666	-0.1010
0.1700	-0.1010
0.1733	-0.1010
0.1766	-0.0950
0.1800	-0.0950
0.1833	-0.0950
0.1866	-0.0950
0.1900	-0.0950
0.1933	-0.0950
0.1966	-0.0890
0.2000	-0.0890
0.2033	-0.0890
0.2066	-0.0890
0.2100	-0.0890
0.2133	-0.0820
0.2166	-0.0820

0.2200	-0.0820
0.2233	-0.0820
0.2266	-0.0820
0.2300	-0.0820
0.2333	-0.0820
0.2366	-0.0760
0.2400	-0.0760
0.2433	-0.0760
0.2466	-0.0760
0.2500	-0.0760
0.2533	-0.0760
0.2566	-0.0760
0.2600	-0.0760
0.2633	-0.0760
0.2666	-0.0690
0.2700	-0.0690
0.2733	-0.0690
0.2766	-0.0690
0.2800	-0.0690
0.2833	-0.0690
0.2866	-0.0690
0.2900	-0.0690
0.2933	-0.0690
0.2966	-0.0690
0.3000	-0.0690
0.3033	-0.0630
0.3066	-0.0630
0.3100	-0.0630
0.3133	-0.0630
0.3166	-0.0630
0.3200	-0.0630
0.3233	-0.0630
0.3266	-0.0630
0.3300	-0.0630
0.3333	-0.0630
0.3500	-0.0570
0.3666	-0.0570
0.3833	-0.0570
0.4000	-0.0570
0.4166	-0.0500
0.4333	-0.0500
0.4500	-0.0500
0.4666	-0.0500

0.4833	-0.0500
0.5000	-0.0500
0.5166	-0.0500
0.5333	-0.0500
0.5500	-0.0500
0.5666	-0.0440
0.5833	-0.0440
0.6000	-0.0440
0.6166	-0.0440
0.6333	-0.0440
0.6500	-0.0440
0.6666	-0.0440
0.6833	-0.0440
0.7000	-0.0440
0.7166	-0.0440
0.7333	-0.0440
0.7500	-0.0440
0.7666	-0.0440
0.7833	-0.0440
0.8000	-0.0440
0.8166	-0.0440
0.8333	-0.0440
0.8500	-0.0440
0.8666	-0.0440
0.8833	-0.0440
0.9000	-0.0440
0.9166	-0.0440
0.9333	-0.0380
0.9500	-0.0380
0.9666	-0.0380
0.9833	-0.0380
1.0000	-0.0380
1.2000	-0.0380
1.4000	-0.0380
1.6000	-0.0310
1.8000	-0.0310
2.0000	-0.0310
2.2000	-0.0310
2.4000	-0.0310
2.6000	-0.0250
2.8000	-0.0250
3.0000	-0.0250
3.2000	-0.0250

3.4000	-0.0250
3.6000	-0.0250
3.8000	-0.0250
4.0000	-0.0250
4.2000	-0.0250
4.4000	-0.0190
4.6000	-0.0190
4.8000	-0.0190
5.0000	-0.0190
5.2000	-0.0190
5.4000	-0.0190
5.6000	-0.0190
5.8000	-0.0190
6.0000	-0.0190
6.2000	-0.0190
6.4000	-0.0190
6.6000	-0.0190
6.8000	-0.0190
7.0000	-0.0190
7.2000	-0.0190
7.4000	-0.0190
7.6000	-0.0190
7.8000	-0.0190
8.0000	-0.0190
8.2000	-0.0190
8.4000	-0.0190
8.6000	-0.0190
8.8000	-0.0190
9.0000	-0.0190
9.2000	-0.0190
9.4000	-0.0190
9.6000	-0.0190
9.8000	-0.0120
10.0000	-0.0190
12.0000	-0.0120
14.0000	-0.0120
16.0000	-0.0120
18.0000	-0.0060
20.0000	-0.0060
22.0000	-0.0060
24.0000	-0.0060
26.0000	-0.0060
28.0000	-0.0060

30.0000	-0.0060
32.0000	-0.0060
34.0000	-0.0060
36.0000	-0.0060
38.0000	0.0000
40.0000	0.0000
42.0000	0.0000
44.0000	0.0000
46.0000	0.0000
48.0000	0.0000
50.0000	0.0000
52.0000	0.0000
54.0000	0.0000
56.0000	0.0000
58.0000	0.0000
60.0000	0.0000

Tazewell County Landfill

MW-7

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
9.99	0.019	0.026
11.99	0.012	0.016
13.99	0.012	0.016
15.99	0.012	0.016
17.99	0.006	0.008
19.99	0.006	0.008
21.99	0.006	0.008
23.99	0.006	0.008
25.99	0.006	0.008
27.99	0.006	0.008
29.99	0.006	0.008
31.99	0.006	0.008
33.99	0.006	0.008
35.99	0.006	0.008

MW-7

Slug Withdrawal Test

SE1000C
Environmental Logger
6/29/93 17:37

Unit# 01814 Test 8
INPUT 1: Level (F) TOC

Reference:	0.00
Linearity:	0.12
Scale factor:	20.06
Offset:	-0.03
Delay mSEC:	50.00

Step 0 06/29 13:26:42

Elapsed Time	INPUT 1
0.0000	0.0000
0.0033	0.0000
0.0066	0.3170
0.0100	0.3930
0.0133	0.6160
0.0166	0.8630
0.0200	0.9270
0.0233	1.3330
0.0266	1.0090
0.0300	0.9710
0.0333	0.6660
0.0366	1.0280
0.0400	1.0160
0.0433	1.0280
0.0466	0.5770
0.0500	0.6350
0.0533	0.6470
0.0566	0.5770
0.0600	0.7550
0.0633	0.6790

0.0666	0.5900
0.0700	0.6220
0.0733	0.6220
0.0766	0.5710
0.0800	0.5200
0.0833	0.5390
0.0866	0.5200
0.0900	0.5140
0.0933	0.4890
0.0966	0.3810
0.1000	0.3170
0.1033	0.2730
0.1066	0.2410
0.1100	0.2090
0.1133	0.1900
0.1166	0.1770
0.1200	0.1710
0.1233	0.1710
0.1266	0.1650
0.1300	0.1650
0.1333	0.1580
0.1366	0.1520
0.1400	0.1460
0.1433	0.1390
0.1466	0.1330
0.1500	0.1390
0.1533	0.1330
0.1566	0.1330
0.1600	0.1270
0.1633	0.1270
0.1666	0.1270
0.1700	0.1200
0.1733	0.1200
0.1766	0.1140
0.1800	0.1140
0.1833	0.1080
0.1866	0.1080
0.1900	0.1080
0.1933	0.1010

0.1966	0.1010
0.2000	0.0950
0.2033	0.0950
0.2066	0.0950
0.2100	0.0950
0.2133	0.0890
0.2166	0.0890
0.2200	0.0890
0.2233	0.0890
0.2266	0.0820
0.2300	0.0820
0.2333	0.0820
0.2366	0.0820
0.2400	0.0760
0.2433	0.0760
0.2466	0.0760
0.2500	0.0760
0.2533	0.0760
0.2566	0.0690
0.2600	0.0690
0.2633	0.0690
0.2666	0.0690
0.2700	0.0690
0.2733	0.0690
0.2766	0.0630
0.2800	0.0630
0.2833	0.0630
0.2866	0.0630
0.2900	0.0630
0.2933	0.0630
0.2966	0.0570
0.3000	0.0570
0.3033	0.0570
0.3066	0.0570
0.3100	0.0570
0.3133	0.0570
0.3166	0.0570
0.3200	0.0570
0.3233	0.0500

0.3266	0.0500
0.3300	0.0500
0.3333	0.0500
0.3500	0.0500
0.3666	0.0440
0.3833	0.0440
0.4000	0.0440
0.4166	0.0380
0.4333	0.0380
0.4500	0.0380
0.4666	0.0380
0.4833	0.0310
0.5000	0.0310
0.5166	0.0310
0.5333	0.0310
0.5500	0.0310
0.5666	0.0310
0.5833	0.0250
0.6000	0.0250
0.6166	0.0250
0.6333	0.0250
0.6500	0.0250
0.6666	0.0250
0.6833	0.0250
0.7000	0.0250
0.7166	0.0250
0.7333	0.0250
0.7500	0.0250
0.7666	0.0250
0.7833	0.0250
0.8000	0.0250
0.8166	0.0250
0.8333	0.0250
0.8500	0.0250
0.8666	0.0250
0.8833	0.0250
0.9000	0.0250
0.9166	0.0250
0.9333	0.0250

0.9500	0.0250
0.9666	0.0250
0.9833	0.0250
1.0000	0.0250
1.2000	0.0250
1.4000	0.0250
1.6000	0.0250
1.8000	0.0250
2.0000	0.0250
2.2000	0.0250
2.4000	0.0250
2.6000	0.0250
2.8000	0.0250
3.0000	0.0250
3.2000	0.0250
3.4000	0.0250
3.6000	0.0250
3.8000	0.0250
4.0000	0.0250
4.2000	0.0250
4.4000	0.0250
4.6000	0.0250
4.8000	0.0250
5.0000	0.0250
5.2000	0.0250
5.4000	0.0250
5.6000	0.0250
5.8000	0.0250
6.0000	0.0250
6.2000	0.0310
6.4000	0.0310
6.6000	0.0250
6.8000	0.0310
7.0000	0.0310
7.2000	0.0310
7.4000	0.0250
7.6000	0.0250
7.8000	0.0250
8.0000	0.0310

8.2000	0.0250
8.4000	0.0310
8.6000	0.0310
8.8000	0.0250
9.0000	0.0310
9.2000	0.0310
9.4000	0.0310
9.6000	0.0310
9.8000	0.0310
10.0000	0.0310
12.0000	0.0310
14.0000	0.0310
16.0000	0.0310
18.0000	0.0310

Tazewell County Landfill

MW-7

Slug Withdrawal Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.00	0.73	1.000
0.01	0.863	1.182
0.03	0.666	0.912
0.03	1.028	1.408
0.03	1.016	1.392
0.04	1.028	1.408
0.04	0.577	0.790
0.05	0.577	0.790
0.05	0.755	1.034
0.06	0.679	0.930
0.06	0.59	0.808
0.06	0.622	0.852
0.07	0.622	0.852
0.07	0.571	0.782
0.07	0.52	0.712
0.08	0.539	0.738
0.08	0.52	0.712
0.08	0.514	0.704
0.09	0.489	0.670
0.09	0.381	0.522
0.09	0.317	0.434
0.10	0.273	0.374
0.10	0.241	0.330
0.10	0.209	0.286
0.11	0.19	0.260
0.11	0.177	0.242
0.11	0.171	0.234
0.12	0.171	0.234
0.12	0.165	0.226
0.12	0.165	0.226
0.13	0.158	0.216
0.13	0.152	0.208
0.13	0.146	0.200
0.14	0.139	0.190
0.14	0.133	0.182
0.14	0.139	0.190
0.15	0.133	0.182
0.15	0.133	0.182
0.15	0.127	0.174
0.16	0.127	0.174
0.16	0.127	0.174
0.16	0.12	0.164
0.17	0.12	0.164

Tazewell County Landfill

MW-7

Slug Withdrawal Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.17	0.114	0.156
0.17	0.114	0.156
0.18	0.108	0.148
0.18	0.108	0.148
0.18	0.108	0.148
0.19	0.101	0.138
0.19	0.101	0.138
0.19	0.095	0.130
0.20	0.095	0.130
0.20	0.095	0.130
0.20	0.095	0.130
0.21	0.089	0.122
0.21	0.089	0.122
0.21	0.089	0.122
0.22	0.089	0.122
0.22	0.082	0.112
0.22	0.082	0.112
0.23	0.082	0.112
0.23	0.082	0.112
0.23	0.076	0.104
0.24	0.076	0.104
0.24	0.076	0.104
0.24	0.076	0.104
0.25	0.076	0.104
0.25	0.069	0.095
0.25	0.069	0.095
0.26	0.069	0.095
0.26	0.069	0.095
0.26	0.069	0.095
0.27	0.069	0.095
0.27	0.063	0.086
0.27	0.063	0.086
0.28	0.063	0.086
0.28	0.063	0.086
0.28	0.063	0.086
0.29	0.063	0.086
0.29	0.057	0.078
0.29	0.057	0.078
0.30	0.057	0.078
0.30	0.057	0.078
0.30	0.057	0.078
0.31	0.057	0.078
0.31	0.057	0.078

Tazewell County Landfill

MW-7

Slug Withdrawal Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.31	0.057	0.078
0.32	0.05	0.068
0.32	0.05	0.068
0.32	0.05	0.068
0.33	0.05	0.068
0.34	0.05	0.068
0.36	0.044	0.060
0.38	0.044	0.060
0.39	0.044	0.060
0.41	0.038	0.052
0.43	0.038	0.052
0.44	0.038	0.052
0.46	0.038	0.052
0.48	0.031	0.042
0.49	0.031	0.042
0.51	0.031	0.042
0.53	0.031	0.042
0.54	0.031	0.042
0.56	0.031	0.042
0.58	0.025	0.034
0.59	0.025	0.034
0.61	0.025	0.034
0.63	0.025	0.034
0.64	0.025	0.034
0.66	0.025	0.034
0.68	0.025	0.034
0.69	0.025	0.034
0.71	0.025	0.034
0.73	0.025	0.034
0.74	0.025	0.034
0.76	0.025	0.034
0.78	0.025	0.034
0.79	0.025	0.034
0.81	0.025	0.034
0.83	0.025	0.034
0.84	0.025	0.034
0.86	0.025	0.034
0.88	0.025	0.034
0.89	0.025	0.034
0.91	0.025	0.034
0.93	0.025	0.034
0.94	0.025	0.034
0.96	0.025	0.034

Tazewell County Landfill

MW-7

Slug Withdrawal Test

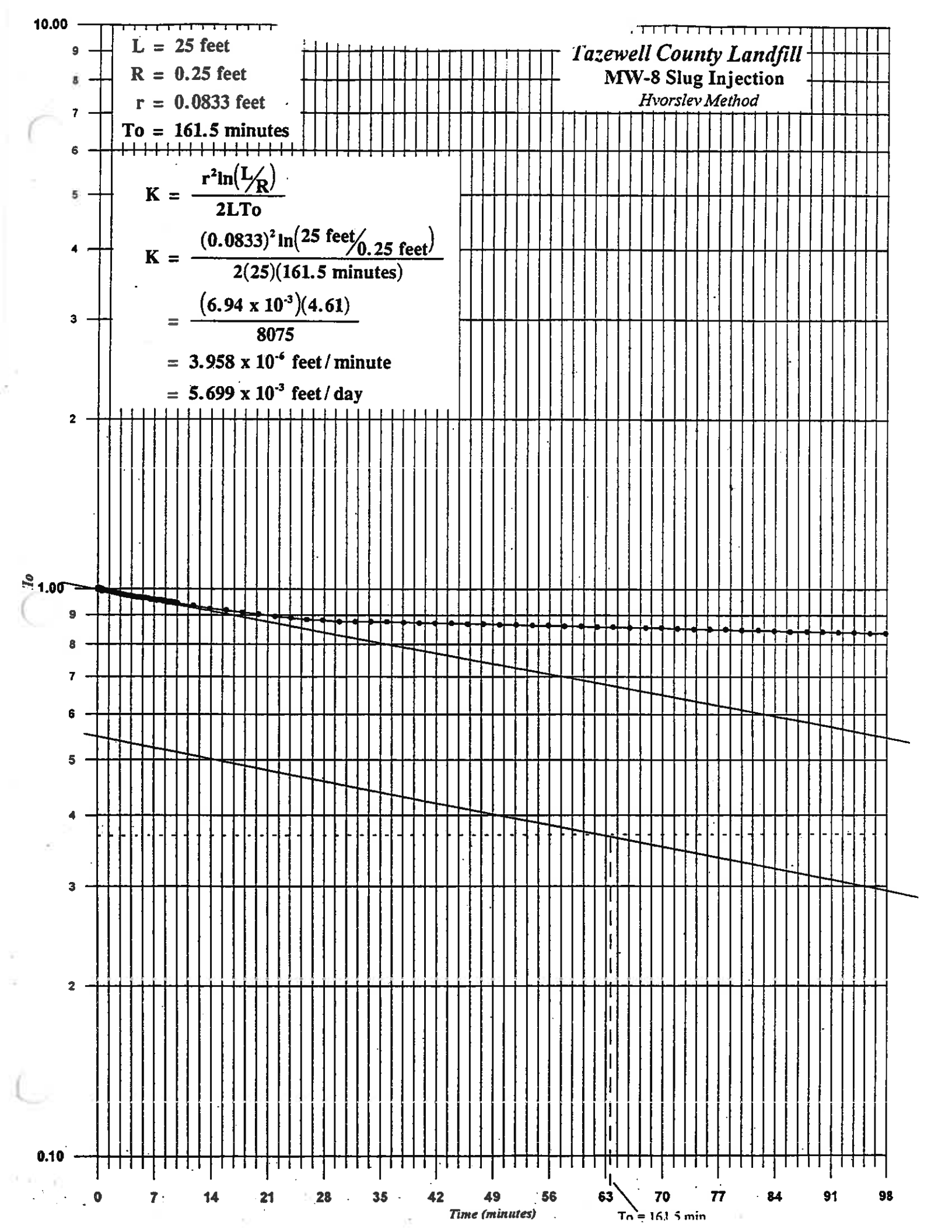
Elapsed Time	h (ft. of head)	H- h/H-Ho
0.98	0.025	0.034
0.99	0.025	0.034
1.19	0.025	0.034
1.39	0.025	0.034
1.59	0.025	0.034
1.79	0.025	0.034
1.99	0.025	0.034
2.19	0.025	0.034
2.39	0.025	0.034
2.59	0.025	0.034
2.79	0.025	0.034
2.99	0.025	0.034
3.19	0.025	0.034
3.39	0.025	0.034
3.59	0.025	0.034
3.79	0.025	0.034
3.99	0.025	0.034
4.19	0.025	0.034
4.39	0.025	0.034
4.59	0.025	0.034
4.79	0.025	0.034
4.99	0.025	0.034
5.19	0.025	0.034
5.39	0.025	0.034
5.59	0.025	0.034
5.79	0.025	0.034
5.99	0.025	0.034
6.19	0.031	0.042
6.39	0.031	0.042
6.59	0.025	0.034
6.79	0.031	0.042
6.99	0.031	0.042
7.19	0.031	0.042
7.39	0.025	0.034
7.59	0.025	0.034
7.79	0.025	0.034
7.99	0.031	0.042
8.19	0.025	0.034
8.39	0.031	0.042
8.59	0.031	0.042
8.79	0.025	0.034
8.99	0.031	0.042
9.19	0.031	0.042

Tazewell County Landfill

MW-7

Slug Withdrawal Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
9.39	0.031	0.042
9.59	0.031	0.042
9.79	0.031	0.042
9.99	0.031	0.042
11.99	0.031	0.042
13.99	0.031	0.042
15.99	0.031	0.042
17.99	0.031	0.042


Tazewell County Landfill
MW-8 Slug Injection
Hvorslev Method
L = 25 feet
R = 0.25 feet
r = 0.0833 feet
To = 161.5 minutes
$K = \frac{r^2 \ln(L/R)}{2LTo}$
$K = \frac{(0.0833)^2 \ln(25\ feet / 0.25\ feet)}{2(25)(161.5\ minutes)}$
$= \frac{(6.94 \times 10^{-3})(4.61)}{8075}$
$= 3.958 \times 10^{-6}$ feet / minute
$= 5.699 \times 10^{-3}$ feet / day
10.00
1.00
0.10
To
0
7
14
21
28
35
42
49
56
63
70
77
84
91
98
Time (minutes)
To = 161.5 min

MW-8

Background Test

SE1000C
Environmental Logger
7/7/93 16:48

Unit# 01814 Test 12
INPUT 1: Level (F) TOC

Reference:	0.00
Linearity:	0.12
Scale factor:	20.06
Offset:	-0.03
Delay mSEC:	50.00

Step 0 06/30 10:13:53

Elapsed Time	INPUT 1
0.0000	0.0060
0.0033	0.0000
0.0066	0.0000
0.0100	0.0000
0.0133	0.0000
0.0166	0.0000
0.0200	0.0000
0.0233	0.0000
0.0266	0.0000
0.0300	0.0000
0.0333	0.0000
0.0366	0.0000
0.0400	0.0000
0.0433	0.0000
0.0466	0.0000
0.0500	0.0000
0.0533	0.0000
0.0566	0.0000
0.0600	0.0000
0.0633	0.0000

0.0666	0.0000
0.0700	0.0000
0.0733	0.0000
0.0766	0.0000
0.0800	0.0000
0.0833	0.0000
0.0866	0.0000
0.0900	0.0000
0.0933	0.0000
0.0966	0.0000
0.1000	0.0000
0.1033	0.0000
0.1066	0.0000
0.1100	0.0000
0.1133	0.0000
0.1166	0.0000
0.1200	0.0000
0.1233	0.0000
0.1266	0.0000
0.1300	0.0060
0.1333	0.0060
0.1366	0.0000
0.1400	0.0000
0.1433	0.0000
0.1466	0.0000
0.1500	0.0060
0.1533	0.0000
0.1566	0.0000
0.1600	0.0000
0.1633	0.0060
0.1666	0.0060
0.1700	0.0000
0.1733	0.0000
0.1766	0.0000
0.1800	0.0060
0.1833	0.0000
0.1866	0.0000
0.1900	0.0000
0.1933	0.0060

0.1966	0.0000
0.2000	0.0000
0.2033	0.0000
0.2066	0.0000
0.2100	0.0060
0.2133	0.0000
0.2166	0.0000
0.2200	0.0000
0.2233	0.0000
0.2266	0.0000
0.2300	0.0000
0.2333	0.0000
0.2366	0.0000
0.2400	0.0060
0.2433	0.0060
0.2466	0.0060
0.2500	0.0060
0.2533	0.0000
0.2566	0.0000
0.2600	0.0060
0.2633	0.0060
0.2666	0.0060
0.2700	0.0000
0.2733	0.0000
0.2766	0.0000
0.2800	0.0000
0.2833	0.0000
0.2866	0.0060
0.2900	0.0000
0.2933	0.0000
0.2966	0.0060
0.3000	0.0000
0.3033	0.0000
0.3066	0.0000
0.3100	0.0060
0.3133	0.0000
0.3166	0.0000
0.3200	0.0000
0.3233	0.0060

0.3266	0.0060
0.3300	0.0000
0.3333	0.0000
0.3500	0.0060
0.3666	0.0060
0.3833	0.0060
0.4000	0.0000
0.4166	0.0000
0.4333	0.0000
0.4500	0.0000
0.4666	0.0000
0.4833	0.0000
0.5000	0.0060
0.5166	0.0000
0.5333	0.0060
0.5500	0.0000
0.5666	0.0000
0.5833	0.0060
0.6000	0.0000
0.6166	0.0000
0.6333	0.0060
0.6500	0.0000
0.6666	0.0000
0.6833	0.0000
0.7000	0.0000
0.7166	0.0060
0.7333	0.0000
0.7500	0.0000
0.7666	0.0060
0.7833	0.0060
0.8000	0.0060
0.8166	0.0060
0.8333	0.0060
0.8500	0.0000
0.8666	0.0000
0.8833	0.0060
0.9000	0.0060
0.9166	0.0060
0.9333	0.0000

0.9500	0.0060
0.9666	0.0060
0.9833	0.0060
1.0000	0.0060
1.2000	0.0060
1.4000	0.0060
1.6000	0.0060
1.8000	0.0060
2.0000	0.0060
2.2000	0.0060
2.4000	0.0120
2.6000	0.0120
2.8000	0.0120
3.0000	0.0120
3.2000	0.0120
3.4000	0.0120
3.6000	0.0120
3.8000	0.0120
4.0000	0.0120
4.2000	0.0190
4.4000	0.0190
4.6000	0.0190
4.8000	0.0190

MW-8
Slug Injection Test

SE1000C
Environmental Logger
7/1/93 17:34

Unit# 01814 Test 13
INPUT 1: Level (F) TOC

Reference:	0.00
Linearity:	0.12
Scale factor:	20.06
Offset:	-0.03
Delay mSEC:	50.00

Step 0 06/30 10:54:27

Elapsed Time	INPUT 1
0.0000	0.0120
0.0033	0.0120
0.0066	0.0120
0.0100	-0.5150
0.0133	-1.3290
0.0166	-2.8120
0.0200	-3.5000
0.0233	-3.8240
0.0266	-4.2890
0.0300	-4.4930
0.0333	-4.1170
0.0366	-4.0400
0.0400	-3.9320
0.0433	-4.0020
0.0466	-3.9070
0.0500	-3.7030
0.0533	-4.0280
0.0566	-3.7290
0.0600	-3.9960
0.0633	-3.8430
0.0666	-3.8560
0.0700	-3.9260
0.0733	-3.8180

0.0766	-3.8810
0.0800	-3.8240
0.0833	-3.8940
0.0866	-3.7480
0.0900	-3.5690
0.0933	-3.3400
0.0966	-3.2700
0.1000	-3.0730
0.1033	-3.1680
0.1066	-3.4550
0.1100	-3.3790
0.1133	-3.6080
0.1166	-3.4930
0.1200	-3.5950
0.1233	-3.5250
0.1266	-3.5440
0.1300	-3.5310
0.1333	-3.5190
0.1366	-3.5440
0.1400	-3.5250
0.1433	-3.5380
0.1466	-3.5250
0.1500	-3.5380
0.1533	-3.5310
0.1566	-3.5380
0.1600	-3.5310
0.1633	-3.5310
0.1666	-3.5310
0.1700	-3.5310
0.1733	-3.5310
0.1766	-3.5310
0.1800	-3.5310
0.1833	-3.5310
0.1866	-3.5310
0.1900	-3.5310
0.1933	-3.5310
0.1966	-3.5310
0.2000	-3.5310
0.2033	-3.5310
0.2066	-3.5310
0.2100	-3.5310
0.2133	-3.5310
0.2166	-3.5310

0.2200	-3.5310
0.2233	-3.5310
0.2266	-3.5310
0.2300	-3.5310
0.2333	-3.5310
0.2366	-3.5310
0.2400	-3.5310
0.2433	-3.5380
0.2466	-3.5250
0.2500	-3.5310
0.2533	-3.5190
0.2566	-3.5380
0.2600	-3.5310
0.2633	-3.5440
0.2666	-3.5310
0.2700	-3.5310
0.2733	-3.5310
0.2766	-3.5310
0.2800	-3.5310
0.2833	-3.5310
0.2866	-3.5310
0.2900	-3.5310
0.2933	-3.5310
0.2966	-3.5310
0.3000	-3.5310
0.3033	-3.5250
0.3066	-3.5310
0.3100	-3.5250
0.3133	-3.5310
0.3166	-3.5380
0.3200	-3.5250
0.3233	-3.5440
0.3266	-3.5250
0.3300	-3.5310
0.3333	-3.5310
0.3500	-3.5310
0.3666	-3.5250
0.3833	-3.5310
0.4000	-3.5310
0.4166	-3.5250
0.4333	-3.5250
0.4500	-3.5250
0.4666	-3.5310

0.4833	-3.5250
0.5000	-3.5250
0.5166	-3.5250
0.5333	-3.5250
0.5500	-3.5250
0.5666	-3.5250
0.5833	-3.5250
0.6000	-3.5250
0.6166	-3.4930
0.6333	-3.5120
0.6500	-3.5000
0.6666	-3.5120
0.6833	-3.5190
0.7000	-3.5190
0.7166	-3.5190
0.7333	-3.5190
0.7500	-3.5190
0.7666	-3.5190
0.7833	-3.5190
0.8000	-3.5190
0.8166	-3.5190
0.8333	-3.5190
0.8500	-3.5120
0.8666	-3.5120
0.8833	-3.5120
0.9000	-3.5120
0.9166	-3.5120
0.9333	-3.5120
0.9500	-3.5120
0.9666	-3.5120
0.9833	-3.5120
1.0000	-3.5120
1.2000	-3.5060
1.4000	-3.5000
1.6000	-3.4930
1.8000	-3.4870
2.0000	-3.4870
2.2000	-3.4800
2.4000	-3.4740
2.6000	-3.4680
2.8000	-3.4610
3.0000	-3.4550
3.2000	-3.4550

3.4000	-3.4490
3.6000	-3.4420
3.8000	-3.4360
4.0000	-3.4290
4.2000	-3.4290
4.4000	-3.4230
4.6000	-3.4230
4.8000	-3.4170
5.0000	-3.4170
5.2000	-3.4100
5.4000	-3.4100
5.6000	-3.4040
5.8000	-3.4040
6.0000	-3.3980
6.2000	-3.3980
6.4000	-3.3910
6.6000	-3.3850
6.8000	-3.3850
7.0000	-3.3790
7.2000	-3.3790
7.4000	-3.3720
7.6000	-3.3720
7.8000	-3.3660
8.0000	-3.3660
8.2000	-3.3590
8.4000	-3.3590
8.6000	-3.3530
8.8000	-3.3530
9.0000	-3.3470
9.2000	-3.3470
9.4000	-3.3400
9.6000	-3.3400
9.8000	-3.3340
10.0000	-3.3340
12.0000	-3.2960
14.0000	-3.2640
16.0000	-3.2390
18.0000	-3.2130
20.0000	-3.1870
22.0000	-3.1620
24.0000	-3.1370
26.0000	-3.1180
28.0000	-3.1110

30.0000	-3.0990
32.0000	-3.0990
34.0000	-3.0920
36.0000	-3.0920
38.0000	-3.0860
40.0000	-3.0790
42.0000	-3.0790
44.0000	-3.0730
46.0000	-3.0670
48.0000	-3.0670
50.0000	-3.0600
52.0000	-3.0540
54.0000	-3.0470
56.0000	-3.0470
58.0000	-3.0410
60.0000	-3.0350
62.0000	-3.0280
64.0000	-3.0280
66.0000	-3.0220
68.0000	-3.0220
70.0000	-3.0160
72.0000	-3.0090
74.0000	-3.0030
76.0000	-2.9970
78.0000	-2.9970
80.0000	-2.9900
82.0000	-2.9900
84.0000	-2.9840
86.0000	-2.9780
88.0000	-2.9780
90.0000	-2.9710
92.0000	-2.9650
94.0000	-2.9650
96.0000	-2.9580
98.0000	-2.9580
100.0000	-2.9520
120.0000	-2.9070
140.0000	-2.8630
160.0000	-2.8250
180.0000	-2.7870
200.0000	-2.7480
220.0000	-2.7100
240.0000	-2.6720

260.0000	-2.6340
280.0000	-2.5960
300.0000	-2.5640
320.0000	-2.5250
340.0000	-2.4870
360.0000	-2.4560
380.0000	-2.4240
400.0000	-2.3860
420.0000	-2.3480
440.0000	-2.3160
460.0000	-2.2840
480.0000	-2.2520
500.0000	-2.2200
520.0000	-2.1880
540.0000	-2.1500
560.0000	-2.1240
580.0000	-2.0930
600.0000	-2.0610
620.0000	-2.0290
640.0000	-1.9970
660.0000	-1.9720
680.0000	-1.9400
700.0000	-1.9080
720.0000	-1.8830
740.0000	-1.8510
760.0000	-1.8260
780.0000	-1.8000
800.0000	-1.7680
820.0000	-1.7430
840.0000	-1.7170
860.0000	-1.6920
880.0000	-1.6660
900.0000	-1.6410
920.0000	-1.6150
940.0000	-1.5900
960.0000	-1.5650
980.0000	-1.5390
1000.0000	-1.5140
1200.0000	-1.2850
1400.0000	-1.0680
1600.0000	-0.8710

Tazewell County Landfill

MW-8

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.000	3.531	1.000
0.003	3.525	0.998
0.007	3.544	1.004
0.010	3.531	1.000
0.013	3.519	0.997
0.017	3.544	1.004
0.020	3.525	0.998
0.023	3.538	1.002
0.027	3.525	0.998
0.030	3.538	1.002
0.033	3.531	1.000
0.037	3.538	1.002
0.040	3.531	1.000
0.043	3.531	1.000
0.047	3.531	1.000
0.050	3.531	1.000
0.053	3.531	1.000
0.057	3.531	1.000
0.060	3.531	1.000
0.063	3.531	1.000
0.067	3.531	1.000
0.070	3.531	1.000
0.073	3.531	1.000
0.077	3.531	1.000
0.080	3.531	1.000
0.083	3.531	1.000
0.087	3.531	1.000
0.090	3.531	1.000
0.093	3.531	1.000
0.097	3.531	1.000
0.100	3.531	1.000
0.103	3.531	1.000
0.107	3.531	1.000
0.110	3.531	1.000
0.113	3.531	1.000
0.117	3.531	1.000
0.120	3.531	1.000
0.123	3.538	1.002
0.127	3.525	0.998
0.130	3.531	1.000
0.133	3.519	0.997
0.137	3.538	1.002
0.140	3.531	1.000

Tazewell County Landfill

MW-8

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.143	3.544	1.004
0.147	3.531	1.000
0.150	3.531	1.000
0.153	3.531	1.000
0.157	3.531	1.000
0.160	3.531	1.000
0.163	3.531	1.000
0.167	3.531	1.000
0.170	3.531	1.000
0.173	3.531	1.000
0.177	3.531	1.000
0.180	3.531	1.000
0.183	3.525	0.998
0.187	3.531	1.000
0.190	3.525	0.998
0.193	3.531	1.000
0.197	3.538	1.002
0.200	3.525	0.998
0.203	3.544	1.004
0.207	3.525	0.998
0.210	3.531	1.000
0.213	3.531	1.000
0.230	3.531	1.000
0.247	3.525	0.998
0.263	3.531	1.000
0.280	3.531	1.000
0.297	3.525	0.998
0.313	3.525	0.998
0.330	3.525	0.998
0.347	3.531	1.000
0.363	3.525	0.998
0.380	3.525	0.998
0.397	3.525	0.998
0.413	3.525	0.998
0.430	3.525	0.998
0.447	3.525	0.998
0.463	3.525	0.998
0.480	3.525	0.998
0.497	3.493	0.989
0.513	3.512	0.995
0.530	3.500	0.991
0.547	3.512	0.995
0.563	3.519	0.997

Tazewell County Landfill

MW-8

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.580	3.519	0.997
0.597	3.519	0.997
0.613	3.519	0.997
0.630	3.519	0.997
0.647	3.519	0.997
0.663	3.519	0.997
0.680	3.519	0.997
0.697	3.519	0.997
0.713	3.519	0.997
0.730	3.512	0.995
0.747	3.512	0.995
0.763	3.512	0.995
0.780	3.512	0.995
0.797	3.512	0.995
0.813	3.512	0.995
0.830	3.512	0.995
0.847	3.512	0.995
0.863	3.512	0.995
0.880	3.512	0.995
1.080	3.506	0.993
1.280	3.500	0.991
1.480	3.493	0.989
1.680	3.487	0.988
1.880	3.487	0.988
2.080	3.480	0.986
2.280	3.474	0.984
2.480	3.468	0.982
2.680	3.461	0.980
2.880	3.455	0.978
3.080	3.455	0.978
3.280	3.449	0.977
3.480	3.442	0.975
3.680	3.436	0.973
3.880	3.429	0.971
4.080	3.429	0.971
4.280	3.423	0.969
4.480	3.423	0.969
4.680	3.417	0.968
4.880	3.417	0.968
5.080	3.410	0.966
5.280	3.410	0.966
5.480	3.404	0.964
5.680	3.404	0.964

Tazewell County Landfill

MW-8

Slug Injection Test

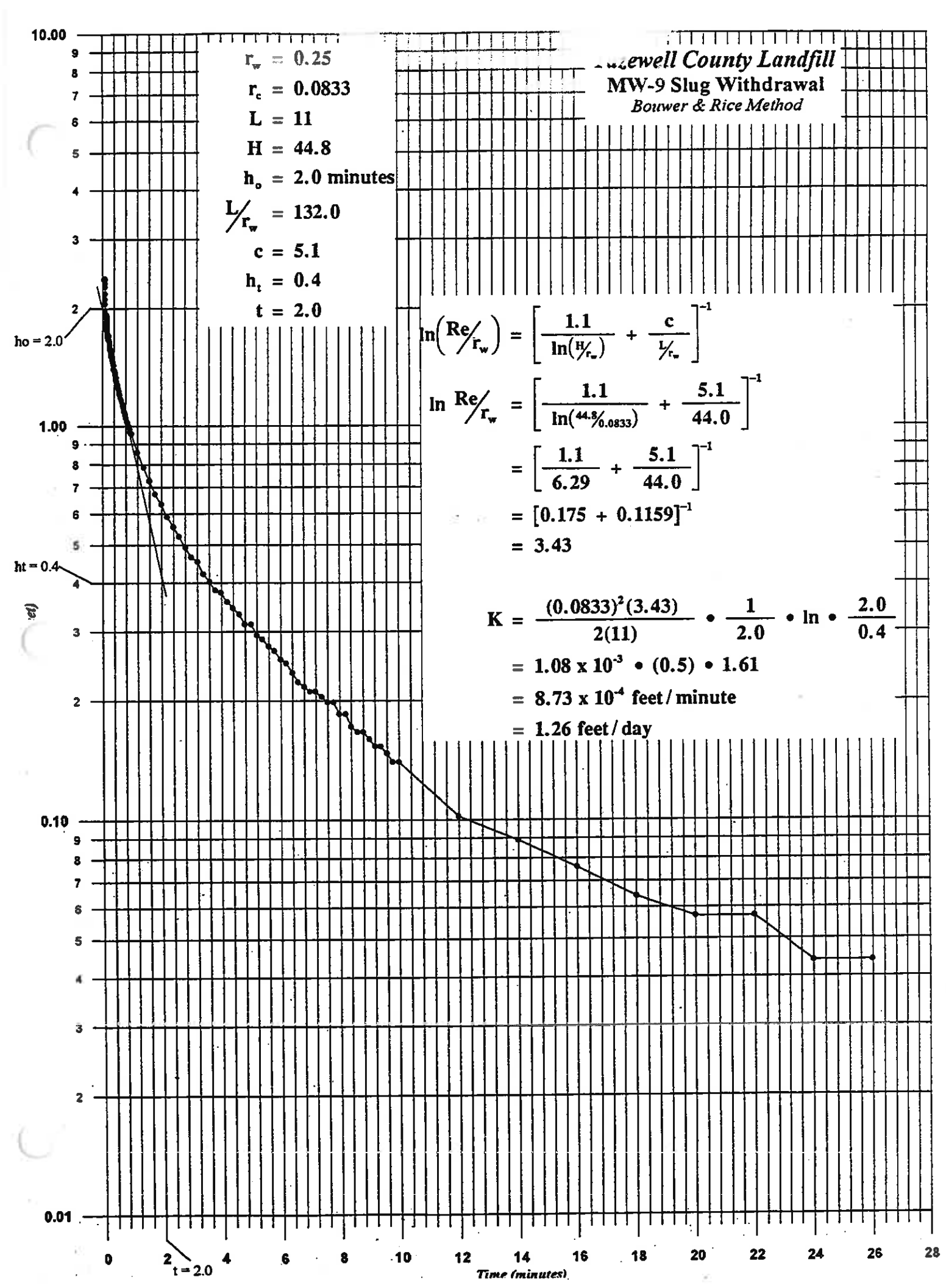
Elapsed Time	h (ft. of head)	H- h/H-Ho
5.880	3.398	0.962
6.080	3.398	0.962
6.280	3.391	0.960
6.480	3.385	0.959
6.680	3.385	0.959
6.880	3.379	0.957
7.080	3.379	0.957
7.280	3.372	0.955
7.480	3.372	0.955
7.680	3.366	0.953
7.880	3.366	0.953
8.080	3.359	0.951
8.280	3.359	0.951
8.480	3.353	0.950
8.680	3.353	0.950
8.880	3.347	0.948
9.080	3.347	0.948
9.280	3.340	0.946
9.480	3.340	0.946
9.680	3.334	0.944
9.880	3.334	0.944
11.880	3.296	0.933
13.880	3.264	0.924
15.880	3.239	0.917
17.880	3.213	0.910
19.880	3.187	0.903
21.880	3.162	0.895
23.880	3.137	0.888
25.880	3.118	0.883
27.880	3.111	0.881
29.880	3.099	0.878
31.880	3.099	0.878
33.880	3.092	0.876
35.880	3.092	0.876
37.880	3.086	0.874
39.880	3.079	0.872
41.880	3.079	0.872
43.880	3.073	0.870
45.880	3.067	0.869
47.880	3.067	0.869
49.880	3.060	0.867
51.880	3.054	0.865
53.880	3.047	0.863

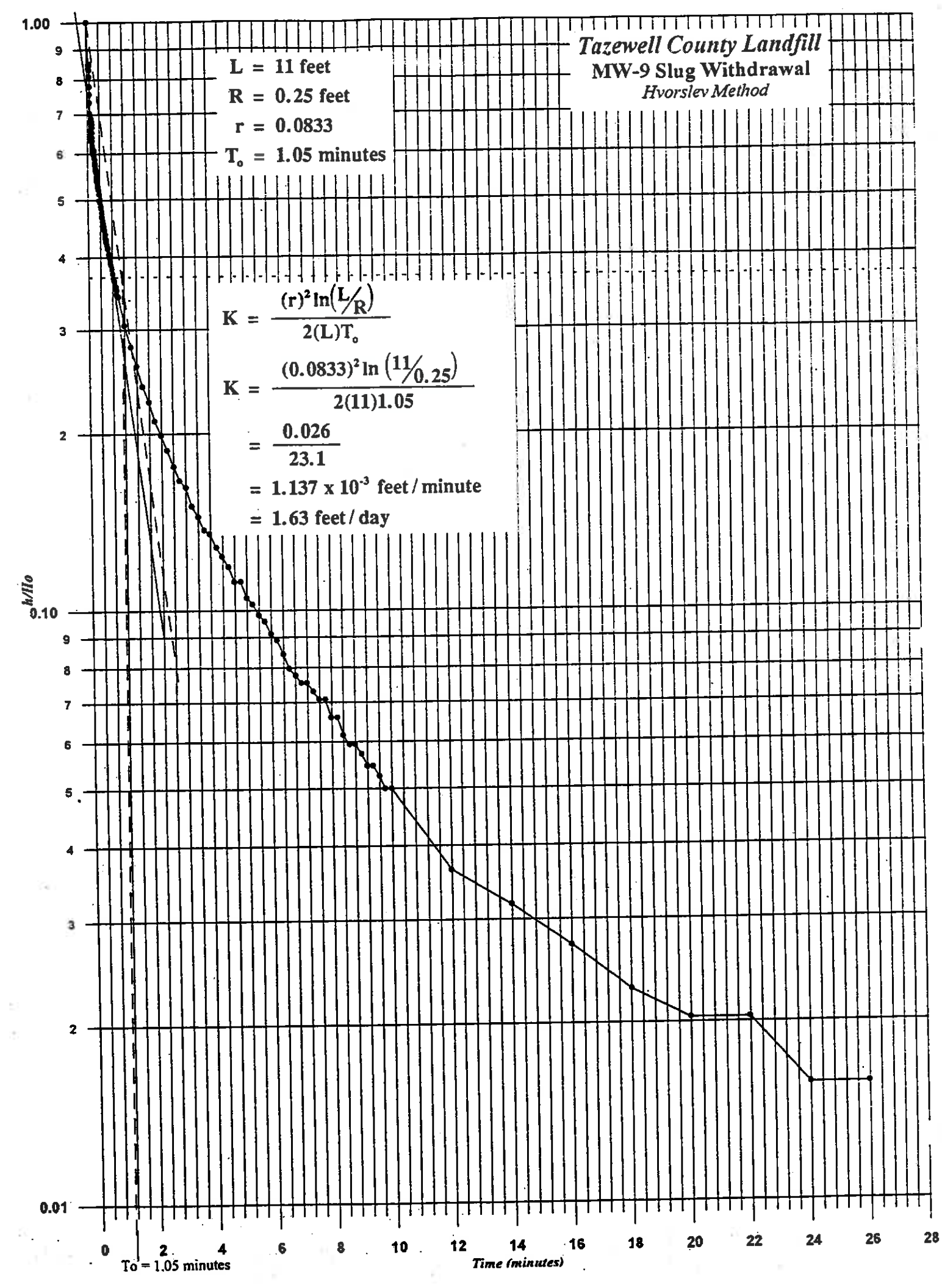
Tazewell County Landfill

MW-8

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
55.880	3.047	0.863
57.880	3.041	0.861
59.880	3.035	0.860
61.880	3.028	0.858
63.880	3.028	0.858
65.880	3.022	0.856
67.880	3.022	0.856
69.880	3.016	0.854
71.880	3.009	0.852
73.880	3.003	0.850
75.880	2.997	0.849
77.880	2.997	0.849
79.880	2.990	0.847
81.880	2.990	0.847
83.880	2.984	0.845
85.880	2.978	0.843
87.880	2.978	0.843
89.880	2.971	0.841
91.880	2.965	0.840
93.880	2.965	0.840
95.880	2.958	0.838
97.880	2.958	0.838
99.880	2.958	0.838


Lakewell County Landfill
MW-9 Slug Withdrawal
Bouwer & Rice Method
r_w = 0.25
r_c = 0.0833
L = 11
H = 44.8
h_o = 2.0 minutes
L/r_w = 132.0
c = 5.1
h_t = 0.4
t = 2.0
$\ln(Re/r_w) = \left[\frac{1.1}{\ln(H/r_w)} + \frac{c}{L/r_w}\right]^{-1}$
$\ln Re/r_w = \left[\frac{1.1}{\ln(44.8/0.0833)} + \frac{5.1}{44.0}\right]^{-1}$
$= \left[\frac{1.1}{6.29} + \frac{5.1}{44.0}\right]^{-1}$
$= [0.175 + 0.1159]^{-1}$
$= 3.43$
$K = \frac{(0.0833)^2(3.43)}{2(11)} \bullet \frac{1}{2.0} \bullet \ln \bullet \frac{2.0}{0.4}$
$= 1.08 \times 10^{-3} \bullet (0.5) \bullet 1.61$
$= 8.73 \times 10^{-4}$ feet / minute
$= 1.26$ feet / day
ho = 2.0
ht = 0.4
t = 2.0
Time (minutes)


Tazewell County Landfill
MW-9 Slug Withdrawal
Hvorslev Method
L = 11 feet
R = 0.25 feet
r = 0.0833
T_o = 1.05 minutes
$K = \frac{(r)^2 \ln(L/R)}{2(L)T_o}$
$K = \frac{(0.0833)^2 \ln(11/0.25)}{2(11)1.05}$
$= \frac{0.026}{23.1}$
$= 1.137 \times 10^{-3}$ feet / minute
= 1.63 feet / day
h/Ho
1.00
0.10
0.01
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
To = 1.05 minutes
Time (minutes)

MW-9

Background Test

SE1000C
Environmental Logger
6/29/93 17:34

Unit# 01814 Test 9
INPUT 1: Level (F) TOC

Reference:	0.00
Linearity:	0.12
Scale factor:	20.06
Offset:	-0.03
Delay mSEC:	50.00

Step 0 06/29 14:52:24

Elapsed Time	INPUT 1
0.0000	0.0000
0.0033	0.0060
0.0066	0.0000
0.0100	0.0000
0.0133	0.0060
0.0166	0.0000
0.0200	0.0060
0.0233	0.0060
0.0266	0.0000
0.0300	0.0000
0.0333	0.0000
0.0366	0.0060
0.0400	0.0060
0.0433	0.0000
0.0466	0.0060
0.0500	0.0000
0.0533	0.0000
0.0566	0.0060
0.0600	0.0060
0.0633	0.0000

0.0666	0.0060
0.0700	0.0060
0.0733	0.0000
0.0766	0.0060
0.0800	0.0000
0.0833	0.0000
0.0866	0.0060
0.0900	0.0000
0.0933	0.0000
0.0966	0.0000
0.1000	0.0000
0.1033	0.0120
0.1066	0.0000
0.1100	0.0120
0.1133	0.0060
0.1166	0.0000
0.1200	0.0120
0.1233	0.0000
0.1266	0.0000
0.1300	0.0000
0.1333	0.0060
0.1366	0.0060
0.1400	0.0120
0.1433	0.0060
0.1466	0.0120
0.1500	0.0060
0.1533	0.0060
0.1566	0.0060
0.1600	0.0060
0.1633	0.0060
0.1666	0.0060
0.1700	0.0060
0.1733	0.0060
0.1766	0.0000
0.1800	0.0060
0.1833	0.0120
0.1866	0.0060
0.1900	0.0000
0.1933	0.0120

0.1966	0.0000
0.2000	0.0060
0.2033	0.0120
0.2066	0.0120
0.2100	0.0120
0.2133	0.0060
0.2166	0.0120
0.2200	0.0060
0.2233	0.0120
0.2266	0.0120
0.2300	0.0120
0.2333	0.0120
0.2366	0.0060
0.2400	0.0120
0.2433	0.0120
0.2466	0.0060
0.2500	0.0120
0.2533	0.0120
0.2566	0.0060
0.2600	0.0120
0.2633	0.0060
0.2666	0.0060
0.2700	0.0120
0.2733	0.0060
0.2766	0.0120
0.2800	0.0000
0.2833	0.0120
0.2866	0.0060
0.2900	0.0060
0.2933	0.0060
0.2966	0.0060
0.3000	0.0060
0.3033	0.0060
0.3066	0.0120
0.3100	0.0060
0.3133	0.0120
0.3166	0.0120
0.3200	0.0060
0.3233	0.0060

0.3266	0.0190
0.3300	0.0190
0.3333	0.0120
0.3500	0.0060
0.3666	0.0190
0.3833	0.0120
0.4000	0.0190
0.4166	0.0060
0.4333	0.0120
0.4500	0.0190
0.4666	0.0120
0.4833	0.0060
0.5000	0.0120
0.5166	0.0120
0.5333	0.0060
0.5500	0.0190
0.5666	0.0120
0.5833	0.0120
0.6000	0.0120
0.6166	0.0190
0.6333	0.0120
0.6500	0.0120
0.6666	0.0120
0.6833	0.0190
0.7000	0.0120
0.7166	0.0190
0.7333	0.0120
0.7500	0.0120
0.7666	0.0190
0.7833	0.0250
0.8000	0.0190
0.8166	0.0120
0.8333	0.0120
0.8500	0.0190
0.8666	0.0250
0.8833	0.0190
0.9000	0.0250
0.9166	0.0250
0.9333	0.0190

0.9500	0.0250
0.9666	0.0190
0.9833	0.0250
1.0000	0.0250
1.2000	0.0320
1.4000	0.0380
1.6000	0.0320
1.8000	0.0380
2.0000	0.0440
2.2000	0.0440
2.4000	0.0440
2.6000	0.0570
2.8000	0.0510
3.0000	0.0510
3.2000	0.0640
3.4000	0.0640
3.6000	0.0570
3.8000	0.0640
4.0000	0.0640
4.2000	0.0700
4.4000	0.0700
4.6000	0.0770
4.8000	0.0700
5.0000	0.0640
5.2000	0.0700
5.4000	0.0700
5.6000	0.0770
5.8000	0.0700
6.0000	0.0700
6.2000	0.0700
6.4000	0.0770
6.6000	0.0830
6.8000	0.0770
7.0000	0.0830
7.2000	0.0770
7.4000	0.0890
7.6000	0.0830
7.8000	0.0890
8.0000	0.0770

8.2000	0.0770
8.4000	0.0890
8.6000	0.0770
8.8000	0.0770
9.0000	0.0830
9.2000	0.0770
9.4000	0.0890
9.6000	0.0890
9.8000	0.0830
10.0000	0.0830
12.0000	0.0890
14.0000	0.0890

Tazewell County Landfill

MW-9

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.00	2.800	1.000
0.02	2.378	0.849
0.02	2.826	1.009
0.03	3.223	1.151
0.03	3.556	1.270
0.03	3.831	1.368
0.04	4.016	1.434
0.04	4.106	1.466
0.04	4.029	1.439
0.05	3.780	1.350
0.05	3.383	1.208
0.05	2.903	1.037
0.06	2.436	0.870
0.06	2.027	0.724
0.06	1.720	0.614
0.07	1.509	0.539
0.07	1.406	0.502
0.07	1.432	0.511
0.08	1.521	0.543
0.08	1.675	0.598
0.08	1.841	0.658
0.09	2.007	0.717
0.09	2.154	0.769
0.09	2.276	0.813
0.10	2.385	0.852
0.10	2.468	0.881
0.10	2.519	0.900
0.11	2.538	0.906
0.11	2.551	0.911
0.11	2.525	0.902
0.12	2.500	0.893
0.12	2.449	0.875
0.12	2.391	0.854
0.13	2.321	0.829
0.13	2.250	0.804
0.13	2.167	0.774
0.14	2.097	0.749
0.14	2.046	0.731
0.14	1.994	0.712
0.15	1.963	0.701
0.15	1.944	0.694
0.15	1.944	0.694
0.16	1.956	0.699

Tazewell County Landfill

MW-9

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.16	1.969	0.703
0.16	1.988	0.710
0.17	2.027	0.724
0.17	2.059	0.735
0.17	2.078	0.742
0.18	2.103	0.751
0.18	2.123	0.758
0.18	2.136	0.763
0.19	2.136	0.763
0.19	2.129	0.760
0.19	2.110	0.754
0.20	2.097	0.749
0.20	2.078	0.742
0.20	2.039	0.728
0.21	2.020	0.721
0.21	1.994	0.712
0.21	1.963	0.701
0.22	1.950	0.696
0.22	1.931	0.690
0.22	1.911	0.683
0.23	1.898	0.678
0.23	1.892	0.676
0.23	1.898	0.678
0.24	1.892	0.676
0.24	1.905	0.680
0.24	1.911	0.683
0.25	1.918	0.685
0.25	1.918	0.685
0.25	1.918	0.685
0.26	1.924	0.687
0.26	1.918	0.685
0.26	1.924	0.687
0.28	1.873	0.669
0.30	1.822	0.651
0.31	1.784	0.637
0.33	1.758	0.628
0.35	1.726	0.616
0.36	1.688	0.603
0.38	1.662	0.594
0.40	1.643	0.587
0.41	1.605	0.573
0.43	1.592	0.569
0.45	1.554	0.555

Tazewell County Landfill

MW-9

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.46	1.540	0.550
0.48	1.515	0.541
0.50	1.489	0.532
0.51	1.470	0.525
0.53	1.444	0.516
0.55	1.438	0.514
0.56	1.406	0.502
0.58	1.400	0.500
0.60	1.374	0.491
0.61	1.361	0.486
0.63	1.342	0.479
0.65	1.317	0.470
0.66	1.317	0.470
0.68	1.298	0.464
0.70	1.278	0.456
0.71	1.266	0.452
0.73	1.246	0.445
0.75	1.227	0.438
0.76	1.227	0.438
0.78	1.202	0.429
0.80	1.202	0.429
0.81	1.176	0.420
0.83	1.176	0.420
0.85	1.157	0.413
0.86	1.144	0.409
0.88	1.138	0.406
0.90	1.125	0.402
0.91	1.106	0.395
0.93	1.106	0.395
1.13	0.972	0.347
1.33	0.876	0.313
1.53	0.786	0.281
1.73	0.728	0.260
1.93	0.664	0.237
2.13	0.620	0.221
2.33	0.562	0.201
2.53	0.537	0.192
2.73	0.498	0.178
2.93	0.466	0.166
3.13	0.447	0.160
3.33	0.415	0.148
3.53	0.390	0.139
3.73	0.377	0.135

Tazewell County Landfill

MW-9

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
3.93	0.351	0.125
4.13	0.338	0.121
4.33	0.326	0.116
4.53	0.313	0.112
4.73	0.300	0.107
4.93	0.287	0.103
5.13	0.268	0.096
5.33	0.262	0.094
5.53	0.242	0.086
5.73	0.242	0.086
5.93	0.230	0.082
6.13	0.223	0.080
6.33	0.211	0.075
6.53	0.204	0.073
6.73	0.204	0.073
6.93	0.191	0.068
7.13	0.185	0.066
7.33	0.179	0.064
7.53	0.172	0.061
7.73	0.159	0.057
7.93	0.159	0.057
8.13	0.159	0.057
8.33	0.159	0.057
8.53	0.153	0.055
8.73	0.134	0.048
8.93	0.140	0.050
9.13	0.134	0.048
9.33	0.128	0.046
9.53	0.121	0.043
9.73	0.115	0.041
9.93	0.121	0.043
11.93	0.089	0.032
13.93	0.076	0.027
15.93	0.051	0.018
17.93	0.051	0.018
19.93	0.051	0.018
21.93	0.044	0.016
23.93	0.032	0.011
25.93	0.038	0.014
27.93	0.032	0.011
29.93	0.032	0.011
31.93	0.019	0.007
33.93	0.019	0.007

Tazewell County Landfill

MW-9

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
35.93	0.019	0.007
37.93	0.019	0.007

MW-9
Slug Injection Test

SE1000C
Environmental Logger
6/29/93 17:31

Unit# 01814 Test 10
INPUT 1: Level (F) TOC

Reference:	0.00
Linearity:	0.12
Scale factor:	20.06
Offset:	-0.03
Delay mSEC:	50.00

Step 0 06/29 15:14:45

Elapsed Time	INPUT 1
0.0000	0.0060
0.0033	0.0060
0.0066	0.0000
0.0100	0.0120
0.0133	0.0000
0.0166	0.0000
0.0200	0.0060
0.0233	0.0000
0.0266	0.0060
0.0300	0.0000
0.0333	0.0000
0.0366	0.0060
0.0400	0.0000
0.0433	0.0060
0.0466	0.0060
0.0500	0.0060
0.0533	0.0060
0.0566	0.0060
0.0600	0.0060
0.0633	0.0060
0.0666	0.0000
0.0700	0.0060
0.0733	-0.0760

0.0766	-0.4280
0.0800	-0.9070
0.0833	-1.4000
0.0866	-1.8730
0.0900	-2.3780
0.0933	-2.8260
0.0966	-3.2230
0.1000	-3.5560
0.1033	-3.8310
0.1066	-4.0160
0.1100	-4.1060
0.1133	-4.0290
0.1166	-3.7800
0.1200	-3.3830
0.1233	-2.9030
0.1266	-2.4360
0.1300	-2.0270
0.1333	-1.7200
0.1366	-1.5090
0.1400	-1.4060
0.1433	-1.4320
0.1466	-1.5210
0.1500	-1.6750
0.1533	-1.8410
0.1566	-2.0070
0.1600	-2.1540
0.1633	-2.2760
0.1666	-2.3850
0.1700	-2.4680
0.1733	-2.5190
0.1766	-2.5380
0.1800	-2.5510
0.1833	-2.5250
0.1866	-2.5000
0.1900	-2.4490
0.1933	-2.3910
0.1966	-2.3210
0.2000	-2.2500
0.2033	-2.1670
0.2066	-2.0970
0.2100	-2.0460
0.2133	-1.9940
0.2166	-1.9630

0.2200	-1.9440
0.2233	-1.9440
0.2266	-1.9560
0.2300	-1.9690
0.2333	-1.9880
0.2366	-2.0270
0.2400	-2.0590
0.2433	-2.0780
0.2466	-2.1030
0.2500	-2.1230
0.2533	-2.1360
0.2566	-2.1360
0.2600	-2.1290
0.2633	-2.1100
0.2666	-2.0970
0.2700	-2.0780
0.2733	-2.0390
0.2766	-2.0200
0.2800	-1.9940
0.2833	-1.9630
0.2866	-1.9500
0.2900	-1.9310
0.2933	-1.9110
0.2966	-1.8980
0.3000	-1.8920
0.3033	-1.8980
0.3066	-1.8920
0.3100	-1.9050
0.3133	-1.9110
0.3166	-1.9180
0.3200	-1.9180
0.3233	-1.9180
0.3266	-1.9240
0.3300	-1.9180
0.3333	-1.9240
0.3500	-1.8730
0.3666	-1.8220
0.3833	-1.7840
0.4000	-1.7580
0.4166	-1.7260
0.4333	-1.6880
0.4500	-1.6620
0.4666	-1.6430

0.4833	-1.6050
0.5000	-1.5920
0.5166	-1.5540
0.5333	-1.5400
0.5500	-1.5150
0.5666	-1.4890
0.5833	-1.4700
0.6000	-1.4440
0.6166	-1.4380
0.6333	-1.4060
0.6500	-1.4000
0.6666	-1.3740
0.6833	-1.3610
0.7000	-1.3420
0.7166	-1.3170
0.7333	-1.3170
0.7500	-1.2980
0.7666	-1.2780
0.7833	-1.2660
0.8000	-1.2460
0.8166	-1.2270
0.8333	-1.2270
0.8500	-1.2020
0.8666	-1.2020
0.8833	-1.1760
0.9000	-1.1760
0.9166	-1.1570
0.9333	-1.1440
0.9500	-1.1380
0.9666	-1.1250
0.9833	-1.1060
1.0000	-1.1060
1.2000	-0.9720
1.4000	-0.8760
1.6000	-0.7860
1.8000	-0.7280
2.0000	-0.6640
2.2000	-0.6200
2.4000	-0.5620
2.6000	-0.5370
2.8000	-0.4980
3.0000	-0.4660
3.2000	-0.4470

3.4000	-0.4150
3.6000	-0.3900
3.8000	-0.3770
4.0000	-0.3510
4.2000	-0.3380
4.4000	-0.3260
4.6000	-0.3130
4.8000	-0.3000
5.0000	-0.2870
5.2000	-0.2680
5.4000	-0.2620
5.6000	-0.2420
5.8000	-0.2420
6.0000	-0.2300
6.2000	-0.2230
6.4000	-0.2110
6.6000	-0.2040
6.8000	-0.2040
7.0000	-0.1910
7.2000	-0.1850
7.4000	-0.1790
7.6000	-0.1720
7.8000	-0.1590
8.0000	-0.1590
8.2000	-0.1590
8.4000	-0.1590
8.6000	-0.1530
8.8000	-0.1340
9.0000	-0.1400
9.2000	-0.1340
9.4000	-0.1280
9.6000	-0.1210
9.8000	-0.1150
10.0000	-0.1210
12.0000	-0.0890
14.0000	-0.0760
16.0000	-0.0510
18.0000	-0.0510
20.0000	-0.0510
22.0000	-0.0440
24.0000	-0.0320
26.0000	-0.0380
28.0000	-0.0320

30.0000	-0.0320
32.0000	-0.0190
34.0000	-0.0190
36.0000	-0.0190
38.0000	-0.0190

Tazewell County Landfill

MW-9

Slug Injection Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
5.73	0.242	0.086
5.93	0.230	0.082
6.13	0.223	0.080
6.33	0.211	0.075
6.53	0.204	0.073
6.73	0.204	0.073
6.93	0.191	0.068
7.13	0.185	0.066
7.33	0.179	0.064
7.53	0.172	0.061
7.73	0.159	0.057
7.93	0.159	0.057
8.13	0.159	0.057
8.33	0.159	0.057
8.53	0.153	0.055
8.73	0.134	0.048
8.93	0.140	0.050
9.13	0.134	0.048
9.33	0.128	0.046
9.53	0.121	0.043
9.73	0.115	0.041
9.93	0.121	0.043
11.93	0.089	0.032
13.93	0.076	0.027
15.93	0.051	0.018
17.93	0.051	0.018
19.93	0.051	0.018
21.93	0.044	0.016
23.93	0.032	0.011
25.93	0.038	0.014
27.93	0.032	0.011
29.93	0.032	0.011
31.93	0.019	0.007
33.93	0.019	0.007
35.93	0.019	0.007
37.93	0.019	0.007

MW-9
Slug Withdrawal Test

SE1000C
Environmental Logger
6/29/93 17:28

Unit# 01814 Test 11
INPUT 1: Level (F) TOC

Reference:	0.00
Linearity:	0.12
Scale factor:	20.06
Offset:	-0.03
Delay mSEC:	50.00

Step 0 06/29 15:55:48

Elapsed Time	INPUT 1
0.0000	0.0000
0.0033	-0.0060
0.0066	0.0000
0.0100	-0.0060
0.0133	0.0190
0.0166	0.0700
0.0200	0.1270
0.0233	0.1850
0.0266	0.2810
0.0300	0.4030
0.0333	0.5430
0.0366	0.6900
0.0400	0.8690
0.0433	1.0350
0.0466	1.2200
0.0500	1.3930
0.0533	1.5780
0.0566	1.7380
0.0600	1.9040
0.0633	2.0380
0.0666	2.1410
0.0700	2.2300
0.0733	2.2940

0.0766	2.3390
0.0800	2.3710
0.0833	2.3830
0.0866	2.3830
0.0900	2.3640
0.0933	2.3260
0.0966	2.2680
0.1000	2.1850
0.1033	2.1150
0.1066	2.0510
0.1100	1.9680
0.1133	1.9040
0.1166	1.8400
0.1200	1.8080
0.1233	1.7830
0.1266	1.7700
0.1300	1.7830
0.1333	1.8020
0.1366	1.8150
0.1400	1.8400
0.1433	1.8720
0.1466	1.8980
0.1500	1.9170
0.1533	1.9300
0.1566	1.9300
0.1600	1.9170
0.1633	1.9040
0.1666	1.8850
0.1700	1.8590
0.1733	1.8210
0.1766	1.7890
0.1800	1.7700
0.1833	1.7380
0.1866	1.7190
0.1900	1.6940
0.1933	1.6800
0.1966	1.6740
0.2000	1.6740
0.2033	1.6800
0.2066	1.6870
0.2100	1.6870
0.2133	1.6940
0.2166	1.7000

0.2200	1.7060
0.2233	1.7060
0.2266	1.7000
0.2300	1.6940
0.2333	1.6940
0.2366	1.6740
0.2400	1.6610
0.2433	1.6550
0.2466	1.6420
0.2500	1.6230
0.2533	1.6170
0.2566	1.5970
0.2600	1.5970
0.2633	1.5780
0.2666	1.5780
0.2700	1.5780
0.2733	1.5720
0.2766	1.5780
0.2800	1.5650
0.2833	1.5720
0.2866	1.5650
0.2900	1.5650
0.2933	1.5650
0.2966	1.5590
0.3000	1.5520
0.3033	1.5590
0.3066	1.5400
0.3100	1.5400
0.3133	1.5270
0.3166	1.5210
0.3200	1.5140
0.3233	1.5080
0.3266	1.5020
0.3300	1.5020
0.3333	1.4890
0.3500	1.4760
0.3666	1.4570
0.3833	1.4310
0.4000	1.3990
0.4166	1.3870
0.4333	1.3670
0.4500	1.3550
0.4666	1.3290

0.4833	1.3100
0.5000	1.2910
0.5166	1.2710
0.5333	1.2590
0.5500	1.2460
0.5666	1.2270
0.5833	1.2080
0.6000	1.2010
0.6166	1.1880
0.6333	1.1760
0.6500	1.1630
0.6666	1.1560
0.6833	1.1310
0.7000	1.1310
0.7166	1.1180
0.7333	1.1050
0.7500	1.0930
0.7666	1.0860
0.7833	1.0740
0.8000	1.0670
0.8166	1.0480
0.8333	1.0480
0.8500	1.0290
0.8666	1.0220
0.8833	1.0160
0.9000	1.0030
0.9166	0.9970
0.9333	0.9900
0.9500	0.9840
0.9666	0.9650
0.9833	0.9580
1.0000	0.9580
1.2000	0.8560
1.4000	0.7860
1.6000	0.7280
1.8000	0.6710
2.0000	0.6330
2.2000	0.5880
2.4000	0.5560
2.6000	0.5240
2.8000	0.4920
3.0000	0.4660
3.2000	0.4530

3.4000	0.4210
3.6000	0.4030
3.8000	0.3830
4.0000	0.3770
4.2000	0.3580
4.4000	0.3450
4.6000	0.3320
4.8000	0.3130
5.0000	0.3130
5.2000	0.2940
5.4000	0.2870
5.6000	0.2750
5.8000	0.2680
6.0000	0.2550
6.2000	0.2490
6.4000	0.2360
6.6000	0.2230
6.8000	0.2170
7.0000	0.2110
7.2000	0.2110
7.4000	0.2040
7.6000	0.1980
7.8000	0.1980
8.0000	0.1850
8.2000	0.1850
8.4000	0.1720
8.6000	0.1660
8.8000	0.1660
9.0000	0.1600
9.2000	0.1530
9.4000	0.1530
9.6000	0.1470
9.8000	0.1400
10.0000	0.1400
12.0000	0.1020
14.0000	0.0890
16.0000	0.0760
18.0000	0.0640
20.0000	0.0570
22.0000	0.0570
24.0000	0.0440
26.0000	0.0440

Tazewell County Landfill

MW-9

Slug Withdrawal Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.00	2.8	1.000
0.07	2.339	0.835
0.07	2.371	0.847
0.07	2.383	0.851
0.08	2.383	0.851
0.08	2.364	0.844
0.08	2.326	0.831
0.09	2.268	0.810
0.09	2.185	0.780
0.09	2.115	0.755
0.10	2.051	0.733
0.10	1.968	0.703
0.10	1.904	0.680
0.11	1.84	0.657
0.11	1.808	0.646
0.11	1.783	0.637
0.12	1.77	0.632
0.12	1.783	0.637
0.12	1.802	0.644
0.13	1.815	0.648
0.13	1.84	0.657
0.13	1.872	0.669
0.14	1.898	0.678
0.14	1.917	0.685
0.14	1.93	0.689
0.15	1.93	0.689
0.15	1.917	0.685
0.15	1.904	0.680
0.16	1.885	0.673
0.16	1.859	0.664
0.16	1.821	0.650
0.17	1.789	0.639
0.17	1.77	0.632
0.17	1.738	0.621
0.18	1.719	0.614
0.18	1.694	0.605
0.18	1.68	0.600
0.19	1.674	0.598
0.19	1.674	0.598
0.19	1.68	0.600
0.20	1.687	0.603
0.20	1.687	0.603
0.20	1.694	0.605

Tazewell County Landfill

MW-9

Slug Withdrawal Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.21	1.7	0.607
0.21	1.706	0.609
0.21	1.706	0.609
0.22	1.7	0.607
0.22	1.694	0.605
0.22	1.694	0.605
0.23	1.674	0.598
0.23	1.661	0.593
0.23	1.655	0.591
0.24	1.642	0.586
0.24	1.623	0.580
0.24	1.617	0.578
0.25	1.597	0.570
0.25	1.597	0.570
0.25	1.578	0.564
0.26	1.578	0.564
0.26	1.578	0.564
0.26	1.572	0.561
0.27	1.578	0.564
0.27	1.565	0.559
0.27	1.572	0.561
0.28	1.565	0.559
0.28	1.565	0.559
0.28	1.565	0.559
0.29	1.559	0.557
0.29	1.552	0.554
0.29	1.559	0.557
0.30	1.54	0.550
0.30	1.54	0.550
0.30	1.527	0.545
0.31	1.521	0.543
0.31	1.514	0.541
0.31	1.508	0.539
0.32	1.502	0.536
0.32	1.502	0.536
0.32	1.489	0.532
0.34	1.476	0.527
0.36	1.457	0.520
0.37	1.431	0.511
0.39	1.399	0.500
0.41	1.387	0.495
0.42	1.367	0.488
0.44	1.355	0.484

Tazewell County Landfill

MW-9

Slug Withdrawal Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
0.46	1.329	0.475
0.47	1.31	0.468
0.49	1.291	0.461
0.51	1.271	0.454
0.52	1.259	0.450
0.54	1.246	0.445
0.56	1.227	0.438
0.57	1.208	0.431
0.59	1.201	0.429
0.61	1.188	0.424
0.62	1.176	0.420
0.64	1.163	0.415
0.66	1.156	0.413
0.67	1.131	0.404
0.69	1.131	0.404
0.71	1.118	0.399
0.72	1.105	0.395
0.74	1.093	0.390
0.76	1.086	0.388
0.77	1.074	0.384
0.79	1.067	0.381
0.81	1.048	0.374
0.82	1.048	0.374
0.84	1.029	0.368
0.86	1.022	0.365
0.87	1.016	0.363
0.89	1.003	0.358
0.91	0.997	0.356
0.92	0.99	0.354
0.94	0.984	0.351
0.96	0.965	0.345
0.97	0.958	0.342
0.99	0.958	0.342
1.19	0.856	0.306
1.39	0.786	0.281
1.59	0.728	0.260
1.79	0.671	0.240
1.99	0.633	0.226
2.19	0.588	0.210
2.39	0.556	0.199
2.59	0.524	0.187
2.79	0.492	0.176
2.99	0.466	0.166

Tazewell County Landfill

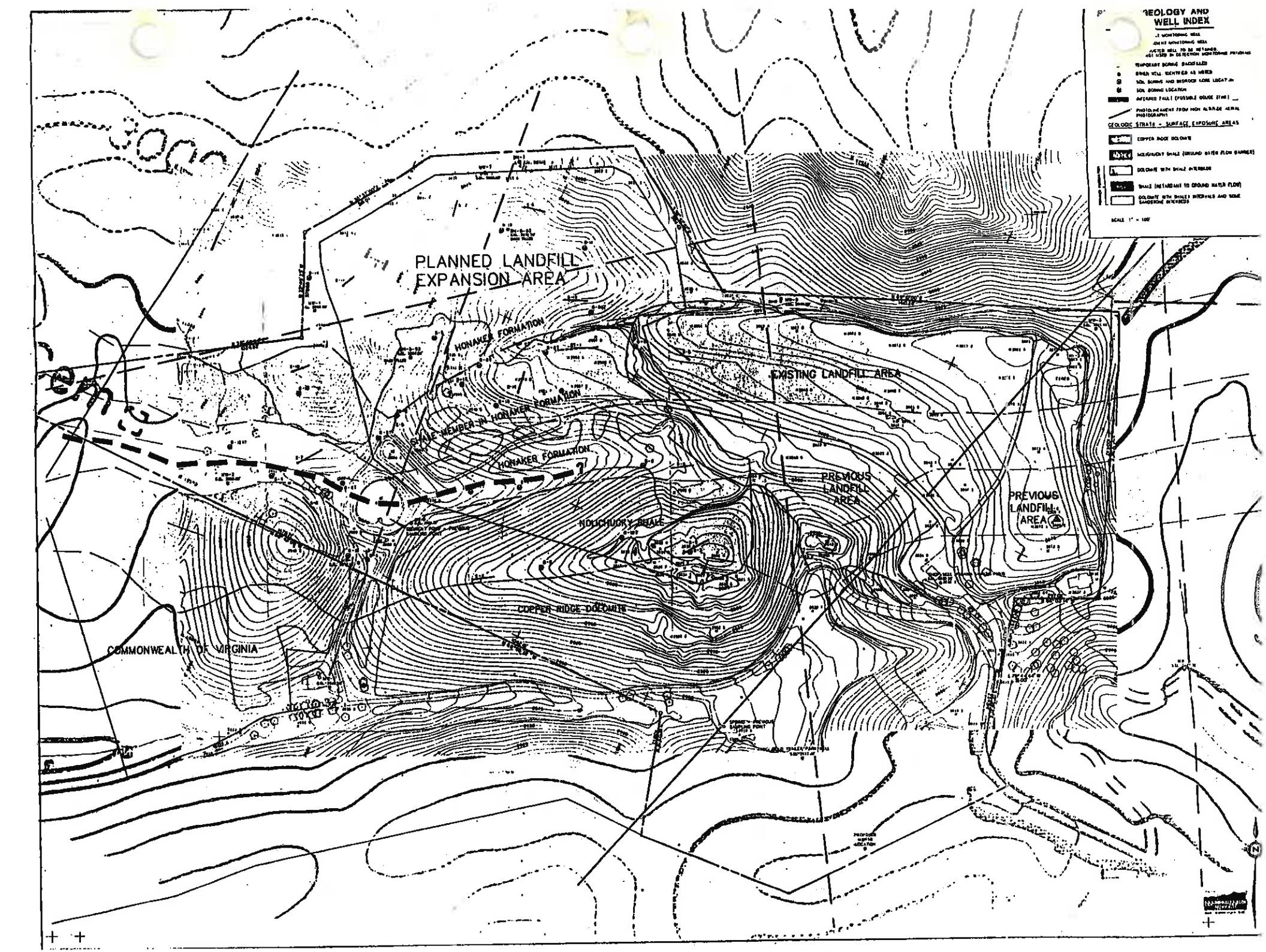
MW-9

Slug Withdrawal Test

Elapsed Time	h (ft. of head)	H- h/H-Ho
3.19	0.453	0.162
3.39	0.421	0.150
3.59	0.403	0.144
3.79	0.383	0.137
3.99	0.377	0.135
4.19	0.358	0.128
4.39	0.345	0.123
4.59	0.332	0.119
4.79	0.313	0.112
4.99	0.313	0.112
5.19	0.294	0.105
5.39	0.287	0.103
5.59	0.275	0.098
5.79	0.268	0.096
5.99	0.255	0.091
6.19	0.249	0.089
6.39	0.236	0.084
6.59	0.223	0.080
6.79	0.217	0.078
6.99	0.211	0.075
7.19	0.211	0.075
7.39	0.204	0.073
7.59	0.198	0.071
7.79	0.198	0.071
7.99	0.185	0.066
8.19	0.185	0.066
8.39	0.172	0.061
8.59	0.166	0.059
8.79	0.166	0.059
8.99	0.16	0.057
9.19	0.153	0.055
9.39	0.153	0.055
9.59	0.147	0.053
9.79	0.14	0.050
9.99	0.14	0.050
11.99	0.102	0.036
13.99	0.089	0.032
15.99	0.076	0.027
17.99	0.064	0.023
19.99	0.057	0.020
21.99	0.057	0.020
23.99	0.044	0.016
25.99	0.044	0.016

Maps


PLANNED LANDFILL EXPANSION AREA
EXISTING LANDFILL AREA
PREVIOUS LANDFILL AREA
PREVIOUS LANDFILL AREA
HONAKER FORMATION
SHALE MEMBER IN HONAKER FORMATION
HONAKER FORMATION
NOLICHUCKY SHALE
COPPER RIDGE DOLOMITE
COMMONWEALTH OF VIRGINIA
GEOLOGY AND WELL INDEX
GEOLOGIC STRATA - SURFACE EXPOSURE AREAS
COPPER RIDGE DOLOMITE
DOLOMITE WITH SHALE INTERBEDS
SHALE (RETARDANT TO GROUND WATER FLOW)
DOLOMITE WITH SHALEY INTERVALS AND SOME SANDSTONE INTERBEDS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Draper Aden Associates

Engineering • Surveying • Environmental Services

2008 Tri-State Solid Waste Rate Report

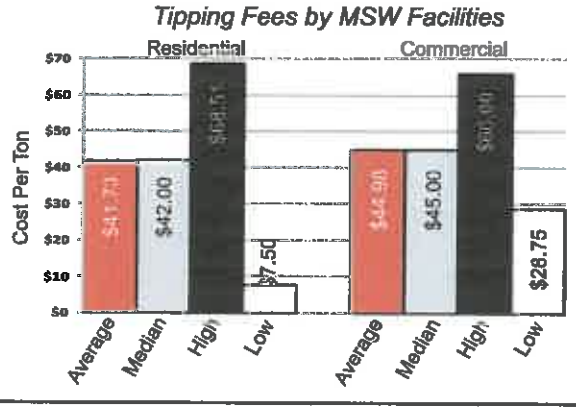
A look at tipping fees and recycling practices in Virginia, North Carolina and Tennessee

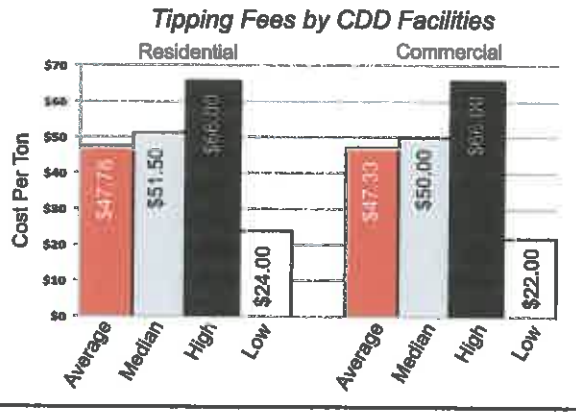
Draper Aden Associates sent questionnaires to solid waste managers in Virginia, North Carolina and Tennessee during the summer of 2007 in order to gather information and compare tipping fee rates. The first half of the two-part survey covered tipping fees for municipal solid waste, construction and demolition waste, and sludge and yard waste. The second part of the survey asked questions concerning recycling programs and fees. This report is a summary of the results of that survey.

A special thank you to all participants who responded and helped make this report a success once again. Contact information is on the back cover if you have any questions, comments or would like to have extra copies.

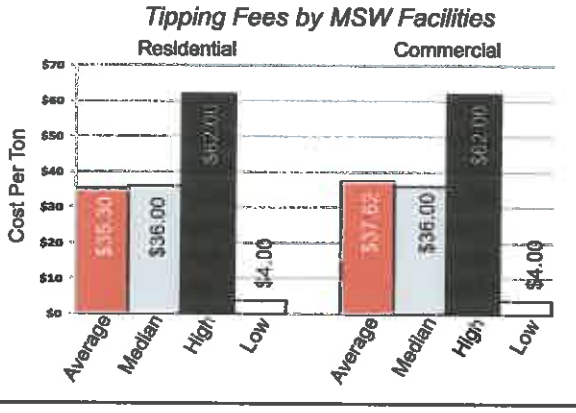
The graphs below reflect the results, represented by state, of the information gathered from survey participants.

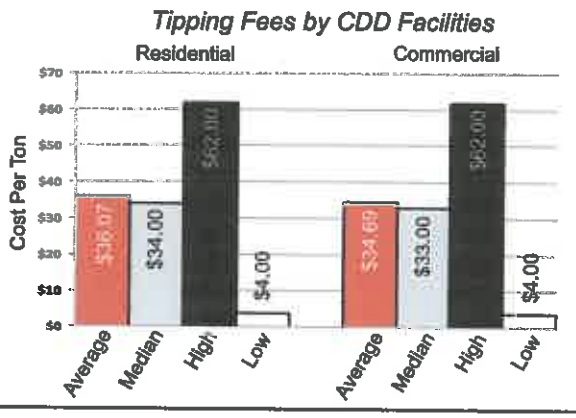
Virginia



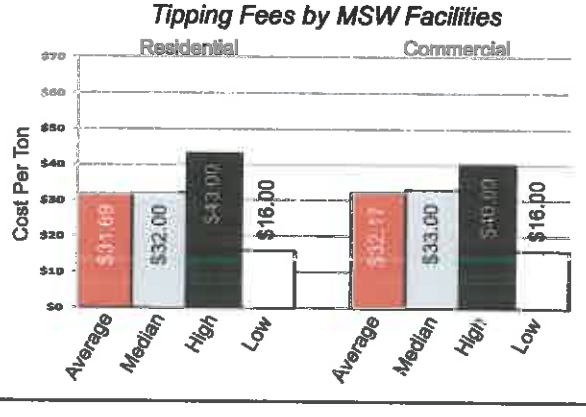


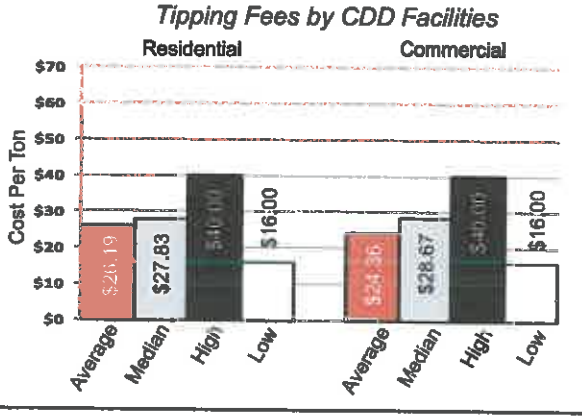
North Carolina





Tennessee





Solid Waste Rates

Survey participants disposed of just over 7 million tons of solid waste in 2006. Each facility dealt with an average of 42,000 tons of solid waste with a median of 15,400 tons.

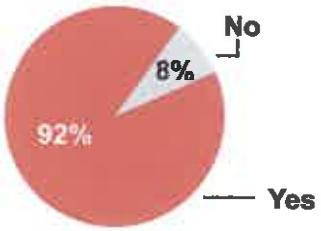
The table to the right indicates the averages of all tipping fees, per ton, either paid or charged by survey participants. Individual data for each respondent can be found in the following pages of this report.

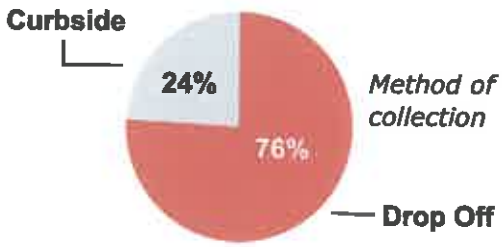
Average Fees Charged Per Ton	MSW Residential	MSW Commercial	CDD Residential	CDD Commercial	MSW Paid	CDD Paid
All	$38.86	$40.41	$39.37	$38.10	$34.97	$36.96
VA	$41.73	$44.98	$47.78	$47.33	$38.48	$44.54
NC	$35.30	$37.62	$36.07	$34.69	$39.01	$37.96
TN	$31.69	$32.17	$26.19	$24.36	$28.99	$29.72

Recycling

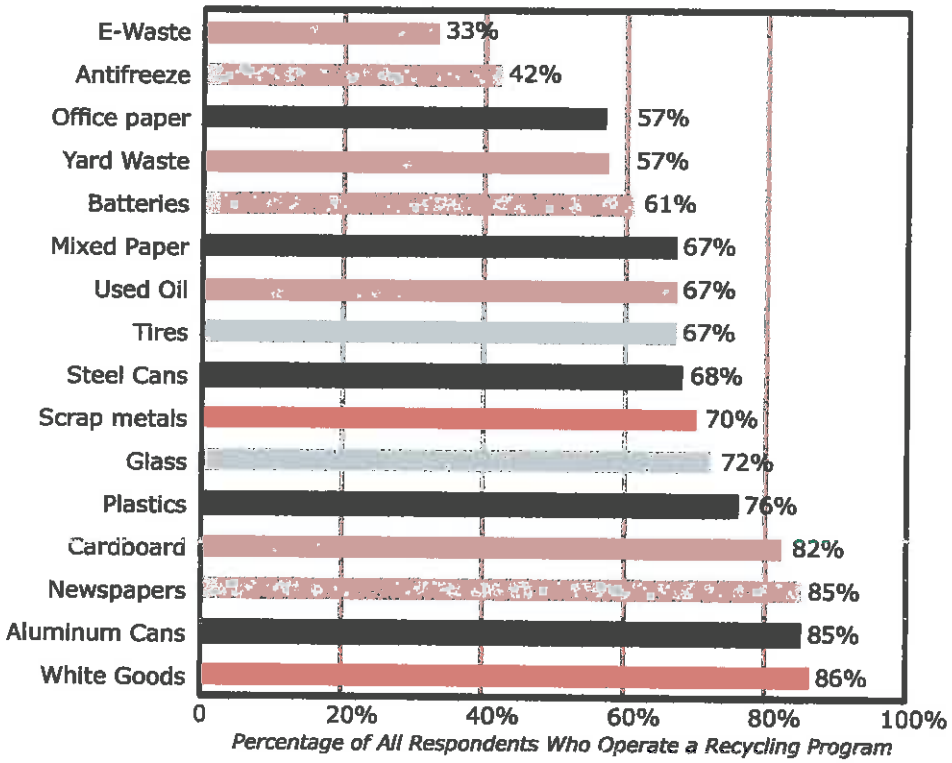
Just over 2.1 million tons of materials were recycled by survey respondants who said they participated in a recycling program. Questions regarding recycling programs, methods of collection, and materials accepted were asked in the survey. Ninety-two percent (92%) of survey participants indicated they either owned, operated or participated in some kind of recycling program. The method of collection favored was drop off with only 26% indicating they utilized curbside pickup.

Municipalities that participate in recycling programs





Method of collection



White goods, closely followed by aluminum cans, newspapers and cardboard were the materials that were most widely accepted by recycling programs according to survey results. The materials least accepted for recycling purposes were textiles which were received at 10% of the recycling programs surveyed. Only 11% of the recycling programs accepted construction/demolition materials.

Solid Waste Rates

Key: L = Landfill, TS = Transfer Station, O = Other, Y = Yes, N = No, All fees represent cost per ton except where noted. Yard waste and sludge fees represent per cubic foot except where noted.

Virginia Locality	Facility	Tons Disposed	Ownership	Operation	Fees Charged MSW Res	Fees Charged MSW Com	Fees Charged CDD Res	Fees Charged CDD Com	Fees Paid MSW	Fees Paid CDD	Sludge Charged	Yard Waste Charged	Sludge Paid	Yard Waste Paid
Accomack County	LF	21,025	Y	Y	$56.51	$56.51	$56.51	$56.51	$53.51	$53.51	$56.51/ton	$56.51/ton		
Accomack County	LF	28,468	Y	Y	$56.51	$56.51	$56.51	$56.51	$53.51	$53.51	$56.51/ton	$56.51/ton		
Amherst County	LF	27,608	Y	N	$53.00	$44.00	$53.00	$44.00						
Augusta Co. Service Authority	LF	156,947	N	Y	$7.50	$40.00					$40.00/ton	$15.00/ton		
Bath County	TS	7,295	Y	N		$60.00			$40.00					
Bedford County	LF	47,308	Y	Y	$57.00	$38.00		$38.00	$57.00	$57.00				
Botetourt County	LF	28,698	Y	Y	$27.50	$51.00	$41.50	$51.00						
Buckingham County	LF	5,663	N	N	$40.00									
Buckingham County	LF	3,650	N	N	$28.75	$28.75								
Buckingham County	LF	60	N	N							$5.00			
Buckingham County	TS	9,313	Y	Y										
Buckingham County	O	1,332												
Campbell County	LF	62,269	Y	Y	$35.00	$35.00					$25/ton	$35/ton	$0.00	$0.00
Covington, City of	LF	10,592	Y	Y	$40.00	$45.00								
Cumberland Plateau Reg. WMA	TS		Y	Y	$32.56	$32.56			$32.56		$32.56	$32.56	$32.56	$32.56
Cumberland Plateau Reg. WMA	TS		Y	Y	$32.91	$32.91			$32.91		$32.91	$32.91	$32.91	$32.91
Cumberland Plateau Reg. WMA	TS		Y	Y	$30.62	$30.62			$30.62		$30.62	$30.62	$30.62	$30.62
Fauquier County	LF		Y	Y				$46.00		$46.00				
Fauquier County	LF				$45.00	$45.00			$45.00					
Franklin County	LF	61,000	Y	Y	$32.00	$32.00	$32.00				$32/ton	$32/ton	$32/ton	$32/ton
Frederick County	LF	146,026	Y	Y	$24.00	$40.00			$24.00	$40.00				
Frederick County	LF		Y	Y			$24.00	$36.00	$24.00	$24.00				
Greensville County	LF	30,131	Y	Y	$38.00	$38.00			$38.00	$38.00	$38/ton	$10/ton	$38/ton	$10/ton
Hanover County	TS	37,000	Y	Y		$50.00	$50.00	$50.00						$50/ton
Henrico County	LF	100,000	Y	Y		$50.00		$50.00	$50.00	$50.00				
Henry County	O	22,000	Y	Y					$47.67	$47.67				$47.67
Manassas, City of	TS	14,674	N	N					$48.00	$48.00				
Martinsville, City of	TS	8,906	Y	Y					$46.33	$46.33			$32/ton	$46.33/ton
Nelson County	TS	14,238	Y	Y		$55.00	$55.00	$55.00						
Newport News, City of	LF	87,000	N	N					$25.66	$29.85				
Newport News, City of	O	20,794	Y	Y										$0.00
New River Resource Authority	LF	244,000	Y	Y	$32.00	$32.00	$32.00	$32.00			$17/ton	$20/ton		
Northampton County	LF	11,188	Y	Y	$51.00	$51.00	$51.00	$51.00			$51.00	$51.00		
Orange County	LF	33,327	Y	Y		$40.00		$40.00			$0.00	$0.00	$0.00	$0.00
Portsmouth, City of	LF	17,000	Y	Y				$0.00						
Prince Edward County	LF	25,300	Y	Y	$30.00	$30.00	$30.00	$30.00			$25/ton	$30/ton		
Prince George County	TS	3,077	Y	Y	$68.51									
Prince William County	LF	352,400	Y	Y	$45.00	$45.00								
Prince William County	O		Y	Y	$45.00	$45.00								
Prince William County	O		Y	Y										
Rappannock County	LF	5,943	Y	Y	$43.00	$43.00	$43.00	$43.00						
Rivanna Solid Waste Authority	LF	5,111	Y	Y								$46.00		
Rivanna Solid Waste Authority	LF	17,987	Y	Y								$7.00		
Rivanna Solid Waste Authority	TS	38,234	Y	Y	$66.00	$66.00	$66.00	$66.00	$40.35	$40.35				
Rivanna Solid Waste Authority	TS	38,618	N	N	$62.00	$62.00	$62.00	$62.00	$34.00	$34.00				
Rivanna Solid Waste Authority	O	2,088	Y	Y										
Rivanna Solid Waste Authority	O	3,028	N	Y										
Rivanna Solid Waste Authority	O	300	Y	Y										

Solid Waste Rates

Virginia Locality	Facility	Tons Disposed	Ownership	Operation	Fees Charged MSW Res	Fees Charged MSW Com	Fees Charged CDD Res	Fees Charged CDD Com	Fees Paid MSW	Fees Paid CDD	Sludge Charged	Yard Waste Charged	Sludge Paid	Yard Waste Paid
Roanoke County	LF		N	N	$45.00	$55.00	$45.00	$55.00	$45.00	$45.00		$35.00		$35.00
Roanoke County	TS	45,798												
Roanoke County	O	472	N	N										
Roanoke Valley Res. Authority	LF	154,128	Y	Y	$45.00	$55.00	$55.00	$55.00			$55.00	$35.00		
Roanoke Valley Res. Authority	TS	169,624	Y	Y	$45.00	$55.00	$55.00	$55.00			$55.00	$35.00		
Rockbridge County	LF		Y	Y		$41.25		$41.25						
Rockingham County	LF	95,000	Y	Y	$41.00	$41.00	$56.00	$56.00	$41.00	$56.00				
Shenandoah County	LF		Y	Y	$36.00	$36.00	$52.50	$52.50	$36.00	$52.50	$52.50/ton		$52.50/ton	
Smyth County	TS	24,769	Y	Y	$45.00	$45.00								
Spotsylvania County	LF	58,957	Y	Y		$45.00					$115./load			
Staunton, City of	LF	35,227	Y	Y	$40.00	$40.00	$40.00	$40.00	$40.00	$40.00				
Suffolk, City of	LF	43,000	N	N		$60.00		$22.00						
Washington County	TS	38,000	Y	Y		$35.00								
Wise County	LF	6,398	Y	Y										
Wise County	TS	35,224	Y	Y										
Wythe/Bland Joint PSA	TS	33,180	Y	Y	$52.00	$52.00	$52.00	$52.00						

North Carolina Locality	Facility	Tons Disposed	Ownership	Operation	Fees Charged MSW Res	Fees Charged MSW Com	Fees Charged CDD Res	Fees Charged CDD Com	Fees Paid MSW	Fees Paid CDD	Sludge Charged	Yard Waste Charged	Sludge Paid	Yard Waste Paid
Aberdeen, Town of														
Alamance County	LF	84,000	Y	Y	$36.00	$36.00	$30.00	$30.00						$19/ton
Albemarle, City of	LF	7,583	Y	Y	$28.00	$28.00			$28.00			$18.00		$18.00
Albemarle, City of	LF	468	Y	Y			$20.00	$20.00		$20.00				
Albemarle Regional SW Mgt. Authority	LF	12,440	N	N					$40.85	$40.85				
Albemarle Regional SW Mgt. Authority	LF	678	Y	Y								$45/ton		$45/ton
Albemarle Regional SW Mgt. Authority	TS		Y	Y	$62.00	$62.00	$62.00	$62.00	$55.37	$55.37				
Bladen County	LF	3,564	Y				$25.00	$25.00						
Bladen County	LF	457	Y	Y				$25.00						
Bladen County	TS	21,330	Y	Y		$33.50								
Blowing Rock, Town of	TS	2,855	N	N					$45.00					
Burlington, City of	LF	19,319	N	N	$36.00				$36.00			$19/ton		$19/ton
Cabarrus County	LF	158,625	Y	Y			$22.00	$22.00						
Cabarrus County	LF	159,831	N	N										
Camden County	LF	1,468	N	N						$48.00				
Camden County	LF	3,597	N	N					$64.00					
Camden County	LF	4	N	N					$73.00					
Caswell County	O	7,763		Y										
Catawaba County	LF	211,852				$30.00	$19.50	$19.50						
Chatham County	TS	11,500	N	N						$46.61	$46.61			
Coastal Regional SWM Authority	LF	233,359	Y	Y	$34.00	$34.00	$34.00	$34.00			$34.00	$12.50	$0.00	$0.00
Coastal Regional SWM Authority	TS	120,870	Y	Y	$46.50	$46.50	$46.50	$46.50				$25.00		
Coastal Regional SWM Authority	S	10,074	Y	Y	$46.50	$46.50	$46.50	$46.50				$25.00		
Gaston County	LF	105,000	Y	Y	$26.00	$30.00								
Gaston County	LF	52,350	Y	Y			$22.00	$22.00						
Goldsboro, City of	LF	10,112	N	N					$23.00	$23.00				
Goldsboro, City of	TS	10,112	Y	Y										
Granville County	LF	30,000	Y	Y			$22.00	$22.00						

Solid Waste Rates

North Carolina Locality	Facility	Tons Disposed	Ownership	Operation	Fees Charged MSW Res	Fees Charged MSW Com	Fees Charged CDD Res	Fees Charged CDD Com	Fees Paid MSW	Fees Paid CDD	Sludge Charged	Yard Waste Charged	Sludge Paid	Yard Waste Paid
Granville County	LF	58,000	N	N					$32.00					
Greensboro, City of	LF	201,396	Y	Y	$36.00	$36.00	$22.00	$22.00			$36/ton	$36/ton	$0.00	$0.00
Greensboro, City of	TS	46,413	Y	Y	$36.00	$36.00	$36.00	$36.00	$36.00	$36.00				
Guilford County	O		Y	Y										
High Point, City of	LF	96,505	Y	Y	$36.00	$36.00								
High Point, City of	O	16,477	Y	Y		$36.00								
High Point, City of	O	5,842	Y	Y	$20.00	$20.00								
Iredell County	LF	214,182	Y			$33.00		$22.00						
Iredell County	TS	42,858	Y			$41.00		$22.00						
Jackson County	TS	33,889	Y	Y		$45.00	$45.00	$45.00				$20.00		
Kannapolis, City of	LF		N	N					$34.80					
Kernersville, Town of	LF	15,201	N	N					$28.00					
Kernersville, Town of	O	1,115	N	N										
Kernersville, Town of	O	254	N	N										
Laurinburg, City of	LF	801	N	N			$33.00	$33.00		$33.00				
Laurinburg, City of	TS	10,390	N	N	$37.00	$37.00				$37.00	$37.00			
Laurinburg, City of	O	3,972	N	N	$18.00	$18.00			$18.00	$18.00				
Lenoir, City of	LF	6,167	N	N					$3.48	$48.00	$0.00	$0.00	$0.00	$0.00
Macon County	LF	27,783	Y	Y		$58.00	$58.00	$58.00			$58/ton	$30/ton		
Macon County	LF	9,383	Y	Y		$58.00	$58.00	$58.00			$58/ton	$30/ton		
McDowell County	LF	33,739	N	N					$37.41	$37.41				
McDowell County	TS	33,739	Y	Y		$40.00		$34.00						
Moore County	LF	36,405	Y	Y										
Moore County	TS	14,419	N	N					$35.74					
Orange County	LF		Y	Y	$46.00	$46.00								
Orange County	LF		Y	Y			$41.00	$41.00						
Perquimans County	LF	24,000	N	N	$4.00	$4.00	$4.00	$4.00	$58.00	$58.00		$45/ton		
Perquimans County	TS	24,000	Y	N	$62.00	$62.00	$62.00	$62.00						
Pitt County	TS	143,672	Y	Y		$42.00		$42.00				$0.00		
Reidsville, City of	LF	6,582	N	N	$31.82									
Reidsville, City of	LF	138	N	N			$38.00							
Reidsville, City of	TS	6,582	Y	Y										
Robeson County	LF	85,075	Y	Y	$34.50	$34.50					$34.50			
Robeson County	LF	23,707	Y	Y	$24.50	$24.50								
Rocky Mount, City of	TS	96,000	Y	Y	$42.00	$42.00			$0.00	$0.00				
Sunset Beach, Town of	LF	3,369	N	N					$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Tarboro, City of	LF	4,368	N	N					$40.00	$40.00				
Wake County	LF	434,566	Y	N	$29.50	$29.50								
Wake County	TS	149,343	Y	N	$33.50	$33.50								
Warren County	LF	8,040	N	N					$48.75					
Warren County	LF	35	N	N					$48.75					
Warren County	TS	10,310	Y	N	$60.00	$60.00	$60.00	$60.00				$16/ton		
Warren County	TS	2,236	N	N					$32.00	$32.00				
Washington, City of	TS	5,412	N	N										
Washington, City of	TS	6,186	N	N						$41.00				
Wayne County	LF	116,160	Y	Y		$23.00	$23.00	$23.00			$0.00	$0.00	$0.00	$0.00
Wilson, City of	LF	282	N	N					$40.00					
Wilson, City of	LF	5,008	N	N						$31.00				
Wilson, City of	LF	7,445	N	N										$21/ton

Solid Waste Rates

North Carolina Locality	Facility	Tons Disposed	Ownership	Operation	Fees Charged MSW Res	Fees Charged MSW Com	Fees Charged CDD Res	Fees Charged CDD Com	Fees Paid MSW	Fees Paid CDD	Sludge Charged	Yard Waste Charged	Sludge Paid	Yard Waste Paid
Wilson, City of	TS	23,681	N	N					$31.65					
Wilson, City of	TS	1,295	N	N					$46.37					
Wrightsville Beach, Town of	LF	5,277	N	N	$46.00									
Wrightsville Beach, Town of	O	649	N	N								$2.00		$2.00

Tennessee Locality	Facility	Tons Disposed	Ownership	Operation	Fees Charged MSW Res	Fees Charged MSW Com	Fees Charged CDD Res	Fees Charged CDD Com	Fees Paid MSW	Fees Paid CDD	Sludge Charged	Yard Waste Charged	Sludge Paid	Yard Waste Paid
Alcoa, City of	LF	97,396	Y	Y	$32.00	$32.00	$32.00	$32.00						
Carter County/Elizabethton SW	LF							$30.00						
Carter County/Elizabethton SW	TS	14,355	Y	Y		$37.00								
Claiborne County	TS	14,500	Y	Y	$40.00	$40.00	$40.00	$40.00	$30.00	$30.00	$40.00	$40.00	$30.00	$30.00
Coffee County	TS	9,731	N	N					$29.29	$29.29				
Collegedale, City of	LF	2,451	N	N					$24.50					
Collegedale, City of	TS		Y	Y										
Cumberland County	LF	23,458	Y	Y		$40.00			$40.00					
Cumberland County	LF	16,605	Y	Y				$32.00		$32.00				
Elizabethton, City of	LF	815	N	N						$30.00				$30.00
Elizabethton, City of	LF	11,559	N	N					$31.00				$33.00	
Fentress County	TS	9,698												
Franklin, City of	LF	54,000	N	N					$18.45	$18.45				
Franklin, City of	LF	10,000	N	N								$2.00		
Franklin, City of	TS	28,000	Y	Y	$29.50	$29.50	$29.50	$29.50						
Giles County	LF	5,721	N	N			$22.00	$22.00		$22.00		$22.00		$22.00
Giles County	TS	22,166	N	N	$27.83	$27.83	$27.83	$27.83	$27.83	$27.83		$27.83		$27.83
Greeneville, Town of	LF	42,024	N	N					$17.51					
Greeneville, Town of	TS	42,140	Y	Y	$33.51	$33.51			$17.66					
Greeneville, Town of	LF	7,085	Y	Y			$16.00	$16.00						
Johnson City, City of	LF		Y	N					$30.82	$35.62				
Lafayette, City of	LF	5,454	N	N					$30.00	$30.00			$30.00	
McMinn County	LF	41,250	Y	Y	$16.00	$16.00					$16/ton	$16/ton		
McMinn County	LF	15,250	Y	Y			$16.00	$16.00						
McMinnville, City of	TS	10,402	N	N					$35.75	$35.75				
Memphis, City of	LF	130,098	N	N					$21.42					
Memphis, City of	LF	152,768	N	N					$21.42					
Memphis, City of	LF	43,798	N	N					$19.00					
Montomery County	LF	182,727	Y	Y		$33.00					$6.00	$2.00		
Montomery County	O	288,860	Y	Y										
Portland, City of	TS	5,000	N	N				$43.00	$43.00					
Red Boiling Springs, Town of	LF	321	N	N					$35.00					
Red Boiling Springs, Town of	LF	83	N	N					$50.00					
Sevierville, City of	LF	14,984	Y	N					$38.85	$35.95			$23.50/ton	$16.50/ton
Shelby County	LF	2,257	N	N					$20.99					
Shelby County	TS	187	N	N										
White County	LF	15,477	Y	Y		$35.00								
White County	LF	4,773	Y	Y				$35.00						

Recycling

Locality		Materials Received																Activities Performed					
		Aluminum Cans	Mixed Paper	Cardboard	Steel Cans	Used Oil	Glass	Newspapers	Antifreeze	Plastics	White Goods	Scrap Metals	yard Waste	Batteries	Office Paper	Textiles	Tires	Drop Off	Curbside	MRF	Hauling	Mulching	Baling
VA	Accomack County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●				●	
VA	Amherst County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●						
VA	Augusta County	●	●	●	●	●	●	●	●		●	●	●	●	●		●	●				●	
VA	Bath County	●	●	●	●	●		●	●	●	●	●		●			●	●					
VA	Bedford County	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●		●	
VA	Buckingham County	●	●	●			●				●	●						●			●		
VA	Campbell County	●	●	●	●	●		●			●	●	●	●	●		●		●				
VA	Covington, City of	●	●	●		●	●	●		●			●	●	●		●	●					
VA	Cumberland County	●	●	●	●		●	●		●	●	●			●		●	●			●		
VA	Cumberland Plateau Reg. WMA	●	●	●		●		●		●	●	●		●	●		●	●				●	
VA	Fauquier County	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●
VA	Franklin County	●		●	●	●		●		●	●	●	●				●	●			●	●	
VA	Frederick County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●				●	
VA	Greensville County									●	●	●					●	●					
VA	Hanover County	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●
VA	Henrico County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●			●	
VA	Henry County	●	●	●	●						●	●			●			●			●		
VA	Lexington, City of	●	●	●	●		●	●		●	●	●			●		●	●			●		●
VA	Manassas, City of	●	●	●	●		●	●		●	●		●		●	●		●	●				
VA	Martinsville, City of	●			●		●	●			●	●					●	●					
VA	Nelson County	●	●	●	●		●	●		●	●	●	●		●		●	●				●	
VA	Newport News, City of	●	●	●	●	●	●	●	●	●	●		●	●	●		●	●	●			●	
VA	New River Resource Authority										●	●		●			●					●	
VA	Northampton County	●	●	●	●	●	●	●		●	●	●		●	●			●					
VA	Orange County	●		●	●	●	●	●	●	●	●	●		●			●	●					
VA	Portsmouth, City of	●		●			●	●		●								●					
VA	Prince Edward County			●			●	●		●	●	●					●	●			●		
VA	Prince George County	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				●	
VA	Prince William County	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
VA	Rappannock County	●			●	●	●	●	●	●	●	●		●			●						
VA	Rivanna Solid Waste Authority	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●		●	●	●	●
VA	Roanoke County	●		●				●			●		●					●				●	
VA	Roanoke Valley Resource Authority	●						●			●	●	●	●			●	●				●	
VA	Rockingham County	●		●	●	●	●	●	●	●	●	●		●			●	●					
VA	Shenandoah County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●				●	●
VA	Smyth County	●				●		●		●	●	●					●	●					
VA	Spotsylvania County	●		●		●	●	●	●	●	●	●	●	●	●		●	●					
VA	Staunton, City of	●			●		●	●		●									●				
VA	Suffolk, City of	●	●	●	●	●	●	●	●	●	●	●	●					●					
VA	Washington County	●	●		●	●	●	●	●	●	●	●			●			●			●		
VA	Wise County		●	●				●		●	●	●						●					
NC	Aberdeen, Town of	●		●	●		●	●		●								●	●				
NC	Alamance County	●		●	●	●	●	●	●	●	●	●	●	●			●	●				●	●
NC	Albemarle, City of										●		●						●				
NC	Albemarle Regional SW Mgt. Authority	●	●	●	●	●	●	●	●	●	●	●	●		●		●	●					
NC	Bladen County	●		●		●					●	●	●	●			●	●			●		
NC	Blowing Rock, Town of	●	●	●	●		●	●					●					●				●	
NC	Burlington, City of	●	●	●	●		●	●		●	●	●	●		●				●				
NC	Cabarrus County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			●	●	●
NC	Camden County			●		●	●	●	●	●	●				●		●	●					

Recycling

Locality		Materials Received																Activities Performed					
		Aluminum Cans	Mixed Paper	Cardboard	Steel Cans	Used Oil	Glass	Newspapers	Antifreeze	Plastics	White Goods	Scrap Metals	yard Waste	Batteries	Office Paper	Textiles	Tires	Drop Off	Curbside	MRF	Hauling	Mulching	Baling
NC	Caswell County	●		●	●	●		●			●	●		●			●	●		●	●		
NC	Catawaba County	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
NC	Chatham County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			●	●	
NC	East Carolina Environmental	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			●	●	
NC	Gaston County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			●	●	●
NC	Goldsboro, City of	●	●	●			●	●		●	●		●						●				
NC	Granville County	●		●	●	●	●	●	●	●	●	●	●	●			●	●					
NC	Greensboro, City of	●	●	●	●	●	●	●	●	●	●	●	●	●	●			●	●	●		●	
NC	Guilford County					●			●		●			●			●	●					
NC	High Point, City of	●	●	●	●		●	●		●	●	●	●		●			●	●	●	●	●	●
NC	Iredell County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●				●	●
NC	Jackson County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●				●	
NC	Kernersville, Town of	●	●	●	●		●	●		●	●	●	●		●				●		●	●	
NC	Laurinburg, City of	●	●	●	●	●	●	●		●	●	●	●				●	●	●	●	●		●
NC	Macon County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●		●			●
NC	McDowell County	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●				●	●
NC	Moore County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●				●	
NC	Orange County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●		●	●	●
NC	Pitt County	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●		●	●		
NC	Reidsville, City of	●	●		●	●	●	●		●	●		●		●			●				●	
NC	Robeson County	●	●	●	●	●		●	●	●	●	●		●	●		●	●					
NC	Rocky Mount, City of	●	●		●	●	●	●		●	●		●	●	●			●				●	
NC	Sunset Beach, Town of												●						●				
NC	Tarboro, City of	●		●	●	●	●	●		●									●				
NC	Wake County	●	●	●	●	●	●	●	●	●	●	●		●	●		●	●			●		●
NC	Warren County	●	●	●		●	●	●			●			●	●		●	●					
NC	Washington, City of	●	●	●			●	●		●					●				●				
NC	Wayne County	●	●	●	●	●	●			●	●	●		●		●	●	●			●		
NC	Wilson, City of	●			●		●	●		●									●				
NC	Wrightsville Beach, Town of	●	●	●			●	●		●	●		●					●	●		●		
TN	Alcoa, City of	●		●	●	●	●	●		●	●	●		●			●	●	●				
TN	Carter County/Elizabethton SW		●	●		●		●			●			●	●			●			●		●
TN	Claiborne County	●	●	●		●		●			●	●		●			●	●			●		
TN	Coffee County	●	●	●			●	●		●	●						●	●					
TN	Collegedale, City of												●						●			●	
TN	Cumberland County	●	●	●	●	●	●	●		●	●	●		●	●		●	●		●	●		●
TN	Elizabethton, City of																						
TN	Fentress County	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●			●	●		●
TN	Franklin, City of																						
TN	Giles County	●		●	●		●	●		●								●					
TN	Greeneville, Town of					●			●		●	●	●	●								●	
TN	Greeneville, Town of					●		●			●		●	●				●	●			●	
TN	Johnson City, City of	●	●	●		●	●	●		●	●		●	●	●			●	●		●	●	
TN	Lafayette, City of			●																			
TN	McMinn County	●	●	●		●		●			●	●		●			●	●			●		
TN	McMinnville, City of			●														●			●		
TN	Memphis, City of	●	●	●	●		●	●		●	●		●		●		●	●	●			●	
TN	Montomery County	●	●	●	●	●	●	●		●	●	●	●	●	●		●	●					
TN	Shelby County			●										●	●		●	●					
TN	White County	●	●	●	●	●		●		●	●	●		●	●		●	●			●		

Recycling

Locality		Privatization					Track		C&D					E-Waste						
		Privatization	Drop Off Boxes	Curbside Collection	Hauling	Industries	Non-Profit	C&D Recycling	Wood	Metals	Plastics	Pallets	E-waste	Computers	CRT	Cell Phones	Printers	E-Waste Charge
VA	Accomack County	Y			•	•		N					Y			•		
VA	Amherst County	Y	•		•			Y				•	N					
VA	Augusta County	N						Y	•	•		•	N					•
VA	Bath County	Y	•			•	•	N					N					
VA	Bedford County	Y	•		•	•		N					Y	•	•	•	•	
VA	Buckingham County	Y	•		•	•	•	N					Y			•		
VA	Campbell County	N					•	N					N					
VA	Covington, City of	Y						Y	•				N					
VA	Cumberland County	Y	•		•	•	•	N					N					
VA	Cumberland Plateau Reg. WMA	Y	•			•	•	N					Y	•	•	•	•	
VA	Fauquier County	Y			•			Y	•	•		•	Y	•	•	•	•	•
VA	Franklin County	N						N					N					
VA	Frederick County	Y			•			Y					Y	•	•	•	•	•
VA	Greensville County	N						Y					N					•
VA	Hanover County	Y	•					Y	•	•		•	Y	•	•	•	•	•
VA	Henrico County	Y	•	•		•		N					Y	•	•	•	•	•
VA	Henry County	Y	•					N					N					
VA	Lexington, City of	Y	•			•		N					N					
VA	Manassas, City of	Y	•	•				N					Y	•	•	•	•	
VA	Martinsville, City of	Y	•		•	•	•	N										
VA	Nelson County	Y	•		•		•	Y					N					
VA	Newport News, City of	Y	•	•		•		Y					Y	•	•	•	•	
VA	New River Resource Authority	N						N					N					
VA	Northampton County	Y	•		•			N					N					
VA	Orange County	N						N					N					
VA	Portsmouth, City of	N						N					N					
VA	Prince Edward County	Y						N					Y	•	•	•	•	
VA	Prince George County	Y	•					N					Y	•	•	•	•	
VA	Prince William County	Y		•	•	•	•	N					Y	•	•	•	•	
VA	Rappannock County	Y						N					Y	•	•	•	•	•
VA	Rivanna Solid Waste Authority	Y	•	•	•	•	•	Y		•			Y			•		
VA	Roanoke County	N				•		N					Y	•	•	•	•	
VA	Roanoke Valley Resource Authority	Y	•	•				N					N					
VA	Rockingham County	N	•			•		Y	•				Y	•	•			
VA	Shenandoah County	Y	•			•		Y	•	•	•	•	Y	•	•		•	
VA	Smyth County	N				•		N					Y	•	•	•	•	•
VA	Spotsylvania County	N						N					Y	•	•	•	•	
VA	Staunton, City of	N				•	•	N					N					
VA	Suffolk, City of	N						N					N					•
VA	Washington County	N						N					N					
VA	Wise County	N						N					Y		•		•	•
NC	Aberdeen, Town of	N						N					N					
NC	Alamance County	Y	•	•	•			Y		•			N					
NC	Albemarle, City of	Y		•				N					N					
NC	Albemarle Regional SW Mgt. Authority	Y			•			N					N					
NC	Bladen County	N						N					N					
NC	Blowing Rock, Town of	Y			•			N					N					
NC	Burlington, City of	Y		•	•			N					N					
NC	Cabarrus County	Y			•			N					Y	•	•	•	•	•
NC	Camden County	Y						N					N					

Privatization:

Survey participants were asked if their locality privatized either a part of or their entire recycling program.

Of the 56% who indicated all or part of their program is privatized, 25% said their entire recycling program was privatized.

Tracking:

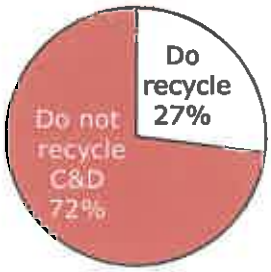
Survey participants were asked if their locality tracked recycling carried out by others within the locality's jurisdiction. The others represented businesses, industries and non-profit organizations.

Recycling

Locality		Privatization				Track		C&D					E-Waste					
		Privatization	Drop Off Boxes	Curbside Collection	Hauling	Industries	Non-Profit	C&D Recycling	Wood	Metals	Plastics	Pallets	E-waste	Computers	CRT	Cell Phones	Printers	E-Waste Charge
NC	Caswell County	Y	•		•								N					
NC	Catawaba County	Y	•	•	•			Y	•	•		•	Y	•	•	•	•	
NC	Chatham County	Y						N					Y	•	•			•
NC	Coastal Regional SWM Authority							N					Y	•	•	•	•	
NC	East Carolina Environmental	Y			•	•	•	Y		•		•	N					
NC	Gaston County	N						Y	•		•	•	Y	•	•	•	•	•
NC	Goldsboro, City of	N						N					N					
NC	Granville County	Y	•					N					N					
NC	Greensboro, City of	Y			•			N					Y	•	•	•	•	•
NC	Guilford County	Y			•			N					Y	•	•	•	•	
NC	High Point, City of	N						N					N					
NC	Iredell County	N						N					Y	•	•	•	•	
NC	Jackson County	Y	•		•								N					
NC	Kernersville, Town of	N						Y		•	•	•	Y	•	•	•	•	
NC	Laurinburg, City of	N						N					N					
NC	Macon County	Y			•			Y				•	N					•
NC	McDowell County	Y	•	•	•			Y	•	•	•	•	N					
NC	Moore County	N						N					N					
NC	Orange County	Y						Y	•	•		•	Y	•	•	•	•	•
NC	Pitt County	Y						Y	•	•		•	Y	•	•		•	
NC	Reidsville, City of	N						N					N					
NC	Robeson County	N						N					N					•
NC	Sunset Beach, Town of	Y		•				N					N					
NC	Tarboro, City of	Y						N					N					
NC	Wake County	Y	•		•			N					Y	•	•	•	•	•
NC	Warren County	Y						N					N					
NC	Washington, City of	N						N					N					
NC	Wayne County	N						Y		•				•	•	•	•	
NC	Wilson, City of	Y						N					N					
NC	Wrightsville Beach, Town of	N						N					N					
TN	Alcoa, City of	Y						N					N					
TN	Carter County/Elizabethton SW	N						N					N					
TN	Claiborne County	Y			•	•		N					N					•
TN	Coffee County	N						N					N					
TN	Collegedale, City of	N						N					N					
TN	Cumberland County	N				•	•	N					N					
TN	Elizabethton, City of	Y	•					N					N					
TN	Fentress County				•			N					Y	•	•	•	•	
TN	Giles County	Y						N					N					
TN	Greeneville, Town of	N						Y	•	•			N					
TN	Johnson City, City of	N						N					Y	•	•	•	•	
TN	Lafayette, City of	Y						N					N					
TN	McMinn County	N				•	•	Y		•		•	N					
TN	McMinnville, City of	N						N					N					
TN	Memphis, City of	Y		•				N					N					
TN	Montomery County	N				•	•	Y		•			Y	•	•		•	
TN	Red Boiling Springs, Town of	N						N					N					
TN	Sevierville, City of	N											N					
TN	Shelby County	N					•						Y	•	•	•	•	
TN	White County	N						Y		•	•		N					

Construction/Demo:

Construction/Demo recyclers indicated the most common materials recycled were "metals" followed by pallets.



Other materials accepted by survey participants for C&D recycling were concrete, bricks, stone asphalt and vinyl.

E-waste:

Participants were asked if their locality recycled computers, monitors, printers and/or cell phones. At least three survey respondents noted e-waste was accepted at a "once a year event." Four respondents indicated a charge from $5-$7 for each monitor or television recycled.

Draper Aden Associates

Engineering • Surveying • Environmental Services

2206 South Main Street
Blacksburg, VA 24060
(540) 552-0444

700 Harris Street
Charlottesville, VA 22903
(4434) 295-0700

11828 Fishing Point Drive, Ste 118
Newport News, VA 23606
(757) 599-9800

8090 Villa Park Drive
Richmond, VA 23228
(804) 264-2228

Forwarding Service Requestesed

EMERGENCY RESPONSE

CONTRACTOR

LISTING

GARY

EARP

COMPILED BY
VIRGINIA DEPARTMENT OF EMERGENCY SERVICES
TECHNOLOGICAL HAZARDS DIVISION
S.W. VA OFFICE

HAZARDOUS WASTE CONTRACTORS LISTING
SOUTHWEST VIRGINIA LISTING

AAA Environmental Services, Inc.
109-B Bonham Road
Bristol, VA 24201
Ted Cox
1-800-469-2856
1-540-466-2856

Bio Tech Environmental Services
P.O. Box 297
Bluefield, WV 24701
Mike Walk
1-800-525-7602
1-304-425-0134

EMI Professional Services
P.O. Box 1477
Coeburn, VA 24230
Randy Porter
1-888-236-4522
1-540-395-3661

Environmental Pollution Services, Inc.
P.O. Box 458
Jonesborough, TN 37659
Dale Schreiber
1-423-753-2227

Evergreen Environmental Management, Inc.
P.O. Box 382
Ghent, WV 25843
Johnny Staring
Kathy McMillion
1-800-330-3248

Ferguson – Harbour Inc.
P.O. Box 3779
Johnson City, TN. 37602
Mike Moody
1-800-235-1344
1-423-477-4995

Four Seasons Industrial Services, Inc.
P.O. Box 16590
Greensboro, NC 27416-0590
1-800-868-2718
1-336-273-2718

HEPACO
2175 Highway 75
Blountville, TN 37617
Mark Scott
1-800-888-7689
1-423-323-0133

LCM
P.O. Box 13487
Roanoke, VA 24034
1-800-774-5583
1-540-344-5583

Marshall Miller & Associates
P.O. Box 848
Bluefield, VA 24605-0848
540-322-5467

MXI Environmental Services
17600 Jeb Stuart Highway
Abingdon, VA 24211
Joey Atkins
540-628-3378 Ext. 18

Schreiber Associates
P.O. Box 3587
Johnson City, TN 37602
Dale Schreiber
1-423-283-4823

SGI
406 Dexter Road
Roanoke, VA 24019
Danny Collins
1-800-285-1243
1-540-265-7964

WEL Enterprises
P.O. Box 109
Concord, VA 24538
1-800-847-2455
1-804-993-2210

TANK TESTING COMPANY

Advance Tank Testing
673 Emory Valley Road
Oak Ridge, TN 37830
1-800-365-8378

Carolina Testing, Inc.
P.O. Box 5930
Spartanburg, SC 29304
Tracy Fletcher
1-800-732-2580
1-864-487-8800

Petro Tite Tank Testing
CS 1500
Blountville, TN 37617
1-423-323-5235

HAZARDOUS WASTE LANDFILLS

Hamm's
Petertown, WV
Ronnie Mann
1-304-753-9840

Stalite Environmental
P.O. Box 1037
Salisbury, NC 28144
Bill Chappell
1-800-476-5800
1-704-637-2797

TSI Environmental
Three Seasons, Inc.
P.O. Box 1340
Saltville, VA 24370
1-800-487-4437
540-496-4437

WASTE OIL HAULERS

J & W
Oil, Filter & Antifreeze Recycling Service
P.O. Box 103
Hiltons, VA 24258
1-540-386-2115
1-540-386-3423 (after hours)
1-540-386-2151 (after hours)

Necessary Oil Company
1300 Georgia Ave.
Bristol, TN 37620-4048
Mark Byington
1-423-764-4533

LABORATORIES

EMI Professional Services
P.O. Box 1477
Coeburn, VA 24230
Randy Porter
1-540-395-3661
1-888-236-4522

Spectrum Laboratories
P.O. Box 1578
Coeburn, VA 24230-1578
Craig Lott
John Lydzinski
1-540-395-5189
1-540-395-5958
1-304-753-9840

COMMONWEALTH of VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

SOUTHWEST REGIONAL OFFICE
355 Deadmore Street, P.O. Box 1688, Abingdon, Virginia 24212
(276) 676-4800 Fax (276) 676-4899
www.deq.virginia.gov

October 7, 2008

Mr. James H. Spencer III
Tazewell County Administrator
106 East Main Street
Tazewell, Virginia 24651

RE: Tazewell County Landfill
Permit #564
Certification to Operate Phase 4A, Area 01

Dear Mr. Spencer:

This correspondence is in response to the September 11, 2008, submission by Schnabel Engineering, LLC, which was received by the Department on September 19, 2008 and revised on October 2, 2008. Based on visual inspections conducted by the Department of Environmental Quality on September 11, 2008, a certification letter signed by Steven J. Winter, P.E. of Schnabel Engineering prepared in accordance with §9 VAC 20-80-250.B.18.d. and a second certification letter signed by Jennifer L. Dawson, P.E. of Thompson and Litton, prepared in accordance with §9 VAC 20-80-550.A, you are now authorized to operate Phase 4A, Area 01 in accordance with Solid Waste Management Facility Permit No. 564, issued to Tazewell County.

Sincerely,

Dallas R. Sizemore
Regional Director

cc: Vince Maiden, SWRO
Greg Widener, P.E., Thompson and Litton
Permit file #564

COMMONWEALTH of VIRGINIA

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street Address: 355 Deadmore Street, Abingdon, Virginia 24210
Mailing Address: P.O. Box 1688, Abingdon, Virginia 24212-1688
Fax: (276) 676-4899
www.deq.virginia.gov

Robert G. Burnley
Director

Michael D. Overstreet
Regional Director
(276) 676-4800

January 19, 2005

Mr. James H. Spencer III
Tazewell County Administrator
106 East Main Street
Tazewell, Virginia 24651

RE: Tazewell County Landfill
Permit #564
Certification to Operate Phase IIIB

Dear Mr. Spencer:

This correspondence is in response to the October 28, 2004, submission by Alliance Consulting, Inc., which was received by the Department on October 29, 2004. Based on visual inspections conducted by the Department of Environmental Quality on January 12, 2005 a certification letter signed by Joseph W. Sulesky, P.E. of Alliance Consulting, Inc. prepared in accordance with §9 VAC 20-80-250.B.18.d, and a second certification letter signed by Henry Murray, P.E. of Tazewell County, prepared in accordance with §9 VAC 20-80-550.A, you are now authorized to operate Phase IIIB in accordance with Solid Waste Management Facility Permit No. 564, issued to Tazewell County.

Sincerely,

Dallas R. Sizemore

Dallas R. Sizemore
Deputy Regional Director

cc: Linda Stull, SWRO

Mr. Quinto Falgiani, Landfill Foreman,
Tazewell County
106 East Main Street
Tazewell, Virginia 24651

Mr. Henry Murray
Tazewell County Engineer
106 East Main Street
Tazewell, Virginia 24651

Mr. Joseph W. Sulesky, P.E.
Alliance Consulting, Inc.
124 Philpott Lane
Raleigh County Airport Industrial Park
Beaver, WV 25813

file

COPY
JOE, HENRY
PAT & QUINTO
1-24-05 PG

COMMONWEALTH of VIRGINIA

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street Address: 355 Deadmore Street, Abingdon, Virginia 24210
Mailing Address: P.O. Box 1688, Abingdon, Virginia 24212-1688
Fax: (276) 676-4899
www.deq.virginia.gov

Robert G. Burnley
Director

Michael D. Overstreet
Regional Director
(276) 676-4800

January 19, 2005

Mr. James H. Spencer III
Tazewell County Administrator
106 East Main Street
Tazewell, Virginia 24651

RE: Tazewell County Landfill
Permit #564
Certification to Operate Phase IIIB

Dear Mr. Spencer:

This correspondence is in response to the October 28, 2004, submission by Alliance Consulting, Inc., which was received by the Department on October 29, 2004. Based on visual inspections conducted by the Department of Environmental Quality on January 12, 2005 a certification letter signed by Joseph W. Sulesky, P.E. of Alliance Consulting, Inc. prepared in accordance with §9 VAC 20-80-250.B.18.d, and a second certification letter signed by Henry Murray, P.E. of Tazewell County, prepared in accordance with §9 VAC 20-80-550.A, you are now authorized to operate Phase IIIB in accordance with Solid Waste Management Facility Permit No. 564, issued to Tazewell County.

Sincerely,

Dallas R. Sizemore

Dallas R. Sizemore
Deputy Regional Director

cc: Linda Stull, SWRO
Mr. Quinto Falgiani, Landfill Foreman,
Tazewell County
106 East Main Street
Tazewell, Virginia 24651

Mr. Henry Murray
Tazewell County Engineer
106 East Main Street
Tazewell, Virginia 24651

Mr. Joseph W. Sulesky, P.E.
Alliance Consulting, Inc.
124 Philpott Lane
Raleigh County Airport Industrial Park
Beaver, WV 25813

file

Tazewell County Sanitary Landfill
Phase III Landfill Construction

Description Of Work Performed	Unit Price In Figures	Total Price In Figures	Difference (+) or (-)
Clearing & Grubbing	$ 2,000.00	$ 10,000.00	$ 22,880.00
Unclassified Excavation	$ 5.00	$ 121,730.00	$ 84,965.65
Unclassified Fill & Compaction	$ 5.00	$ 122,155.00	$ 2,885.35
6" Recompacted Subbase	$ 5.00	$ 29,040.00	$ 292.50
Two Ft. Thick Compacted Clay Liner	$ 5.00	$ 116,160.00	$ 1,175.00
60ML HDPE Liner (Textured on Slope)	$ 0.50	$ 156,816.00	$ 6,346.00
Geonet-Geonet-Geotextile Composite on 3:1 Slope	$ 0.50	$ 156,816.00	$ 6,346.00
18" Protective Soil Cushion on Side Slopes	$ 5.00	$ 87,120.00	$ 882.50
6" Dia. Sch. 80 solid PVC Pipe Incl. End Plugs	$ 12.00	$ 17,772.00	$ (9,972.00)
6" Dia. Sch. 80 perforated PVC Pipe Incl. End Plugs	$ 12.00	$ 30,996.00	$ (12,744.00)
Diversion Ditch SCC-I - 2 ft. deep	$ 40.00	$ 12,000.00	$ -
Diversion Ditch SCC-2 Grassed Section - 2 ft. deep	$ 3.00	$ 4,740.00	$ -
Diversion Ditch SCC-4 Loose Riprap, 2 ft. deep	$ 30.00	$ 9,900.00	$ -
For Leachate Liners #57 Stone	$ 20.00	$ 8,600.00	$ (4,800.00)
Silt Fence	$ 2.00	$ 1,300.00	$ (1,300.00)
Record Drawings including as built marked-up Construction Drawings	$ 2,500.00	$ 5,000.00	$ -
Temporary Construction Field Office	$ 4,855.00	$ 4,855.00	$ -
Rock Excavation	$ 1.00	$ 5,000.00	$ (5,000.00)
		$ 900,000.00	$ 991,957.00

MOBILIZATION	Mobile Out	$ 5,000.00	$ -	$ 5,000.00
	Mobilize Liner Crew	$ 3,000.00	$ -	$ 3,000.00
	Mobilize In Equipment	$ 5,000.00	$ -	$ 5,000.00
	Extra Surveying	$ 15,000.00	$ -	$ 15,000.00
	Hammer	$ 150.00	$ -	$ 9,075.00
	Grout Vent Pipe	$ 3,000.00	$ -	$ 3,000.00
	Mobile Hammer In Out	$ 1,200.00	$ -	$ 1,200.00
	Test Grid	$ 400.00	$ -	$ 400.00
	Uncover liner beside Road	$ 460.00	$ -	$ 460.00
LINER (NEW	Build Test Pad	$ 8,090.00	$ -	$ 8,090.00
	Remove Topsoil from Clay	$ 20,217.50	$ -	$ 20,217.50
	Regrade Clay Borrow Drawing E	$ 8,215.00	$ -	$ 8,215.00
	Excavator Rental Test Pitts	$ 4,680.00	$ -	$ 4,680.00
BORROW PIT	Dip Main Pond	$ 4,995.00	$ -	$ 4,995.00
	Haul & Load Mud Trash	$ 6,315.00	$ -	$ 6,315.00
	Hammer Riprap for Fill	$ 7,950.00	$ -	$ 7,950.00
	Remove Topsoil off Clay	$ 15,781.00	$ -	$ 15,781.00
			$ 900,000.00	$ 1,110,335.50

Landfill Project
Phase III Construction Cost

Work performed within the Scope of the Contract Description Of Work Performed	Application #1	Application #2	Application #3	Total Job
Clearing & Grubbing	$ 14,500.00	$ 18,380.00	$ -	$ 32,880.00
Unclassified Excavation	$ 159,308.00	$ 7,743.00	$ 39,644.65	$ 206,695.65
Unclassified Fill & Compaction	$ 96,500.00	$ -	$ 28,540.35	$ 125,040.35
6" Recompacted Subbase	$ -	$ 17,637.50	$ 11,695.00	$ 29,332.50
Two Ft. Thick Compacted Clay Liner	$ -	$ 70,550.00	$ 46,785.00	$ 117,335.00
60ML HDPE Liner (Textured on Slope)	$ -	$ 100,000.00	$ 63,162.00	$ 163,162.00
Geonet-Geonet-Geotextile Composite on 3:1 Slope	$ -	$ 100,000.00	$ 63,162.00	$ 163,162.00
18" Protective Soil Cushion on Side Slopes	$ -	$ 52,912.50	$ 35,090.00	$ 88,002.50
6" Dia. Sch. 80 solid PVC Pipe Incl. End Plugs	$ -	$ 3,000.00	$ 4,800.00	$ 7,800.00
6" Dia. Sch. 80 perforated PVC Pipe Incl. End Plugs	$ -	$ 11,052.00	$ 7,200.00	$ 18,252.00
Diversion Ditch SCC-I - 2 ft. deep	$ -	$ -	$ 12,000.00	$ 12,000.00
Diversion Ditch SCC-2 Grassed Section - 2 ft. deep	$ -	$ -	$ 4,740.00	$ 4,740.00
Diversion Ditch SCC-4 Loose Riprap, 2 ft. deep	$ -	$ -	$ 9,900.00	$ 9,900.00
For Leachate Liners #57 Stone	$ -	$ -	$ 3,800.00	$ 3,800.00
Silt Fence	$ -	$ -	$ -	$ -
Record Drawings incl. as built marked-up Const. Drawings	$ -	$ -	$ 5,000.00	$ 5,000.00
Temporary Construction Field Office	$ -	$ 4,855.00	$ -	$ 4,855.00
Rock Excavation	$ -	$ -	$ -	$ -
	$ 270,308.00	$ 386,130.00	$ 335,519.00	$ 991,957.00

Work performed outside the Scope of the Contract	#1	#2	#3	Total
Mobile Out	$ -	$ 5,000.00	$ -	$ 5,000.00
Mobilize Liner Crew	$ -	$ -	$ 3,000.00	$ 3,000.00
Mobilize In Equipment	$ -	$ -	$ 5,000.00	$ 5,000.00
Extra Surveying	$ -	$ -	$ 15,000.00	$ 15,000.00
Hammer	$ 9,075.00	$ -	$ -	$ 9,075.00
Grout Vent Pipe	$ 3,000.00	$ -	$ -	$ 3,000.00
Mobile Hammer In Out	$ -	$ 1,200.00	$ -	$ 1,200.00
Test Grid	$ -	$ 400.00	$ -	$ 400.00
Uncover liner beside Road	$ -	$ 460.00	$ -	$ 460.00
Build Test Pad	$ -	$ 8,090.00	$ -	$ 8,090.00
Remove Topsoil from Clay	$ -	$ 20,217.50	$ -	$ 20,217.50
Regrade Clay Borrow Drawing E	$ -	$ -	$ 8,215.00	$ 8,215.00
Excavator Rental Test Pitts	$ -	$ -	$ 4,680.00	$ 4,680.00
Dip Main Pond	$ -	$ -	$ 4,995.00	$ 4,995.00
Haul & Load Mud Trash	$ -	$ -	$ 6,315.00	$ 6,315.00
Hammer Riprap for Fill	$ -	$ -	$ 7,950.00	$ 7,950.00
Remove Topsoil off Clay	$ -	$ -	$ 15,781.00	$ 15,781.00
	$ 282,383.00	$ 421,497.50	$ 406,455.00	$ 1,110,335.50

Tazewell County Sanitary Landfill
Phase III Landfill Construction
Detail by Application Number

Estimated Quanity	Actual Quanity	Description Of Work Performed	Unit Price In Figures	Total Contract Price	Application #1	Application #2	Application #3	Total Job	Difference (+) or (-)
5	16.44	Clearing & Grubbing	$ 2,000.00	$ 10,000.00	$ 14,500.00	$ 18,380.00	$ -	$ 32,880.00	$ 22,880.00
24,346	41,339.13	Unclassified Excavation	$ 5.00	$ 121,730.00	$ 159,308.00	$ 7,743.00	$ 39,644.65	$ 206,695.65	$ 84,965.65
24,431	25,008.07	Unclassified Fill & Compaction	$ 5.00	$ 122,155.00	$ 96,500.00	$ -	$ 28,540.35	$ 125,040.35	$ 2,885.35
5,808	5,866.50	6" Recompacted Subbase	$ 5.00	$ 29,040.00	$ -	$ 17,637.50	$ 11,695.00	$ 29,332.50	$ 292.50
23,232	23,467	Two Ft. Thick Compacted Clay Liner	$ 5.00	$ 116,160.00	$ -	$ 70,550.00	$ 46,785.00	$ 117,335.00	$ 1,175.00
313,632	326,324	60ML HDPE Liner (Textured on Slope)	$ 0.50	$ 156,816.00	$ -	$ 100,000.00	$ 63,162.00	$ 163,162.00	$ 6,346.00
313,632	326,324	Geonet-Geonet-Geotextile Composite on 3:1 Slope	$ 0.50	$ 156,816.00	$ -	$ 100,000.00	$ 63,162.00	$ 163,162.00	$ 6,346.00
17,424	17,600.50	18" Protective Soil Cushion on Side Slopes	$ 5.00	$ 87,120.00	$ -	$ 52,912.50	$ 35,090.00	$ 88,002.50	$ 882.50
1,481	650	6" Dia. Sch. 80 solid PVC Pipe Incl. End Plugs	$ 12.00	$ 17,772.00	$ -	$ 3,000.00	$ 4,800.00	$ 7,800.00	$ (9,972.00)
2,583	1,521	6" Dia. Sch. 80 perforated PVC Pipe Incl. End Plugs	$ 12.00	$ 30,996.00	$ -	$ 11,052.00	$ 7,200.00	$ 18,252.00	$ (12,744.00)
300	300	Diversion Ditch SCC-I - 2 ft. deep	$ 40.00	$ 12,000.00	$ -	$ -	$ 12,000.00	$ 12,000.00	$ -
1,580	1,580	Diversion Ditch SCC-2 Grassed Section - 2 ft. deep	$ 3.00	$ 4,740.00	$ -	$ -	$ 4,740.00	$ 4,740.00	$ -
330	330	Diversion Ditch SCC-4 Loose Riprap, 2 ft. deep	$ 30.00	$ 9,900.00	$ -	$ -	$ 9,900.00	$ 9,900.00	$ -
430	190	For Leachate Liners #57 Stone	$ 20.00	$ 8,600.00	$ -	$ -	$ 3,800.00	$ 3,800.00	$ (4,800.00)
650	-	Silt Fence	$ 2.00	$ 1,300.00	$ -	$ -	$ -	$ -	$ (1,300.00)
2	2	Record Drawings incl. as built marked-up Const. Drawings	$ 2,500.00	$ 5,000.00	$ -	$ -	$ 5,000.00	$ 5,000.00	$ -
1	1	Temporary Construction Field Office	$ 4,855.00	$ 4,855.00	$ -	$ 4,855.00	$ -	$ 4,855.00	$ -
5,000	-	Rock Excavation	$ 1.00	$ 5,000.00	$ -	$ -	$ -	$ -	$ (5,000.00)
Total Contract Original vs Actual:				$ 900,000.00	$ 270,308.00	$ 386,130.00	$ 335,519.00	$ 991,957.00	$ 91,957.00
					#1	#2	#3	Total	Difference
0	1	Mobile Out	$ 5,000.00	$ -	$ -	$ 5,000.00	$ -	$ 5,000.00	$ 5,000.00
0	1	Mobilize Liner Crew	$ 3,000.00	$ -	$ -	$ -	$ 3,000.00	$ 3,000.00	$ 3,000.00
0	1	Mobilize In Equipment	$ 5,000.00	$ -	$ -	$ -	$ 5,000.00	$ 5,000.00	$ 5,000.00
0	1	Extra Surveying	$ 15,000.00	$ -	$ -	$ -	$ 15,000.00	$ 15,000.00	$ 15,000.00
0	60.5	Hammer	$ 150.00	$ -	$ 9,075.00	$ -	$ -	$ 9,075.00	$ 9,075.00
0	1	Grout Vent Pipe	$ 3,000.00	$ -	$ 3,000.00	$ -	$ -	$ 3,000.00	$ 3,000.00
0	1	Mobile Hammer In Out	$ 1,200.00	$ -	$ -	$ 1,200.00	$ -	$ 1,200.00	$ 1,200.00
0	1	Test Grid	$ 400.00	$ -	$ -	$ 400.00	$ -	$ 400.00	$ 400.00
0	1	Uncover liner beside Road	$ 460.00	$ -	$ -	$ 460.00	$ -	$ 460.00	$ 460.00
0	1	Build Test Pad	$ 8,090.00	$ -	$ -	$ 8,090.00	$ -	$ 8,090.00	$ 8,090.00
0	1	Remove Topsoil from Clay	$ 20,217.50	$ -	$ -	$ 20,217.50	$ -	$ 20,217.50	$ 20,217.50
0	1	Regrade Clay Borrow Drawing E	$ 8,215.00	$ -	$ -	$ -	$ 8,215.00	$ 8,215.00	$ 8,215.00
0	1	Excavator Rental Test Pitts	$ 4,680.00	$ -	$ -	$ -	$ 4,680.00	$ 4,680.00	$ 4,680.00
0	1	Dip Main Pond	$ 4,995.00	$ -	$ -	$ -	$ 4,995.00	$ 4,995.00	$ 4,995.00
0	1	Haul & Load Mud Trash	$ 6,315.00	$ -	$ -	$ -	$ 6,315.00	$ 6,315.00	$ 6,315.00
0	1	Hammer Riprap for Fill	$ 7,950.00	$ -	$ -	$ -	$ 7,950.00	$ 7,950.00	$ 7,950.00
0	1	Remove Topsoil off Clay	$ 15,781.00	$ -	$ -	$ -	$ 15,781.00	$ 15,781.00	$ 15,781.00
Total Contract Original vs Actual Including Extra's:				$ 900,000.00	$ 282,383.00	$ 421,497.50	$ 406,455.00	$ 1,110,335.50	$ 210,335.50

Permits

Boissevain

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
SOUTHWEST REGIONAL OFFICE
355-A Deadmore Street, Abingdon, Virginia 24210
Phone (276) 676-4800 Fax (276) 676-4899
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

Jeffrey Hurst.
Regional Director

April 09, 2020

Mr. Kenneth Dunford
Tazewell County Engineer
197 Main Street
Tazewell, Virginia 24651

RE: Tazewell County Transfer Station - Boissevain
Permit-by-Rule #004
Tazewell, Virginia

Dear Mr. Dunford:

The Department has received the DEQ requested information to update Permit-by-Rule 004 for the Tazewell County Transfer Station - Boissevain located at 1287 Boissevain Road, Pocahontas, Virginia in the County of Tazewell. The request and associated revised documentation was received relating to update the permit information and requirements to meet all applicable standards and documentation. The modification includes incidental modifications to the site description and operations.

Attached to this letter are two documents that have been modified and must not be separated from this letter for compliance purposes. The two documents are:

ATTACHMENT I: CONDITIONS OF THE PERMIT-BY-RULE STATUS

ATTACHMENT II: FACILITY DESCRIPTION

The purpose of this letter is to acknowledge receipt of the revised documentation submitted in accordance with the requirements of 9 VAC 20-81-410.A.6. for Permit-by-Rule modifications. In accordance with 9 VAC 20-81-410.A.4. this facility continues to operate under permit-by-rule status. With this modification, Attachments I and II have been revised and enclosed. Please insert the revised Attachments and submitted documentation into all copies of Permit-by-Rule 004 along with this letter to document the modification. Please note, however, that in accordance with 9 VAC 20-81-410.A.5., and the attached "Conditions of the Permit-by-Rule Status," the Director may require changes in the documents designed to assure compliance with the standards of the VSWMR. Should such changes not be accomplished by the facility owner or operator, the Director may require the owner or operator to submit the full application and to obtain a regular solid waste management facility permit.

In addition, with the acknowledgement of this permit modification, the facility is required to comply with the following requirements:

1. The facility shall maintain records of self-inspections, facility monitoring, and receipt of unauthorized waste in accordance with 9 VAC 20-81-350.
2. The facility is required to follow the reporting requirements of 9 VAC 20-81-530.C., which includes written notification of any planned physical alterations (C.1) and notification, orally within 24 hours and written within 5 days, of any noncompliance or unusual condition which may endanger health or the environment (such as receipt of hazardous waste, facility fires, etc) (C.3).
3. Submission of the Solid Waste Information and Assessment (SWIA) 50-25 Form in accordance with 9 VAC 20-81-80 by March 31st of each year. This form can be found online at https://node.deq.virginia.gov/SWIAWebApp/login.jsp.
4. The facility is responsible for paying an annual fee to the Department of Environmental Quality by October 1st of each year. The fee amount is determined based upon the procedures outlined in 9 VAC 20-90-115.
5. The facility shall review and certify its Operations Manual is consistent with current facility operations and regulatory requirements annually, by December 31st of each calendar year. These certifications shall be maintained in the facility's operating record.
6. **The facility is required to adjust the Financial Assurance to $8,180 plus the inflation factor on the next cycle, beginning at the end of 2020.**
7. The facility is required to adjust the estimated closure cost amount annually for inflation 60 days prior to the anniversary date of the establishment of the financial mechanism in accordance with 9 VAC 20-70-10, *et seq*.

Please note that it is the responsibility of Tazewell County to obtain any other permits or authorizations that may be necessary. If you have any questions regarding this matter, please contact Daniel P. Scott, PE Environmental Engineer Senior, at (276) 676-4866 or email at daniel.scott@deq.virginia.gov.

Respectfully,

Daniel Manweiler
DEQ-SWRO Land Protection Manager

Attachments I & II

c: Kathryn Perszyk – DEQ-CO - Solid Waste Permit Coordinator
Suzanne Taylor – DEQ-CO - Financial Assurance
Daniel Scott - DEQ-SWRO – Solid Waste Permits
Stephan Martin – DEQ-SWRO – Solid Waste Inspections

ATTACHMENT I
CONDITIONS OF THE PERMIT-BY-RULE STATUS

I. CHANGE OF OWNERSHIP

A permit-by-rule may not be transferred by the permittee to a new owner or operator. However, when the property transfer takes place without proper closure, the new owner shall notify the Department of the sale and fulfill all the requirements contained in 9 VAC 20-81-410.A.2.a. through 9 VAC 20-81-410.A.2.k. of the Virginia Solid Waste Management Regulations (VSWMR, 9 VAC 20-81-10, *et seq.*). Upon presentation of the financial assurance proof required by the Financial Assurance Regulations for Solid Waste Facilities (9 VAC 20-70-10, *et seq.*) by the owner, the Department will release the old owner from his closure and financial responsibilities and acknowledge the new permit-by-rule in the name of the new owner.

II. FACILITY MODIFICATIONS

The owner or operator of a facility operating under a permit-by-rule may modify its design and operation by furnishing the Department a new design and construction certificate prepared by the professional engineer and an operations manual certificate. Whenever modifications in the design or operation of the facility affect the provisions of the approved closure plan, the owner or operator shall also submit an amended closure plan certificate signed by a professional engineer.

III. LOSS OF PERMIT-BY-RULE STATUS

In the event that a facility operating under a permit-by-rule violates any applicable siting, design and construction, or closure provisions of 9 VAC 20-81-320, 9 VAC 20-81-330, or 9 VAC 20-81-360, respectively, the owner or operator of the facility will be considered to be operating an unpermitted facility as provided for in 9 VAC 20-81-45 of the VSWMR and shall be required to either obtain a new permit as required by Part V [9 VAC 20-81-400, *et seq.*] or close under Part III [9 VAC 20-81-100, *et seq.*] or IV [9 VAC 20-81-300, *et seq.*] of these regulations, as applicable.

IV. TERMINATION

The Director shall terminate permit-by-rule and shall require closure of the facility whenever he finds that:

a. As a result of changes in key personnel, the requirements necessary for a permit-by-rule are no longer satisfied;

b. The applicant has knowingly or willfully misrepresented or failed to disclose a material fact in his disclosure statement, or any other report or certification required under this regulation, or has knowingly or willfully failed to notify the Director of any material change to the information in the disclosure statement;

c. Any key personnel have been convicted of any of the crimes listed in § 10.1-1409 of the Code of Virginia, punishable as felonies under the laws of the Commonwealth or the equivalent of them under the laws of any other jurisdiction; or have been adjudged by an administrative agency or a court of competent jurisdiction to have violated the environmental protection laws of the United States, the Commonwealth or any other state and the Director determines that such conviction or adjudication is sufficiently probative of the permittee's inability or unwillingness to operate the facility in a lawful manner.

d. The operation of the facility is inconsistent with the facility's operations manual and/or the operational requirements of the regulations.

V. CERTIFIED OPERATOR

In accordance with the Virginia Waste Management Act (Title 10.1, Chapter 14 of the Code of Virginia), § 10.1-1408.2, this facility must employ a facility operator licensed by the Board of Waste Management Facility Operators (Licensing Regulations, 18 VAC 155-20-10 *et seq.*).

VI. RIGHT OF APPEAL

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date of the service of this decision to initiate an appeal of this decision, by filing notice with:

David K. Paylor, Director
Virginia Department of Environmental Quality
ATTN: Office of Waste Permitting & Compliance
Post Office Box 1105
Richmond, Virginia 23218

In the event this decision is served to you by mail, three days will be added to that period. Please refer to Part Two of the rules of the Supreme Court of Virginia, which describes the required content of the Notice of Appeal, including specification of the Circuit Court to which the appeal is taken, and additional requirements governing appeals from decisions of administrative agencies.

ATTACHMENT II
FACILITY DESCRIPTION

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF LAND PROTECTION & REVITALIZATION
OFFICE OF WASTE PERMITTING & COMPLIANCE
Permit-By-Rule #004

Facility Name: Tazewell County Transfer Station - Boissevain

Facility Type: Transfer Station **Latitude:** 37° 17'21" North

Site Location: Town of Pocahontas **Longitude:** 81° 22 '22" West

Location Description: The facility is located at 1287 Boissevain Road, Pocahontas, Virginia in the County of Tazewell. Access is provided by an all-weather access paved road.

Background: The facility is owned and operated by Tazewell County. The facility consists of an office, waste roll-off trailer with compactor, tire roll-off container, bulk goods roll-off container, recycling bins, oil storage, and a leachate collection tank. Normal operating procedure entails receipt of residential and commercial municipal waste from the Town of Pocahontas from both private and private collection and hauling services for compaction and bulk transportation and disposal at the Tazewell County Landfill. Unacceptable waste shall be segregated for refusal or separate disposal prior to acceptance. A full list of acceptable and unacceptable waste may be found in the Operations Manual. Leachate and spray down are discharged to the Tazewell County PSA collection system for conveyance and treatment at the Boissevain STW.

Submission Highlights: The Department is in receipt of DEQ Form PBR signed by C. Eric Young, Tazewell County Administrator, on December 11, 2019. The following documents comprise the Permit-by-Rule submittal:

A. A notice of intent dated February 17, 1993 with area and site location maps. A notarized disclosure statement have been provided during the period of its operation. A local government certification was previously submitted. These documents are in accordance with 9 VAC 20-81-450.B., and are required submissions under 9 VAC 20-81-410.A.2.a. and 9 VAC 20-81-410.A.2.c.

B. A document signed by Robert Roberts, PE of Olver, Inc. dated May 28, 1993 certifying that the facility conforms to the siting standards of 9 VAC 20-81-320. This is a required submission in accordance with 9 VAC 20-81-410.A.2.b.

C. A document signed by Robert Roberts, PE of Olver, Inc. dated May 28, 1993 certifying that the facility has an operations manual that conforms to the standards of 9 VAC 20-81-340. This is a required submission in accordance with 9 VAC 20-81-410.A.2.d.

D. A document signed by Robert Roberts, PE of Olver, Inc. dated May 28, 1993 certifying that the facility has been designed and constructed in accordance with the standards of 9 VAC 20-81-330. This is a required submission in accordance with 9 VAC 20-81-410.A.2.e.(1).

E. A document signed by Robert Roberts, PE of Olver, Inc. dated May 28, 1993 certifying that the facility has a closure plan that conforms to the standards of 9 VAC 20-81-360. This is a required submission in accordance with 9 VAC 20-81-410.A.2.e.(2).

F. A copy of deed or lease demonstrating Tazewell County has legal control over the site. This is a required submission under 9 VAC 20-81-410.A.2.f.

G. The cost estimate for facility closure is $8,180, which covers the design throughput of 36 tons. Financial Assurance in the amount of $3,802 has been provided in the form of a local government certification and was previously approved by the Office of Financial Assurance. The Financial Assurance will be required to be updated in the next cycle. This is a required submission in accordance with 9 VAC 20-81-410.A.2.h.

H. Public participation documents which resulted from the public participation effort, in accordance with 9 VAC 20-81-410.A.3. The advertisement of the public meeting was published in the Bluefield Daily Telegraph newspaper on March 24, 1993. The public meeting was held on April 12, 1993. The public comment period closed on April 22, 1993. No public comments were received. This is a required submission in accordance with 9 VAC 20-81-410.A.2.i.

I. This facility is considered a transfer station as it does not meet the definition of a convenience center as defined under 9 VAC 20-81-10.

J. No permit application fee required as this was an Agency initiated update.

Cedar Bluff

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
SOUTHWEST REGIONAL OFFICE
355-A Deadmore Street, Abingdon, Virginia 24210
Phone (276) 676-4800 Fax (276) 676-4899
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

Jeffrey Hurst.
Regional Director

March 12, 2020

Mr. Kenneth Dunford
Tazewell County Engineer
197 Main Street
Tazewell, Virginia 24651

RE: Tazewell County Transfer Station – Cedar Bluff
Permit-by-Rule #002
Tazewell, Virginia

Dear Mr. Dunford:

The Department has received the DEQ requested information to update Permit-by-Rule 002 for the Tazewell County Transfer Station – Cedar Bluff located at 193 Cedar Valley Drive, Cedar Bluff in the County of Tazewell. The request and associated revised documentation was received relating to update the permit information and requirements to meet all applicable standards and documentation. The modification includes incidental modifications to the site description and operations.

Attached to this letter are two documents that have been modified and must not be separated from this letter for compliance purposes. The two documents are:

ATTACHMENT I: CONDITIONS OF THE PERMIT-BY-RULE STATUS

ATTACHMENT II: FACILITY DESCRIPTION

The purpose of this letter is to acknowledge receipt of the revised documentation submitted in accordance with the requirements of 9 VAC 20-81-410.A.6. for Permit-by-Rule modifications. In accordance with 9 VAC 20-81-410.A.4. this facility continues to operate under permit-by-rule status. With this modification, Attachments I and II have been revised and enclosed. Please insert the revised Attachments and submitted documentation into all copies of Permit-by-Rule 004 along with this letter to document the modification. Please note, however, that in accordance with 9 VAC 20-81-410.A.5., and the attached "Conditions of the Permit-by-Rule Status," the Director may require changes in the documents designed to assure compliance with the standards of the VSWMR. Should such changes not be accomplished by the facility owner or operator, the Director may require the owner or operator to submit the full application and to obtain a regular solid waste management facility permit.

In addition, with the acknowledgement of this permit modification, the facility is required to comply with the following requirements:

1. The facility shall maintain records of self-inspections, facility monitoring, and receipt of unauthorized waste in accordance with 9 VAC 20-81-350.
2. The facility is required to follow the reporting requirements of 9 VAC 20-81-530.C., which includes written notification of any planned physical alterations (C.1) and notification, orally within 24 hours and written within 5 days, of any noncompliance or unusual condition which may endanger health or the environment (such as receipt of hazardous waste, facility fires, etc) (C.3).
3. Submission of the Solid Waste Information and Assessment (SWIA) 50-25 Form in accordance with 9 VAC 20-81-80 by March 31st of each year. This form can be found online at https://node.deq.virginia.gov/SWIAWebApp/login.jsp.
4. The facility is responsible for paying an annual fee to the Department of Environmental Quality by October 1st of each year. The fee amount is determined based upon the procedures outlined in 9 VAC 20-90-115.
5. The facility shall review and certify its Operations Manual is consistent with current facility operations and regulatory requirements annually, by December 31st of each calendar year. These certifications shall be maintained in the facility's operating record.
6. **The facility is required to adjust the Financial Assurance to $11,526 plus the inflation factor on the next cycle, beginning at the end of 2020.**
7. The facility is required to adjust the estimated closure cost amount annually for inflation 60 days prior to the anniversary date of the establishment of the financial mechanism in accordance with 9 VAC 20-70-10, *et seq*.

Please note that it is the responsibility of Tazewell County to obtain any other permits or authorizations that may be necessary. If you have any questions regarding this matter, please contact Daniel P. Scott, PE Environmental Engineer Senior, at (276) 676-4866 or email at daniel.scott@deq.virginia.gov.

Respectfully,

Daniel Manweiler
DEQ-SWRO Land Protection Manager

Attachments I & II

c: Kathryn Perszyk – DEQ-CO - Solid Waste Permit Coordinator
Suzanne Taylor – DEQ-CO - Financial Assurance
Daniel Scott - DEQ-SWRO – Solid Waste Permits
Stephan Martin – DEQ-SWRO – Solid Waste Inspections

ATTACHMENT I
CONDITIONS OF THE PERMIT-BY-RULE STATUS

I. CHANGE OF OWNERSHIP

A permit-by-rule may not be transferred by the permittee to a new owner or operator. However, when the property transfer takes place without proper closure, the new owner shall notify the Department of the sale and fulfill all the requirements contained in 9 VAC 20-81-410.A.2.a. through 9 VAC 20-81-410.A.2.k. of the Virginia Solid Waste Management Regulations (VSWMR, 9 VAC 20-81-10, *et seq.*). Upon presentation of the financial assurance proof required by the Financial Assurance Regulations for Solid Waste Facilities (9 VAC 20-70-10, *et seq.*) by the owner, the Department will release the old owner from his closure and financial responsibilities and acknowledge the new permit-by-rule in the name of the new owner.

II. FACILITY MODIFICATIONS

The owner or operator of a facility operating under a permit-by-rule may modify its design and operation by furnishing the Department a new design and construction certificate prepared by the professional engineer and an operations manual certificate. Whenever modifications in the design or operation of the facility affect the provisions of the approved closure plan, the owner or operator shall also submit an amended closure plan certificate signed by a professional engineer.

III. LOSS OF PERMIT-BY-RULE STATUS

In the event that a facility operating under a permit-by-rule violates any applicable siting, design and construction, or closure provisions of 9 VAC 20-81-320, 9 VAC 20-81-330, or 9 VAC 20-81-360, respectively, the owner or operator of the facility will be considered to be operating an unpermitted facility as provided for in 9 VAC 20-81-45 of the VSWMR and shall be required to either obtain a new permit as required by Part V [9 VAC 20-81-400, *et seq.*] or close under Part III [9 VAC 20-81-100, *et seq.*] or IV [9 VAC 20-81-300, *et seq.*] of these regulations, as applicable.

IV. TERMINATION

The Director shall terminate permit-by-rule and shall require closure of the facility whenever he finds that:

a. As a result of changes in key personnel, the requirements necessary for a permit-by-rule are no longer satisfied;

b. The applicant has knowingly or willfully misrepresented or failed to disclose a material fact in his disclosure statement, or any other report or certification required under this regulation, or has knowingly or willfully failed to notify the Director of any material change to the information in the disclosure statement;

c. Any key personnel have been convicted of any of the crimes listed in § 10.1-1409 of the Code of Virginia, punishable as felonies under the laws of the Commonwealth or the equivalent of them under the laws of any other jurisdiction; or have been adjudged by an administrative agency or a court of competent jurisdiction to have violated the environmental protection laws of the United States, the Commonwealth or any other state and the Director determines that such conviction or adjudication is sufficiently probative of the permittee's inability or unwillingness to operate the facility in a lawful manner.

d. The operation of the facility is inconsistent with the facility's operations manual and/or the operational requirements of the regulations.

V. CERTIFIED OPERATOR

In accordance with the Virginia Waste Management Act (Title 10.1, Chapter 14 of the Code of Virginia), § 10.1-1408.2, this facility must employ a facility operator licensed by the Board of Waste Management Facility Operators (Licensing Regulations, 18 VAC 155-20-10 *et seq.*).

VI. RIGHT OF APPEAL

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have 30 days from the date of the service of this decision to initiate an appeal of this decision, by filing notice with:

David K. Paylor, Director
Virginia Department of Environmental Quality
ATTN: Office of Waste Permitting & Compliance
Post Office Box 1105
Richmond, Virginia 23218

In the event this decision is served to you by mail, three days will be added to that period. Please refer to Part Two of the rules of the Supreme Court of Virginia, which describes the required content of the Notice of Appeal, including specification of the Circuit Court to which the appeal is taken, and additional requirements governing appeals from decisions of administrative agencies.

ATTACHMENT II
FACILITY DESCRIPTION

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF LAND PROTECTION & REVITALIZATION
OFFICE OF WASTE PERMITTING & COMPLIANCE
Permit-By-Rule #002

Facility Name: Tazewell County Transfer Station – Cedar Bluff

Facility Type: Transfer Station **Latitude:** 37°04'54" North

Site Location: Tazewell County **Longitude:** 81°45'15" West

Location Description: The facility is located at 193 Cedar Valley Drive, Cedar Bluff in the County of Tazewell. Access is provided by an all-weather access paved road connecting to State Route 460.

Background: The facility is owned and operated by Tazewell County. The facility consists of an office, waste roll-off trailer with compactor, tire roll-off container, bulk goods roll-off container, recycling bins, oil storage, and a leachate collection tank. Normal operating procedure entails receipt of residential and commercial municipal waste from the Towns of Richlands and Cedar Bluff from both private and private collection and hauling services for compaction and bulk transportation and disposal at the Tazewell County Landfill. Unacceptable waste shall be segregated for refusal or separate disposal prior to acceptance. A full list of acceptable and unacceptable waste may be found in the Operations Manual. Leachate and spray down are collected in a 500 gallon leachate storage tank for offsite haul and disposal at the Town of Tazewell STW.

This facility has a process rate of 80 tons per day of municipal waste. The hours of operation for the facility are Monday – Saturday 8:00 AM to 4:30 PM.

Submission Highlights: The Department is in receipt of DEQ Form PBR signed by C. Eric Young, Tazewell County Administrator, on December 11, 2019. The following documents comprise the Permit-by-Rule submittal:

A. A notice of intent dated September 27, 1993 with area and site location maps. A notarized disclosure statement have been provided during the period of its operation. A local government certification was previously submitted. These documents are in accordance with 9 VAC 20-81-450.B., and are required submissions under 9 VAC 20-81-410.A.2.a. and 9 VAC 20-81-410.A.2.c.

B. A document signed by Robert Roberts, PE of Olver, Inc. dated May 28, 1993 certifying that the facility conforms to the siting standards of 9 VAC 20-81-320. This is a required submission in accordance with 9 VAC 20-81-410.A.2.b.

C. A document signed by Robert Roberts, PE of Olver, Inc. dated May 28, 1993 certifying that the facility has an operations manual that conforms to the standards of 9 VAC 20-81-340. This is a required submission in accordance with 9 VAC 20-81-410.A.2.d.

D. A document signed by Robert Roberts, PE of Olver, Inc. dated May 28, 1993 certifying that the facility has been designed and constructed in accordance with the standards of 9 VAC 20-81-330. This is a required submission in accordance with 9 VAC 20-81-410.A.2.e.(1).

E. A document signed by Robert Roberts, PE of Olver, Inc. dated May 28, 1993 certifying that the facility has a closure plan that conforms to the standards of 9 VAC 20-81-360. This is a required submission in accordance with 9 VAC 20-81-410.A.2.e.(2).

F. A copy of deed or lease demonstrating Tazewell County has legal control over the site. This is a required submission under 9 VAC 20-81-410.A.2.f.

G. The cost estimate for facility closure is $11,526, which covers the design throughput of 80 tons. Financial Assurance in the amount of $571 has been provided in the form of a local government financial test and was previously approved by the Office of Financial Assurance. The Financial Assurance will be required to be updated in the next cycle. This is a required submission in accordance with 9 VAC 20-81-410.A.2.h.

H. Public participation documents which resulted from the public participation effort, in accordance with 9 VAC 20-81-410.A.3. The advertisement of the public meeting was published in the Bluefield Daily Telegraph newspaper on March 24, 1993. The public meeting was held on April 12, 1993. The public comment period closed on April 22, 1993. No public comments were received. This is a required submission in accordance with 9 VAC 20-81-410.A.2.i.

I. This facility is considered a transfer station as it does not meet the definition of a convenience center as defined under 9 VAC 20-81-10.

J. No permit application fee required as this was an Agency initiated update.

Storm water

Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

SOUTHWEST REGIONAL OFFICE
355-A Deadmore Street, Abingdon, Virginia 24210
(276) 676-4800 FAX (276) 676-4899
www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director
(804) 698-4000

Jeffrey Hurst
Regional Director

September 27, 2019

Mr. Kenneth Dunford, Interim Director of Engineering
Tazewell County Sanitary Landfill
2475 Lynn Hollow Road
North Tazewell, VA 24630

Sent via email: jwhite@labellapc.com

RE: Coverage under the VPDES General Permit Regulation for Discharges of Stormwater Associated with Industrial Activity, Registration # VAR051267

Dear Mr. Dunford:

We have reviewed your Registration Statement received on May 1, 2019. Because you submitted a timely registration statement, your coverage under the 2014 permit was administratively continued. We have determined that stormwater discharges from the above facility are hereby covered under the referenced VPDES general permit. Your coverage under this permit is effective as of the date of this letter. The enclosed copy of the general permit contains the applicable stormwater pollution prevention plan (SWPPP), sector specific requirements, monitoring requirements, and other conditions of coverage.

The general permit requires that you update your Stormwater Pollution Prevention Plan (SWPPP) within 90-days of your date of coverage under the permit to incorporate the SWPPP changes that the Department made for this permit reissuance.

For this reissuance, all permit discharge monitoring is semi-annual (i.e., once per six months) unless otherwise directed by the Department. As noted above, your facility's permit coverage has been administratively continued under the 2014 Industrial Stormwater General Permit. As such, your facility is responsible for continuing the monitoring required by the 2014 Industrial Stormwater General Permit during the July 1, 2019 through December 31, 2019 monitoring period. These monitoring results must be submitted to DEQ through the e-DMR system and are due no later than January 10, 2020. Monitoring for your facility under the requirements of the 2019 Industrial Stormwater General Permit begins with the January 1, 2020 through June 30, 2020 monitoring period to be submitted through e-DMR no later than July 10, 2020.

Monitoring results shall be reported in the department's electronic discharge monitoring report (e-DMR) system. All reports and forms submitted in compliance with this permit shall be submitted electronically

by the permittee in accordance with 9VAC25-31-1020. A Discharge Monitoring Report (DMR) form is included in the reissuance package as a courtesy copy. Answers to frequently asked questions and the e-DMR registration process can be located at the following website:

https://www.deq.virginia.gov/Programs/Water/PermittingCompliance/ElectronicDMRsubmissions.aspx

The following discharge monitoring applies to your facility:

- Benchmark Monitoring. Specific stormwater monitoring for your facility based on the industrial sectors that apply to your facility. Refer to the permit Part I A 1 b for the benchmark monitoring requirements, and the sector specific sections for the benchmark monitoring applicable to your facility.

- Impaired Waters Monitoring – Waters With An Approved TMDL (other than PCBs or ChesBay). Your facility has been identified as discharging the pollutant of concern to an impaired waterbody that has an approved Total Maximum Daily Load (TMDL) wasteload allocation. As such, you are required to modify your SWPPP to implement best management practices (BMPs) designed to meet the allocation in the TMDL. The TMDL contains a specific wasteload allocation for your facility that is equivalent to a concentration of 100 mg/L of total suspended solids in the stormwater discharge. Therefore, you are required to monitor your stormwater discharges for the TMDL pollutant of concern. Refer to the permit Part I A 1 c (3) for TMDL monitoring requirements, and permit Special Condition # 7a (permit Part I B 7 a) regarding TMDL requirements. Copies of the TMDL Final Report are available upon request.

This general permit will expire on June 30, 2024. The permit requires that you submit a new registration statement at least 60 days prior to that date if you wish continued coverage under the general permit, unless permission for a later date has been granted by the Board. Permission cannot be granted to submit the registration statement after the expiration date of the permit.

If you have any questions, please feel free to contact David Nishida at david.nishida@deq.virginia.gov or (276) 676-4864.

Sincerely,

Mark S. Trent
Water Permit Manager

Copy: DEQ File 6001-2

Attachments: VPDES Industrial Stormwater General Permit
Courtesy copy of DMR

PERMITTED FACILITY

Tazewell County Landfill

2475 Lynn Hollow Rd, North Tazewell VA 24630

Permit Number: VAR051267

No Discharge: ☐

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

INDUSTRIAL STORMWATER
DISCHARGE MONITORING REPORT (DMR)

	MONITORING PERIOD						
	YEAR	MO	DAY		YEAR	MO	DAY
FROM				TO			

RETURN TO

Department of Environmental Quality
Southwest Regional Office
355-A Deadmore Street, Abingdon VA 24210
(276) 676-4800

NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM AND RETURNING IT.

Outfall Num: 001 **Reporting Frequency: Semi-Annual** **Type: BENCHMARK_MONITORING**

Run Date: Sep 27, 2019

PARAMETER		QUALITY OR CONCENTRATION				NO. EX.	SAMPLE TYPE
		MINIMUM	AVERAGE	MAXIMUM	UNITS		
004 TSS	REPORTD	*********	*********				
	REQRMNT	*********	*********	100	MG/L		GRAB

STORM EVENT INFORMATION

DATE			DURATION		RAINFALL TOTAL (IN.)	PRECEDING	
YEAR	MO	DAY	HOURS	MIN		Days	Hours

Benchmark Monitoring:

Comments:

PERMITTED FACILITY

Tazewell County Landfill

2475 Lynn Hollow Rd, North Tazewell VA 24630

Permit Number: VAR051267

No Discharge: ☐

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY

INDUSTRIAL STORMWATER
DISCHARGE MONITORING REPORT (DMR)

	MONITORING PERIOD						
	YEAR	MO	DAY		YEAR	MO	DAY
FROM				TO			

RETURN TO

Department of Environmental Quality

Southwest Regional Office

355-A Deadmore Street, Abingdon VA 24210

(276) 676-4800

NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM AND RETURNING IT.

Outfall Num: 001 **Reporting Frequency: Semi-Annual** **Type: TMDL_MONITORING**

Run Date: Sep 27, 2019

PARAMETER		QUALITY OR CONCENTRATION				NO. EX.	SAMPLE TYPE
		MINIMUM	AVERAGE	MAXIMUM	UNITS		
004 TSS	REPORTD	*********	*********				
	REQRMNT	*********	*********	100	MG/L		GRAB

STORM EVENT INFORMATION

DATE			DURATION		RAINFALL TOTAL (IN.)	PRECEDING	
YEAR	MO	DAY	HOURS	MIN		Days	Hours

TMDL Monitoring:

Comments:

This report is ;ed by your VPDES permit and by law. (See, e.g., the Code of Virginia of 1950 §62. and 9 VAC 25-31-50.) Failure to report or failure to report truthfully can result in civ)alties of $32,500 per violation, per day and felony prosecutions which can carry a 15 year term.

DISCHARGE MONITORING REPORT (DMR) - GENERAL INSTRUCTIONS

1. Complete this form in permanent ink or indelible pencil. The use of 'correction fluids/tape' is not allowed.
2. Enter a check mark or otherwise indicate the appropriate "Monitoring Period" when sampling occurred.
3. For those parameters where the "REQUIREMENT" spaces have a reporting requirement or limitation, provide data in the "REPORTED" spaces in accordance with your permit.
4. Enter maximum concentration and units in the "REPORTED" spaces in the appropriate column under the header of "Concentration".
5. For all parameters enter the number of samples which do not comply with the minimum or maximum permit requirement in the "REPORTED" space in the column marked "No. Ex." (Number of Exceedances). If none, enter "0". Do NOT include monthly average violations in this field.
6. You are required to sample (at a minimum) according to the Sample Frequencies and Sample Types specified in your permit. If you sample more often than the Sample Frequency specified in your permit then all data must be used when completing the DMR.
7. Enter the actual type of sample (Grab, 8HC, 24HC, etc) collected for each parameter in the "REPORTED" space in the column marked "Sample Type".
8. Storm Event Information (i.e., a "measurable storm event" is a storm event that results in an actual discharge from the site, providing the interval from the preceding measurable Storm event is at least 72 hours):
    1. Enter the date (Year/Month/Day) of the "measurable storm event"
    2. Enter the duration (hours and minutes) of "measurable storm event"
    3. Enter the rainfall total (inches) of the "measurable storm event"
    4. Enter the number of days and hours from the preceding "measurable storm event"
9. The principal executive officer then reviews the form and must sign in the space provided and provide a telephone number where he/she can be reached. Enter the date (Year/Month/Day) the DMR was signed. The final page of the DMR must have an original signature and date.
10. Send the completed form(s) with original signatures to your Department of Environmental Quality Regional Office by the 10th of month following the monitoring period.
11. You are required to retain a copy of the report for your records.

PERMITTED FACILITY
Tazewell County Landfill
2475 Lynn Hollow Rd, North Tazewell VA 24630
Permit Number: VAR051267

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
INDUSTRIAL STORMWATER
DISCHARGE MONITORING REPORT (DMR)

RETURN TO
Department of Environmental Quality
Southwest Regional Office
355-A Deadmore Street, Abingdon VA 24210
(276) 676-4800
NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM AND RETURNING IT.

I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS TO THE BEST OF MY KNOWLEDGE AND BELIEF TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS.

BYPASS AND OVERFLOWS		
TOTAL OCCURRENCES	TOTAL FLOW(M.G.)	TOTAL BOD5(K.G.)

OPERATOR IN RESPONSIBLE CHARGE			DATE		
TYPED OR PRINTED NAME	SIGNATURE	CERTIFICATE NO.	YEAR	MO.	DAY
PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT		TELEPHONE			
TYPED OR PRINTED NAME	SIGNATURE		YEAR	MO.	DAY

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

General Permit Registration No.: VAR051267
Effective Date: July 1, 2019
Expiration Date: June 30, 2024

VPDES GENERAL PERMIT FOR STORMWATER DISCHARGES
ASSOCIATED WITH INDUSTRIAL ACTIVITY

AUTHORIZATION TO DISCHARGE UNDER THE VIRGINIA POLLUTANT DISCHARGE
ELIMINATION SYSTEM AND THE VIRGINIA STATE WATER CONTROL LAW

In compliance with the provisions of the Clean Water Act, as amended, and pursuant to the State Water Control Law and regulations adopted pursuant thereto, owners of facilities with stormwater discharges associated with industrial activity are authorized to discharge to surface waters within the boundaries of the Commonwealth of Virginia, except those waters specifically named in board regulation that prohibit such discharges.

The authorized discharge shall be in accordance with this cover page, the registration statement, Part I-Effluent Limitations, Monitoring Requirements and Special Conditions, Part II-Conditions Applicable to All VPDES Permits, Part III-Stormwater Pollution Prevention Plan, and Part IV-Sector-Specific Permit Requirements, as set forth in this general permit.

Part I. Effluent Limitations, Monitoring Requirements and Special Conditions

A. Effluent limitations and monitoring requirements.

There are four individual and separate categories of monitoring requirements that a facility may be subject to under this permit: (i) quarterly visual monitoring; (ii) benchmark monitoring of discharges associated with specific industrial activities; (iii) compliance monitoring for discharges subject to numerical effluent limitations; and (iv) monitoring of discharges to impaired waters, both those with an approved TMDL and those without an approved TMDL. The monitoring requirements and numeric effluent limitations applicable to a facility depend on the types of industrial activities generating stormwater runoff from the facility, and for TMDL monitoring, the location of the facility's discharge or discharges. Part IV of the permit (9VAC25-151-90 et seq.) identifies monitoring requirements applicable to specific sectors of industrial activity. The permittee shall review Part I A 1 and Part IV of the permit to determine which monitoring requirements and numeric limitations apply to his facility. Unless otherwise specified, limitations and monitoring requirements under Part I A 1 and Part IV are additive.

Sector-specific monitoring requirements and limitations are applied discharge by discharge at facilities with colocated activities. Where stormwater from the colocated activities are commingled, the monitoring requirements and limitations are additive. Where more than one numeric limitation for a specific parameter applies to a discharge, compliance with the more restrictive limitation is required. Where benchmark, numerical effluent limitations, or TMDL monitoring requirements for a monitoring period overlap, the permittee may use a single sample to satisfy monitoring requirements.

1. Types of monitoring requirements and limitations.
   a. Quarterly visual monitoring. The requirements and procedures for quarterly visual monitoring are applicable to all facilities covered under this permit, regardless of the facility's sector of industrial activity.
      (1) The permittee shall perform and document a quarterly visual examination of a stormwater discharge associated with industrial activity from each outfall, except discharges exempted in Part I A 3 or Part I A 4. The examinations shall be made at least once in each of the following three-month periods: January through March, April through June, July through September, and October through December. The visual examination shall be made during normal working hours, where practicable, and when considerations for safety and feasibility allow. If no storm event resulted in runoff from the facility during a monitoring quarter, the permittee is excused from visual monitoring for that quarter provided that documentation is included with the monitoring records indicating that no runoff occurred. The documentation shall be signed and certified in accordance with Part II K of this permit.
      (2) Samples shall be collected in accordance with Part I A 2. Sample examination shall document observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of stormwater pollution. The visual examination of the sample shall be conducted in a well-lit area. No analytical tests are required to be performed on the samples.
      (3) The visual examination reports shall be maintained on-site with the SWPPP. The report shall include the outfall location, the examination date and time, examination personnel, the nature of the discharge (i.e., runoff or snow melt), visual quality of the stormwater discharge (including observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other obvious indicators of stormwater pollution), and probable sources of any observed stormwater contamination.

b. Benchmark monitoring of discharges associated with specific industrial activities.

Table 70-1 identifies the specific industrial sectors subject to the benchmark monitoring requirements of this permit and the industry-specific pollutants of concern. The permittee shall refer to the tables found in the individual sectors in Part IV (9VAC25-151-90 et seq.) for benchmark monitoring concentration values. Colocated industrial activities at the facility that are described in more than one sector in Part IV shall comply with all applicable benchmark monitoring requirements from each sector.

The results of benchmark monitoring are primarily for the permittee to use to determine the overall effectiveness of the SWPPP in controlling the discharge of pollutants to receiving waters. Benchmark concentration values, included in Part IV of this permit, are not effluent limitations. Exceedance of a benchmark concentration does not constitute a violation of this permit and does not indicate that violation of a water quality standard has occurred; however, it does signal that modifications to the SWPPP are necessary, unless justification is provided in a routine facility inspection. In addition, exceedance of benchmark concentrations may identify facilities that would be more appropriately covered under an individual, or alternative general permit where more specific pollution prevention controls could be required.

TABLE 70-1
INDUSTRIAL SECTORS SUBJECT TO BENCHMARK MONITORING

Industry Sector[1]	SIC Code or Activity Code	Benchmark Monitoring Parameters
L	LF (Landfills, Land Application Sites, and Open Dumps)	TSS.

[1] Table does not include parameters for compliance monitoring under effluent limitations guidelines.

(1) Benchmark monitoring shall be performed for all benchmark parameters specified for the industrial sector or sectors applicable to a facility's discharge. Monitoring shall be performed at least once during each of the first four, and potentially all, monitoring periods after coverage under the permit begins. Monitoring commences with the first full monitoring period after the owner is granted coverage under the permit. Monitoring periods are specified in Part I A 2.

Depending on the results of four consecutive monitoring periods, benchmark monitoring may not be required to be conducted in subsequent monitoring periods (see Part I A 1 b (2)).

(2) Benchmark monitoring waivers for facilities testing below benchmark concentration values. Waivers from benchmark monitoring are available to facilities whose discharges are below benchmark concentration values on an outfall by outfall basis. Sector-specific benchmark monitoring is not required to be conducted in subsequent monitoring periods during the term of this permit provided:

(a) Samples were collected in four consecutive monitoring periods, and the average of the four samples for all parameters at the outfall is below the applicable benchmark concentration value in Part IV. Facilities that were covered under the 2014 industrial stormwater general permit may use sampling data from the last two monitoring periods of that permit and the first two monitoring periods of this permit to satisfy the four consecutive monitoring periods requirement;

(b) The facility is not subject to a numeric effluent limitation established in Part I A 1 c (1) (stormwater effluent limitations), Part I A 1 c (2) (coal pile runoff), or Part IV (Sector Specific Permit Requirements) for any of the parameters at that outfall; and

(c) A waiver request is submitted to and approved by the board. The waiver request shall be sent to the appropriate DEQ regional office, along with the supporting monitoring data for four consecutive monitoring periods, and a certification that, based on current potential pollutant sources and control measures used, discharges from the facility are reasonably expected to be essentially the same (or cleaner) compared to when the benchmark monitoring for the four consecutive monitoring periods was done.

Waiver requests will be evaluated by the board based upon (i) benchmark monitoring results below the benchmark concentration values; (ii) a favorable compliance history (including inspection results); and (iii) no outstanding enforcement actions.

The monitoring waiver may be revoked by the board for cause. The permittee will be notified in writing that the monitoring waiver is revoked, and that the benchmark monitoring requirements are again in force and will remain in effect until the permit's expiration date.

(3) Samples shall be collected and analyzed in accordance with Part I A 2. Monitoring results shall be reported in accordance with Part I A 5 and Part II C and retained in accordance with Part II B.

c. Compliance monitoring for discharges subject to numerical effluent limitations or discharges to impaired waters.

(1) Facilities subject to stormwater effluent limitation guidelines.

(a) Facilities subject to stormwater effluent limitation guidelines (see Table 70-2) are required to monitor such discharges to evaluate compliance with numerical effluent limitations. Industry-specific numerical limitations and compliance monitoring requirements are described in Part IV of the permit (9VAC25-151-90 et seq.). Permittees with colocated industrial activities at the facility that are described in more than one sector in Part IV shall comply on a discharge-by-discharge basis with all applicable effluent limitations from each sector.

(b) Permittees shall monitor the discharges for the presence of the pollutant subject to the effluent limitation at least once during each of the monitoring periods after coverage under the permit begins. Monitoring commences with the first full monitoring period after the owner is granted coverage under the permit. Monitoring periods are specified in Part I A 2. The substantially identical outfall monitoring provisions (Part I A 2 f) are not available for numeric effluent limits monitoring.

(c) Samples shall be collected and analyzed in accordance with Part I A 2. Monitoring results shall be reported in accordance with Part I A 5 and Part II C, and retained in accordance with Part II B.

TABLE 70-2 STORMWATER-SPECIFIC EFFLUENT LIMITATION GUIDELINES	
Runoff from landfills (40 CFR Part 445, Subpart A and B (established January 19, 2000))	K and L

(2) Facilities subject to coal pile runoff monitoring.

(a) Facilities with discharges of stormwater from coal storage piles shall comply with the limitations and monitoring requirements of Table 70-3 for all discharges containing the coal pile runoff, regardless of the facility's sector of industrial activity.

(b) Permittees shall monitor such stormwater discharges at least once during each of the monitoring periods after coverage under the permit begins. Monitoring commences with the first full monitoring period after the owner is granted coverage under the permit. Monitoring periods are specified in Part I A 2. The substantially identical outfall monitoring provisions (Part I A 2 f) are not available for coal pile numeric effluent limits monitoring.

(c) The coal pile runoff shall not be diluted with other stormwater or other flows in order to meet this limitation.

(d) If a facility is designed, constructed and operated to treat the volume of coal pile runoff that is associated with a 10-year, 24-hour rainfall event, any untreated overflow of coal pile runoff from the treatment unit is not subject to the 50 mg/L limitation for total suspended solids.

(e) Samples shall be collected and analyzed in accordance with Part I A 2. Monitoring results shall be reported in accordance with Part I A 5 and Part II C, and retained in accordance with Part II B.

TABLE 70-3
NUMERIC LIMITATIONS FOR COAL PILE RUNOFF

Parameter	Limit	Monitoring Frequency	Sample Type
Total Suspended Solids (TSS)	50 mg/l, max.	1/6 months	Grab
pH	6.0 min. - 9.0 max.	1/6 months	Grab

(3) Facilities discharging to an impaired water with an approved TMDL wasteload allocation. Owners of facilities that are a source of the specified pollutant of concern to waters for which a TMDL wasteload allocation has been approved prior to the term of this permit will be notified as such by the department when they are approved for coverage under the general permit.

(a) Upon written notification from the department, facilities subject to TMDL wasteload allocations shall be required to monitor such discharges to evaluate compliance with the TMDL requirements.

(b) Permittees shall monitor the discharges for the pollutant subject to the TMDL wasteload allocation once every six months after coverage under the permit begins, unless otherwise determined by the department for polychlorinated biphenyls (PCBs). Monitoring commences with the first full monitoring period after the owner is granted coverage under the permit. Monitoring periods are specified in Part I A 2.

(c) Samples shall be collected and analyzed in accordance with Part I A 2. Monitoring results shall be reported in accordance with Part I A 5 and Part II C, and retained in accordance with Part II B.

(d) If the pollutant subject to the TMDL wasteload allocation is below the quantitation level in all of the samples from the first four monitoring periods (i.e., the first two years of coverage under the permit), the permittee may request to the board in writing that further sampling be discontinued, unless the TMDL has specific instructions to the contrary (in which case those instructions shall be followed). The laboratory certificate of analysis shall be submitted with the request. If approved, documentation of this shall be kept with the SWPPP.

If the pollutant subject to the TMDL wasteload allocation is above the quantitation level in any of the samples from the first four monitoring periods, the permittee shall continue the scheduled TMDL monitoring throughout the term of the permit.

(4) Facilities discharging to an impaired water without an approved TMDL wasteload allocation.
Owners of facilities that discharge to waters listed as impaired in the 2016 Final 305(b)/303(d) Water Quality Assessment Integrated Report, and for which a TMDL wasteload allocation has not been approved prior to the term of this permit, will be notified as such by the department when they are approved for coverage under the general permit.

(a) Upon written notification from the department, facilities discharging to an impaired water without an approved TMDL wasteload allocation shall be required to monitor such discharges for the pollutants that caused the impairment.

(b) Permittees shall monitor the discharges for all pollutants for which the waterbody is impaired, and for which a standard analytical method exists, at least once during each of the monitoring periods after coverage under the permit begins. Monitoring commences with the first full monitoring period after the owner is granted coverage under the permit. Monitoring periods are specified in Part I A 2.

(c) If the pollutant for which the waterbody is impaired is suspended solids, turbidity, or sediment, or sedimentation, monitor for total suspended solids (TSS). If the pollutant for which the waterbody is impaired is expressed in the form of an indicator or surrogate pollutant, monitor for that indicator or surrogate pollutant. No monitoring is required when a waterbody's biological communities are impaired but no pollutant, including indicator or surrogate pollutants, is specified as causing the impairment, or when a waterbody's impairment is related to hydrologic modifications, impaired hydrology, or temperature.

Samples shall be collected and analyzed in accordance with Part I A 2. Monitoring results shall be reported in accordance with Part I A 5 and Part II C, and retained in accordance with Part II B.

(d) If the pollutant for which the water is impaired is below the quantitation level in the discharges from the facility, or it is above the quantitation level but its presence is caused solely by natural background sources, the permittee may request to the board in writing that further impaired water monitoring be discontinued. The laboratory certificate of analysis shall be submitted with the request. If approved, documentation of this shall be kept with the SWPPP.

To support a determination that the pollutant's presence is caused solely by natural background sources, the following documentation shall be submitted with the request and kept with the SWPPP: (i) an explanation of why it is believed that the presence of the impairment pollutant in the facility's discharge is not related to the activities at the facility; and (ii) data or studies that tie the presence of the impairment pollutant in the facility's discharge to natural background sources in the watershed. Natural background pollutants include those substances that are naturally occurring in soils or groundwater. Natural background pollutants do not include legacy pollutants from earlier activity at the facility's site, or pollutants in run-on from neighboring sources that are not naturally occurring.

2. Monitoring instructions.
   a. Collection and analysis of samples. Sampling requirements shall be assessed on an outfall by outfall basis. Samples shall be collected and analyzed in accordance with the requirements of Part II A.

b. When and how to sample. A minimum of one grab sample shall be taken from the discharge associated with industrial activity resulting from a storm event that results in a discharge from the site (defined as a "measurable storm event"), providing the interval from the preceding measurable storm event is at least 72 hours. The 72-hour storm interval is waived if the permittee is able to document that less than a 72-hour interval is representative for local storm events during the sampling period. In the case of snowmelt, the monitoring shall be performed at a time when a measurable discharge occurs at the site. For discharges from a stormwater management structure, the monitoring shall be performed at a time when a measurable discharge occurs from the structure.

   The grab sample shall be taken during the first 30 minutes of the discharge. If it is not practicable to take the sample during the first 30 minutes, the sample may be taken during the first three hours of the discharge, provided that the permittee explains why a grab sample during the first 30 minutes was impracticable. This information shall be submitted in the department's electronic discharge monitoring report (e-DMR) system, and maintained with the SWPPP. If the sampled discharge commingles with process or nonprocess water, the permittee shall attempt to sample the stormwater discharge before it mixes with the nonstormwater.

c. Storm event data. For each monitoring event (except snowmelt monitoring), along with the monitoring results, the permittee shall identify the date and duration (in hours) of the storm events sampled; rainfall total (in inches) of the storm event that generated the sampled runoff; and the duration between the storm event sampled and the end of the previous measurable storm event. For snowmelt monitoring, the permittee shall identify the date of the sampling event.
d. Monitoring periods.
   (1) Quarterly visual monitoring. The quarterly visual examinations shall be made at least once in each of the following three-month periods each year of permit coverage: January through March, April through June, July through September, and October through December.
   (2) Benchmark monitoring, effluent limitation monitoring, and impaired waters monitoring (for waters both with and without an approved TMDL). Monitoring shall be conducted at least once in each of the following semiannual periods each year of permit coverage: January through June, and July through December.
e. Documentation explaining a facility's inability to obtain a sample (including dates and times the outfalls were viewed or sampling was attempted), of no rain event, or of deviation from the "measurable" storm event requirements shall be maintained with the SWPPP. Acceptable documentation includes National Climatic Data Center (NCDC) weather station data, local weather station data, facility rainfall logs, and other appropriate supporting data.
f. Representative outfalls - substantially identical discharges. If the facility has two or more outfalls that discharge substantially identical effluents, based on similarities of the industrial activities, significant materials, size of drainage areas, and stormwater management practices occurring within the drainage areas of the outfalls, frequency of discharges, and stormwater management practices occurring within the drainage areas of the outfalls, the permittee may conduct monitoring on the effluent of just one of the outfalls and report that the observations also apply to the substantially identical outfall or outfalls. The substantially identical outfall monitoring provisions apply to quarterly visual monitoring, benchmark monitoring, and impaired waters monitoring (both those with and without an approved TMDL). The substantially identical outfall monitoring provisions are not available for numeric effluent limits monitoring.
   The permittee shall include the following information in the SWPPP:

(1) The locations of the outfalls;
(2) An evaluation, including available monitoring data, indicating the outfalls are expected to discharge substantially identical effluents, including evaluation of monitoring data where available; and
(3) An estimate of the size of each outfall's drainage area in acres.

3. Adverse climatic conditions waiver. When adverse weather conditions prevent the collection of samples, a substitute sample may be taken during a qualifying storm event in the next monitoring period. Adverse weather conditions are those that are dangerous or create inaccessibility for personnel, and may include such things as local flooding, high winds, electrical storms, or situations that otherwise make sampling impracticable, such as drought or extended frozen conditions. Unless specifically stated otherwise, this waiver may be applied to any monitoring required under this permit. Narrative documentation of conditions necessitating the use of the waiver shall be kept with the SWPPP.

4. Inactive and unstaffed sites (including temporarily inactive sites).
   a. A waiver of the quarterly visual monitoring, routine facility inspections, and monitoring requirements (including benchmark, effluent limitation, and impaired waters monitoring) may be granted by the board at a facility that is both inactive and unstaffed, as long as the facility remains inactive and unstaffed and there are no industrial materials or activities exposed to stormwater. The owner of such a facility is only required to conduct an annual routine site inspection in accordance with the requirements in Part III B 5.
   b. An inactive and unstaffed sites waiver request shall be submitted to the board for approval and shall include the name of the facility; the facility's VPDES general permit registration number; a contact person, phone number and email address; the reason for the request; and the date the facility became or will become inactive and unstaffed. The waiver request shall be signed and certified in accordance with Part II K. If this waiver is granted, a copy of the request and the board's written approval of the waiver shall be maintained with the SWPPP.
   c. If circumstances change and industrial materials or activities become exposed to stormwater, or the facility becomes either active or staffed, the permittee shall notify the department within 30 days, and all quarterly visual monitoring, routine facility inspections, and monitoring requirements shall be resumed immediately.
   d. The board retains the right to revoke this waiver when it is determined that the discharge is causing, has a reasonable potential to cause, or contributes to a water quality standards violation.
   e. Inactive and unstaffed facilities covered under Sector G (Metal Mining) and Sector H (Coal Mines and Coal Mining-Related Facilities) are not required to meet the "no industrial materials or activities exposed to stormwater" standard to be eligible for this waiver, consistent with the conditional exemption requirements established in Part IV Sector G and Part IV Sector H.

5. Reporting monitoring results.
   a. Reporting to the department. The permittee shall follow the reporting requirements and deadlines below for the types of monitoring that apply to the facility:

TABLE 70-4 MONITORING REPORTING REQUIREMENTS	
Semiannual Monitoring	Submit the results by January 10 and by July 10.
Quarterly Visual Monitoring	Retain results with SWPPP - do not submit unless requested to do so by the department.

Permittees shall submit results for each outfall associated with industrial activity according to the requirements of Part II C.

b. Significant digits. The permittee shall report at least the same number of significant digits as a numeric effluent limitation or TMDL wasteload allocation for a given parameter; otherwise, at least two significant digits shall be reported for a given parameter. Regardless of the rounding convention used by the permittee (i.e., five always rounding up or to the nearest even number), the permittee shall use the convention consistently and shall ensure that consulting laboratories employed by the permittee use the same convention.

6. Corrective actions.
   a. Data exceeding benchmark concentration values.
      (1) If the benchmark monitoring result exceeds the benchmark concentration value for that parameter, the permittee shall review the SWPPP and modify it as necessary to address any deficiencies that caused the exceedance. Revisions to the SWPPP shall be completed within 60 days after an exceedance is discovered. When control measures need to be modified or added (distinct from regular preventive maintenance of existing control measures described in Part III C), implementation shall be completed before the next anticipated storm event if possible, but no later than 60 days after the exceedance is discovered, or as otherwise provided or approved by the department. In cases where construction is necessary to implement control measures, the permittee shall include a schedule in the SWPPP that provides for the completion of the control measures as expeditiously as practicable, but no later than three years after the exceedance is discovered. Where a construction compliance schedule is included in the SWPPP, the SWPPP shall include appropriate nonstructural and temporary controls to be implemented in the affected portions of the facility prior to completion of the permanent control measure. Any control measure modifications shall be documented and dated, and retained with the SWPPP, along with the amount of time taken to modify the applicable control measures or implement additional control measures.
      (2) Natural background pollutant levels. If the concentration of a pollutant exceeds a benchmark concentration value, and the permittee determines that exceedance of the benchmark is attributable solely to the presence of that pollutant in the natural background, corrective action is not required provided that:
         (a) The concentration of the benchmark monitoring result is less than or equal to the concentration of that pollutant in the natural background;
         (b) The permittee documents and maintains with the SWPPP the supporting rationale for concluding that benchmark exceedances are in fact attributable solely to natural background pollutant levels. The supporting rationale shall include any data previously collected by the facility or others (including literature studies) that describe the levels of natural background pollutants in the facility's stormwater discharges; and
         (c) The permittee notifies the department on the benchmark monitoring DMR that the benchmark exceedances are attributable solely to natural background pollutant levels.

         Natural background pollutants include those substances that are naturally occurring in soils or groundwater. Natural background pollutants do not include legacy pollutants from earlier activity on the facility's site, or pollutants in run-on from neighboring sources that are not naturally occurring.
   b. Corrective actions. The permittee shall take corrective action whenever:
      (1) Routine facility inspections, inspections by local, state or federal officials, or any other process, observation or event result in a determination that modifications to the stormwater control measures are necessary to meet the permit requirements;
      (2) There is any exceedance of an effluent limitation (including coal pile runoff), TMDL wasteload allocation, or a reduction required by a local ordinance established by a municipality to meet Chesapeake Bay TMDL requirements; or

(3) The department determines, or the permittee becomes aware, that the stormwater control measures are not stringent enough for the discharge to meet applicable water quality standards.

The permittee shall review the SWPPP and modify it as necessary to address any deficiencies. Revisions to the SWPPP shall be completed within 60 days following the discovery of the deficiency. When control measures need to be modified or added (distinct from regular preventive maintenance of existing control measures described in Part III C), implementation shall be completed before the next anticipated storm event if possible, but no later than 60 days after the deficiency is discovered, or as otherwise provided or approved by the department. In cases where construction is necessary to implement control measures, the permittee shall include a schedule in the SWPPP that provides for the completion of the control measures as expeditiously as practicable, but no later than three years after the deficiency is discovered. Where a construction compliance schedule is included in the SWPPP, the SWPPP shall include appropriate nonstructural and temporary controls to be implemented in the affected portion of the facility prior to completion of the permanent control measure. The amount of time taken to modify a control measure or implement additional control measures shall be documented in the SWPPP.

Any corrective actions taken shall be documented and retained with the SWPPP. Reports of corrective actions shall be signed in accordance with Part II K.

c. Follow-up reporting. If at any time monitoring results indicate that discharges from the facility exceed an effluent limitation or a TMDL wasteload allocation, or the department determines that discharges from the facility are causing or contributing to an exceedance of a water quality standard, immediate steps shall be taken to eliminate the exceedances in accordance with the above Part I A 6 b (Corrective actions). Within 30 calendar days of implementing the relevant corrective action, an exceedance report shall be submitted to the department. The following information shall be included in the report:
(1) General permit registration number;
(2) Facility name and address;
(3) Receiving water for each outfall exceeding an effluent limitation of TMDL wasteload allocation;
(4) Monitoring data from the event being reported;
(5) A narrative description of the situation;
(6) A description of actions taken since the event was discovered and steps taken to minimize to the extent feasible pollutants in the discharge; and
(7) A local facility contact name, email address, and phone number.

B. Special conditions.

1. Authorized nonstormwater discharges. Except as provided in this section or in Part IV (9VAC25-151-90 et seq.), all discharges covered by this permit shall be composed entirely of stormwater. The following nonstormwater discharges are authorized by this permit:
   a. Discharges from emergency firefighting activities;
   b. Fire hydrant flushings, managed in a manner to avoid an instream impact;
   c. Potable water, including water line flushings, managed in a manner to avoid an instream impact;
   d. Uncontaminated condensate from air conditioners, coolers, and other compressors and from the outside storage of refrigerated gases or liquids;
   e. Irrigation drainage;
   f. Landscape watering provided all pesticides, herbicides, and fertilizer have been applied in accordance with the approved labeling;

g. Routine external building washdown that does not use detergents or hazardous cleaning products;
h. Pavement wash waters where no detergents or hazardous cleaning products are used and no spills or leaks of toxic or hazardous materials have occurred (unless all spilled material has been removed). Pavement wash waters shall be managed in a manner to avoid an instream impact;
i. Uncontaminated groundwater or spring water;
j. Foundation or footing drains where flows are not contaminated with process materials; and
k. Incidental windblown mist from cooling towers that collects on rooftops or adjacent portions of the facility, but not intentional discharges from the cooling tower (e.g., "piped" cooling tower blowdown or drains).

All other nonstormwater discharges are not authorized and shall either be eliminated or covered under a separate VPDES permit.

2. Releases of hazardous substances or oil in excess of reportable quantities. The discharge of hazardous substances or oil in the stormwater discharges from the facility shall be prevented or minimized in accordance with the SWPPP for the facility. This permit does not authorize the discharge of hazardous substances or oil resulting from an on-site spill. This permit does not relieve the permittee of the reporting requirements of 40 CFR Part 110, 40 CFR Part 117, and 40 CFR Part 302 or § 62.1-44.34:19 of the Code of Virginia.

   Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117, or 40 CFR Part 302 occurs during a 24-hour period:
   a. The permittee is required to notify the department in accordance with the requirements of Part II G as soon as he has knowledge of the discharge;
   b. Where a release enters an MS4, the permittee shall also notify the owner of the MS4; and
   c. The SWPPP required under Part III shall be reviewed to identify measures to prevent the reoccurrence of such releases and to respond to such releases, and the SWPPP shall be modified where appropriate.

3. Colocated industrial activity. If the facility has industrial activities occurring on-site which are described by any of the activities in Part IV of the permit (9VAC25-151-90 et seq.), those industrial activities are considered to be colocated industrial activities. Stormwater discharges from colocated industrial activities are authorized by this permit, provided that the permittee complies with any and all additional SWPPP and monitoring requirements from Part IV applicable to that particular colocated industrial activity. The permittee shall be responsible for additional SWPPP and monitoring requirements applicable to the colocated industrial activity by examining the narrative descriptions of all discharges covered under this section.

4. The stormwater discharges authorized by this permit may be combined with other sources of stormwater which are not required to be covered under a VPDES permit, so long as the combined discharge is in compliance with this permit.

5. There shall be no discharge of waste, garbage, or floating debris in other than trace amounts.

6. Approval for coverage under this general permit does not relieve the permittee of the responsibility to comply with any other applicable federal, state, or local statute, ordinance, or regulation.

7. Discharges to waters subject to TMDL wasteload allocations. Owners of facilities that are a source of the specified pollutant of concern to waters for which a TMDL wasteload allocation has been approved prior to the term of this permit shall incorporate measures and controls into the SWPPP required by Part III that are consistent with the assumptions and requirements of the TMDL. The department will provide written notification to the owner that a facility is subject to the TMDL requirements. The facility's SWPPP shall specifically address any conditions or requirements included in the TMDL that are applicable to discharges from the facility. If the TMDL establishes a specific numeric wasteload allocation that applies to discharges from the facility, the owner shall perform any required monitoring in accordance with Part I A 1 c (3), and implement control measures designed to meet that allocation.

8. Discharges to waters subject to the Chesapeake Bay TMDL.
   a. Owners of facilities in the Chesapeake Bay watershed shall monitor their discharges for total suspended solids (TSS), total nitrogen (TN), and total phosphorus (TP) to characterize the contributions from their facility's specific industrial sector for these parameters. Total nitrogen is the sum of total Kjeldahl nitrogen (TKN) and nitrite + nitrate and shall be derived from the results of those tests. After the facility is granted coverage under the permit, samples shall be collected during each of the first four monitoring periods (i.e., the first two years of permit coverage). Monitoring periods are specified in Part I A 2. Samples shall be collected and analyzed in accordance with Part I A 2. Monitoring results shall be reported in accordance with Part I A 5 and Part II C, and retained in accordance with Part II B.
   b. Facilities that were covered under the 2014 industrial stormwater general permit shall comply with the following:
      (1) Facilities that submitted a Chesapeake Bay TMDL action plan that was approved by the board during the 2014 industrial stormwater general permit term shall continue to implement the approved Chesapeake Bay TMDL action plan during this permit term. An annual report shall be submitted to the department by June 30 of each year describing the progress in meeting the required reductions unless this reporting requirement is waived by the department in accordance with Part I B 8 g. Monitoring in accordance with Part I B 8 a is not required for these facilities during this permit term.
      (2) Facilities that completed four samples for TSS, TN, and TP during the 2014 industrial stormwater general permit term shall utilize the procedures in Part I B 8 c (2) to calculate their facility stormwater loads. The permittee shall submit a copy of the calculations and Chesapeake Bay TMDL action plan if required under Part I B 8 f to the department within 60 days of coverage under this general permit.
      (3) Facilities that did not complete four samples for TSS, TN, and TP during the 2014 industrial stormwater general permit term shall be subject to completing the monitoring requirements in Part I B 8 a beginning with the first full monitoring period after receiving permit coverage. Calculations and a Chesapeake Bay TMDL action plan if required under Part I B 8 f shall be submitted no later than 90 days following the completion of the fourth monitoring period to the DEQ regional office serving the area where the industrial facility is located on a form provided by the department and maintained with the facility's SWPPP.
      (4) Facilities that monitored for TSS, TN, or TP may use the applicable sampling data collected during the 2014 industrial stormwater general permit term to satisfy all or part of the four monitoring periods requirement in accordance with Part I B 8 a.

   c. Chesapeake Bay TMDL wasteload allocations and Chesapeake Bay TMDL action plans.
      (1) EPA's Chesapeake Bay TMDL (December 29, 2010) includes wasteload allocations for VPDES permitted industrial stormwater facilities as part of the regulated stormwater aggregate load. EPA used data submitted by Virginia with the Phase I

Chesapeake Bay TMDL Watershed Implementation Plan, including the number of industrial stormwater permits per county and the number of urban acres regulated by industrial stormwater permits, as part of their development of the aggregate load. Aggregate loads for industrial stormwater facilities were appropriate because actual facility loading data were not available to develop individual facility wasteload allocations.

Virginia estimated the loadings from industrial stormwater facilities using actual and estimated facility acreage information and TP, TN, and TSS loading rates from the Northern Virginia Planning District Commission (NVPDC) Guidebook for Screening Urban Nonpoint Pollution Management Strategies (Annandale, VA November 1979), prepared for the Metropolitan Washington Council of Governments. The loading rates used were as follows:

TP - High (80%) imperviousness industrial; 1.5 lb/ac/yr
TN - High (80%) imperviousness industrial; 12.3 lb/ac/yr
TSS - High (80%) imperviousness industrial; 440 lb/ac/yr

The actual facility area information and the TP, TN, and TSS data collected for this permit will be used by the board to quantify the nutrient and sediment loads from VPDES permitted industrial stormwater facilities.

(2) Calculation of facility loads. The permittee shall analyze the nutrient and sediment data collected in accordance with Part I B 8 a and 8 b to determine if pollution reductions are required for this permit term. The permittee shall average the data collected at the facility for each of the pollutants of concern (POC) (e.g., TP, TN, and TSS) and compare the results to the loading rates for TP, TN, and TSS presented in Part I B 8 c (1).

The following formula may be used to determine the loading rate:
$L = 0.226 \times P \times Pj \times (0.05 + (0.9 \times Ia)) \times C$

where:
L = the POC loading rate (lb/acre/year)
P = the annual rainfall (inches/year) - The permittee may use either actual annual average rainfall data for the facility location (in inches/year), the Virginia annual average rainfall of 44.3 inches/year, or another method approved by the board.
Pj = the fraction of annual events that produce runoff - The permittee shall use 0.9 unless the board approves another rate.
Ia = the impervious fraction of the facility impervious area of industrial activity to the facility industrial activity area
C = the POC average concentration of all facility samples (mg/L) - Facilities with multiple outfalls shall calculate a weighted average concentration for each outfall using the drainage area of each outfall.

For total phosphorus and total suspended solids, all daily concentration data below the quantitation level (QL) for the analytical method used shall be treated as half the QL. All daily concentration data equal to or above the QL for the analytical method used shall be treated as it is reported.

For total nitrogen, if none of the daily concentration data for the respective species (i.e., TKN, nitrate, or nitrite) are equal to or above the QL for the respective analytical methods used, the daily TN concentration value reported shall equal one half of the largest QL used for the respective species. If one of the data is equal to or above the

QL, the daily TN concentration value shall be treated as that data point is reported. If more than one of the data is above the QL, the daily TN concentration value shall equal the sum of the data points as reported.

d. The permittee shall submit a copy of the calculations to the department within 90 days from the end of the last monitoring period that satisfies the monitoring requirement in Part I B 8 a. Calculations shall be submitted to the DEQ regional office serving the area where the industrial facility is located, on a form provided by the department, and maintained with the facility's SWPPP.
e. Any modification to the facility's industrial acreage or impervious industrial acreage shall require the facility to recalculate facility loading rates. This may require the facility to modify the facility's Chesapeake Bay TMDL action plan or submit a Chesapeake Bay TMDL action plan as appropriate. Any recalculation of facility loading rates or modifications to a Chesapeake Bay TMDL action plan shall be submitted to the department within 90 days of the date on which the permittee completes a site modification. If previous monitoring is no longer representative of the modified facility, monitoring in accordance with Part I B 8 a shall commence within 90 days of the modification and the revised calculations and Chesapeake Bay TMDL action plan if required under Part I B 8 f shall be submitted no later than 90 days following completion of the fourth monitoring period.
f. Chesapeake Bay TMDL action plan requirements. If the calculated facility loading rate for TP, TN, or TSS is above the loading rates for TP, TN, or TSS presented in Part I B 8 c (1), then the permittee shall develop and submit a Chesapeake Bay TMDL action plan to the department.

   The Chesapeake Bay TMDL action plan shall be submitted on a form provided by the department to the regional office serving the area where the industrial facility is located within 90 days following the completion of the fourth monitoring period. A copy of the current Chesapeake Bay TMDL action plan and all facility loading rate calculations shall be maintained with the facility's SWPPP. The Chesapeake Bay TMDL action plan shall include:
   (1) A determination of the total pollutant load reductions for TP, TN, and TSS (as appropriate) necessary to reduce the annual loads from industrial activities. This shall be determined by multiplying the industrial average times the difference between the TMDL loading rates listed in Part I B 8 c (1) and the actual facility loading rates calculated in accordance with Part I B 8 c (2). The reduction applies to the total difference calculated for each pollutant of concern;
   (2) The means and methods, such as management practices and retrofit programs, that will be utilized to meet the required reductions determined in Part I B 8 f (1) and a schedule to achieve those reductions by June 30, 2024. The schedule should include annual milestones to demonstrate the ongoing progress in meeting those reductions; and
   (3) The permittee may consider utilization of any pollutant trading or offset program in accordance with §§ 62.1-44.19:20 through 62.1-44.19:23 of the Code of Virginia, governing trading and offsetting, to meet the required reductions.
g. A permittee required to develop and implement a Chesapeake Bay TMDL Action Plan shall submit an annual report to the department by June 30 of each year describing the progress in meeting the required reductions.

h. Chesapeake Bay TMDL action plan annual reporting waiver. Upon implementation of the facility's Chesapeake Bay TMDL action plan, permittees may submit a waiver for the annual reporting requirements. The waiver request shall be submitted for board approval to the DEQ regional office serving the area where the industrial facility is located on a form provided by the department. Annual reporting requirements will be in effect until the permittee receives notice from the department that the waiver has been approved. A copy of the waiver approval shall be maintained with the SWPPP. The waiver may be revoked for cause by the board. A waiver request may be approved by the board once the permittee demonstrates that they have achieved all of the required pollutant reductions calculated under Part I B 8 f (1). Pollutant reductions may be achieved using a combination of the following alternatives:
   (1) Reductions provided by one or more of the BMPs from the Virginia Stormwater BMP Clearinghouse listed in 9VAC25-870-65, approved BMPs found on the Virginia Stormwater Clearinghouse website, or BMPs approved by the Chesapeake Bay Program. Any BMPs implemented to provide the required pollutant reductions shall be incorporated in the SWPPP and be permanently maintained by the permittee;
   (2) Implementation of site-specific BMPs followed by a minimum of four stormwater samples collected in accordance with sampling requirements in Part I B 8 a that demonstrate pollutant loadings have been reduced below those calculated under Part I B 8 c. Any BMPs implemented to provide the required pollutant reductions shall be incorporated in the SWPPP and be permanently maintained by the permittee; or
   (3) Acquisition of nonpoint source credits certified by the board as perpetual in accordance with § 62.1-44.19:20 of the Code of Virginia.

9. Discharges through a regulated MS4 to waters subject to the Chesapeake Bay TMDL. In addition to the requirements of this permit, any facility with industrial activity stormwater discharges through a regulated MS4 that is notified by the MS4 operator that the locality has adopted ordinances to meet the Chesapeake Bay TMDL shall incorporate measures and controls into its SWPPP to comply with applicable local TMDL ordinance requirements.

10. Expansion of facilities that discharge to waters subject to the Chesapeake Bay TMDL. Virginia's Phase I Chesapeake Bay TMDL Watershed Implementation Plan (November 29, 2010), states that the wasteloads from any expansion of an existing permitted facility discharging stormwater in the Chesapeake Bay watershed cannot exceed the nutrient and sediment loadings that were discharged from the expanded portion of the land prior to the land being developed for the expanded industrial activity.
    a. For any industrial activity area expansions (i.e., construction activities, including clearing, grading, and excavation activities) that commence on or after July 1, 2019, (the effective date of this permit), the permittee shall document in the SWPPP the information and calculations used to determine the nutrient and sediment loadings discharged from the expanded land area prior to the land being developed, and the measures and controls that were employed to meet the no net increase of stormwater nutrient and sediment load as a result of the expansion of the industrial activity. Any land disturbance that is exempt from permitting under the VPDES construction stormwater general permit regulation (9VAC25-880) is exempt from this requirement.
    b. The permittee may use the VSMP water quality design criteria to meet the requirements of Part I B 10 a. Under this criteria, the total phosphorus load shall not exceed the greater of (i) the total phosphorus load that was discharged from the expanded portion of the land prior to the land being developed for the industrial activity or (ii) 0.41 pounds per acre per year. Compliance with the water quality design criteria may be determined utilizing the Virginia Runoff Reduction Method or another equivalent methodology approved by the board. Design specifications and pollutant removal efficiencies for specific BMPs can be found on the Virginia Stormwater BMP Clearinghouse website.

c. The permittee may consider utilization of any pollutant trading or offset program in accordance with §§ 62.1-44.19:20 through 62.1-44.19:23 of the Code of Virginia, governing trading and offsetting, to meet the no net increase requirement.

10. Water quality protection. The discharges authorized by this permit shall be controlled as necessary to meet applicable water quality standards. The board expects that compliance with the conditions in this permit will control discharges as necessary to meet applicable water quality standards.

11. Adding or deleting stormwater outfalls. The permittee may add new or delete existing stormwater outfalls at the facility as necessary and appropriate. The permittee shall update the SWPPP and notify the department of all outfall changes within 30 days of the change. The permittee shall submit a copy of the updated SWPPP site map with this notification.

12. Antidegradation requirements for new or increased discharges to high quality waters. Facilities that add new outfalls, or increase their discharges from existing outfalls that discharge directly to high quality waters designated under Virginia's water quality standards antidegradation policy under 9VAC25-260-30 A 2 may be notified by the department that additional control measures, or other permit conditions are necessary to comply with the applicable antidegradation requirements, or may be notified that an individual permit is required in accordance with 9VAC25-31-170 B 3.

13. Termination of permit coverage.
    a. The owner may terminate coverage under this general permit by filing a complete notice of termination with the department. The notice of termination may be filed after one or more of the following conditions have been met:
        (1) Operations have ceased at the facility and there are no longer discharges of stormwater associated with industrial activity from the facility;
        (2) A new owner has assumed responsibility for the facility. A notice of termination does not have to be submitted if a VPDES Change of Ownership Agreement Form has been submitted;
        (3) All stormwater discharges associated with industrial activity have been covered by an individual VPDES permit; or
        (4) Termination of coverage is being requested for another reason, provided the board agrees that coverage under this general permit is no longer needed.
    b. The notice of termination shall contain the following information:
        (1) Owner's name, mailing address, telephone number, and email address (if available);
        (2) Facility name and location;
        (3) VPDES industrial stormwater general permit registration number;
        (4) The basis for submitting the notice of termination, including:
            (a) A statement indicating that a new owner has assumed responsibility for the facility;
            (b) A statement indicating that operations have ceased at the facility, and there are no longer discharges of stormwater associated with industrial activity from the facility;
            (c) A statement indicating that all stormwater discharges associated with industrial activity have been covered by an individual VPDES permit; or
            (d) A statement indicating that termination of coverage is being requested for another reason and a description of the reason; and

(5) The following certification: "I certify under penalty of law that all stormwater discharges associated with industrial activity from the identified facility that are authorized by this VPDES general permit have been eliminated, or covered under a VPDES individual permit, or that I am no longer the owner of the industrial activity, or permit coverage should be terminated for another reason listed above. I understand that by submitting this notice of termination, that I am no longer authorized to discharge stormwater associated with industrial activity in accordance with the general permit, and that discharging pollutants in stormwater associated with industrial activity to surface waters is unlawful where the discharge is not authorized by a VPDES permit. I also understand that the submittal of this notice of termination does not release an owner from liability for any violations of this permit or the Clean Water Act."

c. The notice of termination shall be signed in accordance with Part II K.
d. The notice of termination shall be submitted to the DEQ regional office serving the area where the industrial facility is located.

Part II. Conditions Applicable To All VPDES Permits

A. Monitoring.

1. Samples and measurements taken as required by this permit shall be representative of the monitored activity.
2. Monitoring shall be conducted according to procedures approved under 40 CFR Part 136 or alternative methods approved by the U.S. Environmental Protection Agency, unless other procedures have been specified in this permit.
3. The permittee shall periodically calibrate and perform maintenance procedures on all monitoring and analytical instrumentation at intervals that will ensure accuracy of measurements.
4. Samples taken as required by this permit shall be analyzed in accordance with 1VAC30-45, (Certification for Noncommercial Environmental Laboratories), or 1VAC30-46 (Accreditation for Commercial Environmental Laboratories).

B. Records.

1. Records of monitoring information shall include:
   a. The date, exact place, and time of sampling or measurements;
   b. The individuals who performed the sampling or measurements;
   c. The dates and times analyses were performed;
   d. The individuals who performed the analyses;
   e. The analytical techniques or methods used; and
   f. The results of such analyses.
2. The permittee shall retain copies of the SWPPP, including any modifications made during the term of this permit, records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the registration statement for this permit, for a period of at least three years from the date that coverage under this permit expires or is terminated. This period of retention shall be extended automatically during the course of any unresolved litigation regarding the regulated activity or regarding control standards applicable to the permittee, or as requested by the board.

C. Reporting Monitoring Results.

1. The permittee shall submit the results of the monitoring required by this permit not later than the 10th day of the month after monitoring takes place, unless another reporting schedule is specified elsewhere in this permit. Monitoring results shall be submitted to the department's regional office.
2. Monitoring results shall be reported in the department's electronic discharge monitoring report (e-DMR) system. All reports and forms submitted in compliance with this permit shall be submitted electronically by the permittee in accordance with 9VAC25-31-1020.
3. If the permittee monitors any pollutant specifically addressed by this permit more frequently than required by this permit using test procedures approved under 40 CFR Part 136 or using other test procedures approved by the U.S. Environmental Protection Agency or using procedures specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in e-DMR or reporting form specified by the department.
4. Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified in this permit.

D. Duty to Provide Information.

The permittee shall furnish to the Department, within a reasonable time, any information which the board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating coverage under this permit or to determine compliance with this permit. The board may require the permittee to furnish, upon request, such plans, specifications, and other pertinent information as may be necessary to determine the effect of the wastes from the discharge on the quality of state waters, or such other information as may be necessary to accomplish the purposes of the State Water Control Law. The permittee shall also furnish to the department upon request, copies of records required to be kept by this permit.

E. Compliance Schedule Reports.

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Unauthorized Discharges.

Except in compliance with this permit, or another permit issued by the Board, it shall be unlawful for any person to:

1. Discharge into state waters sewage, industrial wastes, other wastes, or any noxious or deleterious substances; or
2. Otherwise alter the physical, chemical or biological properties of such state waters and make them detrimental to the public health, or to animal or aquatic life, or to the use of such waters for domestic or industrial consumption, or for recreation, or for other uses.

G. Reports of Unauthorized Discharges.

Any permittee who discharges or causes or allows a discharge of sewage, industrial waste, other wastes or any noxious or deleterious substance into or upon state waters in violation of Part II F; or who discharges or causes or allows a discharge that may reasonably be expected to enter state waters in violation of Part II F, shall notify the department of the discharge immediately upon discovery of the discharge, but in no case later than 24 hours after said discovery. A written report of the unauthorized discharge shall be submitted to the department within five days of discovery of the discharge. The written report shall contain:

1. A description of the nature and location of the discharge;
2. The cause of the discharge;
3. The date on which the discharge occurred;
4. The length of time that the discharge continued;
5. The volume of the discharge;
6. If the discharge is continuing, how long it is expected to continue;
7. If the discharge is continuing, what the expected total volume of the discharge will be; and
8. Any steps planned or taken to reduce, eliminate and prevent a recurrence of the present discharge or any future discharges not authorized by this permit.

Discharges reportable to the department under the immediate reporting requirements of other regulations are exempted from this requirement.

H. Reports of Unusual or Extraordinary Discharges.

If any unusual or extraordinary discharge including a bypass or upset should occur from a treatment works and the discharge enters or could be expected to enter state waters, the permittee shall promptly notify, in no case later than 24 hours, the department by telephone after the discovery of the discharge. This notification shall provide all available details of the incident, including any adverse affects on aquatic life and the known number of fish killed. The permittee shall reduce the report to writing and shall submit it to the department within five days of discovery of the discharge in accordance with Part II I 1 b. Unusual and extraordinary discharges include any discharge resulting from:

1. Unusual spillage of materials resulting directly or indirectly from processing operations;
2. Breakdown of processing or accessory equipment;
3. Failure or taking out of service some or all of the treatment works; and
4. Flooding or other acts of nature.

I. Reports of Noncompliance.

1. The permittee shall report any noncompliance that may adversely affect state waters or may endanger public health.
   a. An oral report shall be provided within 24 hours from the time the permittee becomes aware of the circumstances. The following shall be included as information which shall be reported within 24 hours under Part II I:
      (1) Any unanticipated bypass; and
      (2) Any upset which causes a discharge to surface waters.
   b. A written report shall be submitted within five days and shall contain:
      (1) A description of the noncompliance and its cause;
      (2) The period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and
      (3) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

   The board may waive the written report on a case-by-case basis for reports of noncompliance under Part II I if the oral report has been received within 24 hours and no adverse impact on state waters has been reported.

2. The permittee shall report all instances of noncompliance not reported under Part II I 1 in writing, at the time the next monitoring reports are submitted. The reports shall contain the information listed in Part II I 1.
3. The immediate (within 24 hours) reports required in Part II G, H. and I. may be made to the department's regional office. Reports may be made by telephone, FAX, or online at http://www.deq.virginia.gov/Programs/PollutionResponsePreparedness/MakingaReport.aspx. For reports outside normal working hours, a message may be left and this shall fulfill the immediate reporting requirement. For emergencies, the Virginia Department of Emergency Management maintains a 24-hour telephone service at 1-800-468-8892.

J. Notice of Planned Changes.

1. The permittee shall give notice to the department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:
   a. The permittee plans alteration or addition to any building, structure, facility, or installation from which there is or may be a discharge of pollutants, the construction of which commenced:

(1) After promulgation of standards of performance under § 306 of Clean Water Act which are applicable to such source; or
(2) After proposal of standards of performance in accordance with § 306 of Clean Water Act which are applicable to such source, but only if the standards are promulgated in accordance with § 306 within 120 days of their proposal;

b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations nor to notification requirements specified elsewhere in this permit; or
c. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

2. The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

K. Signatory Requirements.

1. Registration Statements. All registration statements shall be signed as follows:
   a. For a corporation: by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or (ii) the manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit registration requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;
   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively; or
   c. For a municipality, state, federal, or other public agency: by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a public agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.
2. Reports, etc. All reports required by permits, and other information requested by the board shall be signed by a person described in Part II K 1 or by a duly authorized representative of that person. A person is a duly authorized representative only if:
   a. The authorization is made in writing by a person described in Part II K 1;
   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. A duly authorized representative may thus be either a named individual or any individual occupying a named position; and
   c. The written authorization is submitted to the department.
3. Changes to authorization. If an authorization under Part II K 2 is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part II K 2 shall be submitted to the department prior to or together with any reports, or information to be signed by an authorized representative.

4. Certification. Any person signing a document under Part II K 1 or 2 shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

L. Duty to Comply.

The permittee shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the State Water Control Law and the Clean Water Act, except that noncompliance with certain provisions of this permit may constitute a violation of the State Water Control Law but not the Clean Water Act. Permit noncompliance is grounds for enforcement action; for permit coverage termination or denial of a permit coverage renewal.

The permittee shall comply with effluent standards or prohibitions established under § 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish these standards even if this permit has not yet been modified to incorporate the requirement.

M. Duty to Reapply.

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee shall submit a new registration statement at least 60 days before the expiration date of the existing permit, unless permission for a later date has been granted by the board. The board shall not grant permission for registration statements to be submitted later than the expiration date of the existing permit.

N. Effect of a Permit.

This permit does not convey any property rights in either real or personal property or any exclusive privileges, nor does it authorize any injury to private property or invasion of personal rights, or any infringement of federal, state or local law or regulations.

O. State Law.

Nothing in this permit shall be construed to preclude the institution of any legal action under, or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any other state law or regulation or under authority preserved by § 510 of the Clean Water Act. Except as provided in permit conditions on "bypassing" (Part II U), and "upset" (Part II V) nothing in this permit shall be construed to relieve the permittee from civil and criminal penalties for noncompliance.

P. Oil and Hazardous Substance Liability.

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under §§ 62.1-44.34:14 through 62.1-44.34:23 of the State Water Control Law.

Q. Proper Operation and Maintenance.

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes effective plant performance, adequate funding, adequate staffing, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by the permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

R. Disposal of Solids or Sludges.

Solids, sludges or other pollutants removed in the course of treatment or management of pollutants shall be disposed of in a manner so as to prevent any pollutant from such materials from entering state waters.

S. Duty to Mitigate.

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

T. Need to Halt or Reduce Activity not a Defense.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

U. Bypass

1. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Part II U 2 and 3.
2. Notice
   a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, prior notice shall be submitted, if possible at least 10 days before the date of the bypass.
   b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Part II I.
3. Prohibition of bypass.
   a. Bypass is prohibited, and the board may take enforcement action against a permittee for bypass, unless:
      (1) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
      (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
      (3) The permittee submitted notices as required under Part II U 2.
   b. The board may approve an anticipated bypass, after considering its adverse effects, if the board determines that it will meet the three conditions listed above in Part II U 3 a.

V. Upset.

1. An upset constitutes an affirmative defense to an action brought for noncompliance with technology based permit effluent limitations if the requirements of Part II V 2 are met. A determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is not a final administrative action subject to judicial review.
2. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
   a. An upset occurred and that the permittee can identify the causes of the upset;
   b. The permitted facility was at the time being properly operated;
   c. The permittee submitted notice of the upset as required in Part II I; and
   d. The permittee complied with any remedial measures required under Part II S.
3. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

W. Inspection and Entry.

The permittee shall allow the director, or an authorized representative, including an authorized contractor acting as a representative of the administrator, upon presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act and the State Water Control Law, any substances or parameters at any location.

For purposes of this section, the time for inspection shall be deemed reasonable during regular business hours, and whenever the facility is discharging. Nothing contained herein shall make an inspection unreasonable during an emergency.

X. Permit Actions.

Permit coverages may be terminated for cause. The filing of a request by the permittee for a permit termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

Y. Transfer of Permits.

1. Permits are not transferable to any person except after notice to the department.
2. Coverage under this permit may be automatically transferred to a new permittee if:
   a. The current permittee notifies the department within 30 days of the transfer of the title to the facility or property; unless permission for a later date has been granted by the board;
   b. The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them; and
   c. The board does not notify the existing permittee and the proposed new permittee of its intent to deny the new permittee coverage under the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Part II Y 2 b.

Z. Severability.

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

Part III. Stormwater Pollution Prevention Plan

A stormwater pollution prevention plan (SWPPP) shall be developed and implemented for the facility covered by this permit. The SWPPP is intended to document the selection, design, and installation of control measures, including BMPs, to minimize the pollutants in all stormwater discharges from the facility, and to meet applicable effluent limitations and water quality standards.

The SWPPP requirements of this general permit may be fulfilled, in part, by incorporating by reference other plans or documents such as a spill prevention control and countermeasure (SPCC) plan developed for the facility under § 311 of the Clean Water Act, or best management practices (BMP) programs otherwise required for the facility, provided that the incorporated plan meets or exceeds the plan requirements of Part III B (Contents of the SWPPP). All plans incorporated by reference into the SWPPP become enforceable under this permit. If a plan incorporated by reference does not contain all of the required elements of the SWPPP of Part III B, the permittee shall develop the missing SWPPP elements and include them in the required plan.

A. Deadlines for SWPPP preparation and compliance.

1. Facilities that were covered under the 2014 Industrial Stormwater General Permit. Owners of facilities that were covered under the 2014 Industrial Stormwater General Permit who are continuing coverage under this general permit shall update and implement any revisions to the SWPPP within 90 days of the board granting coverage under this permit.
2. New facilities, facilities previously covered by an expiring individual permit, and existing facilities not currently covered by a VPDES permit. Owners of new facilities, facilities previously covered by an expiring individual permit, and existing facilities not currently covered by a VPDES permit who elect to be covered under this general permit shall prepare and implement the SWPPP prior to submitting the registration statement.
3. New owners of existing facilities. Where the owner of an existing facility that is covered by this permit changes, the new owner of the facility shall update and implement any revisions to the SWPPP within 60 days of the ownership change.
4. Extensions. Upon a showing of good cause, the director may establish a later date in writing for the preparation and compliance with the SWPPP.

B. Contents of the SWPPP.

The contents of the SWPPP shall comply with the requirements listed below and those in the appropriate sectors of Part IV (9VAC25-151-90 et seq.). These requirements are cumulative. If a facility has colocated industrial activities that are covered in more than one sector of Part IV, that facility's SWPPP shall comply with the requirements listed in all applicable sectors. The following requirements are applicable to all SWPPPs developed under this general permit. The SWPPP shall include, at a minimum, the following items:

1. Pollution prevention team. The SWPPP shall identify the staff individuals by name or title who comprise the facility's stormwater pollution prevention team. The pollution prevention team is responsible for assisting the facility or plant manager in developing, implementing, maintaining, revising and ensuring compliance with the facility's SWPPP. Specific responsibilities of each staff individual on the team shall be identified and listed.
2. Site description. The SWPPP shall include the following:
   a. A description of the industrial activities at the facility.
   b. A site map identifying the following:
      (1) The boundaries of the property and the size of the property in acres;
      (2) The location and extent of significant structures and impervious surfaces;

(3) Locations of all stormwater conveyances, including ditches, pipes, swales, and inlets, and the directions of stormwater flow using arrows to indicate which direction stormwater will flow;
(4) Locations of all stormwater control measures, including BMPs;
(5) Locations of all surface water bodies, including wetlands;
(6) Locations of potential pollutant sources identified under Part III B 3;
(7) Locations where significant spills or leaks identified under Part III B 3 c have occurred;
(8) Locations of stormwater outfalls.
(a) An approximate outline of the area draining to each outfall;
(b) The drainage area of each outfall in acres;
(c) The longitude and latitude of each outfall;
(d) The location of any MS4 conveyance receiving discharge from the facility; and
(e) Each outfall shall be identified with a unique numerical identification code. For example: Outfall Number 001, Outfall Number 002, etc.;
(9) Location and description of all nonstormwater discharges;
(10) Location of any storage piles containing salt;
(11) Locations and sources of suspected run-on to the site from an adjacent property if the run-on is suspected of containing significant quantities of pollutants; and
(12) Locations of all stormwater monitoring points.

c. Receiving waters and wetlands. The name of all surface waters receiving discharges from the site, including intermittent streams, dry sloughs, and arroyos. Provide a description of wetland sites that may receive discharges from the facility. If the facility discharges through an MS4, identify the MS4 operator, and the receiving water to which the MS4 discharges.

3. Summary of potential pollutant sources. The SWPPP shall identify each separate area at the facility where industrial materials or activities are exposed to stormwater. Industrial materials or activities include material handling equipment or activities, industrial machinery, raw materials, industrial production and processes, intermediate products, byproducts, final products, and waste products. Material handling activities include the storage, loading and unloading, transportation, disposal, or conveyance of any raw material, intermediate product, final product or waste product. For each separate area identified, the description shall include:
   a. Activities in the area. A list of the industrial activities exposed to stormwater.
   b. Pollutants. A list of the pollutants, pollutant constituents, or industrial chemicals associated with each industrial activity that could potentially be exposed to stormwater. The pollutant list shall include all significant materials handled, treated, stored or disposed that have been exposed to stormwater in the three years prior to the date this SWPPP was prepared or amended. The list shall include any hazardous substances or oil at the facility.
   c. Spills and leaks. The SWPPP shall clearly identify areas where potential spills and leaks that can contribute pollutants to stormwater discharges can occur and their corresponding outfalls. The SWPPP shall include a list of significant spills and leaks of toxic or hazardous pollutants that actually occurred at exposed areas, or that drained to a stormwater conveyance during the three-year period prior to the date this SWPPP was prepared or amended. The list shall be updated within 60 days of the incident if significant spills or leaks occur in exposed areas of the facility during the term of the permit.
   d. Sampling data. The SWPPP shall include stormwater discharge sampling data collected during the previous three years.
4. Stormwater controls.
   a. Control measures shall be implemented for all the areas identified in Part III B 3 to prevent or control pollutants in stormwater discharges from the facility. Regulated stormwater discharges from the facility include stormwater run-on that commingles with stormwater discharges associated with industrial activity at the facility. The SWPPP shall describe the type, location and implementation of all control measures for each area where industrial materials or activities are exposed to stormwater.
   Selection of control measures shall take into consideration:

(1) That preventing stormwater from coming into contact with polluting materials is generally more effective, and less costly, than trying to remove pollutants from stormwater;
(2) Control measures generally shall be used in combination with each other for most effective water quality protection;
(3) Assessing the type and quantity of pollutants, including their potential to impact receiving water quality, is critical to designing effective control measures;
(4) That minimizing impervious areas at the facility can reduce runoff and improve groundwater recharge and stream base flows in local streams (however, care must be taken to avoid groundwater contamination);
(5) Flow attenuation by use of open vegetated swales and natural depressions can reduce instream impacts of erosive flows;
(6) Conservation or restoration of riparian buffers will help protect streams from stormwater runoff and improve water quality; and
(7) Treatment interceptors (e.g., swirl separators and sand filters) may be appropriate in some instances to minimize the discharge of pollutants.

b. Nonnumeric technology-based effluent limits. The permittee shall implement the following types of control measures to prevent and control pollutants in the stormwater discharges from the facility, unless it can be demonstrated and documented that such controls are not relevant to the discharges.
(1) Good housekeeping. The permittee shall keep clean all exposed areas of the facility that are potential sources of pollutants to stormwater discharges. The permittee shall perform the following good housekeeping measures to minimize pollutant discharges:
(a) The SWPPP shall include a schedule for regular pickup and disposal of waste materials, along with routine inspections for leaks and conditions of drums, tanks, and containers;
(b) As feasible, the facility shall sweep or vacuum;
(c) Store materials in containers constructed of appropriate materials;
(d) Manage all waste containers to prevent a discharge of pollutants;
(e) Minimize the potential for waste, garbage, and floatable debris to be discharged by keeping areas exposed to stormwater free of such materials or by intercepting such materials prior to discharge; and
(f) Facilities that handle pre-production plastic or plastic waste shall implement BMPs to eliminate stormwater discharges of plastics.
(2) Eliminating and minimizing exposure. To the extent practicable, manufacturing, processing, and material storage areas (including loading and unloading, storage, disposal, cleaning, maintenance, and fueling operations) shall be located inside, or protected by a storm-resistant covering to prevent exposure to rain, snow, snowmelt, and runoff. Eliminating exposure at all industrial areas may make the facility eligible for the "Conditional Exclusion for No Exposure" provision of 9VAC25-31-120 E, thereby eliminating the need to have a permit. Unless infeasible, facilities shall implement the following:
(a) Use grading, berming, or curbing to prevent runoff of contaminated flows and divert run-on away from potential sources of pollutants;
(b) Locate materials, equipment, and activities so that potential leaks and spills are contained, or able to be contained, or diverted before discharge;
(c) Clean up spills and leaks immediately, upon discovery of the spills or leaks, using dry methods (e.g., absorbents) to prevent the discharge of pollutants;
(d) Store leaking vehicles and equipment indoors or, if stored outdoors, use drip pans and adsorbents;
(e) Utilize appropriate spill or overflow protections equipment;
(f) Perform all vehicle maintenance or equipment cleaning operations indoors, under cover, or in bermed areas that prevent runoff and run-on and also capture any overspray; and

(g) Drain fluids from equipment and vehicles that will be decommissioned, and for any equipment and vehicles that remain unused for extended periods of time, inspect at least monthly for leaks.

(3) Preventive maintenance. The permittee shall have a preventive maintenance program that includes regular inspection, testing, maintenance and repairing of all industrial equipment and systems to avoid situations that could result in leaks, spills and other releases of pollutants in stormwater discharged from the facility. This program is in addition to the specific control measure maintenance required under Part III C (Maintenance).

(4) Spill prevention and response procedures. The SWPPP shall describe the procedures that will be followed for preventing and responding to spills and leaks, including:

(a) Preventive measures, such as barriers between material storage and traffic areas, secondary containment provisions, and procedures for material storage and handling;

(b) Response procedures, including notification of appropriate facility personnel, emergency agencies, and regulatory agencies, and procedures for stopping, containing and cleaning up spills. Measures for cleaning up hazardous material spills or leaks shall be consistent with applicable Resource Conservation and Recovery Act regulations at 40 CFR Part 264 and 40 CFR Part 265. Employees who may cause, detect or respond to a spill or leak shall be trained in these procedures and have necessary spill response equipment available. If possible, one of these individuals shall be a member of the Pollution Prevention Team;

(c) Procedures for plainly labeling containers (e.g., "used oil," "spent solvents," "fertilizers and pesticides," etc.) that could be susceptible to spillage or leakage to encourage proper handling and facilitate rapid response if spills or leaks occur; and

(d) Contact information for individuals and agencies that must be notified in the event of a spill shall be included in the SWPPP, and in other locations where it will be readily available.

(5) Salt storage piles or piles containing salt. Storage piles of salt or piles containing salt used for deicing or other commercial or industrial purposes shall be enclosed or covered to prevent exposure to precipitation. The permittee shall implement appropriate measures (e.g., good housekeeping, diversions, containment) to minimize exposure resulting from adding to or removing materials from the pile. All salt storage piles shall be located on an impervious surface. All runoff from the pile, and runoff that comes in contact with salt, including under drain systems, shall be collected and contained within a bermed basin lined with concrete or other impermeable materials, or within an underground storage tank or tanks, or within an above ground storage tank or tanks, or disposed of through a sanitary sewer (with the permission of the owner of the treatment facility). A combination of any or all of these methods may be used. In no case shall salt contaminated stormwater be allowed to discharge directly to the ground or to surface waters.

(6) Employee training. The permittee shall implement a stormwater employee training program for the facility. The SWPPP shall include a schedule for all types of necessary training, and shall document all training sessions and the employees who received the training. Training shall be provided at least annually for all employees who work in areas where industrial materials or activities are exposed to stormwater, and for employees who are responsible for implementing activities identified in the SWPPP (e.g., inspectors, maintenance personnel, etc.). The training shall cover the components and goals of the SWPPP, and include such topics as spill response, good housekeeping, material management practices, control measure operation and maintenance, etc. The SWPPP shall include a summary of any training performed.

(7) Sediment and erosion control. The SWPPP shall identify areas at the facility that, due to topography, land disturbance (e.g., construction, landscaping, site grading), or other factors, have a potential for soil erosion. The permittee shall identify and implement structural, vegetative, and stabilization control measures to prevent or control on-site and off-site erosion and sedimentation. Flow velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel if the flows would otherwise create erosive conditions.

(8) Management of runoff. The SWPPP shall describe the stormwater runoff management practices (i.e., permanent structural control measures) for the facility. These types of control measures shall be used to divert, infiltrate, reuse, or otherwise reduce pollutants in stormwater discharges from the site.

Structural control measures may require a separate permit under § 404 of the Clean Water Act and the Virginia Water Protection Permit Program Regulation (9VAC25-210) before installation begins.

(9) Dust suppression and vehicle tracking of industrial materials. The permittee shall implement control measures to minimize the generation of dust and off-site tracking of raw, final, or waste materials. Stormwater collected on-site may be used for the purposes of dust suppression or for spraying stockpiles. Potable water, well water, and uncontaminated reuse water may also be used for this purpose. There shall be no direct discharge to surface waters from dust suppression activities or as a result of spraying stockpiles.

5. Routine facility inspections. Personnel who possess the knowledge and skills to assess conditions and activities that could impact stormwater quality at the facility and who can also evaluate the effectiveness of control measures shall regularly inspect all areas of the facility where industrial materials or activities are exposed to stormwater, areas where spills or leaks have occurred in the past three years, discharge points, and control measures. At least one member of the pollution prevention team shall participate in the routine facility inspections.

The inspection frequency shall be specified in the SWPPP based upon a consideration of the level of industrial activity at the facility, but shall be at a minimum of once per calendar quarter unless more frequent intervals are specified elsewhere in the permit or written approval is received from the department for less frequent intervals. Inspections shall be performed during operating hours. At least once each calendar year, the routine facility inspection shall be conducted during a period when a stormwater discharge is occurring.

The requirement for routine facility inspections is waived for facilities that have maintained an active VEEP E3/E4 status. Certain sectors in Part IV have additional inspection requirements. If the VEEP E3/E4 waiver language is not included for the sector specific inspections, these additional inspection requirements may not be waived.

Any deficiencies in the implementation of the SWPPP that are found shall be corrected as soon as practicable, but not later than within 60 days of the inspection, unless permission for a later date is granted in writing by the director. The results of the inspections shall be documented in the SWPPP and shall include at a minimum:

a. The inspection date;
b. The names of the inspectors;
c. Weather information and a description of any discharges occurring at the time of the inspection;
d. Any previously unidentified discharges of pollutants from the site;
e. Any control measures needing maintenance or repairs;
f. Any failed control measures that need replacement;

g. Any incidents of noncompliance observed; and
h. Any additional control measures needed to comply with the permit requirements.

C. Maintenance.

The SWPPP shall include a description of procedures and a regular schedule for preventive maintenance of all control measures, and shall include a description of the back-up practices that are in place should a runoff event occur while a control measure is off-line. The effectiveness of nonstructural control measures shall also be maintained by appropriate means (e.g., spill response supplies available and personnel trained, etc.).

All control measures identified in the SWPPP shall be maintained in effective operating condition and shall be observed at least annually when a stormwater discharge is occurring to ensure that they are functioning correctly. Where discharge locations are inaccessible, nearby downstream locations shall be observed. The observations shall be documented in the SWPPP.

If routine facility inspections required by Part III B 5 identify control measures that are not operating effectively, repairs or maintenance shall be performed before the next anticipated storm event. If maintenance prior to the next anticipated storm event is not possible, maintenance shall be scheduled and accomplished as soon as practicable. In the interim, back-up measures shall be employed and documented in the SWPPP until repairs or maintenance is complete. Documentation shall be kept with the SWPPP of maintenance and repairs of control measures, including the dates of regular maintenance, dates of discovery of areas in need of repair or replacement, dates for repairs, dates that the control measures returned to full function, and the justification for any extended maintenance or repair schedules.

D. Nonstormwater discharges.

1. Discharges of certain sources of nonstormwater listed in Part I B 1 are allowable discharges under this permit. All other nonstormwater discharges are not authorized and shall be either eliminated or covered under a separate VPDES permit.
2. Annual outfall evaluation for unauthorized discharges.
   a. The SWPPP shall include documentation that all stormwater outfalls associated with industrial activity have been evaluated annually for the presence of unauthorized discharges. The documentation shall include:
      (1) The date of the evaluation;
      (2) A description of the evaluation criteria used;
      (3) A list of the outfalls or on-site drainage points that were directly observed during the evaluation;
      (4) A description of the results of the evaluation for the presence of unauthorized discharges; and
      (5) The actions taken to eliminate unauthorized discharges if any were identified.
   b. The permittee may request in writing to the department that the facility be allowed to conduct annual outfall evaluations at 20% of the outfalls. If approved, the permittee shall evaluate at least 20% of the facility outfalls each year on a rotating basis such that all facility outfalls will be evaluated during the period of coverage under this permit.

E. Signature and SWPPP review.

1. Signature and location. The SWPPP, including revisions to the SWPPP to document any corrective actions taken as required by Part I A 6, shall be signed in accordance with Part II K, dated, and retained on-site at the facility covered by this permit in accordance with Part II B 2. All other changes to the SWPPP, and other permit compliance documentation, shall be signed and dated by the person preparing the change or documentation. For inactive and unstaffed facilities, the plan may be kept at the nearest office of the permittee.
2. Availability. The permittee shall retain a copy of the current SWPPP required by this permit at the facility, and it shall be immediately available to the department, EPA, or the operator of an MS4 receiving discharges from the site at the time of an on-site inspection or upon request.
3. Required modifications. The permittee shall modify the SWPPP whenever necessary to address all corrective actions required by Part I A 6 a (Data exceeding benchmark concentration values) or Part I A 6 b (Corrective actions). Changes to the SWPPP shall be made in accordance with the corrective action deadlines in Part I A 6 a and Part I A 6 b, and shall be signed and dated in accordance with Part III E 1.

   The director may notify the permittee at any time that the SWPPP, control measures, or other components of the facility's stormwater program do not meet one or more of the requirements of this permit. The notification shall identify specific provisions of the permit that are not being met, and may include required modifications to the stormwater program, additional monitoring requirements, and special reporting requirements. The permittee shall make any required changes to the SWPPP within 60 days of receipt of such notification, unless permission for a later date is granted in writing by the director, and shall submit a written certification to the director that the requested changes have been made.

F. Maintaining an updated SWPPP.

1. The permittee shall review and amend the SWPPP as appropriate whenever:
   a. There is construction or a change in design, operation, or maintenance at the facility that has a significant effect on the discharge, or the potential for the discharge, of pollutants from the facility;
   b. Routine inspections or compliance evaluations determine that there are deficiencies in the control measures, including BMPs;
   c. Inspections by local, state, or federal officials determine that modifications to the SWPPP are necessary;
   d. There is a significant spill, leak, or other release at the facility;
   e. There is an unauthorized discharge from the facility; or
   f. The department notifies the permittee that a TMDL has been developed and applies to the permitted facility, consistent with Part I B.
2. SWPPP modifications shall be made within 60 calendar days after discovery, observation or event requiring a SWPPP modification. Implementation of new or modified control measures (distinct from regular preventive maintenance of existing control measures described in Part III C) shall be initiated before the next storm event if possible, but no later than 60 days after discovery, or as otherwise provided or approved by the director. The amount of time taken to modify a control measure or implement additional control measures shall be documented in the SWPPP.
3. If the SWPPP modification is based on a significant spill, leak, release, or unauthorized discharge, include a description and date of the incident, the circumstances leading to the incident, actions taken in response to the incident, and measures to prevent the recurrence of such releases. Unauthorized discharges are subject to the reporting requirements of Part II G of this permit.

Part IV. Sector Specific Permit Requirements

The permittee must only comply with the additional requirements of Part IV (9VAC25-151-90 et seq.) that apply to the sectors of industrial activity located at the facility. These sector specific requirements are in addition to the requirements specified in Parts I, II and III of this permit. All numeric effluent limitations and benchmark monitoring concentration values reflect two significant digits, unless otherwise noted.

9VAC25-151-190. Sector L – Landfills, land application sites and open dumps.

A. Discharges covered under this section. The requirements listed under this section apply to stormwater discharges associated with industrial activity from waste disposal at landfills, land application sites, and open dumps that receive or have received industrial wastes (Industrial Activity Code "LF"), including sites subject to regulation under Subtitle D of the Resource Conservation and Recovery Act (RCRA). Landfills, land application sites, and open dumps that have stormwater discharges from other types of industrial activities such as vehicle maintenance, truck washing, and recycling may be subject to additional requirements specified elsewhere in this permit. This permit does not cover discharges from landfills that receive only municipal wastes. Landfills (including landfills in "post-closure care") that have been properly closed and capped in accordance with 9VAC20-81-160 and 9VAC20-81-170 and have no significant materials exposed to stormwater do not require this permit. Landfills closed in accordance with regulations or permits in effect prior to December 21, 1988, do not require this permit, unless significant materials are exposed to stormwater.

B. Special conditions. Prohibition of nonstormwater discharges. In addition to the general nonstormwater prohibition in Part I B 1, the following discharges are not covered by this permit: leachate, gas collection condensate, drained free liquids, contaminated ground water, laboratory wastewater, and contact washwater from washing truck, equipment, and railcar exteriors and surface areas that have come in direct contact with solid waste at the landfill facility.

C. Definitions.

"Contaminated stormwater" means stormwater that comes in direct contact with landfill wastes, the waste handling and treatment areas, or landfill wastewater. Some areas of a landfill that may produce contaminated stormwater include, but are not limited to, the working face of an active landfill; the areas around wastewater treatment operations; trucks, equipment, or machinery that has been in direct contact with the waste; and waste dumping areas.

"Drained free liquids" means aqueous wastes drained from waste containers (e.g., drums, etc.) prior to landfilling.

"Landfill wastewater," as defined in 40 CFR Part 445 (Landfills Point Source Category), means all wastewater associated with, or produced by, landfilling activities except for sanitary wastewater, noncontaminated stormwater, contaminated groundwater, and wastewater from recovery pumping wells. Landfill wastewater includes leachate, gas collection condensate, drained free liquids, laboratory derived wastewater, contaminated stormwater and contact washwater from washing truck, equipment, and railcar exteriors and surface areas that have come in direct contact with solid waste at the landfill facility.

"Leachate" means liquid that has passed through or emerged from solid waste and contains soluble, suspended, or miscible materials removed from such waste.

"Noncontaminated stormwater" means stormwater that does not come into direct contact with landfill wastes, the waste handling and treatment areas, or landfill wastewater as defined above. Noncontaminated stormwater includes stormwater that flows off the cap, intermediate cover, or final cover of the landfill.

"Open dump" means a site on which any solid waste is placed, discharged, deposited, injected, dumped, or spilled so as to present a threat of a release of harmful substances into the environment or present a hazard to human health. Such a site is subject to the open dump criteria in 9VAC20-81-45.

D. Stormwater controls. In addition to the requirements in Part III, the SWPPP shall include, at a minimum, the following items:

1. Preventive maintenance program. As part of the preventive maintenance program, the permittee shall maintain all elements of leachate collection and treatment systems to prevent commingling of leachate with stormwater and the integrity and effectiveness of any intermediate or final cover (including making repairs to the cover as necessary), to minimize the effects of settlement, sinking, and erosion.

2. Routine facility inspections.
   a. Inspections of active sites. Operating landfills, open dumps, and land application sites shall be inspected at least once every seven days. Qualified personnel shall inspect areas of landfills that have not yet been finally stabilized, active land application areas, areas used for storage of materials or wastes that are exposed to precipitation, stabilization and structural control measures, leachate collection and treatment systems, and locations where equipment and waste trucks enter and exit the site. Erosion and sediment control measures shall be observed to ensure they are operating correctly. For stabilized sites and areas where land application has been completed, inspections shall be conducted at least once every month.
   b. Inspections of inactive sites. Inactive landfills, open dumps, and land application sites shall be inspected at least quarterly. Qualified personnel shall inspect landfill (or open dump) stabilization and structural erosion control measures and leachate collection and treatment systems and all closed land application areas.

3. Recordkeeping and internal reporting procedures. Landfill and open dump owners shall provide for a tracking system for the types of wastes disposed of in each cell or trench of a landfill or open dump. Land application site owners shall track the types and quantities of wastes applied in specific areas.
4. Annual outfall evaluation for unauthorized discharges. The evaluation shall also be conducted for the presence of leachate and vehicle washwater.

5. Sediment and erosion control plan. Landfill and open dump owners shall provide for temporary stabilization of materials stockpiled for daily, intermediate, and final cover. Stabilization practices to consider include temporary seeding, mulching, and placing geotextiles on the inactive portions of the stockpiles. Landfill and open dump owners shall provide for temporary stabilization of inactive areas of the landfill or open dump which have an intermediate cover but no final cover. Landfill and open dump owners shall provide for temporary stabilization of any landfill or open dumping areas which have received a final cover until vegetation has established itself. Land application site owners shall also stabilize areas where waste application has been completed until vegetation has been established.

E. Numeric effluent limitations. As set forth at 40 CFR Part 445 Subpart B, the numeric limitations in Table 190-1 apply to contaminated stormwater discharges from municipal solid waste landfills (MSWLFs) that have not been closed in accordance with 40 CFR 258.60, and contaminated stormwater discharges from those landfills that are subject to the provisions of 40 CFR Part 257 (these include construction and debris landfills and industrial landfills) except for discharges from any of the following facilities:

1. Landfills operated in conjunction with other industrial or commercial operations when the landfill only receives wastes generated by the industrial or commercial operation directly associated with the landfill;

2. Landfills operated in conjunction with other industrial or commercial operations when the landfill receives wastes generated by the industrial or commercial operation directly associated with the landfill and also receives other wastes provided the other wastes received for disposal are generated by a facility that is subject to the same provisions in 40 CFR Subchapter N as the industrial or commercial operation or the other wastes received are of similar nature to the wastes generated by the industrial or commercial operation;

3. Landfills operated in conjunction with centralized waste treatment (CWT) facilities subject to 40 CFR Part 437 so long as the CWT facility commingles the landfill wastewater with other nonlandfill wastewater for discharge. A landfill directly associated with a CWT facility is subject to this part if the CWT facility discharges landfill wastewater separately from other CWT wastewater or commingles the wastewater from its landfill only with wastewater from other landfills; or

4. Landfills operated in conjunction with other industrial or commercial operations when the landfill receives wastes from public service activities so long as the company owning the landfill does not receive a fee or other remuneration for the disposal service.

Table 190-1
Sector L – Numeric Effluent Limitations

Parameter	Effluent Limitations	
	Maximum Daily	Maximum Monthly Average
Landfills (Industrial Activity Code "LF") that are Subject to the Requirements of 40 CFR Part 445 Subpart B.		
Biochemical Oxygen Demand (BOD_5)	140 mg/L	37 mg/L
Total Suspended Solids (TSS)	88 mg/L	27 mg/L
Ammonia	10 mg/L	4.9 mg/L
Alpha Terpineol	0.033 mg/L	0.016 mg/L
Benzoic Acid	0.12 mg/L	0.071 mg/L
p-Cresol	0.025 mg/L	0.014 mg/L
Phenol	0.026 mg/L	0.015 mg/L
Zinc (Total)	0.20 mg/L	0.11 mg/L
pH	Within the range of 6.0 - 9.0 s.u.	

F. Benchmark monitoring and reporting requirements. Landfills, land application, and open dump sites are required to monitor their stormwater discharges for the pollutants of concern listed in Table 190-2. These benchmark monitoring concentrations apply to stormwater discharges associated with industrial activity other than contaminated stormwater discharges from landfills subject to the numeric effluent limitations set forth in Table 190-1.

Table 190-2
Sector L – Benchmark Monitoring Requirements

Pollutants of Concern	Benchmark Concentration
Landfills, Land Application Sites and Open Dumps (Industrial Activity Code "LF").	
Total Suspended Solids (TSS)	100 mg/L