ALTAMONT ENVIRONMENTAL, INC.
Engineering & Hydrogeology

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TRANSMITTAL LETTER

To:	Mr. Jim Coffey, NCDENR Solid Waste Section, Raleigh, NC
From:	John Mueller
Date:	August 19, 2002
cc:	James Patterson, NCDENR Solid Waste Section, Asheville, NC Ken Westmoreland, Jackson County Manager, Sylva, NC
Subject:	Closed Jackson County Municipal Solid Waste Landfill

Contents:

One copy of the Landfill Gas Management Plan for the above referenced site

Action | Date | Doc No.
PC 8/21/02 | DIN

ALTAMONT ENVIRONMENTAL, INC.
ENGINEERING, HYDROGEOLOGY, RISK MANAGEMENT
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CF

February 5, 2002

Mr. James Coffey
NCDENR Division of Waste Management
Solid Waste Section
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Subject: Landfill Gas Update
Jackson County Municipal Solid Waste Landfill
Jackson County, North Carolina

Dear Mr. Coffey:

Altamont Environmental, Inc. met with James Patterson of the NCDENR Asheville Regional Office on January 31, 2002 to provide him with an update on the status of landfill gas (LFG) compliance efforts at the former Jackson County Municipal Solid Waste Landfill in Dillsboro, North Carolina. I am writing to provide you with a summary of that meeting for the record.

We completed the first phase of a Landfill Gas Mitigation Pilot Study in December 2001. As generally described in correspondence to DENR dated September 28, 2001, Phase 1 of the Pilot Study utilized existing trenches and vents along the northern property boundary in an effort to reduce methane concentrations to less than five percent. Three vents and associated underground trenches were connected in series to a blower with aboveground piping to draw a vacuum on the vents. The blower was operated for three weeks and gas concentrations were monitored daily throughout the system and at four nearby boundary landfill gas probes. Two of the four probes were within compliance limits before the study began and decreased further during the study. One probe came into compliance during the study, decreasing from 18 percent methane prior to startup to 1.8 percent average during the study. The fourth probe showed some reduction during the study, decreasing from over 40 percent to less than 10 percent methane. However, the LFG concentration in this probe increased to over 30 percent toward the end of the study. Soil moisture content, due to rainfall, is suspected to be a contributing factor in the fluctuating methane concentrations. Based on these results, we have concluded that the existing vents are not constructed in a manner that will provide a reliable mechanism for reducing methane concentrations at all boundary compliance locations.

Phase 2 of the Landfill Gas Mitigation Pilot Study was designed to evaluate the effectiveness of vertical landfill gas extraction wells at the southeastern property boundary. The plan called for two weeks of active gas extraction on the wells using a blower. Methane monitoring would be conducted at three existing and four newly installed gas probes spaced at various radii from each well. On January 22, 2002 two 24-inch diameter borings were installed to the bottom of waste (30 and 36 feet deep) in an area of historic non-compliance along the southeastern property boundary. A six-inch perforated casing was installed in each boring and the borings were backfilled with gravel to one foot about the perforated section (about ten feet below grade). Solid casing was installed from the perforated section to four feet above grade and the boring was sealed with alternating layers of bentonite and backfill. After installation of the wells, landfill gas monitoring results indicated that methane concentrations at all three

southeastern boundary probes were within compliance limits. Therefore, the blower installation was delayed pending reevaluation of methane concentrations in the nearby LFG probes.

In order to obtain meaningful results from the Phase 2 Study, Altamont proposes to suspend installation of the blower and continue to evaluate methane concentrations in boundary probes on a monthly basis. If methane concentrations in the southeastern boundary probes exceed compliance levels during at least two consecutive months, then the Phase 2 Study will be resumed. If the Phase 2 Study is resumed, active extraction of LFG will be conducted for two weeks with regular monitoring of probe pressures, flows, and LFG concentrations.

Regarding closure of the construction and demolition (C&D) cell at Dillsboro; Altamont has evaluated bids and recommended an engineering firm for closure design of the C&D portion of the landfill. A contract will be issued to the design firm this week. We plan to immediately start preliminary design activities with construction following in late spring.

If you have any questions or would like further information please call Jim McElduff or me at (828) 281-3350.

Sincerely,

John P. Mueller, P.E.
Altamont Environmental, Inc.

cc: James Patterson, NCDENR Solid Waste Section, Asheville
Ken Westmoreland, Jackson County Manager

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June 17, 2002

Mr. James Coffey
NCDENR Division of Waste Management
Solid Waste Section
1646 Mail Service Center
Raleigh, North Carolina 27699-1646

Subject: Closure of Construction and Demolition Debris Disposal Area
Jackson County Municipal Solid Waste Landfill, Permit Number 50-02
Jackson County, North Carolina

Dear Mr. Coffey:

On behalf of Jackson County, Altamont Environmental, Inc. (Altamont), is requesting an extension to the June 19, 2002 deadline for closure of the Construction and Demolition (C&D) debris disposal area at the closed municipal solid waste (MSW) landfill near Dillsboro.

As you know, the C&D closure was delayed to allow time for implementation of landfill gas pilot studies at the northern and southeastern boundaries of the landfill. Those studies were completed on April 2, 2002 and the Landfill Gas Extraction Pilot Study Report was submitted to your office on May 10, 2002.

On Febraury 11, 2002, Altamont retained the services of Caliber Engineering to perform civil design and prepare bid documents for the C&D closure. On May 2, 2002, specifications and drawings were submitted to Tim Jewett in the Solid Waste Section for approval. We are awaiting written approval of the plans from the Solid Waste Section before proceeding with the construction contractor bid solicitation process. We anticipate a period of approximately four months from the time we receive written approval until construction is completed. To accommodate this timeframe and any unanticipated delays, we are requesting that the deadline for closure be extended for an additional 180-day period until December 19, 2002.

If you have any questions or would like more information please call me at (828) 281-3350.

Sincerely,

John Mueller, P.E.

CC: Tim Jewett, NCDENR Solid Waste Section, Winston-Salem
James Patterson, NCDENR Solid Waste Section, Asheville
Ken Westmoreland, Jackson County Manager

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LANDFILL GAS MANAGEMENT PLAN

CLOSED JACKSON COUNTY MUNICIPAL SOLID WASTE LANDFILL JACKSON COUNTY, NORTH CAROLINA

Prepared for
Jackson County

August 19, 2002

Prepared by
Altamont Environmental, Inc.
78½ Patton Avenue
Asheville, NC 28801
(828) 281-3350

James S. McElduff, P.E.
Project Manager

John Mueller, P.E.
Project Engineer

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1.0 INTRODUCTION

Altamont Environmental, Inc. (Altamont), on behalf of Jackson County, has prepared a Landfill Gas (LFG) Management Plan for the closed municipal solid waste (MSW) landfill near Dillsboro. The site location is shown on Figure 1.

This plan was prepared pursuant to a meeting between Altamont and the North Carolina Department of Environment and Natural Resources (DENR) on July 9, 2002 at the DENR headquarters in Raleigh. Attendees at the meeting were Jim Coffey, Larry Rose, Cheryl Marks, and Jim McElduff. This document formalizes the approach to LFG management presented by Altamont at that meeting. The plan takes a risk-management approach to achieving the following objectives:

- Minimize potential risks to human health and property associated with explosive concentrations of methane;
- Evaluate long-term risk management alternatives and potential beneficial uses of LFG;
- Design and implement a long-term LFG management system, as necessary.

The LFG Management Plan incorporates the following elements:

- Identification of potential health and safety risks to nearby inhabitants and structures;
- Identification of deficiencies in the existing LFG monitoring network;
- Evaluation of site conditions affecting LFG generation, migration, and mitigation;
- Development of additional site characterization data to satisfy data needs for remedial evaluation and design;
- Identification and evaluation of potential local end users of LFG as an energy source;
- Identification and evaluation of long-term LFG management alternatives; and
- Design and implementation of a selected LFG management alternative.

2.0 BACKGROUND

Jackson County, with the assistance of Altamont, has historically conducted two types of LFG monitoring at the closed MSW landfill near Dillsboro, North Carolina. The first LFG monitoring program was initiated in approximately 1996 and is related to compliance with the landfill permit conditions. As such, it is a continuing effort. The DENR Solid Waste Management Rules specify a regulatory compliance limit for methane concentrations at the property boundaries of five percent. Five percent methane corresponds to the lower explosive limit (LEL), the lowest concentration at which methane becomes explosive in air if an ignition source is present. The second LFG monitoring program was initiated in January 1999 as part of a groundwater quality assessment. In the second program, Altamont (formerly known as the Fletcher Group of North Carolina) measured LFG concentrations at onsite monitoring locations using the closed-loop protocol recommended by DENR. The measurements were collected on a monthly basis between January 1999 and November 2001. In December 2001, Jackson County began collecting the monthly monitoring data. The monitoring well, vent, and gas probe locations are shown on Figure 2.

In January 1999, LFG was detected at concentrations greater than the LEL for methane at several locations on County property and in the groundwater monitoring well (PMW-01) on adjacent property that at the time was owned by Western Builders (***Note:*** That property is now owned by Jackson County and houses the County Maintenance Department). Between March 15 and 19, 1999, Altamont oversaw installation of LFG probes in 18 locations near the landfill. These probes were installed as part of the effort to characterize groundwater quality in the vicinity of landfill. LFG concentrations were measured in each of the probes monthly between installation and March 2000.

Jackson County awarded a contract to McGill Associates (McGill) of Asheville, North Carolina on March 24, 1999 for design and construction of LFG control structures. These structures were installed between March 29 and April 9, 1999. Following installation of these structures, LFG measurements in some areas, particularly the northern and southeastern boundaries, generally remained greater than the

LEL. As a result, the County requested that Altamont provide engineering services related to evaluation and mitigation of LFG for the Dillsboro facility.

Altamont submitted a LFG Mitigation Plan to DENR on September 28, 2001. The plan detailed a two-phased LFG mitigation pilot study for the northern (Phase I) and southeastern (Phase II) boundaries of the property. The purpose of the pilot study was to evaluate options for achieving regulatory compliance regarding methane concentrations at property boundaries. After submittal of the plan, Jackson County determined that LFG compliance along the southeast side of the landfill could be achieved by purchasing the adjacent property from Webster Enterprises. Since Jackson County was exploring this option, the LFG pilot study was redesigned to focus on the northern property boundary.

Phase I of the study was implemented at the northern boundary between November 13 and December 3, 2001. DENR stipulated that if the Webster Enterprises property was not acquired by the end of December 2001, remedial alternatives for the southeast side should be evaluated and implemented. By January 1, 2002, the County had not acquired the Webster Enterprises property, so Altamont proceeded with design and implementation of a pilot study for the southeast side.

Phase II of the study was implemented at the southeastern boundary between March 18 and April 2, 2002. A *LFG Extraction Pilot Study Report* describing activities and results of both phases of the study was submitted to DENR on May 10, 2002. The study identified challenges (e.g., high water table, steep terrain, and small radius of influence) to achieving control of LFG migration along both of the property boundaries evaluated during the test. In the report, Altamont recommended obtaining additional subsurface data to evaluate the depth and extent of waste deposition, geologic strata conducive to gas migration, and water levels within the waste. This information would provide a basis for development of alternative LFG mitigation strategies. In addition, Altamont recommended a comprehensive evaluation of the LFG monitoring network to identify data gaps and ensure the protection of human health until the need for a long-term remedy can be evaluated.

On July 9, 2002, Altamont met with DENR representatives in Raleigh to present results of the Pilot Study and the risk-based approach to a comprehensive LFG management program. This document formalizes the risk-based approach to LFG management presented at that meeting.

The risk-based approach will be implemented in an incremental manner. Data collected during initial tasks will be evaluated prior to the design and implementation of subsequent tasks. Throughout the program, the highest priority will be given to risk management. The risk-based approach is illustrated by the decision diagram shown on Figure 3.

3.0 LANDFILL GAS MANAGEMENT TASKS

3.1 TASK 1: Identify Health and Safety Risks to Human Health and Real Property

3.1.1 Conduct Assessment of County Maintenance Building

The County Maintenance Building is located approximately 200 feet southeast of the landfill property boundary (see Figure 2). Gas monitoring probes GP-15D and GP-15S are also located approximately 200 feet from the landfill property boundary and approximately 70 feet southwest of the County Maintenance Building. These probes have periodically had concentrations of methane above the LEL (five percent). During the Phase II Pilot Study at the southeastern corner of the landfill, methane concentrations generally ranged from five to 20 percent in these probes.

The County Maintenance Building is equipped with a methane detector and alarm. To date, there has been no reported triggering of the methane alarm system. However, there is currently no inspection, maintenance, and testing program in place for the system. Altamont will inspect the methane alarm system and make recommendations for system improvements and implementation of a regularly scheduled inspection program. The following system parameters will be evaluated: number and location of detectors; action level for alarm activation; alarm response plan; and documentation. Altamont will establish a record-keeping protocol for the County and train the appropriate County staff in taking the measurements.

In an enclosed structure, any detectable concentration of methane is considered significant because the presence of non-explosive low concentrations can be used as an early warning mechanism to predict potential increases in methane concentrations. As a result, Altamont will also implement a quarterly LFG screening program for the County Maintenance Building using an intrinsically safe flame-ionization detector (FID). The FID measures total organic vapors, including methane. The FID will be used with a carbon filter which filters out hydrocarbons, leaving methane for measurement. The FID is typically more sensitive than LFG meters by approximately three orders of magnitude. During monitoring events,

particular attention will be given to cracks or joints in the floor slab and walls, conduit openings, etc. Measurements from each monitoring event will be appended to the Operating Record for the landfill.

3.1.2 Conduct Assessment of Nearby Residences and Commercial Buildings

The monitoring locations in which consistently high concentrations of LFG have been measured can be segregated into two general areas. One such area is along the north-central portion of the landfill. The second area is in the southeastern portion of the landfill. In addition, measurements from a recently installed gas monitoring probe located along the northeastern boundary of the landfill (GP-19) suggest that methane concentrations in that area may also exceed the LEL.

Altamont will undertake a reevaluation of the monitoring network along all boundaries to ensure that potential LFG migration routes to structures are adequately monitored. Figure 2 shows the locations of residences and commercial buildings with respect to the landfill and LFG monitoring probes.

During the July 9, 2002 meeting with DENR, Altamont obtained a set of plans for the Jackson MSW Landfill dated March 12, 1984. The plans include topographic contours and cross-sections showing proposed cut and fill areas for successive phases of landfill development. This information will be used in conjunction with historic topographic contours and boring log data to refine cross-sections prepared for the *LFG Extraction Pilot Study Report* (refer to Figures 4 through 6). This information will be used to gain a better understanding of factors affecting LFG migration near the landfill and identify deficiencies in the LFG monitoring network.

3.1.3 Install Additional LFG Probes as Needed Based on the Evaluations Described in Sections 3.1.1 and 3.1.2

Additional LFG probes will be installed as necessary to document the presence or absence of LFG in critical areas between the landfill and nearby structures. The depths and locations of new probes will be selected based on an evaluation of potential LFG migration pathways.

3.2 TASK 2: Perform LFG Resource Evaluation

3.2.1 Identify Potential End Users of LFG

Altamont will identify potential end users of LFG as an energy source in the vicinity of the landfill. Based on preliminary evaluation, the two most likely uses of LFG are electricity generation and direct use in a nearby asphalt plant. Electric generation may be through use of internal combustion engine or small microturbine. Additional potential uses will also be considered as appropriate.

3.2.2 Evaluate Economic Feasibility of LFG Collection for Resource Utilization

The potential resource utilization scenarios identified under this task will be subject to an economic feasibility screening. This will be a rough order of magnitude analysis with the objective of determining whether or not a more detailed analysis is warranted. The analysis will take into consideration such factors as energy unit costs, estimated remaining methane generation potential, power plant cost, asphalt plant energy requirements, and pipeline cost. Potential revenues will be estimated and balanced against estimated development costs.

3.2.3 Evaluate Benefits and Grant Potential for Innovative LFG Utilization Projects

If LFG resource utilization is not found to be feasible from a purely economic perspective, additional analysis will be performed to evaluate less tangible benefits to the community as well as potential for financial assistance grants for implementation of innovative LFG utilization projects. An example of such a project is the Yancey-Mitchell Landfill which uses LFG to heat a greenhouse and fire a pottery kiln. Considerations will include federal tax credits, state and federal assistance programs, and public and private grant sources.

3.3 TASK 3: Identify and Evaluate Alternatives for Ensuring Long-Term Protection of Human Health and Real Property

The need for implementation of risk mitigation measures is dependent upon the findings of Task 1. If the evaluation conducted under Task 1 identifies unacceptable risks, then appropriate remedial actions will be identified and evaluated as described below.

3.3.1 Identify Alternatives for Mitigating Risks by Managing Property Use

One approach to risk management is to control the use of properties that may be subject to LFG migration. For example, if a structure is found to be at risk due to unacceptable concentrations of methane in or near the building, the County might consider condemnation or demolition options and continue long-term monitoring at the property boundaries.

3.3.2 Identify Alternatives for Mitigating Risks by Controlling LFG Migration

Risks identified in Task 1 may be mitigated by design and installation of a perimeter LFG collection system. Such systems are typically comprised of a network of gas extraction wells and piping connected to a vacuum. The closed Jackson County MSW Landfill poses unique challenges to perimeter gas migration control associated with topography, perched groundwater, proximity of waste to property boundaries, and infrastructure (e.g., roads and utility corridors).

3.3.3 Evaluate Risk Mitigation Alternatives and Select Alternative for Implementation

The alternatives identified under this task will be evaluated to determine which alternative provides the greatest measure of protection at a reasonable cost. Alternatives will be evaluated on the basis of effectiveness, implementability, and cost. Based on this evaluation, a single alternative will be proposed for implementation.

3.4 TASK 4: Conduct Additional Site Investigation

In order to evaluate and design appropriate risk mitigation alternatives, additional site characterization data will be needed. Some of the tasks listed below will be implemented prior to the identification and evaluation of alternatives in Task 3. Additional information needs may be identified during the process of evaluating alternatives under Task 3. The alternative evaluation may be inconclusive pending implementation of additional site characterization. Some of the information needs are identified below.

3.4.1 Estimate Leachate Generation Potential Using Hydrologic Evaluation of Landfill Performance (HELP) Model

During implementation of the Phase II LFG Extraction Pilot Study, Altamont observed what appeared to be a perched water table at the southeastern corner of the landfill. The water hampered gas extraction efforts in extraction wells EW-1 and EW-2 by reducing the length of exposed screen in the wells (see May 19, 2002 report). The nature and extent of this water has not been determined. If, based on further investigation, efforts to lower the water table are considered as part of a gas extraction system, then leachate generation and disposal will be important considerations. The HELP model will be used as a mechanism for estimating quantities of leachate generation based on site-specific parameters.

3.4.2 Evaluate Nature and Extent of Shallow Water Encountered during the Phase II LFG Extraction Pilot Study

Based on evaluation of historic water levels in monitoring wells around the perimeter of the landfill, the presence of shallow water in gas extraction wells EW-1 and EW-2 was unexpected. The nature and extent of this water is not known. Further evaluation is required to determine whether the water is an isolated perched unit, leachate, or recharging groundwater. This evaluation will be completed by installing piezometers throughout the landfill to measure water levels.

3.4.3 Troubleshoot Phase II Pilot Study Extraction Wells

Two LFG extraction wells, EW-1 and EW-2, were operated under a vacuum during the Phase II LFG Extraction Pilot Study. Despite application of a high vacuum, gas flow in these wells dropped to zero within a week. The apparent blockage of flow will be investigated by visual inspection down the well casings and, if necessary, by excavating down to the screened interval. The objective of the investigation will be to identify the cause of blockage so that future gas extraction wells can be appropriately designed to eliminate this problem.

3.4.4 Install Additional LFG Probes, Vents, and Piezometers as Needed to Characterize Site

Additional LFG probes, vents, and piezometers will be installed as necessary to provide data on depth of waste, LFG quality and generation potential, and nature and extent of shallow water. The scope of the investigation will depend on the results of Tasks 1, 2, and 3. If a gas extraction system is proposed, then more thorough data will be required to design the system. If a gas extraction system is not necessary, then additional LFG probes will not be necessary.

3.5 TASK 5: Design LFG Collection and Control System as Applicable

This task will be further developed after implementation of Tasks 1 through 4. The need for a LFG collection and control system will be determined based on the findings of the evaluations conducted under Tasks 1 and 2. The LFG collection and control system (if needed) will be designed based on the results of the alternative evaluation conducted in Tasks 3 and 4. The system will be designed to achieve perimeter control of LFG migration, maximize LFG collection for resource utilization, or to achieve both of these objectives.

3.6 TASK 6: Implement Pilot-Scale LFG Collection and Control System

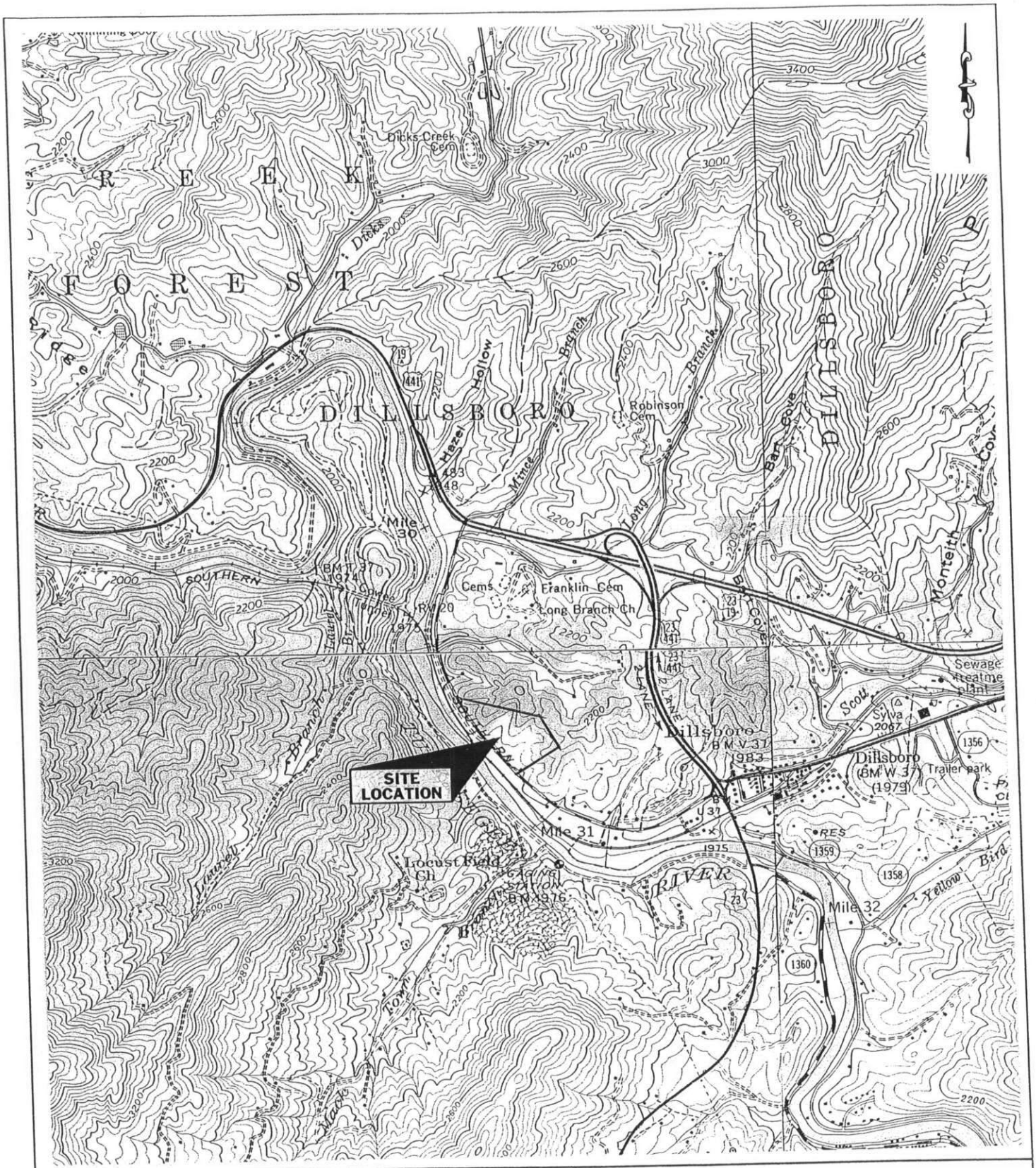
If a LFG extraction system is required, full-scale design of the system will be initiated only after pilot-scale testing has been completed. This will allow the design and operating parameters to be optimized based on actual site-specific conditions. The period of operation and operational requirements of the pilot scale system will be determined during the preliminary design phase.

3.7 TASK 7: Refine System Design and Implement Full-Scale System

Data collected during operation of the pilot scale system will be used to refine the design to achieve the desired results (i.e., minimize risk to human health and nearby structures and/or maximize quantity and quantity of LFG collection).

4.0 SCHEDULE

Some of the activities described in this plan (e.g., evaluate monitoring network, refine cross-sections, and run HELP model) are work in progress. As shown in the attached Table 1, Tasks 1 through 4 can be completed by the end of the calendar year. At that time, Tasks 5 through 7 will be better defined and a schedule for implementation of those Tasks will be prepared.



Altamont Environmental, Inc.

ENGINEERING & HYDROGEOLOGY

78½ PATTON AVENUE
ASHEVILLE, NORTH CAROLINA
PHONE 828-281-3350

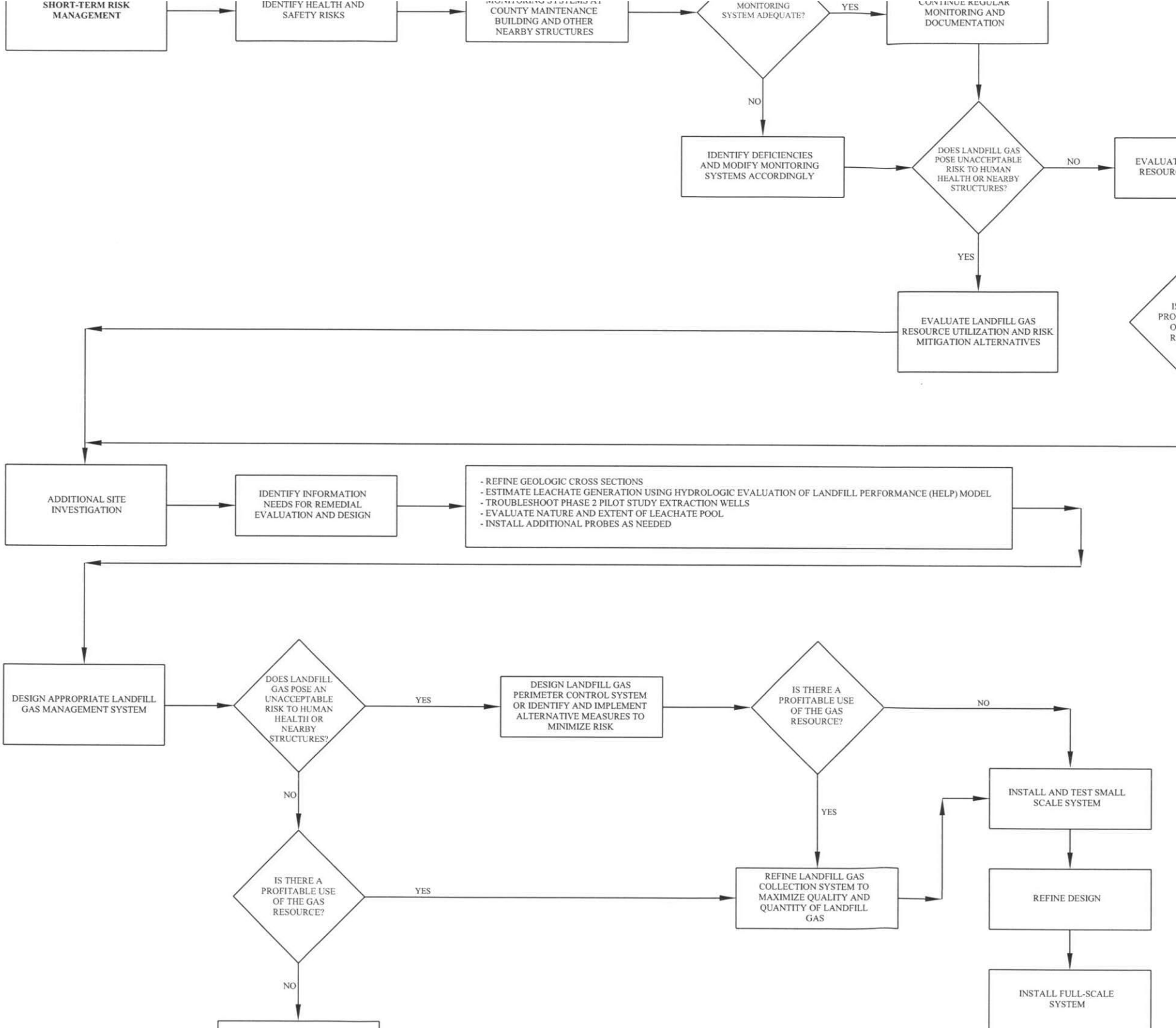
FIGURE 1
SITE LOCATION MAP
JACKSON COUNTY LANDFILL
JACKSON COUNTY, NORTH CAROLINA
GREENS CREEK, WHITTIER, SYLVA NORTH & SYLVA SOUTH NORTH CAROLINA U.S.G.S. QUADRANGLES

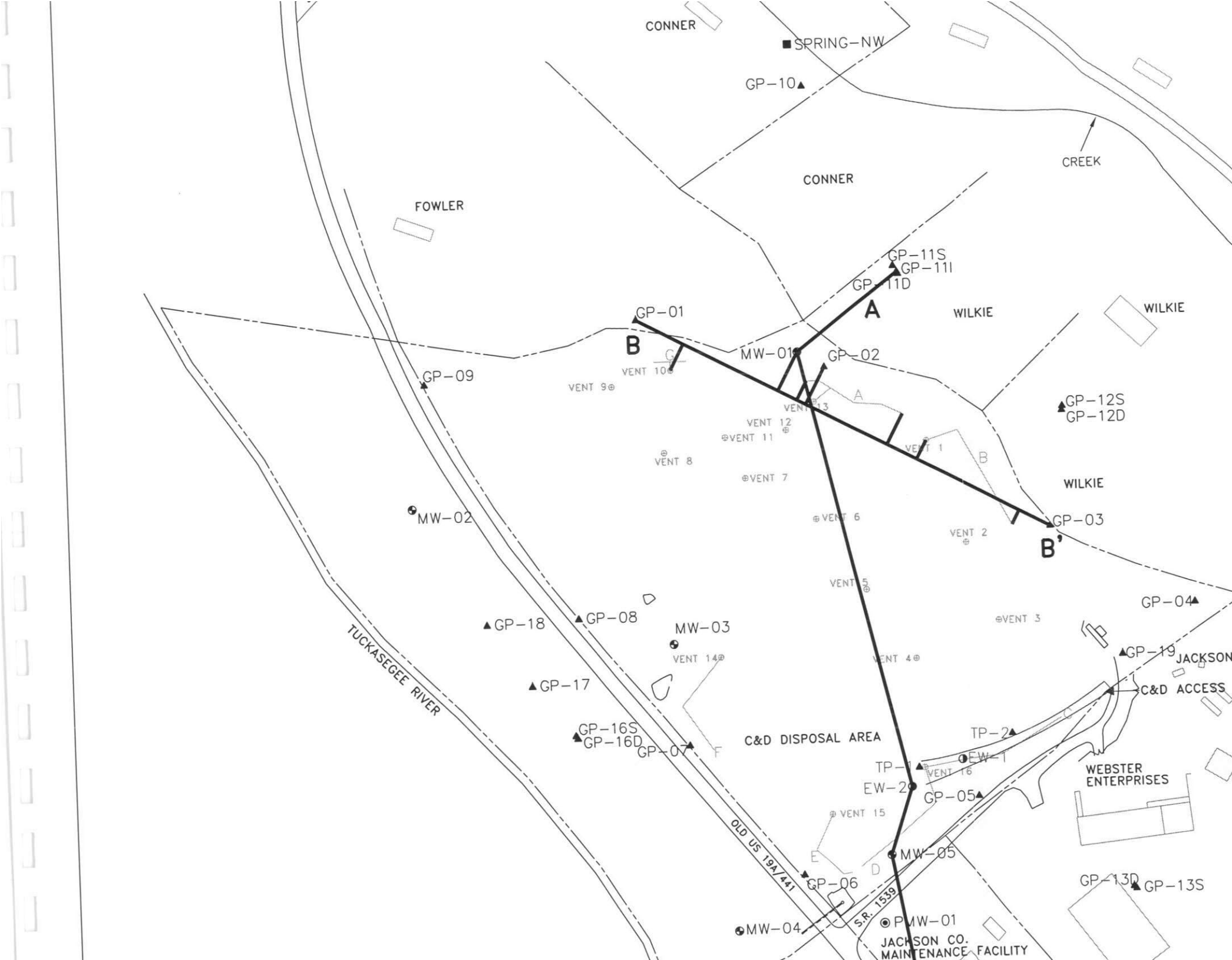
DRAWN BY: JOHN CHASE DATE: 05-01-02
PROJECT MANAGER: JIM MCELDUFF
CLIENT: JACKSON COUNTY
FILE: PROJECTS/JACKSON CO/FIGURE 1

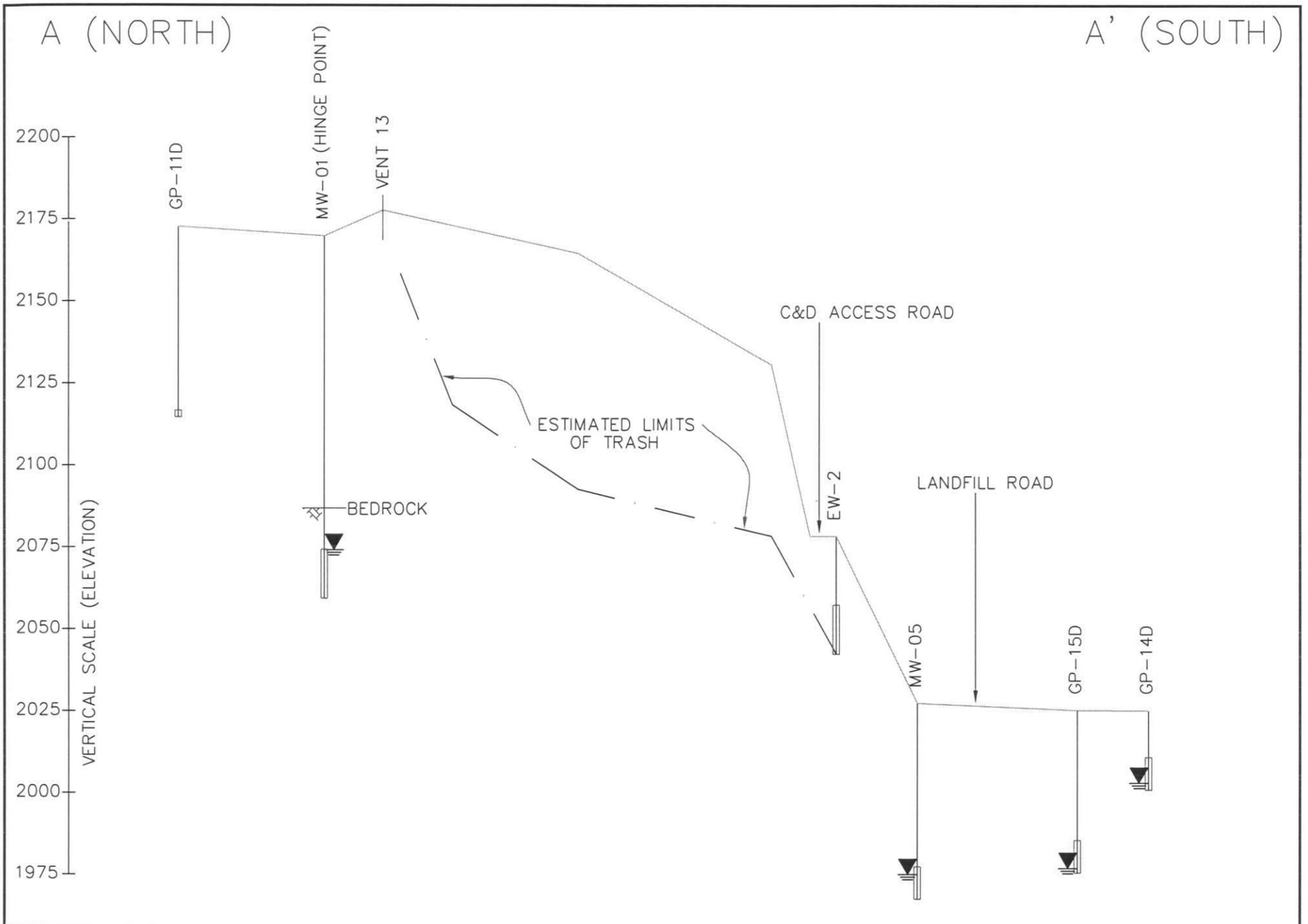
COUNTOUR INTERVALS: 40 FEET
MAP DATES: 1940, 1967, & 1946
PHOTO REVISIONS: 1978 & 1990

GRAPHIC SCALE
1000 0 500 1000 2000
IN FEET


GP-10
CONNER
CREEK
FOWLER
GP-11S
GP-11I
GP-11D
GP-01
WILKIE
WILKIE
GP-09
MW-01
GP-02
GP-12S
GP-12D
MW-02
WILKIE
GP-03
GP-18
GP-08
MW-03
GP-04
TUCKASEGEE RIVER
GP-17
GP-19
JACKSON
C&D ACCESS
GP-16S
GP-16D
GP-07
C&D DISPOSAL AREA
TP-2
TP-1
EW-1
EW-2
WEBSTER
ENTERPRISES
GP-05
OLD US 19A/441
MW-05
GP-06
GP-13D
GP-13S
S.R. 1539
MW-04
PMW-01
JACKSON CO.
MAINTENANCE FACILITY
GP-15D
GP-15S


SHORT-TERM RISK MANAGEMENT
IDENTIFY HEALTH AND SAFETY RISKS
COUNTY MAINTENANCE BUILDING AND OTHER NEARBY STRUCTURES
MONITORING SYSTEM ADEQUATE?
YES
CONTINUE REGULAR MONITORING AND DOCUMENTATION
NO
IDENTIFY DEFICIENCIES AND MODIFY MONITORING SYSTEMS ACCORDINGLY
DOES LANDFILL GAS POSE UNACCEPTABLE RISK TO HUMAN HEALTH OR NEARBY STRUCTURES?
NO
YES
EVALUAT
RESOUR
EVALUATE LANDFILL GAS RESOURCE UTILIZATION AND RISK MITIGATION ALTERNATIVES
ADDITIONAL SITE INVESTIGATION
IDENTIFY INFORMATION NEEDS FOR REMEDIAL EVALUATION AND DESIGN
- REFINE GEOLOGIC CROSS SECTIONS
- ESTIMATE LEACHATE GENERATION USING HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE (HELP) MODEL
- TROUBLESHOOT PHASE 2 PILOT STUDY EXTRACTION WELLS
- EVALUATE NATURE AND EXTENT OF LEACHATE POOL
- INSTALL ADDITIONAL PROBES AS NEEDED
DESIGN APPROPRIATE LANDFILL GAS MANAGEMENT SYSTEM
DOES LANDFILL GAS POSE AN UNACCEPTABLE RISK TO HUMAN HEALTH OR NEARBY STRUCTURES?
YES
DESIGN LANDFILL GAS PERIMETER CONTROL SYSTEM OR IDENTIFY AND IMPLEMENT ALTERNATIVE MEASURES TO MINIMIZE RISK
IS THERE A PROFITABLE USE OF THE GAS RESOURCE?
NO
INSTALL AND TEST SMALL SCALE SYSTEM
YES
REFINE LANDFILL GAS COLLECTION SYSTEM TO MAXIMIZE QUALITY AND QUANTITY OF LANDFILL GAS
REFINE DESIGN
INSTALL FULL-SCALE SYSTEM
NO
IS THERE A PROFITABLE USE OF THE GAS RESOURCE?
YES


CONNER
SPRING-NW
GP-10
CREEK
CONNER
FOWLER
GP-11S
GP-11I
GP-11D
A
WILKIE
WILKIE
GP-01
B
MW-01
GP-02
GP-09
VENT 10
VENT 9
VENT 13
VENT 12
VENT 11
VENT 8
VENT 7
VENT 1
GP-12S
GP-12D
WILKIE
MW-02
VENT 6
VENT 2
GP-03
B'
VENT 5
GP-04
VENT 3
GP-18
GP-08
MW-03
VENT 14
VENT 4
GP-19
JACKSON
C&D ACCESS
TUCKASEGEE RIVER
GP-17
GP-16S
GP-16D
GP-07
C&D DISPOSAL AREA
TP-2
EW-1
TP-1
VENT 16
WEBSTER
ENTERPRISES
EW-2
GP-05
VENT 15
MW-05
OLD US 19A/441
GP-06
GP-13D
GP-13S
S.R. 1539
MW-04
MW-01
JACKSON CO.
MAINTENANCE FACILITY



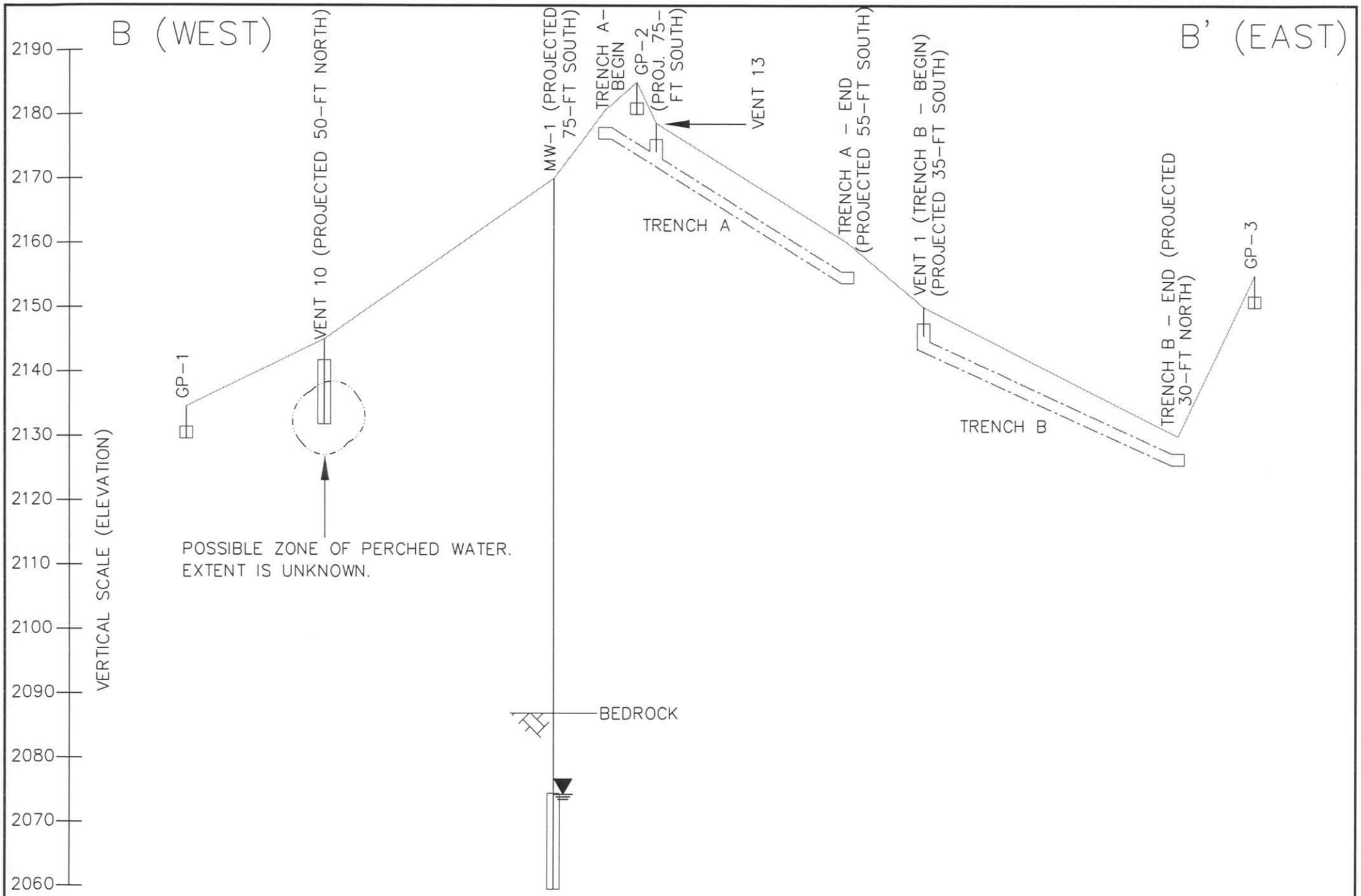
NOTES:
1. VERTICAL SCALE IS 1 INCH = 40 FEET (5X EXAGGERATION).
2. ELEVATIONS ARE BASED ON MEAN SEA LEVEL.
3. GROUNDWATER MEASUREMENTS TAKEN ON 3-20-02, EXCEPT MW-1 WAS MEASURED ON 4-10-02.

LEGEND:
GROUNDWATER ELEVATION
ESTIMATED LIMITS OF TRASH

HORIZONTAL SCALE (IN FEET)
100 0 200
1-INCH = 200-FEET

FIGURE 5
VENT AND PROBE CROSS SECTION
A - A'
JACKSON COUNTY LANDFILL
JULY 2002

Altamont Environmental, Inc.
ENGINEERING & HYDROGEOLOGY
78½ PATTON AVENUE
ASHEVILLE, NORTH CAROLINA



NOTES:
1. VERTICAL SCALE IS 1 INCH = 20 FEET (5X EXAGGERATION).
2. ELEVATIONS ARE BASED ON MEAN SEA LEVEL.
3. GROUNDWATER MEASUREMENTS TAKEN ON 4-10-02.

LEGEND: ▼ GROUNDWATER ELEVATION

HORIZONTAL SCALE (IN FEET)

50 0 100

1-INCH = 100-FEET

FIGURE 6
VENT AND PROBE CROSS SECTION
B - B'
JACKSON COUNTY LANDFILL
APRIL 2002

Altamont Environmental, Inc.
ENGINEERING & HYDROGEOLOGY
78½ PATTON AVENUE
ASHEVILLE, NORTH CAROLINA

TABLE 1

LANDFILL GAS MANAGEMENT SCHEDULE
CLOSED JACKSON COUNTY MUNICIPAL SOLID WASTE LANDFILL
DILLSBORO, NORTH CAROLINA

AUGUST 19, 2002

TASKS	*SCHEDULE*
TASK 1: IDENTIFY HEALTH AND SAFETY RISKS TO HUMAN HEALTH AND REAL PROPERTY	SEPTEMBER 20, 2002
a) Conduct assessment of County Maintenance Building.	
b) Conduct assessment of nearby residences and commercial buildings.	
c) Install additional LFG probes as needed based on the evaluation described in Task 1a and 1b.	
TASK 2: PERFORM LFG RESOURCE EVALUATION	NOVEMBER 29, 2002
a) Identify potential end users of landfill gas.	
b) Evaluate economic feasibility of LFG collection for resource utilization.	
c) Evaluate benefits and grant potential for innovative LFG utilization projects.	
TASK 3: IDENTIFY AND EVALUATE ALTERNATIVES FOR ENSURING LONG-TERM PROTECTION OF HUMAN HEALTH AND REAL PROPERTY	DECEMBER 20, 2002
a) Identify alternatives for mitigating risks by managing property use.	
b) Identify alternatives for mitigating risks by controlling LFG migration.	
c) Evaluate risk mitigation alternatives and select alternative for implementation.	
TASK 4: CONDUCT ADDITIONAL SITE INVESTIGATION	DECEMBER 20, 2002
a) Refine cross-sections based on landfill plans.	
b) Estimate leachate generation potential using HELP model.	
c) Evaluate nature and extent of shallow water encountered during the Phase II LFG Extraction Pilot Study.	
d) Troubleshoot Phase II Pilot Study extraction wells.	
e) Install additional LFG probes as needed to characterize site.	
TASK 5: DESIGN LFG COLLECTION AND CONTROL SYSTEM AS APPLICABLE	TO BE DETERMINED
TASK 6: IMPLEMENT PILOT-SCALE LFG COLLECTION AND CONTROL SYSTEM	TO BE DETERMINED
TASK 7: REFINE SYSTEM DESIGN AND IMPLEMENT FULL-SCALE SYSTEM	TO BE DETERMINED