

CEC

CARLSON ENVIRONMENTAL CONSULTANTS, PC

Landfill Gas, Air Permitting, and Regulatory Compliance Services

SOLID WASTE APPROVAL APPLICATION
LANDFILL GAS COLLECTION AND CONTROL SYSTEM

At the:

WATAUGA COUNTY LANDFILL

336 Landfill Road
Boone, North Carolina 28607
(828) 264-5305

Prepared for:

**NORTH CAROLINA DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES**

Division of Waste Management
1664 Mail Service Center
Raleigh, North Carolina 27699-1646

On Behalf of:

**BLUE RIDGE RESOURCE CONSERVATION
& DEVELOPMENT COUNCIL, INC.**

1081-2 Old U.S. Highway 421
Sugar Grove, North Carolina 28679
(828) 297-5805

Prepared by:

CARLSON ENVIRONMENTAL CONSULTANTS, PC

400 West Windsor Street
Monroe, NC 28112
(704) 506-7312

October 20, 2004
CEC File No. J1-20421-00

Carlson Environmental Consultants, PC

400 West Windsor Street
Monroe, NC 28112
704-506-7312
704-283-9755 fax

October 20, 2004
File No. J1-20421-00

Mr. Ed Mussler
Solid Waste Permit Engineer
NCDENR – Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646

Subject: Request for NCDENR Division of Waste Management Approval
Construction and Operation of Landfill Gas System
Watauga County Landfill – Boone, North Carolina

Dear Mr. Mussler:

On behalf of Watauga County, North Carolina (County) and the Blue Ridge Resource Conservation and Development Council, Inc. (Blue Ridge RC&D), Carlson Environmental Consultants, PC (CEC) is submitting this request for approval from the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Waste Management to construct and operate an active landfill gas (LFG) collection and control system at the Watauga County Landfill (Landfill) located near Boone, North Carolina.

LANDFILL BACKGROUND

The Watauga County Landfill is a closed municipal solid waste (MSW) landfill located off Highway 421 approximately one mile east of the Town of Boone. The facility is owned and operated by Watauga County, North Carolina. The Landfill was operated as a sanitary landfill under Solid Waste Permit No. 95-01 from 1972 to 1984 and under Permit No. 95-02 from 1984 to 1994. In addition to MSW, the facility also accepted yard waste and construction and demolition (C&D) material.

The MSW landfill was closed in 1994 and the County began operation of an onsite transfer station. The Landfill does not have a Subtitle D liner system or a leachate collection system. In 1996, a final cover system was installed over the MSW portions of the Landfill that consisted of a 40-mil LLDPE synthetic cap overlain with 24-inches of soil cover. Included with the final cover was the installation of twenty-two (22) passive gas vents. See the attached detail depicting the construction of the gas vents, construction of the final cover system, and penetration of the gas vents through the final cover.

The Landfill is not subject to the New Source Performance Standards (NSPS) as listed in 40 CFR Part 60 – Subpart WWW or the National Emission Standards for Hazardous Air Pollutants (NESHAP) as listed in 40 CFR Part 61.

PROPOSED LANDFILL GAS SYSTEM

The overall objective of this project is to collect the Landfill's generated gas and use it in a beneficial use project, such as to generate heat and/or electricity for the facility or other end-users, thus providing an environmental benefit by reducing the potential for offsite migration and fugitive emissions of LFG.

As a first step, the County and Blue Ridge RC&D desire to connect the existing 22 passive gas vents to an active gas blower and route this gas to a small open flare control device for combustion. See the attached landfill gas drawings and details for additional information. The installation of the LFG system will be performed in two (or more) phases depending on construction costs. The installation and operation of gas-to-energy devices has not been decided upon at this time and will be determined based upon actual gas collection once the LFG system is installed.

Header and Lateral Piping

The header and lateral collection piping which delivers the LFG to the blower/flare station has been sized considering the head losses throughout the piping network to minimize the vacuum requirements of the system. Based upon the LandGEM Modeling provided to CEC by the Blue Ridge RC&D, the Landfill is projected to have a landfill gas recovery of about 101 scfm in 2004. In the event that the Landfill generates more LFG than expected, CEC has conservatively sized the collection system components for a LFG recovery of up to 400 scfm.

The header piping has been designed to be 6-inch diameter SDR 17 HDPE, with the laterals being 4-inch diameter SDR 17 HDPE. While slightly oversized for this project, the 6-inch diameter HDPE piping also provides more protection from landfill settlement and it allows condensate and gas to flow more easily in opposite directions. The header and lateral piping is proposed to be installed below grade to be out of the way of post closure operations or landfill activities.

Condensate Sumps

Condensate is formed as the temperature of LFG extracted from a landfill decreases in the collection system piping. The preliminary design provides for two sumps to be located at low points in the LFG collection system piping. The sumps are also located in areas off the landfill footprint (away from the synthetic cap) as shown in the conceptual plans.

The sumps will be designed to meet the NCDENR regulations, which prohibit the discharge of condensate into an unlined landfill cell. The sumps will be designed to collect and retain liquids as a reservoir. The condensate sumps will be sized to handle the maximum weekly condensate collection anticipated. The sumps will be periodically evacuated by pump truck and the condensate will be disposed offsite. In the future, condensate pumps may be added to the sumps to pump the stored condensate to a central storage tank (as needed) to facilitate condensate removal from the site.

Condensate formed in header piping can form a blockage if it collects in a low point and is not removed from the header system. To maintain positive drainage, a 2 percent slope is specified for collection piping on the landfill surface (where possible). Differential settlement under the collection piping is less of a concern in areas off the refuse mound, therefore a minimum slope of 1 percent is specified for piping located on natural soil.

Wellheads and Isolation Valves

The existing 22 gas vents will be fitted with a gas wellhead consisting of a control valve and sampling ports. These wellheads will allow individual control and analysis of each gas well. Since this is a voluntary LFG system, the wellheads will not be monitored to meet any regulatory requirements; however, the collection of LFG will be routinely monitored to maximize LFG extraction and minimize the infiltration of ambient air (for the prevention of landfill fires). Isolation valves will be installed in the main header piping to allow additional control over sections of the wellfield. Flanges will also be installed in the main header to allow for expansion of the wellfield as needed.

Landfill Gas Blower and Open Flare

Based upon the LandGEM modeling and the collected field data, it is assumed that an open flare and blower capable of about 250 scfm will be sufficient for the LFG collection system. An exact blower/flare system has not been selected at this time; however, it is anticipated that a small skid-mounted 2 to 4-inch diameter open flare with a small centrifugal or fan-style blower capable of 250 scfm will be used. At a minimum, the blower/flare will be equipped with a flame arrestor, shut-off valves, sample ports, a flow meter or orifice plate, and a condensate knock-out pot.

LFG SYSTEM CONSTRUCTION

As stated above, the construction of the LFG collection and control system will be completed in two (or more) phases depending on construction costs. The first stage will concentrate on completing the main header system, the condensate sumps, and the blower/flare station. Based on these costs, as many of the 22 existing vents as possible will be connected to the main header. At a minimum, the existing vents closest to the southern boundary, where methane migration is reported to be occurring, will be connected.

The construction will be monitored by construction quality assurance (CQA) personnel. The primary item that will be observed will be the header/lateral trenching over the existing geosynthetic cover system. The LFG piping will be installed in the soil cover (approximately 24 inches) over the synthetic cap. As shown on the drawings a minimum of 2 inches of sand, soil, or other suitable cushion material will be maintained between the header/lateral piping and the synthetic cover. All solid wall header/lateral piping will be pressure tested with air to check for leaks. These tests will be performed at various intervals during construction.

The contractor will be required to take care in excavating the soil cover and installing the LFG system to prevent damage to the final cover system. For this reason, trenchers will not be allowed and the contractor will be required to use a piece of equipment with a bucket that has a smooth plate welded over the teeth to prevent cap punctures. The contractor will be required to minimize damage to the vegetative cover system during construction. The contractor will be required to restore all trenched and disturbed areas of the cap to the pre-construction condition. This will include reseeding with existing grasses and foliage, liming, fertilization, and mulching the areas. The contractor will be required to take all necessary precautions, such covering the trenches with plastic sheeting, to protect open trenches if precipitation occurs during daily construction activities or if trenches are left open overnight.

If a puncture of the synthetic cap occurs during excavation, the contractor will be required to immediately make repairs to the synthetic cover. The repairs will consist of carefully excavating around the damaged section and welding a new piece of 40 mil LLDPE overlapping the damaged section by at least 12 inches on all sides. The contractor must either have the welding equipment and materials on-site, be able to obtain the welding equipment and materials quickly, or have a welding subcontractor available to perform the work. The area will be covered with plastic sheeting until the repairs can be made.

CONSTRUCTION DOCUMENTATION

Upon completion of the LFG collection and control system installation, CEC will provide to the NCDENR Division of Waste Management asbuilts of the LFG system as well as a Record Documentation Report. The Record Documentation Report will include (at a minimum) the following:

- A description of the construction work, parties involved, and materials and equipment used;
- Daily field logs from the CQA personnel as well as the contractor (as appropriate);
- Header and lateral pipe leak testing forms;
- Photographs from the construction;
- Documentation on any repairs made to the synthetic cap (as needed);

- As-built drawings; and.
- Certification from a North Carolina Professional Engineer.

LANDFILL GAS SYSTEM OPERATIONS AND MAINTENANCE

Once operational, the LFG collection and control system will be maintained in accordance with the blower/flare system manufacturer's recommendations and generally accepted practices for operating active LFG systems. These include (at a minimum) inspecting and greasing the blowers, observing the operation of the flare, checking the liquid levels in the condensate sumps, checking and recording the LFG quality, pressure, and temperature at each gas well, checking the LFG quality, pressure, and temperature of the gas at the blower/flare station, recording the gas flow at the blower/flare station, and inspecting the wellheads for damaged or loose fittings. Spare parts for the most common maintenance items such as blower grease, spare blower belts, wellhead parts, fuses, and the like will be kept at the Landfill for quick replacement or will be quickly available via third party LFG O&M services.

While the Landfill is not subject to the requirements of the NSPS, which prescribe monthly monitoring, specific limits on wellhead pressure and oxygen, and continuous operation of the LFG system, the County and Blue Ridge RC&D will be maintaining the Landfill's LFG system similar to the NSPS in order to maximize available gas collection and minimize methane migration and the potential for landfill fires.

Based on recent liquid level measurements in the existing gas wells, subsurface liquid does not appear to be a problem at the Landfill; therefore, the active LFG system does not provide for the use of downwell pumps in the existing gas wells. However, if in the future, subsurface liquids do become a problem, downwell pumps can be added with minimal difficulty. The collected condensate from these pumps would be pumped via pipeline to a holding tank for removal from the site via pumper truck.

No additional LFG vertical wells are proposed to be added for this LFG collection system; however, if in the future a well becomes unusable to the active LFG system due to poor gas quality or low gas flow, it may be temporarily decommissioned from the LFG system. This will involve closing the wellhead valve for an indeterminate period of time to allow the well to regenerate and/or to allow additional testing to be performed. A gas well may be permanently decommissioned by removing the wellhead and placing a cap on the well.

Landfill Fires

Due to the synthetic cover system, ambient air infiltration into the waste mass due to the active gas system will be minimized thus reducing the potential for a landfill fire. However, the LFG system will be routinely monitored for temperature and oxygen content at each wellhead, and the wells will be adjusted accordingly if conditions for a

landfill fire become favorable, such as high well temperatures (in excess of 140 degrees F) and high oxygen content (in excess of 7.5 percent).

Should a landfill fire be suspected, the County will follow the existing procedures in its Solid Waste Closure Plan, which include notifying NCDENR and the local fire department. The County will turn off all nearby active gas wells to prevent additional air infiltration and monitor the carbon monoxide levels in the nearby wells to determine the extent of the fire. County and Blue Ridge RC&D personnel who work on the LFG system will be trained on the proper response to a suspected landfill fire.

FINANCIAL ASSURANCE

The initial installation of the LFG collection and control system is being funded through grants obtained by the Blue Ridge RC&D. Additional upgrades, future work, and LFG O&M will be paid for by both the Blue Ridge RC&D and Watauga County. Watauga County, as the owner of the Landfill, and the Blue Ridge RC&D, as the LFG system operator, understand and accept the appropriate financial responsibility for this project.

CLOSING

I appreciate your assistance on this project and look forward to your comments. The permit plans and a similar letter report have also been submitted to the Division of Air Quality for approval. Since the County and Blue Ridge RC&D desire to begin construction on this project as soon as possible, your quick review and approval would be greatly appreciated. If you have any questions or need additional information, please feel free to contact me at (704) 506-7312.

Respectfully Submitted,



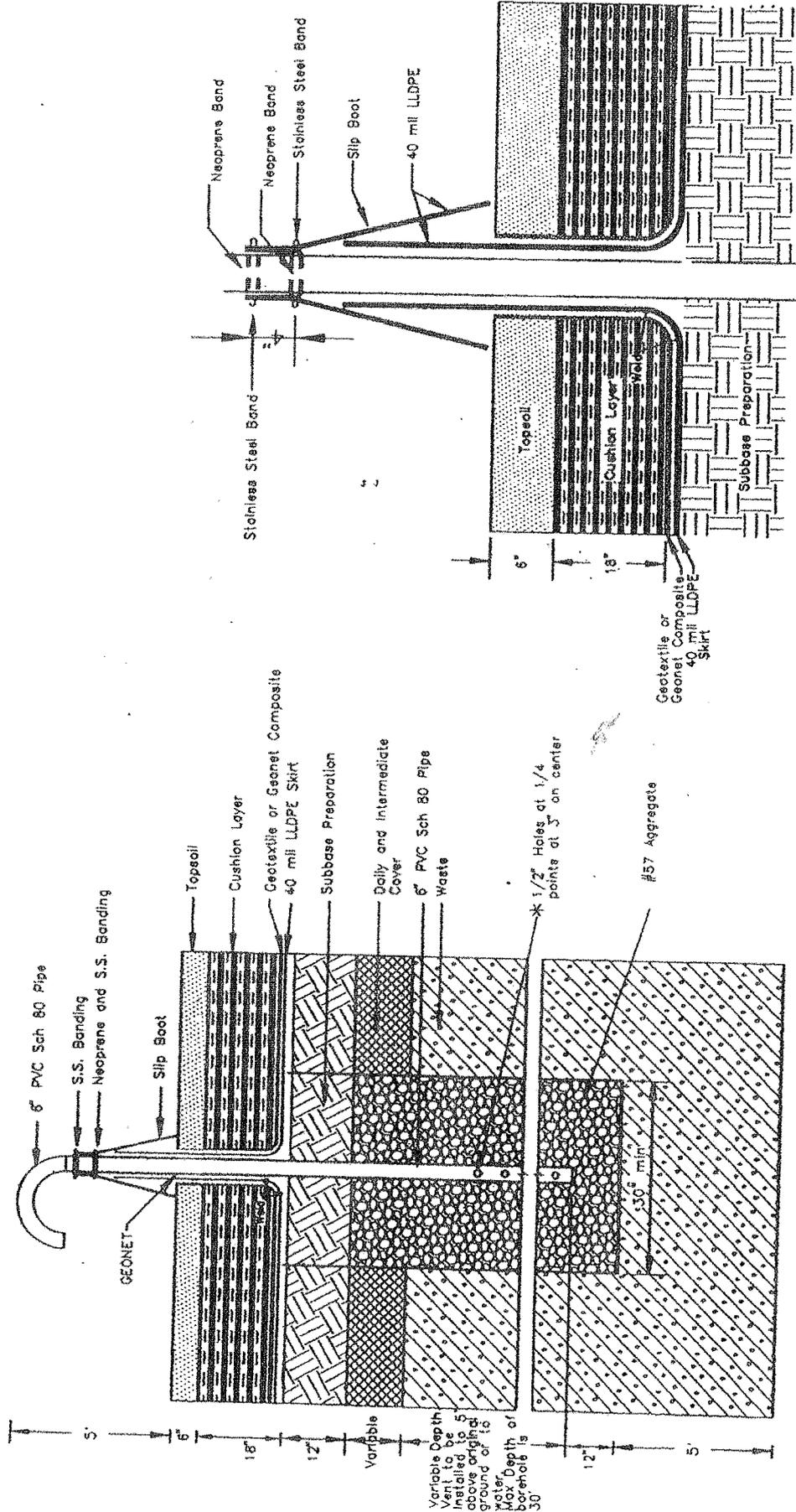
Kristofer L. Carlson, P.E.
Principal
Carlson Environmental Consultants, PC

Attachments

cc: Stan Steury, Blue Ridge RC&D
Rocky Nelson, Watauga County
Eric McGee, MEI

ATTACHMENT A

GAS VENT DETAIL



* PVC Pipe to be perforated from 5' below grade to the bottom.

9.5

GAS VENT

NO SCALE

SLIP BOOT DETAIL

ATTACHMENT B

LANDFILL GAS SYSTEM PERMIT DRAWINGS

PERMIT DRAWINGS

LANDFILL GAS COLLECTION AND CONTROL SYSTEM INSTALLATION WATAUGA COUNTY LANDFILL

OWNER:

**WATAUGA COUNTY, NORTH CAROLINA
WATAUGA COUNTY LANDFILL
336 LANDFILL ROAD
BOONE, NORTH CAROLINA 28607
(828) 264-5305**

IN PARTNERSHIP WITH:

**BLUE RIDGE RESOURCE CONSERVATION & DEVELOPMENT COUNCIL, INC.
1081-2 OLD US HIGHWAY 421
SUGAR GROVE, NORTH CAROLINA 28679
(828) 297-5805**

ENGINEER:

**CARLSON ENVIRONMENTAL CONSULTANTS, PC
400 WEST WINDSOR STREET
MONROE, NORTH CAROLINA 28112
(704) 506-7312**

CEC JOB NO. J1-20421-00

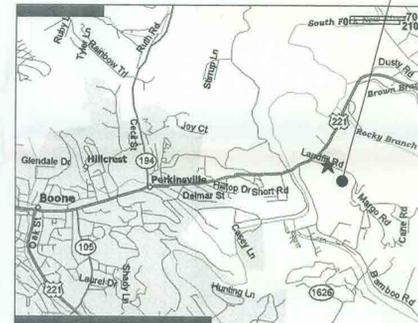
OCTOBER 2004

SITE



AREA MAP
SCALE: AS SHOWN

SITE



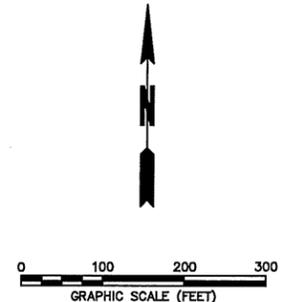
LOCATION MAP
SCALE: AS SHOWN

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	PHASE 1 - SITE PLAN
3	PHASE 2 - SITE PLAN
4	DETAILS
5	BLOWER/FLARE STATION

DRAWING TITLE:		TITLE SHEET	
PROJECT:		LFG COLLECTION SYSTEM DESIGN WATAUGA COUNTY LANDFILL BOONE, NORTH CAROLINA	
CLIENT:		BLUE RIDGE RD&D COUNCIL	
		CARLSON ENVIRONMENTAL CONSULTANTS, PC	
400 WEST WINDSOR STREET MONROE, NORTH CAROLINA 28112		(704) 506-7312 FAX (704) 283-9755	
CEC PROJECT NO.	J1-20421-00	DWG. WC.TITLE.PERMIT	REV. 0
SCALE	NO SCALE	SHEET 1 OF 5	
DATE	OCTOBER 2004		



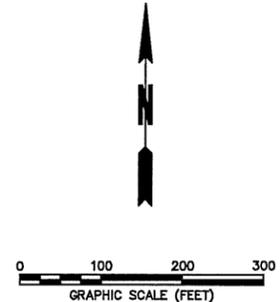


LEGEND			
— 3100 —	EXISTING GROUND		
---	WASTE BOUNDARY		
---	LFG HEADER/LATERAL PIPING	1/4	
▲ EW-22	EXISTING LFG VENT	5/4	6/4
● CS-1	CONDENSATE SUMP	2/4	3/4
▼ V-1	LFG SYSTEM ISOLATION VALVE	4/4	4/4
	BLIND FLANGE	4/4	
■	ROAD CROSSING	4/4	

- NOTES:
- EXISTING LANDFILL SITE CONDITIONS AND HISTORICAL INFORMATION PROVIDED BY WATAUGA COUNTY, NORTH CAROLINA AND THE BLUE RIDGE RESOURCE CONSERVATION & DEVELOPMENT COUNCIL, INC.
 - EXISTING LANDFILL TOPOGRAPHY PROVIDED BY DRAPER ADEN ASSOCIATES AS TAKEN FROM AERIAL SURVEYS BY J.H. BELL, P.C. DATED JUNE 1992, FEBRUARY 1994, AND JANUARY 23, 1996. INCLUDING TOPOGRAPHY OF EXISTING CAPPED LANDFILL BY WESTERN CAROLINA SURVEYORS, P.A. DATED JANUARY 15, 1997, TOPOGRAPHY OF LCID AREA BY BLOWING ROCK SURVEYING AND MAPPING DATED OCTOBER 31, 1997, AND TOPOGRAPHY OF BUILDING SITE AREAS BY DRAPER ADEN ASSOCIATES DATED MARCH 2003.
 - ALL LANDFILL GAS HEADER AND LATERAL PIPING TO BE INSTALLED AT A MINIMUM 2% GRADE UNLESS OTHERWISE APPROVED BY ENGINEER. DUE TO SURFACE GRADES, CONTRACTOR PERMITTED TO INSTALL LFG HEADER FROM EW-14 TO CS-1 AND EW-11 TO CS-1 AT A MINIMUM 1% GRADE.
 - CONTRACTOR REQUIRED TO FIELD SURVEY ALL HEADER LINES AT A MINIMUM SPACING OF ONE SURVEY POINT EVERY 10 FEET IN AREAS INSTALLED AT LESS THAN 2% SLOPE TO VERIFY POSITIVE CONDENSATE DRAINAGE.

**NOT FOR CONSTRUCTION
FOR PERMIT PURPOSES ONLY**

DRAWING TITLE:		PHASE 1 - SITE PLAN	
PROJECT:		LFG COLLECTION SYSTEM DESIGN WATAUGA COUNTY LANDFILL BOONE, NORTH CAROLINA	
CLIENT:		BLUE RIDGE RC&D COUNCIL	
		CARLSON ENVIRONMENTAL CONSULTANTS, PC	
400 WEST WINDSOR STREET MONROE, NORTH CAROLINA 28112		(704) 506-7312 FAX (704) 283-9755	
CEC PROJECT NO.	J1-20421-00	DWG. SITE PLAN	REV. 0
SCALE	1" = 100'	SHEET 2 OF 5	
DATE	OCTOBER 2004		



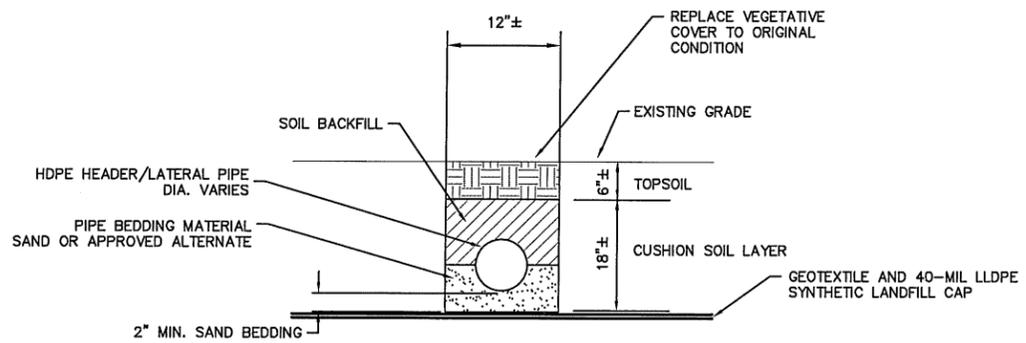
LEGEND	
— 3100 —	EXISTING GROUND
---	WASTE BOUNDARY
---	EXISTING LFG HEADER/LATERAL PIPING
---	PHASE 2 LFG HEADER/LATERAL PIPING
▲ EW-22	EXISTING LFG VENT
● CS-1	EXISTING CONDENSATE SUMP
▶ V-1	EXISTING LFG ISOLATION VALVE
	EXISTING BLIND FLANGE

NOTES:

- EXISTING LANDFILL SITE CONDITIONS AND HISTORICAL INFORMATION PROVIDED BY WATAUGA COUNTY, NORTH CAROLINA AND THE BLUE RIDGE RESOURCE CONSERVATION & DEVELOPMENT COUNCIL, INC.
- EXISTING LANDFILL TOPOGRAPHY PROVIDED BY DRAPER ADEN ASSOCIATES AS TAKEN FROM AERIAL SURVEYS BY J.H. BELL, P.C. DATED JUNE 1992, FEBRUARY 1994, AND JANUARY 23, 1996. INCLUDING TOPOGRAPHY OF EXISTING CAPPED LANDFILL BY WESTERN CAROLINA SURVEYORS, P.A. DATED JANUARY 15, 1997, TOPOGRAPHY OF LCID AREA BY BLOWING ROCK SURVEYING AND MAPPING DATED OCTOBER 31, 1997, AND TOPOGRAPHY OF BUILDING SITE AREAS BY DRAPER ADEN ASSOCIATES DATED MARCH 2003.
- ALL LANDFILL GAS HEADER AND LATERAL PIPING TO BE INSTALLED AT A MINIMUM 2% GRADE UNLESS OTHERWISE APPROVED BY ENGINEER.

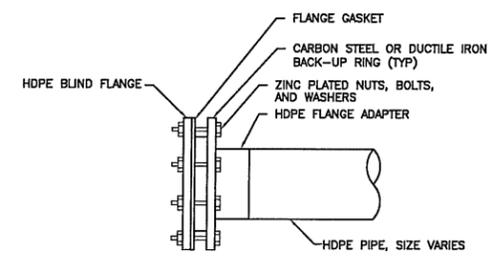
**NOT FOR CONSTRUCTION
FOR PERMIT PURPOSES ONLY**

DRAWING TITLE:		PHASE 2 - SITE PLAN	
PROJECT:		LFG COLLECTION SYSTEM DESIGN WATAUGA COUNTY LANDFILL BOONE, NORTH CAROLINA	
CLIENT:		BLUE RIDGE RC&D COUNCIL	
		CARLSON ENVIRONMENTAL CONSULTANTS, PC	
400 WEST WINDSOR STREET MONROE, NORTH CAROLINA 28112		(704) 506-7312 FAX (704) 283-9755	
CEC PROJECT NO.	J1-20421-00	DWG. SITE PLAN	REV. 0
SCALE	1" = 100'	SHEET 3 OF 5	
DATE	OCTOBER 2004		

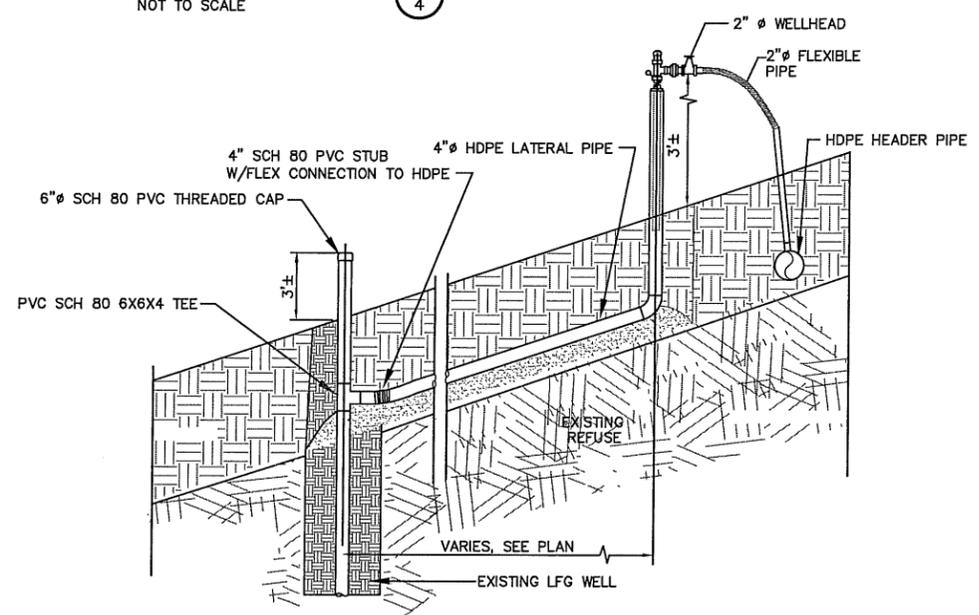


LFG HEADER/LATERAL TRENCH DETAIL (1/4)
NOT TO SCALE

NOTE: PIPE BEDDING MATERIAL MAY BE SAND, CLEAN EXCAVATED SOILS, OR OTHER MATERIAL AS APPROVED BY ENGINEER. SAND WILL BE USED IN ALL AREAS WHERE THE LANDFILL SYNTHETIC CAP IS EXPOSED OR OTHERWISE MAY COME IN CONTACT WITH THE LFG HEADER/LATERAL PIPING.

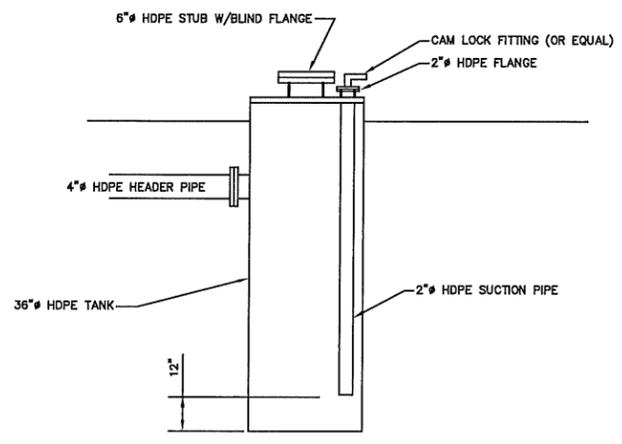


BLIND FLANGE DETAIL (2/4)
NOT TO SCALE

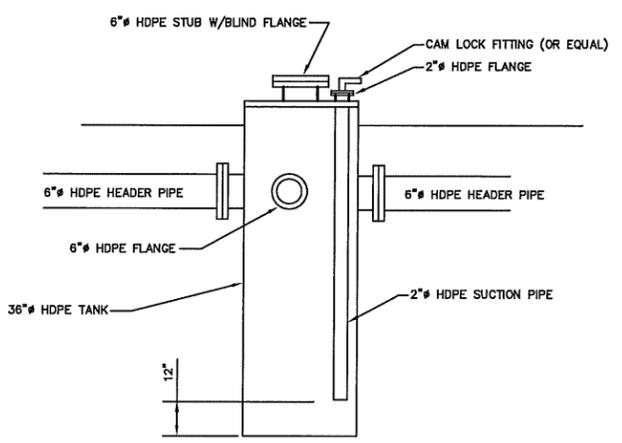


DOWNSLOPE WELLHEAD DETAIL (7/4)
NOT TO SCALE

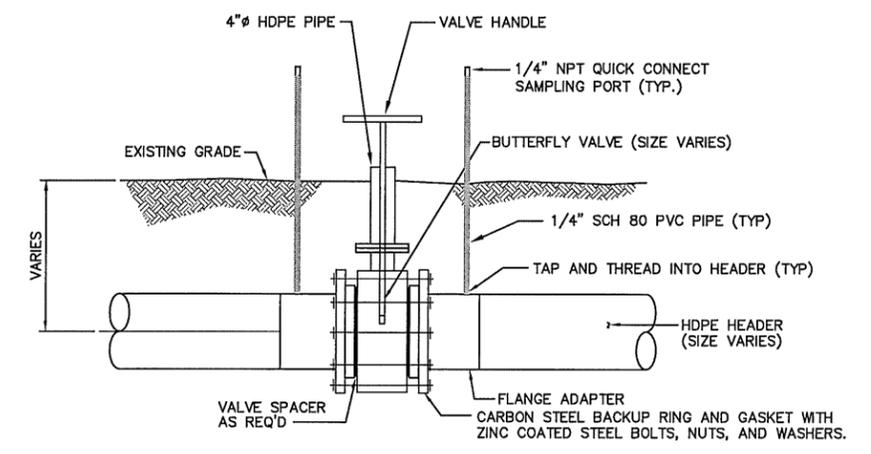
NOTE: THIS DETAIL REFERS TO THE PROPOSED RETROFITTING FOR VERTICAL WELLS EW-1, EW-16, EW-17, EW-18, AND EW-22.



CONDENSATE SUMP (CS-2) DETAIL (6/4)
NOT TO SCALE

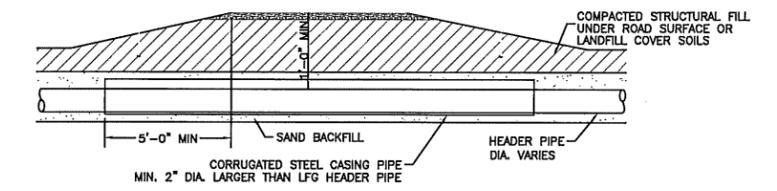


CONDENSATE SUMP (CS-1) DETAIL (5/4)
NOT TO SCALE



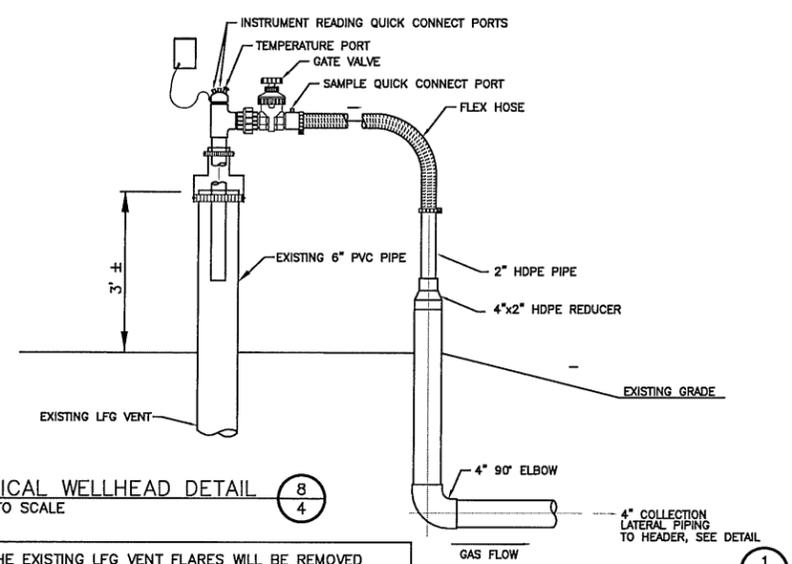
ISOLATION VALVE DETAIL (3/4)
NOT TO SCALE

NOTE: THE BUTTERFLY VALVE AND SAMPLE PORTS MAY BE INSTALLED IN A BELOWGRADE ENCASEMENT. VALVE TO BE WRAPPED IN A 5-MIL PLASTIC SHEETING. A MINIMUM OF 2 INCHES OF SAND AND TWO LAYERS OF 5-MIL PLASTIC SHEETING TO BE PLACED BETWEEN BOTTOM OF VALVE AND LANDFILL SYNTHETIC CAP.



ROAD CROSSING DETAIL (4/4)
NOT TO SCALE

NOTE: ROAD CROSSING DETAIL DEPICTED HERE IS AN EXAMPLE OF A TYPICAL PIPE ENCASEMENT TO BE UTILIZED IN AREAS WHERE THE LFG HEADER MAY REQUIRE ADDITIONAL PROTECTION FROM LANDFILL POST-CLOSURE ACTIVITIES. SECTIONS FOR ENCASEMENT TO BE IDENTIFIED BY LANDFILL OWNER PRIOR TO CONSTRUCTION.

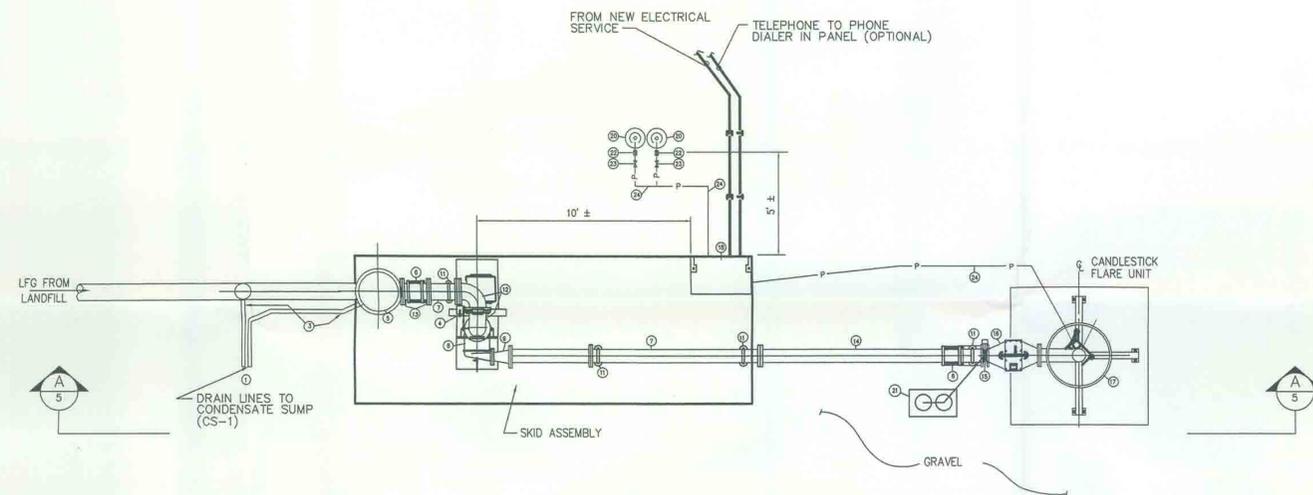


TYPICAL WELLHEAD DETAIL (8/4)
NOT TO SCALE

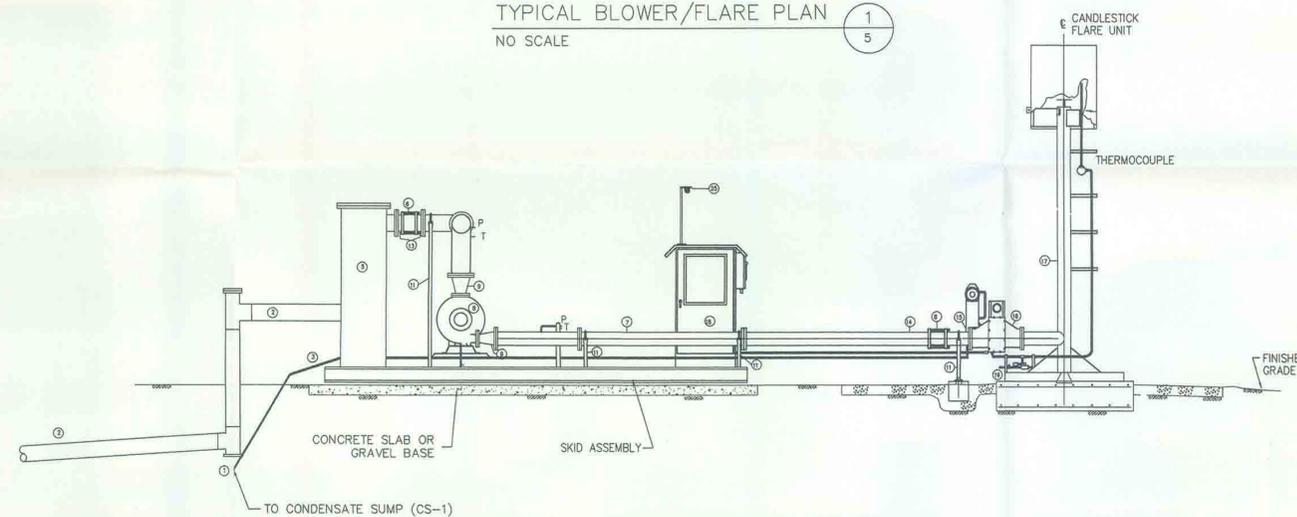
NOTE: THE EXISTING LFG VENT FLARES WILL BE REMOVED FROM THE VERTICAL WELLS AND A LANDFILL GAS WELLHEAD SIMILAR TO AS SHOWN HERE WILL BE INSTALLED. SIX-INCH PVC WELL PIPE MAY REQUIRE RAISING TO OBTAIN 3'± HEIGHT.

NOT FOR CONSTRUCTION FOR PERMIT PURPOSES ONLY

DRAWING TITLE:		DETAILS	
PROJECT:		LFG COLLECTION SYSTEM DESIGN WATAUGA COUNTY LANDFILL BOONE, NORTH CAROLINA	
CLIENT:		BLUE RIDGE RC&D COUNCIL	
		CARLSON ENVIRONMENTAL CONSULTANTS, PC	
400 WEST WINDSOR STREET MONROE, NORTH CAROLINA 28112		(704) 506-7312 FAX (704) 283-9755	
CEC PROJECT NO.	J1-20421-00	DWG. WC.DETAILS.PERMIT	REV. 0
SCALE	NO SCALE	SHEET 4 OF 5	
DATE	OCTOBER 2004		



TYPICAL BLOWER/FLARE PLAN 1/5
NO SCALE



TYPICAL BLOWER/FLARE ELEVATION A/5
NO SCALE

NOTES:
 1. THE BLOWER/FLARE PLAN AND ELEVATION SHOWN ARE FOR INFORMATIONAL PURPOSES ONLY. IT IS A SCHEMATIC LAYOUT AND DETAILS SHOWN HERE MAY DIFFER FROM FINAL BLOWER/FLARE SYSTEM. FINAL BLOWER/FLARE DESIGN TO BE PROVIDED BY THE MANUFACTURER OR FIELD FABRICATED BY CONTRACTOR AND APPROVED BY THE ENGINEER.
 2. BLOWER/FLARE MAY BE EXISTING EQUIPMENT, DELIVERED FROM DIFFERENT SITE.
 3. BLOWER/FLARE MAY BE SKID MOUNTED AS ONE ASSEMBLY, PARTIALLY SKID-MOUNTED AS DEPICTED HERE, OR MOUNTED ON A TRAILER.

LEGEND

- ① CONDENSATE SUMP
- ② HDPE HEADER PIPE
- ③ CONDENSATE DRAIN LINE
- ④ BUTTERFLY VALVE
- ⑤ FLANGED MOISTURE SEPARATOR w/ DE-MISTER PAD
- ⑥ FLANGED EXPANSION JOINT
- ⑦ CONNECTOR PIPE
- ⑧ BLOWER/MOTOR ASSEMBLY
- ⑨ FLANGED EXPANSION JOINT REDUCER
- ⑩ NUMBER NOT USED
- ⑪ PIPE SUPPORT
- ⑫ 90° FLANGED BEND
- ⑬ FLANGE ADAPTER
- ⑭ FLANGED PIPE
- ⑮ AUTOMATIC SHUT-OFF VALVE
- ⑯ FLANGED FLAME ARRESTOR
- ⑰ VERTICAL CANDLESTICK FLARE UNIT w/ WINDSHIELD
- ⑱ CONTROL PANEL w/SUN SHIELD
- ⑲ PILOT ASSEMBLY VALVE TRAIN
- ⑳ PROPANE TANKS WITH GAUGES
- ㉑ NITROGEN TANKS AND BASE
- ㉒ PRESSURE REGULATOR
- ㉓ VALVE
- ㉔ PIPE AND FITTINGS.
- ㉕ WEATHERPROOF LIGHT FIXTURE PROVIDED ON SKID ASSEMBLY

P - PRESSURE GAUGE
T - TEMPERATURE GAUGE

NOTE:
 1. DIMENSIONS AND MATERIALS SHOWN MAY BE MODIFIED TO SUIT INDIVIDUAL SKID MANUFACTURER'S (OR EXISTING SKID'S) REQUIREMENTS.

**NOT FOR CONSTRUCTION
FOR PERMIT PURPOSES ONLY**

DRAWING TITLE: BLOWER/FLARE STATION		
PROJECT: LFG COLLECTION SYSTEM DESIGN WATAUGA COUNTY LANDFILL BOONE, NORTH CAROLINA		
CLIENT: BLUE RIDGE RC&D COUNCIL		
CARLSON ENVIRONMENTAL CONSULTANTS, PC		
400 WEST WINDSOR STREET MONROE, NORTH CAROLINA 28112		
(704) 506-7312 FAX (704) 283-9755		
CEC PROJECT NO. J1-20421-00	DWG. WC.DETAILS.PERMIT	REV. 0
SCALE NO SCALE	SHEET 5 OF 5	
DATE OCTOBER 2004		

