

January 10, 2013
File No. 23211003.00

MEMORANDUM

TO: Chris Nagel, Missouri Department of Natural Resources

FROM: Craig Almanza, Bridgeton Landfill, LLC
Dan Brennan, SCS Engineers

SUBJECT: Bridgeton Landfill - Gas Interceptor Well Design

1 INTRODUCTION

In an effort to minimize or stop movement of subsurface heat from the south quarry to the north quarry, additional special purpose, interceptor gas wells are being proposed. These wells are planned to be located approximately 50 feet north of the first line of temperature monitoring probes (TMPs 7R, 8, and 9) installed at the facility. A description of the design approach and contingencies are described below.

2 DESIGN APPROACH

The location of the interceptor wells are 50 feet north of a theoretical line that would run from TMP-7R through TMP-8 and then to TMP-9.

The Gas Interceptor Wells (GIWs) have been planned so the first well is located approximately 75 feet from the west edge of the quarry (south quarry). The remaining wells begin 50 feet from the first well and are spaced 50 feet from one another along the line described above (50 feet north of the theoretical TMP line). The GIWs are labeled on the Site Map – GIW-1 through GIW-7. The wells are grouped into two separate collection lines – four wells in one group and three wells in the other group. Each well group has a common header manifold that is then connected to the existing 16-inch header which runs east and west at the narrow part of the landfill at the North and South Quarry boundaries. Each well group has a main header valve, the potential for a bypass to a cooling device if needed, and each well has a control valve. Additionally, each well has a 6” Tee which has been designed to accommodate the use of a phase separation tank, if required.

The well spacing design will provide heavy vacuum overlap from well to well. This will create a low pressure area “wall” (vacuum curtain) that will allow heated and pressurized gas a controlled means of escape where it can be safely destructed in the current GCCS.

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3 WELL DESIGN

The wells are designed to be drilled a maximum depth of 150 feet below ground surface. However, due to the bottom surface grades, GIW-1 can only achieve a depth of approximately 57 feet below ground surface. A well schedule has been provided on the detail sheet drawing.

The wells will be constructed of carbon steel and be 6-inch in diameter. The wells will have 25 feet of solid pipe and the rest will be perforated pipe, as shown on the well detail (Detail 3 on Sheet 3). Each well will have a flanged cast iron knife valve (McMaster-Carr Model #6312T35 or equivalent) for control of heated gas and potential liquids that may be collected. This knife provides maximum flexibility in adjusting to actual conditions that may be encountered. The top of each well will be a steel flange that can either accept a custom steel wellhead or a Landtec wellhead. Each well head will be approximately 4-5 feet above ground when completely constructed.

4 WELL DESIGN CONTINGENCIES

Due to the nature of the heat generating reaction at the Bridgeton Landfill, it is possible that the collected gas may be heated above normal operating temperatures or may be heated gas along with liquids. Both of these situations have been identified and worked into the design of the system.

If the collected gas is a heated gas with the extra liquids, each GIW had been design with a tee and blind flange that can be utilized to direct the collected gas to a phase separation device and then be re-inserted into the header piping. If the collected gas is only a heated gas (without the extra liquids) then a bypass line has been designed into each well group header that can direct the gas into a cooling device before continuing to the blower/flare station.

5 HEADER SYSTEM

The header system of the proposed GIW collection system will be tied into the existing 16-inch diameter header located approximately at the North/South Quarry boundary. The existing header is located approximately 4 feet below ground surface and slopes both to the east and the west from the high point approximately at the midpoint of the header. The headers from the new well groups will be sloped downhill to the existing header, running above ground until it gets close to the tie-in with the existing header, where it will go below ground to make the connection to the existing header.

The main header and from each well group as well as the common collector pipe for each well group is a 10-inch diameter pipe. The lateral to each GIW is a 4-inch diameter pipe. Steel piping

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for the header and the common collection manifolds will be used on the well side of the contingency cooling device flange. HDPE pipe will be used from this flange north to the 16" header tie-in. The 4" lateral lines will also be constructed of steel (See detail drawing).

2013 GAS INTERCEPTOR WELL DESIGN BRIDGETON LANDFILL BRIDGETON, ST. LOUIS COUNTY, MISSOURI

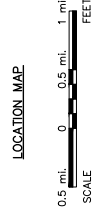
DRAWING INDEX	
DRAWING NO.	DRAWING TITLE
1	COVER SHEET
2	WELL LAYOUT SHEET
3	CARBON STEEL INTERCEPTOR WELL DETAILS



BRIDGETON LANDFILL

PREPARED FOR:
BRIDGETON LANDFILL, LLC
13570 ST. CHARLES ROCK ROAD
BRIDGETON, MO 63044

PREPARED BY:
SCS ENGINEERS
2060 READING ROAD
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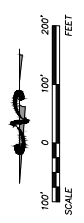
JANUARY 10, 2013

CLIENT:	BRIDGETON LANDFILL, LLC 13570 ST. CHARLES ROCK ROAD BRIDGETON, MO 63044
SHEET TITLE:	COVER SHEET
PROJECT TITLE:	2013 GAS INTERCEPTOR WELL DESIGN
REV.	
DATE	
DESCRIPTION	
BY	
CR	

DATE:	1/10/2013
SCALE:	NONE
DRAWING NO.:	
CUSTOMER:	BRIDGETON LANDFILL, LLC
PROJECT NO.:	23211003.00
DATE:	1/10/2013
SCALE:	NONE
DRAWING NO.:	

DATE:	1/10/2013
SCALE:	NONE
DRAWING NO.:	

DATE:	1/10/2013
SCALE:	NONE
DRAWING NO.:	



NOTES:

- EXISTING GRADE CONTOURS SHOWN ARE FROM AERIAL SURVEY COMPLETED BY THE SANBORN MAPS COMPANY. THE VERTICAL CURVE DATA SHOWN ON THIS DRAWING FROM A GROUND SURVEY COMPLETED BY SHERBET-ORSON-CARTON, LLC IN MAY 2011.
- EXISTING AND PROPOSED GAS INTERCEPTOR WELL SYSTEM COMPONENTS (PERFECTED GAS, GAS CONTROL INFORMATION, WHERE AVAILABLE, AND APPROXIMATED OTHERWISE).
- CONSTRUCTED COMPONENTS (WELLS, DIMENSIONS, AND MATERIALS) SHOWN ARE APPROXIMATE, UNLESS OTHERWISE NOTED. OTHERWISE THEY ARE APPROXIMATE.
- BASE MAP PROVIDED BY AQUATERRA ENVIRONMENTAL SOLUTIONS, INC.

LEGEND

EXISTING 10' CONTOURS	EXISTING 2' CONTOURS	ELECTRIC LINE
BUILDING	FENCE	CONDENSATE SUMP
PAVED ROAD	UNPAVED ROAD	2012 PROPOSED WELLS
PERMITTED WASTE LIMITS	LFG COLLECTION PIPE	LEACHATE COLLECTION PIPE
LFG COLLECTION WELL	VALVE	LEACHATE DISCHARGE
DUAL-EXTRACTION WELL	SURFACE COLLECTOR	LFG MONITORING PROBE
OVER LIMER 1/2-IN POINT	WELL BORE BOOT	PERIMETER LFG COLLECTION WELL
CLEANOUT	STORM WATER OUTFALL	PERIMETER CONNECTION PIPE
PL		LFG INTERCEPTION TRENCH WELL
		GROUNDWATER WELL
		PROPERTY LINE
		POWERPOLE



BRIDGETON LANDFILL 2013 GAS INTERCEPTOR WELL DESIGN

BRIDGETON LANDFILL, LLC

13570 ST CHARLES ROCK ROAD

BRIDGETON, MO 63044

SCS ENGINEERS

STEARN, CONRAD AND SCHAUBT

CONSULTING ENGINEERS, INC.

506 KICKING ROCK BLVD SUITE 100

BRIDGETON, MISSOURI 63044

PH (314) 421-5333 FAX (314) 421-2841

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C:\WORK\231103 BRIDGETON LF ENG ASS\TMS\DEL\WELLS-REPORTS\INTERCEPTOR WELLS\SITE MAP 1-9-13.DWG

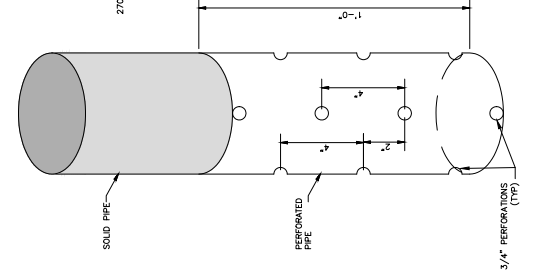
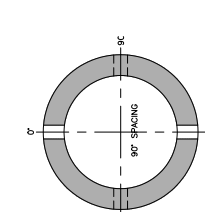
WELL SCHEDULE

Well No.	Well Location	Well Type	Well Depth (ft)	Well Diameter (in)	Well Material	Well Construction	Well Status	Well Remarks
100-1	100-1	Production	100	6	Carbon Steel	Perforated	Active	
100-2	100-2	Production	100	6	Carbon Steel	Perforated	Active	
100-3	100-3	Production	100	6	Carbon Steel	Perforated	Active	
100-4	100-4	Production	100	6	Carbon Steel	Perforated	Active	
100-5	100-5	Production	100	6	Carbon Steel	Perforated	Active	
100-6	100-6	Production	100	6	Carbon Steel	Perforated	Active	
100-7	100-7	Production	100	6	Carbon Steel	Perforated	Active	
100-8	100-8	Production	100	6	Carbon Steel	Perforated	Active	
100-9	100-9	Production	100	6	Carbon Steel	Perforated	Active	
100-10	100-10	Production	100	6	Carbon Steel	Perforated	Active	

- NOTES:**
- THIS DRAFT WELL SCHEDULE IS NOT INTENDED FOR CONSTRUCTION UNTIL ACTUAL SURVEY DATA IS OBTAINED AND THE WELL SCHEDULE IS REVISED BY THE ENGINEER.
 - SURVEYOR SHALL LOCATE WELLS AND VERIFY SURFACE ELEVATIONS BEFORE CONSTRUCTION. A PRE-CONSTRUCTION SURVEY CONTRACTOR SHALL BE EMPLOYED TO CONDUCT SURVEYING AND TO PROVIDE SURVEY DATA TO THE ENGINEER. THE WELL SCHEDULE BASED ON THE PRE-CONSTRUCTION SURVEY CONTRACTOR'S ENGINEER SIGNATURE SHALL BE USED FOR CONSTRUCTION.
 - FOLLOWING REVIEW OF SURVEY DATA, CONTRACTOR SHALL GET AUTHORIZATION FROM OWNER AND ENGINEER PRIOR TO DRILLING.
 - WELL DEPTHS BASED ON TOPOGRAPHIC SURVEYED BY SHERRITT-CARSON-CLAYTON, DATED MAY 2011, AND BASE GRADES OBTAINED FROM MIDWEST ENVIRONMENTAL CONSULTANTS APRIL 1998 LANDFILL GAS RECOVERY SYSTEM DESIGN.

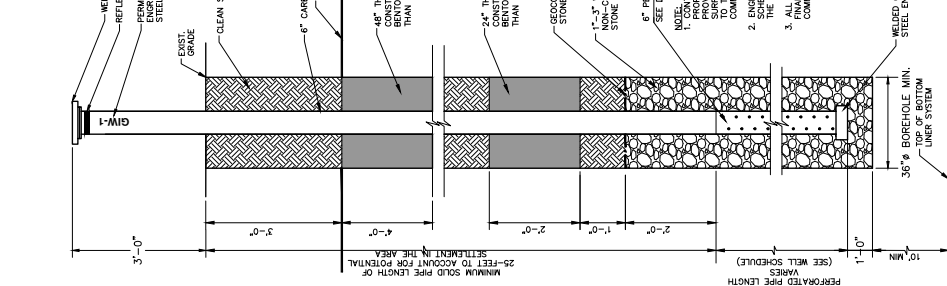
DESIGN FIRM D/A/C REVIEWER ACKNOWLEDGEMENT: _____ DATE _____
 DESIGN FIRM PROJECT MANAGER ACKNOWLEDGEMENT: _____ DATE _____
 ENVIRONMENTAL MANAGER: _____ DATE _____
 COA INSPECTOR: _____ DATE _____
 SURVEYOR ACKNOWLEDGEMENT: _____ DATE _____
 DRILLER ACKNOWLEDGEMENT: _____ DATE _____

UNLESS OTHERWISE SPECIFIED, ALL DRILLING ACTIVITIES BEGIN WITHOUT PROVIDING THE ABOVE SIGNATURES. ANY CHANGES TO WELL LOCATIONS OR DEPTHS SHALL REQUIRE THESE SIGNATURES TO BE OBTAINED AGAIN.

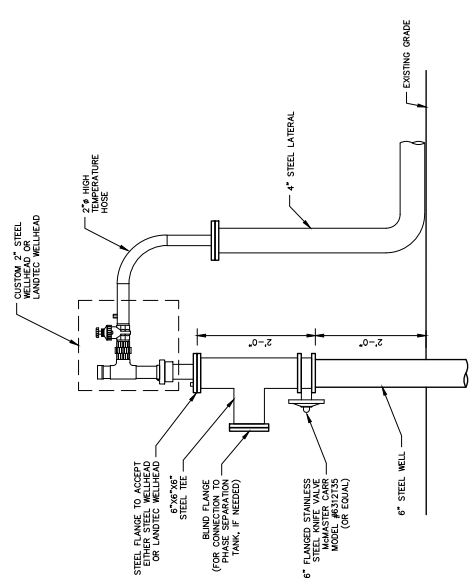


- CARBON STEEL WELL CASING
- 3/4\"/>

PERFORATION DETAIL 2
NOT TO SCALE



GAS INTERCEPTOR WELL DETAIL 1
NOT TO SCALE



WELLHEAD DETAIL 3
NOT TO SCALE