SCS ENGINEERS

Transmittal

West Des Moines, IA

PROJECT:	Mahaska Co,LF Gas Migration Plan,IA 27225383.00	DATE:	8/6/2025
SUBJECT:	Mahaska County Sanitary Landfill, Binns & Stevens MSWLF Unit-62-SDP-01-74P-Landfill Gas Migration Action Plan	TRANSMITTAL ID:	00001
PURPOSE:	For your review and comment	VIA:	Info Exchange

FROM

NAME	COMPANY	EMAIL	PHONE
Nathan Ohrt West Des Moines, IA	SCS Engineers	NOhrt@scsengineers.com	+1-515-415-9220

TO

NAME	COMPANY	EMAIL	PHONE
Mike Smith 502 East 9th Street Des Moines IA 50319-0034 United States	Iowa, State of	mike.smith@dnr.iowa.gov	515-725-8200

REMARKS:

Good morning Mike-

Please see below for download the Landfill Gas Migration Action Plan for the Binns & Stevens MSWLF Unit at the Mahaska County Sanitary Landfill. If you have any questions or comments regarding this plan, please do not hesitate to let us know. Thank you.

Nathan Ohrt
Senior Project Professional
SCS Engineers
West Des Moines, Iowa
319-331-9613
nohrt@scsengineers.com

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Transmittal

DATE: 8/6/2025
TRANSMITTAL ID: 00001

DESCRIPTION OF CONTENTS

QTY	DATED	TITLE	NOTES
1	8/6/2025	Mahaska County Sanitary Landfill, Binns & Stevens MSWLF Unit-62-SDP-01-74P-Landfill Gas Migration Action Plan.pdf	

COPIES:

Joe Farris	(Mahaska County Solid Waste Management Commission)
Tim Buelow	(SCS Engineers)
Nathan Ohrt	(SCS Engineers)
Christine Collier	(SCS Engineers)
Becky Jolly	

August 6, 2025
File No. 27224360.00

Mr. Mike Smith, P.E.
Iowa Department of Natural Resources
Land Quality Bureau
6200 Park Avenue
Des Moines, Iowa 50321

Subject: Landfill Gas Migration Action Plan
Mahaska County Sanitary Landfill
Binns & Stevens MSWLF Unit
Permit No. 62-SDP-01-74P

Dear Mike:

SCS Engineers (SCS), on behalf of the Mahaska County Solid Waste Management Commission, is submitting this response to Iowa Department of Natural Resources (DNR) correspondence, dated April 18, 2025 (Doc #112889), which requested an action plan to mitigate landfill gas migration at the Binns & Stevens municipal solid waste landfill unit (Binns & Stevens MSWLF unit) at the Mahaska County Sanitary Landfill. Landfill gas is consistently measured above the action level near the facility boundary; the action level at the property boundary is defined by Iowa Administrative Code (IAC) 567—113.9(2)*a*(2) as 100% of the lower explosive limit (LEL) for methane; the LEL is 5% methane by volume.

The *Geoprobe Assessment Report*, prepared by Terracon and dated June 4, 2012 (Doc #72422), described efforts to delineate the area of landfill gas migration and concluded that landfill gas was migrating off-site primarily along the north-central and northwest portions of the fill boundary, traveling mostly through the sandy clay material. The report stated: "*It is recommended that a gas collection trench be installed within the waste boundary to actively collect landfill gas prior to movement of the gas past the permitted waste limits*."

To mitigate the landfill gas migration, a landfill gas cutoff trench was installed along the northern waste boundary to passively vent landfill gas before it migrated off-site. The construction was documented in the *Landfill Gas Trench Construction Documentation Report*, prepared by Terracon and dated October 7, 2015 (Doc #84426).

A DNR comment letter dated May 28, 2019 (Doc #95258), commented on the effectiveness of the trench in mitigating landfill gas migration, stating the following:

> *A cursory review of the effectiveness of the vapor trench, by summing the measurements of lower explosive levels (LELs) for each quarter since the first quarter of calendar year 2016, indicates that the trench has had no impact on the control of migrating explosive landfill gas. In fact, both the Mann-Kendall and linear regression evaluation below indicates an increasing trend. Therefore, the DNR reminds the permit holder of the intent of IAC 113.9 and that time is of the essence in meeting IAC 113.9 when LELs are at or above 100% at the landfill property.*

The *Landfill Gas Lateral Construction Documentation Report*, prepared by Terracon and dated October 12, 2020 (Doc #98749), included the following description of the effectiveness of the trench in mitigating landfill gas migration:

> *A landfill gas cutoff trench was originally designed to be constructed in the waste to be in direct connection with the migrating gas. The IDNR allowed the trench to be constructed outside the waste to accelerate installation. The possible decrease in effectiveness of a trench located outside the waste was discussed. The landfill gas cutoff trench was installed in 2015 outside the northern waste boundary to passively collect landfill gas prior to its movement past the site boundary. For several years the concentration of landfill gas migrating past the site boundary was significantly reduced by the trench. Recent data collected quarterly at the site has indicted* [sic] *the effectiveness of the trench has decreased over time. In a review letter dated May 28, 2019* (Doc #95258) *the IDNR indicated that the effectiveness of the cutoff trench had experienced a reduced effect on the control of migrating landfill gas and required additional work. The IDNR reviewed and accepted a Gas Lateral Installation Work Plan submitted on November 27, 2019. The workplan recommended the construction of five gas laterals extending from the current cutoff trench into the waste to be in direct connection with the migrating gas.*
>
> *The gas laterals were installed in conjunction with initial waste cell capping operations between August 31 and September 1, 2020.*

An evaluation of explosive gas level trends was included in the *2024 Annual Water Quality Report*, prepared by SCS and dated February 27, 2025 (Doc #112394). The report stated the following:

> *In correspondence dated February 29, 2024 (Doc #109356), the Iowa Department of Natural Resources (DNR) requested a statistical evaluation of explosive gas level trends and an action plan to bracket the limits of gas migration and mitigate the situation. To evaluate the effectiveness of the existing landfill gas control system at the Landfill, methane concentration data as % volume for the period from 2022-2024 was graphed. A linear regression trendline including equation and R^2 values was calculated. An R^2 value is between zero and one. The closer to one, the better the "fit" of the data to the regression. The calculated R^2 values are included in the tables below and the graphs are in the attached Appendix I* [graphs not included].

Point ID#	*R^2 Value*	*Increasing/ Decreasing*
SG-3	*0.0748*	*Increasing*
SG-5R	*0.0008*	*Increasing*
UW-9R	*0.0029*	*Decreasing*
UW-10	*0.4817*	*Decreasing*
VP-3	*0.0333*	*Decreasing*
VP-4	*0.0058*	*Decreasing*

Point ID#	*R^2 Value*	*Increasing/ Decreasing*
VP-5	*0.0258*	*Decreasing*
VP-6	*0.3681*	*Decreasing*
VP-7	*0.0086*	*Increasing*
VP-8	*0.4268*	*Decreasing*
GV-1	*0.1428*	*Decreasing*
GV-2	*0.0091*	*Decreasing*

> *The low R^2 values indicate the data vary significantly from being linear. Monitoring points SG-3, SG-5R, and VP-7 indicated some degree of increasing trends based on the slopes of the regression lines and monitoring points UW-9R, UW-10, VP-3, VP-4,*

VP-5, VP-6, VP-8, GV-1, and GV-2 indicated some degree of decreasing trends based on the slopes of the regression lines. However, due to the non-linear form of the datasets, the trend indications should not be considered conclusive. In most cases, the methane concentrations in the monitoring points were significantly above the compliance level.

The *Landfill Gas Trench Construction Documentation Report*, prepared by Terracon and dated October 7, 2015 (Doc #84426), described the trench as being excavated to a depth of 5-7.5 feet below ground surface (bgs). Sheet 2 – Passive Gas Trench Profile from Doc #84426 is included in **Attachment A**. The profile is oriented from west to east. Some vent points installed in the trench are consistently measured at methane concentrations exceeding the LEL, indicating that the trench and laterals are venting landfill gas. However, monitoring points SG-3, UW-9R, UW-9RA, and UW-10, located north of the trench, consistently have methane concentrations greater than the LEL, indicating the effectiveness of the trench is limited in mitigating landfill gas migration.

Landfill gas concentrations greater than 100% of the LEL were measured during the quarterly monitoring events in 2024 in the monitoring points shown in the table below. It should be noted that monitoring points GV-1 and GV-2 are screened in waste.

Monitoring Points				1/5/2024		5/14/2024		9/5/2024		11/20/2024	
No.	Name	Type	Description	% LEL	S (Y/N)	% LEL	S (Y/N)	% LEL	S (Y/N)	% LEL	S (Y/N)
#3	SG-3	Subsurface	North site boundary	>100	N	>100	N	>100	N	60	N
#4	SG-4	Subsurface	West site boundary	0	N	>100	N	10	N	2	N
#5	SG-5R	Subsurface	West site boundary	>100	N	0	N	>100	N	>100	N
#9	UW-9R	Subsurface	Northwest site boundary	>100	N	0	N	>100	N	55	N
#10	UW-9RA	Subsurface	Northwest site boundary	0	N	0	N	>100	N	>100	N
#11	UW-10	Subsurface	North site boundary	>100	N	0	N	>100	N	>100	N
#16	VP-3	Trench Vent	North of waste boundary	>100		>100		>100		28	
#17	VP-4	Trench Vent	North of waste boundary	>100		>100		>100		>100	
#18	VP-5	Trench Vent	North of waste boundary	>100				>100		54	
#19	VP-6	Trench Vent	North of waste boundary	>100		>100		>100		>100	
#20	VP-7	Trench Vent	North of waste boundary	>100		>100		>100		>100	
#21	VP-8	Trench Vent	West site boundary	>100		1		3		0	
#25	GV-1	Subsurface	South of SG-3	>100	N	>100	N	>100	N	>100	N
#26	GV-2	Subsurface	West of SG-1	>100	N	0	N	>100	N	>100	N

S(Y/N) - Was screen submerged, yes or no or blank is non-applicable.

It is apparent that the previously installed trench and trench laterals do not intercept all of the landfill gas migrating in the subsurface. **Attachment B** includes Table 2 of the *Geoprobe Assessment Report* (Doc #72422) referenced above that includes the percentage methane readings at specified depth intervals of Geoprobe borings. The trench would presumably intersect gas migrating in the four to eight-foot depth interval. However, the highest methane concentration was deeper than eight feet in each of the 22 borings, with two exceptions (GP-4 had a low concentration of methane, and GP-12 was abandoned at eight feet). However, the deepest intervals included in the assessment were one boring advanced to 20-24 feet bgs and seven borings advanced to 16-20 feet bgs.

A United States Geological Survey (USGS) map of the Eddyville Quadrangle from 1968 in **Attachment C** shows the disturbed area of the strip mine that preceded much of the Binns & Steven MSWLF unit area. A contour around the water impoundment on the northern side of the site is 720 feet above

mean sea level (amsl). Although not clearly shown in the USGS map, it is likely that a high wall may be present on the northern side of the previous strip mine, particularly in this area, which is the west half of the north boundary of the MSWLF unit. This area is also where some of the highest non-waste fill ground surface elevations are present, resulting in the bottom of waste being potentially as much as 40 feet below the bottom of the landfill gas migration interceptor trench in this area.

Leachate piezometer LMEW-7 was drilled to 50 feet bgs, resulting in a bottom elevation of approximately 728 feet amsl, while leachate piezometer LMEW-8 was drilled to 57 feet bgs, resulting in a bottom elevation of approximately 730 feet amsl (Doc #62097). Leachate piezometer LMEW-9A was drilled to 57 feet bgs, resulting in a bottom elevation of approximately 728 feet amsl (Doc #99973). The installed depths of the leachate piezometers and the contour elevation from the USGS map indicate a substantial waste depth on the north side of the MSWLF unit, which indicates the potential for landfill gas migration at greater depths.

Monitoring wells UW-9R, UW-9RA, SG-3, and UW-10 frequently have elevated methane concentrations, with numerous measurements above the LEL. Monitoring well UW-9RA has a top of screen elevation approximately 20 feet below the base of the trench and had methane concentrations above the LEL in 2024. The boring log for monitoring well UW-9R indicates 30 feet of sandstone before a screened interval in shale. The higher permeability sandstone may function as a preferential pathway for methane migration. Monitoring point SG-3 has a short screen near the trench. The top of the screen of monitoring well UW-10 is nearly ten feet below the bottom of the trench. Methane is also elevated on the west side of the MSWLF unit near monitoring points SG-4 and SG-5R, with SG-5R having more exceedances measured in 2024. Monitoring point SG-5R is screened down to an elevation of approximately 724 feet amsl.

The screened interval geologies did not indicate a predominant soil type as potentially being a primary pathway for landfill gas migration. Screened interval geologies in the monitoring points with multiple 2024 LEL exceedances included sandy clay, coal to shale, sandstone to shale, sandy clay with clay seams, and shale. Therefore, targeting a specific stratum is unlikely to intersect the multiple migration pathways that potentially exist adjacent to the waste mass, and the migration may be more influenced by subsurface modifications resulting from past strip mining activities than by the in-situ geology.

The focus of this action plan will be venting the subsurface to a greater depth by installing passive vents within the waste mass with the intent to intercept landfill gas migration before the landfill gas reaches the compliance boundary. Ten passive landfill gas venting wells will be installed along the northern waste boundary and portions of the western waste boundary at select points with accessibility for drilling equipment based in areas of known gas migration, as shown on the attached site map (**Figure 1**). The borings will be advanced to near the estimated depth of waste and screened from the bottom of the boring to approximately 5 to 10 feet bgs to intercept landfill gas. Landfill gas migrating shallower than 10 feet bgs on the north side of the MSWLF unit is expected to be influenced by the previously installed trench system. **Table 1** on the following page summarizes the proposed depths of the new passive venting wells. Actual depths will be determined in the field based on observations made while drilling.

Table 1
Proposed Passive Gas Vent Information

Passive Vent	Proposed Vent Depth (feet bgs)	Proposed Screened Interval (feet bgs)
GV-6	20	5-20
GV-7	35	5-35
GV-8	35	10-35
GV-9	50	10-50
GV-10	45	10-45
GV-11	45	10-45
GV-12	40	10-40
GV-13	30	10-30
GV-14	25	10-25
GV-15	25	10-25

To measure the effectiveness of the remedy, the current monitoring program will continue with the addition of the passive venting wells to the quarterly monitoring schedule. If, after three years of monitoring (twelve monitoring events following installation of the venting wells), a reduction of LEL exceedances in the compliance network is not observed, additional landfill gas migration mitigation strategies will be evaluated.

If you have any questions regarding this action plan, please contact Nathan Ohrt at (319) 331-9613 or Tim Buelow at (515) 681-5455.

Sincerely,

Nathan Ohrt
Senior Project Professional
SCS Engineers

Timothy C. Buelow, P.E.
VP, Senior Project Advisor
SCS Engineers

NPO/TCB

Copies: Mr. Joe Farris, Mahaska County Sanitary Landfill

No.	Name	Type	Description
#1	SG-1	Subsurface	East site boundary
#2	SG-2	Subsurface	North site boundary
#3	SG-3	Subsurface	North site boundary
#4	SG-4	Subsurface	West site boundary
#5	SG-5R	Subsurface	West site boundary
#6	SG-6R	Subsurface	South of waste boundary
#7	SG-7R	Subsurface	South of waste boundary
#8	SG-8	Subsurface	East site boundary
#9	UW-9R	Subsurface	Northwest site boundary
#10	UW-9RA	Subsurface	Northwest site boundary
#11	UW-10	Subsurface	North site boundary
#12	UW-10A	Subsurface	North site boundary
#13	DW-8	Subsurface	West site boundary
#14	VP-1	Trench Vent	East site boundary
#15	VP-2	Trench Vent	North of waste boundary
#16	VP-3	Trench Vent	North of waste boundary
#17	VP-4	Trench Vent	North of waste boundary
#18	VP-5	Trench Vent	North of waste boundary
#19	VP-6	Trench Vent	North of waste boundary
#20	VP-7	Trench Vent	North of waste boundary
#21	VP-8	Trench Vent	West site boundary
#22	Scale House Basement	Indoor	Inside scalehouse basement
#23	Scale Pit	Outdoor	Near scale pit
#24	Shop	Indoor	Inside shop building
#25	GV-1	Subsurface	South of SG-3
#26	GV-2	Subsurface	West off SG-1

Proposed Gas Vent Locations

Figure 1

SCS ENGINEERS
environmental consultants and contractors

Legend

- Methane Monitoring Point
- Approximate Monitoring Point
- Approximate Leachate Monitoring Point
- Approximate Gas Probe
- Approximate Trench Vent
- Vapor Trench
- Cell Boundary
- Approximate Site Boundary - Active Site
- Approximate Waste Boundary
- Proposed Gas Vent

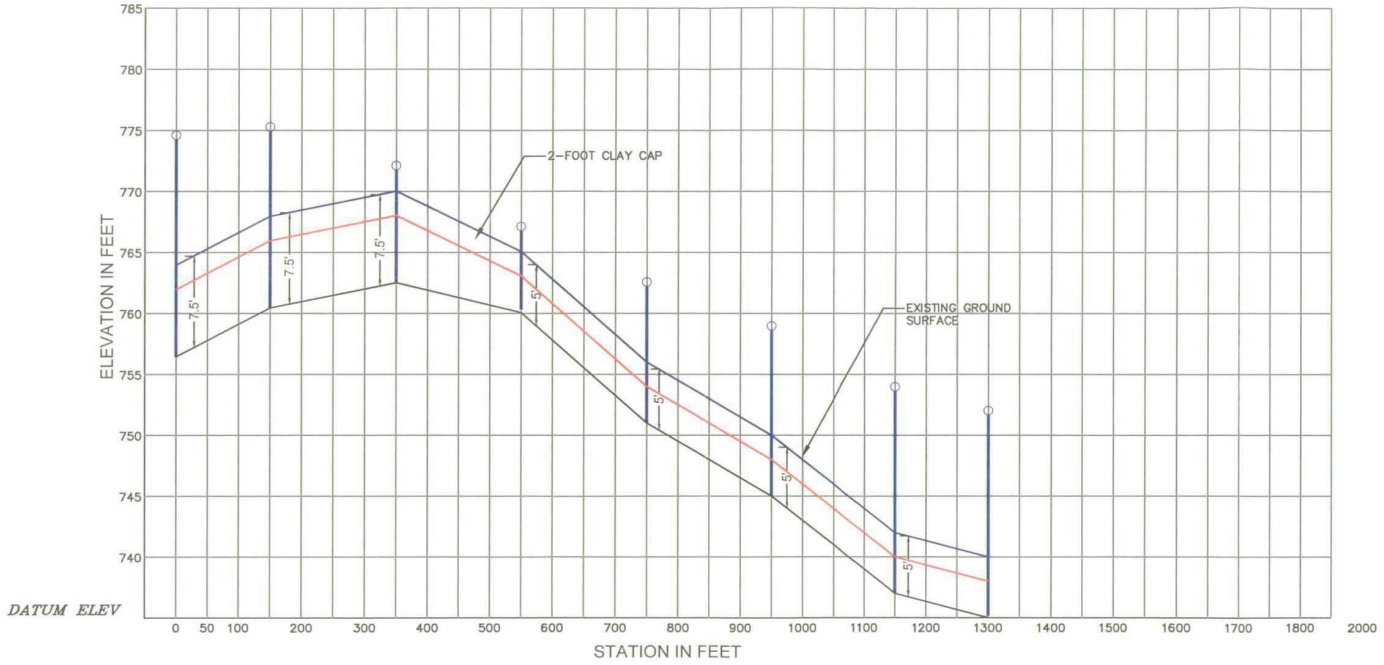
Mahaska County Sanitary Landfill
Binns & Stevens Site
Oskaloosa, Iowa
Project No: 27224360.00
Drawing Date: June 2025

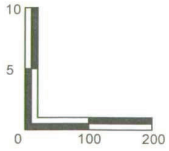
N
W E
S

0 162.5 325 650 975 Feet

Attachment A

Sheet 2 from *Landfill Gas Trench Construction Documentation Report*
(Doc #84426)





INDICATES APPROXIMATE LOCATION OF EXISTING GROUND SURFACE

INDICATES APPROXIMATE LOCATION OF LANDFILL GAS VENT RISER

INDICATES APPROXIMATE LOCATION OF SLOTTED PVC PIPE SDR 35 OR EQUIVALENT

INDICATES APPROXIMATE LOCATION OF BASE OF TRENCH

Project No:	Date:
08157027	7/15/2015
Project Mngr:	Drawn By:
JBM	ngd
File Name:	
08157027-04.dwg	
Layout Name:	
SHT2	

Terracon
Consulting Engineers and Scientists
600 SW 7TH STREET DES MOINES, IOWA 50309
PH: (515) 244-3184 FAX: (515) 244-5249

PASSIVE GAS TRENCH PROFILE
MAHASKA COUNTY SANITARY LANDFILL
BINNS & STEVENS (NORTH)
OSKALOOSA, IOWA

SHEET
2

Attachment B

Table 2 from *Geoprobe Assessment Report*
(Doc #72422)

Table 2
Geoprobe Assessment - Percent Methane Readings
Mahaska County Sanitary Landfill - Binns and Stevens Site
Terracon Project No. 08117053

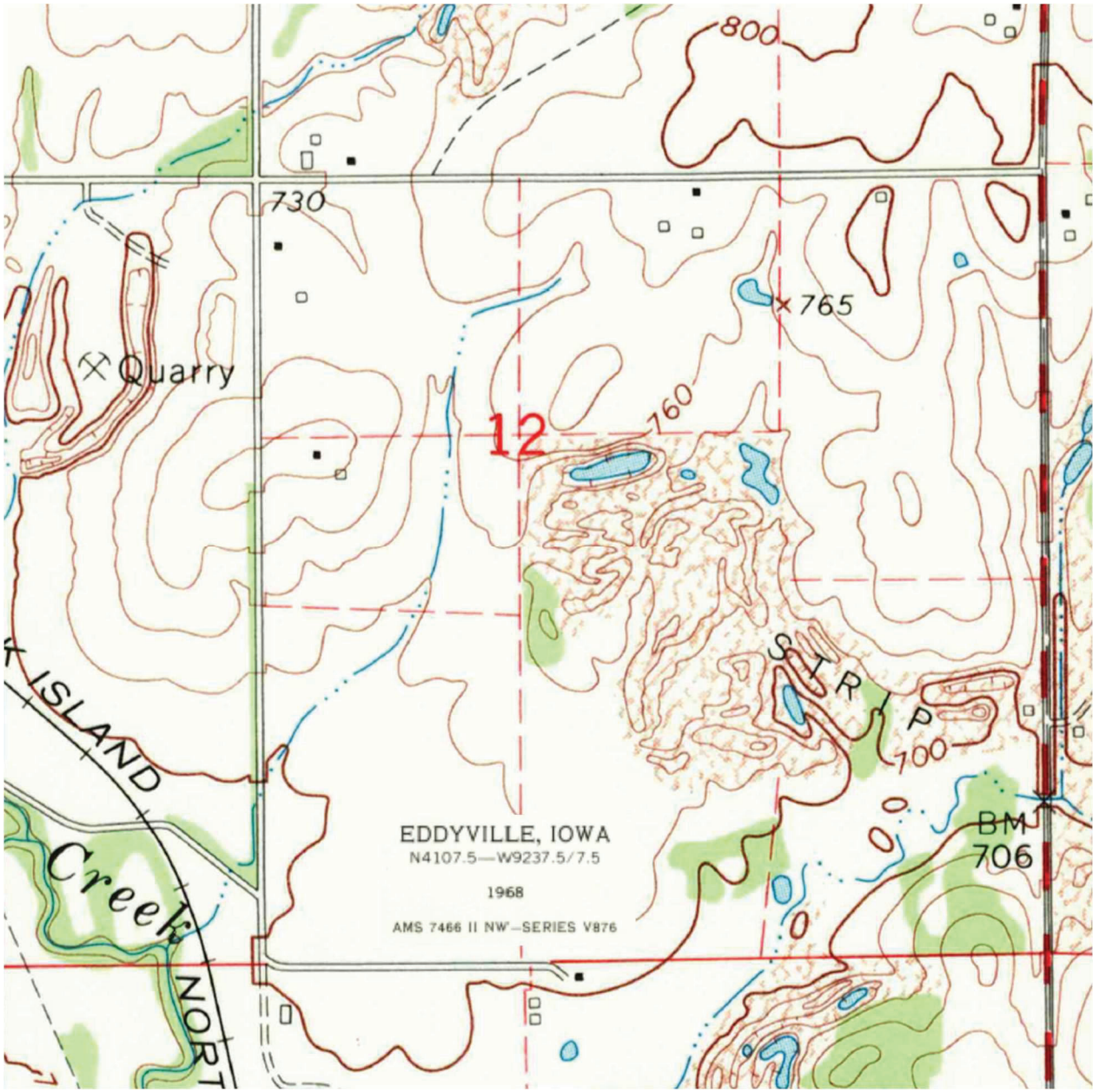
Geoprobe	Percent Methane at Specified Depth Interval (ft)					Refusal of Geoprobe (ft bgs)	Approximate Ground Surface Elevation	Approximate Ground Water Elevation
	4-8	8-12	12-16	16-20	20-24			
GP-1	0.0	0.3	2.3	-	-	15.5	776.0	dry
GP-2	0.0	20.0	19.7	2.5	-	18.0	773.5	756.24
GP-3	0.0	0.0	3.3	1.0	-	20.0	770.5	754.00
GP-4	3.9	0.0	1.2	-	-	15.5	764.0	752.51
GP-5	1.6	0.9	2.8	0.0	-	18.5	761.0	746.54
GP-6	0.0	25.2	-	-	-	12.0	758.0	745.10
GP-7	0.0	0.0	0.0	-	-	15.5	752.5	743.19
GP-8	0.0	0.0	-	-	-	12.5	761.0	752.95
GP-9	0.0	0.0	0.0	-	-	13.5	764.0	753.03
GP-10	0.0	0.0	0.0	-	-	15.0	767.0	dry
GP-11	0.0	0.0	15.0	18.1	-	19.5	777.0	759.67
GP-12	7.4	-	-	-	-	Refusal not reached[1]	778.0	dry
GP-13	0.0	17.3	-	-	-	12.8	781.0	dry
GP-14	16.0	0.0	25.4	0.0	-	18.5	776.0	dry
GP-15	0.0	9.0	27.9	30.0	33.8	22.5	770.5	dry
GP-16	0.0	0.0	0.0	0.0	-	19.5	772.0	dry
GP-17	0.0	25.5	-	-	-	Refusal not reached[2]	764.0	dry
GP-18	0.0	0.0	0.0	0.0	-	22.0	743.0	724.00
GP-19	0.0	0.0	0.0	-	-	16.0	744.0	731.00
GP-20	0.0	0.0	0.0	-	-	14.5	747.0	dry
GP-21	0.0	0.0	0.0	-	-	17.0	745.5	dry
GP-22	60.3	60.5	16.3	-	-	15.0	767.0	753.83

Well I.D.	Percent Methane (1-19-2012)
SG-1	0.0
SG-2	0.0
UW-10	42.2
UW-10A	0.0
SG-3	60.2
UW-9R	47.0
UW-9RA	53.1
SG-4	0.0
SG-5	0.0
DW-8	0.0
PZ-8A	0.0

bgs - indicated below ground surface
1 - GP-12 was abandoned at 8 ft bgs and moved north to find water
2 - GP-17 was abandoned at 12 ft bgs and moved west to find water

Attachment C

USGS Topographical Map, Eddyville Quadrangle, 1968


800
730
765
Quarry
12
160
STRIP
100
ISLAND
Creek
NORT
EDDYVILLE, IOWA
N4107.5—W9237.5/7.5
1968
AMS 7466 II NW—SERIES V876
BM
706