The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 20c

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

Lab ID: 17070059-013 **Client Sample ID:** MW8R

Matrix: GROUNDWATER **Collection Date:** 07/13/2017 11:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**12.70**	ft	1	07/13/2017 11:15	R235423
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**8.78**		1	07/13/2017 11:15	R235423
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**2.7**	NTU	1	07/13/2017 11:15	R235423
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-231**	mV	1	07/13/2017 11:15	R235423
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**1730**	µS/cm	1	07/13/2017 11:15	R235423
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.99**	°C	1	07/13/2017 11:15	R235423
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	07/13/2017 11:15	R235423
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**2040**	mg/L	1	07/17/2017 15:02	R235310
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	07/18/2017 15:09	R235311
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1140**	mg/L	50	07/17/2017 15:54	R235313
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	07/14/2017 14:13	R235182
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	07/14/2017 16:53	R235239
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0070**	mg/L	5	07/17/2017 17:03	132182
Barium	NELAP	0.0010		**0.0757**	mg/L	5	07/17/2017 17:03	132182
Boron	NELAP	0.0250		**47.7**	mg/L	5	07/17/2017 17:03	132182
Iron	NELAP	0.0250		**0.480**	mg/L	5	07/17/2017 17:03	132182
Manganese	NELAP	0.0010		**0.419**	mg/L	5	07/17/2017 17:03	132182
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	07/17/2017 17:03	132182

Client: Natural Resource Technology, Inc.
Work Order: 17070059
Client Project: Dynegy - Vermillion Power Station
Report Date: 02-Aug-17
Lab ID: 17070059-014
Client Sample ID: MW9
Matrix: GROUNDWATER
Collection Date: 07/12/2017 0:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**7.93**	ft	1	07/12/2017 0:00	R235423

Client: Natural Resource Technology, Inc.
Work Order: 17070059

Client Project: Dynegy - Vermillion Power Station
Report Date: 02-Aug-17

Lab ID: 17070059-015
Client Sample ID: MW19

Matrix: GROUNDWATER
Collection Date: 07/13/2017 0:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**7.10**	ft	1	07/13/2017 0:00	R236423

Teklab, Inc.
Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Work Order: 17070059
Client Project: Dynegy - Vermillion Power Station
Report Date: 02-Aug-17
Lab ID: 17070059-016
Client Sample ID: MW20
Matrix: GROUNDWATER
Collection Date: 07/13/2017 14:09

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**14.31**	ft	1	07/13/2017 14:09	R235423
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.25**		1	07/13/2017 14:09	R235423
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**55.5**	NTU	1	07/13/2017 14:09	R235423
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-34**	mV	1	07/13/2017 14:09	R235423
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**364**	µS/cm	1	07/13/2017 14:09	R235423
STANDARD METHODS 2550 B FIELD								
Temperature		0		**20.54**	°C	1	07/13/2017 14:09	R235423
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	07/13/2017 14:09	R235423
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**368**	mg/L	1	07/17/2017 15:03	R235310
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	07/18/2017 15:12	R235311
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**61**	mg/L	5	07/15/2017 1:50	R235238
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	07/14/2017 14:15	R235182
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	07/14/2017 17:01	R235239
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	07/17/2017 17:11	132182
Barium	NELAP	0.0010		**0.0149**	mg/L	5	07/18/2017 14:34	132182
Boron	NELAP	0.0250		**0.377**	mg/L	5	07/18/2017 14:34	132182
Iron	NELAP	0.0250		**0.247**	mg/L	5	07/18/2017 14:34	132182
Manganese	NELAP	0.0010		**0.0159**	mg/L	5	07/18/2017 14:34	132182
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	07/17/2017 17:11	132182

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

Lab ID: 17070059-017 **Client Sample ID:** MW34

Matrix: GROUNDWATER **Collection Date:** 07/13/2017 15:01

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**14.12**	ft	1	07/13/2017 15:01	R235423
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.29**		1	07/13/2017 15:01	R235423
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**48.7**	NTU	1	07/13/2017 15:01	R235423
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-115**	mV	1	07/13/2017 15:01	R235423
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**618**	µS/cm	1	07/13/2017 15:01	R235423
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.25**	°C	1	07/13/2017 15:01	R235423
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**6.17**	mg/L	1	07/13/2017 15:01	R235423
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**510**	mg/L	1	07/17/2017 15:03	R235310
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	07/18/2017 15:14	R235311
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	07/14/2017 17:12	R235238
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.68**	mg/L	1	07/14/2017 14:17	R235182
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**33**	mg/L	1	07/14/2017 17:09	R235239
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0230**	mg/L	5	07/17/2017 21:42	132209
Barium	NELAP	0.0010		**0.147**	mg/L	5	07/18/2017 14:59	132209
Boron	NELAP	0.0250		**0.435**	mg/L	5	07/17/2017 21:42	132209
Iron	NELAP	0.0250		**5.22**	mg/L	5	07/18/2017 14:59	132209
Manganese	NELAP	0.0010		**0.0629**	mg/L	5	07/18/2017 14:59	132209
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	07/17/2017 21:42	132209

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

Lab ID: 17070059-018 **Client Sample ID:** Field Blank

Matrix: GROUNDWATER **Collection Date:** 07/13/2017 16:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**< 20**	mg/L	1	07/17/2017 15:03	R235310
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.065**	mg/L	1	07/18/2017 15:27	R235311
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	07/14/2017 17:36	R235238
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	07/14/2017 14:24	R235182
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	07/14/2017 17:33	R235239
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	07/17/2017 21:50	132209
Barium	NELAP	0.0010		**< 0.0010**	mg/L	5	07/18/2017 15:07	132209
Boron	NELAP	0.0250		**< 0.0250**	mg/L	5	07/17/2017 21:50	132209
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	07/18/2017 15:07	132209
Manganese	NELAP	0.0010		**< 0.0010**	mg/L	5	07/18/2017 15:07	132209
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	07/17/2017 21:50	132209

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

Lab ID: 17070059-019 **Client Sample ID:** DUP1

Matrix: GROUNDWATER **Collection Date:** 07/13/2017 11:43

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**7.10**	ft	1	07/13/2017 11:43	R235423
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.62**		1	07/13/2017 11:43	R235423
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**5.5**	NTU	1	07/13/2017 11:43	R235423
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-142**	mV	1	07/13/2017 11:43	R235423
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**803**	µS/cm	1	07/13/2017 11:43	R235423
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.57**	°C	1	07/13/2017 11:43	R235423
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	07/13/2017 11:43	R235423
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**744**	mg/L	1	07/17/2017 15:04	R235310
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	07/18/2017 15:29	R235311
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**193**	mg/L	10	07/14/2017 17:44	R235238
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.49**	mg/L	1	07/14/2017 14:26	R235182
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**27**	mg/L	1	07/14/2017 17:36	R235239
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0077**	mg/L	5	07/17/2017 21:59	132209
Barium	NELAP	0.0010		**0.200**	mg/L	5	07/18/2017 15:32	132209
Boron	NELAP	0.0250		**5.04**	mg/L	5	07/17/2017 21:59	132209
Iron	NELAP	0.0250		**2.68**	mg/L	5	07/18/2017 15:32	132209
Manganese	NELAP	0.0010		**0.0489**	mg/L	5	07/18/2017 15:32	132209
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	07/17/2017 21:59	132209

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

Lab ID: 17070059-020 **Client Sample ID:** DUP2

Matrix: GROUNDWATER **Collection Date:** 07/13/2017 13:06

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**7.58**	ft	1	07/13/2017 13:06	R235423
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.25**		1	07/13/2017 13:06	R235423
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**2.3**	NTU	1	07/13/2017 13:06	R235423
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-74**	mV	1	07/13/2017 13:06	R235423
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**558**	µS/cm	1	07/13/2017 13:06	R235423
STANDARD METHODS 2550 B FIELD								
Temperature		0		**16.48**	°C	1	07/13/2017 13:06	R235423
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	07/13/2017 13:06	R235423
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**520**	mg/L	1	07/17/2017 15:04	R235310
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	07/18/2017 15:31	R235311
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**97**	mg/L	5	07/17/2017 15:57	R235313
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.11**	mg/L	1	07/14/2017 14:33	R235182
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**7**	mg/L	1	07/14/2017 17:44	R235239
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	07/17/2017 21:01	132209
Barium	NELAP	0.0010		**0.0615**	mg/L	5	07/18/2017 15:40	132209
Boron	NELAP	0.0250		**0.149**	mg/L	5	07/17/2017 21:01	132209
Iron	NELAP	0.0250		**0.0953**	mg/L	5	07/18/2017 15:40	132209
Manganese	NELAP	0.0010		**0.213**	mg/L	5	07/18/2017 15:40	132209
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	07/17/2017 21:01	132209

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17070059
Report Date: 02-Aug-17

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
17070059-001	MW1	Groundwater	4	07/13/2017 9:38
17070059-002	MW2	Groundwater	4	07/13/2017 10:17
17070059-003	MW7	Groundwater	4	07/12/2017 12:42
17070059-004	MW10	Groundwater	4	07/12/2017 18:07
17070059-005	MW17	Groundwater	4	07/12/2017 18:47
17070059-006	MW18	Groundwater	4	07/12/2017 19:09
17070059-007	MW21	Groundwater	4	07/13/2017 9:02
17070059-008	TW1	Groundwater	4	07/13/2017 0:00
17070059-009	MW3R	Groundwater	4	07/13/2017 11:43
17070059-010	MW4	Groundwater	4	07/13/2017 15:27
17070059-011	MW5	Groundwater	4	07/13/2017 12:21
17070059-012	MW6R	Groundwater	4	07/13/2017 13:06
17070059-013	MW8R	Groundwater	4	07/13/2017 11:15
17070059-014	MW9	Groundwater	1	07/12/2017 0:00
17070059-015	MW19	Groundwater	1	07/13/2017 0:00
17070059-016	MW20	Groundwater	4	07/13/2017 14:09
17070059-017	MW34	Groundwater	4	07/13/2017 15:01
17070059-018	Field Blank	Groundwater	4	07/13/2017 16:20
17070059-019	DUP1	Groundwater	4	07/13/2017 11:43
17070059-020	DUP2	Groundwater	4	07/13/2017 13:06

Teklab, Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17070059

Report Date: 02-Aug-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17070059-001A	MW1	07/13/2017 9:38	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 9:38
	Standard Method 4500-H B Field				07/13/2017 9:38
	Standard Methods 2130 B Field				07/13/2017 9:38
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 9:38
	Standard Methods 2510 B Field				07/13/2017 9:38
	Standard Methods 2550 B Field				07/13/2017 9:38
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:14
	Standard Methods 4500-O G Field				07/13/2017 9:38
	SW-846 9036 (Total)				07/17/2017 15:46
	SW-846 9251 (Total)				07/14/2017 14:59
17070059-001B	MW1	07/13/2017 9:38	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 14:58
	SW-846 9214 (Dissolved)				07/14/2017 13:45
17070059-001C	MW1	07/13/2017 9:38	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 15:33
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/18/2017 13:53
17070059-001D	MW1	07/13/2017 9:38	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 14:30
17070059-002A	MW2	07/13/2017 10:17	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 10:17
	Standard Method 4500-H B Field				07/13/2017 10:17
	Standard Methods 2130 B Field				07/13/2017 10:17
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 10:17
	Standard Methods 2510 B Field				07/13/2017 10:17
	Standard Methods 2550 B Field				07/13/2017 10:17
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:15
	Standard Methods 4500-O G Field				07/13/2017 10:17
	SW-846 9036 (Total)				07/15/2017 1:10
	SW-846 9251 (Total)				07/14/2017 15:08
17070059-002B	MW2	07/13/2017 10:17	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 14:58
	SW-846 9214 (Dissolved)				07/14/2017 13:48
17070059-002C	MW2	07/13/2017 10:17	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 18:33
17070059-002D	MW2	07/13/2017 10:17	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 14:32

Teklab, Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17070059
Report Date: 02-Aug-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17070059-004A	MW10	07/12/2017 18.07	07/13/2017 19.45		
	Field Elevation Measurements				07/12/2017 18:07
	Standard Method 4500-H B Field				07/12/2017 18:07
	Standard Methods 2130 B Field				07/12/2017 18:07
	Standard Methods 18th Ed. 2580 B Field				07/12/2017 18:07
	Standard Methods 2510 B Field				07/12/2017 18:07
	Standard Methods 2550 B Field				07/12/2017 18:07
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:15
	Standard Methods 4500-O G Field				07/12/2017 18:07
	SW-846 9036 (Total)				07/14/2017 15:24
	SW-846 9251 (Total)				07/14/2017 15:16
17070059-004B	MW10	07/12/2017 18:07	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 14:59
	SW-846 9214 (Dissolved)				07/14/2017 13:50
17070059-004C	MW10	07/12/2017 18:07	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 15:41
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/18/2017 14:02
17070059-004D	MW10	07/12/2017 18:07	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 14:34
17070059-005A	MW17	07/12/2017 18:47	07/13/2017 19:45		
	Field Elevation Measurements				07/12/2017 18:47
	Standard Method 4500-H B Field				07/12/2017 18:47
	Standard Methods 2130 B Field				07/12/2017 18:47
	Standard Methods 18th Ed. 2580 B Field				07/12/2017 18:47
	Standard Methods 2510 B Field				07/12/2017 18:47
	Standard Methods 2550 B Field				07/12/2017 18:47
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:16
	Standard Methods 4500-O G Field				07/12/2017 18:47
	SW-846 9036 (Total)				07/17/2017 15:49
	SW-846 9251 (Total)				07/14/2017 15:40
17070059-005B	MW17	07/12/2017 18:47	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 14:59
	SW-846 9214 (Dissolved)				07/14/2017 13:53
17070059-005C	MW17	07/12/2017 18:47	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 15:49
17070059-005D	MW17	07/12/2017 18:47	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 14:52

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17070059-006A	MW18	07/12/2017 19:09	07/13/2017 19:45		
	Field Elevation Measurements				07/12/2017 19:09
	Standard Method 4500-H B Field				07/12/2017 19:09
	Standard Methods 2130 B Field				07/12/2017 19:09
	Standard Methods 18th Ed. 2580 B Field				07/12/2017 19:09
	Standard Methods 2510 B Field				07/12/2017 19:09
	Standard Methods 2550 B Field				07/12/2017 19:09
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:16
	Standard Methods 4500-O G Field				07/12/2017 19:09
	SW-846 9036 (Total)				07/15/2017 1:37
	SW-846 9251 (Total)				07/14/2017 15:48
17070059-006B	MW18	07/12/2017 19:09	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:00
	SW-846 9214 (Dissolved)				07/14/2017 13:59
17070059-006C	MW18	07/12/2017 19:09	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 16:14
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/18/2017 14:10
17070059-006D	MW18	07/12/2017 19:09	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 14:54
17070059-007A	MW21	07/13/2017 9:02	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 9:02
	Standard Method 4500-H B Field				07/13/2017 9:02
	Standard Methods 2130 B Field				07/13/2017 9:02
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 9:02
	Standard Methods 2510 B Field				07/13/2017 9:02
	Standard Methods 2550 B Field				07/13/2017 9:02
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:16
	Standard Methods 4500-O G Field				07/13/2017 9:02
	SW-846 9036 (Total)				07/14/2017 15:59
	SW-846 9251 (Total)				07/14/2017 15:56
17070059-007B	MW21	07/13/2017 9:02	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:00
	SW-846 9214 (Dissolved)				07/14/2017 14:01
17070059-007C	MW21	07/13/2017 9:02	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 16:22
17070059-007D	MW21	07/13/2017 9:02	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 14:56

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17070059-009A	MW3R	07/13/2017 11:43	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 11:43
	Standard Method 4500-H B Field				07/13/2017 11:43
	Standard Methods 2130 B Field				07/13/2017 11:43
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 11:43
	Standard Methods 2510 B Field				07/13/2017 11:43
	Standard Methods 2550 B Field				07/13/2017 11:43
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:16
	Standard Methods 4500-O G Field				07/13/2017 11:43
	SW-846 9036 (Total)				07/14/2017 16:12
	SW-846 9251 (Total)				07/14/2017 16:04
17070059-009B	MW3R	07/13/2017 11:43	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:00
	SW-846 9214 (Dissolved)				07/14/2017 14:02
17070059-009C	MW3R	07/13/2017 11:43	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 16:30
17070059-009D	MW3R	07/13/2017 11:43	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 14:58
17070059-010A	MW4	07/13/2017 15:27	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 15:27
	Standard Method 4500-H B Field				07/13/2017 15:27
	Standard Methods 2130 B Field				07/13/2017 15:27
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 15:27
	Standard Methods 2510 B Field				07/13/2017 15:27
	Standard Methods 2550 B Field				07/13/2017 15:27
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:17
	Standard Methods 4500-O G Field				07/13/2017 15:27
	SW-846 9036 (Total)				07/15/2017 1:39
	SW-846 9251 (Total)				07/14/2017 16:12
17070059-010B	MW4	07/13/2017 15:27	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:01
	SW-846 9214 (Dissolved)				07/14/2017 14:04
17070059-010C	MW4	07/13/2017 15:27	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 16:39
17070059-010D	MW4	07/13/2017 15:27	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 15:00

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17070059-011A	MW5	07/13/2017 12:21	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 12:21
	Standard Method 4500-H B Field				07/13/2017 12:21
	Standard Methods 2130 B Field				07/13/2017 12:21
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 12:21
	Standard Methods 2510 B Field				07/13/2017 12:21
	Standard Methods 2550 B Field				07/13/2017 12:21
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:18
	Standard Methods 4500-O G Field				07/13/2017 12:21
	SW-846 9036 (Total)				07/14/2017 16:45
	SW-846 9251 (Total)				07/14/2017 16:37
17070059-011B	MW5	07/13/2017 12:21	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:01
	SW-846 9214 (Dissolved)				07/14/2017 14:10
17070059-011C	MW5	07/13/2017 12:21	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 16:47
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/18/2017 14:18
17070059-011D	MW5	07/13/2017 12:21	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 15:05
17070059-012A	MW6R	07/13/2017 13:06	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 13:06
	Standard Method 4500-H B Field				07/13/2017 13:06
	Standard Methods 2130 B Field				07/13/2017 13:06
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 13:06
	Standard Methods 2510 B Field				07/13/2017 13:06
	Standard Methods 2550 B Field				07/13/2017 13:06
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:18
	Standard Methods 4500-O G Field				07/13/2017 13:06
	SW-846 9036 (Total)				07/15/2017 1:45
	SW-846 9251 (Total)				07/14/2017 16:45
17070059-012B	MW6R	07/13/2017 13:06	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:02
	SW-846 9214 (Dissolved)				07/14/2017 14:11
17070059-012C	MW6R	07/13/2017 13:06	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 16:55
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/18/2017 14:26
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/19/2017 14:56

Teklab, Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17070059-012D	MW6R	07/13/2017 13:06	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 15:07
17070059-013A	MW8R	07/13/2017 11:15	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 11:15
	Standard Method 4500-H B Field				07/13/2017 11:15
	Standard Methods 2130 B Field				07/13/2017 11:15
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 11:15
	Standard Methods 2510 B Field				07/13/2017 11:15
	Standard Methods 2550 B Field				07/13/2017 11:15
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:19
	Standard Methods 4500-O G Field				07/13/2017 11:15
	SW-846 9036 (Total)				07/17/2017 15:54
	SW-846 9251 (Total)				07/14/2017 16:53
17070059-013B	MW8R	07/13/2017 11:15	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:02
	SW-846 9214 (Dissolved)				07/14/2017 14:13
17070059-013C	MW8R	07/13/2017 11:15	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 17:03
17070059-013D	MW8R	07/13/2017 11:15	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 15:09
17070059-014A	MW9	07/12/2017 0:00	07/13/2017 19:45		
	Field Elevation Measurements				07/12/2017 0:00
17070059-015A	MW19	07/13/2017 0:00	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 0:00
17070059-016A	MW20	07/13/2017 14:09	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 14:09
	Standard Method 4500-H B Field				07/13/2017 14:09
	Standard Methods 2130 B Field				07/13/2017 14:09
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 14:09
	Standard Methods 2510 B Field				07/13/2017 14:09
	Standard Methods 2550 B Field				07/13/2017 14:09
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:19
	Standard Methods 4500-O G Field				07/13/2017 14:09
	SW-846 9036 (Total)				07/15/2017 1:50
	SW-846 9251 (Total)				07/14/2017 17:01
17070059-016B	MW20	07/13/2017 14:09	07/13/2017 19:45		

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:03
	SW-846 9214 (Dissolved)				07/14/2017 14:15
17070059-016C	MW20	07/13/2017 14:09	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/17/2017 17:11
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 11:43	07/18/2017 14:34
17070059-016D	MW20	07/13/2017 14:09	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 15:12
17070059-017A	MW34	07/13/2017 15:01	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 15:01
	Standard Method 4500-H B Field				07/13/2017 15:01
	Standard Methods 2130 B Field				07/13/2017 15:01
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 15:01
	Standard Methods 2510 B Field				07/13/2017 15:01
	Standard Methods 2550 B Field				07/13/2017 15:01
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:19
	Standard Methods 4500-O G Field				07/13/2017 15:01
	SW-846 9036 (Total)				07/14/2017 17:12
	SW-846 9251 (Total)				07/14/2017 17:09
17070059-017B	MW34	07/13/2017 15:01	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:03
	SW-846 9214 (Dissolved)				07/14/2017 14:17
17070059-017C	MW34	07/13/2017 15:01	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 17:23	07/17/2017 21:42
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 17:23	07/18/2017 14:59
17070059-017D	MW34	07/13/2017 15:01	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 15:14
17070059-018A	Field Blank	07/13/2017 16:20	07/13/2017 19:45		
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:19
	SW-846 9036 (Total)				07/14/2017 17:36
	SW-846 9251 (Total)				07/14/2017 17:33
17070059-018B	Field Blank	07/13/2017 16:20	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:03
	SW-846 9214 (Dissolved)				07/14/2017 14:24
17070059-018C	Field Blank	07/13/2017 16:20	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 17:23	07/17/2017 21:50
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 17:23	07/18/2017 15:07

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17070059-018D	Field Blank	07/13/2017 16:20	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 15:27
17070059-019A	DUP1	07/13/2017 11:43	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 11:43
	Standard Method 4500-H B Field				07/13/2017 11:43
	Standard Methods 2130 B Field				07/13/2017 11:43
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 11:43
	Standard Methods 2510 B Field				07/13/2017 11:43
	Standard Methods 2550 B Field				07/13/2017 11:43
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:20
	Standard Methods 4500-O G Field				07/13/2017 11:43
	SW-846 9036 (Total)				07/14/2017 17:44
	SW-846 9251 (Total)				07/14/2017 17:36
17070059-019B	DUP1	07/13/2017 11:43	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:04
	SW-846 9214 (Dissolved)				07/14/2017 14:26
17070059-019C	DUP1	07/13/2017 11:43	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 17:23	07/17/2017 21:59
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 17:23	07/18/2017 15:32
17070059-019D	DUP1	07/13/2017 11:43	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 15:29
17070059-020A	DUP2	07/13/2017 13:06	07/13/2017 19:45		
	Field Elevation Measurements				07/13/2017 13:06
	Standard Method 4500-H B Field				07/13/2017 13:06
	Standard Methods 2130 B Field				07/13/2017 13:06
	Standard Methods 18th Ed. 2580 B Field				07/13/2017 13:06
	Standard Methods 2510 B Field				07/13/2017 13:06
	Standard Methods 2550 B Field				07/13/2017 13:06
	Standard Methods 4500-NO2 B (Total)				07/14/2017 16:20
	Standard Methods 4500-O G Field				07/13/2017 13:06
	SW-846 9036 (Total)				07/17/2017 15:57
	SW-846 9251 (Total)				07/14/2017 17:44
17070059-020B	DUP2	07/13/2017 13:06	07/13/2017 19:45		
	Standard Methods 2540 C (Dissolved)				07/17/2017 15:04
	SW-846 9214 (Dissolved)				07/14/2017 14:33
17070059-020C	DUP2	07/13/2017 13:06	07/13/2017 19:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 17:23	07/17/2017 21:01

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17070059

Report Date: 02-Aug-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			07/14/2017 17:23	07/18/2017 15:40
17070059-020D	DUP2	07/13/2017 13:06	07/13/2017 19:45		
	Standard Methods 4500-NO3 F (Total)				07/18/2017 15:31

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

STANDARD METHOD 4500-H B FIELD

Batch R235423 **SampType:** LCS Units

SampID: LCS-R235423

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	1.00		**7.01**	7.000	0	100.1	99.1	100.9	07/12/2017
pH	1.00		**6.98**	7.000	0	99.7	99.1	100.9	07/13/2017

STANDARD METHODS 2510 B FIELD

Batch R235423 **SampType:** LCS Units µS/cm

SampID: LCS-R235423

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Conductivity	1		**1400**	1409	0	99.4	90	110	07/13/2017
Conductivity	1		**1420**	1409	0	100.8	90	110	07/12/2017

STANDARD METHODS 2540 C (DISSOLVED)

Batch R235310 **SampType:** MBLK Units mg/L

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						07/17/2017
Total Dissolved Solids	20		**< 20**						07/17/2017
Total Dissolved Solids	20		**< 20**						07/17/2017

Batch R235310 **SampType:** LCS Units mg/L

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**978**	1000	0	97.8	90	110	07/17/2017

Batch R235310 **SampType:** LCSQC Units mg/L

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**970**	1000	0	97.0	90	110	07/17/2017
Total Dissolved Solids	20		**974**	1000	0	97.4	90	110	07/17/2017

Batch R235310 **SampType:** MS Units mg/L

SampID: 17070059-005BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**2530**	500.0	2032	99.2	85	115	07/17/2017

Batch R235310 **SampType:** MSD Units mg/L RPD Limit **5**

SampID: 17070059-005BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**2550**	500.0	2032	103.6	2528	0.87	07/17/2017

STANDARD METHODS 2540 C (DISSOLVED)

Batch R235310 **SampType:** DUP Units **mg/L** RPD Limit **5**

SampID: 17070059-012BDUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**534**				524.0	1.89	07/17/2017

STANDARD METHODS 4500 NO2 B (TOTAL)

Batch R235224 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**< 0.05**						07/14/2017
Nitrogen, Nitrite (as N)	0.05		**< 0.05**						07/14/2017

Batch R235224 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.50**	0.4880	0	102.3	90	110	07/14/2017
Nitrogen, Nitrite (as N)	0.05		**0.50**	0.4880	0	102.3	90	110	07/14/2017

Batch R235224 **SampType:** MS Units **mg/L**

SampID: 17070059-011AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.52**	0.5000	0	103.8	85	115	07/14/2017

Batch R235224 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17070059-011AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.50**	0.5000	0	99.2	0.5190	4.53	07/14/2017

STANDARD METHODS 4500-NO3 F (TOTAL)

Batch R235311 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate (as N)	0.050		**< 0.050**						07/18/2017

SW-846 9036 (TOTAL)

Batch R235238 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						07/14/2017

Batch R235238 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	102.0	90	110	07/14/2017

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17070059
Report Date: 02-Aug-17

SW-846 9036 (TOTAL)

Batch R235313 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						07/17/2017

Batch R235313 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	101.3	90	110	07/17/2017

SW-846 9214 (DISSOLVED)

Batch R235182 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						07/14/2017

Batch R235182 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**0.98**	1.000	0	98.1	90	110	07/14/2017

Batch R235182 **SampType:** MS Units **mg/L**
SampID: 17070059-005BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.12**	2.000	0.1700	97.4	85	115	07/14/2017

Batch R235182 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17070059-005BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.23**	2.000	0.1700	102.8	2.119	4.93	07/14/2017

Batch R235182 **SampType:** MS Units **mg/L**
SampID: 17070059-019BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.56**	2.000	0.4880	103.8	85	115	07/14/2017

Batch R235182 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17070059-019BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.65**	2.000	0.4880	108.2	2.565	3.30	07/14/2017

Client: Natural Resource Technology, Inc. **Work Order:** 17070059

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Aug-17

SW-846 9251 (TOTAL)

Batch R235239 **SampType:** MBLK **Units** mg/L
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		< 5						07/14/2017

Batch R235239 **SampType:** LCS **Units** mg/L
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		21	20.00	0	104.6	90	110	07/14/2017

Batch R235314 **SampType:** MBLK **Units** mg/L
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		< 5						07/17/2017

Batch R235314 **SampType:** LCS **Units** mg/L
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		22	20.00	0	110.0	90	110	07/17/2017

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 132182 **SampType:** MBLK **Units** mg/L
SampID: MBLK-132182

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		< 0.0010	).00100(	0	0	-100	100	07/17/2017
Barium	0.0010		< 0.0010	).00100(	0	0	-100	100	07/18/2017
Boron	0.0250		< 0.0250	0.02500	0	0	-100	100	07/17/2017
Boron	0.0250		< 0.0250	0.02500	0	0	-100	100	07/18/2017
Iron	0.0250		< 0.0250	0.02500	0	34.5	-100	100	07/18/2017
Manganese	0.0010		< 0.0010	).00100(	0	0	-100	100	07/18/2017
Selenium	0.0010		< 0.0010	).00100(	0	0	-100	100	07/17/2017

Batch 132182 **SampType:** LCS **Units** mg/L
SampID: LCS-132182

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		0.481	0.5000	0	96.1	80	120	07/17/2017
Barium	0.0010		1.94	2.000	0	97.0	80	120	07/17/2017
Boron	0.0250		0.496	0.5000	0	99.2	80	120	07/17/2017
Iron	0.0250		2.05	2.000	0	102.4	80	120	07/17/2017
Manganese	0.0010		0.482	0.5000	0	96.3	80	120	07/17/2017
Selenium	0.0010		0.478	0.5000	0	95.7	80	120	07/17/2017

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17070059

Report Date: 02-Aug-17

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 132182 **SampType:** MS Units **mg/L**

SampID: 17070059-002CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.497**	0.5000	0.008340	97.8	75	125	07/17/2017
Barium	0.0010		**2.09**	2.000	0.1556	96.6	75	125	07/17/2017
Boron	0.0250		**0.780**	0.5000	0.2894	98.1	75	125	07/17/2017
Iron	0.0250		**2.45**	2.000	0.4121	101.9	75	125	07/17/2017
Manganese	0.0010		**0.570**	0.5000	0.09090	95.8	75	125	07/17/2017
Selenium	0.0010		**0.434**	0.5000	0	86.8	75	125	07/17/2017

Batch 132182 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17070059-002CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.490**	0.5000	0.008340	96.3	0.4971	1.43	07/17/2017
Barium	0.0010		**2.07**	2.000	0.1556	95.5	2.087	1.00	07/17/2017
Boron	0.0250		**0.746**	0.5000	0.2894	91.3	0.7798	4.43	07/17/2017
Iron	0.0250		**2.46**	2.000	0.4121	102.6	2.450	0.54	07/17/2017
Manganese	0.0010		**0.564**	0.5000	0.09090	94.6	0.5698	1.05	07/17/2017
Selenium	0.0010		**0.425**	0.5000	0	85.1	0.4341	2.06	07/17/2017

Batch 132209 **SampType:** MBLK Units **mg/L**

SampID: MBLK-132209

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**< 0.0010**	).00100(	0	0	-100	100	07/17/2017
Barium	0.0010		**< 0.0010**	).00100(	0	0	-100	100	07/18/2017
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	07/17/2017
Iron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	07/18/2017
Manganese	0.0010		**< 0.0010**	).00100(	0	0	-100	100	07/18/2017
Selenium	0.0010		**< 0.0010**	).00100(	0	0	-100	100	07/17/2017

Batch 132209 **SampType:** LCS Units **mg/L**

SampID: LCS-132209

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.471**	0.5000	0	94.1	80	120	07/17/2017
Barium	0.0010		**1.88**	2.000	0	94.1	80	120	07/17/2017
Boron	0.0250		**0.488**	0.5000	0	97.6	80	120	07/17/2017
Iron	0.0250		**2.00**	2.000	0	99.9	80	120	07/17/2017
Manganese	0.0010		**0.471**	0.5000	0	94.2	80	120	07/17/2017
Selenium	0.0010		**0.461**	0.5000	0	92.3	80	120	07/17/2017

Quality Control Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17070059
Report Date: 02-Aug-17

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 132209 **SampType:** MS Units **mg/L**
SampID: 17070059-020CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.478**	0.5000	0	95.7	75	125	07/17/2017
Barium	0.0010		**1.99**	2.000	0.06146	96.2	75	125	07/18/2017
Boron	0.0250		**0.643**	0.5000	0.1490	98.9	75	125	07/17/2017
Iron	0.0250		**2.02**	2.000	0.09535	96.4	75	125	07/18/2017
Manganese	0.0010		**0.683**	0.5000	0.2128	94.1	75	125	07/18/2017
Selenium	0.0010		**0.394**	0.5000	0	78.7	75	125	07/17/2017

Batch 132209 **SampType:** MSD Units **mg/L** RPD Limit **20**
SampID: 17070059-020CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.483**	0.5000	0	96.5	0.4783	0.91	07/17/2017
Barium	0.0010		**2.00**	2.000	0.06146	97.0	1.986	0.79	07/18/2017
Boron	0.0250		**0.659**	0.5000	0.1490	102.0	0.6434	2.40	07/17/2017
Iron	0.0250		**2.04**	2.000	0.09535	97.3	2.023	0.87	07/18/2017
Manganese	0.0010		**0.686**	0.5000	0.2128	94.7	0.6833	0.41	07/18/2017
Selenium	0.0010		**0.397**	0.5000	0	79.3	0.3936	0.75	07/17/2017

Teklab, Inc. Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Work Order: 17070059
Client Project: Dynegy - Vermillion Power Station
Report Date: 02-Aug-17

Carrier: Joselen Simpson
Received By: AMD

Completed by: Amber M. Dilallo
On: 14-Jul-17

Reviewed by: Elizabeth A. Hurley
On: 14-Jul-17

Pages to follow: Chain of custody 2 Extra pages included 38

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C	1.02
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐	
Chain of custody present?	Yes ☑	No ☐			
Chain of custody signed when relinquished and received?	Yes ☑	No ☐			
Chain of custody agrees with sample labels?	Yes ☑	No ☐			
Samples in proper container/bottle?	Yes ☑	No ☐			
Sample containers intact?	Yes ☑	No ☐			
Sufficient sample volume for indicated test?	Yes ☑	No ☐			
All samples received within holding time?	Yes ☑	No ☐			
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐		
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐			

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

Additional Nitric Acid was needed in MW5 upon arrival at the laboratory. AMD 7/14/17

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 17070059

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: Natural Resource Technology, Inc.
Address: 2422 East Washington Street
City / State / Zip: Bloomington, IL 61704
Contact: Steve Wiskes Phone: (414) 837-3614
E-Mail: steve.wiskes@obg.com Fax:

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 1.0 °C
Preserved in: ☒ LAB ☐ FIELD **FOR LAB USE ONLY**
Lab Notes: MN5 HNO3 OM 7/14/17

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No
Are these samples known to be hazardous? ☐ Yes ☒ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☒ No

Client Comments
Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.
⊗ MW7 NO SAMPLE COLLECTED - WELL DRY gms

Project Name/Number: Dynegy - Vermillion Power Station
Sample Collector's Name: T. Mathis J. Simpson

Results Requested: ☒ Standard ☐ 1-2 Day (100% Surcharge) ☐ Other ____ ☐ 3 Day (50% Surcharge)
Billing Instructions:

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Groundwater	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O	Field ORP SM 2580-B	Field pH SM 4500-H+B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500-NO3 E	Sulfate 9036	TDS SM 2540C
17070059-001	MW1	7-13-17 0938	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
002	MW2	7-13-17 1017	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
003	MW7 ⊗	7-12-17 1242	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
004	MW10	7-12-17 1807	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
005	MW17	7-12-17 1847	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
006	MW18	7-12-17 1909	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
007	MW21	7-13-17 0902	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
008	TW1	7-13-17	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
009	MW3R	7-13-17 1143	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
010	MW4	7-13-17 1527	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
gms	7-13-17 1945	Omar Decario	7/13/17 1945

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 38582

OM 7/14/17

CHAIN OF CUSTODY

pg. 2 of 2 Work order # 17070059

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client:	Natural Resource Technology, Inc.
Address:	2422 East Washington Street
City / State / Zip	Bloomington, IL 61704
Contact:	Steve Wiskes
Phone:	(414) 837-3614
E-Mail:	steve.wiskes@obg.com
Fax:	

Samples on: ☒ ICE ☒ BLUE ICE ☒ NO ICE ____ °C

Preserved in: ☒ LAB ☒ FIELD **FOR LAB USE ONLY**

Lab Notes:

Client Comments

Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.

MW9 * depth only

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No

Are these samples known to be hazardous? ☐ Yes ☒ No

Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☒ No

Project Name/Number	Sample Collector's Name
Dynegy - Vermillion Power Station	

Results Requested: ☒ Standard ☐ 1-2 Day (100% Surcharge) ☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Matrix: Groundwater	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O	Field ORP SM 2580-B	Field pH SM 4500-H+B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500-NO3 F	Sulfate 9036	TDS SM 2540C
17070059-011	MW5	7-13-17 1221	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
012	MW6R	7-13-17 1306	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
013	MW8R	7-13-17 1115	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
014	MW9 *	7-12-17 ~~1225~~	0			X										X			
015	MW19 *	7-13-17	0			X										X			
016	MW20	7-13-17 1409	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
017	MW34	7-13-17 1501	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
018	Field Blank	7-13-17 1620	2	1	1	X	X	X	X								X	X	X
019	DUP1	7-13-17 1143	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
020	DUP2	7-13-17 1306	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	7-13-17 1945	[signature]	7/13/17 1945

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 38582

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	7-13-17			X	
Well Number	MW11				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2. Inner casing	Yes	No	NA	
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
	Yes	No	NA	
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?		✓		
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		✓		
19. Concrete pad				
Slope away form casing?			✓	
Not deteriorated?			✓	
Not heaved or below surrounding grade?			✓	
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

Needs new Lock

Jns

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion
Client: NRT
Project Number:
Task #:
Start Date: 7.13.17
Time: 0919
Field Personnel: T. Mathis J. Simpson
Finish Date: 7.13.17
Time: 0938

WELL INFORMATION

Well ID: MW1
Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	0919	0	77.67								
	0922	.13	78.79	1.12	18.91	7.52	1920	8.04	0	6	clear
	0926	.26	79.33	0.54	18.99	7.32	1950	7.81	0	42	clear
	0930	.39	79.82	0.49	18.88	7.23	1960	8.17	0.2	65	clear
	0934	.52	79.95	0.13	19.37	7.19	1940	7.02	0.2	75	clear
	0938	.65	80.00	0.05	19.34	7.18	2000	7.40	0.1	83	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	7.12.17			✓	
Well Number	MW2				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?		✓		
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		✓		
19. Concrete pad				
Slope away form casing?			✓	
Not deteriorated?			✓	
Not heaved or below surrounding grade?			✓	
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

Needs new lock installed

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilior
Client: NRT ~~gns~~
Project Number:
Task #:
Start Date: 7.13.~~17~~ 17
Time: 1001
Field Personnel: T-Mathis J-Simpson
Finish Date: 7.13-17
Time: 1017

WELL INFORMATION

Well ID: MW2
Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☒ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1001	0	18.60								
	1005	.13	19.48	0.88	18.19	7.69	642	4.63	0.8	-88	clear
	1009	.26	19.72	0.24	16.25	7.80	637	7.01	0.6	-126	clear
	1013	.39	20.02	0.30	16.42	7.82	632	2.51	0.8	-136	clear
	1017	.52	20.25	0.23	16.32	7.83	623	1.86	1.0	-141	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	7-12-17				
Well Number	~~MW2~~ MW7				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2 Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?	✓	✓		lock cut off
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		✓		
19 . Concrete pad				
Slope away form casing?			✓	
Not deteriorated?			✓	
Not heaved or below surrounding grade?			✓	
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

Needs new lock installed   Well dry *

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion
Client: NRT
Project Number:
Task #:
Start Date: 7-12-17
Time: 1242
Field Personnel: T. Mathis J Simpson
Finish Date:
Time:

WELL INFORMATION

Well ID: MW7
Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity

NOTES (continued)

* NO SAMPLE COLLECTED - WELL DRY JMS

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: Vermilion
Inspection Date: 7-12-17
Well Number: MW10

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?		✓		
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19. Concrete pad				
Slope away form casing?	✓			
Not deteriorated?	✓			
Not heaved or below surrounding grade?	✓			
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:
Needs new lock

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT
Project Number: Task #: Start Date: 7-12-17 Time: 1755
Field Personnel: T. Mathis T. Simpson Finish Date: 7-12-17 Time: 1807

WELL INFORMATION

Well ID: MW10
Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☒ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1755	0	49.89	0							
	1759	.13	*~~49.89~~	1.38	18.98	6.79	998	4.75	0	125	clear
	1803	.26	51.27	0	18.10	6.78	999	4.86	0	124	clear
	1807	.39	51.88	.61	17.22	6.73	991	4.46	0.2	121	clear

NOTES (continued)

*51.27

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	7-12-17			X	
Well Number	MW17				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2. Inner casing	Yes	No	NA	
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
	Yes	No	NA	
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?	✓			
7. Bumper posts in good condition?	✓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19 . Concrete pad				
Slope away form casing?	✓			
Not deteriorated?	✓			
Not heaved or below surrounding grade?	✓			
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT
Project Number: Task #: Start Date: 7-12-17 Time: 1824
Field Personnel: T. Mathis J. Simpson Finish Date: 7-12-17 Time: 1847

WELL INFORMATION

Well ID: MW17
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1824	0	38.54								
	1828	.13	39.95	1.41	20.31	6.94	1800	5.03	21.2	-1	clear
	1832	.26	40.41	0.46	20.10	6.92	1820	3.40	18.2	-15	clear
	1835	.39	40.90	0.49	19.44	6.92	1830	2.56	15.6	-24	clear
	1839	.52	41.70	0.80	18.59	6.91	1820	1.81	12.0	-30	clear
	1843	.65	42.70	1.00	17.92	6.88	1810	1.68	11.1	-29	clear
	1847	.78	43.70	1.00	17.28	6.89	1800	1.66	9.5	-31	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	7.12.17				
Well Number	MW 18				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?	✓			
7. Bumper posts in good condition?	✓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19. Concrete pad				
Slope away form casing?	✓			
Not deteriorated?	✓			
Not heaved or below surrounding grade?	✓			
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT

Project Number: Task #: Start Date: 7-12-17 Time: 1853

Field Personnel: T. Mathis J. Simpson Finish Date: 7-12-17 Time: 1909

WELL INFORMATION

Well ID: MW18

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1853	0	23.47								
	1857	.13	23.47	0	17.94	7.00	1580	5.29	16.9	30	clear
	* ~~1900~~	.26	23.47	0	14.83	6.86	1600	2.06	12.9	23	clear
	1905	.39	23.47	0	14.76	6.84	1530	1.75	10.0	23	clear
	1909	.52	23.47	0	15.28	6.83	1510	1.75	8.7	25	clear

NOTES (continued)

* 1901

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	7-12-17			X	
Well Number	MW21				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?	✓			
7. Bumper posts in good condition?	✓			

Flushmount Monitoring Wells	Yes	No	NA	Comments
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	Comments
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	Comments
18. Concrete pad installed?	✓			
19 . Concrete pad				
Slope away form casing?	✓			
Not deteriorated?		✓		
Not heaved or below surrounding grade?	✓			
20. No surface seal settling?	✓	[illegible]		Concrete. 1.5 [illegible]
21. Well clearly visible and labeled?	✓			

Comments:

Needs a new lock installed.

gms

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT

Project Number: ____ Task #: ____ Start Date: 7.13.17 Time: 0842

Field Personnel: T Mathis J. Simpson Finish Date: 7.13.17 Time: 0902

WELL INFORMATION

Well ID: MW21

Casing ID: ____ inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (μs/cm)	Dissolved Oxygen (mg/L)	* Turbidity (NTU)	ORP (mV)	Visual Clarity
	0842	0	89.55						5.6		
	0846	.13	91.25	1.70	15.06	7.37	608	9.03	* ~~8.96~~	-22	clear
	0850	.26	92.37	1.12	14.29	7.52	586	5.78	5.0 ~~5.74~~ *	-63	clear
	0854	.39	93.12	0.75	14.62	7.61	580	3.63	3.0	-80	clear
	0858	.52	93.24	0.12	15.18	7.62	575	2.95	1.7	-87	clear
	0902	.65	93.24	0	16.18	7.61	573	2.60	1.6	-88	clear

NOTES (continued)

Turb 5.6 JMS
* 5.0
3.0
1.7
1.6

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?		
Inspection Date	7.13.17	Yes	No	NA
Well Number	TW1		✓	

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?	✓			
7. Bumper posts in good condition?	✓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		✓		
19 . Concrete pad				
Slope away form casing?			✓	
Not deteriorated?			✓	
Not heaved or below surrounding grade?			✓	
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?		✓		

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion
Client:
Project Number:
Task #:
Start Date: 7·13·17
Time:
Field Personnel: T. Mathis J. Simpson
Finish Date: 7·13·17
Time:

WELL INFORMATION

Well ID: TW1
Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
		0	4.60								

NOTES (continued)

Unable to sample.

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: Vermilion
Inspection Date: 1-12-17
Well Number: MW3R

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?		✓		
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		✓		
19. Concrete pad				
Slope away form casing?			✓	
Not deteriorated?			✓	
Not heaved or below surrounding grade?			✓	
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

Needs new lock

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT

Project Number: Task #: Start Date: 7·13·17 Time: 1122

Field Personnel: T. Mathis J. Simpson Finish Date: 7·13·17 Time: 1143

WELL INFORMATION

Well ID: MW3R

Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☒ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1122	0	7.10								
	1125	.13	7.10	0	15.50	7.98	845	3.16	5.9	-119	clear
	1128	.26	7.10	0	14.63	7.81	801	1.63	8.0	-128	clear
	1131	.39	7.10	0	14.51	7.75	786	1.20	5.4	-135	clear
	1134	.52	7.10	0	14.41	7.71	789	1.12	4.4	-140	clear
	1137	.65	7.10	0	14.50	7.67	794	1.01	3.6	-140	clear
	1140	.78	7.10	0	14.43	7.62	803	0.97	4.1	-142	clear
	1143	.91	7.10	0	14.57	7.62	803	0.96	5.5	-142	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	7.12.17			X	
Well Number	MW4				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			

2. Inner casing	Yes	No	NA	
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?		✓		
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18 Concrete pad installed?		✓		
19 . Concrete pad				
Slope away form casing?			✓	
Not deteriorated?			✓	
Not heaved or below surrounding grade?			✓	
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

Needs new lock

* Major well repair are those that require a subcontractor or separate mobilization to complete

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WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT

Project Number: Task #: Start Date: 7-13-17 Time: 1515

Field Personnel: T. Mathis J. Simpson Finish Date: 7-13-17 Time: 1527

WELL INFORMATION

Well ID: MW4

Casing ID: inches

EVENT TYPE

- ☐ Well Development
- ☐ Well Volume Approach Sampling
- ☑ Low-Flow / Low Stress Sampling
- ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1515	0	7.40								
	1518	.13	7.40	0	19.94	7.85	455	2.22	1.7	-108	clear
	1521	.26	7.46	.06	19.91	7.76	441	1.45	1.5	-114	clear
	1524	.39	7.46	0	19.83	7.74	438	1.15	1.5	-117	clear
	1527	.52	7.46	0	19.49	7.72	448	1.15	1.3	-116	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		✓	
Inspection Date	7.13.17				
Well Number	MW 5				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			

2. Inner casing	Yes	No	NA	
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?	✓			
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19 . Concrete pad				
Slope away form casing?	✓			
Not deteriorated?	✓			
Not heaved or below surrounding grade?	✓			
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion   Client: NRT
Project Number: Task #:   Start Date: 7-13-17   Time: 1205
Field Personnel: J. Simpson T. Mathis   Finish Date: 7-13-17   Time: 1221

WELL INFORMATION

Well ID: MW5
Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☒ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1205	0	6.89								
	1209	.13	6.89	0	17.92	7.75	604	1.14	1.0	-57	clear
	1213	.26	6.89	0	17.71	7.64	605	1.14	1.9	-53	clear
	1217	.39	6.89	0	16.45	7.63	602	1.10	0.7	-51	clear
	1221	.52	6.89	0	16.27	7.61	600	1.09	0.8	-49	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		✓	
Inspection Date	7.12.17				
Well Number	MW6R				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			

	Yes	No	NA	
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?		✓		
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19 Concrete pad				
Slope away form casing?	✓			
Not deteriorated?	✓			
Not heaved or below surrounding grade?	✓			
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

Needs new lock

* Major well repair are those that require a subcontractor or separate mobilization to complete

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WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion	Client: NRT

Project Number: 	Task #: 	Start Date: 7.13.17	Time: 1255

Field Personnel: T. Mathis J. Simpson	Finish Date: 7.13.17	Time: 1306

WELL INFORMATION

Well ID: MW6R

Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☒ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1256	0	7.58								
	1258	.13	7.58	0	16.90	7.55	580	2.43.~~0~~ JMS	3.0	-54	clear
	1300	.26	7.58	0	16.85	7.36	561	1.27	1.8	-64	clear
	1302	.39	7.58	0	17.02	7.29	557	1.23	2.4	-69	clear
	1304	.52	7.58	0	16.64	7.24	559	1.01	2.7	-72	clear
	1306	.65	7.58	0	16.48	7.25	558	0.94	2.3	-74	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	7.12.17			X	
Well Number	MW8R				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			

2. Inner casing	Yes	No	NA	Comments
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			

	Yes	No	NA	Comments
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?		✓		
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells	Yes	No	NA	Comments
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	Comments
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	Comments
18. Concrete pad installed?		✓		
19. Concrete pad				
Slope away form casing?			✓	
Not deteriorated?			✓	
Not heaved or below surrounding grade?			✓	
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

Needs new lock

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion
Client: NRT
Project Number:
Task #:
Start Date: 7-13-17 Time: 1035
Field Personnel: T. Mathis J. Simpson
Finish Date: 7-13-17 Time: 1115

WELL INFORMATION

Well ID: MW8R
Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1035	0	12.70								
	1039	.13	12.91	0.21	17.30	7.62	1180	2.26	5.4	-117	clear
	1043	.26	12.91	0	16.88	7.79	1590	1.59	5.8	-143	clear
	1047	.39	12.91	0	15.99	7.98	1670	1.23	5.0	-164	clear
	1051	.52	12.95	0.04	15.71	8.27	1730	1.06	4.7	-192	clear
	1055	.65	12.95	0	15.37	8.45	1730	0.93	4.1	-208	clear
	1059	.78	12.95	0	15.37	8.58	1740	0.89	3.3	-217	clear
	1103	.91	12.95	0	15.16	8.66	1746	0.83	2.7	-224	clear
	1107	1.04	12.95	0	15.17	8.71	1740	0.96	4.9	-227	clear
	1111	1.17	12.95	0	15.03	8.75	1740	0.97	3.5	-229	clear
	1115	1.30	12.95	0	14.99	8.78	1730	0.94	2.7	-231	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site Vermilion
Inspection Date 7-13-17
Well Number MW19

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		✓	

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?		✓		
7. Bumper posts in good condition?	✓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19 . Concrete pad				
Slope away form casing?	✓			
Not deteriorated?	✓			
Not heaved or below surrounding grade?	✓			
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:
Needs new lock

* Major well repair are those that require a subcontractor or separate mobilization to complete

Monitoring Well Evaluation Checklist

Site: Vermilion
Inspection Date: 7.12.17
Well Number: MW9

Major wells repairs* required to maintain well integrity?	Yes	No	NA
	✓ *		

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose		✓		very loose *
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?		✓		ziptie
6. Is there a lock present?		✓		
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19 . Concrete pad				
Slope away form casing?	✓			
Not deteriorated?	✓			
Not heaved or below surrounding grade?	✓			
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:
Needs lock

* Major well repair are those that require a subcontractor or separate mobilization to complete

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		✓	
Inspection Date					
Well Number	MW 20				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?		✓		cut
7. Bumper posts in good condition?	✓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19 . Concrete pad				
Slope away form casing?	✓			
Not deteriorated?	✓			
Not heaved or below surrounding grade?	✓			
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

Needs a lock Installed

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion | Client: NRT
Project Number: | Task #: | Start Date: 7.13.17 | Time: 1320
Field Personnel: T. Mathis J. Simpson | Finish Date: 7.13.17 | Time: ~~1409~~

WELL INFORMATION

Well ID: MW20
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1320	0	14.31								
	1323	.13	14.31	0							
	1326	.26	14.31	0							
	1329	.39	14.31	0							
	1332	.52	14.31	0	24.38	7.68	343	0.27	132	-53	sl. cloudy
	1335	.65	14.31	0	24.01	7.51	343	1.06	109	-48	sl. cloudy
	1338	.78	14.31	0	23.65	7.44	341	1.00	108	-46	sl. cloudy
	1341	.91	14.31	0	23.14	7.44	341	1.17	50.1	-35	clear
	1345	.94	14.31	0	23.00	7.39	343	0.73	45.5	-36	clear
	1348	1.07	14.31	0	22.77	7.36	344	0.70	40.6	-37	clear
	1351	1.20	14.31	0	20.56	7.31	363	0.73	108	-37	clear
	1354	1.33	14.31	0	20.14	7.49	360	2.18	72	-32	clear
	1357	1.46	14.31	0	20.69	7.28	363	0.69	74.1	-31	clear
	1400	1.59	14.31	0	20.75	7.25	368	0.69	70.7	-32	clear

NOTES (continued)

Depths only for first three reading due to sample clarity.

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion
Client: NRT
Project Number:
Task #:
Start Date: 7-13-17 Time: 1320
Field Personnel: T. Mathis J. Simpson
Finish Date: 7-13-17 Time: 1409

WELL INFORMATION

Well ID: MW20
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1403	1.72	14.31	0	20.85	7.22	371	0.64	45.9	-32	clear
	1406	1.85	14.31	0	20.73	7.25	368	0.61	47.3	-34	clear
	1409	1.98	14.31	0	20.54	7.25	364	0.61	55.5	-34	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	7.12.17			✓	
Well Number	MW 34				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			

	Yes	No	NA	
2. Inner casing				
Not corroded	✓			
Not dented	✓			
Not cracked	✓			
Not loose	✓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?	✓			
7. Bumper posts in good condition?	✓			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			✓	
10. No water in the flushmount?			✓	
11. Is the well cap lockable?			✓	
12. Is there a lock present?			✓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?	✓			
13. No obstructions in well?			✓	
14. No plant roots or vegetation in well?			✓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19 . Concrete pad				
Slope away form casing?	✓			
Not deteriorated?	✓			
Not heaved or below surrounding grade?	✓			
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion | Client: NRT

Project Number: | Task #: | Start Date: 7-13-17 | Time: 1416

Field Personnel: T. Mathis J. Simpson | Finish Date: 7-13-17 | Time: 1501

WELL INFORMATION

Well ID: MW34

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (μs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1416	0	14.12								
	1419	.13	14.24	0.12							
	1422	.26	14.24	0							
	1425	.39	14.27	.03							
	1428	.52	14.27	0	16.44	7.22	610	1.39	259	-101	cloudy
	1431	.65	~~15.77~~ 14.27	0	15.68	7.26	615	1.39	243	-104	cloudy
	1434	.78	14.34	.07	15.33	7.27	619	1.06	222	-108	cloudy
	1437	.91	14.34	0	15.14	7.28	620	2.31	130	-111	cloudy
	1440	1.04	14.37	.03	14.80	7.28	619	3.21	100	-112	cloudy
	1443	1.17	14.37	0	14.44	7.29	615	0.78	109	-114	cloudy
	1446	1.30	14.37	0	14.62	7.29	615	3.23	77.4	-115	cloudy
	1449	1.43	14.37	0	13.98	7.29	621	3.59	66.0	-116	clear
	1452	1.56	14.42	.05	13.46	7.29	622	3.46	56.0	-117	clear
	1455	1.69	14.42	0	13.83	7.35	627	1.54	49.0	-113	clear

NOTES (continued)

depth only due to clarity

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT

Project Number: Task #: Start Date: 7-13-17 Time 1416

Field Personnel: T. Mathis J. Simpson Finish Date: 7-13-17 Time 1501

WELL INFORMATION

Well ID: MW34

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
~~1458~~	1458	1.82	14.42	0	13.89	7.31	622	5.83	49.3	-114	Clear
~~14 1501~~	1501	1.95	14.42	0	14.25	7.29	618	6.17	48.7	-115	Clear
~~[illegible]~~	~~[illegible]~~	~~[illegible]~~									

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion
Client: NRT
Project Number:
Task #:
Start Date: 7.13.17
Time: 1122
Field Personnel: J. Mathis J. Simpson
Finish Date: 7.13.17
Time: 1143

WELL INFORMATION

Well ID: MW3R
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1143	.91	7.10	0	14.57	7.62	803	0.96	5.5	-142	clear

NOTES (continued)

Duplicate #1

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion
Client: NRT
Project Number:
Task #:
Start Date: 7-13-17 Time 1256
Field Personnel: F. Mathis J. Simpson
Finish Date: 7-13-17 Time 1306

WELL INFORMATION

Well ID: MW6R
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1306	.65	7.58	0	16.48	7.25	558	0.94	2.3	-74	clear

NOTES (continued)

Duplicate #2

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Field Calibration Form
Groundwater Quality Meter

Groundwater Quality Meter Manufacturer/Model Horiba U52
Serial Number ____________________
oxidation/reduction potential, dissolved oxygen, pH, tubidity

Date of Calibration Check	Calibration Standard Concentration	Calibration Reading	Within +/_ 10% (yes or no)	Comments
7-12-17	7.00 PH	7.01	YES	
1700	4.00	4.04		
	10.00	9.97		
	1412 Cond	1420		
	0 turb	0.1		
	100% DO	94.6%	YES	
7-12-17	7.00	7.04		
2200	1412	1440		
	0 Turb	0.3		
	100% DO	103.4		
7-13-17	7.00	6.98	YES	
0630	4.00	4.00		
	10.00	10.02		
	1412	1400		
	0	0.4		
	100%	101.1%	YES	
7-13-17	7.00	7.02		
1600	1412	1390		
	0	0		
	100%	98.7%		

http://www.teklabinc.com/

September 22, 2017

Steve Wiskes
Natural Resource Technology, Inc.
2422 East Washington Street
Suite 104
Bloomington, IL 61704
TEL: (414) 837-3614
FAX: (414) 837 3608

RE: Dynegy - Vermillion Power Station **WorkOrder:** 17090414

Dear Steve Wiskes:

TEKLAB, INC received 20 samples on 9/14/2017 3:55:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414
Report Date: 22-Sep-17

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
Case Narrative	4
Accreditations	5
Laboratory Results	6
Sample Summary	24
Dates Report	25
Quality Control Results	34
Receiving Check List	41
Chain of Custody	Appended

Abbr Definition

Abbr	Definition
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414

Report Date: 22-Sep-17

Cooler Receipt Temp: 2.02 °C

An employee of Teklab, Inc. collected the sample(s).

MW7 could not be collected; the well was dry TW1 could not be collected; the well was inaccessable

Locations

Collinsville

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	jhriley@teklabinc.com

Springfield

Address	3920 Pintail Dr Springfield, IL 62711-9415
Phone	(217) 698-1004
Fax	(217) 698-1005
Email	KKlostermann@teklabinc.com

Kansas City

Address	8421 Nieman Road Lenexa, KS 66214
Phone	(913) 541-1998
Fax	(913) 541-1998
Email	jhriley@teklabinc.com

Collinsville Air

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	EHurley@teklabinc.com

Chicago

Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(630) 324-6855
Fax	
Email	jhriley@teklabinc.com

Client: Natural Resource Technology, Inc.

Work Order: 17090414

Client Project: Dynegy - Vermillion Power Station

Report Date: 22-Sep-17

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2018	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2018	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2018	Collinsville
Kentucky	KDEP	98006		12/31/2017	Collinsville
Kentucky	UST	0073		1/31/2018	Collinsville
Louisiana	LDPH	LA170027		12/31/2017	Collinsville
Missouri	MDNR	930		1/31/2018	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2018	Collinsville

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-001 **Client Sample ID:** MW1

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 13:43

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**78.92**	ft	1	09/13/2017 13:43	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.18**		1	09/13/2017 13:43	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/13/2017 13:43	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**105**	mV	1	09/13/2017 13:43	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**1910**	µS/cm	1	09/13/2017 13:43	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**18.57**	°C	1	09/13/2017 13:43	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**5.97**	mg/L	1	09/13/2017 13:43	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**2040**	mg/L	1	09/18/2017 15:19	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.356**	mg/L	1	09/15/2017 10:35	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**995**	mg/L	50	09/18/2017 19:04	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.13**	mg/L	1	09/15/2017 15:07	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**22**	mg/L	1	09/18/2017 18:56	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 22:53	134180
Barium	NELAP	0.0010		**0.0122**	mg/L	5	09/15/2017 22:53	134180
Boron	NELAP	0.0250		**1.06**	mg/L	5	09/15/2017 22:53	134180
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	09/15/2017 22:53	134180
Manganese	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 22:53	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 22:53	134180

Laboratory Results

Client: Natural Resource Technology, Inc. **Work Order:** 17090414
Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17
Lab ID: 17090414-002 **Client Sample ID:** MW2
Matrix: GROUNDWATER **Collection Date:** 09/14/2017 11:04

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**19.19**	ft	1	09/14/2017 11:04	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.72**		1	09/14/2017 11:04	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/14/2017 11:04	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-110**	mV	1	09/14/2017 11:04	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**699**	µS/cm	1	09/14/2017 11:04	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.66**	°C	1	09/14/2017 11:04	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	09/14/2017 11:04	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**530**	mg/L	1	09/18/2017 15:19	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 10:37	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**20**	mg/L	1	09/18/2017 19:07	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.62**	mg/L	1	09/15/2017 15:13	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	10		**49**	mg/L	2	09/18/2017 19:15	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0077**	mg/L	5	09/15/2017 23:01	134180
Barium	NELAP	0.0010		**0.182**	mg/L	5	09/15/2017 23:01	134180
Boron	NELAP	0.0250		**0.260**	mg/L	5	09/15/2017 23:01	134180
Iron	NELAP	0.0250		**0.283**	mg/L	5	09/15/2017 23:01	134180
Manganese	NELAP	0.0010		**0.0920**	mg/L	5	09/15/2017 23:01	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 23:01	134180

Teklab, Inc.
Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17090414
Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17
Lab ID: 17090414-004 **Client Sample ID:** MW10
Matrix: GROUNDWATER **Collection Date:** 09/14/2017 9:02

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**50.95**	ft	1	09/14/2017 9:02	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**6.68**		1	09/14/2017 9:02	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/14/2017 9:02	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**137**	mV	1	09/14/2017 9:02	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**1110**	µS/cm	1	09/14/2017 9:02	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.80**	°C	1	09/14/2017 9:02	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**6.63**	mg/L	1	09/14/2017 9:02	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**1020**	mg/L	1	09/18/2017 15:20	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.208**	mg/L	1	09/15/2017 10:39	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**281**	mg/L	10	09/18/2017 19:48	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.15**	mg/L	1	09/15/2017 15:15	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**8**	mg/L	1	09/18/2017 19:39	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 23:09	134180
Barium	NELAP	0.0010		**0.0704**	mg/L	5	09/15/2017 23:09	134180
Boron	NELAP	0.0250		**0.0861**	mg/L	5	09/15/2017 23:09	134180
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	09/15/2017 23:09	134180
Manganese	NELAP	0.0010		**0.131**	mg/L	5	09/15/2017 23:09	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 23:09	134180

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-005 **Client Sample ID:** MW17

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 14:12

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**39.55**	ft	1	09/13/2017 14:12	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**6.95**		1	09/13/2017 14:12	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**3.2**	NTU	1	09/13/2017 14:12	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-38**	mV	1	09/13/2017 14:12	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**1880**	µS/cm	1	09/13/2017 14:12	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**17.68**	°C	1	09/13/2017 14:12	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**1.39**	mg/L	1	09/13/2017 14:12	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**1970**	mg/L	1	09/18/2017 15:20	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.275**	mg/L	1	09/15/2017 10:44	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1020**	mg/L	50	09/18/2017 19:56	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.17**	mg/L	1	09/15/2017 15:21	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**35**	mg/L	1	09/18/2017 19:48	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0012**	mg/L	5	09/15/2017 23:17	134180
Barium	NELAP	0.0010		**0.0240**	mg/L	5	09/15/2017 23:17	134180
Boron	NELAP	0.0250		**5.24**	mg/L	5	09/15/2017 23:17	134180
Iron	NELAP	0.0250		**2.11**	mg/L	5	09/15/2017 23:17	134180
Manganese	NELAP	0.0010		**0.601**	mg/L	5	09/15/2017 23:17	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 23:17	134180

Laboratory Results

Teklab Inc. Environmental Laboratory

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-006 **Client Sample ID:** MW18

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 14:29

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**25.70**	ft	1	09/13/2017 14:29	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**6.88**		1	09/13/2017 14:29	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/13/2017 14:29	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**27**	mV	1	09/13/2017 14:29	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**1620**	µS/cm	1	09/13/2017 14:29	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**13.32**	°C	1	09/13/2017 14:29	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	09/13/2017 14:29	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**1650**	mg/L	1	09/18/2017 15:21	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 10:46	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**784**	mg/L	20	09/18/2017 20:04	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.12**	mg/L	1	09/15/2017 15:24	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**23**	mg/L	1	09/18/2017 19:56	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0014**	mg/L	5	09/15/2017 23:26	134180
Barium	NELAP	0.0010		**0.0161**	mg/L	5	09/15/2017 23:26	134180
Boron	NELAP	0.0250		**4.42**	mg/L	5	09/15/2017 23:26	134180
Iron	NELAP	0.0250		**0.0749**	mg/L	5	09/15/2017 23:26	134180
Manganese	NELAP	0.0010		**1.47**	mg/L	5	09/15/2017 23:26	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 23:26	134180

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-007 **Client Sample ID:** MW21

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 13:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**90.04**	ft	1	09/13/2017 13:15	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.33**		1	09/13/2017 13:15	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/13/2017 13:15	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-46**	mV	1	09/13/2017 13:15	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**516**	µS/cm	1	09/13/2017 13:15	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**17.49**	°C	1	09/13/2017 13:15	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**2.49**	mg/L	1	09/13/2017 13:15	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**400**	mg/L	1	09/18/2017 15:21	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.052**	mg/L	1	09/15/2017 10:55	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10	S	**18**	mg/L	1	09/18/2017 20:06	R237776
MS did not recover within control limits. Result is verified by re-analysis at a dilution.								
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**1.16**	mg/L	1	09/15/2017 15:26	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	09/18/2017 20:04	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0305**	mg/L	5	09/15/2017 23:34	134180
Barium	NELAP	0.0010		**0.0898**	mg/L	5	09/15/2017 23:34	134180
Boron	NELAP	0.0250		**0.773**	mg/L	5	09/15/2017 23:34	134180
Iron	NELAP	0.0250		**0.327**	mg/L	5	09/15/2017 23:34	134180
Manganese	NELAP	0.0010		**0.113**	mg/L	5	09/15/2017 23:34	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 23:34	134180

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-009 **Client Sample ID:** MW3R

Matrix: GROUNDWATER **Collection Date:** 09/14/2017 10:18

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**8.17**	ft	1	09/14/2017 10:18	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.23**		1	09/14/2017 10:18	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/14/2017 10:18	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-108**	mV	1	09/14/2017 10:18	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**806**	µS/cm	1	09/14/2017 10:18	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**16.65**	°C	1	09/14/2017 10:18	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	09/14/2017 10:18	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**698**	mg/L	1	09/18/2017 15:21	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 11:08	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**144**	mg/L	5	09/18/2017 20:58	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.50**	mg/L	1	09/15/2017 15:32	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**27**	mg/L	1	09/18/2017 20:50	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0077**	mg/L	5	09/15/2017 23:42	134180
Barium	NELAP	0.0010		**0.179**	mg/L	5	09/15/2017 23:42	134180
Boron	NELAP	0.0250		**3.70**	mg/L	5	09/15/2017 23:42	134180
Iron	NELAP	0.0250		**2.39**	mg/L	5	09/15/2017 23:42	134180
Manganese	NELAP	0.0010		**0.0413**	mg/L	5	09/15/2017 23:42	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 23:42	134180

Teklab, Inc. Environmental Laboratory

Laboratory Results

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Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-010 **Client Sample ID:** MW4

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 16:38

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**8.34**	ft	1	09/13/2017 16:38	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.50**		1	09/13/2017 16:38	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/13/2017 16:38	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-115**	mV	1	09/13/2017 16:38	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**507**	µS/cm	1	09/13/2017 16:38	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**15.54**	°C	1	09/13/2017 16:38	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	09/13/2017 16:38	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**428**	mg/L	1	09/18/2017 15:21	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 11:17	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**69**	mg/L	2	09/18/2017 21:06	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.30**	mg/L	1	09/15/2017 15:35	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	09/18/2017 20:58	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0056**	mg/L	5	09/15/2017 23:50	134180
Barium	NELAP	0.0010		**0.271**	mg/L	5	09/15/2017 23:50	134180
Boron	NELAP	0.0250		**6.48**	mg/L	5	09/15/2017 23:50	134180
Iron	NELAP	0.0250		**0.915**	mg/L	5	09/15/2017 23:50	134180
Manganese	NELAP	0.0010		**0.547**	mg/L	5	09/15/2017 23:50	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 23:50	134180

Client: Natural Resource Technology, Inc.
Work Order: 17090414
Client Project: Dynegy - Vermillion Power Station
Report Date: 22-Sep-17
Lab ID: 17090414-011
Client Sample ID: MW5
Matrix: GROUNDWATER
Collection Date: 09/14/2017 9:48

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**9.73**	ft	1	09/14/2017 9:48	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.26**		1	09/14/2017 9:48	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/14/2017 9:48	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**68**	mV	1	09/14/2017 9:48	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**696**	µS/cm	1	09/14/2017 9:48	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**15.21**	°C	1	09/14/2017 9:48	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	09/14/2017 9:48	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**634**	mg/L	1	09/18/2017 15:22	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 11:19	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**262**	mg/L	10	09/18/2017 21:30	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.51**	mg/L	1	09/15/2017 15:38	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	09/18/2017 21:22	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 23:58	134180
Barium	NELAP	0.0010		**0.0248**	mg/L	5	09/15/2017 23:58	134180
Boron	NELAP	0.0250		**17.2**	mg/L	5	09/15/2017 23:58	134180
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	09/15/2017 23:58	134180
Manganese	NELAP	0.0010		**0.325**	mg/L	5	09/15/2017 23:58	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 23:58	134180

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-012 **Client Sample ID:** MW6R

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 14:55

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**9.79**	ft	1	09/13/2017 14:55	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**6.93**		1	09/13/2017 14:55	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/13/2017 14:55	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-44**	mV	1	09/13/2017 14:55	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**698**	µS/cm	1	09/13/2017 14:55	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**15.19**	°C	1	09/13/2017 14:55	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	09/13/2017 14:55	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**546**	mg/L	1	09/18/2017 15:22	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 11:21	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**68**	mg/L	2	09/18/2017 21:38	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.17**	mg/L	1	09/15/2017 15:43	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	09/18/2017 21:30	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 0:07	134180
Barium	NELAP	0.0010		**0.0807**	mg/L	5	09/16/2017 0:07	134180
Boron	NELAP	0.0250		**0.234**	mg/L	5	09/19/2017 10:41	134180
Iron	NELAP	0.0250		**0.0924**	mg/L	5	09/16/2017 0:07	134180
Manganese	NELAP	0.0010		**0.225**	mg/L	5	09/16/2017 0:07	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 0:07	134180

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-013 **Client Sample ID:** MW8R

Matrix: GROUNDWATER **Collection Date:** 09/14/2017 10:39

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**13.80**	ft	1	09/14/2017 10:39	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**8.37**		1	09/14/2017 10:39	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/14/2017 10:39	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-159**	mV	1	09/14/2017 10:39	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**1980**	µS/cm	1	09/14/2017 10:39	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.73**	°C	1	09/14/2017 10:39	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**4.96**	mg/L	1	09/14/2017 10:39	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**2080**	mg/L	1	09/18/2017 15:22	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 11:24	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1210**	mg/L	50	09/18/2017 21:46	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	09/15/2017 15:45	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**18**	mg/L	1	09/18/2017 21:38	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0098**	mg/L	5	09/16/2017 0:31	134180
Barium	NELAP	0.0010		**0.0464**	mg/L	5	09/16/2017 0:31	134180
Boron	NELAP	1.00		**52.8**	mg/L	200	09/18/2017 18:47	134180
Iron	NELAP	0.0250		**0.0610**	mg/L	5	09/16/2017 0:31	134180
Manganese	NELAP	0.0010		**0.0720**	mg/L	5	09/16/2017 0:31	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 0:31	134180

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-014 **Client Sample ID:** MW9

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 11:42

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**10.09**	ft	1	09/13/2017 11:42	R237894

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-015 **Client Sample ID:** MW19

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 11:48

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**10.13**	ft	1	09/13/2017 11:48	R237894

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-016 **Client Sample ID:** MW20

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 15:39

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**15.47**	ft	1	09/13/2017 16:30	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.07**		1	09/13/2017 15:39	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**10.0**	NTU	1	09/13/2017 15:39	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-27**	mV	1	09/13/2017 15:39	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**487**	µS/cm	1	09/13/2017 15:39	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**13.56**	°C	1	09/13/2017 15:39	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	09/13/2017 15:39	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**392**	mg/L	1	09/18/2017 15:22	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 11:28	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**60**	mg/L	2	09/18/2017 21:54	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	09/15/2017 15:48	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	09/18/2017 21:46	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 0:40	134180
Barium	NELAP	0.0010		**0.0229**	mg/L	5	09/16/2017 0:40	134180
Boron	NELAP	0.0250		**0.422**	mg/L	5	09/18/2017 19:44	134180
Iron	NELAP	0.0250		**0.321**	mg/L	5	09/16/2017 0:40	134180
Manganese	NELAP	0.0010		**0.0293**	mg/L	5	09/16/2017 0:40	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 0:40	134180

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-017 **Client Sample ID:** MW34

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 16:13

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**14.71**	ft	1	09/13/2017 16:13	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.00**		1	09/13/2017 16:13	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**102**	NTU	1	09/13/2017 16:13	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-111**	mV	1	09/13/2017 16:13	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**679**	µS/cm	1	09/13/2017 16:13	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**12.71**	°C	1	09/13/2017 16:13	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	09/13/2017 16:13	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**494**	mg/L	1	09/18/2017 16:02	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 11:30	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	09/18/2017 21:57	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.67**	mg/L	1	09/15/2017 15:58	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**33**	mg/L	1	09/18/2017 21:55	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0232**	mg/L	5	09/16/2017 0:48	134180
Barium	NELAP	0.0010		**0.146**	mg/L	5	09/16/2017 0:48	134180
Boron	NELAP	0.0250		**0.472**	mg/L	5	09/18/2017 19:53	134180
Iron	NELAP	0.0250		**5.34**	mg/L	5	09/16/2017 0:48	134180
Manganese	NELAP	0.0010		**0.0619**	mg/L	5	09/16/2017 0:48	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 0:48	134180

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-018 **Client Sample ID:** Field Blank

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 17:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**< 20**	mg/L	1	09/18/2017 16:03	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.853**	mg/L	1	09/15/2017 11:32	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	09/18/2017 22:00	R237776
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	09/15/2017 15:59	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	09/18/2017 21:56	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 0:56	134180
Barium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 0:56	134180
Boron	NELAP	0.0250		**< 0.0250**	mg/L	5	09/18/2017 20:01	134180
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	09/16/2017 0:56	134180
Manganese	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 0:56	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 0:56	134180

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-019 **Client Sample ID:** DUP1

Matrix: GROUNDWATER **Collection Date:** 09/13/2017 14:29

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**25.70**	ft	1	09/13/2017 14:29	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**6.88**		1	09/13/2017 14:29	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/13/2017 14:29	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**27**	mV	1	09/13/2017 14:29	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**1620**	µS/cm	1	09/13/2017 14:29	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**13.32**	°C	1	09/13/2017 14:29	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	09/13/2017 14:29	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**1640**	mg/L	1	09/18/2017 16:03	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 11:46	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**789**	mg/L	20	09/20/2017 13:08	R237876
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.12**	mg/L	1	09/15/2017 16:02	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**23**	mg/L	1	09/18/2017 22:16	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0013**	mg/L	5	09/16/2017 1:04	134180
Barium	NELAP	0.0010		**0.0161**	mg/L	5	09/16/2017 1:04	134180
Boron	NELAP	0.0250		**4.44**	mg/L	5	09/18/2017 20:09	134180
Iron	NELAP	0.0250		**0.0728**	mg/L	5	09/16/2017 1:04	134180
Manganese	NELAP	0.0010		**1.46**	mg/L	5	09/16/2017 1:04	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 1:04	134180

The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 20d

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Lab ID: 17090414-020 **Client Sample ID:** DUP2

Matrix: GROUNDWATER **Collection Date:** 09/14/2017 9:48

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**9.73**	ft	1	09/14/2017 9:48	R237894
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.26**		1	09/14/2017 9:48	R237894
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	09/14/2017 9:48	R237894
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**68**	mV	1	09/14/2017 9:48	R237894
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**696**	µS/cm	1	09/14/2017 9:48	R237894
STANDARD METHODS 2550 B FIELD								
Temperature		0		**15.21**	°C	1	09/14/2017 9:48	R237894
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	09/14/2017 9:48	R237894
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**602**	mg/L	1	09/18/2017 16:03	R237825
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	09/15/2017 11:48	R237724
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**278**	mg/L	10	09/20/2017 13:11	R237876
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.49**	mg/L	1	09/15/2017 16:03	R237726
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	09/18/2017 22:24	R237801
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 1:12	134180
Barium	NELAP	0.0010		**0.0252**	mg/L	5	09/16/2017 1:12	134180
Boron	NELAP	0.0250		**20.8**	mg/L	5	09/18/2017 20:17	134180
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	09/16/2017 1:12	134180
Manganese	NELAP	0.0010		**0.327**	mg/L	5	09/16/2017 1:12	134180
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/16/2017 1:12	134180

Sample Summary

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414
Report Date: 22-Sep-17

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
17090414-001	MW1	Groundwater	4	09/13/2017 13:43
17090414-002	MW2	Groundwater	4	09/14/2017 11:04
17090414-003	MW7	Groundwater	4	09/13/2017 11:32
17090414-004	MW10	Groundwater	4	09/14/2017 9:02
17090414-005	MW17	Groundwater	4	09/13/2017 14:12
17090414-006	MW18	Groundwater	4	09/13/2017 14:29
17090414-007	MW21	Groundwater	4	09/13/2017 13:15
17090414-008	TW1	Groundwater	4	09/14/2017 0:00
17090414-009	MW3R	Groundwater	4	09/14/2017 10:18
17090414-010	MW4	Groundwater	4	09/13/2017 16:38
17090414-011	MW5	Groundwater	4	09/14/2017 9:48
17090414-012	MW6R	Groundwater	4	09/13/2017 14:55
17090414-013	MW8R	Groundwater	4	09/14/2017 10:39
17090414-014	MW9	Groundwater	1	09/13/2017 11:42
17090414-015	MW19	Groundwater	1	09/13/2017 11:48
17090414-016	MW20	Groundwater	4	09/13/2017 15:39
17090414-017	MW34	Groundwater	4	09/13/2017 16:13
17090414-018	Field Blank	Groundwater	4	09/13/2017 17:00
17090414-019	DUP1	Groundwater	4	09/13/2017 14:29
17090414-020	DUP2	Groundwater	4	09/14/2017 9:48

Teklab, Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414
Report Date: 22-Sep-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17090414-001A	MW1	09/13/2017 13:43	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 13:43
	Standard Method 4500-H B Field				09/13/2017 13:43
	Standard Methods 2130 B Field				09/13/2017 13:43
	Standard Methods 18th Ed. 2580 B Field				09/13/2017 13:43
	Standard Methods 2510 B Field				09/13/2017 13:43
	Standard Methods 2550 B Field				09/13/2017 13:43
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:22
	Standard Methods 4500-O G Field				09/13/2017 13:43
	SW-846 9036 (Total)				09/18/2017 19:04
	SW-846 9251 (Total)				09/18/2017 18:56
17090414-001B	MW1	09/13/2017 13:43	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:19
	SW-846 9214 (Dissolved)				09/15/2017 15:07
17090414-001C	MW1	09/13/2017 13:43	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/15/2017 22:53
17090414-001D	MW1	09/13/2017 13:43	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 10:35
17090414-002A	MW2	09/14/2017 11:04	09/14/2017 15:55		
	Field Elevation Measurements				09/14/2017 11:04
	Standard Method 4500-H B Field				09/14/2017 11:04
	Standard Methods 2130 B Field				09/14/2017 11:04
	Standard Methods 18th Ed. 2580 B Field				09/14/2017 11:04
	Standard Methods 2510 B Field				09/14/2017 11:04
	Standard Methods 2550 B Field				09/14/2017 11:04
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:22
	Standard Methods 4500-O G Field				09/14/2017 11:04
	SW-846 9036 (Total)				09/18/2017 19:07
	SW-846 9251 (Total)				09/18/2017 19:15
17090414-002B	MW2	09/14/2017 11:04	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:19
	SW-846 9214 (Dissolved)				09/15/2017 15:13
17090414-002C	MW2	09/14/2017 11:04	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/15/2017 23:01
17090414-002D	MW2	09/14/2017 11:04	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 10:37

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414
Report Date: 22-Sep-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17090414-004A	MW10	09/14/2017 9:02	09/14/2017 15:55		
	Field Elevation Measurements				09/14/2017 9:02
	Standard Method 4500-H B Field				09/14/2017 9:02
	Standard Methods 2130 B Field				09/14/2017 9:02
	Standard Methods 18th Ed. 2580 B Field				09/14/2017 9:02
	Standard Methods 2510 B Field				09/14/2017 9:02
	Standard Methods 2550 B Field				09/14/2017 9:02
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:23
	Standard Methods 4500-O G Field				09/14/2017 9:02
	SW-846 9036 (Total)				09/18/2017 19:48
	SW-846 9251 (Total)				09/18/2017 19:39
17090414-004B	MW10	09/14/2017 9:02	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:20
	SW-846 9214 (Dissolved)				09/15/2017 15:15
17090414-004C	MW10	09/14/2017 9:02	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/15/2017 23:09
17090414-004D	MW10	09/14/2017 9:02	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 10:39
17090414-005A	MW17	09/13/2017 14:12	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 14:12
	Standard Method 4500-H B Field				09/13/2017 14:12
	Standard Methods 2130 B Field				09/13/2017 14:12
	Standard Methods 18th Ed. 2580 B Field				09/13/2017 14:12
	Standard Methods 2510 B Field				09/13/2017 14:12
	Standard Methods 2550 B Field				09/13/2017 14:12
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:24
	Standard Methods 4500-O G Field				09/13/2017 14:12
	SW-846 9036 (Total)				09/18/2017 19:56
	SW-846 9251 (Total)				09/18/2017 19:48
17090414-005B	MW17	09/13/2017 14:12	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:20
	SW-846 9214 (Dissolved)				09/15/2017 15:21
17090414-005C	MW17	09/13/2017 14:12	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/15/2017 23:17
17090414-005D	MW17	09/13/2017 14:12	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 10:44

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414
Report Date: 22-Sep-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17090414-006A	MW18	09/13/2017 14:29	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 14:29
	Standard Method 4500-H B Field				09/13/2017 14:29
	Standard Methods 2130 B Field				09/13/2017 14:29
	Standard Methods 18th Ed. 2580 B Field				09/13/2017 14:29
	Standard Methods 2510 B Field				09/13/2017 14:29
	Standard Methods 2550 B Field				09/13/2017 14:29
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:25
	Standard Methods 4500-O G Field				09/13/2017 14:29
	SW-846 9036 (Total)				09/18/2017 20:04
	SW-846 9251 (Total)				09/18/2017 19:56
17090414-006B	MW18	09/13/2017 14:29	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:21
	SW-846 9214 (Dissolved)				09/15/2017 15:24
17090414-006C	MW18	09/13/2017 14:29	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/15/2017 23:26
17090414-006D	MW18	09/13/2017 14:29	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 10:46
17090414-007A	MW21	09/13/2017 13:15	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 13:15
	Standard Method 4500-H B Field				09/13/2017 13:15
	Standard Methods 2130 B Field				09/13/2017 13:15
	Standard Methods 18th Ed. 2580 B Field				09/13/2017 13:15
	Standard Methods 2510 B Field				09/13/2017 13:15
	Standard Methods 2550 B Field				09/13/2017 13:15
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:26
	Standard Methods 4500-O G Field				09/13/2017 13:15
	SW-846 9036 (Total)				09/18/2017 20:06
	SW-846 9251 (Total)				09/18/2017 20:04
17090414-007B	MW21	09/13/2017 13:15	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:21
	SW-846 9214 (Dissolved)				09/15/2017 15:26
17090414-007C	MW21	09/13/2017 13:15	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/15/2017 23:34
17090414-007D	MW21	09/13/2017 13:15	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 10:55

Teklab, Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414

Report Date: 22-Sep-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17090414-009A	MW3R	09/14/2017 10:18	09/14/2017 15:55		
	Field Elevation Measurements				09/14/2017 10:18
	Standard Method 4500-H B Field				09/14/2017 10:18
	Standard Methods 2130 B Field				09/14/2017 10:18
	Standard Methods 18th Ed. 2580 B Field				09/14/2017 10:18
	Standard Methods 2510 B Field				09/14/2017 10:18
	Standard Methods 2550 B Field				09/14/2017 10:18
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:27
	Standard Methods 4500-O G Field				09/14/2017 10:18
	SW-846 9036 (Total)				09/18/2017 20:58
	SW-846 9251 (Total)				09/18/2017 20:50
17090414-009B	MW3R	09/14/2017 10:18	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:21
	SW-846 9214 (Dissolved)				09/15/2017 15:32
17090414-009C	MW3R	09/14/2017 10:18	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/15/2017 23:42
17090414-009D	MW3R	09/14/2017 10:18	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 11:08
17090414-010A	MW4	09/13/2017 16:38	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 16:38
	Standard Method 4500-H B Field				09/13/2017 16:38
	Standard Methods 2130 B Field				09/13/2017 16:38
	Standard Methods 18th Ed. 2580 B Field				09/13/2017 16:38
	Standard Methods 2510 B Field				09/13/2017 16:38
	Standard Methods 2550 B Field				09/13/2017 16:38
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:27
	Standard Methods 4500-O G Field				09/13/2017 16:38
	SW-846 9036 (Total)				09/18/2017 21:06
	SW-846 9251 (Total)				09/18/2017 20:58
17090414-010B	MW4	09/13/2017 16:38	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:21
	SW-846 9214 (Dissolved)				09/15/2017 15:35
17090414-010C	MW4	09/13/2017 16:38	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/15/2017 23:50
17090414-010D	MW4	09/13/2017 16:38	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 11:17

Teklab Inc. Environmental Laboratory

Dates Report

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Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17090414-011A	MW5	09/14/2017 9:48	09/14/2017 15:55		
	Field Elevation Measurements				09/14/2017 9:48
	Standard Method 4500-H B Field				09/14/2017 9:48
	Standard Methods 2130 B Field				09/14/2017 9:48
	Standard Methods 18th Ed. 2580 B Field				09/14/2017 9:48
	Standard Methods 2510 B Field				09/14/2017 9:48
	Standard Methods 2550 B Field				09/14/2017 9:48
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:28
	Standard Methods 4500-O G Field				09/14/2017 9:48
	SW-846 9036 (Total)				09/18/2017 21:30
	SW-846 9251 (Total)				09/18/2017 21:22
17090414-011B	MW5	09/14/2017 9:48	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:22
	SW-846 9214 (Dissolved)				09/15/2017 15:38
17090414-011C	MW5	09/14/2017 9:48	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/15/2017 23:58
17090414-011D	MW5	09/14/2017 9:48	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 11:19
17090414-012A	MW6R	09/13/2017 14:55	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 14:55
	Standard Method 4500-H B Field				09/13/2017 14:55
	Standard Methods 2130 B Field				09/13/2017 14:55
	Standard Methods 18th Ed. 2580 B Field				09/13/2017 14:55
	Standard Methods 2510 B Field				09/13/2017 14:55
	Standard Methods 2550 B Field				09/13/2017 14:55
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:29
	Standard Methods 4500-O G Field				09/13/2017 14:55
	SW-846 9036 (Total)				09/18/2017 21:38
	SW-846 9251 (Total)				09/18/2017 21:30
17090414-012B	MW6R	09/13/2017 14:55	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:22
	SW-846 9214 (Dissolved)				09/15/2017 15:43
17090414-012C	MW6R	09/13/2017 14:55	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/16/2017 0:07
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/19/2017 10:41
17090414-012D	MW6R	09/13/2017 14:55	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 11:21

Teklab, Inc.
Environmental Laboratory

Dates Report

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Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414
Report Date: 22-Sep-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17090414-013A	MW8R	09/14/2017 10:39	09/14/2017 15:55		
	Field Elevation Measurements				09/14/2017 10:39
	Standard Method 4500-H B Field				09/14/2017 10:39
	Standard Methods 2130 B Field				09/14/2017 10:39
	Standard Methods 18th Ed. 2580 B Field				09/14/2017 10:39
	Standard Methods 2510 B Field				09/14/2017 10:39
	Standard Methods 2550 B Field				09/14/2017 10:39
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:29
	Standard Methods 4500-O G Field				09/14/2017 10:39
	SW-846 9036 (Total)				09/18/2017 21:46
	SW-846 9251 (Total)				09/18/2017 21:38
17090414-013B	MW8R	09/14/2017 10:39	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:22
	SW-846 9214 (Dissolved)				09/15/2017 15:45
17090414-013C	MW8R	09/14/2017 10:39	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/16/2017 0:31
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/18/2017 18:47
17090414-013D	MW8R	09/14/2017 10:39	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 11:24
17090414-014A	MW9	09/13/2017 11:42	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 11:42
17090414-015A	MW19	09/13/2017 11:48	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 11:48
17090414-016A	MW20	09/13/2017 15:39	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 15:39
	Standard Method 4500-H B Field				09/13/2017 15:39
	Standard Methods 2130 B Field				09/13/2017 15:39
	Standard Methods 18th Ed. 2580 B Field				09/13/2017 15:39
	Standard Methods 2510 B Field				09/13/2017 15:39
	Standard Methods 2550 B Field				09/13/2017 15:39
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:30
	Standard Methods 4500-O G Field				09/13/2017 15:39
	SW-846 9036 (Total)				09/18/2017 21:54
	SW-846 9251 (Total)				09/18/2017 21:46
17090414-016B	MW20	09/13/2017 15:39	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 15:22
	SW-846 9214 (Dissolved)				09/15/2017 15:48

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414

Report Date: 22-Sep-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17090414-016C	MW20	09/13/2017 15:39	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/16/2017 0:40
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/18/2017 19:44
17090414-016D	MW20	09/13/2017 15:39	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 11:28
17090414-017A	MW34	09/13/2017 16:13	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 16:13
	Standard Method 4500-H B Field				09/13/2017 16:13
	Standard Methods 2130 B Field				09/13/2017 16:13
	Standard Methods 18th Ed. 2580 B Field				09/13/2017 16:13
	Standard Methods 2510 B Field				09/13/2017 16:13
	Standard Methods 2550 B Field				09/13/2017 16:13
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:30
	Standard Methods 4500-O G Field				09/13/2017 16:13
	SW-846 9036 (Total)				09/18/2017 21:57
	SW-846 9251 (Total)				09/18/2017 21:55
17090414-017B	MW34	09/13/2017 16:13	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 16:02
	SW-846 9214 (Dissolved)				09/15/2017 15:58
17090414-017C	MW34	09/13/2017 16:13	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/16/2017 0:48
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/18/2017 19:53
17090414-017D	MW34	09/13/2017 16:13	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 11:30
17090414-018A	Field Blank	09/13/2017 17:00	09/14/2017 15:55		
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:31
	SW-846 9036 (Total)				09/18/2017 22:00
	SW-846 9251 (Total)				09/18/2017 21:56
17090414-018B	Field Blank	09/13/2017 17:00	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 16:03
	SW-846 9214 (Dissolved)				09/15/2017 15:59
17090414-018C	Field Blank	09/13/2017 17:00	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/16/2017 0:56
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/18/2017 20:01
17090414-018D	Field Blank	09/13/2017 17:00	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 11:32

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Environmental Laboratory

Dates Report

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Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414
Report Date: 22-Sep-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17090414-019A	DUP1	09/13/2017 14:29	09/14/2017 15:55		
	Field Elevation Measurements				09/13/2017 14:29
	Standard Method 4500-H B Field				09/13/2017 14:29
	Standard Methods 2130 B Field				09/13/2017 14:29
	Standard Methods 18th Ed. 2580 B Field				09/13/2017 14:29
	Standard Methods 2510 B Field				09/13/2017 14:29
	Standard Methods 2550 B Field				09/13/2017 14:29
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:32
	Standard Methods 4500-O G Field				09/13/2017 14:29
	SW-846 9036 (Total)				09/20/2017 13:08
	SW-846 9251 (Total)				09/18/2017 22:16
17090414-019B	DUP1	09/13/2017 14:29	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 16:03
	SW-846 9214 (Dissolved)				09/15/2017 16:02
17090414-019C	DUP1	09/13/2017 14:29	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/16/2017 1:04
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/18/2017 20:09
17090414-019D	DUP1	09/13/2017 14:29	09/14/2017 15:55		
	Standard Methods 4500-NO3 F (Total)				09/15/2017 11:46
17090414-020A	DUP2	09/14/2017 9:48	09/14/2017 15:55		
	Field Elevation Measurements				09/14/2017 9:48
	Standard Method 4500-H B Field				09/14/2017 9:48
	Standard Methods 2130 B Field				09/14/2017 9:48
	Standard Methods 18th Ed. 2580 B Field				09/14/2017 9:48
	Standard Methods 2510 B Field				09/14/2017 9:48
	Standard Methods 2550 B Field				09/14/2017 9:48
	Standard Methods 4500-NO2 B (Total)				09/15/2017 11:32
	Standard Methods 4500-O G Field				09/14/2017 9:48
	SW-846 9036 (Total)				09/20/2017 13:11
	SW-846 9251 (Total)				09/18/2017 22:24
17090414-020B	DUP2	09/14/2017 9:48	09/14/2017 15:55		
	Standard Methods 2540 C (Dissolved)				09/18/2017 16:03
	SW-846 9214 (Dissolved)				09/15/2017 16:03
17090414-020C	DUP2	09/14/2017 9:48	09/14/2017 15:55		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/16/2017 1:12
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			09/14/2017 16:52	09/18/2017 20:17
17090414-020D	DUP2	09/14/2017 9:48	09/14/2017 15:55		

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Methods 4500-NO3 F (Total)				09/15/2017 11:48

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

STANDARD METHOD 4500-H B FIELD

Batch R237894 **SampType:** LCS Units

SampID: LCS-R237894

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	1.00		**7.00**	7.000	0	100.0	99.1	100.9	09/13/2017
pH	1.00		**7.00**	7.000	0	100.0	99.1	100.9	09/14/2017

STANDARD METHODS 2510 B FIELD

Batch R237894 **SampType:** LCS Units **µmhos/cm**

SampID: LCS-R237894

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Conductivity	1		**1410**	1412	0	99.9	90	110	09/14/2017
Conductivity	1		**1410**	1412	0	99.9	90	110	09/13/2017

STANDARD METHODS 2540 C (DISSOLVED)

Batch R237825 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						09/18/2017
Total Dissolved Solids	20		**< 20**						09/18/2017
Total Dissolved Solids	20		**< 20**						09/18/2017

Batch R237825 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**980**	1000	0	98.0	90	110	09/18/2017

Batch R237825 **SampType:** LCSQC Units **mg/L**

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**976**	1000	0	97.6	90	110	09/18/2017
Total Dissolved Solids	20		**962**	1000	0	96.2	90	110	09/18/2017

Batch R237825 **SampType:** MS Units **mg/L**

SampID: 17090414-005BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**2490**	500.0	1970	104.8	85	115	09/18/2017

Batch R237825 **SampType:** MSD Units **mg/L** RPD Limit **5**

SampID: 17090414-005BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**2510**	500.0	1970	107.6	2494	0.56	09/18/2017

STANDARD METHODS 2540 C (DISSOLVED)

Batch R237825 **SampType:** DUP Units **mg/L** RPD Limit **5**
SampID: 17090414-017BDUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**504**				494.0	2.00	09/18/2017

STANDARD METHODS 4500-NO2 B (TOTAL)

Batch R237707 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**< 0.05**						09/15/2017

Batch R237707 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.50**	0.4880	0	101.6	90	110	09/15/2017

Batch R237707 **SampType:** MS Units **mg/L**
SampID: 17090414-004AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.51**	0.5000	0	101.6	85	115	09/15/2017

Batch R237707 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17090414-004AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.49**	0.5000	0	97.8	0.5080	3.81	09/15/2017

Batch R237707 **SampType:** MS Units **mg/L**
SampID: 17090414-011AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.48**	0.5000	0	95.0	85	115	09/15/2017

Batch R237707 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17090414-011AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.46**	0.5000	0	93.0	0.4750	2.13	09/15/2017

STANDARD METHODS 4500-NO3 F (TOTAL)

Batch R237724 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate Nitrite (as N)	0.050		**< 0.050**						09/15/2017

STANDARD METHODS 4500-NO3 F (TOTAL)

Batch R237724 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	1.00		**8.11**	8.570	0	94.6	90	110	09/15/2017

Batch R237724 **SampType:** MS Units **mg/L**
SampID: 17090414-006DMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.285**	0.2500	0	114.0	85	115	09/15/2017

Batch R237724 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17090414-006DMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.286**	0.2500	0	114.4	0.2850	0.35	09/15/2017

Batch R237724 **SampType:** MS Units **mg/L**
SampID: 17090414-009DMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.290**	0.2500	0.02600	105.6	85	115	09/15/2017

Batch R237724 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17090414-009DMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.312**	0.2500	0.02600	114.4	0.2900	7.31	09/15/2017

SW-846 9036 (TOTAL)

Batch R237776 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						09/18/2017

Batch R237776 **SampType:** MBLK Units **mg/L**
SampID: MBLK 134164

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						09/18/2017

Batch R237776 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	96.6	90	110	09/18/2017

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

SW-846 9036 (TOTAL)

Batch R237776 **SampType:** MS Units mg/L
SampID: 17090414-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**29**	10.00	20.02	87.8	85	115	09/18/2017

Batch R237776 **SampType:** MSD Units mg/L RPD Limit 10
SampID: 17090414-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	10		**29**	10.00	20.02	91.0	28.80	1.10	09/18/2017

Batch R237776 **SampType:** MS Units mg/L
SampID: 17090414-007AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10	S	**26**	10.00	17.93	82.8	85	115	09/18/2017

Batch R237776 **SampType:** MSD Units mg/L RPD Limit 10
SampID: 17090414-007AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	10		**27**	10.00	17.93	86.8	26.21	1.51	09/18/2017

Batch R237876 **SampType:** MBLK Units mg/L
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						09/20/2017

Batch R237876 **SampType:** LCS Units mg/L
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	97.7	90	110	09/20/2017

SW-846 9214 (DISSOLVED)

Batch R237726 **SampType:** MBLK Units mg/L
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						09/15/2017

Batch R237726 **SampType:** LCS Units mg/L
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**1.01**	1.000	0	101.4	90	110	09/15/2017

SW-846 9214 (DISSOLVED)

Batch R237726 **SampType:** MS Units **mg/L**

SampID: 17090414-001BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.19**	2.000	0.1330	102.8	85	115	09/15/2017

Batch R237726 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17090414-001BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.20**	2.000	0.1330	103.6	2.190	0.68	09/15/2017

Batch R237726 **SampType:** MS Units **mg/L**

SampID: 17090414-011BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.71**	2.000	0.5110	110.0	85	115	09/15/2017

Batch R237726 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17090414-011BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.78**	2.000	0.5110	113.4	2.712	2.48	09/15/2017

SW-846 9251 (TOTAL)

Batch R237801 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						09/18/2017

Batch R237801 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**21**	20.00	0	103.9	90	110	09/18/2017

Batch R237801 **SampType:** MS Units **mg/L**

SampID: 17090414-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	10		**84**	40.00	49.08	88.5	85	115	09/18/2017

Batch R237801 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 17090414-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	10		**84**	40.00	49.08	88.6	84.46	0.05	09/18/2017

Client: Natural Resource Technology, Inc. **Work Order:** 17090414

Client Project: Dynegy - Vermillion Power Station **Report Date:** 22-Sep-17

SW-846 9251 (TOTAL)

Batch R237801 **SampType:** MS Units mg/L

SampID: 17090414-007AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**22**	20.00	2.250	97.8	85	115	09/18/2017

Batch R237801 **SampType:** MSD Units mg/L RPD Limit 15

SampID: 17090414-007AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**22**	20.00	2.250	97.6	21.80	0.09	09/18/2017

Batch R237910 **SampType:** MBLK Units mg/L

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						09/20/2017

Batch R237910 **SampType:** LCS Units mg/L

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	102.0	90	110	09/20/2017

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 134180 **SampType:** MBLK Units mg/L

SampID: MBLK-134180

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**< 0.0010**	).00100C	0	0	-100	100	09/15/2017
Barium	0.0010		**< 0.0010**	).00100C	0	0	-100	100	09/15/2017
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	09/15/2017
Iron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	09/15/2017
Manganese	0.0010		**< 0.0010**	).00100C	0	0	-100	100	09/15/2017
Selenium	0.0010		**< 0.0010**	).00100C	0	0	-100	100	09/15/2017

Batch 134180 **SampType:** LCS Units mg/L

SampID: LCS-134180

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.471**	0.5000	0	94.2	80	120	09/16/2017
Barium	0.0010		**1.89**	2.000	0	94.7	80	120	09/16/2017
Boron	0.0250		**0.496**	0.5000	0	99.2	80	120	09/18/2017
Iron	0.0250		**1.93**	2.000	0	96.5	80	120	09/16/2017
Manganese	0.0010		**0.468**	0.5000	0	93.7	80	120	09/16/2017
Selenium	0.0010		**0.461**	0.5000	0	92.2	80	120	09/16/2017

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 134180 **SampType:** MS Units **mg/L**

SampID: 17090414-009CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.486**	0.5000	0.007668	95.4	75	125	09/16/2017
Barium	0.0010		**2.04**	2.000	0.1794	93.2	75	125	09/16/2017
Boron	0.0250		**4.17**	0.5000	3.696	94.5	75	125	09/19/2017
Iron	0.0250		**4.24**	2.000	2.386	92.9	75	125	09/16/2017
Manganese	0.0010		**0.499**	0.5000	0.04135	91.5	75	125	09/16/2017
Selenium	0.0010		**0.448**	0.5000	0	89.5	75	125	09/16/2017

Batch 134180 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17090414-009CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.486**	0.5000	0.007668	95.6	0.4849	0.19	09/16/2017
Barium	0.0010		**2.06**	2.000	0.1794	94.2	2.043	0.97	09/16/2017
Boron	0.0250		**4.25**	0.5000	3.696	111.0	4.169	1.96	09/19/2017
Iron	0.0250		**4.26**	2.000	2.386	93.9	4.245	0.47	09/16/2017
Manganese	0.0010		**0.505**	0.5000	0.04135	92.7	0.4991	1.11	09/16/2017
Selenium	0.0010		**0.457**	0.5000	0	91.3	0.4476	1.99	09/16/2017

Batch 134180 **SampType:** MS Units **mg/L**

SampID: 17090414-017CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.485**	0.5000	0.02320	92.4	75	125	09/16/2017
Barium	0.0010		**1.98**	2.000	0.1460	91.5	75	125	09/16/2017
Boron	0.0250		**0.957**	0.5000	0.4718	97.0	75	125	09/18/2017
Iron	0.0250		**7.02**	2.000	5.339	83.8	75	125	09/16/2017
Manganese	0.0010		**0.512**	0.5000	0.06192	90.0	75	125	09/16/2017
Selenium	0.0010		**0.453**	0.5000	0	90.6	75	125	09/16/2017

Batch 134180 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17090414-017CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.489**	0.5000	0.02320	93.2	0.4852	0.82	09/16/2017
Barium	0.0010		**1.99**	2.000	0.1460	92.2	1.976	0.75	09/16/2017
Boron	0.0250		**0.943**	0.5000	0.4718	94.3	0.9567	1.41	09/18/2017
Iron	0.0250		**6.99**	2.000	5.339	82.4	7.016	0.40	09/16/2017
Manganese	0.0010		**0.514**	0.5000	0.06192	90.4	0.5117	0.46	09/16/2017
Selenium	0.0010		**0.459**	0.5000	0	91.7	0.4532	1.17	09/16/2017

Teklab, Inc.
Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17090414

Report Date: 22-Sep-17

Carrier: Tim Mathis

Received By: KF

Completed by: Kalyn Foecke
On: 14-Sep-17
Kalyn Foecke

Reviewed by: Elizabeth A. Hurley
On: 14-Sep-17
Elizabeth A. Hurley

Pages to follow: Chain of custody 2 Extra pages included 30

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 2.02
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

 Work order # 17090414

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: Natural Resource Technology, Inc.
Address: 2422 East Washington Street
City / State / Zip: Bloomington, IL 61704
Contact: Steve Wiskes
Phone: (414) 837-3614
E-Mail: steve.wiskes@obg.com
Fax:

Samples on: [X] ICE [ ] BLUE ICE [ ] NO ICE 2.02 °C
Preserved in: [ ] LAB [X] FIELD
FOR LAB USE ONLY
Lab Notes: KF 9/14/17

Are these samples known to be involved in litigation? If yes, a surcharge will apply [ ] Yes [X] No
Are these samples known to be hazardous? [ ] Yes [X] No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. [ ] Yes [X] No

Client Comments
Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.
* WELL DRY
(*) ~~SAT~~ UNABLE TO ACCESS TAPE

Project Name/Number: Dynegy - Vermillion Power Station
Sample Collector's Name: T.~ / CHZP

Results Requested: [X] Standard [ ] 1-2 Day (100% Surcharge) [ ] Other ____ [ ] 3 Day (50% Surcharge)

Billing Instructions:

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Matrix: Groundwater	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O	Field ORP SM 2580-B	Field pH SM 4500-H+B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500 NO3 F	Sulfate 9036	TDS SM 2540C
17090414-001	MW1	9-13-17 1343	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
002	MW2	9-14-17 1104	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
003	MW7 *	9-13-17 1132	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
004	MW10	9-14-17 0902	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
005	MW17	9-13-17 1412	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
006	MW18	9-13-17 1429	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
007	MW21	9-13-17 1315	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
008	TW1 (*)	-	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
009	MW3R	9-14-17 1018	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
010	MW4	9-13-17 1638	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	9-14-17 1555	[signature]	9/14/17 1555

BottleOrder: 39591

CHAIN OF CUSTODY

 Work order # 17090414

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client:	Natural Resource Technology, Inc.
Address:	2422 East Washington Street
City / State / Zip	Bloomington, IL 61704
Contact:	Steve Wiskes
Phone:	(414) 837-3614
E-Mail:	steve.wiskes@obg.com
Fax:	

Samples on: ☐ ICE ☐ BLUE ICE ☐ NO ICE ______ °C

Preserved in: ☐ LAB ☐ FIELD

FOR LAB USE ONLY

Lab Notes:

Client Comments

Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No

Are these samples known to be hazardous? ☐ Yes ☒ No

Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☒ No

Project Name/Number	Sample Collector's Name
Dynegy - Vermillion Power Station	

Results Requested

☒ Standard ☐ 1-2 Day (100% Surcharge)

☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Matrix: Groundwater	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O	Field ORP SM 2580-B	Field pH SM 4500-H-B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500-NO3 E	Sulfate 9036	TDS SM 2540C
17090414-011	MW5	9-14-17 0948	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
012	MW6R	9-13-17 1455	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
013	MW8R	9-14-17 1039	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
014	MW9	9-13-17 1142	0			X										X			
015	MW19	9-13-17 1148	0			X										X			
016	MW20	9-13-17 1539	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
017	MW34	9-13-17 1613	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
018	Field Blank	9-13-17 1700	2	1	1	X	X	X	X								X	X	X
019	DUP1	9-13-17 1429	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
020	DUP2	9-14-17 0945	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	9-14-17 1555	[signature]	9/14/17 1555

BottleOrder: 39591

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	MW 1				
Well Number	9.13.17				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition	X		X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 9.13.17 Time: 1331

Field Personnel: Tm / CWP Finish Date: 9.13.17 Time: 1343

WELL INFORMATION

Well ID: TMW 24 MW1

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1331		78.92								
	1334	.13	79.70	.92	20.04	7.23	1750	6.07	0	85	CLEAR
	1337	.26	80.00	.30	19.23	7.22	1830	6.06	0	92	CLEAR
	1340	.39	80.30	.30	19.05	7.18	1870	5.59	0	100	CLEAR
	1343	.52	80.50	.20	18.57	7.18	1910	5.97	0	105	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILION	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	9.14.17			X	
Well Number	MW 2				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?			X	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19. Concrete pad			X	
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion   Client: NPT

Project Number: ______   Task #: ______   Start Date: 9.14.17   Time: 1049

Field Personnel: Tim / CHF   Finish Date: 9.14.17   Time: 1104

WELL INFORMATION

Well ID: MW-2

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	~~1052~~ 1049		19.19								
	1055	0.26	20.60	1.41	15.05	7.90	691	0.29	0	-88	CLEAR
	1058	0.39	21.05	.45	~~15~~ 14.79	7.82	686	0	0	-98	CLEAR
	1101	0.52	21.45	.40	14.64	7.75	689	0	0	-107	CLEAR
	1104	0.65	21.45	.0	14.66	7.72	699	0	0	-110	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILION	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	9.14.17			✓	
Well Number	10				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
2. Inner casing				
Not corroded	✓			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
3. Are there weep holes in outer casing?	✓			
4. Weep holes able to drain?	↓			
5. Is there a lockable cap present?	↓			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	↓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition			✓	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19 . Concrete pad	↓			
Slope away form casing?	↓			
Not deteriorated?	↓			
Not heaved or below surrounding grade?	↓			
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?	↓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILLON
Client: ART
Project Number:
Task #:
Start Date: 9-14-17
Time: 0852
Field Personnel: TM [illegible]
Finish Date:
Time: 0902

WELL INFORMATION

Well ID: 10
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	0852		50.95								
	0853	.13	52.15	1.20	15.05	6.54	1110	8.34	0	142	CLEAR
	0856	.26	52.75	.60	14.60	6.63	1110	7.81	0	140	CLEAR
	0859	.39	53.20	.45	14.32	6.67	1110	7.40	0	138	CLEAR
	0902	.52	53.90	.70	14.80	6.68	1110	6.63	0	137	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	9-13-17			✓	
Well Number	17				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	✓			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

2. Inner casing	Yes	No	NA	
Not corroded	✓			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
3. Are there weep holes in outer casing?	✓			
4. Weep holes able to drain?	↓			
5. Is there a lockable cap present?	↓			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	↓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition			✓	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19 . Concrete pad	↓			
Slope away form casing?	↓			
Not deteriorated?	↓			
Not heaved or below surrounding grade?	↓			
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?	↓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION　　Client: NRT

Project Number: 　　Task #: 　　Start Date: 9.13.17　　Time: 1357

Field Personnel: TM/CWB　　Finish Date: 9.13.17　　Time: 1412

WELL INFORMATION

Well ID: 17

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1357		39.55								
	1400	.13	40.40	.85	20.53	7.32	1790	3.92	1.8	110	CLEAR
	1403	.26	40.90	.50	19.15	7.21	1806	2.59	1.9	82	CLEAR
	1406	.39	41.30	.40	18.86	7.02	1810	1.81	4.9	-20	CLEAR
	1409	.52	41.35	.05	18.46	6.98	1830	1.44	4.2	-39	CLEAR
	1412	.65	41.90	.55	17.68	6.95	1880	1.39	3.2	-38	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	VERMILION	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	9.13.17				
Well Number	18				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				
	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION Client: N&T
Project Number: ______ Task #: ______ Start Date: 9.13.17 Time: 1421
Field Personnel: Tm / CWB Finish Date: 9.13.17 Time: 1429

WELL INFORMATION

Well ID: 18
Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☑ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (μs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1421		25.70								
	1423	.18	25.70	0	17.29	7.05	1570	3.39	0	51	CLEAR
	1425	.26	25.70	0	13.55	6.93	1660	0.27	0	26	CLEAR
	1427	.39	25.70	0	13.38	6.89	1630	0.26	0	26	CLEAR
	1429	.52	25.70	0	13.32	6.58	1620	0.39	0	27	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILION	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	9.13-17			X	
Well Number	21				

Stick-up Monitoring Wells				Comments
1. Outer protective Casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				
2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				
	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?		X		PAD UNSTABLE
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION　　Client: NRT

Project Number: ______　Task #: ______　Start Date: 9.13.17　Time: 1300

Field Personnel: TM / CHEP　Finish Date: ______　Time: 1315

WELL INFORMATION

Well ID: 21

Casing ID: ______ inches

EVENT TYPE

☐ Well Development　☑ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling　☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1300		90.04								
	1303	0.13	90.85	.71	21.75	6.81	549	8.72	0	69	CLEAR
	1306	0.26	91.32	.47	20.60	7.30	521	9.00	0	73	CLEAR
	1309	.39	92.08	.76	19.00	7.35	520	5.63	0	14	CLEAR
	1312	.52	92.74	.64	18.15	7.30	516	3.60	0	-28	CLEAR
	1315	.65	93.15	.41	17.49	7.33	516	2.49	0	-46	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

				Yes	No	NA
Site	VERMILION	Major wells repairs* required to maintain well integrity?			X	
Inspection Date	9.14.17					
Well Number	MW 3R					

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				
	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?			X	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19. Concrete pad			X	
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION
Client: NRT
Project Number:
Task #:
Start Date: 9-14-17 Time: 1003
Field Personnel: T. Jewell
Finish Date: 9-14-17 Time: 1018

WELL INFORMATION

Well ID: MW3R
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1003	~~1003~~	8.17								
	1006	~~100~~ .13	8.40	.23	17.63	6.86	794	6.76	0	72.2	CLEAR
	1009	.26	8.40	0	17.38	7.02	794	3.73	0	-75	CLEAR
	1012	.39	8.40	0	16.99	7.15	788	1.85	0	-85	CLEAR
	1015	.52	8.40	0	16.81	7.20	794	1.23	0	-103	CLEAR
	1018	.65	8.40	0	16.65	7.23	806	0.67	0	-108	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	9-13-17			✓	
Well Number	MW04				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	✓			
Not dented				
Not cracked				
Not loose	✓			

2. Inner casing	Yes	No	NA	
Not corroded	✓			
Not dented				
Not cracked				
Not loose	✓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?			✓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			✓	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?			✓	
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?			✓	
21. Well clearly visible and labeled?	✓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion   Client: NRT

Project Number: ____   Task #: ____   Start Date: 9.13.17   Time: 1620

Field Personnel: [illegible]   Finish Date: 9.13.17   Time: 1638

WELL INFORMATION

Well ID: MW04

Casing ID: ____ inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1620		8.34								
	1623	.13	8.90	.56	16.09	7.36	505	5.27	0	-75	CLEAR
	1626	.26	8.90	.0	15.68	7.38	508	2.36	0	-93	CLEAR
	1629	.39	8.90	0	15.58	7.46	508	0.80	0	-105	CLEAR
	1632	.52	8.90	0	15.58	7.55	507	0.27	0	-113	CLEAR
	1635	.65	8.90	0	15.56	7.50	507	0.11	0	-114	CLEAR
	1638	.78	8.90	0	15.54	7.50	507	0.09	0	-115	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILION	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	9.14.17			O	
Well Number	MW06				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION Client: NDT
Project Number: ____ Task #: ____ Start Date: 9.14.17 Time: 0936
Field Personnel: Tim Cheif Finish Date: 9.14.17 Time: 0948

WELL INFORMATION

Well ID: MW05
Casing ID: ____ inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	0936	0	9.73								
	0939	.13	9.73	0	15.66	7.01	689	0.79	0	105	CLEAR
	0942	.26	9.73	0	15.40	7.16	694	0.46	0	84	CLEAR
	0945	.39	9.73	0	15.31	7.22	695	0.28	0	72	CLEAR
	0948	.52	9.73	0	15.21	7.26	696	0.30	0	68	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	9.13.17				
Well Number	MW6R				

Stick-up Monitoring Wells — **Comments**

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	Comments
3. Are there weep holes in outer casing?		X	~~X~~	
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells	Yes	No	NA	Comments
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	Comments
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	Comments
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION   Client: NRT

Project Number: Task #:   Start Date: 9-13-17   Time: 1445

Field Personnel: TM / CHIP   Finish Date: 9/13/17   Time: 1455

WELL INFORMATION

Well ID: MW612

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1446		9.79								
	1447	0.13	9.79	0	16.40	6.980 TME	667	1.65	0	5	CLEAR
	1449	0.26	9.79	0	15.31	6.88	690	0.65	0	-19	CLEAR
	1451	0.39	9.79	0	15.27	6.91	695	0.36	0	-33	CLEAR
	1453	0.52	9.79	0	15.24	6.92	698	0.20	0	-41	CLEAR
	1455	0.65	9.79	0	15.19	6.93	698	0.13	0	-44	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILION	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	9.14.17			X	
Well Number	MW8R				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
2. Inner casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

TM TE	Yes	No	NA	
3. Are there weep holes in outer casing?	~~X~~	X		
4. Weep holes able to drain?	~~↓~~		X	
5. Is there a lockable cap present?	~~↓~~ X			
6. Is there a lock present?	~~↓~~ X			
7. Bumper posts in good condition?	~~↓~~	~~X~~	X	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19. Concrete pad			X	
Slope away form casing?			↓	
Not deteriorated?			↓	
Not heaved or below surrounding grade?			↓	
20. No surface seal settling?		X		
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion   Client: NRT
Project Number: ____   Task #: ____   Start Date: 9.14.17   Time: 1025
Field Personnel: Thu / Chip   Finish Date: 9.14.17   Time: 1039

WELL INFORMATION

Well ID: MW8R
Casing ID: ____ inches

EVENT TYPE

☐ Well Development   ☐ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling   ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1025		13.80								
	1027	.13	13.80	0	14.93	7.98	1940	5.67	0	-139	CLEAR
	1029	.26	13.80	0	14.80	8.07	1970	5.65	0	-144	CLEAR
	1031	.39	13.80	0	14.74	8.18	1970	5.52	0	-149	CLEAR
	1033	.52	13.80	0	MISSED	READINGS					
	1035	.65	13.80	0	14.80	8.30	1980	5.25	0	-154	CLEAR
	~~1038~~ 1037	.78	13.80	0	14.75	8.33	1980	5.14	0	-156	CLEAR
	1039	.91	13.80	0	14.73	8.37	1980	4.96	0	-159	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FTBTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILLION Client: NRT

Project Number: ______ Task #: ______ Start Date: 9-13-17 Time: 1142

Field Personnel: ______ Finish Date: ______ Time: ______

WELL INFORMATION

Well ID: MW9

Casing ID: ______ inches

EVENT TYPE

☐ Well Development ☐ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
		10.09									

NOTES (continued)

DTW 0.824

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion　　Client: NRT

Project Number: ______　　Task #: ______　　Start Date: 9-13-17　　Time: 1148

Field Personnel: TW/CHEP　　Finish Date: ______　　Time: ______

WELL INFORMATION

Well ID: MW 19

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☐ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
			10.13								

NOTES (continued)

DTW ONLY

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	9-13-17				
Well Number	MW8U				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

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WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION ✓ Client: NRT

Project Number: Task #: Start Date: 9.13.17 Time: 1506

Field Personnel: TW/ CWIP Finish Date: 9.13.17 Time: 1539

WELL INFORMATION

Well ID: MW20

Casing ID: inches

EVENT TYPE

- ☐ Well Development
- ☐ Well Volume Approach Sampling
- ☒ Low-Flow / Low Stress Sampling
- ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (μs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1506		15.47								
	1509	.13	1547	0	~~7.39~~ 16.06	7.36	422	3.04	720	37	CLOUDY
	1512	.26	15.47	0	14.48	7.19	446	0.38	244	35	CLOUDY
	1515	0.39	15.47	0	14.05	7.12	459	0.02	150	22	CLOUDY
	1518	0.52	15.47	0	13.87	7.10	467	0	98.6	7	CLOUDY
	1521	0.65	15.47	0	13.80	7.09	475	0	50.3	-5	CLOUDY
	1524	0.78	15.47	0	13.74	7.08	477	0	41.4	-11	CLEAR
	1527	0.91	15.47	0	13.71	7.08	479	0	35.6	-14	CLEAR
	1530	1.02	15.47	0	13.68	7.07	482	0	28.2	-19	CLEAR
	1533	1.15	15.47	0	13.65	7.07	484	0	24.2	-23	CLEAR
	1536	1.28	15.47	0	13.58	7.07	485	0	15.4	-25	CLEAR
	1539	1.31	15.47	0	13.56	7.07	487	0	10.0	-27	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: VERMILION
Inspection Date: 9.13.17
Well Number: MW34

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X	~~X~~	
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION Client: NRT

Project Number: / Task #: Start Date: 9/13/17 Time: 1546

Field Personnel: TM /CHF Finish Date: 9/13/17 Time: 1613

WELL INFORMATION

Well ID: MW34

Casing ID: inches

EVENT TYPE

☐ Well Development
☑ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1546		14.71								
	1549	0.13	14.80	~~.08~~ .09	18.55	6.51	666	2.16	0	-18	CLEAR
	1552	0.26	14.80	0	14.24	6.77	670	0.13	10.8	-86	CLEAR
	1555	0.39	15.10	.30	12.98	6.88	676	0.02	20.4	-102	CLEAR
	1558	0.52	15.10	.0	12.76	6.93	678	0.24	36.7	-107	CLEAR
	16.01	0.65	15.10	0	12.64	6.97	682	0.94	80.8	-112	CLOUDY
	16.04	0.78	15.10	0	12.58	7.02	680	0.78	102	-116	CLOUDY
	1607	0.91	15.10	0	& RINSED FLOW THRU CELL						
	1610	1.02	15.10	0	12.95	7.01	678	1.23	102	-110	CLOUDY
	1613	1.15	15.10	0	12.71	7.00	679	0.72	102	-111	CLOUDY

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
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nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION   Client:

Project Number: ______ Task #: ______ Start Date: 9.13.17 Time: 1421

Field Personnel: ______ Finish Date: 9.13.17 Time: 1429

WELL INFORMATION

Well ID: Dup 1

Casing ID: inches

EVENT TYPE

☐ Well Development ☐ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1421	.52	25.70	0	13.32	6.88	1620	0.39	0	27	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILLION   Client: NRT

Project Number: ______   Task #: ______   Start Date: 9-14-17   Time: 0936

Field Personnel: TL/CHT   Finish Date: 9-14-17   Time: 0948

WELL INFORMATION

Well ID: Dup 2

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☐ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	0948	.52	9.73	0	15.21	7.26	696	0.30	0	62	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Field Calibration Form
Groundwater Quality Meter

Groundwater Quality Meter Manufacturer/Model YSI ProDSS
Serial Number ____________________
oxidation/reduction potential, dissolved oxygen, pH, tubidity

Date of Calibration Check	Calibration Standard Concentration	Calibration Reading	Within +/_ 10% (yes or no)	Comments
9.13.17	7.00	7.00	YES	
1230	4.00	4.00		
	10.00	10.00		
	1412	1410		
	0.0	0.0		
	100%	100.8%	YES	
CCV	7.00	7.04		
	1412	1450		
	0.0	1.0		
	100%	109.6%		
9.14.17	7.00	7.00	YES	
0830	10.00	10.00		
	4.00	4.00		
	1412	1410		
	0.0	0.1		
	100.0%	108%	YES	
9.14.17 CCV	7.00	7.04		
1215	1412	1440		
	0.0	0.8		
	100.0	109.8%		

Teklab, Inc. Environmental Laboratory

http://www.teklabinc.com/

November 30, 2017

Steve Wiskes
Natural Resource Technology, Inc
2422 East Washington Street
Suite 104
Bloomington, IL 61704
TEL: (414) 837-3614
FAX: (414) 837-3608

NELAP ACCREDITED TNI LABORATORY

RE: Dynegy - Vermillion Power Station

WorkOrder: 17101691

Dear Steve Wiskes:

TEKLAB, INC received 20 samples on 11/9/2017 12:20:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
Case Narrative	4
Accreditations	5
Laboratory Results	6
Sample Summary	24
Dates Report	25
Quality Control Results	34
Receiving Check List	42
Chain of Custody	Appended

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Abbr	Definition
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

- # Unknown hydrocarbon
- E - Value above quantitation range
- I - Associated internal standard was outside method criteria
- ND - Not Detected at the Reporting Limit
- S - Spike Recovery outside recovery limits
- X - Value exceeds Maximum Contaminant Level
- B Analyte detected in associated Method Blank
- H - Holding times exceeded
- M - Manual Integration used to determine area response
- R - RPD outside accepted recovery limits
- T - TIC(Tentatively identified compound)

Case Narrative

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Cooler Receipt Temp: 3.62 °C

An employee of Teklab, Inc. collected the sample(s).

MW7 could not be collected; the well was dry. TW1 could not be collect, the well no longer exists. TWM/EAH 11/9/17

Locations

	Collinsville		Springfield		Kansas City
Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425	Address	3920 Pintail Dr Springfield, IL 62711-9415	Address	8421 Nieman Road Lenexa, KS 66214
Phone	(618) 344-1004	Phone	(217) 698-1004	Phone	(913) 541-1998
Fax	(618) 344-1005	Fax	(217) 698-1005	Fax	(913) 541-1998
Email	jhriley@teklabinc.com	Email	KKlostermann@teklabinc.com	Email	jhriley@teklabinc.com

	Collinsville Air		Chicago
Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425	Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(618) 344-1004	Phone	(630) 324-6855
Fax	(618) 344-1005	Fax	
Email	EHurley@teklabinc.com	Email	arenner@teklabinc.com

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2018	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2018	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2018	Collinsville
Kentucky	KDEP	98006		12/31/2017	Collinsville
Kentucky	UST	0073		1/31/2018	Collinsville
Louisiana	LDPH	LA170027		12/31/2017	Collinsville
Missouri	MDNR	930		1/31/2018	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2018	Collinsville

Teklab Inc. Environmental Laboratory

Laboratory Results

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Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-001 **Client Sample ID:** MW1

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 10:42

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**79.40**	ft	1	11/08/2017 10:42	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.00**		1	11/08/2017 10:42	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	11/08/2017 10:42	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**139**	mV	1	11/08/2017 10:42	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**2210**	µS/cm	1	11/08/2017 10:42	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**12.99**	°C	1	11/08/2017 10:42	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**6.89**	mg/L	1	11/08/2017 10:42	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**2070**	mg/L	1	11/10/2017 17:09	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.376**	mg/L	1	11/14/2017 12:55	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1000**	mg/L	50	11/10/2017 19:08	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.13**	mg/L	1	11/10/2017 15:21	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5	S	**20**	mg/L	1	11/10/2017 18:41	R239983
MS and/or MSD did not recover within control limits due to matrix interference.								
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 3:35	135725
Barium	NELAP	0.0010		**0.0118**	mg/L	5	11/14/2017 3:35	135725
Boron	NELAP	0.0250		**1.05**	mg/L	5	11/15/2017 9:39	135725
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	11/14/2017 3:35	135725
Manganese	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 3:35	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 3:35	135725

Teklab, Inc. Environmental Laboratory

Laboratory Results

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Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-002 **Client Sample ID:** MW2

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 11:42

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**18.84**	ft	1	11/08/2017 11:42	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.72**		1	11/08/2017 11:42	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	11/08/2017 11:42	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-139**	mV	1	11/08/2017 11:42	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**796**	µS/cm	1	11/08/2017 11:42	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**13.66**	°C	1	11/08/2017 11:42	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 11:42	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**506**	mg/L	1	11/10/2017 17:10	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.067**	mg/L	1	11/14/2017 12:59	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**14**	mg/L	1	11/10/2017 19:18	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.62**	mg/L	1	11/10/2017 15:24	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**47**	mg/L	1	11/10/2017 19:16	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0062**	mg/L	5	11/14/2017 3:44	135725
Barium	NELAP	0.0010		**0.178**	mg/L	5	11/14/2017 3:44	135725
Boron	NELAP	0.0250		**0.309**	mg/L	5	11/15/2017 9:50	135725
Iron	NELAP	0.0250		**0.211**	mg/L	5	11/14/2017 3:44	135725
Manganese	NELAP	0.0010		**0.0903**	mg/L	5	11/14/2017 3:44	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 3:44	135725

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-004 **Client Sample ID:** MW10

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 15:24

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**51.76**	ft	1	11/08/2017 15:24	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**6.86**		1	11/08/2017 15:24	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	11/08/2017 15:24	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**84**	mV	1	11/08/2017 15:24	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**1150**	µS/cm	1	11/08/2017 15:24	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**13.11**	°C	1	11/08/2017 15:24	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**4.26**	mg/L	1	11/08/2017 15:24	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**900**	mg/L	1	11/10/2017 17:10	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.404**	mg/L	1	11/14/2017 13:01	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**269**	mg/L	10	11/10/2017 19:32	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.14**	mg/L	1	11/10/2017 15:31	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**7**	mg/L	1	11/10/2017 19:24	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 3:52	135725
Barium	NELAP	0.0010		**0.0697**	mg/L	5	11/14/2017 3:52	135725
Boron	NELAP	0.0250		**0.0943**	mg/L	5	11/15/2017 9:58	135725
Iron	NELAP	0.025	J	**0.014**	mg/L	5	11/14/2017 3:52	135725
Manganese	NELAP	0.0010		**0.0954**	mg/L	5	11/14/2017 3:52	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 3:52	135725

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Laboratory Results

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Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-005 **Client Sample ID:** MW17

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 16:56

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**39.65**	ft	1	11/08/2017 16:56	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**6.84**		1	11/08/2017 16:56	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**20.7**	NTU	1	11/08/2017 16:56	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**48**	mV	1	11/08/2017 16:56	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**1910**	µS/cm	1	11/08/2017 16:56	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**11.81**	°C	1	11/08/2017 16:56	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**6.48**	mg/L	1	11/08/2017 16:56	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**2020**	mg/L	1	11/10/2017 17:11	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.092**	mg/L	1	11/14/2017 13:04	R240076
MS and/or MSD did not recover within control limits due to matrix interference.								
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1200**	mg/L	50	11/10/2017 19:40	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.13**	mg/L	1	11/10/2017 15:33	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**6**	mg/L	1	11/10/2017 19:32	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010	J	**0.0007**	mg/L	5	11/14/2017 4:00	135725
Barium	NELAP	0.0010		**0.0299**	mg/L	5	11/14/2017 4:00	135725
Boron	NELAP	0.0250		**1.33**	mg/L	5	11/15/2017 10:06	135725
Iron	NELAP	0.0250		**1.03**	mg/L	5	11/14/2017 4:00	135725
Manganese	NELAP	0.0010		**0.0633**	mg/L	5	11/14/2017 4:00	135725
Selenium	NELAP	0.0010		**0.0031**	mg/L	5	11/14/2017 4:00	135725

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Laboratory Results

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Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-006 **Client Sample ID:** MW18

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 17:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**26.80**	ft	1	11/08/2017 17:10	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**6.85**		1	11/08/2017 17:10	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	11/08/2017 17:10	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**32**	mV	1	11/08/2017 17:10	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**1900**	µS/cm	1	11/08/2017 17:10	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**12.17**	°C	1	11/08/2017 17:10	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 17:10	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**1710**	mg/L	1	11/10/2017 17:12	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.058**	mg/L	1	11/14/2017 13:23	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**835**	mg/L	20	11/10/2017 20:02	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.12**	mg/L	1	11/10/2017 15:35	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**21**	mg/L	1	11/10/2017 19:40	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0023**	mg/L	5	11/14/2017 4:09	135725
Barium	NELAP	0.0010		**0.0163**	mg/L	5	11/14/2017 4:09	135725
Boron	NELAP	0.0250		**3.40**	mg/L	5	11/15/2017 10:15	135725
Iron	NELAP	0.0250		**0.156**	mg/L	5	11/14/2017 4:09	135725
Manganese	NELAP	0.0010		**1.52**	mg/L	5	11/14/2017 4:09	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 4:09	135725

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-007 **Client Sample ID:** MW21

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 11:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**91.09**	ft	1	11/08/2017 11:10	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.38**		1	11/08/2017 11:10	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	11/08/2017 11:10	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-105**	mV	1	11/08/2017 11:10	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**591**	µS/cm	1	11/08/2017 11:10	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**12.82**	°C	1	11/08/2017 11:10	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 11:10	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**382**	mg/L	1	11/10/2017 17:12	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.503**	mg/L	1	11/14/2017 13:26	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10	J	**10**	mg/L	1	11/10/2017 20:04	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**1.17**	mg/L	1	11/10/2017 15:39	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5	J	**2**	mg/L	1	11/10/2017 20:02	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0313**	mg/L	5	11/14/2017 4:17	135725
Barium	NELAP	0.0010		**0.0932**	mg/L	5	11/14/2017 4:17	135725
Boron	NELAP	0.0250		**0.823**	mg/L	5	11/15/2017 10:41	135725
Iron	NELAP	0.0250		**0.258**	mg/L	5	11/14/2017 4:17	135725
Manganese	NELAP	0.0010		**0.113**	mg/L	5	11/14/2017 4:17	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 4:17	135725

Laboratory Results

Client: Natural Resource Technology, Inc. **Work Order:** 17101691
Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17
Lab ID: 17101691-009 **Client Sample ID:** MW3R
Matrix: GROUNDWATER **Collection Date:** 11/08/2017 12:39

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**8.71**	ft	1	11/08/2017 12:39	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.37**		1	11/08/2017 12:39	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**5.2**	NTU	1	11/08/2017 12:39	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-137**	mV	1	11/08/2017 12:39	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**816**	µS/cm	1	11/08/2017 12:39	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.91**	°C	1	11/08/2017 12:39	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 12:39	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**606**	mg/L	1	11/10/2017 17:12	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.130**	mg/L	1	11/14/2017 13:28	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**70**	mg/L	5	11/10/2017 20:12	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.50**	mg/L	1	11/10/2017 15:45	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**25**	mg/L	1	11/10/2017 20:04	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0074**	mg/L	5	11/14/2017 4:25	135725
Barium	NELAP	0.0010		**0.168**	mg/L	5	11/14/2017 4:25	135725
Boron	NELAP	0.0250		**3.15**	mg/L	5	11/15/2017 10:49	135725
Iron	NELAP	0.0250		**2.04**	mg/L	5	11/14/2017 4:25	135725
Manganese	NELAP	0.0010		**0.0407**	mg/L	5	11/14/2017 4:25	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 4:25	135725

Teklab Inc. Environmental Laboratory

Laboratory Results

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Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-010 **Client Sample ID:** MW4

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 14:56

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**7.53**	ft	1	11/08/2017 14:56	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.52**		1	11/08/2017 14:56	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	11/08/2017 14:56	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-93**	mV	1	11/08/2017 14:56	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**535**	µS/cm	1	11/08/2017 14:56	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.99**	°C	1	11/08/2017 14:56	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 14:56	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**330**	mg/L	1	11/10/2017 17:13	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050	J	**0.046**	mg/L	1	11/14/2017 13:30	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**44**	mg/L	1	11/10/2017 20:15	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.32**	mg/L	1	11/10/2017 15:47	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**9**	mg/L	1	11/10/2017 20:13	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0056**	mg/L	5	11/14/2017 4:33	135725
Barium	NELAP	0.0010		**0.260**	mg/L	5	11/14/2017 4:33	135725
Boron	NELAP	0.0250		**6.20**	mg/L	5	11/15/2017 10:58	135725
Iron	NELAP	0.0250		**0.880**	mg/L	5	11/14/2017 4:33	135725
Manganese	NELAP	0.0010		**0.547**	mg/L	5	11/14/2017 4:33	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 4:33	135725

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-011 **Client Sample ID:** MW5

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 13:02

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**7.31**	ft	1	11/08/2017 13:02	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.29**		1	11/08/2017 13:02	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	11/08/2017 13:02	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**17**	mV	1	11/08/2017 13:02	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**815**	µS/cm	1	11/08/2017 13:02	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.66**	°C	1	11/08/2017 13:02	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 13:02	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**362**	mg/L	1	11/10/2017 17:13	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.163**	mg/L	1	11/14/2017 13:34	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**291**	mg/L	10	11/10/2017 20:29	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.46**	mg/L	1	11/10/2017 15:49	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	11/10/2017 20:21	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 4:42	135725
Barium	NELAP	0.0010		**0.0286**	mg/L	5	11/14/2017 4:42	135725
Boron	NELAP	0.0250		**17.8**	mg/L	5	11/14/2017 19:41	135725
Iron	NELAP	0.025	J	**0.010**	mg/L	5	11/14/2017 4:42	135725
Manganese	NELAP	0.0010		**0.456**	mg/L	5	11/14/2017 4:42	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 4:42	135725

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-012 **Client Sample ID:** MW6R

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 13:36

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**9.45**	ft	1	11/08/2017 13:36	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.00**		1	11/08/2017 13:36	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	11/08/2017 13:36	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-101**	mV	1	11/08/2017 13:36	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**845**	µS/cm	1	11/08/2017 13:36	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.71**	°C	1	11/08/2017 13:36	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 13:36	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20	H	**606**	mg/L	1	11/21/2017 17:40	R240449
Sample required re-analysis out of hold time.								
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050	J	**0.044**	mg/L	1	11/14/2017 13:37	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**160**	mg/L	5	11/13/2017 13:14	R240101
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.15**	mg/L	1	11/10/2017 15:51	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**7**	mg/L	1	11/10/2017 20:29	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:07	135725
Barium	NELAP	0.0010		**0.0764**	mg/L	5	11/14/2017 5:07	135725
Boron	NELAP	0.0250		**0.197**	mg/L	5	11/14/2017 19:49	135725
Iron	NELAP	0.0250		**0.194**	mg/L	5	11/14/2017 5:07	135725
Manganese	NELAP	0.0010		**0.258**	mg/L	5	11/14/2017 5:07	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:07	135725

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-013 **Client Sample ID:** MW8R

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 12:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**13.66**	ft	1	11/08/2017 12:20	R240145
STANDARD METHOD 4500 H B FIELD								
pH		1.00		**8.56**		1	11/08/2017 12:20	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	11/08/2017 12:20	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-97**	mV	1	11/08/2017 12:20	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**2020**	µS/cm	1	11/08/2017 12:20	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.28**	°C	1	11/08/2017 12:20	R240145
STANDARD METHODS 4500 O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 12:20	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**2040**	mg/L	1	11/10/2017 17:14	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	11/14/2017 13:39	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1140**	mg/L	50	11/10/2017 21:15	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	11/10/2017 15:54	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**17**	mg/L	1	11/10/2017 21:07	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0106**	mg/L	5	11/14/2017 5:15	135725
Barium	NELAP	0.0010		**0.0476**	mg/L	5	11/14/2017 5:15	135725
Boron	NELAP	0.500	S	**51.6**	mg/L	100	11/15/2017 12:04	135725
Iron	NELAP	0.0250		**0.0377**	mg/L	5	11/14/2017 5:15	135725
Manganese	NELAP	0.0010		**0.113**	mg/L	5	11/14/2017 5:15	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:15	135725

MS QC limits for B are not applicable due to high sample/spike ratio.

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-014 **Client Sample ID:** MW9

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 13:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		9.77	ft	1	11/08/2017 13:20	R240145

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-015 **Client Sample ID:** MW19

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 13:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		8.67	ft	1	11/08/2017 13:15	R240145

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-016 **Client Sample ID:** MW20

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 14:05

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**15.06**	ft	1	11/08/2017 14:05	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.22**		1	11/08/2017 14:05	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**3.3**	NTU	1	11/08/2017 14:05	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-20**	mV	1	11/08/2017 14:05	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**527**	µS/cm	1	11/08/2017 14:05	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**15.08**	°C	1	11/08/2017 14:05	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 14:05	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**372**	mg/L	1	11/10/2017 17:14	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050	J	**0.011**	mg/L	1	11/14/2017 13:41	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**58**	mg/L	2	11/10/2017 21:23	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10	J	**0.07**	mg/L	1	11/10/2017 15:59	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5	J	**4**	mg/L	1	11/10/2017 21:15	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010	J	**0.0006**	mg/L	5	11/14/2017 5:23	135725
Barium	NELAP	0.0010		**0.0170**	mg/L	5	11/14/2017 5:23	135725
Boron	NELAP	0.0250		**0.531**	mg/L	5	11/14/2017 20:06	135725
Iron	NELAP	0.0250		**0.178**	mg/L	5	11/14/2017 5:23	135725
Manganese	NELAP	0.0010		**0.0283**	mg/L	5	11/14/2017 5:23	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:23	135725

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-017 **Client Sample ID:** MW34

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 14:36

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**14.57**	ft	1	11/08/2017 14:36	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**6.94**		1	11/08/2017 14:36	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**126**	NTU	1	11/08/2017 14:36	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-132**	mV	1	11/08/2017 14:36	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**772**	µS/cm	1	11/08/2017 14:36	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**12.31**	°C	1	11/08/2017 14:36	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 14:36	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**488**	mg/L	1	11/10/2017 17:15	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050	J	**0.030**	mg/L	1	11/14/2017 13:43	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	11/10/2017 21:25	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.69**	mg/L	1	11/10/2017 16:01	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**33**	mg/L	1	11/10/2017 21:23	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0229**	mg/L	5	11/14/2017 5:32	135725
Barium	NELAP	0.0010		**0.147**	mg/L	5	11/14/2017 5:32	135725
Boron	NELAP	0.0250		**0.518**	mg/L	5	11/14/2017 20:14	135725
Iron	NELAP	0.0250		**5.45**	mg/L	5	11/14/2017 5:32	135725
Manganese	NELAP	0.0010		**0.0618**	mg/L	5	11/14/2017 5:32	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:32	135725

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-018 **Client Sample ID:** Field Blank

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 17:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20	J	**12**	mg/L	1	11/10/2017 17:15	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.431**	mg/L	1	11/14/2017 13:56	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	11/10/2017 21:28	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	11/10/2017 16:02	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	11/10/2017 21:26	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:40	135725
Barium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:40	135725
Boron	NELAP	0.0250		**< 0.0250**	mg/L	5	11/15/2017 11:06	135725
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	11/14/2017 5:40	135725
Manganese	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:40	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:40	135725

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-019 **Client Sample ID:** DUP1

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 12:39

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**8.71**	ft	1	11/08/2017 12:39	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.37**		1	11/08/2017 12:39	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**5.2**	NTU	1	11/08/2017 12:39	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-137**	mV	1	11/08/2017 12:39	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**816**	µS/cm	1	11/08/2017 12:39	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.91**	°C	1	11/08/2017 12:39	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 12:39	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**602**	mg/L	1	11/10/2017 17:16	R240031
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050	J	**0.039**	mg/L	1	11/14/2017 14:21	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**80**	mg/L	5	11/10/2017 21:52	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.49**	mg/L	1	11/10/2017 16:04	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**25**	mg/L	1	11/10/2017 21:44	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0068**	mg/L	5	11/14/2017 5:48	135725
Barium	NELAP	0.0010		**0.168**	mg/L	5	11/14/2017 5:48	135725
Boron	NELAP	0.0250		**3.13**	mg/L	5	11/14/2017 20:31	135725
Iron	NELAP	0.0250		**1.97**	mg/L	5	11/14/2017 5:48	135725
Manganese	NELAP	0.0010		**0.0389**	mg/L	5	11/14/2017 5:48	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:48	135725

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Lab ID: 17101691-020 **Client Sample ID:** DUP2

Matrix: GROUNDWATER **Collection Date:** 11/08/2017 13:36

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point		0		**9.45**	ft	1	11/08/2017 13:36	R240145
STANDARD METHOD 4500-H B FIELD								
pH		1.00		**7.00**		1	11/08/2017 13:36	R240145
STANDARD METHODS 2130 B FIELD								
Turbidity		1.0		**< 1.0**	NTU	1	11/08/2017 13:36	R240145
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential		-300		**-101**	mV	1	11/08/2017 13:36	R240145
STANDARD METHODS 2510 B FIELD								
Conductivity		1		**845**	µS/cm	1	11/08/2017 13:36	R240145
STANDARD METHODS 2550 B FIELD								
Temperature		0		**14.71**	°C	1	11/08/2017 13:36	R240145
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved		1.00		**< 1.00**	mg/L	1	11/08/2017 13:36	R240145
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20	RH	**616**	mg/L	1	11/21/2017 17:40	R240449
Sample required re-analysis out of hold time.								
RPD for DUP was outside of QC limit due to sample composition.								
STANDARD METHODS 4500-NO3 F (TOTAL)								
Nitrogen, Nitrate (as N)	NELAP	0.050	J	**0.048**	mg/L	1	11/14/2017 14:01	R240076
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**152**	mg/L	5	11/10/2017 22:06	R240063
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.14**	mg/L	1	11/10/2017 16:07	R239991
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**7**	mg/L	1	11/10/2017 21:58	R239983
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:57	135725
Barium	NELAP	0.0010		**0.0759**	mg/L	5	11/14/2017 5:57	135725
Boron	NELAP	0.0250		**0.181**	mg/L	5	11/14/2017 20:39	135725
Iron	NELAP	0.0250		**0.190**	mg/L	5	11/14/2017 5:57	135725
Manganese	NELAP	0.0010		**0.255**	mg/L	5	11/14/2017 5:57	135725
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 5:57	135725

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17101691

Report Date: 30-Nov-17

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
17101691-001	MW1	Groundwater	4	11/08/2017 10:42
17101691-002	MW2	Groundwater	4	11/08/2017 11:42
17101691-003	MW7	Groundwater	4	11/08/2017 0:00
17101691-004	MW10	Groundwater	4	11/08/2017 15:24
17101691-005	MW17	Groundwater	4	11/08/2017 16:56
17101691-006	MW18	Groundwater	4	11/08/2017 17:10
17101691-007	MW21	Groundwater	4	11/08/2017 11:10
17101691-008	TW1	Groundwater	4	11/08/2017 0:00
17101691-009	MW3R	Groundwater	4	11/08/2017 12:39
17101691-010	MW4	Groundwater	4	11/08/2017 14:56
17101691-011	MW5	Groundwater	4	11/08/2017 13:02
17101691-012	MW6R	Groundwater	4	11/08/2017 13:36
17101691-013	MW8R	Groundwater	4	11/08/2017 12:20
17101691-014	MW9	Groundwater	1	11/08/2017 13:20
17101691-015	MW19	Groundwater	1	11/08/2017 13:15
17101691-016	MW20	Groundwater	4	11/08/2017 14:05
17101691-017	MW34	Groundwater	4	11/08/2017 14:36
17101691-018	Field Blank	Groundwater	4	11/08/2017 17:30
17101691-019	DUP1	Groundwater	4	11/08/2017 12:39
17101691-020	DUP2	Groundwater	4	11/08/2017 13:36

Teklab, Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 17101691
Report Date: 30-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17101691-001A	MW1	11/08/2017 10:42	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 10:42
	Standard Method 4500-H B Field				11/08/2017 10:42
	Standard Methods 2130 B Field				11/08/2017 10:42
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 10:42
	Standard Methods 2510 B Field				11/08/2017 10:42
	Standard Methods 2550 B Field				11/08/2017 10:42
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:41
	Standard Methods 4500-O G Field				11/08/2017 10:42
	SW-846 9036 (Total)				11/10/2017 19:08
	SW-846 9251 (Total)				11/10/2017 18:41
17101691-001B	MW1	11/08/2017 10:42	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:09
	SW-846 9214 (Dissolved)				11/10/2017 15:21
17101691-001C	MW1	11/08/2017 10:42	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 3:35
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/15/2017 9:39
17101691-001D	MW1	11/08/2017 10:42	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 12:55
17101691-002A	MW2	11/08/2017 11:42	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 11:42
	Standard Method 4500-H B Field				11/08/2017 11:42
	Standard Methods 2130 B Field				11/08/2017 11:42
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 11:42
	Standard Methods 2510 B Field				11/08/2017 11:42
	Standard Methods 2550 B Field				11/08/2017 11:42
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:41
	Standard Methods 4500-O G Field				11/08/2017 11:42
	SW-846 9036 (Total)				11/10/2017 19:18
	SW-846 9251 (Total)				11/10/2017 19:16
17101691-002B	MW2	11/08/2017 11:42	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:10
	SW-846 9214 (Dissolved)				11/10/2017 15:24
17101691-002C	MW2	11/08/2017 11:42	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 3:44
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/15/2017 9:50
17101691-002D	MW2	11/08/2017 11:42	11/09/2017 12:20		

Teklab, Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Methods 4500-NO3 F (Total)				11/14/2017 12:59
17101691-004A	MW10	11/08/2017 15:24	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 15:24
	Standard Method 4500-H B Field				11/08/2017 15:24
	Standard Methods 2130 B Field				11/08/2017 15:24
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 15:24
	Standard Methods 2510 B Field				11/08/2017 15:24
	Standard Methods 2550 B Field				11/08/2017 15:24
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:42
	Standard Methods 4500-O G Field				11/08/2017 15:24
	SW-846 9036 (Total)				11/10/2017 19:32
	SW-846 9251 (Total)				11/10/2017 19:24
17101691-004B	MW10	11/08/2017 15:24	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:10
	SW-846 9214 (Dissolved)				11/10/2017 15:31
17101691-004C	MW10	11/08/2017 15:24	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 3:52
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/15/2017 9:58
17101691-004D	MW10	11/08/2017 15:24	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:01
17101691-005A	MW17	11/08/2017 16:56	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 16:56
	Standard Method 4500-H B Field				11/08/2017 16:56
	Standard Methods 2130 B Field				11/08/2017 16:56
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 16:56
	Standard Methods 2510 B Field				11/08/2017 16:56
	Standard Methods 2550 B Field				11/08/2017 16:56
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:42
	Standard Methods 4500-O G Field				11/08/2017 16:56
	SW-846 9036 (Total)				11/10/2017 19:40
	SW-846 9251 (Total)				11/10/2017 19:32
17101691-005B	MW17	11/08/2017 16:56	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:11
	SW-846 9214 (Dissolved)				11/10/2017 15:33
17101691-005C	MW17	11/08/2017 16:56	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 4:00
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/15/2017 10:06

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17101691-005D	MW17	11/08/2017 16:56	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:04
17101691-006A	MW18	11/08/2017 17:10	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 17:10
	Standard Method 4500-H B Field				11/08/2017 17:10
	Standard Methods 2130 B Field				11/08/2017 17:10
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 17:10
	Standard Methods 2510 B Field				11/08/2017 17:10
	Standard Methods 2550 B Field				11/08/2017 17:10
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:42
	Standard Methods 4500-O G Field				11/08/2017 17:10
	SW-846 9036 (Total)				11/10/2017 20:02
	SW-846 9251 (Total)				11/10/2017 19:40
17101691-006B	MW18	11/08/2017 17:10	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:12
	SW-846 9214 (Dissolved)				11/10/2017 15:35
17101691-006C	MW18	11/08/2017 17:10	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 4:09
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/15/2017 10:15
17101691-006D	MW18	11/08/2017 17:10	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:23
17101691-007A	MW21	11/08/2017 11:10	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 11:10
	Standard Method 4500-H B Field				11/08/2017 11:10
	Standard Methods 2130 B Field				11/08/2017 11:10
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 11:10
	Standard Methods 2510 B Field				11/08/2017 11:10
	Standard Methods 2550 B Field				11/08/2017 11:10
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:43
	Standard Methods 4500-O G Field				11/08/2017 11:10
	SW-846 9036 (Total)				11/10/2017 20:04
	SW-846 9251 (Total)				11/10/2017 20:02
17101691-007B	MW21	11/08/2017 11:10	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:12
	SW-846 9214 (Dissolved)				11/10/2017 15:39
17101691-007C	MW21	11/08/2017 11:10	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 4:17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/15/2017 10:41
17101691-007D	MW21	11/08/2017 11:10	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:26
17101691-009A	MW3R	11/08/2017 12:39	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 12:39
	Standard Method 4500-H B Field				11/08/2017 12:39
	Standard Methods 2130 B Field				11/08/2017 12:39
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 12:39
	Standard Methods 2510 B Field				11/08/2017 12:39
	Standard Methods 2550 B Field				11/08/2017 12:39
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:43
	Standard Methods 4500-O G Field				11/08/2017 12:39
	SW-846 9036 (Total)				11/10/2017 20:12
	SW-846 9251 (Total)				11/10/2017 20:04
17101691-009B	MW3R	11/08/2017 12:39	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:12
	SW-846 9214 (Dissolved)				11/10/2017 15:45
17101691-009C	MW3R	11/08/2017 12:39	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 4:25
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/15/2017 10:49
17101691-009D	MW3R	11/08/2017 12:39	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:28
17101691-010A	MW4	11/08/2017 14:56	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 14:56
	Standard Method 4500-H B Field				11/08/2017 14:56
	Standard Methods 2130 B Field				11/08/2017 14:56
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 14:56
	Standard Methods 2510 B Field				11/08/2017 14:56
	Standard Methods 2550 B Field				11/08/2017 14:56
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:43
	Standard Methods 4500-O G Field				11/08/2017 14:56
	SW-846 9036 (Total)				11/10/2017 20:15
	SW-846 9251 (Total)				11/10/2017 20:13
17101691-010B	MW4	11/08/2017 14:56	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:13
	SW-846 9214 (Dissolved)				11/10/2017 15:47
17101691-010C	MW4	11/08/2017 14:56	11/09/2017 12:20		

Teklab Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17101691

Report Date: 30-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 4:33
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/15/2017 10:58
17101691-010D	MW4	11/08/2017 14:56	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:30
17101691-011A	MW5	11/08/2017 13:02	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 13:02
	Standard Method 4500-H B Field				11/08/2017 13:02
	Standard Methods 2130 B Field				11/08/2017 13:02
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 13:02
	Standard Methods 2510 B Field				11/08/2017 13:02
	Standard Methods 2550 B Field				11/08/2017 13:02
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:45
	Standard Methods 4500-O G Field				11/08/2017 13:02
	SW-846 9036 (Total)				11/10/2017 20:29
	SW-846 9251 (Total)				11/10/2017 20:21
17101691-011B	MW5	11/08/2017 13:02	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:13
	SW-846 9214 (Dissolved)				11/10/2017 15:49
17101691-011C	MW5	11/08/2017 13:02	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 4:42
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 19:41
17101691-011D	MW5	11/08/2017 13:02	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:34
17101691-012A	MW6R	11/08/2017 13:36	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 13:36
	Standard Method 4500-H B Field				11/08/2017 13:36
	Standard Methods 2130 B Field				11/08/2017 13:36
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 13:36
	Standard Methods 2510 B Field				11/08/2017 13:36
	Standard Methods 2550 B Field				11/08/2017 13:36
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:45
	Standard Methods 4500-O G Field				11/08/2017 13:36
	SW-846 9036 (Total)				11/13/2017 13:14
	SW-846 9251 (Total)				11/10/2017 20:29
17101691-012B	MW6R	11/08/2017 13:36	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/21/2017 17:40
	SW-846 9214 (Dissolved)				11/10/2017 15:51

The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 20e

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17101691-012C	MW6R	11/08/2017 13:36	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 5:07
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 19:49
17101691-012D	MW6R	11/08/2017 13:36	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:37
17101691-013A	MW8R	11/08/2017 12:20	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 12:20
	Standard Method 4500-H B Field				11/08/2017 12:20
	Standard Methods 2130 B Field				11/08/2017 12:20
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 12:20
	Standard Methods 2510 B Field				11/08/2017 12:20
	Standard Methods 2550 B Field				11/08/2017 12:20
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:46
	Standard Methods 4500-O G Field				11/08/2017 12:20
	SW-846 9036 (Total)				11/10/2017 21:15
	SW-846 9251 (Total)				11/10/2017 21:07
17101691-013B	MW8R	11/08/2017 12:20	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:14
	SW-846 9214 (Dissolved)				11/10/2017 15:54
17101691-013C	MW8R	11/08/2017 12:20	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 5:15
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/15/2017 12:04
17101691-013D	MW8R	11/08/2017 12:20	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:39
17101691-014A	MW9	11/08/2017 13:20	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 13:20
17101691-015A	MW19	11/08/2017 13:15	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 13:15
17101691-016A	MW20	11/08/2017 14:05	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 14:05
	Standard Method 4500-H B Field				11/08/2017 14:05
	Standard Methods 2130 B Field				11/08/2017 14:05
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 14:05
	Standard Methods 2510 B Field				11/08/2017 14:05
	Standard Methods 2550 B Field				11/08/2017 14:05
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:46

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Methods 4500-O G Field				11/08/2017 14:05
	SW-846 9036 (Total)				11/10/2017 21:23
	SW 846 9251 (Total)				11/10/2017 21:15
17101691-016B	MW20	11/08/2017 14:05	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:14
	SW-846 9214 (Dissolved)				11/10/2017 15:59
17101691-016C	MW20	11/08/2017 14:05	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 5:23
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 20:06
17101691-016D	MW20	11/08/2017 14:05	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:41
17101691-017A	MW34	11/08/2017 14:36	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 14:36
	Standard Method 4500-H B Field				11/08/2017 14:36
	Standard Methods 2130 B Field				11/08/2017 14:36
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 14:36
	Standard Methods 2510 B Field				11/08/2017 14:36
	Standard Methods 2550 B Field				11/08/2017 14:36
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:47
	Standard Methods 4500-O G Field				11/08/2017 14:36
	SW-846 9036 (Total)				11/10/2017 21:25
	SW-846 9251 (Total)				11/10/2017 21:23
17101691-017B	MW34	11/08/2017 14:36	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:15
	SW-846 9214 (Dissolved)				11/10/2017 16:01
17101691-017C	MW34	11/08/2017 14:36	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 5:32
	SW 846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 20:14
17101691 017D	MW34	11/08/2017 14:36	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:43
17101691-018A	Field Blank	11/08/2017 17:30	11/09/2017 12:20		
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:47
	SW-846 9036 (Total)				11/10/2017 21:28
	SW-846 9251 (Total)				11/10/2017 21:26
17101691-018B	Field Blank	11/08/2017 17:30	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:15

Teklab Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 9214 (Dissolved)				11/10/2017 16:02
17101691-018C	Field Blank	11/08/2017 17:30	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 5:40
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/15/2017 11:06
17101691-018D	Field Blank	11/08/2017 17:30	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 13:56
17101691-019A	DUP1	11/08/2017 12:39	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 12:39
	Standard Method 4500-H B Field				11/08/2017 12:39
	Standard Methods 2130 B Field				11/08/2017 12:39
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 12:39
	Standard Methods 2510 B Field				11/08/2017 12:39
	Standard Methods 2550 B Field				11/08/2017 12:39
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:47
	Standard Methods 4500-O G Field				11/08/2017 12:39
	SW-846 9036 (Total)				11/10/2017 21:52
	SW-846 9251 (Total)				11/10/2017 21:44
17101691-019B	DUP1	11/08/2017 12:39	11/09/2017 12:20		
	Standard Methods 2540 C (Dissolved)				11/10/2017 17:16
	SW-846 9214 (Dissolved)				11/10/2017 16:04
17101691-019C	DUP1	11/08/2017 12:39	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 5:48
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 20:31
17101691-019D	DUP1	11/08/2017 12:39	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 14:21
17101691-020A	DUP2	11/08/2017 13:36	11/09/2017 12:20		
	Field Elevation Measurements				11/08/2017 13:36
	Standard Method 4500-H B Field				11/08/2017 13:36
	Standard Methods 2130 B Field				11/08/2017 13:36
	Standard Methods 18th Ed. 2580 B Field				11/08/2017 13:36
	Standard Methods 2510 B Field				11/08/2017 13:36
	Standard Methods 2550 B Field				11/08/2017 13:36
	Standard Methods 4500-NO2 B (Total)				11/09/2017 16:48
	Standard Methods 4500-O G Field				11/08/2017 13:36
	SW-846 9036 (Total)				11/10/2017 22:06
	SW-846 9251 (Total)				11/10/2017 21:58
17101691-020B	DUP2	11/08/2017 13:36	11/09/2017 12:20		

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Methods 2540 C (Dissolved)				11/21/2017 17:40
	SW-846 9214 (Dissolved)				11/10/2017 16.07
17101691 020C	DUP2	11/08/2017 13:36	11/09/2017 12:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 5:57
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			11/09/2017 18:59	11/14/2017 20:39
17101691-020D	DUP2	11/08/2017 13:36	11/09/2017 12:20		
	Standard Methods 4500-NO3 F (Total)				11/14/2017 14:01

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

STANDARD METHOD 4500-H B FIELD

Batch R240145 **SampType:** LCS **Units**
SampID: LCS-R240145

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	1.00		**7.01**	7.000	0	100.1	99.1	100.9	11/08/2017

STANDARD METHODS 2510 B FIELD

Batch R240145 **SampType:** LCS **Units** µmhos/cm
SampID: LCS-R240145

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Conductivity	1		**1410**	1412	0	99.9	90	110	11/08/2017

STANDARD METHODS 2540 C (DISSOLVED)

Batch R240031 **SampType:** MBLK **Units** mg/L
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						11/10/2017
Total Dissolved Solids	20	J	**14**						11/10/2017

Batch R240031 **SampType:** LCS **Units** mg/L
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**1000**	1000	0	100.2	90	110	11/10/2017

Batch R240031 **SampType:** LCSQC **Units** mg/L
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**1020**	1000	0	101.8	90	110	11/10/2017

Batch R240031 **SampType:** MS **Units** mg/L
SampID: 17101691-005BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**2450**	500.0	2018	87.2	85	115	11/10/2017

Batch R240031 **SampType:** MSD **Units** mg/L RPD Limit **5**
SampID: 17101691-005BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**2460**	500.0	2018	87.6	2454	0.08	11/10/2017

Batch R240031 **SampType:** DUP **Units** mg/L RPD Limit **5**
SampID: 17101691-017BDUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**500**				488.0	2.43	11/10/2017

STANDARD METHODS 2540 C (DISSOLVED)

Batch R240449 **SampType:** MBLK Units mg/L
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20	J	**14**						11/21/2017
Total Dissolved Solids	20	J	**14**						11/21/2017
Total Dissolved Solids	20		**< 20**						11/21/2017

Batch R240449 **SampType:** LCS Units mg/L
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**984**	1000	0	98.4	90	110	11/21/2017

Batch R240449 **SampType:** LCSQC Units mg/L
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**982**	1000	0	98.2	90	110	11/21/2017
Total Dissolved Solids	20		**978**	1000	0	97.8	90	110	11/21/2017

Batch R240449 **SampType:** DUP Units mg/L RPD Limit **5**
SampID: 17101691-012BDUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20	H	**632**				606.0	4.20	11/21/2017

Batch R240449 **SampType:** DUP Units mg/L RPD Limit **5**
SampID: 17101691-020BDUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20	RH	**512**				616.0	18.44	11/21/2017

STANDARD METHODS 4500-NO2 B (TOTAL)

Batch R239890 **SampType:** MBLK Units mg/L
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**< 0.05**						11/09/2017
Nitrogen, Nitrite (as N)	0.05		**< 0.05**						11/09/2017

Batch R239890 **SampType:** LCS Units mg/L
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.25		**0.88**	0.8950	0	98.9	90	110	11/09/2017
Nitrogen, Nitrite (as N)	0.25		**0.88**	0.8950	0	97.8	90	110	11/09/2017

Batch R239890 **SampType:** MS Units mg/L
SampID: 17101691-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.49**	0.5000	0	97.6	85	115	11/09/2017

STANDARD METHODS 4500-NO2 B (TOTAL)

Batch R239890 **SampType:** MSD Units mg/L RPD Limit 10

SampID: 17101691-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.49**	0.5000	0	98.4	0.4880	0.82	11/09/2017

Batch R239890 **SampType:** MS Units mg/L

SampID: 17101691-013AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.49**	0.5000	0	97.6	85	115	11/09/2017

Batch R239890 **SampType:** MSD Units mg/L RPD Limit 10

SampID: 17101691-013AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.50**	0.5000	0	99.0	0.4880	1.42	11/09/2017

STANDARD METHODS 4500-NO3 F (TOTAL)

Batch R240076 **SampType:** MBLK Units mg/L

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**< 0.050**						11/14/2017

Batch R240076 **SampType:** LCS Units mg/L

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	1.00		**8.72**	8.570	0	101.7	90	110	11/14/2017

Batch R240076 **SampType:** MS Units mg/L

SampID: 17101691-005DMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050	S	**0.393**	0.2500	0.09200	120.4	85	115	11/14/2017

Batch R240076 **SampType:** MSD Units mg/L RPD Limit 10

SampID: 17101691-005DMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050	S	**0.381**	0.2500	0.09200	115.6	0.3930	3.10	11/14/2017

Batch R240663 **SampType:** MBLK Units mg/L

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**< 0.050**						11/27/2017

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

STANDARD METHODS 4500-NO3 F (TOTAL)

Batch R240663 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	1.00		**9.36**	8.570	0	109.2	90	110	11/27/2017

SW-846 9036 (TOTAL)

Batch R240063 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						11/10/2017

Batch R240063 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**18**	20.00	0	92.5	90	110	11/10/2017

Batch R240063 **SampType:** MS Units **mg/L**

SampID: 17101691-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	500		**1510**	500.0	1003	101.5	85	115	11/10/2017

Batch R240063 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17101691-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	500		**1490**	500.0	1003	97.7	1510	1.26	11/10/2017

Batch R240101 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						11/13/2017

Batch R240101 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	99.9	90	110	11/13/2017

Batch R240101 **SampType:** MS Units **mg/L**

SampID: 17101691-012AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	50		**210**	50.00	159.8	100.5	85	115	11/13/2017

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

SW-846 9036 (TOTAL)

Batch R240101 **SampType:** MSD Units mg/L RPD Limit 10

SampID: 17101691-012AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	50		**210**	50.00	159.8	101.0	210.1	0.11	11/13/2017

SW-846 9214 (DISSOLVED)

Batch R239991 **SampType:** MBLK Units mg/L

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						11/10/2017

Batch R239991 **SampType:** LCS Units mg/L

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**0.98**	1.000	0	97.6	90	110	11/10/2017

Batch R239991 **SampType:** MS Units mg/L

SampID: 17101691-002BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.71**	2.000	0.6240	104.1	85	115	11/10/2017

Batch R239991 **SampType:** MSD Units mg/L RPD Limit 10

SampID: 17101691-002BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.80**	2.000	0.6240	108.6	2.706	3.24	11/10/2017

Batch R239991 **SampType:** MS Units mg/L

SampID: 17101691-007BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**3.24**	2.000	1.167	103.8	85	115	11/10/2017

Batch R239991 **SampType:** MSD Units mg/L RPD Limit 10

SampID: 17101691-007BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**3.30**	2.000	1.167	106.7	3.242	1.80	11/10/2017

SW-846 9251 (TOTAL)

Batch R239983 **SampType:** MBLK Units mg/L

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						11/10/2017

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

SW-846 9251 (TOTAL)

Batch R239983 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	100.0	90	110	11/10/2017

Batch R239983 **SampType:** MS Units **mg/L**
SampID: 17101691-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**37**	20.00	19.77	85.2	85	115	11/10/2017

Batch R239983 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 17101691-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5	S	**37**	20.00	19.77	83.8	36.82	0.76	11/10/2017

Batch R239983 **SampType:** MS Units **mg/L**
SampID: 17101691-012AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**25**	20.00	6.540	92.0	85	115	11/10/2017

Batch R239983 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 17101691-012AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**25**	20.00	6.540	91.6	24.94	0.28	11/10/2017

Batch R240085 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						11/13/2017

Batch R240085 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**21**	20.00	0	105.6	90	110	11/13/2017

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 135725 **SampType:** MBLK Units **mg/L**
SampID: MBLK-135725

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**< 0.0010**	).00100C	0	0	-100	100	11/14/2017
Barium	0.0010		**< 0.0010**	).00100C	0	0	-100	100	11/14/2017
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	11/15/2017
Iron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	11/14/2017
Manganese	0.0010		**< 0.0010**	).00100C	0	0	-100	100	11/14/2017
Selenium	0.0010		**< 0.0010**	).00100C	0	0	-100	100	11/14/2017

Client: Natural Resource Technology, Inc. **Work Order:** 17101691

Client Project: Dynegy - Vermillion Power Station **Report Date:** 30-Nov-17

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 135725 **SampType:** LCS Units **mg/L**

SampID: LCS-135725

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.462**	0.5000	0	92.4	80	120	11/14/2017
Barium	0.0010		**1.84**	2.000	0	91.9	80	120	11/14/2017
Boron	0.0250		**0.473**	0.5000	0	94.6	80	120	11/14/2017
Iron	0.0250		**1.79**	2.000	0	89.3	80	120	11/14/2017
Manganese	0.0010		**0.474**	0.5000	0	94.8	80	120	11/14/2017
Selenium	0.0010		**0.466**	0.5000	0	93.3	80	120	11/14/2017

Batch 135725 **SampType:** MS Units **mg/L**

SampID: 17101691-007CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.494**	0.5000	0.03131	92.6	75	125	11/14/2017
Barium	0.0010		**1.91**	2.000	0.09320	90.7	75	125	11/14/2017
Boron	0.0250		**1.25**	0.5000	0.8229	86.4	75	125	11/14/2017
Iron	0.0250		**2.03**	2.000	0.2576	88.8	75	125	11/14/2017
Manganese	0.0010		**0.573**	0.5000	0.1127	92.0	75	125	11/14/2017
Selenium	0.0010		**0.437**	0.5000	0	87.4	75	125	11/14/2017

Batch 135725 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17101691-007CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.497**	0.5000	0.03131	93.2	0.4941	0.62	11/14/2017
Barium	0.0010		**1.92**	2.000	0.09320	91.4	1.907	0.74	11/14/2017
Boron	0.0250		**1.30**	0.5000	0.8229	95.8	1.255	3.67	11/14/2017
Iron	0.0250		**2.04**	2.000	0.2576	89.3	2.034	0.44	11/14/2017
Manganese	0.0010		**0.577**	0.5000	0.1127	92.9	0.5729	0.77	11/14/2017
Selenium	0.0010		**0.439**	0.5000	0	87.8	0.4370	0.51	11/14/2017

Batch 135725 **SampType:** MS Units **mg/L**

SampID: 17101691-013CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.476**	0.5000	0.01057	93.1	75	125	11/14/2017
Barium	0.0010		**1.87**	2.000	0.04765	91.0	75	125	11/14/2017
Boron	0.500	S	**50.0**	0.5000	51.59	-311.4	75	125	11/15/2017
Iron	0.0250		**1.80**	2.000	0.03769	88.1	75	125	11/14/2017
Manganese	0.0010		**0.574**	0.5000	0.1128	92.3	75	125	11/14/2017
Selenium	0.0010		**0.459**	0.5000	0	91.9	75	125	11/14/2017

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17101691

Report Date: 30-Nov-17

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 135725 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17101691-013CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.490**	0.5000	0.01057	95.9	0.4761	2.91	11/14/2017
Barium	0.0010		**1.85**	2.000	0.04765	90.2	1.867	0.79	11/14/2017
Boron	0.500	S	**51.1**	0.5000	51.59	-90.1	50.04	2.19	11/15/2017
Iron	0.0250		**1.86**	2.000	0.03769	91.0	1.800	3.13	11/14/2017
Manganese	0.0010		**0.586**	0.5000	0.1128	94.6	0.5744	1.97	11/14/2017
Selenium	0.0010		**0.475**	0.5000	0	94.9	0.4594	3.26	11/14/2017

Teklab, Inc. Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 17101691

Report Date: 30-Nov-17

Carrier: Tim Mathis

Received By: KF

Completed by: Kalyn Foecke
On: 09-Nov-17
Kalyn Foecke

Reviewed by: Elizabeth A. Hurley
On: 09-Nov-17
Elizabeth A. Hurley

Pages to follow: Chain of custody 2 Extra pages included 34

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 3.62
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

 Work order # 1710691

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client:	Natural Resource Technology, Inc.
Address:	2422 East Washington Street
City / State / Zip	Bloomington, IL 61704
Contact:	Steve Wiskes
Phone:	(414) 837-3614
E-Mail:	steve.wiskes@obg.com
Fax:	

Samples on: [X] ICE [ ] BLUE ICE [ ] NO ICE 3.6 °C

Preserved in: [ ] LAB [X] FIELD KF 11/9/17 **FOR LAB USE ONLY**

Lab Notes: * WELL DRY NO SAMPLE TM 11-8-17
★ TEMPORARY WELL NO LONGER EXISTS TM 11-8-17

Client Comments
Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.

Are these samples known to be involved in litigation? If yes, a surcharge will apply [ ] Yes [X] No

Are these samples known to be hazardous? [ ] Yes [X] No

Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. [ ] Yes [X] No

Project Name/Number	Sample Collector's Name
Dynegy - Vermillion Power Station	

Results Requested: [X] Standard [ ] 1-2 Day (100% Surcharge) [ ] Other ____ [ ] 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Matrix: Groundwater	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O	Field ORP SM 2580-B	Field pH SM 4500-H+B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500-NO3 F	Sulfate 9036	TDS SM 2540C
1710691-001	MW1	11-8-17 1042	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
002	MW2	1142	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
003	MW7 *		2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
004	MW10	1524	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
005	MW17	1656	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
006	MW18	1710	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
007	MW21	1110	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
008	TW1 ★		2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
009	MW3R	1239	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
010	MW4	1456	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	11-9-17 1220	[signature]	11/9/17 1220

BottleOrder: 40609

CHAIN OF CUSTODY

 Work order # ______

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: Natural Resource Technology, Inc.
Address: 2422 East Washington Street
City / State / Zip Bloomington, IL 61704
Contact: Steve Wiskes **Phone:** (414) 837-3614
E-Mail: steve.wiskes@obg.com **Fax:**

Samples on: ☐ ICE ☐ BLUE ICE ☐ NO ICE ______ °C
Preserved in: ☐ LAB ☐ FIELD **FOR LAB USE ONLY**
Lab Notes:

Client Comments
Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No
Are these samples known to be hazardous? ☐ Yes ☒ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☒ No

Project Name/Number	Sample Collector's Name
Dynegy - Vermillion Power Station	

Results Requested
☒ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Matrix: Groundwater	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O	Field ORP SM 2580-B	Field pH SM 4500-H+B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500-NO3 F	Sulfate 9036	TDS SM 2540C
17101691-011	MW5	11-8-17 1302	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
012	MW6R	1336	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
013	MW8R	1220	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
014	MW9	1320	0			X										X			
015	MW19	1315	0			X										X			
016	MW20	1408	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
017	MW34	1436	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
018	Field Blank	1730	2	1	1	X	X	X	X								X	X	X
019	DUP1	1239	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
020	DUP2	1336	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	11-9-17 1220	Kleedle	11/9/17 1220

BottleOrder: 40609

Monitoring Well Evaluation Checklist

			Major wells repairs* required to maintain well integrity?	Yes	No	NA
Site	VERMILLION				X	
Inspection Date	11-8-17					
Well Number	MW-1					

Stick-up Monitoring Wells	Yes	No	NA	**Comments**
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?			X	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19 . Concrete pad			X	
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?	X			
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILLION Client: NRT

Project Number: Task #: Start Date: 11-8-17 Time: 1030

Field Personnel: TIM / JORDAN Finish Date: 11-8-17 Time: 1042

WELL INFORMATION

Well ID: MW1

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1030		79.40								
	1033	.13	80.75	1.35	13.63	6.70	2160	7.74	0	137	CLEAR
	1036	.26	81.55	.80	13.29	6.94	2190	7.26	0	135	CLEAR
	1039	.39	82.20	.65	13.14	6.99	2200	7.05	0	136	CLEAR
	1042	.52	82.90	.70	12.99	7.00	2210	6.89	0	139	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILION	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	11-8-17			x	
Well Number	MW-2				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	x			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	x			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		x		
4. Weep holes able to drain?			x	
5. Is there a lockable cap present?	x			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			x	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

	Yes	No	NA	
Downhole Condition			x	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		x		
19 . Concrete pad			x	
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?	x			
21. Well clearly visible and labeled?				

Comments:

*Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION Client: KZT
Project Number: Task #: Start Date: 11-8-17 Time: 1134
Field Personnel: Tom Jordan Finish Date: 11-8-17 Time: 1142

WELL INFORMATION

Well ID: MW-2
Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☑ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (μs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	11:34		18.84								
	1136	.13	19.70	.96	14.25	7.60	767	3.46	0.9	-82	CLEAR
	1138	.26	20.10	.40	13.74	7.69	789	0.60	0.5	-116	CLEAR
	1140	.39	20.10	0	13.69	7.72	791	0.18	0.4	-129	CLEAR
	1142	.52	20.34	.24	13.66	7.72	796	0	0	-139	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: VERMILION
Inspection Date: 11-8-17
Well Number: MW-7

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		✓	

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
2. Inner casing				
Not corroded	✓			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	↓			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells

	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19. Concrete pad			X	
Slope away form casing?			↓	
Not deteriorated?			↓	
Not heaved or below surrounding grade?			↓	
20. No surface seal settling?	Y			
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILLION　　Client: NRT

Project Number: /　　Task #:　　Start Date: 11·8·17　　Time:

Field Personnel: TM / JORDAN　　Finish Date: 11·8·17　　Time:

WELL INFORMATION

Well ID: MW7

Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity

NOTES (continued)

WELL DRY

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celsius

Monitoring Well Evaluation Checklist

Site: Vermilion
Inspection Date: 11-8-17
Well Number: MW10

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad	X			
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION　　Client: NRT

Project Number: 　　Task #: 　　Start Date: 11-8-17　　Time: 1516

Field Personnel: TIM/JORDAN　　Finish Date: 11-8-17　　Time: 1524

WELL INFORMATION

Well ID: MW-10

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1516		51.76								
	1518	.13	52.50	.74	13.68	6.97	1170	6.55	0	68	CLEAR
	1520	.26	52.90	.40	13.41	6.90	1130	5.25	0	75	CLEAR
	1522	.39	53.54	.64	13.20	6.88	~~1[illegible]~~ 1150	4.37	0	83	CLEAR
	1524	.51	53.95	.41	13.11	6.86	1160	4.26	0	84	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
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ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	VERMILION	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	11-8-17				
Well Number	MW17				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
2. Inner casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	↓			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells

	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

	Yes	No	NA	
General Condition				
18. Concrete pad installed?	X			
19 . Concrete pad	↓			
Slope away form casing?	↓			
Not deteriorated?	↓			
Not heaved or below surrounding grade?	↓			
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION   Client: NRT

Project Number: ____   Task #: ____   Start Date: 11·8·17   Time: 1640

Field Personnel: TJN/JORDAN   Finish Date: 11·8·17   Time: 1656

WELL INFORMATION

Well ID: MW17

Casing ID: ____ inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☑ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (us/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1640		39.65								
	1646	.52	42.20	2.65	12.19	7.08	1900	6.76	99.7	29	CLOUDY
	1648	.65	43.90	1.70	12.04	6.90	1880	6.85	111	42	CLOUDY
	1650	.78	44.80	.90	12.00	6.82	1890	6.86	67.0	50	CLEAR
	1652	.91	45.50	.70	11.27	6.85	1860	6.85	20.4	40	CLEAR
	1654	1.04	46.10	.60	11.81	6.87	1910	6.54	20.9	49	CLEAR
	1656	1.17	46.70	.60	11.81	6.84	1910	6.48	20.7	48	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILTON	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	11-8-17			✓	
Well Number	MW18				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	✓			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			✓	
12. Water level measuring point clearly marked?				
13 No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	✓			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION Client: NRT

Project Number: Task #: Start Date: 11-8-17 Time: 1702

Field Personnel: TW / JORDAN Finish Date: 11-8-17 Time: 1710

WELL INFORMATION

Well ID: MW18

Casing ID: inches

EVENT TYPE

☐ Well Development
☑ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1702		26.80								
	1704	.13	26.80	0	12.23	6.96	1740	4.60	4.2	50	CLEAR
	1706	.26	26.80	0	12.23	6.88	1930	0	0.6	30	CLEAR
	1708	.39	26.80	0	12.17	6.84	1910	0	0	35	CLEAR
	1710	.52	26.80	0	12.17	6.85	1900	0	0	32	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: VERMILION
Inspection Date: 11-8-17
Well Number: MW21

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells — Comments

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?			X	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad	X			
Slope away form casing?	X			
Not deteriorated?	X			
Not heaved or below surrounding grade?		X		
20. No surface seal settling?		X		
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION Client: NRT

Project Number: Task #: Start Date: 11-8-17 Time: 1102

Field Personnel: TIM JORDAN Finish Date: 11-8-17 Time:

WELL INFORMATION

Well ID: MW21

Casing ID: inches

EVENT TYPE

☐ Well Development ☒ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1102		91.09								
	1104	.13	92.85	1.76	13.12	7.29	580	4.60	0.7	-27	CLEAR
	1106	.26	94.14	1.29	12.76	7.36	587	1.00	4.1	-92	CLEAR
	1108	.39	94.85	0.71	12.78	7.46	590	0	2.3	-99	CLEAR
	1110	.52	94.45	0	12.82	7.38	591	0	0.7	-105	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILION	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	11·8·17			x	
Well Number	MW03R.				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	x			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	x			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		x	~~x~~	
4. Weep holes able to drain?			x	
5. Is there a lockable cap present?	x			
6. Is there a lock present?	x			
7. Bumper posts in good condition?	x			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			x	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			x	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		x		
19 . Concrete pad			x	
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?	x			
21. Well clearly visible and labeled?	x			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION   Client: NRT

Project Number: ______   Task #: ______   Start Date: 11·8·17   Time: 1229

Field Personnel: TIM / JORDAN   Finish Date: 11·8·17   Time: 1239

WELL INFORMATION

Well ID: MW03R

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1229		8.71								
	1231	.13	8.80	.09	14.61	7.67	841	1.33	10.2	-86	CLEAR
	1233	.26	8.90	.10	14.59	7.43	841	0.56	10.0	-105	CLEAR
	1235	.39	8.95	.05	14.78	7.36	825	1.54	8.1	-125	CLEAR
	1237	.52	9.05	.10	14.87	7.37	819	0.64	8.1	-133	CLEAR
	1239	.65	9.10	.05	14.91	7.37	816	0.59	5.2	-137	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celsius

Monitoring Well Evaluation Checklist

Site: Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date: 11.8.17			X	
Well Number: MW-04				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	~~↓~~ JM		X	

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells

	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19 . Concrete pad			X	
Slope away form casing?			↓	
Not deteriorated?			↓	
Not heaved or below surrounding grade?			↓	
20. No surface seal settling?	X			
21. Well clearly visible and labeled?	X			

Comments:

~~*Major well repair are those that require a subcontractor or separate mobilization to complete~~

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WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION Client: NRT

Project Number: ______ Task #: ______ Start Date: 11-8-17 Time: 1446

Field Personnel: TIM/JORDAN Finish Date: 11-8-17 Time: ~~1456~~ 1458

WELL INFORMATION

Well ID: MW04

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1446		7.53								
	1448	.13	7.95	.42	14.40	7.30	543	1.94	0	-34	CLEAR
	1450	.26	8.00	.05	14.65	7.45	542	0.66	0	-64	CLEAR
	1452	.39	8.10	.10	14.89	7.54	537	1.36	0	-89	CLEAR
	1454	.52	8.15	.05	14.94	7.52	538	.40	0	-92	CLEAR
	1456	.65	8.15	0	14.99	7.62	535	0	0	-93	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celsius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	MW-5 VERMILION	Major wells repairs* required to maintain well integrity?		x	
Inspection Date	MW-5				
Well Number	11-8-17				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	x			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	x			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		x		
4. Weep holes able to drain?			x	
5. Is there a lockable cap present?	x			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			x	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			x	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	x			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION
Client: NRT

Project Number: ______ Task #: ______
Start Date: 11-8-17 Time: 1258

Field Personnel: Tim Jordan
Finish Date: 11-8-17 Time: 1302

WELL INFORMATION

Well ID: MW05

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1254		7.31								
	1256	.13	7.70	.39	14.70	7.32	791	0.33	0.8	24	CLEAR
	1258	.26	7.70	.0	14.66	7.29	810	0	0	19	CLEAR
	1300	.39	7.70	0	14.67	7.30	818	0	0	17	CLEAR
	1302	.52	7.70	0	14.66	7.29	816	0	0	17	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	VERMILION	Major wells repairs* required to maintain well integrity?		x	
Inspection Date	11-8-19				
Well Number	MW06R				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	x			
Not dented				
Not cracked				
Not loose				
2. Inner casing				
Not corroded	x			
Not dented				
Not cracked				
Not loose				
3. Are there weep holes in outer casing?		x		
4. Weep holes able to drain?			x	
5. Is there a lockable cap present?	x			
6. Is there a lock present?	x			
7. Bumper posts in good condition?			x	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			x	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			x	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	x			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

~~* Major well repair are those that require a subcontractor or separate mobilization to complete~~

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION Client: NRT
Project Number: Task #: Start Date: 11·8·17 Time: 1326
Field Personnel: TW/JORDAN Finish Date: 11·8·17 Time: 1336

WELL INFORMATION

Well ID: MW612
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1326		9.45								
	1328	.13	9.45	0	14.80	7.40	814	6.20	0	-69	CLEAR
	1330	.26	9.45	0	14.67	7.10	847	0.30	0	-93	CLEAR
	1332	.39	9.45	0	14.68	7.01	850	2.53	0	-97	CLEAR
	1334	.52	9.45	0	14.69	6.99	848	0	0	-102	CLEAR
	1336	.65	9.45	0	14.71	7.00	845	0	0	-101	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celsius

Monitoring Well Evaluation Checklist

Site VERMILION
Inspection Date 11-8-17
Well Number MW08R

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		✓	

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	✓			
Not dented	↓			
Not cracked	↓			
Not loose	✓			

	Yes	No	NA	
2. Inner casing				
Not corroded	✓			
Not dented	↓			
Not cracked	↓			
Not loose	✓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		✓		
4. Weep holes able to drain?			✓	
5. Is there a lockable cap present?	✓			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	✓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			✓	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			✓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition			✓	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		✓		
19 . Concrete pad			✓	
Slope away form casing?			↓	
Not deteriorated?			↓	
Not heaved or below surrounding grade?			✓	
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?	✓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION   Client: NRT

Project Number: ______   Task #: ______   Start Date: 11-8-17   Time: 1202

Field Personnel: TM JORDAN   Finish Date: 11-8-17   Time: 1220

WELL INFORMATION

Well ID: MW8R

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1202		13.65								
	1205	.13	13.90	.25	14.42	7.79	2030	1.40	0	-77	CLEAR
	1208	.26	13.95	.05	14.26	8.04	2040	0.20	0	-83	CLEAR
	1211	.39	13.95	0	14.29	8.26	2040	0	0	-83	CLEAR
	1214	.52	13.95	0	14.28	8.44	2030	0	0	-86	CLEAR
	1217	.65	13.95	0	14.31	8.54	2020	0	0	-93	CLEAR
	1220	.78	13.95	0	14.28	8.56	2020	0	0	-97	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILION	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	11-8-17			X	
Well Number	MW-9				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	↓		X	

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad	↓			
Slope away form casing?	↓			
Not deteriorated?	↓			
Not heaved or below surrounding grade?	↓			
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?	↓			

Comments:

~~*Major well repair are those that require a subcontractor or separate mobilization to complete~~

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILLION
Client: NRT
Project Number:
Task #:
Start Date: 11·8·17
Time: 1320
Field Personnel: TW/JORDAN
Finish Date: 11·8·17
Time: 1320

WELL INFORMATION

Well ID: MW-9
Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (μs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1320		9.77								

NOTES (continued)

DTW ONLY

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILION	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	11-8-17			X	
Well Number	MW-19				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1 Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

~~* Major well repair are those that require a subcontractor or separate mobilization to complete~~

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMOZON Client: NET
Project Number: ______ Task #: ______ Start Date: 11-8-17 Time: 1315
Field Personnel: TW / JORDAN Finish Date: ______ Time: 1315

WELL INFORMATION

Well ID: MW-9
Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1315		8.67								

NOTES (continued)

DTW ONLY

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	VERMILION	Major wells repairs* required to maintain well integrity?		
Inspection Date	11.8.17			
Well Number	MW 20			

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19 . Concrete pad			X	
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?	X			
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION Client: NRT

Project Number: Task #: Start Date: 11-8-17 Time: 1357

Field Personnel: TJ JORDAN Finish Date: 11-8-17 Time: 1405

WELL INFORMATION

Well ID: MW-3420

Casing ID: TMR inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1357		~~14.57~~ 15.06 TMR								
	1359	.13	15.23	~~.66~~ .17		7.34	494	0.12	2.8	24	CLEAR
	1401	.26	15.23	0	15.22	7.24	~~4~~ 512	0	3.9	-6	CLEAR
	140~~2~~3 TMR	.39	15.23	0	15.14	7.21	521	0	3.4	-14	CLEAR
	1405	.52	15.23	0	15.08	7.22	527	0	3.3	-20	CLEAR

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	VERMILION	Major wells repairs* required to maintain well integrity?		✓	
Inspection Date	11·8·17				
Well Number	MW 34				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	↓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad	↓			
Slope away form casing?	↓			
Not deteriorated?	↓			
Not heaved or below surrounding grade?	↓			
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?	↓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION　　Client: NRT

Project Number: 　　Task #: 　　Start Date: 11-8-17　　Time: 1412

Field Personnel: TM / JORDAN　　Finish Date: 11-8-17　　Time:

WELL INFORMATION

Well ID: MW-34

Casing ID: inches

EVENT TYPE

☐ Well Development　☒ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling　☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1412		14.57								
	1414	.13	14.85	.32	13.70	6.96	744	.59	101.6	-69	CLOUDY
	1416	.26	14.85	.0	12.62	7.14	780	1.24	37.5	-116	CLEAR
	1418	.39	14.85	0	12.41	7.18	782	1.24	34.8	-128	CLEAR
	1420	.52	14.85	0	12.31	7.18	779	1.03	55.7	-134	CLEAR
	1422	.65	14.86	0	12.24	7.19	779	1.04	105	-138	~~CLEAR~~
	1424	.78	14.85	0	12.23	7.17	777	0.97	124	-141	~~CLEAR~~
	1426	.91	14.85	0	12.20	7.17	774	0.78	126	-142	~~CLEAR~~
	1428	1.04	14.85	0	12.28	7.13	773	0.96	125	-139	~~CLEAR~~
	1430	1.17	14.85	0	12.37	7.07	773	0.50	119	-137	~~CLEAR~~
	1432	1.30	14.85	0	12.40	6.98	773	0.42	127	-134	~~CLEAR~~
	1434	1.43	14.85	0	12.40	6.92	773	0.15	122	-132	CLOUDY
	1436	1.56	14.85	0	12.31	6.94	772	0	126	-132	CLOUDY

CLOUDY

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: VERMILION Client:
Project Number: Task #: Start Date: 11-8-17 Time: 1225
Field Personnel: Finish Date: 11-8-17 Time: 1239

WELL INFORMATION

Well ID: Dup 1
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1229		8.71								
	1239		9.10		14.91	7.37	816	0.59	5.2	-137	CLEAR

NOTES (continued)

Dup 1

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: NERMILION Client: NRT

Project Number: ______ Task #: ______ Start Date: 11-8-17 Time: ______

Field Personnel: [illegible] / JORDAN Finish Date: 11-8-17 Time: ______

WELL INFORMATION

Well ID: DUP 2

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1326										
	1336	.65			14.71	7.00	8.45	0	0	-101	CLEAR

NOTES (continued)

Dup 2

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Field Calibration Form
Groundwater Quality Meter

Groundwater Quality Meter Manufacturer/Model U-5000 HORIBA
Serial Number 17531
oxidation/reduction potential, dissolved oxygen, pH, tubidity

Date of Calibration Check	Calibration Standard Concentration	Calibration Reading	Within +/_ 10% (yes or no)	Comments
11-8-17	4.00	4.00	YES	
BEGINNING	7.00	7.01		
	10.00	10.02		
	1412	1410		
	0 NTU	0.1		
	100% ~~104.1%~~ DO	104.1%		
	7.00	7.02	YES	
ENDING	1412	1370		
	0	0.6		
	100%	108.9		

Teklab Inc.
Environmental Laboratory

February 02, 2018

Steve Wiskes
Natural Resource Technology, Inc.
2422 East Washington Street
Suite 104
Bloomington, IL 61704
TEL. (414) 837-3614
FAX: (414) 837-3608

NELAP ACCREDITED TNI LABORATORY

RE: Dynegy Vermillion Power Station **WorkOrder:** 18010005

Dear Steve Wiskes:

TEKLAB, INC received 20 samples on 1/25/2018 9:00:00 AM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
Case Narrative	4
Accreditations	5
Laboratory Results	6
Sample Summary	24
Dates Report	25
Quality Control Results	34
Receiving Check List	40
Chain of Custody	Appended

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	J -	Analyte detected below quantitation limits
M -	Manual Integration used to determine area response	ND -	Not Detected at the Reporting Limit
R -	RPD outside accepted recovery limits	S -	Spike Recovery outside recovery limits
T -	TIC(Tentatively identified compound)	X -	Value exceeds Maximum Contaminant Level

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 18010005

Report Date: 02-Feb-18

Cooler Receipt Temp: 4.22 °C

An employee of Teklab, Inc. collected the sample(s).

MW7 could not be collected; the well was dry. TW1 could not be collected; the well is no longer in service. JE/EAH 1/25/18

Locations

Collinsville		Springfield		Kansas City	
Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425	Address	3920 Pintail Dr Springfield, IL 62711-9415	Address	8421 Nieman Road Lenexa, KS 66214
Phone	(618) 344-1004	Phone	(217) 698-1004	Phone	(913) 541-1998
Fax	(618) 344-1005	Fax	(217) 698-1005	Fax	(913) 541-1998
Email	jhriley@teklabinc.com	Email	KKlostermann@teklabinc.com	Email	jhriley@teklabinc.com

Collinsville Air		Chicago	
Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425	Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(618) 344-1004	Phone	(630) 324-6855
Fax	(618) 344-1005	Fax	
Email	EHurley@teklabinc.com	Email	arenner@teklabinc.com

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2019	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2018	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2018	Collinsville
Kentucky	KDEP	98006		12/31/2018	Collinsville
Kentucky	UST	0073		1/31/2018	Collinsville
Louisiana	LDPH	LA170027		12/31/2018	Collinsville
Missouri	MDNR	930		1/31/2018	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2018	Collinsville

Teklab Inc.
Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-001 **Client Sample ID:** MW1

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 15:33

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**79.67**	ft	1	01/24/2018 15:33	R242740
STANDARD METHOD 4500 H B 2001 FIELD								
pH	*	1.00		**6.93**		1	01/24/2018 15:33	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 15:33	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**64**	mV	1	01/24/2018 15:33	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**3450**	µS/cm	1	01/24/2018 15:33	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**11.75**	°C	1	01/24/2018 15:33	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 15:33	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**2080**	mg/L	1	01/26/2018 13:54	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.349**	mg/L	1	01/25/2018 12:19	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1040**	mg/L	50	01/26/2018 20:55	R242803
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.13**	mg/L	1	01/26/2018 15:52	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**21**	mg/L	1	01/26/2018 20:47	R242805
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 20:12	138377
Barium	NELAP	0.0010		**0.0128**	mg/L	5	01/25/2018 20:12	138377
Boron	NELAP	0.0250		**1.49**	mg/L	5	01/26/2018 12:10	138377
Iron	NELAP	0.0250		**0.0542**	mg/L	5	01/25/2018 20:12	138377
Manganese	NELAP	0.0010		**0.0058**	mg/L	5	01/25/2018 20:12	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 20:12	138377

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. | Work Order: 18010005

Client Project: Dynegy - Vermillion Power Station | Report Date: 02-Feb-18

Lab ID: 18010005-002 | Client Sample ID: MW2

Matrix: GROUNDWATER | Collection Date: 01/24/2018 16:32

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**18.19**	ft	1	01/24/2018 16:32	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.40**		1	01/24/2018 16:32	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 16:32	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-88**	mV	1	01/24/2018 16:32	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1090**	µS/cm	1	01/24/2018 16:32	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**12.66**	°C	1	01/24/2018 16:32	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**3.33**	mg/L	1	01/24/2018 16:32	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**432**	mg/L	1	01/26/2018 13:54	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.065**	mg/L	1	01/25/2018 12:21	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**19**	mg/L	1	01/26/2018 20:58	R242803
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.57**	mg/L	1	01/26/2018 15:53	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	10		**45**	mg/L	2	01/26/2018 21:06	R242805
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0097**	mg/L	5	01/25/2018 20:20	138377
Barium	NELAP	0.0010		**0.174**	mg/L	5	01/25/2018 20:20	138377
Boron	NELAP	0.0250		**0.338**	mg/L	5	01/26/2018 12:18	138377
Iron	NELAP	0.0250		**0.245**	mg/L	5	01/25/2018 20:20	138377
Manganese	NELAP	0.0010		**0.0811**	mg/L	5	01/25/2018 20:20	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 20:20	138377

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-004 **Client Sample ID:** MW10

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 16:59

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**52.00**	ft	1	01/24/2018 16:59	R242740
STANDARD METHOD 4500 H B 2001 FIELD								
pH	*	1.00		**7.01**		1	01/24/2018 16:59	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**9.5**	NTU	1	01/24/2018 16:59	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**50**	mV	1	01/24/2018 16:59	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1490**	µS/cm	1	01/24/2018 16:59	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.74**	°C	1	01/24/2018 16:59	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 16:59	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**826**	mg/L	1	01/26/2018 13:55	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.122**	mg/L	1	01/25/2018 12:34	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**233**	mg/L	10	01/26/2018 21:52	R242803
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.15**	mg/L	1	01/26/2018 15:55	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	01/26/2018 21:44	R242805
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 20:28	138377
Barium	NELAP	0.0010		**0.0701**	mg/L	5	01/25/2018 20:28	138377
Boron	NELAP	0.0250		**0.108**	mg/L	5	01/26/2018 12:26	138377
Iron	NELAP	0.025	J	**0.011**	mg/L	5	01/25/2018 20:28	138377
Manganese	NELAP	0.0010		**0.0783**	mg/L	5	01/25/2018 20:28	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 20:28	138377

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-005 **Client Sample ID:** MW17

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 11:51

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**38.98**	ft	1	01/24/2018 11:51	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.56**		1	01/24/2018 11:51	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**7.7**	NTU	1	01/24/2018 11:51	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**97**	mV	1	01/24/2018 11:51	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**2490**	µS/cm	1	01/24/2018 11:51	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**9.97**	°C	1	01/24/2018 11:51	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 11:51	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**1630**	mg/L	1	01/26/2018 13:56	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050	J	**0.041**	mg/L	1	01/25/2018 12:37	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**976**	mg/L	50	01/26/2018 22:00	R242803
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.14**	mg/L	1	01/26/2018 15:59	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**13**	mg/L	1	01/26/2018 21:52	R242805
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0015**	mg/L	5	01/25/2018 20:37	138377
Barium	NELAP	0.0010		**0.0286**	mg/L	5	01/25/2018 20:37	138377
Boron	NELAP	0.0250		**2.25**	mg/L	5	01/26/2018 12:34	138377
Iron	NELAP	0.0250		**1.66**	mg/L	5	01/25/2018 20:37	138377
Manganese	NELAP	0.0010		**0.108**	mg/L	5	01/25/2018 20:37	138377
Selenium	NELAP	0.0010	J	**0.0009**	mg/L	5	01/25/2018 20:37	138377

Teklab Inc.
Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-006 **Client Sample ID:** MW18

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 12:06

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**27.80**	ft	1	01/24/2018 12:06	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.55**		1	01/24/2018 12:06	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 12:06	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**79**	mV	1	01/24/2018 12:06	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**2700**	µS/cm	1	01/24/2018 12:06	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**12.03**	°C	1	01/24/2018 12:06	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 12:06	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**1590**	mg/L	1	01/26/2018 13:56	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	01/25/2018 12:39	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**749**	mg/L	20	01/26/2018 22:21	R242803
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.12**	mg/L	1	01/26/2018 16:01	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**25**	mg/L	1	01/26/2018 22:00	R242805
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0013**	mg/L	5	01/25/2018 20:45	138377
Barium	NELAP	0.0010		**0.0171**	mg/L	5	01/25/2018 20:45	138377
Boron	NELAP	0.0250		**5.06**	mg/L	5	01/26/2018 12:42	138377
Iron	NELAP	0.0250		**0.0909**	mg/L	5	01/25/2018 20:45	138377
Manganese	NELAP	0.0010		**1.43**	mg/L	5	01/25/2018 20:45	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 20:45	138377

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Work Order: 18010005
Client Project: Dynegy - Vermillion Power Station
Report Date: 02-Feb-18
Lab ID: 18010005-007
Client Sample ID: MW21
Matrix: GROUNDWATER
Collection Date: 01/24/2018 15:55

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**91.40**	ft	1	01/24/2018 15:55	R242740
STANDARD METHOD 4500 H B 2001 FIELD								
pH	*	1.00		**7.26**		1	01/24/2018 15:55	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 15:55	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-53**	mV	1	01/24/2018 15:55	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**843**	µS/cm	1	01/24/2018 15:55	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**11.58**	°C	1	01/24/2018 15:55	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 15:55	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**346**	mg/L	1	01/26/2018 13:56	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050	J	**0.010**	mg/L	1	01/25/2018 12:41	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**12**	mg/L	1	01/26/2018 22:24	R242803
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**1.10**	mg/L	1	01/26/2018 16:04	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5	J	**2**	mg/L	1	01/26/2018 22:22	R242805
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0357**	mg/L	5	01/25/2018 20:53	138377
Barium	NELAP	0.0010		**0.101**	mg/L	5	01/25/2018 20:53	138377
Boron	NELAP	0.0250		**0.919**	mg/L	5	01/26/2018 12:51	138377
Iron	NELAP	0.0250		**0.418**	mg/L	5	01/25/2018 20:53	138377
Manganese	NELAP	0.0010		**0.111**	mg/L	5	01/25/2018 20:53	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 20:53	138377

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-009 **Client Sample ID:** MW3R

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 14:48

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**5.50**	ft	1	01/24/2018 14:48	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.95**		1	01/24/2018 14:48	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 14:48	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-58**	mV	1	01/24/2018 14:48	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1180**	µS/cm	1	01/24/2018 14:48	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**11.97**	°C	1	01/24/2018 14:48	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 14:48	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**542**	mg/L	1	01/26/2018 13:57	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.053**	mg/L	1	01/25/2018 12:45	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**55**	mg/L	5	01/26/2018 22:32	R242803
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.48**	mg/L	1	01/26/2018 16:07	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**26**	mg/L	1	01/26/2018 22:25	R242805
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0068**	mg/L	5	01/25/2018 21:01	138377
Barium	NELAP	0.0010		**0.162**	mg/L	5	01/25/2018 21:01	138377
Boron	NELAP	0.0250		**2.90**	mg/L	5	01/26/2018 12:59	138377
Iron	NELAP	0.0250		**1.51**	mg/L	5	01/25/2018 21:01	138377
Manganese	NELAP	0.0010		**0.0369**	mg/L	5	01/25/2018 21:01	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 21:01	138377

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. | Work Order: 18010005

Client Project: Dyneqy - Vermillion Power Station | Report Date: 02-Feb-18

Lab ID: 18010005-010 | Client Sample ID: MW4

Matrix: GROUNDWATER | Collection Date: 01/24/2018 13:34

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**6.76**	ft	1	01/24/2018 13:34	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.91**		1	01/24/2018 13:34	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 13:34	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**2**	mV	1	01/24/2018 13:34	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**736**	µS/cm	1	01/24/2018 13:34	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.08**	°C	1	01/24/2018 13:34	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 13:34	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**338**	mg/L	1	01/26/2018 13:57	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	01/25/2018 12:55	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**32**	mg/L	1	01/26/2018 22:35	R242803
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.29**	mg/L	1	01/26/2018 16:10	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**10**	mg/L	1	01/26/2018 22:33	R242805
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0052**	mg/L	5	01/25/2018 21:10	138377
Barium	NELAP	0.0010		**0.274**	mg/L	5	01/25/2018 21:10	138377
Boron	NELAP	0.0250		**5.48**	mg/L	5	01/26/2018 13:07	138377
Iron	NELAP	0.0250		**1.01**	mg/L	5	01/25/2018 21:10	138377
Manganese	NELAP	0.0010		**0.629**	mg/L	5	01/25/2018 21:10	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 21:10	138377

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-011 **Client Sample ID:** MW5

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 14:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**6.38**	ft	1	01/24/2018 14:25	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.99**		1	01/24/2018 14.25	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 14:25	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-35**	mV	1	01/24/2018 14:25	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1050**	µS/cm	1	01/24/2018 14:25	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**9.97**	°C	1	01/24/2018 14:25	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 14:25	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**588**	mg/L	1	01/26/2018 13:57	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.062**	mg/L	1	01/25/2018 12:56	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**261**	mg/L	10	01/26/2018 22:48	R242803
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.46**	mg/L	1	01/26/2018 16:15	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	01/26/2018 22:41	R242805
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 21:18	138377
Barium	NELAP	0.0010		**0.0245**	mg/L	5	01/25/2018 21:18	138377
Boron	NELAP	0.0250		**18.3**	mg/L	5	01/26/2018 13:15	138377
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	01/25/2018 21:18	138377
Manganese	NELAP	0.0010		**0.362**	mg/L	5	01/25/2018 21:18	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 21:18	138377

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-012 **Client Sample ID:** MW6R

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 13:55

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**5.15**	ft	1	01/24/2018 13:55	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.76**		1	01/24/2018 13:55	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 13:55	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-69**	mV	1	01/24/2018 13:55	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1200**	µS/cm	1	01/24/2018 13:55	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.58**	°C	1	01/24/2018 13:55	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 13:55	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**578**	mg/L	1	01/26/2018 13:58	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	01/25/2018 12:59	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**103**	mg/L	5	01/26/2018 22:56	R242803
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.13**	mg/L	1	01/26/2018 16:19	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**7**	mg/L	1	01/26/2018 22:49	R242805
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 21:42	138377
Barium	NELAP	0.0010		**0.0757**	mg/L	5	01/25/2018 21:42	138377
Boron	NELAP	0.0250		**0.166**	mg/L	5	01/26/2018 14:22	138377
Iron	NELAP	0.0250		**0.185**	mg/L	5	01/25/2018 21:42	138377
Manganese	NELAP	0.0010		**0.228**	mg/L	5	01/25/2018 21:42	138377
Selenium	NELAP	0.0010		**0.0027**	mg/L	5	01/25/2018 21:42	138377

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-013 **Client Sample ID:** MW8R

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 15:05

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**12.74**	ft	1	01/24/2018 15:05	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.88**		1	01/24/2018 15:05	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 15:05	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-20**	mV	1	01/24/2018 15:05	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1610**	µS/cm	1	01/24/2018 15:05	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.61**	°C	1	01/24/2018 15:05	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 15:05	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**1110**	mg/L	1	01/26/2018 13:58	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	01/25/2018 13:12	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**378**	mg/L	20	01/29/2018 15:45	R242903
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10	J	**0.06**	mg/L	1	01/26/2018 16:21	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**7**	mg/L	1	01/29/2018 15:24	R242906
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0134**	mg/L	5	01/25/2018 21:51	138377
Barium	NELAP	0.0010		**0.0684**	mg/L	5	01/25/2018 21:51	138377
Boron	NELAP	0.0250		**20.7**	mg/L	5	01/26/2018 14:30	138377
Iron	NELAP	0.0250		**1.03**	mg/L	5	01/25/2018 21:51	138377
Manganese	NELAP	0.0010		**0.343**	mg/L	5	01/25/2018 21:51	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 21:51	138377

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-014 **Client Sample ID:** MW9

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 13:50

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**5.66**	ft	1	01/24/2018 13:50	R242740

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-015 **Client Sample ID:** MW19

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 13:55

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**6.28**	ft	1	01/24/2018 13:55	R242740

Client: Natural Resource Technology, Inc. | **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station | **Report Date:** 02-Feb-18

Lab ID: 18010005-016 | **Client Sample ID:** MW20

Matrix: GROUNDWATER | **Collection Date:** 01/24/2018 13:05

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**14.36**	ft	1	01/24/2018 13:05	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.66**		1	01/24/2018 13:05	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 13:05	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**0**	mV	1	01/24/2018 13:05	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**849**	µS/cm	1	01/24/2018 13:05	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.95**	°C	1	01/24/2018 13:05	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 13:05	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**366**	mg/L	1	01/26/2018 13:58	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050	J	**0.010**	mg/L	1	01/25/2018 13:14	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**73**	mg/L	2	01/29/2018 15:53	R242903
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10	J	**0.07**	mg/L	1	01/26/2018 16:22	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5	J	**4**	mg/L	1	01/29/2018 15:45	R242906
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010	J	**0.0005**	mg/L	5	01/25/2018 21:59	138377
Barium	NELAP	0.0010		**0.0192**	mg/L	5	01/25/2018 21:59	138377
Boron	NELAP	0.0250		**0.456**	mg/L	5	01/29/2018 12:38	138377
Iron	NELAP	0.0250		**0.316**	mg/L	5	01/25/2018 21:59	138377
Manganese	NELAP	0.0010		**0.0265**	mg/L	5	01/25/2018 21:59	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 21:59	138377

Teklab Inc. Environmental Laboratory

Laboratory Results

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Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-017 **Client Sample ID:** MW34

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 12:38

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**15.15**	ft	1	01/24/2018 12:38	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.58**		1	01/24/2018 12:38	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**33.4**	NTU	1	01/24/2018 12:38	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-44**	mV	1	01/24/2018 12:38	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1120**	µS/cm	1	01/24/2018 12:38	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.87**	°C	1	01/24/2018 12:38	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 12:38	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**456**	mg/L	1	01/26/2018 13:58	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	01/25/2018 13:17	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	01/29/2018 15:56	R242903
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.61**	mg/L	1	01/26/2018 16:24	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**33**	mg/L	1	01/29/2018 15:54	R242906
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0233**	mg/L	5	01/25/2018 22:07	138377
Barium	NELAP	0.0010		**0.147**	mg/L	5	01/25/2018 22:07	138377
Boron	NELAP	0.0250		**0.557**	mg/L	5	01/29/2018 12:46	138377
Iron	NELAP	0.0250		**5.12**	mg/L	5	01/25/2018 22:07	138377
Manganese	NELAP	0.0010		**0.0618**	mg/L	5	01/25/2018 22:07	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 22:07	138377

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Laboratory Results

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Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-018 **Client Sample ID:** Field Blank

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 15:39

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**< 20**	mg/L	1	01/26/2018 13:59	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	01/25/2018 13:21	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	01/29/2018 16:00	R242903
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	01/26/2018 16:25	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	01/29/2018 15:59	R242906
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 22:15	138377
Barium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 22:15	138377
Boron	NELAP	0.025	J	**0.020**	mg/L	5	01/26/2018 14:54	138377
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	01/25/2018 22:15	138377
Manganese	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 22:15	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 22:15	138377

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-019 **Client Sample ID:** DUP1

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 13:34

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**6.76**	ft	1	01/24/2018 0:00	R242740
STANDARD METHOD 4500 H B 2001 FIELD								
pH	*	1.00		**6.91**		1	01/24/2018 13:34	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 13:34	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**2**	mV	1	01/24/2018 13:34	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**736**	µS/cm	1	01/24/2018 13:34	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.08**	°C	1	01/24/2018 13:34	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 13:34	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**344**	mg/L	1	01/26/2018 13:59	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	01/25/2018 13:23	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**33**	mg/L	1	01/29/2018 16:04	R242903
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.26**	mg/L	1	01/26/2018 16:27	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**9**	mg/L	1	01/29/2018 16:02	R242906
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0047**	mg/L	5	01/25/2018 22:23	138377
Barium	NELAP	0.0010		**0.252**	mg/L	5	01/25/2018 22:23	138377
Boron	NELAP	0.0250	S	**5.43**	mg/L	5	01/26/2018 15:03	138377
Iron	NELAP	0.0250		**1.01**	mg/L	5	01/25/2018 22:23	138377
Manganese	NELAP	0.0010		**0.582**	mg/L	5	01/25/2018 22:23	138377
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 22:23	138377

Matrix spike control limits for B are not applicable due to high sample/spike ratio.

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab ID: 18010005-020 **Client Sample ID:** DUP2

Matrix: GROUNDWATER **Collection Date:** 01/24/2018 13:55

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**5.15**	ft	1	01/24/2018 0:00	R242740
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.76**		1	01/24/2018 13:55	R242740
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	01/24/2018 13:55	R242740
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-69**	mV	1	01/24/2018 13:55	R242740
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1200**	µS/cm	1	01/24/2018 13:55	R242740
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.58**	°C	1	01/24/2018 13:55	R242740
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	01/24/2018 13:55	R242740
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**586**	mg/L	1	01/26/2018 13:59	R242841
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050	J	**0.016**	mg/L	1	01/25/2018 13:25	R242739
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**115**	mg/L	10	01/29/2018 16:47	R242903
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.12**	mg/L	1	01/26/2018 16:29	R242801
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**7**	mg/L	1	01/29/2018 16:10	R242906
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/25/2018 22:32	138377
Barium	NELAP	0.0010		**0.0773**	mg/L	5	01/25/2018 22:32	138377
Boron	NELAP	0.0250		**0.206**	mg/L	5	01/26/2018 15:11	138377
Iron	NELAP	0.0250		**0.189**	mg/L	5	01/25/2018 22:32	138377
Manganese	NELAP	0.0010		**0.228**	mg/L	5	01/25/2018 22:32	138377
Selenium	NELAP	0.0010		**0.0031**	mg/L	5	01/25/2018 22:32	138377

Teklab Inc. Environmental Laboratory

Sample Summary

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
18010005-001	MW1	Groundwater	4	01/24/2018 15:33
18010005-002	MW2	Groundwater	4	01/24/2018 16:32
18010005-003	MW7	Groundwater	1	01/24/2018 0:00
18010005-004	MW10	Groundwater	4	01/24/2018 16:59
18010005-005	MW17	Groundwater	4	01/24/2018 11:51
18010005-006	MW18	Groundwater	4	01/24/2018 12:06
18010005-007	MW21	Groundwater	4	01/24/2018 15:55
18010005-008	TW1	Groundwater	1	01/24/2018 0:00
18010005-009	MW3R	Groundwater	4	01/24/2018 14:48
18010005-010	MW4	Groundwater	4	01/24/2018 13:34
18010005-011	MW5	Groundwater	4	01/24/2018 14:25
18010005-012	MW6R	Groundwater	4	01/24/2018 13:55
18010005-013	MW8R	Groundwater	4	01/24/2018 15:05
18010005-014	MW9	Groundwater	1	01/24/2018 13:50
18010005-015	MW19	Groundwater	1	01/24/2018 13:55
18010005-016	MW20	Groundwater	4	01/24/2018 13:05
18010005-017	MW34	Groundwater	4	01/24/2018 12:38
18010005-018	Field Blank	Groundwater	4	01/24/2018 15:39
18010005-019	DUP1	Groundwater	4	01/24/2018 13:34
18010005-020	DUP2	Groundwater	4	01/24/2018 13:55

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Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 18010005
Report Date: 02-Feb-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18010005-001A	MW1	01/24/2018 15:33	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 15:33
	Standard Method 4500-H B 2001 Field				01/24/2018 15:33
	Standard Methods 2130 B Field				01/24/2018 15:33
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 15:33
	Standard Methods 2510 B Field				01/24/2018 15:33
	Standard Methods 2550 B Field				01/24/2018 15:33
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:35
	Standard Methods 4500-O G Field				01/24/2018 15:33
	SW-846 9036 (Total)				01/26/2018 20:55
	SW-846 9251 (Total)				01/26/2018 20:47
18010005-001B	MW1	01/24/2018 15:33	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:54
	SW-846 9214 (Dissolved)				01/26/2018 15:52
18010005-001C	MW1	01/24/2018 15:33	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 20:12
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 12:10
18010005-001D	MW1	01/24/2018 15:33	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 12:19
18010005-002A	MW2	01/24/2018 16:32	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 16:32
	Standard Method 4500-H B 2001 Field				01/24/2018 16:32
	Standard Methods 2130 B Field				01/24/2018 16:32
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 16:32
	Standard Methods 2510 B Field				01/24/2018 16:32
	Standard Methods 2550 B Field				01/24/2018 16:32
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:35
	Standard Methods 4500-O G Field				01/24/2018 16:32
	SW-846 9036 (Total)				01/26/2018 20:58
	SW-846 9251 (Total)				01/26/2018 21:06
18010005-002B	MW2	01/24/2018 16:32	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:54
	SW-846 9214 (Dissolved)				01/26/2018 15:53
18010005-002C	MW2	01/24/2018 16:32	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 20:20
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 12:18
18010005-002D	MW2	01/24/2018 16:32	01/25/2018 9:00		

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 12:21
18010005-004A	MW10	01/24/2018 16:59	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 16:59
	Standard Method 4500-H B 2001 Field				01/24/2018 16:59
	Standard Methods 2130 B Field				01/24/2018 16:59
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 16:59
	Standard Methods 2510 B Field				01/24/2018 16:59
	Standard Methods 2550 B Field				01/24/2018 16:59
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:36
	Standard Methods 4500-O G Field				01/24/2018 16:59
	SW-846 9036 (Total)				01/26/2018 21:52
	SW-846 9251 (Total)				01/26/2018 21:44
18010005-004B	MW10	01/24/2018 16:59	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:55
	SW-846 9214 (Dissolved)				01/26/2018 15:55
18010005-004C	MW10	01/24/2018 16:59	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 20:28
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 12:26
18010005-004D	MW10	01/24/2018 16:59	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 12:34
18010005-005A	MW17	01/24/2018 11:51	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 11:51
	Standard Method 4500-H B 2001 Field				01/24/2018 11:51
	Standard Methods 2130 B Field				01/24/2018 11:51
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 11:51
	Standard Methods 2510 B Field				01/24/2018 11:51
	Standard Methods 2550 B Field				01/24/2018 11:51
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:36
	Standard Methods 4500-O G Field				01/24/2018 11:51
	SW-846 9036 (Total)				01/26/2018 22:00
	SW-846 9251 (Total)				01/26/2018 21:52
18010005-005B	MW17	01/24/2018 11:51	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:56
	SW-846 9214 (Dissolved)				01/26/2018 15:59
18010005-005C	MW17	01/24/2018 11:51	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 20:37
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 12:34

Teklab Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18010005-005D	MW17	01/24/2018 11:51	01/25/2018 9:00		
	Standard Methods 4500 NO3 F (Total) 2000				01/25/2018 12:37
18010005-006A	MW18	01/24/2018 12:06	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 12:06
	Standard Method 4500-H B 2001 Field				01/24/2018 12:06
	Standard Methods 2130 B Field				01/24/2018 12:06
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 12:06
	Standard Methods 2510 B Field				01/24/2018 12:06
	Standard Methods 2550 B Field				01/24/2018 12:06
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:36
	Standard Methods 4500-O G Field				01/24/2018 12:06
	SW-846 9036 (Total)				01/26/2018 22:21
	SW-846 9251 (Total)				01/26/2018 22:00
18010005-006B	MW18	01/24/2018 12:06	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:56
	SW-846 9214 (Dissolved)				01/26/2018 16:01
18010005-006C	MW18	01/24/2018 12:06	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 20:45
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 12:42
18010005-006D	MW18	01/24/2018 12:06	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 12:39
18010005-007A	MW21	01/24/2018 15:55	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 15:55
	Standard Method 4500-H B 2001 Field				01/24/2018 15:55
	Standard Methods 2130 B Field				01/24/2018 15:55
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 15:55
	Standard Methods 2510 B Field				01/24/2018 15:55
	Standard Methods 2550 B Field				01/24/2018 15:55
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:37
	Standard Methods 4500-O G Field				01/24/2018 15:55
	SW-846 9036 (Total)				01/26/2018 22:24
	SW-846 9251 (Total)				01/26/2018 22:22
18010005-007B	MW21	01/24/2018 15:55	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:56
	SW-846 9214 (Dissolved)				01/26/2018 16:04
18010005-007C	MW21	01/24/2018 15:55	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 20:53

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 18010005
Report Date: 02-Feb-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 12:51
18010005-007D	MW21	01/24/2018 15:55	01/25/2018 9:00		
	Standard Methods 4500 NO3 F (Total) 2000				01/25/2018 12:41
18010005-009A	MW3R	01/24/2018 14:48	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 14:48
	Standard Method 4500-H B 2001 Field				01/24/2018 14:48
	Standard Methods 2130 B Field				01/24/2018 14:48
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 14:48
	Standard Methods 2510 B Field				01/24/2018 14:48
	Standard Methods 2550 B Field				01/24/2018 14:48
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:38
	Standard Methods 4500-O G Field				01/24/2018 14:48
	SW-846 9036 (Total)				01/26/2018 22:32
	SW-846 9251 (Total)				01/26/2018 22:25
18010005-009B	MW3R	01/24/2018 14:48	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:57
	SW-846 9214 (Dissolved)				01/26/2018 16:07
18010005-009C	MW3R	01/24/2018 14:48	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 21:01
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 12:59
18010005-009D	MW3R	01/24/2018 14:48	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 12:45
18010005-010A	MW4	01/24/2018 13:34	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 13:34
	Standard Method 4500-H B 2001 Field				01/24/2018 13:34
	Standard Methods 2130 B Field				01/24/2018 13:34
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 13:34
	Standard Methods 2510 B Field				01/24/2018 13:34
	Standard Methods 2550 B Field				01/24/2018 13:34
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:39
	Standard Methods 4500-O G Field				01/24/2018 13:34
	SW-846 9036 (Total)				01/26/2018 22:35
	SW-846 9251 (Total)				01/26/2018 22:33
18010005-010B	MW4	01/24/2018 13:34	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:57
	SW-846 9214 (Dissolved)				01/26/2018 16:10
18010005-010C	MW4	01/24/2018 13:34	01/25/2018 9:00		

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 21:10
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 13:07
18010005-010D	MW4	01/24/2018 13:34	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 12:55
18010005-011A	MW5	01/24/2018 14:25	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 14:25
	Standard Method 4500-H B 2001 Field				01/24/2018 14:25
	Standard Methods 2130 B Field				01/24/2018 14:25
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 14:25
	Standard Methods 2510 B Field				01/24/2018 14:25
	Standard Methods 2550 B Field				01/24/2018 14:25
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:39
	Standard Methods 4500-O G Field				01/24/2018 14:25
	SW-846 9036 (Total)				01/26/2018 22:48
	SW-846 9251 (Total)				01/26/2018 22:41
18010005-011B	MW5	01/24/2018 14:25	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:57
	SW-846 9214 (Dissolved)				01/26/2018 16:15
18010005-011C	MW5	01/24/2018 14:25	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 21:18
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 13:15
18010005-011D	MW5	01/24/2018 14:25	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 12:56
18010005-012A	MW6R	01/24/2018 13:55	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 13:55
	Standard Method 4500-H B 2001 Field				01/24/2018 13:55
	Standard Methods 2130 B Field				01/24/2018 13:55
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 13:55
	Standard Methods 2510 B Field				01/24/2018 13:55
	Standard Methods 2550 B Field				01/24/2018 13:55
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:40
	Standard Methods 4500-O G Field				01/24/2018 13:55
	SW-846 9036 (Total)				01/26/2018 22:56
	SW-846 9251 (Total)				01/26/2018 22:49
18010005-012B	MW6R	01/24/2018 13:55	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:58
	SW-846 9214 (Dissolved)				01/26/2018 16:19

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18010005-012C	MW6R	01/24/2018 13:55	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 21:42
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 14:22
18010005-012D	MW6R	01/24/2018 13:55	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 12:59
18010005-013A	MW8R	01/24/2018 15:05	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 15:05
	Standard Method 4500-H B 2001 Field				01/24/2018 15:05
	Standard Methods 2130 B Field				01/24/2018 15:05
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 15:05
	Standard Methods 2510 B Field				01/24/2018 15:05
	Standard Methods 2550 B Field				01/24/2018 15:05
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:40
	Standard Methods 4500-O G Field				01/24/2018 15:05
	SW-846 9036 (Total)				01/29/2018 15:45
	SW-846 9251 (Total)				01/29/2018 15:24
18010005-013B	MW8R	01/24/2018 15:05	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:58
	SW-846 9214 (Dissolved)				01/26/2018 16:21
18010005-013C	MW8R	01/24/2018 15:05	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 21:51
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 14:30
18010005-013D	MW8R	01/24/2018 15:05	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 13:12
18010005-014A	MW9	01/24/2018 13:50	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 13:50
18010005-015A	MW19	01/24/2018 13:55	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 13:55
18010005-016A	MW20	01/24/2018 13:05	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 13:05
	Standard Method 4500-H B 2001 Field				01/24/2018 13:05
	Standard Methods 2130 B Field				01/24/2018 13:05
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 13:05
	Standard Methods 2510 B Field				01/24/2018 13:05
	Standard Methods 2550 B Field				01/24/2018 13:05
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:40

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Methods 4500-O G Field				01/24/2018 13:05
	SW-846 9036 (Total)				01/29/2018 15:53
	SW-846 9251 (Total)				01/29/2018 15:45
18010005-016B	MW20	01/24/2018 13:05	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:58
	SW-846 9214 (Dissolved)				01/26/2018 16:22
18010005-016C	MW20	01/24/2018 13:05	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 21:59
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/29/2018 12:38
18010005-016D	MW20	01/24/2018 13:05	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 13:14
18010005-017A	MW34	01/24/2018 12:38	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 12:38
	Standard Method 4500-H B 2001 Field				01/24/2018 12:38
	Standard Methods 2130 B Field				01/24/2018 12:38
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 12:38
	Standard Methods 2510 B Field				01/24/2018 12:38
	Standard Methods 2550 B Field				01/24/2018 12:38
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:41
	Standard Methods 4500-O G Field				01/24/2018 12:38
	SW-846 9036 (Total)				01/29/2018 15:56
	SW-846 9251 (Total)				01/29/2018 15:54
18010005-017B	MW34	01/24/2018 12:38	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:58
	SW-846 9214 (Dissolved)				01/26/2018 16:24
18010005-017C	MW34	01/24/2018 12:38	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 22:07
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/29/2018 12:46
18010005-017D	MW34	01/24/2018 12:38	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 13:17
18010005-018A	Field Blank	01/24/2018 15:39	01/25/2018 9:00		
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:41
	SW-846 9036 (Total)				01/29/2018 16:00
	SW-846 9251 (Total)				01/29/2018 15:59
18010005-018B	Field Blank	01/24/2018 15:39	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:59

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 9214 (Dissolved)				01/26/2018 16.25
18010005-018C	Field Blank	01/24/2018 15:39	01/25/2018 9:00		
	SW 846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 22:15
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 14:54
18010005-018D	Field Blank	01/24/2018 15:39	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 13:21
18010005-019A	DUP1	01/24/2018 13:34	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 0:00
	Standard Method 4500-H B 2001 Field				01/24/2018 13:34
	Standard Methods 2130 B Field				01/24/2018 13:34
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 13:34
	Standard Methods 2510 B Field				01/24/2018 13:34
	Standard Methods 2550 B Field				01/24/2018 13:34
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:42
	Standard Methods 4500-O G Field				01/24/2018 13:34
	SW-846 9036 (Total)				01/29/2018 16:04
	SW-846 9251 (Total)				01/29/2018 16:02
18010005-019B	DUP1	01/24/2018 13:34	01/25/2018 9:00		
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:59
	SW-846 9214 (Dissolved)				01/26/2018 16:27
18010005-019C	DUP1	01/24/2018 13:34	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 22:23
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 15:03
18010005-019D	DUP1	01/24/2018 13:34	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 13:23
18010005-020A	DUP2	01/24/2018 13:55	01/25/2018 9:00		
	Field Elevation Measurements				01/24/2018 0:00
	Standard Method 4500-H B 2001 Field				01/24/2018 13:55
	Standard Methods 2130 B Field				01/24/2018 13:55
	Standard Methods 18th Ed. 2580 B Field				01/24/2018 13:55
	Standard Methods 2510 B Field				01/24/2018 13:55
	Standard Methods 2550 B Field				01/24/2018 13:55
	Standard Methods 4500-NO2 B (Total) 2000				01/25/2018 16:43
	Standard Methods 4500-O G Field				01/24/2018 13:55
	SW-846 9036 (Total)				01/29/2018 16:47
	SW-846 9251 (Total)				01/29/2018 16:10
18010005-020B	DUP2	01/24/2018 13:55	01/25/2018 9:00		

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Methods 2540 C (Dissolved) 1997				01/26/2018 13:59
	SW-846 9214 (Dissolved)				01/26/2018 16:29
18010005-020C	DUP2	01/24/2018 13:55	01/25/2018 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/25/2018 22:32
	SW 846 3005A, 6020A, Metals by ICPMS (Dissolved)			01/25/2018 9:46	01/26/2018 15:11
18010005-020D	DUP2	01/24/2018 13:55	01/25/2018 9:00		
	Standard Methods 4500-NO3 F (Total) 2000				01/25/2018 13:25

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

STANDARD METHOD 4500-H B 2001 FIELD

Batch R242740 **SampType:** LCS Units

SampID: LCS-R242740

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	1.00		**7.00**	7.000	0	100.0	99.1	100.9	01/24/2018

STANDARD METHODS 2510 B FIELD

Batch R242740 **SampType:** LCS Units **µmhos/cm**

SampID: LCS-R242740

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Conductivity	1		**1410**	1412	0	99.9	90	110	01/24/2018

STANDARD METHODS 2540 C (DISSOLVED) 1997

Batch R242841 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20	J	**16**						01/26/2018
Total Dissolved Solids	20		**< 20**						01/26/2018
Total Dissolved Solids	20	J	**16**						01/26/2018

Batch R242841 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**930**	1000	0	93.0	90	110	01/26/2018

Batch R242841 **SampType:** LCSQC Units **mg/L**

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**930**	1000	0	93.0	90	110	01/26/2018
Total Dissolved Solids	20		**960**	1000	0	96.0	90	110	01/26/2018

Batch R242841 **SampType:** MS Units **mg/L**

SampID: 18010005-007BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**868**	500.0	346.0	104.4	85	115	01/26/2018

Batch R242841 **SampType:** MSD Units **mg/L** RPD Limit **5**

SampID: 18010005-007BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**872**	500.0	346.0	105.2	868.0	0.46	01/26/2018

Batch R242841 **SampType:** DUP Units **mg/L** RPD Limit **5**

SampID: 18010005-018BDUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**< 20**				0	0.00	01/26/2018

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

STANDARD METHODS 4500 NO2 B (TOTAL) 2000

Batch R242754 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**< 0.05**	0.02500	0	0	100	100	01/25/2018
Nitrogen, Nitrite (as N)	0.05		**< 0.05**	0.02500	0	0	-100	100	01/25/2018

Batch R242754 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.25		**0.84**	0.8950	0	94.4	90	110	01/25/2018
Nitrogen, Nitrite (as N)	0.25		**0.84**	0.8950	0	94.4	90	110	01/25/2018

Batch R242754 **SampType:** MS Units **mg/L**

SampID: 18010005-009AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05	S	**0.61**	0.5000	0	121.8	85	115	01/25/2018

Batch R242754 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18010005-009AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05	S	**0.60**	0.5000	0	119.8	0.6090	1.66	01/25/2018

Batch R242754 **SampType:** MS Units **mg/L**

SampID: 18010005-020AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05	S	**0.59**	0.5000	0	118.4	85	115	01/25/2018

Batch R242754 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18010005-020AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05	S	**0.61**	0.5000	0	121.4	0.5920	2.50	01/25/2018

STANDARD METHODS 4500-NO3 F (TOTAL) 2000

Batch R242739 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**< 0.050**	0.01000	0	0	-100	100	01/25/2018

Batch R242739 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	1.00		**9.21**	8.570	0	107.5	90	110	01/25/2018

STANDARD METHODS 4500-NO3 F (TOTAL) 2000

Batch R242739 **SampType:** MS Units **mg/L**

SampID: 18010005-009DMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.322**	0.2500	0.05300	107.6	85	115	01/25/2018

Batch R242739 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18010005-009DMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.310**	0.2500	0.05300	102.8	0.3220	3.80	01/25/2018

SW-846 9036 (TOTAL)

Batch R242803 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						01/26/2018

Batch R242803 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	94.7	90	110	01/26/2018

Batch R242803 **SampType:** MS Units **mg/L**

SampID: 18010005-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**29**	10.00	19.49	93.8	85	115	01/26/2018

Batch R242803 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18010005-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	10		**29**	10.00	19.49	91.3	28.87	0.87	01/26/2018

Batch R242903 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						01/29/2018

Batch R242903 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	92.8	90	110	01/29/2018

The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 20f

SW-846 9214 (DISSOLVED)

Batch R242801 **SampType:** MBLK Units mg/L

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						01/26/2018

Batch R242801 **SampType:** LCS Units mg/L

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**0.90**	1.000	0	90.2	90	110	01/26/2018

Batch R242801 **SampType:** MS Units mg/L

SampID: 18010005-007BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**3.13**	2.000	1.099	101.6	85	115	01/26/2018

Batch R242801 **SampType:** MSD Units mg/L RPD Limit **10**

SampID: 18010005-007BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**3.25**	2.000	1.099	107.6	3.132	3.70	01/26/2018

Batch R242801 **SampType:** MS Units mg/L

SampID: 18010005-011BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.40**	2.000	0.4610	97.0	85	115	01/26/2018

Batch R242801 **SampType:** MSD Units mg/L RPD Limit **10**

SampID: 18010005-011BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.49**	2.000	0.4610	101.6	2.401	3.72	01/26/2018

SW-846 9251 (TOTAL)

Batch R242805 **SampType:** MBLK Units mg/L

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						01/26/2018

Batch R242805 **SampType:** LCS Units mg/L

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	101.2	90	110	01/26/2018

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

SW-846 9251 (TOTAL)

Batch R242805 **SampType:** MS Units **mg/L**
SampID: 18010005-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	10		**81**	40.00	45.05	89.8	85	115	01/26/2018

Batch R242805 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 18010005-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	10		**82**	40.00	45.05	92.6	80.98	1.34	01/26/2018

Batch R242906 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						01/29/2018

Batch R242906 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	101.0	90	110	01/29/2018

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 138377 **SampType:** MBLK Units **mg/L**
SampID: MBLK-138377

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**< 0.0010**	).00100(	0	0	-100	100	01/25/2018
Barium	0.0010		**< 0.0010**	).00100(	0	0	-100	100	01/25/2018
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	01/26/2018
Iron	0.0250	J	**0.0096**	0.02500	0	38.4	-100	100	01/25/2018
Manganese	0.0010		**< 0.0010**	).00100(	0	0	-100	100	01/25/2018
Selenium	0.0010		**< 0.0010**	).00100(	0	0	-100	100	01/25/2018

Batch 138377 **SampType:** LCS Units **mg/L**
SampID: LCS-138377

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.469**	0.5000	0	93.9	80	120	01/25/2018
Barium	0.0010		**1.88**	2.000	0	94.2	80	120	01/25/2018
Boron	0.0250		**0.470**	0.5000	0	94.0	80	120	01/25/2018
Iron	0.0250		**1.74**	2.000	0	87.2	80	120	01/25/2018
Manganese	0.0010		**0.479**	0.5000	0	95.9	80	120	01/25/2018
Selenium	0.0010		**0.479**	0.5000	0	95.8	80	120	01/25/2018

Client: Natural Resource Technology, Inc. **Work Order:** 18010005

Client Project: Dynegy - Vermillion Power Station **Report Date:** 02-Feb-18

SW 846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 138377 **SampType:** MS Units mg/L

SampID: 18010005-002CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.489**	0.5000	0.009688	95.8	75	125	01/25/2018
Barium	0.0010		**2.06**	2.000	0.1737	94.6	75	125	01/25/2018
Boron	0.0250		**0.816**	0.5000	0.3375	95.6	75	125	01/26/2018
Iron	0.0250		**1.95**	2.000	0.2448	85.5	75	125	01/25/2018
Manganese	0.0010		**0.555**	0.5000	0.08113	94.8	75	125	01/25/2018
Selenium	0.0010		**0.423**	0.5000	0	84.7	75	125	01/25/2018

Batch 138377 **SampType:** MSD Units mg/L RPD Limit 20

SampID: 18010005-002CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.477**	0.5000	0.009688	93.4	0.4888	2.52	01/25/2018
Barium	0.0010		**2.03**	2.000	0.1737	92.6	2.065	1.92	01/25/2018
Boron	0.0250		**0.786**	0.5000	0.3375	89.6	0.8158	3.77	01/26/2018
Iron	0.0250		**1.90**	2.000	0.2448	82.8	1.954	2.81	01/25/2018
Manganese	0.0010		**0.541**	0.5000	0.08113	92.0	0.5551	2.51	01/25/2018
Selenium	0.0010		**0.417**	0.5000	0	83.3	0.4235	1.62	01/25/2018

Batch 138377 **SampType:** MS Units mg/L

SampID: 18010005-019CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.470**	0.5000	0.004707	93.1	75	125	01/25/2018
Barium	0.0010		**2.11**	2.000	0.2522	92.7	75	125	01/25/2018
Boron	0.0250	S	**5.65**	0.5000	5.426	44.8	75	125	01/26/2018
Iron	0.0250		**2.60**	2.000	1.011	79.3	75	125	01/25/2018
Manganese	0.0010		**1.04**	0.5000	0.5816	91.5	75	125	01/25/2018
Selenium	0.0010		**0.462**	0.5000	0	92.4	75	125	01/25/2018

Batch 138377 **SampType:** MSD Units mg/L RPD Limit 20

SampID: 18010005-019CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.477**	0.5000	0.004707	94.5	0.4703	1.50	01/25/2018
Barium	0.0010		**2.13**	2.000	0.2522	93.7	2.107	0.87	01/25/2018
Boron	0.0250		**5.81**	0.5000	5.426	76.6	5.650	2.77	01/26/2018
Iron	0.0250		**2.61**	2.000	1.011	80.2	2.597	0.67	01/25/2018
Manganese	0.0010		**1.05**	0.5000	0.5816	92.8	1.039	0.60	01/25/2018
Selenium	0.0010		**0.471**	0.5000	0	94.2	0.4618	1.94	01/25/2018

Teklab, Inc.
Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Work Order: 18010005

Client Project: Dynegy - Vermillion Power Station
Report Date: 02-Feb-18

Carrier: Jordan Evans
Received By: AMD

Completed by: Amber Dilallo
On: 25 Jan 18
Amber M Dilallo

Reviewed by: Elizabeth A. Hurley
On: 25 Jan 18
Elizabeth A Hurley

Pages to follow: Chain of custody [2] Extra pages included [36]

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C	4.22
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice	☐
Chain of custody present?	Yes ☑	No ☐			
Chain of custody signed when relinquished and received?	Yes ☑	No ☐			
Chain of custody agrees with sample labels?	Yes ☑	No ☐			
Samples in proper container/bottle?	Yes ☑	No ☐			
Sample containers intact?	Yes ☑	No ☐			
Sufficient sample volume for indicated test?	Yes ☑	No ☐			
All samples received within holding time?	Yes ☑	No ☐			
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐		
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐			

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 18010005

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: Natural Resource Technology, Inc.
Address: 2422 East Washington Street
City / State / Zip Bloomington, IL 61704
Contact: Steve Wiskes **Phone:** (414) 837-3614
E-Mail: steve.wiskes@obg com **Fax:**

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No
Are these samples known to be hazardous? ☐ Yes ☒ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section ☐ Yes ☒ No

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 4.2 °C
Preserved in: ☐ LAB ☒ FIELD **FOR LAB USE ONLY**
1/25/18
Lab Notes: * TW1 no longer in service
* MW7 Well dry

Client Comments
Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.

Project Name/Number	Sample Collector's Name
Dynegy - Vermillion Power Station	T. Mathis J. Evans

Results Requested: ☒ Standard ☐ 1-2 Day (100% Surcharge) ☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Groundwater	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O B	Field ORP SM 2580-B	Field pH SM 4500-H+B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500-NO3 F	Sulfate 9036	TDS SM 2540C
18010005-001	MW1	1-24-18 1533	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
002	MW2	1-24-18 1632	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
003	MW7 *		2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
004	MW10	1-24-18 1659	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
005	MW17	1-24-18 1151	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
006	MW18	1-24-18 1206	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
007	MW21	1-24-18 1555	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
008	TW1 *		2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
009	MW3R	1-24-18 1448	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
010	MW4	1-24-18 1334	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	1-25-18 0900	[signature]	1/25/18 900

BottleOrder: 41655

0900 1/25/18

CHAIN OF COUSTODY

pg. 2 of 2 Work order # 18010005

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client:	Natural Resource Technology, Inc.
Address:	2422 East Washington Street
City / State / Zip	Bloomington, IL 61704
Contact:	Steve Wiskes
Phone:	(414) 837-3614
E-Mail:	steve.wiskes@obg.com
Fax:	

Samples on: ☒ ICE ☒ BLUE ICE ☒ NO ICE _____ °C

Preserved in: ☒ LAB ☒ FIELD

FOR LAB USE ONLY

Lab Notes:

Client Comments

Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No

Are these samples known to be hazardous? ☐ Yes ☒ No

Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☒ No

Project Name/Number	Sample Collector's Name
Dynegy - Vermillion Power Station	T. Mathis J. Evans

Results Requested

☒ Standard ☐ 1-2 Day (100% Surcharge)

☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Matrix: Groundwater	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O	Field ORP SM 2580-B	Field pH SM 4500-H B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500-NO3 E	Sulfate 9036	TDS SM 2540C
18010005-011	MW5	1-24-18 1425	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
012	MW6R	1-24-18 1355	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
013	MW8R	1-24-18 1505	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
014	MW9	1-24-18 1350	0			X										X			
015	MW19	1-24-18 1355	0			X										X			
016	MW20	1-24-18 1305	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
017	MW34	1-24-18 1238	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
018	Field Blank	1-24-18 1539	2	1	1	X	X	X	X								X	X	X
019	DUP1	1-24-18 1334	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
020	DUP2	1-24-18 1355	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	1-25-18 0900	[signature]	1/25/18 900

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 41655

Monitoring Well Evaluation Checklist

				Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?			X	
Inspection Date	1-24-18					
Well Number	MW1					

Stick-up Monitoring Wells	Yes	No	NA	**Comments**
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14 No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad Installed?		X		
19 . Concrete pad			X	
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ____ Task #: ____ Start Date: 1-24-18 Time: 1525

Field Personnel: T Mathis J Evans Finish Date: 1-24-18 Time: 1533

WELL INFORMATION

Well ID: MW 1

Casing ID: ____ inches

EVENT TYPE

☐ Well Development ☒ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1525		79.67								
	1527	.13	84.02	4.35	10.94	6.80	3540	0	2.2	65	clear
	1529	.26	84.70	.68	11.52	6.90	3480	0	.7	62	Clear
	1531	.39	86.47	1.77	11.72	6.92	3460	0	0	62	clear
	1533	.52	87.51	1.04	11.75	6.93	3450	0	0	64	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celsius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?		
Inspection Date	1-24-18			
Well Number	MW2			

Yes	No	NA
	X	

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded				
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?				
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19 . Concrete pad			X	
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?	✓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 1-24-18 Time: 1620

Field Personnel: T Mathis J Evans Finish Date: 1-24-18 Time: 1632

WELL INFORMATION

Well ID: MW2

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1620		18.14								
	1622	.13	20.34	2.2	12.01	7.02	1120	9.26	0	8	clear
	1624	.26	20.80	.46	12.31	7.19	1090	6.47	0	-50	clear
	1626	.39	21.10	.30	12.44	7.27	1110	5.70	0	-64	Clear
	1628	.52	21.29	.19	12.55	7.35	1100	4.78	0	-75	Clear
	1630	.65	21.78	.49	12.62	7.38	1090	4.13	0	-82	Clear
	1632	.78	21.95	.17	12.66	7.40	1090	3.33	0	-88	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celsius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermillion	Major wells repairs* required to maintain well integrity?			
Inspection Date	1-24-18				
Well Number	MW7				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19 . Concrete pad			X	
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?	X			

Comments.

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion
Client: NRT
Project Number:
Task #:
Start Date: 1-24-18
Time:
Field Personnel: T. Mathis J. Evans
Finish Date: 1-24-18
Time:

WELL INFORMATION

Well ID: MW7
Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
			Dry								

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	1-24-18			X	
Well Number	MW10				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				
	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 1-24-18 Time: 1645

Field Personnel: T Mathis J Evans Finish Date: 1-24-18 Time: 1659

WELL INFORMATION

Well ID: MW10

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1645		52.00								
	1649	.26	53.55	1.55	9.25	7.37	1490	0	0	39	Clear
	1651	.39	53.89	.34	10.24	7.21	1450	0	0	38	Clear
	1653	.52	54.36	.47	10.43	7.14	1460	0	7.6	40	Clear
	1655	.65	54.68	.32	10.55	7.06	1480	0	18.7	44	Clear
	1657	.78	54.68	0	10.60	7.04	1490	0	15.5	48	Clear
	1659	.91	54.68	0	10.74	7.01	1490	.0	9.5	50	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	1-24-18			X	
Well Number	MW-17				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented	X			
Not cracked	X			
Not loose	X			
2. Inner casing				
Not corroded			X	
Not dented				
Not cracked				
Not loose				
3. Are there weep holes in outer casing?		X	X	
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad	X			
Slope away form casing?	X			
Not deteriorated?	X			
Not heaved or below surrounding grade?	X			
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

Page 1 of 2

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion   Client: NRT

Project Number: Task #:   Start Date: 1-24-18   Time: 1052

Field Personnel: J. Evans T. Mathis   Finish Date: 1-24-18   Time: ~~1159~~ 1151

WELL INFORMATION

Well ID: MW-17

Casing ID: inches

EVENT TYPE

1-24-18

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1057		38.98								
	1100	.13	40.92	1.94							
	1103	.26	44.41	3.49							
	1106	.39	46.27	1.86							
	1109	.52	48.00	1.73							
	1112	.65	49.71	1.71							
	1115	.78	52.29	2.58	11.05	7.89	2220	16.3	30.5	157	clear
	1118	.91	53.15	.86	11.51	7.16	2220	19.2	79.1	169	SL cloudy
	1121	.94	53.86	.71	11.05	6.96	2260	.37	119	167	SL cloudy
	1124	1.07	54.17	.31	10.15	6.80	2320	0	119	164	SL cloudy
	1127	1.20	54.36	.19	10.58	6.70	2360	0	113	153	SL cloudy
	1130	1.33	54.80	.44	10.43	6.64	2400	0	102	145	SL cloudy
	1133	1.46	54.99	.19	10.41	6.61	2420	0	35.6	134	SL cloudy
	1136	1.59	55.08	.09	10.31	6.53	2440	0	52.3	126	SL cloudy

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion
Client: NRT
Project Number:
Task #:
Start Date: 1-24-18
Time: 1057
Field Personnel: J Evans T Mathis
Finish Date: 1-24-18
Time: ~~1152~~ 1151

WELL INFORMATION

Well ID: MW-17
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1139	1.72	55.25	.17	10.25	6.56	2440	0	46.8	120	clear
	1142	1.85	55.36	.11	10.10	6.55	2460	0	32.9	112	clear
	1145	1.98	55.40	.04	10.06	6.55	2480	0	19.4	105	clear
	1148	2.11	55.45	.05	10.03	6.55	2490	0	16.6	100	clear
	1151	2.24	55.48	.03	9.97	6.56	2490	0	7.7	97	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	1-24-18			X	
Well Number	MW-18				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
2. Inner casing				
Not corroded	X		X	
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad	X			
Slope away form casing?	X			
Not deteriorated?	X			
Not heaved or below surrounding grade?	X			
20. No surface seal settling?	X			
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion   Client: NRT
Project Number: Task #:   Start Date: 1-24-18   Time: 1200
Field Personnel: T. Mathis J. Evans   Finish Date: 1-24-18   Time: 1206

WELL INFORMATION

Well ID: MW-18
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1200		27.80								clear
	1202	.13	27.80	0	11.89	6.54	2740	0	0	86	
	1204	.26	27.80	0	11.94	6.54	2720	0	0	82	
	1206	.39	27.80	0	12.03	6.55	2700	0	0	79	↓

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	1-24-18			X	
Well Number	MW-4				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad	↓			
Slope away form casing?	↓			
Not deteriorated?	↓			
Not heaved or below surrounding grade?	↓			
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?	↓			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 1-24-18 Time 1547

Field Personnel: T Mathis J Evans Finish Date: 1-24-18 Time 1555

WELL INFORMATION

Well ID: MW 21

Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1547		91.40								
	1551	.26	95.1	3.7	11.24	7.22	884	0	0	-4	Clear
	1553	.39	96.71	1.61	11.55	7.24	850	0	0	-44	clear
	1555	.52	98.03	1.32	11.58	7.26	843	0	0	-53	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	1-24-18			X	
Well Number	MW3R				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
2. Inner casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19 . Concrete pad			X	
Slope away form casing?			X	
Not deteriorated?			X	
Not heaved or below surrounding grade?			X	
20. No surface seal settling?			X	
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion | Client: NRT
Project Number: | Task #: | Start Date: 1-24-18 | Time 1440
Field Personnel: T Mathis J Evans | Finish Date: 1-24-18 | Time 1458

WELL INFORMATION

Well ID: MW3R
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1440		5.5								
	1442	.13	5.5	0	10.95	6.83	1160	0	0	-12	clear
	1444	.26	5.5	0	11.59	6.89	1160	0	0	-40	clear
	1446	.39	5.5	0	11.92	6.92	1170	0	0	-52	clear
	1448	.52	5.5	0	11.97	6.95	1180	0	0	-58	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermillion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	1-24-15				
Well Number	MW04				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19 . Concrete pad			X	
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 1-24-18 Time: 1318

Field Personnel: T Mathis J Evans Finish Date: 1-24-18 Time: 1334

WELL INFORMATION

Well ID: MW04

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1318		6.76								
	1322	.26	7.30	.54							
	1324	.39	7.30	0	9.40	6.44	743	0	0	61	clear
	1326	JE ~~.42~~ .52	7.30	0	9.86	6.66	739	0	0	39	clear
	1328	JE ~~.55~~ .65	7.30	0	9.96	6.74	735	0	0	24	clear
	1330	JE ~~.68~~ .78	7.30	0	10.06	6.82	734	0	0	14	clear
	1332	.91	7.30	0	10.09	6.87	728	0	0	8	clear
	1334	1.04	7.30	0	10.08	6.91	736	0	0	2	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: Vermillion
Inspection Date: 1-24-18
Well Number: MW05

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT
Project Number: Task #: Start Date: 1-24-18 Time: 1413
Field Personnel: T Mathis J Evans Finish Date: 1-24-18 Time: 1425

WELL INFORMATION

Well ID: MW05
Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1413		6.38								
	1421	~~.43~~ .52	6.38	0	9.73	6.96	1050	0	0	-39	clear
	1423	.65	6.38	0	9.90	6.98	1050	0	0	-37	clear
	1425	.78	6.38	0	9.97	6.99	1050	0	0	-35	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	1-24-18			X	
Well Number	MW6R				

Stick up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

	Yes	No	NA	
General Condition				
18. Concrete pad Installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 1-24-18 Time: 340

Field Personnel: T Mathis J Evans Finish Date: 1-24-18 Time: 1355

WELL INFORMATION

Well ID: MW 64R

Casing ID: 1-24-18 inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1349		5.15								
	1351	.13	↓	0	9.97	6.74	1180	0	0	-35	Clear
	1353	.26		0	10.39	6.75	1190	0	0	-59	clear
	1355	.39		0	10.58	6.76	1200	0	0	-69	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	1-24-18			X	
Well Number	MW 8R				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?		X		
19. Concrete pad			X	
Slope away form casing?			X	
Not deteriorated?			X	
Not heaved or below surrounding grade?			X	
20. No surface seal settling?			X	
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

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WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 1-24-18 Time: 1453

Field Personnel: T. Mathis J. Evans Finish Date: 1-24-18 Time: 1505

WELL INFORMATION

Well ID: MW 8R

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☒ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1453		12.74								
	1459	.39	12.74	0	10.45	7.08	1440	0	0	~~0~~ -23	Clear
	1501	.52	12.74	0	10.60	6.96	1510	0	0	-20	clear
	1503	.65	12.74	0	10.61	6.92	1550	0	0	-20	clear
	1505	.78	12.74	0	10.61	6.88	1610	0	0	-20	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date				X	
Well Number	MW09				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21 Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion   Client: NRT

Project Number: ______   Task #: ______   Start Date: 1-24-18   Time: 1350

Field Personnel: T Mathis J Evans   Finish Date: 1-24-18   Time: 1350

WELL INFORMATION

Well ID: MW09

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [ ] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1350		5.66								

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	1-24-18			X	
Well Number	MW19				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented	X			
Not cracked	X			
Not loose	X			

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented	X			
Not cracked	X			
Not loose	X			

	Yes	No	NA	
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			X	
10. No water in the flushmount?			X	
11. Is the well cap lockable?			X	
12. Is there a lock present?			X	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?			X	
14. No plant roots or vegetation in well?			X	
15. No sediment in bottom of well?			X	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad	X			
Slope away form casing?	X			
Not deteriorated?	X			
Not heaved or below surrounding grade?	X			
20. No surface seal settling?	X			
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT
Project Number: Task #: Start Date: 1-24-18 Time: 1355
Field Personnel: T. Mathis J. Evans Finish Date: 1-24-18 Time: 1355

WELL INFORMATION

Well ID: MW19
Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☐ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1355		6.29								

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	1-24-19				
Well Number	MW20				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented	X			
Not cracked	X			
Not loose	X			
2. Inner casing				
Not corroded	X			
Not dented	X			
Not cracked	X			
Not loose	X			
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad	X			
Slope away form casing?	X			
Not deteriorated?	X			
Not heaved or below surrounding grade?	X			
20. No surface seal settling?	X			
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 1-24-18 Time: 1243

Field Personnel: T Mathis J Evans Finish Date: 1-24-18 Time: 1305

WELL INFORMATION

Well ID: MW20

Casing ID: inches

EVENT TYPE

☐ Well Development ☒ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1243		14.36	1-24-18	JE						
	1257	.91		~~0~~	~~10.68~~	~~6.78~~	~~833~~	~~0~~	~~0~~	~~3~~	Clear
	1259	1.03		0	10.68	6.78	833	0	0	3	Clear
	1301	1.16		0	10.82	6.72	841	0	0	1	Clear
	1303	1.29		0	10.92	6.68	845	0	0	1	Clear
	1305	1.42	↓	0	10.95	6.66	849	0	0	0	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	1-24-18			X	
Well Number	MW34				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	Comments
3. Are there weep holes in outer casing?		X		
4. Weep holes able to drain?			X	
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells

	Yes	No	NA	Comments
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	Comments
			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	Comments
18. Concrete pad installed?	X			
19 . Concrete pad	X			
Slope away form casing?	X			
Not deteriorated?	X			
Not heaved or below surrounding grade?	X			
20. No surface seal settling?	X			
21. Well clearly visible and labeled?	X			

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

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WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT
Project Number: Task #: Start Date: 1-24-18 Time: 1220
Field Personnel: T. Mathis J. Evans Finish Date: 1-24-18 Time: 1238

WELL INFORMATION

Well ID: MW34
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1220		15.15								
	1226	.13	15.15	0	9.63	6.39	1120	0	17.6	35	clear
	1228	.26	↓	0	10.19	6.47	1120	0	21.4	-3	clear
	1230	.39		0	10.61	6.50	1120	0	27.9	-21	clear
	1232	.52		0	10.70	6.53	1120	0	41.6	-29	clear
	1234	.65		0	10.77	6.55	1120	0	34.6	-35	clear
	1236	.78		0	10.81	6.56	1120	0	34.9	-40	clear
	1238	.91	↓	0	10.87	6.58	1120	0	33.4	-44	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT

Project Number: Task #: Start Date: 1-24-18 Time: 1318

Field Personnel: T Mathis J Evans Finish Date: 1-24-18 Time: 1334

WELL INFORMATION

Well ID: Dup 1

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1318		6.76								
	1334	1.09	7.30	0	10.03	6.91	736	0	0	2	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT

Project Number: Task #: Start Date: 1-24-18 Time: 1349

Field Personnel: T Muth's J Evans Finish Date: 1-24-18 Time: 1355

WELL INFORMATION

Well ID: Dup 2

Casing ID: inches

EVENT TYPE

☐ Well Development ☒ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1349		5.15								
	1355	.39	5.15	0	10.58	6.76	1200	0	0	-64	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Field Calibration Form

Groundwater Quality Meter

Groundwater Quality Meter Manufacturer/Model Horiba U52

Serial Number 3BTHKUPU

oxidation/reduction potential, dissolved oxygen, pH, tubidity

Date of Calibration Check	Calibration Standard Concentration	Calibration Reading	Within +/_ 10% (yes or no)	Comments
1-24-18	4.00	4.00	Yes	
	7.00	7.00		
	10.00	10.01		
	1412	1410		
	0.0	0.0		
	100%	90.1%		
	7.00	7.05		
	1412	1450		
	0.0	0.9		
	100%	102.4%		

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

10883 Metro Blvd
Maryland Heights, MO 63043
Toll-free: (800) 242-3910

Pine Environmental Services, Inc.

Instrument ID 21305
Description Horiba U-52
Calibrated 1/15/2018 5:09:57PM

Manufacturer Horiba
Model Number U-5000
Serial Number/ Lot Number 3BTHKUPU
Location St. Louis
Department

State Certified
Status Pass
Temp °C 22.2
Humidity % 32

Calibration Specifications

Group # 1
Group Name PH
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.00 / 7.00	PH	7.00	PH	6.99	7.00	0.00%	Pass
4.00 / 4.00	PH	4.00	PH	4.10	4.00	0.00%	Pass

Group # 2
Group Name Turbidity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	3.60	0.00	0.00%	Pass
800.00 / 800.00	NTU	800.00	NTU	832.00	800.00	0.00%	Pass

Group # 3
Group Name Conductivity
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.718 / 0.718	ms/cm	0.718	ms/cm	0.558	0.718	0.00%	Pass
5.000 / 5.000	ms/cm	5.000	ms/cm	4.900	5.000	0.00%	Pass
80.000 / 80.000	ms/cm	80.000	ms/cm	78.000	80.000	0.00%	Pass

Group # 4
Group Name Redox (ORP)
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	251.00	240.00	0.00%	Pass

Group # 5
Group Name Disolved Oxygen
Stated Accy Pct of Reading
Range Acc % 0.0000
Reading Acc % 3.0000
Plus/Minus 0.00

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

10883 Metro Blvd
Maryland Heights, MO 63043
Toll-free: (800) 242-3910

Pine Environmental Services, Inc.

Instrument ID 21305
Description Horiba U-52
Calibrated 1/15/2018 5:09:57PM

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

10883 Metro Blvd
Maryland Heights, MO 63043
Toll-free: (800) 242-3910

Pine Environmental Services, Inc.

Instrument ID 19277
Description Horiba U-52
Calibrated 1/15/2018 5:10:46PM

Manufacturer	Horiba	**State Certified**	
Model Number	U-52	**Status**	Pass
Serial Number/ Lot Number	PSN4WLPU	**Temp °C**	22.2
Location	St. Louis	**Humidity %**	32
Department			

Calibration Specifications

Group # 1
Group Name functionality test
Test Performed: Yes **As Found Result:** Pass **As Left Result:** Pass

Test Instruments Used During the Calibration **(As Of Cal Entry Date)**

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Chris Harkins

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

April 09, 2018

Steve Wiskes
Natural Resource Technology, Inc.
2422 East Washington Street
Suite 104
Bloomington, IL 61704
TEL. (414) 837-3614
FAX: (414) 837-3608

NELAP ACCREDITED TNI LABORATORY

RE: Dynegy - Vermillion Power Station **WorkOrder:** 18030183

Dear Steve Wiskes:

TEKLAB, INC received 19 samples on 3/22/2018 8:20:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
Case Narrative	4
Accreditations	5
Laboratory Results	6
Sample Summary	24
Dates Report	25
Quality Control Results	34
Receiving Check List	41
Chain of Custody	Appended

Abbr Definition

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	J -	Analyte detected below quantitation limits
M -	Manual Integration used to determine area response	ND -	Not Detected at the Reporting Limit
R -	RPD outside accepted recovery limits	S -	Spike Recovery outside recovery limits
T -	TIC(Tentatively identified compound)	X -	Value exceeds Maximum Contaminant Level

Case Narrative

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 18030183

Report Date: 09-Apr-18

Cooler Receipt Temp: 5.42 °C

An employee of Teklab, Inc. collected the sample(s)

MW7 could not be collected; the well was dry. JE/EAH 3/23/18

Locations

Collinsville		Springfield		Kansas City	
Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425	Address	3920 Pintail Dr Springfield, IL 62711-9415	Address	8421 Nieman Road Lenexa, KS 66214
Phone	(618) 344-1004	Phone	(217) 698-1004	Phone	(913) 541-1998
Fax	(618) 344-1005	Fax	(217) 698-1005	Fax	(913) 541-1998
Email	jhriley@teklabinc.com	Email	KKlostermann@teklabinc.com	Email	jhriley@teklabinc.com

Collinsville Air		Chicago	
Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425	Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(618) 344-1004	Phone	(630) 324-6855
Fax	(618) 344-1005	Fax	
Email	EHurley@teklabinc.com	Email	arenner@teklabinc.com

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2019	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88 0966		3/14/2019	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2019	Collinsville
Kentucky	KDEP	98006		12/31/2018	Collinsville
Kentucky	UST	0073		1/31/2019	Collinsville
Louisiana	LDPH	LA170027		12/31/2018	Collinsville
Missouri	MDNR	930		1/31/2019	Collinsville
Missouri	MDNR	00930		5/31/2019	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2019	Collinsville

Teklab Inc.
Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-001 **Client Sample ID:** MW1

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 13:39

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**79.37**	ft	1	03/22/2018 13:39	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.92**		1	03/22/2018 13:39	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**3.3**	NTU	1	03/22/2018 13:39	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**77**	mV	1	03/22/2018 13:39	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**2820**	µS/cm	1	03/22/2018 13:39	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**14.09**	°C	1	03/22/2018 13:39	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**1.02**	mg/L	1	03/22/2018 13:39	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**2240**	mg/L	1	03/23/2018 15:09	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.289**	mg/L	1	03/27/2018 14:02	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1280**	mg/L	50	03/28/2018 19:20	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.15**	mg/L	1	03/23/2018 18:06	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**22**	mg/L	1	03/28/2018 19:11	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 22:21	140252
Barium	NELAP	0.0010		**0.0137**	mg/L	5	03/26/2018 16:38	140252
Boron	NELAP	0.0250	S	**1.98**	mg/L	5	03/27/2018 12:41	140252
Iron	NELAP	0.0250		**0.248**	mg/L	5	03/27/2018 12:41	140252
Manganese	NELAP	0.0010		**0.0268**	mg/L	5	03/26/2018 15:38	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 22:21	140252

B - Matrix interference present in sample. Verified by bench spike.

Laboratory Results

Teklab, Inc. Environmental Laboratory

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-002 **Client Sample ID:** MW2

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 12:47

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**18.90**	ft	1	03/22/2018 12:47	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.60**		1	03/22/2018 12:47	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	03/22/2018 12:47	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-144**	mV	1	03/22/2018 12:47	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**862**	µS/cm	1	03/22/2018 12:47	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**14.22**	°C	1	03/22/2018 12:47	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 12:47	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**506**	mg/L	1	03/23/2018 15:09	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.085**	mg/L	1	03/27/2018 14:04	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**85**	mg/L	5	03/28/2018 15:03	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.66**	mg/L	1	03/23/2018 18:07	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	10		**33**	mg/L	2	03/28/2018 14:36	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0107**	mg/L	5	03/23/2018 22:45	140252
Barium	NELAP	0.0010		**0.174**	mg/L	5	03/26/2018 15:47	140252
Boron	NELAP	0.0250		**0.273**	mg/L	5	03/28/2018 13:09	140252
Iron	NELAP	0.0250		**0.982**	mg/L	5	03/27/2018 12:49	140252
Manganese	NELAP	0.0010		**0.109**	mg/L	5	03/26/2018 15:47	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 22:45	140252

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station
Lab ID: 18030183-004
Matrix: GROUNDWATER

Work Order: 18030183
Report Date: 09-Apr-18
Client Sample ID: MW10
Collection Date: 03/22/2018 15:14

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**50.84**	ft	1	03/22/2018 15:14	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.81**		1	03/22/2018 15:14	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**2.9**	NTU	1	03/22/2018 15:14	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**74**	mV	1	03/22/2018 15:14	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1450**	µS/cm	1	03/22/2018 15:14	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**14.26**	°C	1	03/22/2018 15:14	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 15:14	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**890**	mg/L	1	03/23/2018 15:10	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.115**	mg/L	1	03/27/2018 14:13	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**296**	mg/L	10	03/28/2018 15:19	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.20**	mg/L	1	03/23/2018 18:09	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**9**	mg/L	1	03/28/2018 15:11	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 22:53	140252
Barium	NELAP	0.0010		**0.0890**	mg/L	5	03/26/2018 15:55	140252
Boron	NELAP	0.0250		**0.0812**	mg/L	5	03/27/2018 12:58	140252
Iron	NELAP	0.0250		**0.0272**	mg/L	5	03/27/2018 12:58	140252
Manganese	NELAP	0.0010		**0.0327**	mg/L	5	03/26/2018 15:55	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 22:53	140252

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-005 **Client Sample ID:** MW17

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 8:44

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**39.05**	ft	1	03/22/2018 8:44	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.86**		1	03/22/2018 8:44	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**32.4**	NTU	1	03/22/2018 8:44	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**18**	mV	1	03/22/2018 8:44	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**2850**	µS/cm	1	03/22/2018 8:44	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**12.44**	°C	1	03/22/2018 8:44	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 8:44	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**2090**	mg/L	1	03/23/2018 15:10	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.086**	mg/L	1	03/27/2018 14:15	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1270**	mg/L	50	03/28/2018 15:27	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.23**	mg/L	1	03/23/2018 18:10	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**26**	mg/L	1	03/28/2018 15:19	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0018**	mg/L	5	03/23/2018 23:02	140252
Barium	NELAP	0.0010		**0.0275**	mg/L	5	03/26/2018 16:03	140252
Boron	NELAP	0.0250		**3.25**	mg/L	5	03/27/2018 15:01	140252
Iron	NELAP	0.0250		**3.92**	mg/L	5	03/27/2018 15:01	140252
Manganese	NELAP	0.0010		**0.132**	mg/L	5	03/26/2018 16:03	140252
Selenium	NELAP	0.0010		**0.0012**	mg/L	5	03/23/2018 23:02	140252

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-006 **Client Sample ID:** MW18

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 9:01

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**24.26**	ft	1	03/22/2018 9:01	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.87**		1	03/22/2018 9:01	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	03/22/2018 9:01	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**47**	mV	1	03/22/2018 9:01	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**2310**	µS/cm	1	03/22/2018 9:01	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**13.34**	°C	1	03/22/2018 9:01	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 9:01	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**1540**	mg/L	1	03/23/2018 15:10	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 14:28	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**795**	mg/L	20	03/28/2018 15:35	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.14**	mg/L	1	03/23/2018 18:12	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**24**	mg/L	1	03/28/2018 15:27	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 23:10	140252
Barium	NELAP	0.0010		**0.0150**	mg/L	5	03/26/2018 16:11	140252
Boron	NELAP	0.0250		**7.95**	mg/L	5	03/27/2018 15:09	140252
Iron	NELAP	0.0250		**0.0573**	mg/L	5	03/27/2018 15:09	140252
Manganese	NELAP	0.0010		**1.33**	mg/L	5	03/26/2018 16:11	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 23:10	140252

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-007 **Client Sample ID:** MW21

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 13:08

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**91 25**	ft	1	03/22/2018 13:08	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.40**		1	03/22/2018 13:08	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	03/22/2018 13:08	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-134**	mV	1	03/22/2018 13:08	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**732**	µS/cm	1	03/22/2018 13:08	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**13.49**	°C	1	03/22/2018 13:08	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 13:08	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**390**	mg/L	1	03/23/2018 15:11	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 14:30	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**22**	mg/L	1	03/28/2018 15:38	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**1.10**	mg/L	1	03/23/2018 18:16	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	03/28/2018 15:35	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0322**	mg/L	5	03/23/2018 23:18	140252
Barium	NELAP	0.0010		**0.0909**	mg/L	5	03/26/2018 16:19	140252
Boron	NELAP	0.0250		**0.758**	mg/L	5	03/27/2018 13:06	140252
Iron	NELAP	0.0250		**0.683**	mg/L	5	03/27/2018 13:06	140252
Manganese	NELAP	0.0010		**0.110**	mg/L	5	03/26/2018 16:19	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 23:18	140252

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-008 **Client Sample ID:** MW3R

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 12:13

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**7.71**	ft	1	03/22/2018 12:13	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.34**		1	03/22/2018 12:13	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**1.5**	NTU	1	03/22/2018 12:13	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-128**	mV	1	03/22/2018 12:13	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1070**	µS/cm	1	03/22/2018 12:13	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**13.49**	°C	1	03/22/2018 12:13	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 12:13	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**606**	mg/L	1	03/23/2018 15:11	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 14:32	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**101**	mg/L	5	03/28/2018 16:08	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.69**	mg/L	1	03/23/2018 18:17	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**25**	mg/L	1	03/28/2018 15:54	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0061**	mg/L	5	03/23/2018 23:26	140252
Barium	NELAP	0.0010		**0.167**	mg/L	5	03/26/2018 16:28	140252
Boron	NELAP	0.0250		**3.33**	mg/L	5	03/27/2018 13:14	140252
Iron	NELAP	0.0250		**1.49**	mg/L	5	03/27/2018 13:14	140252
Manganese	NELAP	0.0010		**0.0366**	mg/L	5	03/26/2018 16:28	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 23:26	140252

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-009 **Client Sample ID:** MW4

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 10:55

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**6.35**	ft	1	03/22/2018 10:55	R245290
STANDARD METHOD 4500 H B 2001 FIELD								
pH	*	1.00		**7.54**		1	03/22/2018 10:55	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	03/22/2018 10:55	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-126**	mV	1	03/22/2018 10:55	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**643**	µS/cm	1	03/22/2018 10:55	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.69**	°C	1	03/22/2018 10:55	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 10:55	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**370**	mg/L	1	03/23/2018 15:11	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 14:37	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**47**	mg/L	1	03/28/2018 16:10	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.54**	mg/L	1	03/23/2018 18:19	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**9**	mg/L	1	03/28/2018 16:08	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0047**	mg/L	5	03/23/2018 23:35	140252
Barium	NELAP	0.0010		**0.246**	mg/L	5	03/20/2018 10:30	140252
Boron	NELAP	0.0250		**4.80**	mg/L	5	03/27/2018 13:22	140252
Iron	NELAP	0.0250		**0.974**	mg/L	5	03/27/2018 13:22	140252
Manganese	NELAP	0.0010		**0.595**	mg/L	5	03/26/2018 16:36	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 23:35	140252

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-010 **Client Sample ID:** MW5

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 11:19

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**6.43**	ft	1	03/22/2018 11:19	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.43**		1	03/22/2018 11:19	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	03/22/2018 11:19	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-16**	mV	1	03/22/2018 11:19	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**888**	µS/cm	1	03/22/2018 11:19	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.73**	°C	1	03/22/2018 11:19	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 11:19	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**624**	mg/L	1	03/23/2018 15:11	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 14:39	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**281**	mg/L	10	03/28/2018 16:24	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.67**	mg/L	1	03/23/2018 18:24	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	03/28/2018 16:16	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 23:43	140252
Barium	NELAP	0.0010		**0.0234**	mg/L	5	03/26/2018 16:44	140252
Boron	NELAP	0.0250		**16.7**	mg/L	5	03/27/2018 15:17	140252
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	03/27/2018 15:17	140252
Manganese	NELAP	0.0010		**0.358**	mg/L	5	03/26/2018 16:44	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 23:43	140252

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-011 **Client Sample ID:** MW6R

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 9:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**4.12**	ft	1	03/22/2018 9:25	R245290
STANDARD METHOD 4500 H B 2001 FIELD								
pH	*	1.00		**7.09**		1	03/22/2018 9:25	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**1.5**	NTU	1	03/22/2018 9:25	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-121**	mV	1	03/22/2018 9:25	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1040**	µS/cm	1	03/22/2018 9:25	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.95**	°C	1	03/22/2018 9:25	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 9:25	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**590**	mg/L	1	03/23/2018 15:12	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 14:48	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**135**	mg/L	5	03/28/2018 16:32	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.22**	mg/L	1	03/23/2018 18:26	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**6**	mg/L	1	03/28/2018 16:24	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 23:51	140252
Barium	NELAP	0.0010		**0.0948**	mg/L	5	03/26/2018 17:09	140252
Boron	NELAP	0.0250		**0.166**	mg/L	5	03/28/2018 13:01	140252
Iron	NELAP	0.0250		**0.118**	mg/L	5	03/27/2018 13:30	140252
Manganese	NELAP	0.0010		**0.149**	mg/L	5	03/26/2018 17:09	140252
Selenium	NELAP	0.0010		**0.0027**	mg/L	5	03/23/2018 23:51	140252

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-012 **Client Sample ID:** MW8R

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 11:58

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**12.67**	ft	1	03/22/2018 11:58	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.67**		1	03/22/2018 11:58	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**1.6**	NTU	1	03/22/2018 11:58	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-54**	mV	1	03/22/2018 11:58	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**2200**	µS/cm	1	03/22/2018 11:58	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**11.79**	°C	1	03/22/2018 11:58	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 11:58	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**1700**	mg/L	1	03/23/2018 15:12	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.055		**< 0.055**	mg/L	1	03/27/2018 14:50	R245123
Elevated reporting limit due to matrix interference.								
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1010**	mg/L	50	03/28/2018 16:59	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	03/23/2018 18:27	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	03/28/2018 16:32	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0029**	mg/L	5	03/23/2018 23:59	140252
Barium	NELAP	0.0010		**0.124**	mg/L	5	03/26/2018 17:17	140252
Boron	NELAP	0.0250		**38.4**	mg/L	5	03/27/2018 15:25	140252
Iron	NELAP	0.0250		**0.0406**	mg/L	5	03/27/2018 15:25	140252
Manganese	NELAP	0.0010		**0.244**	mg/L	5	03/26/2018 17:17	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/23/2018 23:59	140252

Client: Natural Resource Technology, Inc.
Work Order: 18030183
Client Project: Dynegy - Vermillion Power Station
Report Date: 09-Apr-18
Lab ID: 18030183-013
Client Sample ID: MW9
Matrix: GROUNDWATER
Collection Date: 03/22/2018 9:35

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**4.60**	ft	1	03/22/2018 9:35	R245290

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-014 **Client Sample ID:** MW19

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 9:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**6.23**	ft	1	03/22/2018 9:25	R245290

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-015 **Client Sample ID:** MW20

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 9:58

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**13.09**	ft	1	03/22/2018 9:58	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.18**		1	03/22/2018 9:58	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**8.1**	NTU	1	03/22/2018 9:58	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-31**	mV	1	03/22/2018 9:58	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**585**	µS/cm	1	03/22/2018 9:58	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.55**	°C	1	03/22/2018 9:58	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 9:58	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**312**	mg/L	1	03/23/2018 15:13	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 14:52	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**46**	mg/L	1	03/28/2018 17:02	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	03/23/2018 18:28	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	03/28/2018 16:59	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	03/24/2018 0:24	140252
Barium	NELAP	0.0010		**0.0133**	mg/L	5	03/26/2018 17:25	140252
Boron	NELAP	0.0250		**0.262**	mg/L	5	03/27/2018 13:39	140252
Iron	NELAP	0.0250		**0.0991**	mg/L	5	03/27/2018 13:39	140252
Manganese	NELAP	0.0010		**0.0159**	mg/L	5	03/26/2018 17:25	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/24/2018 0:24	140252

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-016 **Client Sample ID:** MW34

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 10:32

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**13.99**	ft	1	03/22/2018 10:32	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.18**		1	03/22/2018 10:32	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**52.1**	NTU	1	03/22/2018 10:32	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-153**	mV	1	03/22/2018 10:32	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**954**	µS/cm	1	03/22/2018 10:32	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**12.27**	°C	1	03/22/2018 10:32	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 10:32	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**484**	mg/L	1	03/23/2018 15:13	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 15:05	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10	S	**< 10**	mg/L	1	03/28/2018 17:10	R245223
Matrix spike did not recover within control limits due to matrix interference.								
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.81**	mg/L	1	03/23/2018 18:33	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	10		**34**	mg/L	2	03/28/2018 17:18	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0223**	mg/L	5	03/24/2018 0:32	140252
Barium	NELAP	0.0010		**0.142**	mg/L	5	03/20/2018 17:33	140252
Boron	NELAP	0.0250		**0.453**	mg/L	5	03/27/2018 13:47	140252
Iron	NELAP	0.0250		**5.01**	mg/L	5	03/27/2018 13:47	140252
Manganese	NELAP	0.0010		**0.0614**	mg/L	5	03/26/2018 17:33	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/24/2018 0:32	140252

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-017 **Client Sample ID:** Field Blank

Matrix: AQUEOUS **Collection Date:** 03/22/2018 15:21

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**< 20**	mg/L	1	03/23/2018 15:13	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 15:08	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	03/28/2018 17:45	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	03/23/2018 18:35	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	03/28/2018 17:43	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	03/24/2018 0:40	140252
Barium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/26/2018 17:42	140252
Boron	NELAP	0.0250		**< 0.0250**	mg/L	5	03/27/2018 14:36	140252
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	03/27/2018 14:36	140252
Manganese	NELAP	0.0010		**< 0.0010**	mg/L	5	03/26/2018 17:42	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/24/2018 0:40	140252

Laboratory Results

Teklab, Inc. Environmental Laboratory

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-018 **Client Sample ID:** DUP1

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 9:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**4.12**	ft	1	03/22/2018 9:25	R245290
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.09**		1	03/22/2018 9:25	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**1.5**	NTU	1	03/22/2018 9:25	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-121**	mV	1	03/22/2018 9:25	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1040**	µS/cm	1	03/22/2018 9:25	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**10.95**	°C	1	03/22/2018 9:25	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 9:25	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**618**	mg/L	1	03/23/2018 15:14	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 15:10	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**150**	mg/L	10	03/28/2018 17:53	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.19**	mg/L	1	03/23/2018 18:38	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**6**	mg/L	1	03/28/2018 17:45	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	03/24/2018 0:49	140252
Barium	NELAP	0.0010		**0.0944**	mg/L	5	03/26/2018 17:50	140252
Boron	NELAP	0.0250		**0.145**	mg/L	5	03/27/2018 14:44	140252
Iron	NELAP	0.0250		**0.0255**	mg/L	5	03/27/2018 14:44	140252
Manganese	NELAP	0.0010		**0.148**	mg/L	5	03/26/2018 17:50	140252
Selenium	NELAP	0.0010		**0.0016**	mg/L	5	03/24/2018 0:49	140252

Laboratory Results

Teklab, Inc. Environmental Laboratory

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Lab ID: 18030183-019 **Client Sample ID:** DUP2

Matrix: GROUNDWATER **Collection Date:** 03/22/2018 10:32

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**13.99**	ft	1	03/22/2018 10:32	R245290
STANDARD METHOD 4500 H B 2001 FIELD								
pH	*	1.00		**7.18**		1	03/22/2018 10:32	R245290
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**52.1**	NTU	1	03/22/2018 10:32	R245290
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-153**	mV	1	03/22/2018 10:32	R245290
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**954**	µS/cm	1	03/22/2018 10:32	R245290
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**12.27**	°C	1	03/22/2018 10:32	R245290
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	03/22/2018 10:32	R245290
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**462**	mg/L	1	03/23/2018 15:14	R245066
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	03/27/2018 15:14	R245123
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	03/28/2018 18:01	R245223
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.81**	mg/L	1	03/23/2018 18:39	R245039
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**32**	mg/L	1	03/28/2018 17:59	R245264
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0221**	mg/L	5	03/24/2018 0:57	140252
Barium	NELAP	0.0010		**0.140**	mg/L	5	03/26/2018 17:58	140252
Boron	NELAP	0.0250		**0.436**	mg/L	5	03/27/2018 14:53	140252
Iron	NELAP	0.0250		**4.84**	mg/L	5	03/27/2018 14:53	140252
Manganese	NELAP	0.0010		**0.0612**	mg/L	5	03/26/2018 17:58	140252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	03/24/2018 0:57	140252

Teklab, Inc. Environmental Laboratory

Sample Summary

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 18030183

Report Date: 09-Apr-18

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
18030183-001	MW1	Groundwater	4	03/22/2018 13:39
18030183-002	MW2	Groundwater	4	03/22/2018 12:47
18030183-003	MW7	Groundwater	4	03/22/2018 0:00
18030183-004	MW10	Groundwater	4	03/22/2018 15:14
18030183-005	MW17	Groundwater	4	03/22/2018 8:44
18030183-006	MW18	Groundwater	4	03/22/2018 9:01
18030183-007	MW21	Groundwater	4	03/22/2018 13:08
18030183-008	MW3R	Groundwater	4	03/22/2018 12:13
18030183-009	MW4	Groundwater	4	03/22/2018 10:55
18030183-010	MW5	Groundwater	4	03/22/2018 11:19
18030183-011	MW6R	Groundwater	4	03/22/2018 9:25
18030183-012	MW8R	Groundwater	4	03/22/2018 11:58
18030183-013	MW9	Groundwater	1	03/22/2018 9:35
18030183-014	MW19	Groundwater	1	03/22/2018 9:25
18030183-015	MW20	Groundwater	4	03/22/2018 9:58
18030183-016	MW34	Groundwater	4	03/22/2018 10:32
18030183-017	Field Blank	Aqueous	4	03/22/2018 15:21
18030183-018	DUP1	Groundwater	4	03/22/2018 9:25
18030183-019	DUP2	Groundwater	4	03/22/2018 10:32

Client: Natural Resource Technology, Inc.
Work Order: 18030183
Client Project: Dynegy - Vermillion Power Station
Report Date: 09-Apr-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18030183-001A	MW1	03/22/2018 13:39	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 13:39
	Standard Method 4500-H B 2001 Field				03/22/2018 13:39
	Standard Methods 2130 B Field				03/22/2018 13:39
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 13:39
	Standard Methods 2510 B Field				03/22/2018 13:39
	Standard Methods 2550 B Field				03/22/2018 13:39
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:10
	Standard Methods 4500-O G Field				03/22/2018 13:39
	SW-846 9036 (Total)				03/28/2018 19:20
	SW-846 9251 (Total)				03/28/2018 19:11
18030183-001B	MW1	03/22/2018 13:39	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:09
	SW-846 9214 (Dissolved)				03/23/2018 18:06
18030183-001C	MW1	03/22/2018 13:39	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 22:21
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 15:38
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 12:41
18030183-001D	MW1	03/22/2018 13:39	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:02
18030183-002A	MW2	03/22/2018 12:47	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 12:47
	Standard Method 4500-H B 2001 Field				03/22/2018 12:47
	Standard Methods 2130 B Field				03/22/2018 12:47
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 12:47
	Standard Methods 2510 B Field				03/22/2018 12:47
	Standard Methods 2550 B Field				03/22/2018 12:47
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:11
	Standard Methods 4500-O G Field				03/22/2018 12:47
	SW-846 9036 (Total)				03/28/2018 15:03
	SW-846 9251 (Total)				03/28/2018 14:36
18030183-002B	MW2	03/22/2018 12:47	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:09
	SW-846 9214 (Dissolved)				03/23/2018 18:07
18030183-002C	MW2	03/22/2018 12:47	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 22:45
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 15:47

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 12:49
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/28/2018 13:09
18030183-002D	MW2	03/22/2018 12:47	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:04
18030183-004A	MW10	03/22/2018 15:14	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 15:14
	Standard Method 4500-H B 2001 Field				03/22/2018 15:14
	Standard Methods 2130 B Field				03/22/2018 15:14
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 15:14
	Standard Methods 2510 B Field				03/22/2018 15:14
	Standard Methods 2550 B Field				03/22/2018 15:14
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:11
	Standard Methods 4500-O G Field				03/22/2018 15:14
	SW-846 9036 (Total)				03/28/2018 15:19
	SW-846 9251 (Total)				03/28/2018 15:11
18030183-004B	MW10	03/22/2018 15:14	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:10
	SW-846 9214 (Dissolved)				03/23/2018 18:09
18030183-004C	MW10	03/22/2018 15:14	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 22:53
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 15:55
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 12:58
18030183-004D	MW10	03/22/2018 15:14	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:13
18030183-005A	MW17	03/22/2018 8:44	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 8:44
	Standard Method 4500-H B 2001 Field				03/22/2018 8:44
	Standard Methods 2130 B Field				03/22/2018 8:44
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 8:44
	Standard Methods 2510 B Field				03/22/2018 8:44
	Standard Methods 2550 B Field				03/22/2018 8:44
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:11
	Standard Methods 4500-O G Field				03/22/2018 8:44
	SW-846 9036 (Total)				03/28/2018 15:27
	SW-846 9251 (Total)				03/28/2018 15:19
18030183-005B	MW17	03/22/2018 8:44	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:10

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 9214 (Dissolved)				03/23/2018 18:10
18030183-005C	MW17	03/22/2018 8:44	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 23:02
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 16:03
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 15:01
18030183-005D	MW17	03/22/2018 8:44	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:15
18030183-006A	MW18	03/22/2018 9:01	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 9:01
	Standard Method 4500-H B 2001 Field				03/22/2018 9:01
	Standard Methods 2130 B Field				03/22/2018 9:01
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 9:01
	Standard Methods 2510 B Field				03/22/2018 9:01
	Standard Methods 2550 B Field				03/22/2018 9:01
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:12
	Standard Methods 4500-O G Field				03/22/2018 9:01
	SW-846 9036 (Total)				03/28/2018 15:35
	SW-846 9251 (Total)				03/28/2018 15:27
18030183-006B	MW18	03/22/2018 9:01	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:10
	SW-846 9214 (Dissolved)				03/23/2018 18:12
18030183-006C	MW18	03/22/2018 9:01	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 23:10
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 16:11
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 15:09
18030183-006D	MW18	03/22/2018 9:01	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:28
18030183-007A	MW21	03/22/2018 13:08	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 13:08
	Standard Method 4500-H B 2001 Field				03/22/2018 13:08
	Standard Methods 2130 B Field				03/22/2018 13:08
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 13:08
	Standard Methods 2510 B Field				03/22/2018 13:08
	Standard Methods 2550 B Field				03/22/2018 13:08
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:12
	Standard Methods 4500-O G Field				03/22/2018 13:08
	SW-846 9036 (Total)				03/28/2018 15:38

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 9251 (Total)				03/28/2018 15:35
18030183-007B	MW21	03/22/2018 13:08	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:11
	SW-846 9214 (Dissolved)				03/23/2018 18:16
18030183-007C	MW21	03/22/2018 13:08	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 23:18
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 16:19
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 13:06
18030183-007D	MW21	03/22/2018 13:08	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:30
18030183-008A	MW3R	03/22/2018 12:13	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 12:13
	Standard Method 4500-H B 2001 Field				03/22/2018 12:13
	Standard Methods 2130 B Field				03/22/2018 12:13
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 12:13
	Standard Methods 2510 B Field				03/22/2018 12:13
	Standard Methods 2550 B Field				03/22/2018 12:13
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:13
	Standard Methods 4500-O G Field				03/22/2018 12:13
	SW-846 9036 (Total)				03/28/2018 16:08
	SW-846 9251 (Total)				03/28/2018 15:54
18030183-008B	MW3R	03/22/2018 12:13	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:11
	SW-846 9214 (Dissolved)				03/23/2018 18:17
18030183-008C	MW3R	03/22/2018 12:13	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 23:26
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 16:28
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 13:14
18030183-008D	MW3R	03/22/2018 12:13	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:32
18030183-009A	MW4	03/22/2018 10:55	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 10:55
	Standard Method 4500-H B 2001 Field				03/22/2018 10:55
	Standard Methods 2130 B Field				03/22/2018 10:55
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 10:55
	Standard Methods 2510 B Field				03/22/2018 10:55
	Standard Methods 2550 B Field				03/22/2018 10:55

Teklab, Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:13
	Standard Methods 4500-O G Field				03/22/2018 10:55
	SW-846 9036 (Total)				03/28/2018 16:10
	SW-846 9251 (Total)				03/28/2018 16:08
18030183-009B	MW4	03/22/2018 10:55	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:11
	SW-846 9214 (Dissolved)				03/23/2018 18:19
18030183-009C	MW4	03/22/2018 10:55	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 23:35
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 16:36
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 13:22
18030183-009D	MW4	03/22/2018 10:55	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:37
18030183-010A	MW5	03/22/2018 11:19	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 11:19
	Standard Method 4500-H B 2001 Field				03/22/2018 11:19
	Standard Methods 2130 B Field				03/22/2018 11:19
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 11:19
	Standard Methods 2510 B Field				03/22/2018 11:19
	Standard Methods 2550 B Field				03/22/2018 11:19
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:14
	Standard Methods 4500-O G Field				03/22/2018 11:19
	SW-846 9036 (Total)				03/28/2018 16:24
	SW-846 9251 (Total)				03/28/2018 16:16
18030183-010B	MW5	03/22/2018 11:19	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:11
	SW-846 9214 (Dissolved)				03/23/2018 18:24
18030183-010C	MW5	03/22/2018 11:19	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 23:43
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 16:44
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 15:17
18030183-010D	MW5	03/22/2018 11:19	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:39
18030183-011A	MW6R	03/22/2018 9:25	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 9:25
	Standard Method 4500-H B 2001 Field				03/22/2018 9:25
	Standard Methods 2130 B Field				03/22/2018 9:25

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 9:25
	Standard Methods 2510 B Field				03/22/2018 9:25
	Standard Methods 2550 B Field				03/22/2018 9:25
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:14
	Standard Methods 4500-O G Field				03/22/2018 9:25
	SW-846 9036 (Total)				03/28/2018 16:32
	SW-846 9251 (Total)				03/28/2018 16:24
18030183-011B	MW6R	03/22/2018 9:25	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:12
	SW-846 9214 (Dissolved)				03/23/2018 18:26
18030183-011C	MW6R	03/22/2018 9:25	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 23:51
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 17:09
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 13:30
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/28/2018 13:01
18030183-011D	MW6R	03/22/2018 9:25	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:48
18030183-012A	MW8R	03/22/2018 11:58	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 11:58
	Standard Method 4500-H B 2001 Field				03/22/2018 11:58
	Standard Methods 2130 B Field				03/22/2018 11:58
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 11:58
	Standard Methods 2510 B Field				03/22/2018 11:58
	Standard Methods 2550 B Field				03/22/2018 11:58
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:14
	Standard Methods 4500-O G Field				03/22/2018 11:58
	SW-846 9036 (Total)				03/28/2018 16:59
	SW-846 9251 (Total)				03/28/2018 16:32
18030183-012B	MW8R	03/22/2018 11:58	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:12
	SW-846 9214 (Dissolved)				03/23/2018 18:27
18030183-012C	MW8R	03/22/2018 11:58	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/23/2018 23:59
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 17:17
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 15:25
18030183-012D	MW8R	03/22/2018 11:58	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:50

Teklab Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Work Order: 18030183

Client Project: Dynegy - Vermillion Power Station
Report Date: 09-Apr-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18030183-013A	MW9	03/22/2018 9:35	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 9:35
18030183-014A	MW19	03/22/2018 9:25	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 9:25
18030183-015A	MW20	03/22/2018 9:58	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 9:58
	Standard Method 4500-H B 2001 Field				03/22/2018 9:58
	Standard Methods 2130 B Field				03/22/2018 9:58
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 9:58
	Standard Methods 2510 B Field				03/22/2018 9:58
	Standard Methods 2550 B Field				03/22/2018 9:58
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:15
	Standard Methods 4500-O G Field				03/22/2018 9:58
	SW-846 9036 (Total)				03/28/2018 17:02
	SW-846 9251 (Total)				03/28/2018 16:59
18030183-015B	MW20	03/22/2018 9:58	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:13
	SW-846 9214 (Dissolved)				03/23/2018 18:28
18030183-015C	MW20	03/22/2018 9:58	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/24/2018 0:24
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 17:25
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 13:39
18030183-015D	MW20	03/22/2018 9:58	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 14:52
18030183-016A	MW34	03/22/2018 10:32	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 10:32
	Standard Method 4500-H B 2001 Field				03/22/2018 10:32
	Standard Methods 2130 B Field				03/22/2018 10:32
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 10:32
	Standard Methods 2510 B Field				03/22/2018 10:32
	Standard Methods 2550 B Field				03/22/2018 10:32
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:15
	Standard Methods 4500-O G Field				03/22/2018 10:32
	SW-846 9036 (Total)				03/28/2018 17:10
	SW-846 9251 (Total)				03/28/2018 17:18
18030183-016B	MW34	03/22/2018 10:32	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:13

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 9214 (Dissolved)				03/23/2018 18:33
18030183-016C	MW34	03/22/2018 10:32	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/24/2018 0:32
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 17:33
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 13:47
18030183-016D	MW34	03/22/2018 10:32	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 15:05
18030183-017A	Field Blank	03/22/2018 15:21	03/22/2018 20:20		
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:16
	SW-846 9036 (Total)				03/28/2018 17:45
	SW-846 9251 (Total)				03/28/2018 17:43
18030183-017B	Field Blank	03/22/2018 15:21	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:13
	SW-846 9214 (Dissolved)				03/23/2018 18:35
18030183-017C	Field Blank	03/22/2018 15:21	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/24/2018 0:40
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 17:42
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 14:36
18030183-017D	Field Blank	03/22/2018 15:21	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 15:08
18030183-018A	DUP1	03/22/2018 9:25	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 9:25
	Standard Method 4500-H B 2001 Field				03/22/2018 9:25
	Standard Methods 2130 B Field				03/22/2018 9:25
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 9:25
	Standard Methods 2510 B Field				03/22/2018 9:25
	Standard Methods 2550 B Field				03/22/2018 9:25
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:16
	Standard Methods 4500-O G Field				03/22/2018 9:25
	SW-846 9036 (Total)				03/28/2018 17:53
	SW-846 9251 (Total)				03/28/2018 17:45
18030183-018B	DUP1	03/22/2018 9:25	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:14
	SW-846 9214 (Dissolved)				03/23/2018 18:38
18030183-018C	DUP1	03/22/2018 9:25	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/24/2018 0:49

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10.07	03/26/2018 17:50
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 14.44
18030183-018D	DUP1	03/22/2018 9:25	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 15:10
18030183-019A	DUP2	03/22/2018 10:32	03/22/2018 20:20		
	Field Elevation Measurements				03/22/2018 10:32
	Standard Method 4500-H B 2001 Field				03/22/2018 10:32
	Standard Methods 2130 B Field				03/22/2018 10:32
	Standard Methods 18th Ed. 2580 B Field				03/22/2018 10:32
	Standard Methods 2510 B Field				03/22/2018 10:32
	Standard Methods 2550 B Field				03/22/2018 10:32
	Standard Methods 4500-NO2 B (Total) 2000				03/23/2018 10:17
	Standard Methods 4500-O G Field				03/22/2018 10:32
	SW-846 9036 (Total)				03/28/2018 18:01
	SW-846 9251 (Total)				03/28/2018 17:59
18030183-019B	DUP2	03/22/2018 10:32	03/22/2018 20:20		
	Standard Methods 2540 C (Dissolved) 1997				03/23/2018 15:14
	SW-846 9214 (Dissolved)				03/23/2018 18:39
18030183-019C	DUP2	03/22/2018 10:32	03/22/2018 20:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/24/2018 0:57
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/26/2018 17:58
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			03/23/2018 10:07	03/27/2018 14:53
18030183-019D	DUP2	03/22/2018 10:32	03/22/2018 20:20		
	Standard Methods 4500-NO3 F (Total) 2000				03/27/2018 15:14

STANDARD METHOD 4500-H B 2001 FIELD

Batch R245290 **SampType:** LCS Units
SampID: LCS-R245290

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	1.00		**7.00**	7.000	0	100.0	99.1	100.9	03/22/2018

STANDARD METHODS 2510 B FIELD

Batch R245290 **SampType:** LCS Units **µmhos/cm**
SampID: LCS-R245290

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Conductivity	1		**1410**	1412	0	99.9	90	110	03/22/2018

STANDARD METHODS 2540 C (DISSOLVED) 1997

Batch R245066 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						03/23/2018
Total Dissolved Solids	20		**< 20**						03/23/2018
Total Dissolved Solids	20		**< 20**						03/23/2018
Total Dissolved Solids	20		**< 20**						03/23/2018

Batch R245066 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**986**	1000	0	98.6	90	110	03/23/2018

Batch R245066 **SampType:** LCSQC Units **mg/L**
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**980**	1000	0	98.0	90	110	03/23/2018
Total Dissolved Solids	20		**992**	1000	0	99.2	90	110	03/23/2018
Total Dissolved Solids	20		**970**	1000	0	97.0	90	110	03/23/2018

Batch R245066 **SampType:** MS Units **mg/L**
SampID: 18030183-012BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**2240**	500.0	1704	106.4	85	115	03/23/2018

Batch R245066 **SampType:** MSD Units **mg/L** RPD Limit **5**
SampID: 18030183-012BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**2230**	500.0	1704	104.4	2236	0.45	03/23/2018

Quality Control Results

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Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

STANDARD METHODS 2540 C (DISSOLVED) 1997

Batch R245066 **SampType:** DUP Units **mg/L** RPD Limit **5**

SampID: 18030183-006BDUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**1520**				1538	0.91	03/23/2018

STANDARD METHODS 4500-NO2 B (TOTAL) 2000

Batch R244991 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**< 0.05**	0.02500	0	0	-100	100	03/23/2018

Batch R244991 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.25		**0.63**	0.6510	0	96.8	90	110	03/23/2018

Batch R244991 **SampType:** MS Units **mg/L**

SampID: 18030183-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.51**	0.5000	0	102.4	85	115	03/23/2018

Batch R244991 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18030183-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.51**	0.5000	0	102.0	0.5120	0.39	03/23/2018

Batch R244991 **SampType:** MS Units **mg/L**

SampID: 18030183-012AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.57**	0.5000	0.05200	103.4	85	115	03/23/2018

Batch R244991 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18030183-012AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.56**	0.5000	0.05200	102.2	0.5690	1.06	03/23/2018

STANDARD METHODS 4500-NO3 F (TOTAL) 2000

Batch R245123 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**< 0.050**	).00900(	0	0	-100	100	03/27/2018

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

STANDARD METHODS 4500-NO3 F (TOTAL) 2000

Batch R245123 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	1.00		**9.30**	8.570	0	108.5	90	110	03/27/2018

Batch R245123 **SampType:** MS Units **mg/L**

SampID: 18030183-002DMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.368**	0.2500	0.08500	113.2	85	115	03/27/2018

Batch R245123 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18030183-002DMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.369**	0.2500	0.08500	113.6	0.3680	0.27	03/27/2018

Batch R245123 **SampType:** MS Units **mg/L**

SampID: 18030183-010DMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.299**	0.2500	0.02300	110.4	85	115	03/27/2018

Batch R245123 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18030183-010DMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.306**	0.2500	0.02300	113.2	0.2990	2.31	03/27/2018

SW-846 9036 (TOTAL)

Batch R245223 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**	5.000	0	0	-100	100	03/28/2018

Batch R245223 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	94.2	90	110	03/28/2018

Batch R245223 **SampType:** MS Units **mg/L**

SampID: 18030183-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	50		**141**	50.00	84.85	111.6	85	115	03/28/2018

SW-846 9036 (TOTAL)

Batch R245223 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18030183-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	50		**140**	50.00	84.85	110.5	140.6	0.40	03/28/2018

Batch R245223 **SampType:** MS Units **mg/L**

SampID: 18030183-016AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10	S	**13**	10.00	5.930	71.8	85	115	03/28/2018

Batch R245223 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18030183-016AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	10	S	**13**	10.00	5.930	66.5	13.11	4.13	03/28/2018

SW-846 9214 (DISSOLVED)

Batch R245039 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						03/23/2018

Batch R245039 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**1.00**	1.000	0	100.2	90	110	03/23/2018

Batch R245039 **SampType:** MS Units **mg/L**

SampID: 18030183-006BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.11**	2.000	0.1380	98.4	85	115	03/23/2018

Batch R245039 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18030183-006BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.13**	2.000	0.1380	99.8	2.106	1.32	03/23/2018

Batch R245039 **SampType:** MS Units **mg/L**

SampID: 18030183-016BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.06**	2.000	0.05500	100.4	85	115	03/23/2018

Teklab Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

SW-846 9214 (DISSOLVED)

Batch R245039 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18030183-015BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.10**	2.000	0.05500	102.0	2.063	1.59	03/23/2018

SW-846 9251 (TOTAL)

Batch R245264 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**	0.3300	0	0	-100	100	03/28/2018

Batch R245264 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	100.2	90	110	03/28/2018

Batch R245264 **SampType:** MS Units **mg/L**

SampID: 18030183-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	10		**68**	40.00	32.55	89.7	85	115	03/28/2018

Batch R245264 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 18030183-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	10		**68**	40.00	32.55	89.0	68.41	0.40	03/28/2018

Batch R245264 **SampType:** MS Units **mg/L**

SampID: 18030183-016AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	10		**70**	40.00	34.24	88.7	85	115	03/28/2018

Batch R245264 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 18030183-016AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	10		**69**	40.00	34.24	87.4	69.71	0.76	03/28/2018

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 140252 **SampType:** MBLK Units **mg/L**

SampID: MBLK-140252

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**< 0.0010**	.000380	0	0	-100	100	03/23/2018
Barium	0.0010		**< 0.0010**	.000150	0	0	-100	100	03/26/2018
Boron	0.0250		**< 0.0250**	.009260	0	0	-100	100	03/28/2018
Iron	0.0250		**< 0.0250**	.009000	0	0	-100	100	03/28/2018
Manganese	0.0020		**< 0.0020**	.000750	0	0	-100	100	03/26/2018
Selenium	0.0010		**< 0.0010**	.000280	0	0	-100	100	03/23/2018

Batch 140252 **SampType:** LCS Units **mg/L**

SampID: LCS-140252

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.463**	0.5000	0	92.6	80	120	03/23/2018
Barium	0.0010		**1.88**	2.000	0	93.8	80	120	03/26/2018
Boron	0.0250		**0.476**	0.5000	0	95.3	80	120	03/27/2018
Iron	0.0250		**1.79**	2.000	0	89.5	80	120	03/27/2018
Manganese	0.0020		**0.483**	0.5000	0	96.5	80	120	03/26/2018
Selenium	0.0010		**0.473**	0.5000	0	94.6	80	120	03/23/2018

Batch 140252 **SampType:** MS Units **mg/L**

SampID: 18030183-001CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.475**	0.5000	0	94.9	75	125	03/23/2018
Barium	0.0010		**1.86**	2.000	0.01369	92.1	75	125	03/26/2018
Boron	0.0250	S	**2.72**	0.5000	1.981	148.1	75	125	03/28/2018
Iron	0.0250		**2.10**	2.000	0.2479	92.6	75	125	03/28/2018
Manganese	0.0020		**0.496**	0.5000	0.02680	93.8	75	125	03/26/2018
Selenium	0.0010		**0.471**	0.5000	0	94.3	75	125	03/23/2018

Batch 140252 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 18030183-001CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.466**	0.5000	0	93.2	0.4745	1.79	03/23/2018
Barium	0.0010		**1.84**	2.000	0.01369	91.4	1.856	0.75	03/26/2018
Boron	0.0250	S	**2.69**	0.5000	1.981	141.8	2.722	1.16	03/28/2018
Iron	0.0250		**2.12**	2.000	0.2479	93.7	2.099	1.06	03/28/2018
Manganese	0.0020		**0.490**	0.5000	0.02680	92.6	0.4959	1.22	03/26/2018
Selenium	0.0010		**0.458**	0.5000	0	91.5	0.4714	2.94	03/23/2018

Teklab Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18030183

Client Project: Dynegy - Vermillion Power Station **Report Date:** 09-Apr-18

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 140252 **SampType:** MS Units **mg/L**

SampID: 18030183-019CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.476**	0.5000	0.02212	90.8	75	125	03/23/2018
Barium	0.0010		**1.94**	2.000	0.1399	90.0	75	125	03/26/2018
Boron	0.0250		**1.02**	0.5000	0.4358	116.7	75	125	03/27/2018
Iron	0.0250		**6.60**	2.000	4.840	88.0	75	125	03/27/2018
Manganese	0.0020		**0.521**	0.5000	0.06124	91.9	75	125	03/26/2018
Selenium	0.0010		**0.455**	0.5000	0	90.9	75	125	03/23/2018

Batch 140252 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 18030183-019CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.483**	0.5000	0.02212	92.2	0.4761	1.43	03/23/2018
Barium	0.0010		**2.00**	2.000	0.1399	92.9	1.940	2.90	03/26/2018
Boron	0.0250		**0.917**	0.5000	0.4358	96.2	1.019	10.55	03/27/2018
Iron	0.0250		**6.46**	2.000	4.840	81.1	6.600	2.13	03/27/2018
Manganese	0.0020		**0.534**	0.5000	0.06124	94.5	0.5209	2.44	03/26/2018
Selenium	0.0010		**0.458**	0.5000	0	91.5	0.4546	0.69	03/23/2018

Teklab, Inc.
Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 18030183

Report Date: 09-Apr-18

Carrier: Jordan Evans

Received By: KF

Completed by On: 23 Mar 18 — Kalyn Foecke (signature: Kalyn Foecke)

Reviewed by On: 23 Mar 18 — Elizabeth A. Hurley (signature: Elizabeth A. Hurley)

Pages to follow: Chain of custody 2 — Extra pages included 35

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 5.42
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑	
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑	
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐	
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑	

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 18030183

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: Natural Resource Technology, Inc.
Address: 2422 East Washington Street
City / State / Zip Bloomington, IL 61704
Contact: Steve Wiskes **Phone:** (414) 837-3614
E-Mail: steve.wiskes@obg.com **Fax:**

Samples on: [X] ICE [ ] BLUE ICE [ ] NO ICE 5.42 °C
Preserved in: [ ] LAB [X] FIELD KF 3/23/18
FOR LAB USE ONLY
Lab Notes: * well dry

Client Comments
Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.

Are these samples known to be involved in litigation? If yes, a surcharge will apply [ ] Yes [X] No
Are these samples known to be hazardous? [ ] Yes [X] No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. [ ] Yes [X] No

Project Name/Number	Sample Collector's Name
Dynegy - Vermillion Power Station	T. Mathis J. Evans

Results Requested: [X] Standard [ ] 1-2 Day (100% Surcharge) [ ] Other ____ [ ] 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Matrix: Groundwater	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O B	Field ORP SM 2580-B	Field pH SM 4500-H+B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500-NO3 F	Sulfate 9036	TDS SM 2540C
18030183-001	MW1	3-22-18 1339	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
002	MW2	3-22-18 1247	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
003	MW7 *		2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
004	MW10	3-22-18 1514	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
005	MW17	3-22-18 844	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
006	MW18	3-22-18 901	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
007	MW21	3-22-18 1308	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
008	MW3R	3-22-18 1213	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
009	MW4	3-22-18 1055	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
010	MW5	3-22-18 1119	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	3-22-18 2020	KFischer	3/22/18 2020

BottleOrder: 42606 KF 3/22/18

CHAIN OF CUSTODY

pg. 2 of 2 Work order # 18030183

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: Natural Resource Technology, Inc.
Address: 2422 East Washington Street
City / State / Zip Bloomington, IL 61704
Contact: Steve Wiskes **Phone:** (414) 837-3614
E-Mail: steve.wiskes@obg.com **Fax:**

Samples on: ☒ ICE ☒ BLUE ICE ☒ NO ICE 5.42 °C
Preserved in: ☒ LAB ☒ FIELD **FOR LAB USE ONLY**
Lab Notes:

Client Comments
Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No
Are these samples known to be hazardous? ☐ Yes ☒ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☒ No

Project Name/Number	Sample Collector's Name
Dynegy - Vermillion Power Station	T. Mothis J. Evans

Results Requested: ☒ Standard ☐ 1-2 Day (100% Surcharge) ☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Groundwater	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O B	Field ORP SM 2580-B	Field pH SM 4500-H B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500 NO3 F	Sulfate 9036	TDS SM 2540C
18030183-011	MW6R	3-22-18 925	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
012	MW8R	3-22-18 1158	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
013	MW9	3-22-18 935	0			X										X			
014	MW19	3-22-18 925	0			X										X			
015	MW20	3-22-18 958	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
016	MW34	3-22-18 1032	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
017	Field Blank	3-22-18 1521	2	1	1	X	X	X	X								X	X	X
018	DUP1	3-22-18 925	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
019	DUP2	3-22-18 1032	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	3-22-18 2020	[signature]	3/22/18 2020

BottleOrder: 42606

Monitoring Well Evaluation Checklist

Site: Vermillion
Inspection Date: 3-22-18
Well Number: MW1

Major wells repairs* required to maintain well Integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose	✓			

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose	✓			

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?	✓			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?			✓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?			✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?	✓			
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT
Project Number: Task #: Start Date: 3-22-18 Time: 1324
Field Personnel: T. Mathis J. Evans Finish Date: 3-22-18 Time: 1339

WELL INFORMATION

Well ID: MW 1
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1324		79.37								
	1330	.26	82.24	2.87	14.08	7.09	2840	.94	12.9	33	Clear
	1333	.39	83.68	1.44	14.03	6.95	2790	1.27	5.2	65	clear
	1336	.52	85.27	1.59	14.05	6.91	2796	1.69	4.6	75	Clear
	1339	.65	85.80	.53	14.09	6.92	2820	1.02	3.3	77	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: Vermillion
Inspection Date: 3-22-18
Well Number: MW02

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 3-22-18 Time: 1232

Field Personnel: T. Mathis J. Evans Finish Date: 3-22-18 Time: 1247

WELL INFORMATION

Well ID: MW 2

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☒ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1232		18.90								
	1235	.13	20.08	1.12	13.77	7.40	804	0	0.5	-39	Clear
	1238	.26	20.44	.36	13.96	7.48	822	0	0.6	-107	Clear
	1241	.39	20.72	.28	14.12	7.52	839	0	0.4	-125	Clear
	1244	.52	20.92	.2	14.13	7.57	856	0	0.3	-137	Clear
	~~1247~~	~~.65~~	20.92	0	14.22	7.60	862	0	0.2	-144	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: Vermillion
Inspection Date: 3-22-18
Well Number: MW7

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing	X			
Not corroded				
Not dented				
Not cracked				
Not loose	↓			

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose	↓			

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?	↓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?			↓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion   Client: NRT

Project Number: ______ Task #: ______ Start Date: ______ Time: ______

Field Personnel: T. Mathis J. Evans   Finish Date: ______ Time: ______

WELL INFORMATION

Well ID: MW 07

Casing ID: ______ inches

EVENT TYPE

☐ Well Development ☐ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity

NOTES (continued)

* Well dry

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermillion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	3-22-18				
Well Number	MW10				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented	X			
Not cracked	X			
Not loose	X			

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented	X			
Not cracked	X			
Not loose	X			

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?	X			
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			X	
10. No water in the flushmount?			X	
11. Is the well cap lockable?			X	
12. Is there a lock present?			X	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?			X	
14. No plant roots or vegetation in well?			X	
15. No sediment in bottom of well?			X	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?	X			
Not deteriorated?	X			
Not heaved or below surrounding grade?	X			
20. No surface seal settling?	X			
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 3-22-18 Time: 1502

Field Personnel: T. Mathis J. Evans Finish Date: 3-22-18 Time: 1514

WELL INFORMATION

Well ID: MW10

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1502		50.84								
	1505	.13	52.82	1.98	14.14	7.26	1580	0	1.3	39	Clear
	1508	.26	53.65	.83	14.16	6.89	1500	0	1.3	65	Clear
	1511	.39	54.22	.57	14.20	6.84	1480	0	1.5	69	Clear
	1514	.52	54.61	.39	14.26	6.81	1456	0	2.9	74	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	3-22-18				
Well Number	MW 17				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion　　Client: NRT

Project Number: ______　Task #: ______　Start Date: 3-22-18　Time: 811

Field Personnel: T. Mathis　J. Evans　Finish Date: 3-22-18　Time: 849

WELL INFORMATION

Well ID: MW 17

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	811		39.05								
	823	~~.39~~ .52	48.14	9.09	12.68	6.54	2850	.3	105	95	Cloudy
	826	~~.62~~ .65	48.90	0.76	12.58	6.55	2850	.18	83.2	71	Cloudy
	829	.78	49.85	0.95	12.44	6.63	2860	0.0	80.0	57	Cloudy
	832	.91	50.76	0.91	12.49	6.70	2880	0.0	47.6	38	Clear
	835	1.04	51.85	.99	12.67	6.78	2880	0.0	50.8	26	Cloudy
	838	1.17	52.10	.25	12.78	6.81	2880	0.0	37.8	22	Clear
	841	1.30	52.30	.20	12.67	6.83	2860	0.0	28.5	21	Clear
	844	1.43	52.37	.07	12.44	6.86	2850	0	32.4	18	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: Vermillion
Inspection Date: 3-22-18
Well Number: MW 18

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?	/		X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT
Project Number: Task #: Start Date: 3-22-18 Time: 851
Field Personnel: T. Mathis J. Evans Finish Date: 3-22-18 Time: 901

WELL INFORMATION

Well ID: MW 18
Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☒ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	851		24.26								
	853	.13	24.26	0	11.99	6.84	2570	0	6.1	60	Clear
	855	.26	24.26	0	13.18	6.85	2450	0	2.8	47	Clear
	857	.39	24.26	0	13.41	6.86	2390	0	1.8	45	Clear
	859	.52	24.26	0	13.35	6.87	2330	0	1.5	45	Clear
	901	.65	24.26	0	13.34	6.	2310	0	0.7	47	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermillion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	3-22-18				
Well Number	MW21				

Stick-up Monitoring Wells — Comments

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 3-22-18 Time: 1250

Field Personnel: T. Mathis J. Evans Finish Date: 3-22-18 Time: 1308

WELL INFORMATION

Well ID: MW21

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (μs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1259		91.25								
	1302	.13	93.15	1.9	13.63	7.33	695	0	1.5	-75	Clear
	1305	.26	95.22	2.07	13.55	7.36	730	0	0.8	-101	Clear
	1308	.39	97.28	2.06	13.49	7.40	7.32	0	0.5	-134	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 20g

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required	Yes	No	NA
Inspection Date	3-22-18	to maintain well integrity?		X	
Well Number	MW03R				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Vell Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT

Project Number: ____ Task #: ____ Start Date: 3-22-18 Time: 1200

Field Personnel: T. Mathis J. Evans Finish Date: 3-22-18 Time: 1213

WELL INFORMATION

Well ID: MW 03R

Casing ID: ____ inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1204		7.71								
	1207	.13	7.71	0	13.09	7.35	1050	0	1.4	-100	Clear
	1210	.26	7.71	0	13.38	7.35	1060	0	2.0	-121	Clear
	1213	.39	7.71	0	13.49	7.34	1070	0	1.5	-128	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date: 3-22-18			X	
Well Number: MW04				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad Installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

*-Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 3-22-18 Time: 1043

Field Personnel: T. Mathis Finish Date: 3-22-18 Time: 1055

WELL INFORMATION

Well ID: MW 04

Casing ID: inches

EVENT TYPE

☐ Well Development ☒ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1043		6.35								
	1046	.13	6.87	0.52	10.38	7.40	634	5.25	0.8	-92	clear
	1049	.26	6.96	.09	10.62	7.47	640	4.52	0.6	-112	Clear
	1052	.39	6.96	0	10.65	7.52	642	4.64	1.2	-122	Clear
	1055	.52	6.96	0	10.69	7.54	643	0	0.5	-126	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	3-22-18			X	
Well Number	MW 05				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion — Client: NRT

Project Number: — Task #: — Start Date: 3-22-18 — Time: 1107

Field Personnel: T. Mathis J. Evans — Finish Date: 3-22-18 — Time: 1115

WELL INFORMATION

Well ID: MW 05

Casing ID: inches

EVENT TYPE

☐ Well Development ☒ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1107		6.43								
	1110	.13	6.85	.42	10.57	7.35	878	0	0.6	-15	Clear
	1113	.26	6.96	.11	10.61	7.40	884	0	0.2	-18	Clear
	1116	.39	6.96	0	10.71	7.42	887	0	0.2	-18	Clear
	1119	.52	6.96	0	10.73	7.43	888	0	0.1	-16	clear
								~~0~~ JE 3-22-18			

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	3-22-18			X	
Well Number	MW 6R				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion | Client: NRT
Project Number: | Task #: | Start Date: 3-22-18 | Time: 913
Field Personnel: T. Mathis J. Evans | Finish Date: 3-22-18 | Time: 925

WELL INFORMATION

Well ID: MW 6R
Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	913		4.12								
	916	.13	4.12	0	10.64	6.98	1010	0	10.7	-85	clear
	919	.26	4.12	0	10.79	7.07	1030	0	5.9	-127	Clear
	922	.39	4.12	0	10.91	7.09	1030	0	2.7	-145	clear
	925	.52	4.12	0	10.95	7.09	1040	0	1.5	-121	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	3-22-18				
Well Number	MW08R				

Stick-up Monitoring Wells				**Comments**
1 Outer protective Casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose	↓			
2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose	↓			
	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?	↓			

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?			↓	

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion | Client: NRT

Project Number: | Task #: | Start Date: 3-22-18 | Time: :13

Field Personnel: T. Mathis J. Evans | Finish Date: 3-22-18 | Time: 1158

WELL INFORMATION

Well ID: MW 08R

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [x] Low-Flow / Low Stress Sampling
- [ ] Well Volume Approach Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1131		12.67								
	1134	.13	13.13	.46	11.98	7.05	2170	0	0.7	30	Clear
	1137	.26	13.13	0	11.89	7.17	2160	0	3.5	11	clear
	1140	.39	13.13	0	11.80	7.27	2170	0	2.7	0	Clear
	1143	.52	13.13	0	11.76	7.37	2176	0	2.4	-14	Clear
	1146	.65	13.13	0	11.72	7.47	2180	0	2.4	-23	Clear
	1149	.78	13.13	0	11.74	7.52	2190	0	2.4	-32	Clear
	1152	.91	13.13	0	11.74	7.58	2190	0	2.4	-40	Clear
	1155	1.04	13.13	0	11.76	7.63	2200	0	1.7	-48	Clear
	1158	1.17	13.13	0	11.79	7.67	2200	0	1.6	-54	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	3-22-18				
Well Number	MW09				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT

Project Number: ____ Task #: ____ Start Date: 3-22-18 Time: 935

Field Personnel: T. Mathis Finish Date: ____ Time: ____

WELL INFORMATION

Well ID: MW 09

Casing ID: ____ inches

EVENT TYPE

☐ Well Development ☐ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	935		4.60								

NOTES (continued)

* Depth only

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermilion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	3-28-18			X	
Well Number	MW19				

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

P:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion   Client: NRT

Project Number: Task #:   Start Date: 3-22-18   Time: 925

Field Personnel: T. Mathis   Finish Date: 3-22-18   Time:

WELL INFORMATION

Well ID: MW 19

Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☐ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	925		6.23								

NOTES (continued)

* Depth only

ABBREVIATIONS

Cond. = Actual Conductivity
FT BTOC – Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP – Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	3 22 18			X	
Well Number	MW 20				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
2. Inner casing				
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?	↓			
5. Is there a lockable cap present?	↓			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	↓			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad	↓			
Slope away form casing?	↓			
Not deteriorated?	↓			
Not heaved or below surrounding grade?	↓			
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

:\2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Well Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion
Client: NRT
Project Number:
Task #:
Start Date: 3-22-18
Time: 940
Field Personnel: T. Mathis J. Evans
Finish Date: 3-22-18
Time: 958

WELL INFORMATION

Well ID: MW 20
Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	940		13.09								
	949	.39	13.29	.2	10.44	7.31	568	0	22.8	-21	Clear
	952	.52	13.29	0	10.54	7.23	581	0	21.6	-28	clear
	955	.65	13.29	0	10.55	7.19	583	0	10.5	-31	Clear
	958	.78	13.29	0	10.55	7.18	585	0	8.1	-31	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site Vermilion
Inspection Date 3-22-18
Well Number MW 34

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

* Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion
Client: NRT
Project Number:
Task #:
Start Date: 3-22-18 Time: 1002
Field Personnel: T. Mathis J. Evans
Finish Date: 3-22-18 Time: 1032

WELL INFORMATION

Well ID: MW 34
Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1002		13.99								
	1008	.26	14.64	0.65	11.84	7.09	960	0	27.6	-126	Clear
	1011	.39	14.64	0	12.19	7.15	960	0	40.3	-142	Clear
	1014	.52	14.64	0	12.10	7.16	957	0	51.3	-147	Cloudy
	1017	.65	14.64	0	12.31	7.16	952	0	74.1	-150	Cloudy
	1020	.78	14.64	0	12.20	7.16	951	0	111	-152	Cloudy
	1023	.91	14.64	0	12.31	7.15	953	0	90.9	-149	Cloudy
	1026	1.04	14.64	0	12.29	7.18	958	0	35.7	-146	Clear
	1029	1.17	14.64	0	12.37	7.18	956	0	55.4	-151	Cloudy
	1032	1.30	14.64	0	12.27	7.18	954	0	52.1	-153	Cloudy

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 3-22-18 Time: 913

Field Personnel: T. Mathis J Evans Finish Date: 3-22-18 Time: 925

WELL INFORMATION

Well ID: Dup 1

Casing ID: inches

EVENT TYPE

☐ Well Development

☐ Well Volume Approach Sampling

☒ Low-Flow / Low Stress Sampling

☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	913		4.12								
	925	.52	4.12	0	10.95	7.09	1040	0	1.5	-121	clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion	Client: NRT

Project Number: 	Task #: 	Start Date: 3-22-18	Time: 1002

Field Personnel: T. Mathis J. Evans	Finish Date: 3-22-18	Time: 1032

WELL INFORMATION

Well ID: Dup 2

Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1002		13.99								
	1032	1.30	14.64	0	12.27	7.18	954	0	52.1	-153	Cloudy

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Field Calibration Form
Groundwater Quality Meter

Groundwater Quality Meter Manufacturer/Model Horiba
Serial Number V9E SA G8R
oxidation/reduction potential, dissolved oxygen, pH, tubidity

Date of Calibration Check	Calibration Standard Concentration	Calibration Reading	Within +/- 10% (yes or no)	Comments
3-22-18 150	4.00	4.00	Yes	
	7.00	7.00		
	10.00	10.00		
	1412	1410		
	0	0		
	100%	42%		
3-22-18 1530	7.00	7.05		
	1412	1460		
	0	0		
	100%	104.3%		

May 21, 2018

Steve Wiskes
Natural Resource Technology, Inc.
2422 East Washington Street
Suite 104
Bloomington, IL 61704
TEL. (414) 837-3614
FAX: (414) 837-3608

NELAP ACCREDITED TNI LABORATORY

RE: Dynegy Vermillion Power Station **WorkOrder:** 18050091

Dear Steve Wiskes:

TEKLAB, INC received 19 samples on 5/9/2018 7:00:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermilion Power Station

Work Order: 18050091

Report Date: 21-May-18

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
Case Narrative	4
Accreditations	5
Laboratory Results	6
Sample Summary	23
Dates Report	24
Quality Control Results	32
Receiving Check List	38
Chain of Custody	Appended

Definitions

http://www.teklabinc.com/

Teklab, Inc. Environmental Laboratory

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

#	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
C -	RL shown is a Client Requested Quantitation Limit	E -	Value above quantitation range
H -	Holding times exceeded	I -	Associated internal standard was outside method criteria
M -	Manual Integration used to determine area response	ND -	Not Detected at the Reporting Limit
R -	RPD outside accepted recovery limits	S -	Spike Recovery outside recovery limits
T -	TIC(Tentatively identified compound)	X -	Value exceeds Maximum Contaminant Level

Teklab Inc. Environmental Laboratory

Case Narrative

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 18050091

Report Date: 21-May-18

Cooler Receipt Temp: 2.82 °C

An employee of Teklab, Inc. collected the sample(s).

MW7 could not be collected. Well Dry.
MW19 could not be collected. No access to well due to flooding.

Locations

Collinsville

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	jhriley@teklabinc.com

Springfield

Address	3920 Pintail Dr Springfield, IL 62711-9415
Phone	(217) 698-1004
Fax	(217) 698-1005
Email	KKlostermann@teklabinc.com

Kansas City

Address	8421 Nieman Road Lenexa, KS 66214
Phone	(913) 541-1998
Fax	(913) 541-1998
Email	jhriley@teklabinc.com

Collinsville Air

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	EHurley@teklabinc.com

Chicago

Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(630) 324-6855
Fax	
Email	arenner@teklabinc.com

Accreditations

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2019	Collinsville
Kansas	KDHE	E 10374	NELAP	4/30/2019	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88 0966		3/14/2019	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2019	Collinsville
Kentucky	KDEP	98006		12/31/2018	Collinsville
Kentucky	UST	0073		1/31/2019	Collinsville
Louisiana	LDPH	LA170027		12/31/2018	Collinsville
Missouri	MDNR	930		1/31/2019	Collinsville
Missouri	MDNR	00930		5/31/2019	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2019	Collinsville

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Work Order: 18050091
Client Project: Dynegy - Vermillion Power Station
Report Date: 21-May-18
Lab ID: 18050091-001
Client Sample ID: MW1
Matrix: GROUNDWATER
Collection Date: 05/09/2018 12:27

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**78.75**	ft	1	05/09/2018 12:27	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.63**		1	05/09/2018 12:27	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	05/09/2018 12:27	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**96**	mV	1	05/09/2018 12:27	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**2500**	µS/cm	1	05/09/2018 12:27	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**14.27**	°C	1	05/09/2018 12:27	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**4.99**	mg/L	1	05/09/2018 12:27	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**2090**	mg/L	1	05/10/2018 16:17	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.100		**0.290**	mg/L	2	05/10/2018 14:57	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1070**	mg/L	50	05/14/2018 19:38	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.13**	mg/L	1	05/10/2018 15:56	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**14**	mg/L	1	05/14/2018 19:29	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	05/12/2018 4:35	141740
Barium	NELAP	0.0010		**0.0131**	mg/L	5	05/12/2018 4:35	141740
Boron	NELAP	0.0250		**1.70**	mg/L	5	05/12/2018 4:35	141740
Iron	NELAP	0.0250		**0.223**	mg/L	5	05/12/2018 4:35	141740
Manganese	NELAP	0.0020		**0.0332**	mg/L	5	05/12/2018 4:35	141740
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/12/2018 4:35	141740

Teklab, Inc.
Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Work Order: 18050091
Client Project: Dynegy - Vermillion Power Station
Report Date: 21-May-18
Lab ID: 18050091-002
Client Sample ID: MW2
Matrix: GROUNDWATER
Collection Date: 05/09/2018 9:49

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**18.47**	ft	1	05/09/2018 9:49	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.40**		1	05/09/2018 9:49	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	05/09/2018 9:49	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-124**	mV	1	05/09/2018 9:49	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**821**	µS/cm	1	05/09/2018 9:49	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**14.45**	°C	1	05/09/2018 9:49	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	05/09/2018 9:49	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**502**	mg/L	1	05/10/2018 16:17	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 14:59	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**46**	mg/L	1	05/14/2018 19:41	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.53**	mg/L	1	05/10/2018 15:59	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**37**	mg/L	1	05/14/2018 19:37	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0088**	mg/L	5	05/12/2018 5:08	141740
Barium	NELAP	0.0010		**0.171**	mg/L	5	05/12/2018 5:08	141740
Boron	NELAP	0.0250		**0.249**	mg/L	5	05/12/2018 5:08	141740
Iron	NELAP	0.0250		**0.358**	mg/L	5	05/12/2018 5:08	141740
Manganese	NELAP	0.0020		**0.0847**	mg/L	5	05/12/2018 5:08	141740
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/12/2018 5:08	141740

Teklab, Inc.
Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Work Order: 18050091
Client Project: Dynegy - Vermillion Power Station
Report Date: 21-May-18
Lab ID: 18050091-004
Client Sample ID: MW10
Matrix: GROUNDWATER
Collection Date: 05/09/2018 14:05

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**49.13**	ft	1	05/09/2018 14:05	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.42**		1	05/09/2018 14:05	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**1.2**	NTU	1	05/09/2018 14:05	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**73**	mV	1	05/09/2018 14:05	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1510**	µS/cm	1	05/09/2018 14:05	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**15.30**	°C	1	05/09/2018 14:05	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**1.34**	mg/L	1	05/09/2018 14:05	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**1010**	mg/L	1	05/10/2018 16:17	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.100		**0.405**	mg/L	2	05/10/2018 15:01	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**337**	mg/L	10	05/14/2018 19:54	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.14**	mg/L	1	05/10/2018 16:00	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**8**	mg/L	1	05/14/2018 19:45	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	05/12/2018 5:16	141740
Barium	NELAP	0.0010		**0.0820**	mg/L	5	05/12/2018 5:16	141740
Boron	NELAP	0.0250		**0.0862**	mg/L	5	05/12/2018 5:16	141740
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	05/14/2018 11:13	141740
Manganese	NELAP	0.0020		**0.0284**	mg/L	5	05/12/2018 5:16	141740
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/12/2018 5:16	141740

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091-005 **Client Sample ID:** MW17

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 9:12

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**38.38**	ft	1	05/09/2018 9:12	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.69**		1	05/09/2018 9:12	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**23.2**	NTU	1	05/09/2018 9:12	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**2**	mV	1	05/09/2018 9:12	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**2490**	µS/cm	1	05/09/2018 9:12	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**15.16**	°C	1	05/09/2018 9:12	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**2.78**	mg/L	1	05/09/2018 9:12	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**1980**	mg/L	1	05/10/2018 16:17	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.100		**0.154**	mg/L	2	05/10/2018 15:04	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1150**	mg/L	50	05/14/2018 20:02	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.15**	mg/L	1	05/10/2018 16:02	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**13**	mg/L	1	05/14/2018 19:54	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0021**	mg/L	5	05/12/2018 5:24	141740
Barium	NELAP	0.0010		**0.0285**	mg/L	5	05/12/2018 5:24	141740
Boron	NELAP	0.0250		**3.25**	mg/L	5	05/12/2018 5:24	141740
Iron	NELAP	0.0250		**4.52**	mg/L	5	05/12/2018 5:24	141740
Manganese	NELAP	0.0020		**0.128**	mg/L	5	05/12/2018 5:24	141740
Selenium	NELAP	0.0010		**0.0011**	mg/L	5	05/12/2018 5:24	141740

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091-006 **Client Sample ID:** MW18

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 9:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**22.93**	ft	1	05/09/2018 9:25	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.66**		1	05/09/2018 9:25	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**1.9**	NTU	1	05/09/2018 9:25	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**36**	mV	1	05/09/2018 9:25	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1940**	µS/cm	1	05/09/2018 9:25	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**14.47**	°C	1	05/09/2018 9:25	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	05/09/2018 9:25	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**1420**	mg/L	1	05/10/2018 16:17	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:08	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**700**	mg/L	20	05/14/2018 20:10	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.12**	mg/L	1	05/10/2018 16:06	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**17**	mg/L	1	05/14/2018 20:02	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0013**	mg/L	5	05/12/2018 5:32	141740
Barium	NELAP	0.0010		**0.0142**	mg/L	5	05/12/2018 5:32	141740
Boron	NELAP	0.0250		**10.9**	mg/L	5	05/12/2018 5:32	141740
Iron	NELAP	0.0250		**0.108**	mg/L	5	05/14/2018 11:21	141740
Manganese	NELAP	0.0020		**1.23**	mg/L	5	05/12/2018 5:32	141740
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/12/2018 5:32	141740

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091-007 **Client Sample ID:** MW21

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 12:49

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**90.31**	ft	1	05/09/2018 12:49	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.02**		1	05/09/2018 12:49	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**1.1**	NTU	1	05/09/2018 12:49	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-75**	mV	1	05/09/2018 12:49	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**654**	µS/cm	1	05/09/2018 12:49	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**14.64**	°C	1	05/09/2018 12:49	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**1.40**	mg/L	1	05/09/2018 12:49	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**394**	mg/L	1	05/10/2018 16:18	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:17	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**25**	mg/L	1	05/14/2018 20:29	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**1.08**	mg/L	1	05/10/2018 16:10	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	05/14/2018 20:26	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0264**	mg/L	5	05/12/2018 5:41	141740
Barium	NELAP	0.0010		**0.0957**	mg/L	5	05/12/2018 5:41	141740
Boron	NELAP	0.0250		**0.758**	mg/L	5	05/12/2018 5:41	141740
Iron	NELAP	0.0250		**0.177**	mg/L	5	05/12/2018 5:41	141740
Manganese	NELAP	0.0020		**0.107**	mg/L	5	05/12/2018 5:41	141740
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/12/2018 5:41	141740

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091-008 **Client Sample ID:** MW3R

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 10:21

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**7.03**	ft	1	05/09/2018 10:21	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.16**		1	05/09/2018 10:21	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	05/09/2018 10:21	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-106**	mV	1	05/09/2018 10:21	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1060**	µS/cm	1	05/09/2018 10:21	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**13.98**	°C	1	05/09/2018 10:21	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	05/09/2018 10:21	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**678**	mg/L	1	05/10/2018 16:18	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:19	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**167**	mg/L	5	05/14/2018 21:07	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.48**	mg/L	1	05/10/2018 16:16	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**24**	mg/L	1	05/14/2018 20:29	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0073**	mg/L	5	05/11/2018 19:57	141774
Barium	NELAP	0.0010		**0.187**	mg/L	5	05/11/2018 19:57	141774
Boron	NELAP	0.0250	B	**4.36**	mg/L	5	05/11/2018 19:57	141774
Iron	NELAP	0.0250		**1.96**	mg/L	5	05/11/2018 19:57	141774
Manganese	NELAP	0.0020		**0.0412**	mg/L	5	05/11/2018 19:57	141774
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 19:57	141774

Sample result(s) for B exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.

Laboratory Results

Teklab, Inc. Environmental Laboratory

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091-009 **Client Sample ID:** MW4

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 12:03

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**6.36**	ft	1	05/09/2018 12:03	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.24**		1	05/09/2018 12:03	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	05/09/2018 12:03	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-94**	mV	1	05/09/2018 12:03	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**648**	µS/cm	1	05/09/2018 12:03	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**12.16**	°C	1	05/09/2018 12:03	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	05/09/2018 12:03	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**430**	mg/L	1	05/10/2018 16:19	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:21	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**99**	mg/L	5	05/14/2018 21:45	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.28**	mg/L	1	05/10/2018 16:18	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	10		**11**	mg/L	2	05/14/2018 21:17	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0060**	mg/L	5	05/11/2018 20:29	141774
Barium	NELAP	0.0010		**0.320**	mg/L	5	05/11/2018 20:29	141774
Boron	NELAP	0.0250	B	**5.87**	mg/L	5	05/11/2018 20:29	141774
Iron	NELAP	0.0250		**1.31**	mg/L	5	05/11/2018 20:29	141774
Manganese	NELAP	0.0020		**0.750**	mg/L	5	05/11/2018 20:29	141774
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 20:29	141774

Sample result(s) for B exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091-010 **Client Sample ID:** MW5

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 10:39

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**6.25**	ft	1	05/09/2018 10:39	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.15**		1	05/09/2018 10:39	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	05/09/2018 10:39	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-27**	mV	1	05/09/2018 10:39	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**923**	µS/cm	1	05/09/2018 10:39	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**11.83**	°C	1	05/09/2018 10:39	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	05/09/2018 10:39	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**674**	mg/L	1	05/10/2018 16:19	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:35	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**283**	mg/L	10	05/14/2018 22:01	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.44**	mg/L	1	05/10/2018 16:19	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**9**	mg/L	1	05/14/2018 21:52	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 20:38	141774
Barium	NELAP	0.0010		**0.0283**	mg/L	5	05/11/2018 20:38	141774
Boron	NELAP	0.0250	B	**14.5**	mg/L	5	05/11/2018 20:38	141774
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	05/11/2018 20:38	141774
Manganese	NELAP	0.0020		**0.408**	mg/L	5	05/11/2018 20:38	141774
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 20:38	141774

Sample result(s) for B exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.

Teklab Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091 011 **Client Sample ID:** MW6R

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 11:02

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**3.95**	ft	1	05/09/2018 11:02	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.82**		1	05/09/2018 11:02	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	05/09/2018 11:02	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-66**	mV	1	05/09/2018 11:02	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**868**	µS/cm	1	05/09/2018 11:02	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**11.63**	°C	1	05/09/2018 11:02	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	05/09/2018 11:02	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**568**	mg/L	1	05/10/2018 16:19	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:37	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**166**	mg/L	5	05/14/2018 22:09	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.10**	mg/L	1	05/10/2018 16:21	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	05/14/2018 22:00	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 20:46	141774
Barium	NELAP	0.0010		**0.0679**	mg/L	5	05/11/2018 20:46	141774
Boron	NELAP	0.0250	B	**0.139**	mg/L	5	05/14/2018 11:29	141774
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	05/11/2018 20:46	141774
Manganese	NELAP	0.0020		**0.166**	mg/L	5	05/11/2018 20:46	141774
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 20:46	141774

Sample result(s) for B exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.

Laboratory Results

Teklab, Inc. Environmental Laboratory

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091-012 **Client Sample ID:** MW8R

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 10:07

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**12.44**	ft	1	05/09/2018 10:07	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**7.16**		1	05/09/2018 10:07	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**4.0**	NTU	1	05/09/2018 10:07	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-47**	mV	1	05/09/2018 10:07	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**1720**	µS/cm	1	05/09/2018 10:07	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**13.30**	°C	1	05/09/2018 10:07	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	05/09/2018 10:07	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**1400**	mg/L	1	05/10/2018 16:19	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:39	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**754**	mg/L	50	05/14/2018 22:17	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	05/10/2018 16:23	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**9**	mg/L	1	05/14/2018 22:09	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0017**	mg/L	5	05/11/2018 20:54	141774
Barium	NELAP	0.0010		**0.0965**	mg/L	5	05/11/2018 20:54	141774
Boron	NELAP	0.0250	BS	**32.4**	mg/L	5	05/11/2018 20:54	141774
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	05/11/2018 20:54	141774
Manganese	NELAP	0.0020		**0.145**	mg/L	5	05/11/2018 20:54	141774
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 20:54	141774

Sample result(s) for B exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.
Matrix spike control limits for B are not applicable due to high sample/spike ratio.

Teklab Inc
Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Work Order: 18050091
Client Project: Dynegy - Vermillion Power Station
Report Date: 21-May-18
Lab ID: 18050091-013
Client Sample ID: MW9
Matrix: GROUNDWATER
Collection Date: 05/09/2018 10:48

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**4.40**	ft	1	05/09/2018 10:48	R246935

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Work Order: 18050091
Client Project: Dynegy - Vermillion Power Station
Report Date: 21-May-18
Lab ID: 18050091-015
Client Sample ID: MW20
Matrix: GROUNDWATER
Collection Date: 05/09/2018 11:29

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**13.21**	ft	1	05/09/2018 11:29	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.96**		1	05/09/2018 11:29	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**9.3**	NTU	1	05/09/2018 11:29	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-21**	mV	1	05/09/2018 11:29	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**550**	µS/cm	1	05/09/2018 11:29	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**11.41**	°C	1	05/09/2018 11:29	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	05/09/2018 11:29	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**352**	mg/L	1	05/10/2018 16:19	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:41	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**53**	mg/L	2	05/14/2018 22:39	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	05/10/2018 16:30	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	05/14/2018 22:17	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 21:02	141774
Barium	NELAP	0.0010		**0.0132**	mg/L	5	05/11/2018 21:02	141774
Boron	NELAP	0.0250	B	**0.362**	mg/L	5	05/14/2018 11:37	141774
Iron	NELAP	0.0250		**0.163**	mg/L	5	05/14/2018 11:37	141774
Manganese	NELAP	0.0020		**0.0180**	mg/L	5	05/11/2018 21:02	141774
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 21:02	141774

Sample result(s) for B exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091-016 **Client Sample ID:** MW34

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 11:47

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**13.55**	ft	1	05/09/2018 11:47	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.87**		1	05/09/2018 11:47	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**32.4**	NTU	1	05/09/2018 11:47	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-101**	mV	1	05/09/2018 11:47	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**864**	µS/cm	1	05/09/2018 11:47	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**13.08**	°C	1	05/09/2018 11:47	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	05/09/2018 11:47	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**472**	mg/L	1	05/10/2018 16:20	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:46	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	05/14/2018 22:41	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.65**	mg/L	1	05/10/2018 16:34	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**32**	mg/L	1	05/14/2018 22:38	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**0.0221**	mg/L	5	05/11/2018 21:10	141774
Barium	NELAP	0.0010		**0.141**	mg/L	5	05/11/2018 21:10	141774
Boron	NELAP	0.0250	B	**0.493**	mg/L	5	05/11/2018 21:10	141774
Iron	NELAP	0.0250		**5.02**	mg/L	5	05/11/2018 21:10	141774
Manganese	NELAP	0.0020		**0.0620**	mg/L	5	05/11/2018 21:10	141774
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 21:10	141774

Sample result(s) for B exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091-017 **Client Sample ID:** Field Blank

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 14:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**< 20**	mg/L	1	05/10/2018 16:40	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:48	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	05/14/2018 22:47	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	05/10/2018 16:40	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	05/14/2018 22:43	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 21:19	141774
Barium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 21:19	141774
Boron	NELAP	0.0250	B	**< 0.0250**	mg/L	5	05/11/2018 21:19	141774
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	05/11/2018 21:19	141774
Manganese	NELAP	0.0020		**< 0.0020**	mg/L	5	05/11/2018 21:19	141774
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 21:19	141774

Contamination present in the MBLK for B. Sample results below the reporting limit are reportable per the TNI Standard.

Teklab, Inc. Environmental Laboratory

Laboratory Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091 018 **Client Sample ID:** DUP1

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 11:02

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**3.95**	ft	1	05/09/2018 11:02	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.82**		1	05/09/2018 11:02	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	05/09/2018 11:02	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**-66**	mV	1	05/09/2018 11:02	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**868**	µS/cm	1	05/09/2018 11:02	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**11.63**	°C	1	05/09/2018 11:02	R246935
STANDARD METHODS 4500 O G FIELD								
Oxygen, Dissolved	*	1.00		**< 1.00**	mg/L	1	05/09/2018 11:02	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**586**	mg/L	1	05/10/2018 16:40	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	05/10/2018 15:50	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**159**	mg/L	5	05/14/2018 22:55	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	05/10/2018 16:43	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	05/14/2018 22:46	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 21:27	141774
Barium	NELAP	0.0010		**0.0686**	mg/L	5	05/11/2018 21:27	141774
Boron	NELAP	0.0250	B	**0.114**	mg/L	5	05/11/2018 21:27	141774
Iron	NELAP	0.0250		**< 0.0250**	mg/L	5	05/11/2018 21:27	141774
Manganese	NELAP	0.0020		**0.165**	mg/L	5	05/11/2018 21:27	141774
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 21:27	141774

Sample result(s) for B exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.

Laboratory Results

Teklab Inc. Environmental Laboratory

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Lab ID: 18050091-019 **Client Sample ID:** DUP2

Matrix: GROUNDWATER **Collection Date:** 05/09/2018 12:27

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to water from measuring point	*	0		**78.75**	ft	1	05/09/2018 12:27	R246935
STANDARD METHOD 4500-H B 2001 FIELD								
pH	*	1.00		**6.63**		1	05/09/2018 12:27	R246935
STANDARD METHODS 2130 B FIELD								
Turbidity	*	1.0		**< 1.0**	NTU	1	05/09/2018 12:27	R246935
STANDARD METHODS 18TH ED. 2580 B FIELD								
Oxidation-Reduction Potential	*	-300		**96**	mV	1	05/09/2018 12:27	R246935
STANDARD METHODS 2510 B FIELD								
Conductivity	*	1		**2500**	µS/cm	1	05/09/2018 12:27	R246935
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**14.27**	°C	1	05/09/2018 12:27	R246935
STANDARD METHODS 4500-O G FIELD								
Oxygen, Dissolved	*	1.00		**4.99**	mg/L	1	05/09/2018 12:27	R246935
STANDARD METHODS 2540 C (DISSOLVED) 1997								
Total Dissolved Solids	NELAP	20		**2110**	mg/L	1	05/10/2018 16:40	R246936
STANDARD METHODS 4500-NO3 F (TOTAL) 2000								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.297**	mg/L	1	05/10/2018 15:54	R247082
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1050**	mg/L	50	05/14/2018 23:14	R247133
SW-846 9214 (DISSOLVED)								
Fluoride	NELAP	0.10		**0.11**	mg/L	1	05/10/2018 16:47	R246957
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**14**	mg/L	1	05/14/2018 23:00	R247141
SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)								
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 21:35	141774
Barium	NELAP	0.0010		**0.0131**	mg/L	5	05/11/2018 21:35	141774
Boron	NELAP	0.0250	B	**1.84**	mg/L	5	05/11/2018 21:35	141774
Iron	NELAP	0.0250		**0.283**	mg/L	5	05/14/2018 11:46	141774
Manganese	NELAP	0.0020		**0.0412**	mg/L	5	05/11/2018 21:35	141774
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/11/2018 21:35	141774

Sample result(s) for B exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 18050091

Report Date: 21-May-18

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
18050091-001	MW1	Groundwater	4	05/09/2018 12:27
18050091-002	MW2	Groundwater	4	05/09/2018 9:49
18050091-003	MW7	Groundwater	1	
18050091-004	MW10	Groundwater	4	05/09/2018 14:05
18050091-005	MW17	Groundwater	4	05/09/2018 9:12
18050091-006	MW18	Groundwater	4	05/09/2018 9:25
18050091-007	MW21	Groundwater	4	05/09/2018 12:49
18050091-008	MW3R	Groundwater	4	05/09/2018 10:21
18050091-009	MW4	Groundwater	4	05/09/2018 12:03
18050091-010	MW5	Groundwater	4	05/09/2018 10:39
18050091-011	MW6R	Groundwater	4	05/09/2018 11:02
18050091-012	MW8R	Groundwater	4	05/09/2018 10:07
18050091-013	MW9	Groundwater	1	05/09/2018 10:48
18050091-014	MW19	Groundwater	1	
18050091-015	MW20	Groundwater	4	05/09/2018 11:29
18050091-016	MW34	Groundwater	4	05/09/2018 11:47
18050091-017	Field Blank	Groundwater	4	05/09/2018 14:10
18050091-018	DUP1	Groundwater	4	05/09/2018 11:02
18050091-019	DUP2	Groundwater	4	05/09/2018 12:27

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18050091-001A	MW1	05/09/2018 12:27	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 12:27
	Standard Method 4500-H B 2001 Field				05/09/2018 12:27
	Standard Methods 2130 B Field				05/09/2018 12:27
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 12:27
	Standard Methods 2510 B Field				05/09/2018 12:27
	Standard Methods 2550 B Field				05/09/2018 12:27
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:24
	Standard Methods 4500-O G Field				05/09/2018 12:27
	SW-846 9036 (Total)				05/14/2018 19:38
	SW-846 9251 (Total)				05/14/2018 19:29
18050091-001B	MW1	05/09/2018 12:27	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:17
	SW-846 9214 (Dissolved)				05/10/2018 15:56
18050091-001C	MW1	05/09/2018 12:27	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 14:06	05/12/2018 4:35
18050091-001D	MW1	05/09/2018 12:27	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 14:57
18050091-002A	MW2	05/09/2018 9:49	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 9:49
	Standard Method 4500-H B 2001 Field				05/09/2018 9:49
	Standard Methods 2130 B Field				05/09/2018 9:49
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 9:49
	Standard Methods 2510 B Field				05/09/2018 9:49
	Standard Methods 2550 B Field				05/09/2018 9:49
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:25
	Standard Methods 4500-O G Field				05/09/2018 9:49
	SW-846 9036 (Total)				05/14/2018 19:41
	SW-846 9251 (Total)				05/14/2018 19:37
18050091-002B	MW2	05/09/2018 9:49	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:17
	SW-846 9214 (Dissolved)				05/10/2018 15:59
18050091-002C	MW2	05/09/2018 9:49	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 14:06	05/12/2018 5:08
18050091-002D	MW2	05/09/2018 9:49	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 14:59

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Dates Report

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Client: Natural Resource Technology, Inc.
Work Order: 18050091
Client Project: Dynegy - Vermillion Power Station
Report Date: 21-May-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18050091-003A	MW7		05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:41
	SW-846 9214 (Dissolved)				05/10/2018 15:23
18050091-004A	MW10	05/09/2018 14:05	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 14:05
	Standard Method 4500-H B 2001 Field				05/09/2018 14:05
	Standard Methods 2130 B Field				05/09/2018 14:05
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 14:05
	Standard Methods 2510 B Field				05/09/2018 14:05
	Standard Methods 2550 B Field				05/09/2018 14:05
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:26
	Standard Methods 4500-O G Field				05/09/2018 14:05
	SW-846 9036 (Total)				05/14/2018 19:54
	SW-846 9251 (Total)				05/14/2018 19:45
18050091-004B	MW10	05/09/2018 14:05	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:17
	SW-846 9214 (Dissolved)				05/10/2018 16:00
18050091-004C	MW10	05/09/2018 14:05	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 14:06	05/12/2018 5:16
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 14:06	05/14/2018 11:13
18050091-004D	MW10	05/09/2018 14:05	05/09/2018 19:00		
	Standard Methods 4500 NO3 F (Total) 2000				05/10/2018 15:01
18050091-005A	MW17	05/09/2018 9:12	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 9:12
	Standard Method 4500-H B 2001 Field				05/09/2018 9:12
	Standard Methods 2130 B Field				05/09/2018 9:12
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 9:12
	Standard Methods 2510 B Field				05/09/2018 9:12
	Standard Methods 2550 B Field				05/09/2018 9:12
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:26
	Standard Methods 4500-O G Field				05/09/2018 9:12
	SW-846 9036 (Total)				05/14/2018 20:02
	SW-846 9251 (Total)				05/14/2018 19:54
18050091-005B	MW17	05/09/2018 9:12	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:17
	SW-846 9214 (Dissolved)				05/10/2018 16:02
18050091-005C	MW17	05/09/2018 9:12	05/09/2018 19:00		

Dates Report

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Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 18050091
Report Date: 21-May-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 14:06	05/12/2018 5:24
18050091-005D	MW17	05/09/2018 9:12	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:04
18050091-006A	MW18	05/09/2018 9:25	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 9:25
	Standard Method 4500-H B 2001 Field				05/09/2018 9:25
	Standard Methods 2130 B Field				05/09/2018 9:25
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 9:25
	Standard Methods 2510 B Field				05/09/2018 9:25
	Standard Methods 2550 B Field				05/09/2018 9:25
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:26
	Standard Methods 4500-O G Field				05/09/2018 9:25
	SW-846 9036 (Total)				05/14/2018 20:10
	SW-846 9251 (Total)				05/14/2018 20:02
18050091-006B	MW18	05/09/2018 9:25	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:17
	SW-846 9214 (Dissolved)				05/10/2018 16:06
18050091-006C	MW18	05/09/2018 9:25	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 14:06	05/12/2018 5:32
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 14:06	05/14/2018 11:21
18050091-006D	MW18	05/09/2018 9:25	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:08
18050091-007A	MW21	05/09/2018 12:49	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 12:49
	Standard Method 4500-H B 2001 Field				05/09/2018 12:49
	Standard Methods 2130 B Field				05/09/2018 12:49
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 12:49
	Standard Methods 2510 B Field				05/09/2018 12:49
	Standard Methods 2550 B Field				05/09/2018 12:49
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:27
	Standard Methods 4500-O G Field				05/09/2018 12:49
	SW-846 9036 (Total)				05/14/2018 20:29
	SW-846 9251 (Total)				05/14/2018 20:26
18050091-007B	MW21	05/09/2018 12:49	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:18
	SW-846 9214 (Dissolved)				05/10/2018 16:10
18050091-007C	MW21	05/09/2018 12:49	05/09/2018 19:00		

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 14:06	05/12/2018 5:41
18050091-007D	MW21	05/09/2018 12:49	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:17
18050091-008A	MW3R	05/09/2018 10:21	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 10:21
	Standard Method 4500-H B 2001 Field				05/09/2018 10:21
	Standard Methods 2130 B Field				05/09/2018 10:21
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 10:21
	Standard Methods 2510 B Field				05/09/2018 10:21
	Standard Methods 2550 B Field				05/09/2018 10:21
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:27
	Standard Methods 4500-O G Field				05/09/2018 10:21
	SW-846 9036 (Total)				05/14/2018 21:07
	SW-846 9251 (Total)				05/14/2018 20:29
18050091-008B	MW3R	05/09/2018 10:21	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:18
	SW-846 9214 (Dissolved)				05/10/2018 16:16
18050091-008C	MW3R	05/09/2018 10:21	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/11/2018 19:57
18050091-008D	MW3R	05/09/2018 10:21	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:19
18050091-009A	MW4	05/09/2018 12:03	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 12:03
	Standard Method 4500-H B 2001 Field				05/09/2018 12:03
	Standard Methods 2130 B Field				05/09/2018 12:03
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 12:03
	Standard Methods 2510 B Field				05/09/2018 12:03
	Standard Methods 2550 B Field				05/09/2018 12:03
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:28
	Standard Methods 4500-O G Field				05/09/2018 12:03
	SW-846 9036 (Total)				05/14/2018 21:45
	SW-846 9251 (Total)				05/14/2018 21:17
18050091-009B	MW4	05/09/2018 12:03	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:19
	SW-846 9214 (Dissolved)				05/10/2018 16:18
18050091-009C	MW4	05/09/2018 12:03	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/11/2018 20:29

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18050091-009D	MW4	05/09/2018 12:03	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:21
18050091-010A	MW5	05/09/2018 10:39	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 10:39
	Standard Method 4500-H B 2001 Field				05/09/2018 10:39
	Standard Methods 2130 B Field				05/09/2018 10:39
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 10:39
	Standard Methods 2510 B Field				05/09/2018 10:39
	Standard Methods 2550 B Field				05/09/2018 10:39
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:29
	Standard Methods 4500-O G Field				05/09/2018 10:39
	SW-846 9036 (Total)				05/14/2018 22:01
	SW-846 9251 (Total)				05/14/2018 21:52
18050091-010B	MW5	05/09/2018 10:39	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:19
	SW-846 9214 (Dissolved)				05/10/2018 16:19
18050091-010C	MW5	05/09/2018 10:39	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/11/2018 20:38
18050091-010D	MW5	05/09/2018 10:39	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:35
18050091-011A	MW6R	05/09/2018 11:02	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 11:02
	Standard Method 4500-H B 2001 Field				05/09/2018 11:02
	Standard Methods 2130 B Field				05/09/2018 11:02
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 11:02
	Standard Methods 2510 B Field				05/09/2018 11:02
	Standard Methods 2550 B Field				05/09/2018 11:02
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:29
	Standard Methods 4500-O G Field				05/09/2018 11:02
	SW-846 9036 (Total)				05/14/2018 22:09
	SW-846 9251 (Total)				05/14/2018 22:00
18050091-011B	MW6R	05/09/2018 11:02	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:19
	SW-846 9214 (Dissolved)				05/10/2018 16:21
18050091-011C	MW6R	05/09/2018 11:02	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/11/2018 20:46
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/14/2018 11:29

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Dates Report

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Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 18050091
Report Date: 21-May-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18050091-011D	MW6R	05/09/2018 11:02	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:37
18050091-012A	MW8R	05/09/2018 10:07	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 10:07
	Standard Method 4500-H B 2001 Field				05/09/2018 10:07
	Standard Methods 2130 B Field				05/09/2018 10:07
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 10:07
	Standard Methods 2510 B Field				05/09/2018 10:07
	Standard Methods 2550 B Field				05/09/2018 10:07
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:30
	Standard Methods 4500-O G Field				05/09/2018 10:07
	SW-846 9036 (Total)				05/14/2018 22:17
	SW-846 9251 (Total)				05/14/2018 22:09
18050091-012B	MW8R	05/09/2018 10:07	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:19
	SW-846 9214 (Dissolved)				05/10/2018 16:23
18050091-012C	MW8R	05/09/2018 10:07	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/11/2018 20:54
18050091-012D	MW8R	05/09/2018 10:07	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:39
18050091-013A	MW9	05/09/2018 10:48	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 10:48
18050091-015A	MW20	05/09/2018 11:29	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 11:29
	Standard Method 4500-H B 2001 Field				05/09/2018 11:29
	Standard Methods 2130 B Field				05/09/2018 11:29
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 11:29
	Standard Methods 2510 B Field				05/09/2018 11:29
	Standard Methods 2550 B Field				05/09/2018 11:29
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:30
	Standard Methods 4500-O G Field				05/09/2018 11:29
	SW-846 9036 (Total)				05/14/2018 22:39
	SW-846 9251 (Total)				05/14/2018 22:17
18050091-015B	MW20	05/09/2018 11:29	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:19
	SW-846 9214 (Dissolved)				05/10/2018 16:30

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18050091-015C	MW20	05/09/2018 11:29	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/11/2018 21:02
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/14/2018 11:37
18050091-015D	MW20	05/09/2018 11:29	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:41
18050091-016A	MW34	05/09/2018 11:47	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 11:47
	Standard Method 4500-H B 2001 Field				05/09/2018 11:47
	Standard Methods 2130 B Field				05/09/2018 11:47
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 11:47
	Standard Methods 2510 B Field				05/09/2018 11:47
	Standard Methods 2550 B Field				05/09/2018 11:47
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:30
	Standard Methods 4500 O G Field				05/09/2018 11:47
	SW-846 9036 (Total)				05/14/2018 22:41
	SW-846 9251 (Total)				05/14/2018 22:38
18050091-016B	MW34	05/09/2018 11:47	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:20
	SW-846 9214 (Dissolved)				05/10/2018 16:34
18050091-016C	MW34	05/09/2018 11:47	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/11/2018 21:10
18050091-016D	MW34	05/09/2018 11:47	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:46
18050091-017A	Field Blank	05/09/2018 14:10	05/09/2018 19:00		
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:31
	SW-846 9036 (Total)				05/14/2018 22:47
	SW-846 9251 (Total)				05/14/2018 22:43
18050091-017B	Field Blank	05/09/2018 14:10	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:40
	SW-846 9214 (Dissolved)				05/10/2018 16:40
18050091-017C	Field Blank	05/09/2018 14:10	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/11/2018 21:19
18050091-017D	Field Blank	05/09/2018 14:10	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:48
18050091-018A	DUP1	05/09/2018 11:02	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 11:02

Teklab, Inc. Environmental Laboratory

Dates Report

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.

Client Project: Dynegy - Vermillion Power Station

Work Order: 18050091

Report Date: 21-May-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	Standard Method 4500-H B 2001 Field				05/09/2018 11:02
	Standard Methods 2130 B Field				05/09/2018 11:02
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 11:02
	Standard Methods 2510 B Field				05/09/2018 11:02
	Standard Methods 2550 B Field				05/09/2018 11:02
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:31
	Standard Methods 4500-O G Field				05/09/2018 11:02
	SW-846 9036 (Total)				05/14/2018 22:55
	SW-846 9251 (Total)				05/14/2018 22:46
18050091-018B	DUP1	05/09/2018 11:02	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:40
	SW-846 9214 (Dissolved)				05/10/2018 16:43
18050091-018C	DUP1	05/09/2018 11:02	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/11/2018 21:27
18050091-018D	DUP1	05/09/2018 11:02	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:50
18050091-019A	DUP2	05/09/2018 12:27	05/09/2018 19:00		
	Field Elevation Measurements				05/09/2018 12:27
	Standard Method 4500-H B 2001 Field				05/09/2018 12:27
	Standard Methods 2130 B Field				05/09/2018 12:27
	Standard Methods 18th Ed. 2580 B Field				05/09/2018 12:27
	Standard Methods 2510 B Field				05/09/2018 12:27
	Standard Methods 2550 B Field				05/09/2018 12:27
	Standard Methods 4500-NO2 B (Total) 2000				05/10/2018 20:32
	Standard Methods 4500-O G Field				05/09/2018 12:27
	SW-846 9036 (Total)				05/14/2018 23:14
	SW-846 9251 (Total)				05/14/2018 23:00
18050091-019B	DUP2	05/09/2018 12:27	05/09/2018 19:00		
	Standard Methods 2540 C (Dissolved) 1997				05/10/2018 16:40
	SW-846 9214 (Dissolved)				05/10/2018 16:47
18050091-019C	DUP2	05/09/2018 12:27	05/09/2018 19:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/11/2018 21:35
	SW-846 3005A, 6020A, Metals by ICPMS (Dissolved)			05/10/2018 23:41	05/14/2018 11:46
18050091-019D	DUP2	05/09/2018 12:27	05/09/2018 19:00		
	Standard Methods 4500-NO3 F (Total) 2000				05/10/2018 15:54

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

STANDARD METHOD 4500-H B 2001 FIELD

Batch R246935 **SampType:** LCS Units

SampID: LCS-R246935

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
pH	1.00		**7.00**	7.000	0	100.0	99.1	100.9	05/09/2018

STANDARD METHODS 2510 B FIELD

Batch R246935 **SampType:** LCS Units **µS/cm**

SampID: LCS-R246935

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Conductivity	1		**1410**	1412	0	99.9	90	110	05/09/2018

STANDARD METHODS 2540 C (DISSOLVED) 1997

Batch R246936 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						05/10/2018
Total Dissolved Solids	20		**< 20**						05/10/2018
Total Dissolved Solids	20		**< 20**						05/09/2018
Total Dissolved Solids	20		**< 20**						05/09/2018

Batch R246936 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**982**	1000	0	98.2	90	110	05/09/2018

Batch R246936 **SampType:** LCSQC Units **mg/L**

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**944**	1000	0	94.4	90	110	05/10/2018
Total Dissolved Solids	20		**988**	1000	0	98.8	90	110	05/09/2018
Total Dissolved Solids	20		**980**	1000	0	98.0	90	110	05/10/2018

Batch R246936 **SampType:** MS Units **mg/L**

SampID: 18050091-006BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**1930**	500.0	1422	102.0	85	115	05/10/2018

Batch R246936 **SampType:** MSD Units **mg/L** RPD Limit **5**

SampID: 18050091-006BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**1940**	500.0	1422	103.6	1932	0.41	05/10/2018

STANDARD METHODS 2540 C (DISSOLVED) 1997

Batch R246936 **SampType:** DUP Units mg/L RPD Limit 5

SampID: 18050091-012BDUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**1420**				1404	0.99	05/10/2018

STANDARD METHODS 4500-NO2 B (TOTAL) 2000

Batch R246930 **SampType:** MBLK Units mg/L

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**< 0.05**	0.02500	0	0	-100	100	05/10/2018
Nitrogen, Nitrite (as N)	0.05		**< 0.05**	0.02500	0	0	-100	100	05/10/2018

Batch R246930 **SampType:** LCS Units mg/L

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.25		**1.64**	1.630	0	100.3	90	110	05/10/2018
Nitrogen, Nitrite (as N)	0.25		**1.62**	1.630	0	99.4	90	110	05/10/2018

Batch R246930 **SampType:** MS Units mg/L

SampID: 18050091-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.51**	0.5000	0	102.4	85	115	05/10/2018

Batch R246930 **SampType:** MSD Units mg/L RPD Limit 10

SampID: 18050091-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.51**	0.5000	0	102.6	0.5120	0.20	05/10/2018

Batch R246930 **SampType:** MS Units mg/L

SampID: 18050091-019AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.52**	0.5000	0	103.0	85	115	05/10/2018

Batch R246930 **SampType:** MSD Units mg/L RPD Limit 10

SampID: 18050091-019AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrite (as N)	0.05		**0.52**	0.5000	0	103.0	0.5150	0.00	05/10/2018

STANDARD METHODS 4500-NO3 F (TOTAL) 2000

Batch R247062 **SampType:** MBLK Units mg/L

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**< 0.050**	).00900C	0	0	-100	100	05/10/2018

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

STANDARD METHODS 4500-NO3 F (TOTAL) 2000

Batch R247082 **SampType:** LCS Units mg/L

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	1.00		**7.09**	7.020	0	100.9	90	110	05/10/2018

Batch R247082 **SampType:** MS Units mg/L

SampID: 18050091-006DMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.260**	0.2500	0	104.0	85	115	05/10/2018

Batch R247082 **SampType:** MSD Units mg/L RPD Limit **10**

SampID: 18050091-006DMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.265**	0.2500	0	106.0	0.2600	1.90	05/10/2018

Batch R247082 **SampType:** MS Units mg/L

SampID: 18050091-019DMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.570**	0.2500	0.2970	109.2	85	115	05/10/2018

Batch R247082 **SampType:** MSD Units mg/L RPD Limit **10**

SampID: 18050091-019DMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Nitrogen, Nitrate-Nitrite (as N)	0.050		**0.574**	0.2500	0.2970	110.8	0.5700	0.70	05/10/2018

SW-846 9036 (TOTAL)

Batch R247133 **SampType:** MBLK Units mg/L

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**	5.000	0	0	-100	100	05/14/2018

Batch R247133 **SampType:** MBLK Units mg/L

SampID: MBLK-141698

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**	5.000	0	0	-100	100	05/15/2018

Batch R247133 **SampType:** LCS Units mg/L

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	93.0	90	110	05/14/2018

SW-846 9036 (TOTAL)

Batch R247133 **SampType:** MS **Units** mg/L
SampID: 18050091-009AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	50		**147**	50.00	98.82	95.6	85	115	05/14/2018

Batch R247133 **SampType:** MSD **Units** mg/L **RPD Limit** 10
SampID: 18050091-009AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	50		**152**	50.00	98.82	105.6	146.6	3.36	05/14/2018

SW-846 9214 (DISSOLVED)

Batch R246957 **SampType:** MBLK **Units** mg/L
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**	).00700(	0	0	-100	100	05/10/2018

Batch R246957 **SampType:** LCS **Units** mg/L
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**0.95**	1.000	0	94.8	90	110	05/10/2018

Batch R246957 **SampType:** MS **Units** mg/L
SampID: 18050091-006BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.15**	2.000	0.1160	101.7	85	115	05/10/2018

Batch R246957 **SampType:** MSD **Units** mg/L **RPD Limit** 10
SampID: 18050091-006BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.16**	2.000	0.1160	102.3	2.149	0.60	05/10/2018

Batch R246957 **SampType:** MS **Units** mg/L
SampID: 18050091-012BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.11**	2.000	0.07000	101.8	85	115	05/10/2018

Batch R246957 **SampType:** MSD **Units** mg/L **RPD Limit** 10
SampID: 18050091-012BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.18**	2.000	0.07000	105.3	2.100	3.27	05/10/2018

Teklab, Inc. Environmental Laboratory

Quality Control Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

SW-846 9251 (TOTAL)

Batch R247141 **SampType:** MBLK **Units** mg/L
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**	0.5000	0	0	-100	100	05/14/2018

Batch R247141 **SampType:** MBLK **Units** mg/L
SampID: MBLK-141698

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**	0.5000	0	0	-100	100	05/15/2018

Batch R247141 **SampType:** LCS **Units** mg/L
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	100.0	90	110	05/14/2018

Batch R247141 **SampType:** MS **Units** mg/L
SampID: 18050091-009AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	10		**47**	40.00	11.16	88.8	85	115	05/14/2018

Batch R247141 **SampType:** MSD **Units** mg/L RPD Limit **15**
SampID: 18050091-009AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	10		**46**	40.00	11.16	88.2	46.69	0.58	05/14/2018

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 141740 **SampType:** MBLK **Units** mg/L
SampID: MBLK-141740

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**< 0.0010**	.000380	0	0	-100	100	05/12/2018
Barium	0.0010		**< 0.0010**	.000150	0	0	-100	100	05/12/2018
Boron	0.0250		**< 0.0250**	).00926(	0	0	-100	100	05/12/2018
Iron	0.0250		**< 0.0250**	).00900(	0	0	-100	100	05/14/2018
Manganese	0.0020		**< 0.0020**	.000750	0	0	-100	100	05/12/2018
Selenium	0.0010		**< 0.0010**	.000280	0	0	100	100	05/12/2018

Batch 141740 **SampType:** LCS **Units** mg/L
SampID: LCS-141740

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.476**	0.5000	0	95.1	80	120	05/12/2018
Barium	0.0010		**1.92**	2.000	0	96.0	80	120	05/12/2018
Boron	0.0250		**0.467**	0.5000	0	93.3	80	120	05/12/2018
Iron	0.0250		**1.83**	2.000	0	91.6	80	120	05/12/2018
Manganese	0.0020		**0.470**	0.5000	0	94.0	80	120	05/12/2018
Selenium	0.0010		**0.471**	0.5000	0	94.1	80	120	05/12/2018

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 141740 **SampType:** MS Units **mg/L**

SampID: 18050091-001CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.489**	0.5000	0	97.8	75	125	05/12/2018
Barium	0.0010		**1.91**	2.000	0.01313	95.0	75	125	05/12/2018
Boron	0.0250		**2.14**	0.5000	1.698	87.4	75	125	05/12/2018
Iron	0.0250		**2.05**	2.000	0.2227	91.6	75	125	05/12/2018
Manganese	0.0020		**0.496**	0.5000	0.03315	92.4	75	125	05/12/2018
Selenium	0.0010		**0.467**	0.5000	0	93.4	75	125	05/12/2018

Batch 141740 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 18050091-001CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.482**	0.5000	0	96.3	0.4889	1.48	05/12/2018
Barium	0.0010		**1.87**	2.000	0.01313	92.7	1.914	2.53	05/12/2018
Boron	0.0250		**2.17**	0.5000	1.698	95.2	2.135	1.80	05/12/2018
Iron	0.0250		**2.05**	2.000	0.2227	91.4	2.055	0.24	05/12/2018
Manganese	0.0020		**0.489**	0.5000	0.03315	91.3	0.4952	1.15	05/12/2018
Selenium	0.0010		**0.457**	0.5000	0	91.5	0.4669	2.04	05/12/2018

Batch 141774 **SampType:** MBLK Units **mg/L**

SampID: MBLK-141774

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**< 0.0010**	.000380	0	0	-100	100	05/11/2018
Barium	0.0010		**< 0.0010**	.000150	0	0	-100	100	05/11/2018
Boron	0.0250	S	**< 0.0250**	).00926(	0	125.0	-100	100	05/11/2018
Iron	0.0250		**< 0.0250**	).00900(	0	0	-100	100	05/11/2018
Manganese	0.0020		**< 0.0020**	.000750	0	0	-100	100	05/11/2018
Selenium	0.0010		**< 0.0010**	.000280	0	0	-100	100	05/11/2018

Batch 141774 **SampType:** LCS Units **mg/L**

SampID: LCS-141774

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.466**	0.5000	0	93.2	80	120	05/11/2018
Barium	0.0010		**1.84**	2.000	0	91.8	80	120	05/11/2018
Boron	0.0250	B	**0.478**	0.5000	0	95.6	80	120	05/11/2018
Iron	0.0250		**1.80**	2.000	0	90.1	80	120	05/11/2018
Manganese	0.0020		**0.456**	0.5000	0	91.2	80	120	05/11/2018
Selenium	0.0010		**0.462**	0.5000	0	92.3	80	120	05/11/2018

Quality Control Results

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc. **Work Order:** 18050091

Client Project: Dynegy - Vermillion Power Station **Report Date:** 21-May-18

SW-846 3005A, 6020A, METALS BY ICPMS (DISSOLVED)

Batch 141774 **SampType:** MS Units mg/L

SampID: 18050091-012CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Arsenic	0.0010		**0.472**	0.5000	0.001702	94.1	75	125	05/11/2018
Barium	0.0010		**1.90**	2.000	0.09649	90.2	75	125	05/11/2018
Boron	0.0250	BS	**35.2**	0.5000	32.44	546.9	75	125	05/11/2018
Iron	0.0250		**1.79**	2.000	0.01608	88.7	75	125	05/11/2018
Manganese	0.0020		**0.594**	0.5000	0.1447	89.8	75	125	05/11/2018
Selenium	0.0010		**0.449**	0.5000	0	89.8	75	125	05/11/2018

Batch 141774 **SampType:** MSD Units mg/L RPD Limit **20**

SampID: 18050091-012CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Arsenic	0.0010		**0.478**	0.5000	0.001702	95.2	0.4723	1.11	05/11/2018
Barium	0.0010		**1.90**	2.000	0.09649	90.1	1.901	0.08	05/11/2018
Boron	0.0250	BS	**34.7**	0.5000	32.44	457.4	35.17	1.28	05/11/2018
Iron	0.0250		**1.78**	2.000	0.01608	88.1	1.789	0.61	05/11/2018
Manganese	0.0020		**0.591**	0.5000	0.1447	89.3	0.5938	0.45	05/11/2018
Selenium	0.0010		**0.452**	0.5000	0	90.4	0.4490	0.62	05/11/2018

Teklab, Inc.
Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Natural Resource Technology, Inc.
Client Project: Dynegy - Vermillion Power Station

Work Order: 18050091
Report Date: 21-May-18

Carrier: Jordan Evans
Received By: EAH

Completed by:
On:
10-May-18
Amber M. Dilallo

Reviewed by:
On:
10-May-18
Michael L. Austin

Pages to follow: Chain of custody 2 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C	2.82
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice	☐
Chain of custody present?	Yes ☑	No ☐			
Chain of custody signed when relinquished and received?	Yes ☑	No ☐			
Chain of custody agrees with sample labels?	Yes ☑	No ☐			
Samples in proper container/bottle?	Yes ☑	No ☐			
Sample containers intact?	Yes ☑	No ☐			
Sufficient sample volume for indicated test?	Yes ☑	No ☐			
All samples received within holding time?	Yes ☑	No ☐			
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐		
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐			

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑		
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑		
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐		
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑		

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 18050091

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: Natural Resource Technology, Inc.
Address: 2422 East Washington Street
City / State / Zip Bloomington, IL 61704
Contact: Steve Wiskes **Phone:** (414) 837-3614
E-Mail: steve.wiskes@obg.com **Fax:**

Samples on: [X] ICE [ ] BLUE ICE [ ] NO ICE 2.82 °C
Preserved in: [ ] LAB [X] FIELD
FOR LAB USE ONLY
Lab Notes: * Well Dry ~~5/10/18~~

Client Comments
Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.

Are these samples known to be involved in litigation? If yes, a surcharge will apply [ ] Yes [X] No
Are these samples known to be hazardous? [ ] Yes [X] No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. [ ] Yes [X] No

Project Name/Number: Dynegy - Vermillion Power Station
Sample Collector's Name: T. Mathis J. Evans

Results Requested: [X] Standard [ ] 1-2 Day (100% Surcharge) [ ] Other ____ [ ] 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4					Groundwater						Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O	Field ORP SM 2580-B	Field pH SM 4500-H+B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500-NO3 F	Sulfate 9036	TDS SM 2540C		
18050091-001	MW1	5-9-18 1227	2	1	1					X						X	X	X	X	X	X	X	X	X	X	X	X	X		
002	MW2	5-9-18 949	2	1	1					X						X	X	X	X	X	X	X	X	X	X	X	X	X		
003	MW7 *		2	1	1					X						X	X	X	X	X	X	X	X	X	X	X	X	X		
004	MW10	5-9-18 1405	2	1	1					X						X	X	X	X	X	X	X	X	X	X	X	X	X		
005	MW17	5-9-18 912	2	1	1					X						X	X	X	X	X	X	X	X	X	X	X	X	X		
006	MW18	5-9-18 925	2	1	1					X						X	X	X	X	X	X	X	X	X	X	X	X	X		
007	MW21	5-9-18 1249	2	1	1					X						X	X	X	X	X	X	X	X	X	X	X	X	X		
008	MW3R	5-9-18 1021	2	1	1					X						X	X	X	X	X	X	X	X	X	X	X	X	X		
009	MW4	5-9-18 1203	2	1	1					X						X	X	X	X	X	X	X	X	X	X	X	X	X		
010	MW5	5-9-18 1039	2	1	1					X						X	X	X	X	X	X	X	X	X	X	X	X	X		

Relinquished By	Date/Time	Received By	Date/Time
[signature]	5-9-18 1900	[signature]	5/9/18 1900

BottleOrder: 43690

GKH 5/10/18

CHAIN OF CUSTODY

pg. 2 of 2 Work order # 18050091

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: Natural Resource Technology, Inc.
Address: 2422 East Washington Street
City / State / Zip: Bloomington, IL 61704
Contact: Steve Wiskes **Phone:** (414) 837-3614
E-Mail: steve.wiskes@obg.com **Fax:**

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 2.8 °C
Preserved in: ☐ LAB ☐ FIELD **FOR LAB USE ONLY**
Lab Notes: * MW19 unable to access well

Client Comments
Dissolved Metals: ICP/MS 6020A As Ba B Fe Mn Se.

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No
Are these samples known to be hazardous? ☐ Yes ☒ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☒ No

Project Name/Number	Sample Collector's Name
Dynegy - Vermillion Power Station	T. Mathis J. Evans

Results Requested: ☒ Standard ☐ 1-2 Day (100% Surcharge) ☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNP	HNO3	H2SO4	Groundwater (MATRIX)	Chloride 9251	Diss Fluoride 9214	Dissolved Metals	Field Conductivity SM 2510-B	Field DO SM 4500-O	Field ORP SM 2580-B	Field pH SM 4500 H+B	Field Temperature SM 2550	Field Turbidity SM 2130-B	GW Depth to Water	Nitrate SM 4500-NO3 F	Sulfate 9036	TDS SM 2540C
18050091 011	MW6R	5-9-18 1102	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
012	MW8R	5-9-18 1007	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
013	MW9	5-9-18 1048	0			X										X			
014	MW19 *		0			X										X			
015	MW20	5-9-18 1129	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
016	MW34	5-9-18 1147	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
017	Field Blank	5-9-18 1410	2	1	1	X	X	X	X								X	X	X
018	DUP1	5-9-18 1102	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X
019	DUP2	5-9-18 1227	2	1	1	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	5-9-18 1900	Elizabeth A. Hurley	5/9/18 1900

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 43690

Monitoring Well Evaluation Checklist

Site: Vermilion
Inspection Date: 5-9-18
Well Number: MW1

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				

If present, how much sediment?	ft
16. Installed as total depth.	ft
17. Measured total depth of well.	ft

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring
ell Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 5-9-18 Time: 1217

Field Personnel: T. Mathis J. Evans Finish Date: 5-9-18 Time: 1227

WELL INFORMATION

Well ID: MW1

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1217		78.75								
	1219	0.13	80.26	1.51	14.87	6.96	2600	8.51	0.4	37	Clear
	1221	0.26	81.46	1.20	14.70	6.74	2650	4.75	0.8	69	Clear
	1223	0.39	82.45	0.99	14.13	6.69	2600	5.0	0.6	80	Clear
	1225	0.52	83.59	1.14	14.12	6.63	2540	5.45	0.3	92	Clear
	1227	0.65	84.09	0.5	14.27	6.63	2500	4.99	0.5	96	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermillion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	5-4-18				
Well Number	MW02				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

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ell Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 5-9-18 Time: 933

Field Personnel: T. Mathis J. Evans Finish Date: 5-9-18 Time: 949

WELL INFORMATION

Well ID: MW02

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	933		18.47								
	935	0.13	20.57	2.1	14.83	7.06	716	1.71	9.0	-62	Clear
	937	0.26	21.52	0.95	14.45	7.23	747	1.62	3.0	-78	Clear
	939	0.39	21.95	0.43	14.54	7.27	787	1.04	2.0	-94	clear
	941	0.52	22.16	0.21	14.41	7.33	799	0.90	0.8	-101	Clear
	943	0.65	22.47	0.31	14.47	7.37	812	0.63	0.7	-113	Clear
	945	0.78	22.92	0.45	14.50	7.44	812	0.65	1.0	-118	Clear
	947	0.91	23.14	0.22	14.36	7.41	823	0.40	1.2	-121	clear
	949	1.04	23.30	0.16	14.45	7.40	821	0.40	0.8	-124	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermillion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	5-9-18				
Well Number	MW 07				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments: Well casing was knocked over and laying on groud

Major well repair are those that require a subcontractor or separate mobilization to complete

2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring
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WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion   Client: NRT

Project Number: Task #:   Start Date: 5-9-18   Time: 930

Field Personnel: T. Mathis J. Evans   Finish Date: Time:

WELL INFORMATION

Well ID: MW07

Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity

NOTES (continued)

* Well dry

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	5-9-18				
Well Number	10				

Stick up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

	Yes	No	NA	
General Condition				
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

*Major well repair are those that require a subcontractor or separate mobilization to complete

200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion   Client: NRT

Project Number: ______ Task #: ______ Start Date: 5-9-18 Time: 353

Field Personnel: T. Mathis J. Evans   Finish Date: 5-9-18 Time: 1405

WELL INFORMATION

Well ID: 10

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1353		49.13								
	1355	0.13	50.30	1.17	15.64	7.42	1620	4.9	1.0	-27	Clear
	1357	0.26	51.92	1.32	15.01	6.74	1570	3.02	0.2	32.	Clear
	1359	0.39	52.72	0.8	15.12	6.52	1540	2.09	0.6	50	Clear
	1401	0.52	53.26	0.54	15.08	6.45	1570	1.61	1.3	60	Clear
	1403	0.65	53.67	0.41	15.20	6.43	1510	1.51	1.3	67	Clear
	1405	0.78	53.92	0.25	15.30	6.42	1510	1.34	1.2	73	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celsius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	5-6-18			X	
Well Number	MW17				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?	X			
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?	X			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?			↓	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad	↓			
Slope away form casing?	↓			
Not deteriorated?	↓			
Not heaved or below surrounding grade?	↓			
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?	↓			

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring
ell Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermilion Client: NRT

Project Number: Task #: Start Date: 5-9-18 Time: 833

Field Personnel: T Mathis J Evans Finish Date: 5-9-18 Time: 912

WELL INFORMATION

Well ID: MW 17

Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	833		38.38								
	900	1.17	50.67	12.29	18.76	6.77	2420	3.15	37.0	15	Clear
	903	1.30	51.84	1.17	16.14	6.68	2430	2.82	37.9	10	Clear
	906	1.43	52.20	0.36	15.57	6.67	2470	2.83	26.4	5	Clear
	909	1.56	53.45	1.25	15.47	6.68	2490	2.81	22.5	3	Clear
	912	1.69	53.90	0.45	15.16	6.69	2490	2.78	23.2	2	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: Vermillion
Inspection Date: 5-9-18
Well Number: MW 18

Major wells repairs* required to maintain well integrity?	Yes	No	NA

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose	X			

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring ll Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion
Client: NRT
Project Number:
Task #:
Start Date: 5-9-18 Time: 919
Field Personnel: T. Mathis J. Evans
Finish Date: 5-9-18 Time: 925

WELL INFORMATION

Well ID: MW 18
Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	919		22.93								
	922	0.13	22.93	0	15.58	6.65	2000	1.52	3.3	37	Clear
	925	0.26	22.93	0	14.89	6.67	1970	0.40	1.8	32	Clear
	928	0.39	22.93	0	14.47	6.66	1940	0.11	1.9	36	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	5-4-18			X	
Well Number	MW21				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?	↓			
5. Is there a lockable cap present?	↓			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	↓			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad	↓			
Slope away form casing?	↓			
Not deteriorated?	↓			
Not heaved or below surrounding grade?	↓			
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?	↓			

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring
ll Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 5-9-18 Time: 1241

Field Personnel: T. Mathis J. Evans Finish Date: 5-9-18 Time: 1249

WELL INFORMATION

Well ID: MW 21

Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1241		90.31								
	1243	0.13	92.04	1.73	14.58	7.10	649	4.64	1.5	36	Clear
	1245	0.26	92.34	0.3	14.56	6.99	644	2.66	1.2	-44	Clear
	1247	0.39	92.58	0.24	14.69	6.99	655	1.66	1.2	-71	Clear
	1249	0.52	93.00		14.64	7.02	654	1.4	1.1	-75	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site	Vermillion	Major wells repairs* required to maintain well integrity?	Yes	No	NA
Inspection Date	5-9-18			X	
Well Number	MW 3R				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose	✓			

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose	✓			

	Yes	No	NA	
3. Are there weep holes in outer casing?			X	
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?			✓	

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?			✓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
	X		X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?	✓		✓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?	✓			

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion
Client: NRT
Project Number:
Task #:
Start Date: 5-9-18 Time: 1015
Field Personnel: T. Mathis J. Evans
Finish Date: 5-9-18 Time: 1021

WELL INFORMATION

Well ID: MW3R
Casing ID: inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1015		7.03								
	1017	0.13	7.55	0.52	14.44	7.16	1040	2.31	1.6	-71	Clear
	1019	0.26	7.55	0	14.02	7.16	1050	0.38	0.5	-100	Clear
	1021	0.3c	7.55	0	13.98	7.16	1060	0.10	0.4	-106	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermillion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	5-4-18				
Well Number	MW 4				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion
Client: NRT
Project Number:
Task #:
Start Date: 5-9-18
Time: 55
Field Personnel: T. Mathis J. Evans
Finish Date: 5-9-18
Time: 1203

WELL INFORMATION

Well ID: MW4
Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1155		6.36								
	1157	0.13	6.85	0.49	12.66	7.35	641	0.01	0	-93	Clear
	1159	0.26	6.85	0	12.44	7.27	648	0	0	-93	Clear
	1201	0.39	6.85	0	12.33	7.26	649	0	0	-94	Clear
	1203	0.52	6.85	0	12.16	7.24	648	0	0	-94	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celsius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	5-9-18				
Well Number	MW-5				

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X		/	
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?				
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

	Yes	No	NA	
Downhole Condition			X	
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

	Yes	No	NA	
General Condition				
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 5-9-18 Time: 1029

Field Personnel: T. Mathis J. Evans Finish Date: 5-9-18 Time: 1039

WELL INFORMATION

Well ID: MW5

Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1029		6.25								
	1031	0.13	6.83		12.32	7.33	919	2.84	0.3	-48	Clear
	1033	0.26	6.83	0	12.17	7.25	923	1.03	0	-41	Clear
	1035	0.39	6.83	0	11.89	7.19	921	0.35	0	-35	Clear
	1037	0.52	6.83	0	11.77	7.16	922	0.16	0	-30	Clear
	10.39	0.65	6.83	0	11.83	7.15	923	0.06	0	-27	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

				Yes	No	NA
Site	Vermilion	Major wells repairs* required to maintain well integrity?			X	
Inspection Date	5-9-18					
Well Number	MW 6R					

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 5-9-18 Time: 1050

Field Personnel: T. Mathis J. Evans Finish Date: ______ Time: 1102

WELL INFORMATION

Well ID: MW 6R

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☒ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1050		3.95								
	1052	0.03	4.10	0.15	11.99	7.32	874	0.79	0.3	-61	Clear
	1054	0.26	4.10	[illegible] ~~0.15~~ 0	11.93	7.10	871	0.15	0.4	-62	Clear
	1056	0.39	4.10	0	11.72	6.93	872	0	0.5	-64	Clear
	1058	0.52	4.10	0	11.75	6.88	868	0	0	-64	Clear
	1100	0.65	4.10	0	11.66	6.85	871	0	0	-66	Clear
	1102	0.78	4.10	0	11.63	6.82	868	0.14	0	-66	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermillion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	5-9-18				
Well Number	MW 8R				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented				
Not cracked				
Not loose				

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring
ll Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 5-9-18 Time: 958

Field Personnel: T. Mathis J. Evans Finish Date: 5-9-18 Time: 1007

WELL INFORMATION

Well ID: MW 8R

Casing ID: ______ inches

EVENT TYPE

- [ ] Well Development
- [ ] Well Volume Approach Sampling
- [x] Low-Flow / Low Stress Sampling
- [ ] Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	959		12.44								
	1001	0.13	12.87	0.43	14.10	7.23	1730	2.47	2.5	-63	Clear
	1003	0.26	12.87	0	13.59	7.09	1740	1.09	3.3	-55	Clear
	1005	0.39	12.87	0	13.46	7.11	1750	0.75	4.1	-50	Clear
	1007	0.52	12.87	0	13.30	7.16	1720	0.52	4.0	-47	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermillion	Major wells repairs* required to maintain well integrity?	X		
Inspection Date	5-9-18				
Well Number	MW 9				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded		X		
Not dented		X		
Not cracked	X			
Not loose		X		

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented				
Not cracked				
Not loose	X			

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?	X			
5. Is there a lockable cap present?	X			
6. Is there a lock present?	X			
7. Bumper posts in good condition?			X	

Flushmount Monitoring Wells	Yes	No	NA	
8. Can the lid be secured tightly?				
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells	Yes	No	NA	
Downhole Condition				
12. Water level measuring point clearly marked?				
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?				
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 5-9-18 Time: 1048

Field Personnel: T. Mathis J. Evans Finish Date: Time:

WELL INFORMATION

Well ID: MW 9

Casing ID: inches

EVENT TYPE

☐ Well Development ☒ Low-Flow / Low Stress Sampling

☐ Well Volume Approach Sampling ☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
			4.40								

NOTES (continued)

* Depth only

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: Time:

Field Personnel: T. Mathis J Evans Finish Date: Time:

WELL INFORMATION

Well ID: MW19

Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity

NOTES (continued)

* Unable to access well

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Monitoring Well Evaluation Checklist

Site: Vermillion
Inspection Date: 5-9-18
Well Number: MW20

Major wells repairs* required to maintain well integrity?	Yes	No	NA
		X	

Stick-up Monitoring Wells

	Yes	No	NA	Comments
1. Outer protective Casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
2. Inner casing				
Not corroded	X			
Not dented				
Not cracked				
Not loose				

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?				
5. Is there a lockable cap present?				
6. Is there a lock present?				
7. Bumper posts in good condition?				

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?				
10. No water in the flushmount?				
11. Is the well cap lockable?				
12. Is there a lock present?				

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?				
14. No plant roots or vegetation in well?				
15. No sediment in bottom of well?				

If present, how much sediment?	ft
16. Installed as total depth.	ft
17. Measured total depth of well.	ft

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19 . Concrete pad				
Slope away form casing?				
Not deteriorated?				
Not heaved or below surrounding grade?				
20. No surface seal settling?				
21. Well clearly visible and labeled?				

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring
ll Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 5-9-18 Time: 1113

Field Personnel: T. Mathis J. Evans Finish Date: 5-9-18 Time: 1129

WELL INFORMATION

Well ID: MW20

Casing ID: inches

EVENT TYPE

☐ Well Development

☐ Well Volume Approach Sampling

☒ Low-Flow / Low Stress Sampling

☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1113		13.21								
	1119	0.39	13.41	0.2	13.59	7.37	515	0.21	48.6	-50	Clear
	1121	0.52	13.41	0	11.57	7.21	547	0	64.1	-36	Cloudy
	1123	0.65	13.41	0	11.70	7.01	536	0	22.3	-24	Clear
	1125	0.78	13.41	0	11.54	7.03	542	0	24.4	-20	Clear
	1127	0.91	13.41	0	11.61	7.60	544	0	13.4	-24	Clear
	1129	1.04	13.41	0	11.41	6.96	550	0	9.3	-21	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celsius

Monitoring Well Evaluation Checklist

			Yes	No	NA
Site	Vermillion	Major wells repairs* required to maintain well integrity?		X	
Inspection Date	5-9-18				
Well Number	MW 34				

Stick-up Monitoring Wells

1. Outer protective Casing	Yes	No	NA	Comments
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

2. Inner casing	Yes	No	NA	
Not corroded	X			
Not dented	↓			
Not cracked	↓			
Not loose	↓			

	Yes	No	NA	
3. Are there weep holes in outer casing?	X			
4. Weep holes able to drain?	↓			
5. Is there a lockable cap present?	↓			
6. Is there a lock present?	↓			
7. Bumper posts in good condition?	↓			

Flushmount Monitoring Wells

	Yes	No	NA	
8. Can the lid be secured tightly?			X	
9. Does the lid have a gasket that seals?			↓	
10. No water in the flushmount?			↓	
11. Is the well cap lockable?			↓	
12. Is there a lock present?			↓	

All Monitoring Wells

Downhole Condition	Yes	No	NA	
12. Water level measuring point clearly marked?			X	
13. No obstructions in well?			↓	
14. No plant roots or vegetation in well?			↓	
15. No sediment in bottom of well?			↓	
If present, how much sediment?	ft			
16. Installed as total depth.	ft			
17. Measured total depth of well.	ft			

General Condition	Yes	No	NA	
18. Concrete pad installed?	X			
19. Concrete pad	↓			
Slope away form casing?	↓			
Not deteriorated?	↓			
Not heaved or below surrounding grade?	↓			
20. No surface seal settling?	↓			
21. Well clearly visible and labeled?	X			

Comments:

Major well repair are those that require a subcontractor or separate mobilization to complete

2200\2285\Deliverables\Sampling and Analysis Plans\Teklab Draft Provisional SAP\Appendix B - Field Forms\Monitoring
...ll Inspection Form

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 5-9-18 Time: 1135

Field Personnel: T. Mathis J. Evans Finish Date: 5-9-18 Time: 1147

WELL INFORMATION

Well ID: MW 34

Casing ID: inches

EVENT TYPE

☐ Well Development
☐ Well Volume Approach Sampling
☒ Low-Flow / Low Stress Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1135		13.55								
	1141	0.39	13.89	0.34	13.54	6.72	860	0.83	28.2	-65	Clear
	1143	0.52	13.89	0	13.18	6.82	863	0.23	30.8	-88	Clear
	1145	0.65	13.89	0	13.05	6.86	867	0.07	35.1	-95	Clear
	1147	0.78	13.89	0	13.08	6.87	864	0	32.4	-101	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp.- Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: Task #: Start Date: 5-9-18 Time: 1050

Field Personnel: T. Mathis J. Evans Finish Date: 5-9-18 Time: 1102

WELL INFORMATION

Well ID: Dup 1

Casing ID: inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1050		3.95								
	1102	0.78	4.10	0	11.63	6.82	868	0.14	0	-66	Clear

NOTES (continued)

ABBREVIATIONS

Cond. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

WELL DEVELOPMENT AND GROUNDWATER SAMPLING FIELD FORM

PROJECT INFORMATION

Site: Vermillion Client: NRT

Project Number: ______ Task #: ______ Start Date: 5-9-18 Time: 1217

Field Personnel: T. Mathis J. Evans Finish Date: 5-9-18 Time: 1227

WELL INFORMATION

Well ID: Dup 2

Casing ID: ______ inches

EVENT TYPE

☐ Well Development
☒ Low-Flow / Low Stress Sampling
☐ Well Volume Approach Sampling
☐ Other (Specify):

WATER QUALITY INDICATOR PARAMETERS (continued)

Sampling Stage	Time (military)	Volume Removed (gallons)	Depth to Water (Feet)	Drawdown (Feet)	Temp. (°C)	pH (SU)	SEC or Cond. (µs/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	ORP (mV)	Visual Clarity
	1217		78.75								
	1227	0.65	84.09	0.5	14.27	6.63	2500	4.99	0.5	96	Clear

NOTES (continued)

ABBREVIATIONS

Conc. - Actual Conductivity
FT BTOC - Feet Below Top of Casing
na - Not Applicable
nm - Not Measured
ORP - Oxidation-Reduction Potential
SEC - Specific Electrical Conductance
SU - Standard Units
Temp - Temperature
°C - Degrees Celcius

Field Calibration Form
Groundwater Quality Meter

Groundwater Quality Meter Manufacturer/Model Horiba U52
Serial Number Y9E5AG8R
oxidation/reduction potential, dissolved oxygen, pH, tubidity

Date of Calibration Check	Calibration Standard Concentration	Calibration Reading	Within +/_ 10% (yes or no)	Comments
5-9-18 815	4.00	4.01	Yes	
	10.00	10.00		
	7.00	7.00		
	0.0	0.6		
	1412	1410		
	100%	100%		
5-9-18 1430	7.00	7.01		
	0.0	0.8		
	100%	119.4%		
	1412	1440		

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

10883 Metro Blvd
Maryland Heights, MO 63043
Toll-free: (800) 242-3910

Pine Environmental Services, Inc.

Instrument ID	21152
Description	Horiba U-52
Calibrated	5/8/2018 1:02:17PM

Manufacturer	Horiba	**State Certified**	
Model Number	U-52	**Status**	Pass
Serial Number/ Lot Number	Y9E5AG8R	**Temp °C**	22
Location	St. Louis	**Humidity %**	32
Department			

Calibration Specifications

Group # 1 — **Group Name** PH — **Stated Accy** Pct of Reading
Range Acc % 0.0000 — **Reading Acc %** 3.0000 — **Plus/Minus** 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
7.01 / 7.01	PH	7.01	PH	6.00	7.00	-0.14%	Pass
4.01 / 4.01	PH	4.01	PH	3.50	4.00	-0.25%	Pass

Group # 2 — **Group Name** Turbidity — **Stated Accy** Pct of Reading
Range Acc % 0.0000 — **Reading Acc %** 3.0000 — **Plus/Minus** 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.00 / 0.00	NTU	0.00	NTU	0.00	0.00	0.00%	Pass
800.00 / 800.00	NTU	800.00	NTU	800.00	800.00	0.00%	Pass

Group # 3 — **Group Name** Conductivity — **Stated Accy** Pct of Reading
Range Acc % 0.0000 — **Reading Acc %** 3.0000 — **Plus/Minus** 0.000

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
0.718 / 0.718	ms/cm	0.718	ms/cm	0.800	0.718	0.00%	Pass
5.000 / 5.000	ms/cm	5.000	ms/cm	4.600	5.000	0.00%	Pass
80.000 / 80.000	ms/cm	80.000	ms/cm	94.800	80.000	0.00%	Pass

Group # 4 — **Group Name** Redox (ORP) — **Stated Accy** Pct of Reading
Range Acc % 0.0000 — **Reading Acc %** 3.0000 — **Plus/Minus** 0.00

Nom In Val / In Val	In Type	Out Val	Out Type	Fnd As	Lft As	Dev%	Pass/Fail
240.00 / 240.00	mv	240.00	mv	254.00	240.00	0.00%	Pass

Group # 5 — **Group Name** Temperature DO Span % — **Stated Accy** Pct of Reading
Range Acc % 0.0000 — **Reading Acc %** 3.0000 — **Plus/Minus** 0.00

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

10883 Metro Blvd
Maryland Heights, MO 63043
Toll-free: (800) 242-3910

Pine Environmental Services, Inc.

Instrument ID 21152
Description Horiba U-52
Calibrated 5/8/2018 1:02:17PM

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

INSTRUMENT CALIBRATION REPORT

Pine Environmental Services LLC

10883 Metro Blvd
Maryland Heights, MO 63043
Toll-free: (800) 242-3910

Pine Environmental Services, Inc.

Instrument ID 23260
Description Horiba U-52
Calibrated 5/8/2018 1:02:56PM

Manufacturer	Horiba	**State Certified**	
Model Number	U-52	**Status**	Pass
Serial Number/ Lot Number	F94BU6X6	**Temp °C**	22
Location	St. Louis	**Humidity %**	32
Department			

Calibration Specifications

Group # 1
Group Name DISPLAY
Test Performed: N/A **As Found Result:** **As Left Result:**

Test Instruments Used During the Calibration **(As Of Cal Entry Date)**

Test Standard ID	Description	Manufacturer	Model Number	Serial Number / Lot Number	Last Cal Date/ Opened Date	Next Cal Date / Expiration Date

Notes about this calibration

Calibration Result Calibration Successful
Who Calibrated Kendall Wilkes

All instruments are calibrated by Pine Environmental Services LLC according to the manufacturer's specifications, but it is the customer's responsibility to calibrate and maintain this unit in accordance with the manufacturer's specifications and/or the customer's own specific needs.

Notify Pine Environmental Services LLC of any defect within 24 hours of receipt of equipment
Please call 800-301-9663 for Technical Assistance

INSTRUMENT QC/ PACKING LIST

Description	Horiba U-52/ U-53
Sonde ID#	21152
Display ID#	23260
Date Calibrated	5-8-18

PINE
www.pine-environmental.com

Standard Items	Prepared	QC check	Received by customer	Returned to Pine
Horiba U-52/ 53 w/ 4m' cable and display w/ case	✓	✓		
Manual	✓	✓		
Quick reference card	✓	✓		
(4) C Alkaline batteries	✓	✓		
Probe Guard	✓	✓		
Calibration cup (clear)	✓	✓		
Sample cup (Black)	✓	✓		
Flow cell	✓	✓		
• Cell body	✓	✓		
• Center window	✓	✓		
• Base and black bottom	✓	✓		
• O-ring cover	✓	✓		
• Threaded ring	✓	✓		
• (2) black O-rings	✓	✓		
• (1) red O-ring	✓	✓		
• 2 of each black barb sizes (1/4, 3/8, and 1/2)	✓	✓		
D.O. probe reconditioning kit	✓	✓		
330 internal pH reference solution (1)	✓	✓		
250 ml Autocal solution	✓	✓		
ProCal calibration sheet	✓	✓		
Optional Items				
U-50 Data Collection Software				
USB Cable				

Prepared by: KW
QC checked by: RM
Date: 5-8-18

This packing list is to ensure that every item needed to operate the unit was sent and received. Upon receiving a shipment, please fill out the "Received by customer" column. Call Pine within 24 hours of receiving the equipment if any pieces are missing, damaged, or malfunctioning. Thank you for choosing Pine Environmental Services LLC

Appendix C

November 2017 DMG Letter to IEPA

DYNEGY

DYNEGY MIDWEST GENERATION, LLC
1500 East Port Plaza Drive
Collinsville, IL 62234

Via UPS

November 30, 2017

Mr. Richard Cobb, P.G.
Deputy Division Manager
Bureau of Water; Division of Public Water Supplies
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, Illinois 62794-9276

Dear Mr. Cobb:

Re: Vermilion Site
Ash Pond Closures Options Report

Enclosed please find the Vermilion site ash pond closure options report requested in your May 30, 2017 letter. Options are identified for the north, old east, and new east ash ponds at our former Vermilion power station site. The report was prepared by Stantec Consulting Services, Inc. (St. Louis, MO). It includes cost estimates for the various identified ash pond closure options and costs for associated river bank stabilization options. This report should be read in conjunction with the river bank stabilization options report submitted to you on November 6, 2017 and the groundwater flow and transport modeling report that will be submitted to you in October 2018.

The probable cost estimates are based on information available at this time and should not viewed as exact cost determinations. The estimates are based upon numerous assumptions such as the viability of beneficial reuse, ability to obtain U.S. Army Corp of Engineers permits, availability and costs of materials, etc.

At this time, Dynegy Midwest Generation, LLC (DMG) is unable to make a recommendation as to the closure option that it would like to implement for each ash pond. DMG believes it must wait until the hydrogeologic studies are completed in October 2018 to make a recommendation.

In the meantime, DMG will proceed with Section 404 permitting with Army Corp of Engineers (Louisville, KY District) for implementing river bank stabilization along the north and old east ash ponds.

We would be happy to meet with you to discuss the enclosed report. You should also feel free to call me at 618/343-7761 if you have questions about the report.

Sincerely,
Dynegy Midwest Generation, LLC by its agent Dynegy Operating Company

Rick Diericx
Managing Director – Environmental Compliance

Enclosures

bcc A.D. Diericx Correspondence File - Collinsville
T. L. Davis – Collinsville
M. Ballance / Vic Modeer – Collinsville
D. Tickner – Collinsville

Stantec

Stantec Consulting Services Inc.
1859 Bowles Avenue Suite 250, Fenton MO 63026-1944

November 27, 2017

File: let vermilion closure IEPA 20171127

Attention: Mr. Victor Modeer, PE
Dynegy Midwest Generation, LLC
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

Reference: Closure Options
Ash Ponds Closure
Vermilion Site

Dear Mr. Modeer,

Stantec Consulting Services Inc. (Stantec) has completed an evaluation of closure options for the North Ash Pond (NAP), Old East Ash Pond (OEAP), and New East Ash Pond (NEAP) at the Vermilion Site. For your use in responding to the letter from the Illinois Environmental Protection Agency (IEPA) to Dynegy Midwest Generation, LLC (DMG) dated May 30, 2017, please find attached a table that includes an opinion of probable cost, anticipated project duration, and a summary of each closure option evaluated. The attached figures are provided to illustrate each closure option. Details regarding the riverbank stabilization options along the North and Old East Ash Ponds are included in *Vermilion Site Riverbank Assessment* prepared by Stantec on November 2, 2017 and submitted to the IEPA by DMG on November 6, 2017. The riverbank improvements can be implemented prior to or in conjunction with closure construction.

Stantec appreciates the opportunity to support this project. If you have any questions or need additional information, please call.

STANTEC CONSULTING SERVICES INC.

Matthew Hoy, PE
Project Manager/Senior Associate
Matthew.Hoy@Stantec.com

Matt Vaughan, PE
Senior Associate
Matt.Vaughan@Stantec.com

cel/

Attachments: Table 1 – Closure Options Summary
Figure 1 – Close in Place (Option 1)
Figure 2 – Closure by Removal (Option 2)

Figure 3 – Beneficial Re-use (Option 3)
Figure 4 – Consolidate OEAP to NAP/NEAP (Option 4)
Figure 5 – Consolidate NEAP and OEAP Layback to NAP (Option 5)

Cc. Matt Ballance

The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 20h

Stantec

Client Dynegy Midwest Generation, LLC
Project Name Vermilion Ash Ponds Closure
Location Danville, IL
Facility Vermilion Site
Date 11/27/2017

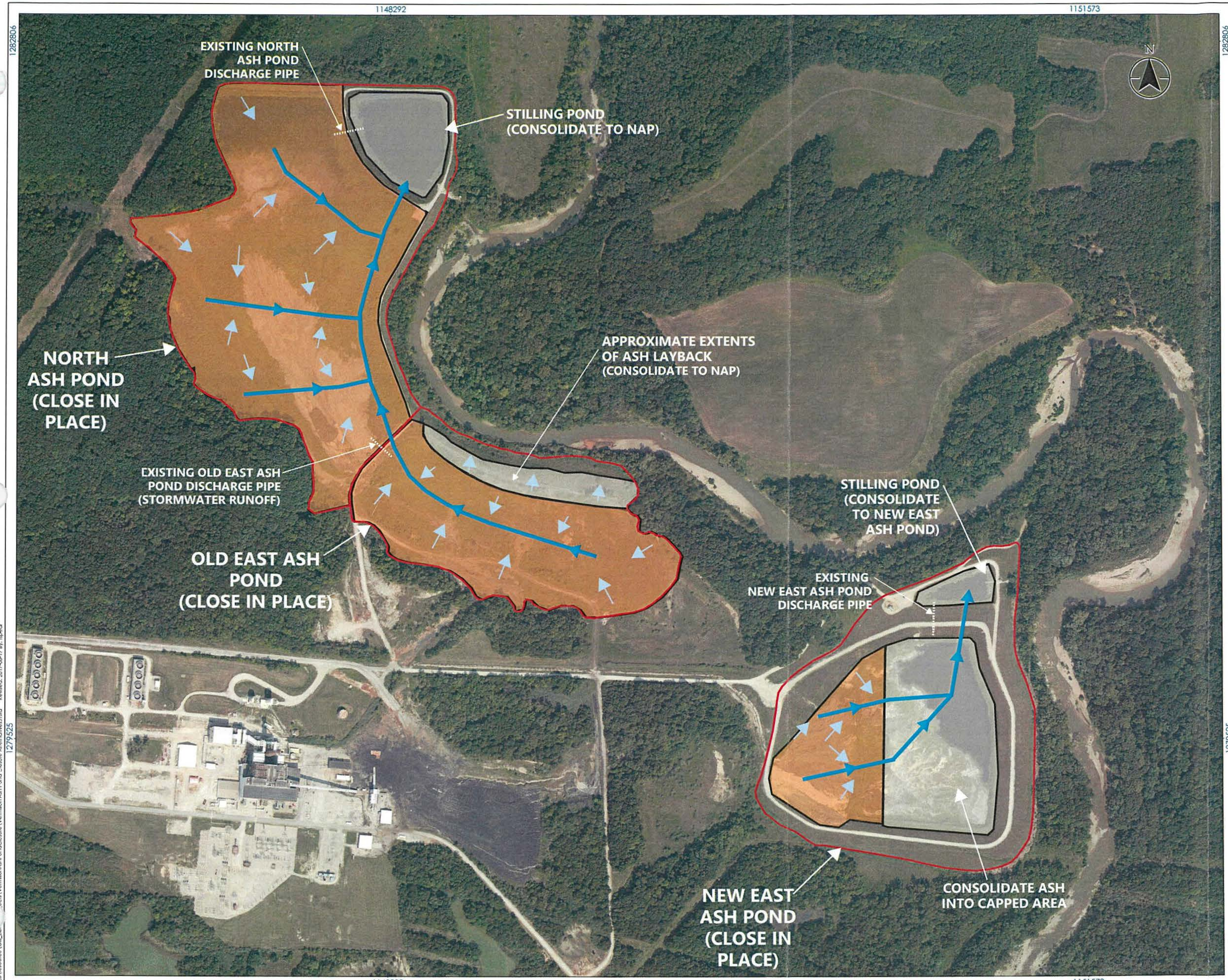
Table 1 - Closure Options Summary

Considerations	Option 1: Close in place (NAP, OEAP); Consolidate ash and close in place (NEAP)[1]	Option 2: Closure by removal (NAP, OEAP, NEAP)	Option 3: Beneficial Re-use (NAP, OEAP, NEAP)	Option 4: Consolidate OEAP to NAP/NEAP, close NAP and NEAP in place	Option 5: Consolidate NEAP and OEAP layback to NAP, close OEAP and NAP in place
Opinion of Probable Cost (Closure)	$29M	$192M	$33M - $145M[3]	$43M	$32M
Anticipated Project Duration (Closure)[2]	2 years	5 to 10 years	10 to 20 years	3 to 5 years	2 to 3 years
Opinion of Probable Cost (Riverbank)	$3M to $3.5M	$3M to $3.5M	$3M to $3.5M	$3M to $3.5M	$3M to $3.5M
Anticipated Project Duration (Riverbank)[2]	6-12 Months	6-12 Months	6-12 Months	6-12 Months	6-12 Months
Summary	Since the NAP and OEAP will remain in place, stabilize the riverbank along the OEAP and NAP, as necessary, with rock toe with live branch layering and/or a buried riprap trench. Contour the ash to promote positive drainage. Consolidate ash in NEAP to a smaller footprint on the west side prior to capping. The OEAP slope along the riverbank will be laid back to provide access for inspections, maintenance and installation of riverbank stabilization. Construct an engineered cap system over the three ash ponds. Drainage of post-closure surface runoff will generally be consistent with existing drainage patterns.	Since closure by removal will require 5-10 years, stabilize the riverbank along the OEAP and NAP, as necessary, with rock toe with live branch layering and/or a buried riprap trench. Moisture condition the ash ,as needed, prior to loading into trucks and hauling offsite. Excavate the ash from the three ash ponds and dispose of it at an offsite landfill. Once all the ash has been removed, soil material from the existing dikes will be used to fill the bottom of the three ponds to promote positive drainage. The site will be left in a condition that will not impound water.	Since excavation for beneficial reuse will require 10-20 years, stabilize the riverbank along the OEAP and NAP, as necessary, with rock toe with live branch layering and/or a buried riprap trench. Excavate the ash from the three ash ponds, if necessary, condition it onsite, and then haul it to an offsite facility for beneficial reuse. Ash that does not conform to the requirements of beneficial reuse will be consolidated and capped with an engineered cap system on-site or disposed of at an offsite landfill. Once all the ash has been removed or consolidated, soil material from the existing dikes will be used to fill the bottom of the three ponds to promote positive drainage. The site will be left in a condition that will not impound water. Note: Quantity, cost, and schedule for this option may vary based on market conditions and quality of the material.	Since excavation for consolidation and closure will require 3-5 years, stabilize the riverbank along the OEAP and NAP, as necessary, with rock toe with live branch layering and/or a buried riprap trench. Excavate ash from the OEAP and place it in the NAP/NEAP. Consolidate ash in NEAP to a smaller footprint on the west side prior to capping. The NAP/NEAP will be closed in place with an engineered cap system. Soil fill will be placed in the bottom of the OEAP to promote positive drainage. The OEAP will be left in a condition that will not impound water.	Since excavation for consolidation and closure will require 2-3 years, stabilize the riverbank along the OEAP and NAP, as necessary, with rock toe with live branch layering and/or a buried riprap trench. Excavate ash from the NEAP and place it in the NAP. Lay back the OEAP slope along the riverbank to provide access for inspections, maintenance and installation of riverbank stabilization. Construct an engineered cap system over the NAP and OEAP. Once the ash is removed from the NEAP, soil fill will be placed in the bottom of the NEAP to promote positive drainage. The NEAP will be left in a condition that will not impound water.
Figure	1	2	3	4	5

[1]Acronyms/Abbreviations used in the table: M (million), NAP (North Ash Pond), NEAP (New East Ash Pond), OEAP (Old East Ash Pond).

[2]Anticipated project duration only includes construction and does not account for design and permitting.

[3] The cost range depicts the volatility of the beneficial reuse market and the differential in cost associated with capping non-conformance materials on-site vs off-site disposal at a landfill.



Stantec

LEGEND

- ASH POND BORDER
- PROPOSED DITCH
- OVERLAND FLOW DIRECTION
- LIMITS OF CLOSURE CAP
- CLOSURE BY CONSOLIDATION

0 500 1,000 Feet

Notes

1. Coordinate System: NAD 1983 StatePlane Illinois East FIPS 1201 Feet
2. Orthoimagery: ESRI Online.

Project Location
Danville, IL

Prepared by T. Lawrence
Reviewed by M. Vaughan

Client/Project
Client: Dynegy Midwest Generation, LLC
Title: Vermilion Site
Project: Ash Ponds Closure

Figure No.
1

Title
Option 1: Close in place (NAP, OEAP); Consolidate ash and close in place (NEAP)

ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL

Stantec

LEGEND

- ASH POND BORDER
- PROPOSED DITCH
- OVERLAND FLOW DIRECTION
- LIMITS OF ASH REMOVAL

0 500 1,000 Feet

Notes

1. Coordinate System: NAD 1983 StatePlane Illinois East FIPS 1201 Feet
2. Orthoimagery: ESRI Online.

Project Location
Danville, IL

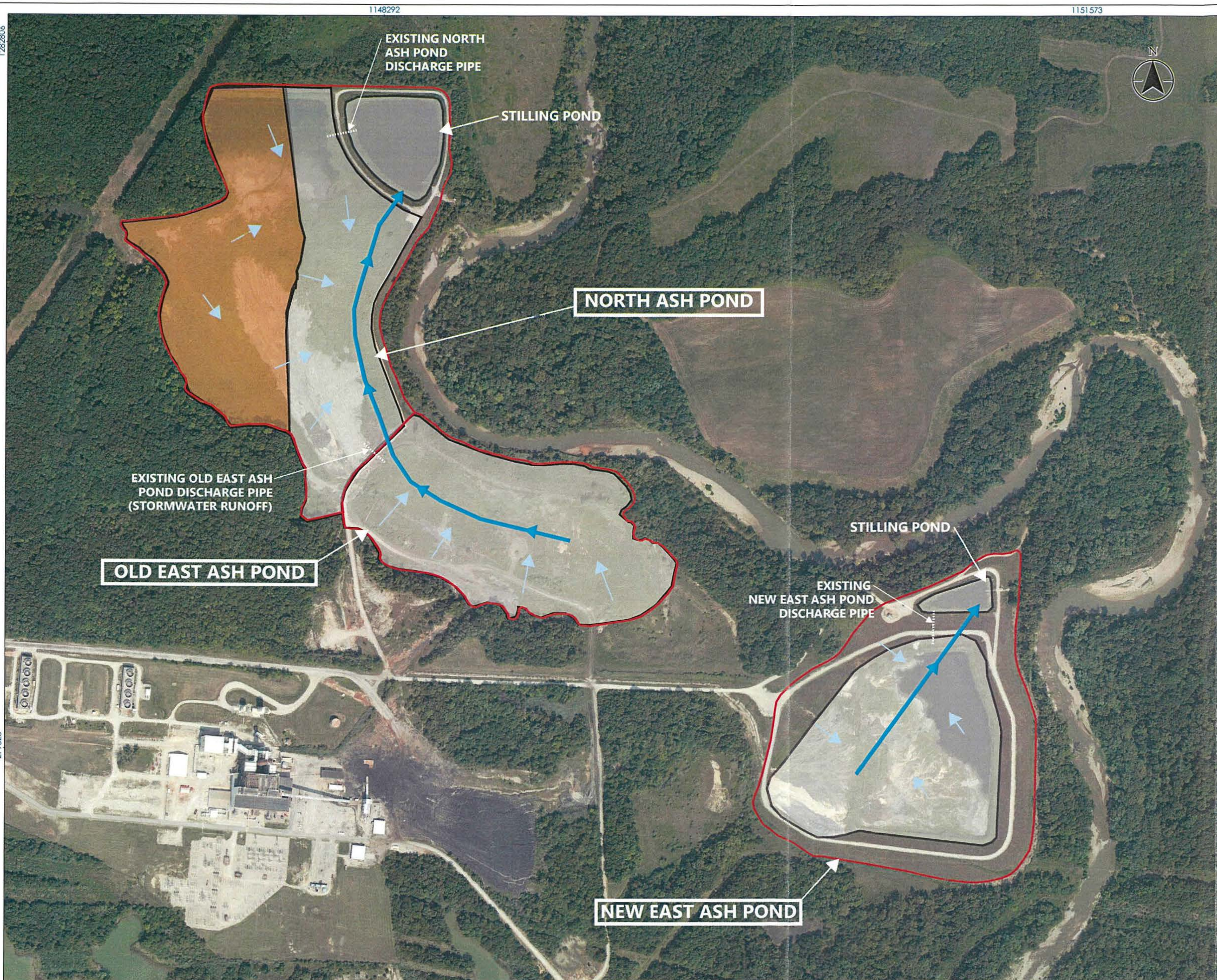
Prepared by T. Lawrence
Reviewed by M. Vaughan

Client/Project
Client: Dynegy Midwest Generation, LLC
Title: Vermilion Site
Project: Ash Ponds Closure

Figure No.
2

Title
Option 2: Closure by Removal (NAP, OEAP, NEAP)

ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL



Stantec

LEGEND

- ASH POND BORDER
- PROPOSED DITCH
- OVERLAND FLOW DIRECTION
- LIMITS OF ASH REMOVAL
- LIMITS OF CAPPED NON-CONFORMANT CCR MATERIAL

0 500 1,000 Feet

Notes
1. Coordinate System: NAD 1983 StatePlane Illinois East FIPS 1201 Feet
2. Orthoimagery: ESRI Online.

Project Location
Danville, IL

Prepared by T. Lawrence
Reviewed by M. Vaughan

Client/Project
Client: Dynegy Midwest Generation, LLC
Title: Vermilion Site
Project: Ash Ponds Closure

Figure No.
3

Title
Option 3: Beneficial Re-use (NAP, OEAP, NEAP)

ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL

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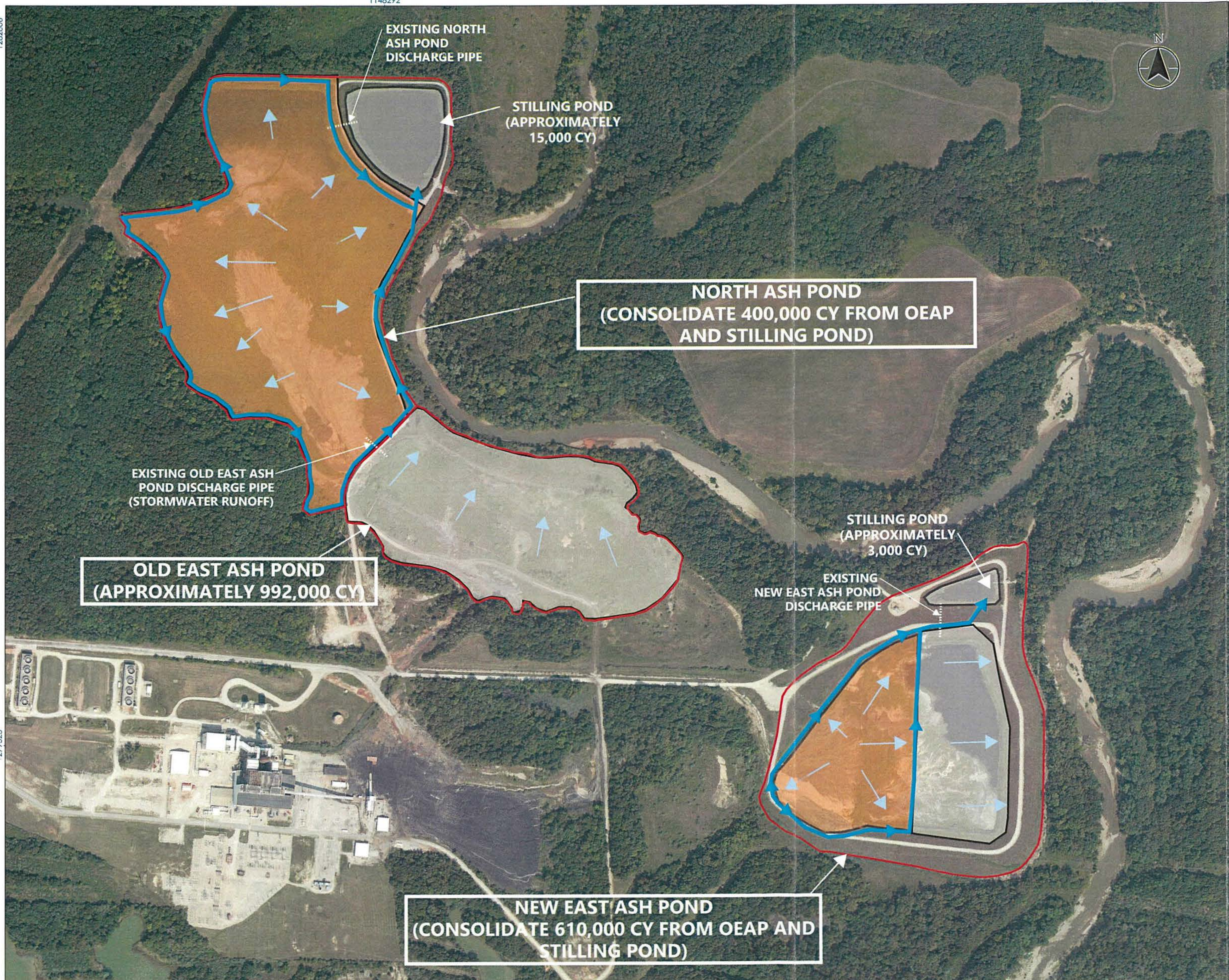


Stantec

LEGEND

- ASH POND BORDER
- PROPOSED DITCH
- OVERLAND FLOW DIRECTION
- LIMITS OF CLOSURE CAP
- CLOSURE BY CONSOLIDATION

0 500 1,000 Feet

Notes

1. Coordinate System: NAD 1983 StatePlane Illinois East FIPS 1201 Feet
2. Orthoimagery: ESRI Online.

Project Location
Danville, IL

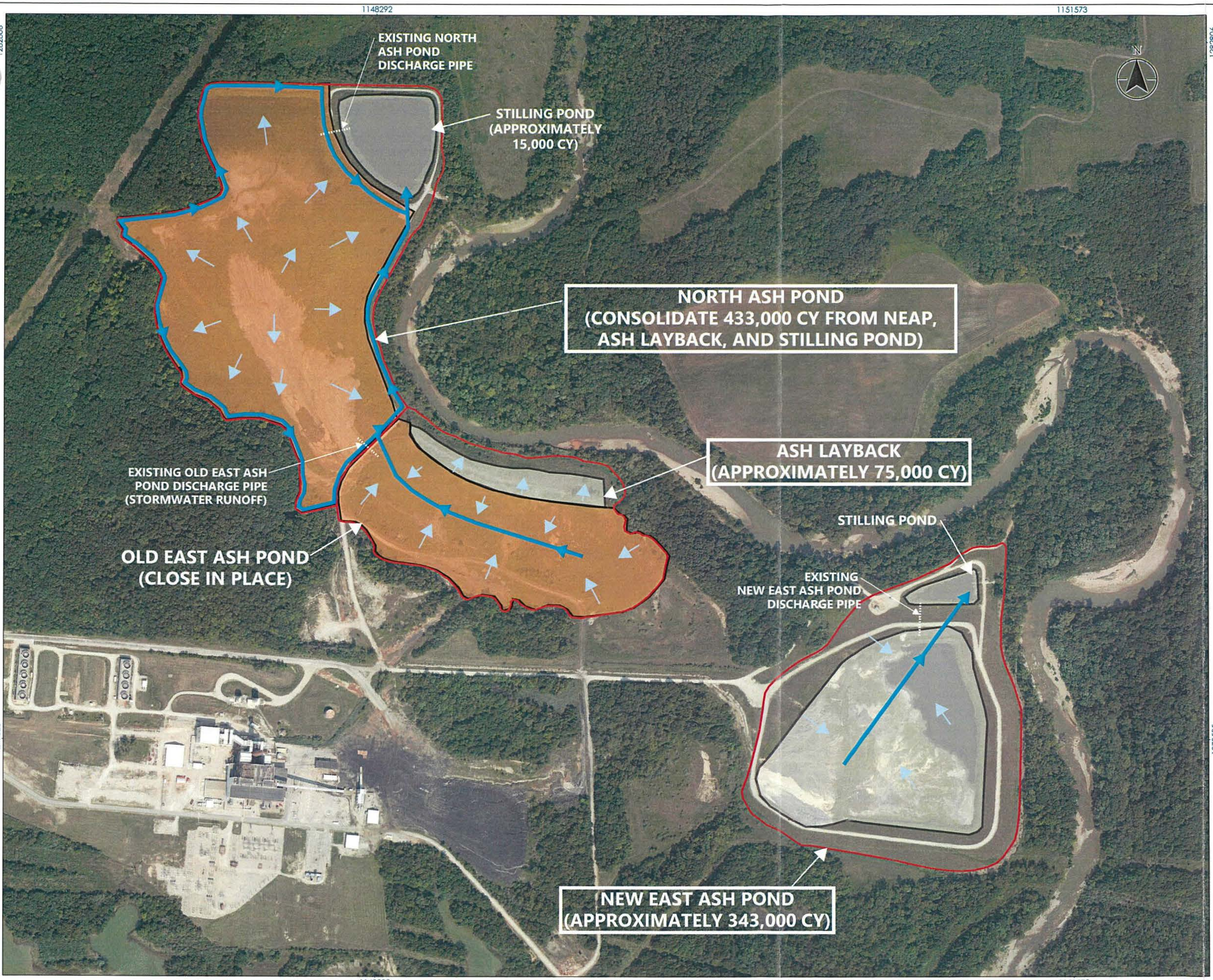
Prepared by T. Lawrence
Reviewed by M. Vaughan

Client/Project
Client: Dynegy Midwest Generation, LLC
Title: Vermilion Site
Project: Ash Ponds Closure

Figure No.
4

Title
Option 4: Consolidate OEAP to NAP/NEAP, close NAP and NEAP in place.

ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL



Stantec

LEGEND

- ASH POND BORDER
- PROPOSED DITCH
- OVERLAND FLOW DIRECTION
- LIMITS OF CLOSURE CAP
- CLOSURE BY CONSOLIDATION

0 500 1,000 Feet

Notes

1. Coordinate System: NAD 1983 StatePlane Illinois East FIPS 1201 Feet
2. Orthoimagery: ESRI Online.

Project Location
Danville, IL

Prepared by T. Lawrence
Reviewed by M. Vaughan

Client/Project
Client: Dynegy Midwest Generation, LLC
Title: Vermilion Site
Project: Ash Ponds Closure

Figure No
5

Title
Option 5: Consolidate NEAP and OEAP Layback to NAP, close OEAP and NAP in place.

ATTORNEY-CLIENT PRIVILEGED AND CONFIDENTIAL

The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 21

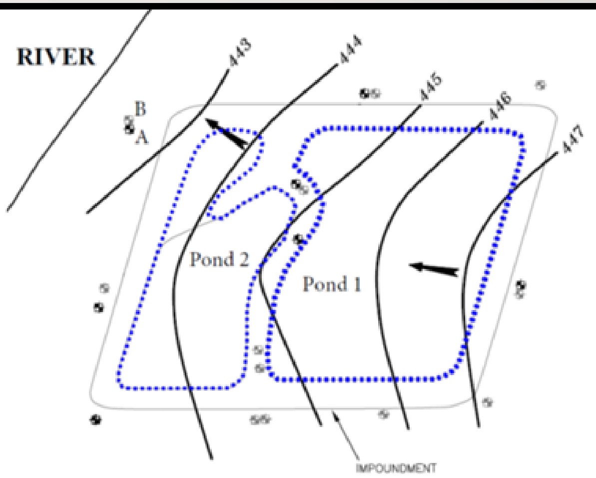
ILLINOIS EPA'S ASH IMPOUNDMENT STRATEGY PROGRESS REPORT 2019

RICK COBB, P.G., ACTING DIVISION MANAGER, DIVISION OF DRINKING WATER AND GROUNDWATER

HAVANA GMZ CASE STUDY 1

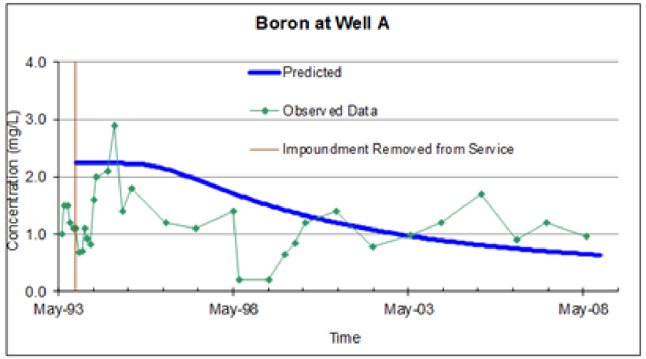
Site 1

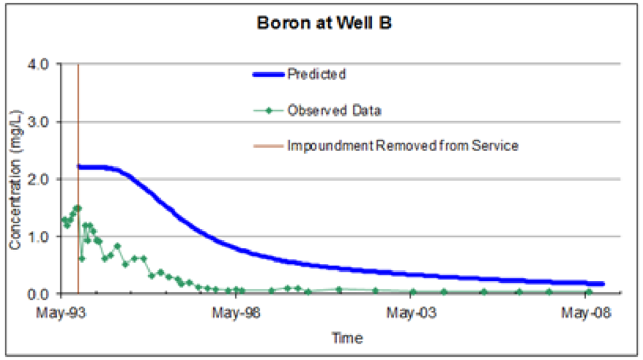
- Unlined impoundments closed in place with soil cap late 1993.
- No intersecting groundwater.
- Alluvial and glacial sands.



Modeled = blue line

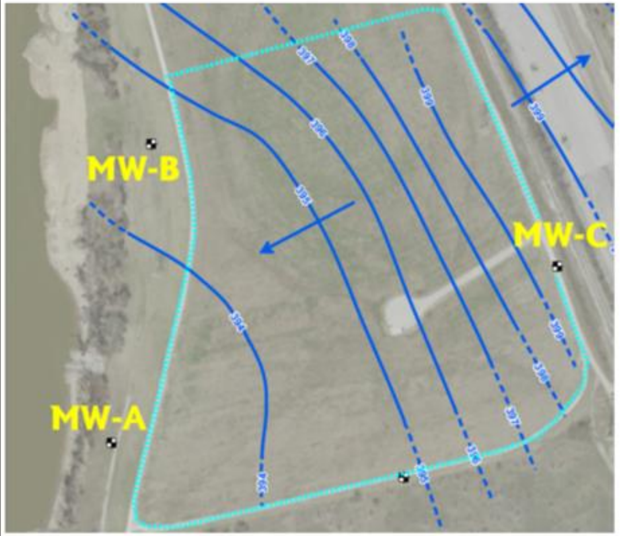
Observed = green line

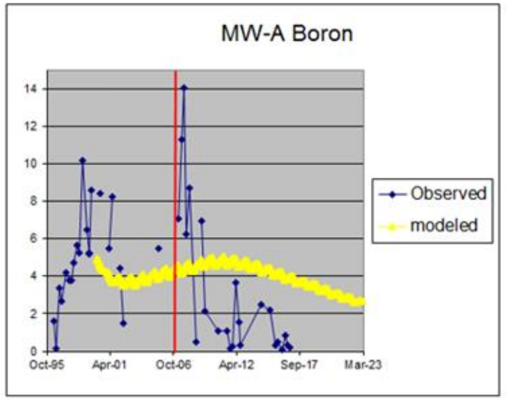


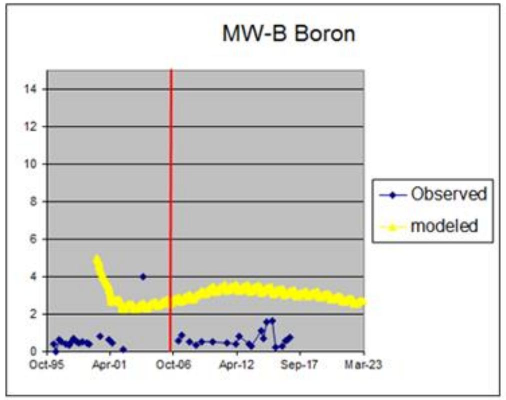


CASE STUDY 5 - VENICE GMZ

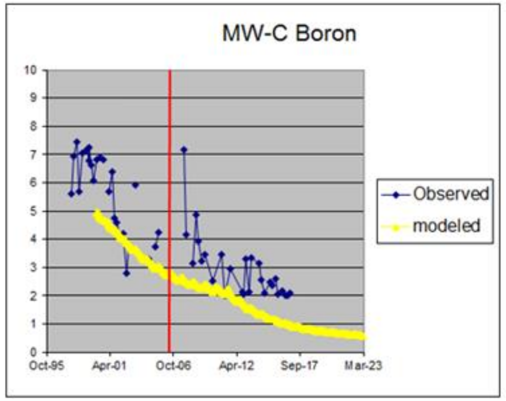
Site 7







- Closed in place with geosynthetic cap
- Intermittent intersecting groundwater



Modeled = yellow

Observed = blue

ATTACHMENT 22

NATURAL RESOURCE TECHNOLOGY

TECHNICAL MEMORANDUM No. 6

www.naturalrt.com

Date: March 12, 2010

Subject: Groundwater Modeling of Venice Former Ash Ponds

From: Brian Hennings and Bruce Hensel

Objective and Summary of Results

The objective of the modeling described in this technical memorandum was to develop a fate and transport model to simulate changes in groundwater quality resulting from capping Venice power plant ash ponds 2 and 3. A final cap, consisting of a geosynthetic material, drainage layer, and protective cover material similar to the recommendation in NRT Technical Memorandum 4 was assumed beginning in 2011.

Groundwater downgradient of the ash ponds has concentrations of boron and manganese that are higher than Illinois Class I groundwater quality standards, and these concentrations are attributable to coal ash leachate. Concentrations of several other constituents also exceed standards, but these concentrations are not attributable to coal ash leachate. The geosynthetic cap will limit the amount of infiltration into the coal ash, which will subsequently limit the generation and release of leachate to groundwater.

Boron was modeled because it is a primary indicator of coal ash leachate and it is more mobile and less reactive in groundwater than manganese. Model results indicated that groundwater quality will improve over time after the geosynthetic cover is applied and leachate percolation from the impoundments is reduced. Model predictions indicate that boron concentrations at off-site monitoring points will be lower than the Class I groundwater quality standard of 2 mg/L within 13 to 20 years, depending on location.

Background

The Venice power plant and ash ponds are located adjacent to the Mississippi River, straddling the county line between St. Clair and Madison Counties west of the city of Venice, Illinois. The site is located within the floodplain of the Mississippi River, in an area referred to as the American Bottoms. The site lies east of the river, and the western boundary of the former ash ponds abuts a portion of the Mississippi River levee (Figure 1).

The ash ponds, hydrogeologic setting, and local groundwater quality are described in detail by Hanson Engineers (2000), and supplemented by NRT Technical Memorandum No. 2 “Supplemental Hydrogeological Assessment, Venice Ash Ponds” prepared in December 1999 and finalized on March 3, 2010. The ponds cover an area of 58 acres. They received fly ash from the 1940s until 1977, and storm water discharge until 2005. The ash is currently uncapped, however vegetation ranging from grass to shrubs to trees covers most of the surface and ash is not readily visible in most places (Figure 1).

Figure 1. Outline of Venice ash ponds showing abundant vegetation growing on the surface.

Boreholes drilled through the coal ash found the base of ash as low as 400 feet MSL, which is 5 to 10 feet higher than the water table at normal river stage. In the spring, when river stage is greater than 400 feet, the water table may be above the base of ash; however, seepage into the ash is restricted beneath much of the footprint by the low-permeability fine-grained alluvial sediments that occur in the upper 20 to 30 feet of the stratigraphic column throughout this area. These fine-grained sediments also restrict the downward migration of leachate from the ponds during periods of low water. The fine-grained alluvium is underlain by coarse-grained sands and gravels that form a highly productive aquifer, as described below.

The description of hydrostratigraphy that follows was developed from site boring logs, the Hanson (2000) hydrogeologic report, and Illinois State Water Survey (ISWS) Circular 180 (ISWS, 1995). Alluvial sediments fill the Mississippi River valley to a depth of approximately 80 feet in this area. The alluvial deposits consist of sand and gravel with variable amounts of silt and clay (see Attachment 1). These deposits coarsen downward with the coarsest encountered in a 30 to 40 foot thick interval near the base of the formation. Mississippian aged limestone bedrock lies beneath the valley fill material. Low permeability and poor water quality make the bedrock less desirable for potable use than the overlying sand and gravel aquifer.

For purposes of this technical memorandum, the alluvium is categorized into three hydrostratigraphic units:

- Interbedded unit: This unit is encountered in the upper 20 to 30 feet of the valley fill, and consists of interbedded layers of sand, silt, and clay. This unit is typically dry at the top while lower portions may be saturated when river stage is above normal. The perched zone monitoring wells are screened across sand layers within this unit, and these sand layers are underlain by silt or clay layers.

- Upper Sand unit: This unit extends from the base of the Interbedded unit to the lower sand and gravel unit. It is primarily composed of sand, although lenses of silt and clay are possible. The existing monitoring wells are all screened in this hydrostratigraphic unit.

- Lower Sand and Gravel unit: This unit is based on regional descriptions of hydrostratigraphy in the American Bottoms, rather than site-specific information. Regionally, the lower 30 to 40 feet of the alluvial valley fill deposits have coarser grain size than overlying deposits.

Perched groundwater was observed within the interbedded unit during operation of the ponds. After dewatering of the ponds, those wells were frequently observed to be dry. This indicates that the perched zone is not a significant pathway for groundwater flow or transport after the ponds were dewatered, therefore the perched zone and associated wells were not included in the model.

Groundwater in the upper and lower sand units occurs under leaky artesian and water-table conditions. Regional groundwater flow in the American Bottoms is from east to west, toward the river. However, there are large groundwater pumping centers and associated cones of depression located in the Venice and National City areas that influence groundwater flow direction (ISWS, 1995). Groundwater withdrawals from those pumping centers are mainly for highway dewatering. Locally, groundwater flow at the site is strongly influenced by seasonal fluctuations in Mississippi River stage. Flow is typically west or southwest toward the Mississippi River; however, temporary flow reversals toward the east occur during periods of high river stage (see Plates 1 and 2 in NRT Technical Memorandum 2).

Groundwater quality monitoring at the site shows concentrations of boron, the primary indicator of coal ash leachate for this site, higher than Class I groundwater quality standards both on site and extending for a distance of approximately 500 feet south of the ash ponds (Figure 2). Concentrations of arsenic, manganese, iron, and total dissolved solids also exceed Class I groundwater quality standards, although arsenic, iron, and total dissolved solids concentrations are not attributable to release of leachate from the ash ponds.

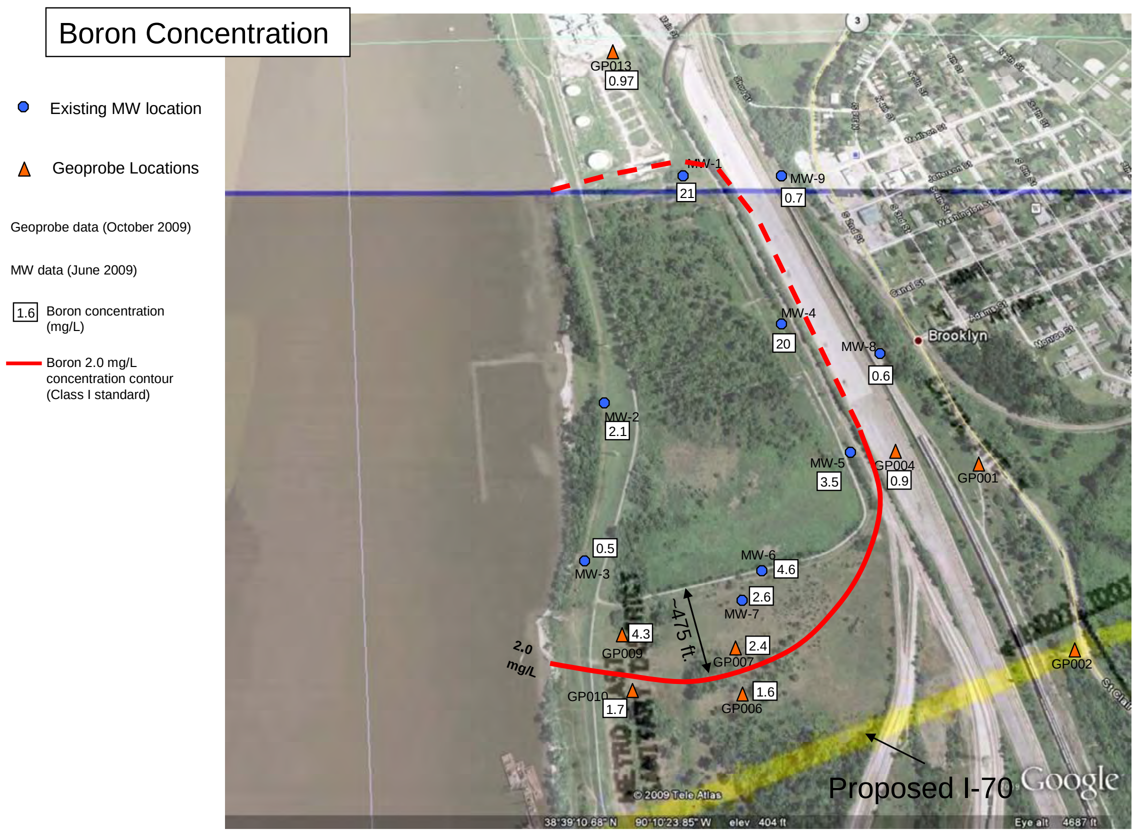


Figure 2. Extent of Class I exceedances attributable to seepage from Ponds 2 and 3, as defined by boron

Conceptual Model

Groundwater in the vicinity of the Venice ash ponds originates as recharge from precipitation, flow from the east, and recharge from the Mississippi River when at high stage. The ultimate discharge point for groundwater is the Mississippi River since there are no known active water supply wells near the ash ponds (see NRT Technical Memorandum 1). Groundwater elevation fluctuates in response to changes in river stage. Flow direction reversals are also common, resulting in a highly variable up and down, back and forth flow pathway.

The only sources considered for this modeling are the Venice ash ponds. While other sources of contamination are present in the area, the ash ponds are the only source of boron, the primary ash indicator constituent. Boron mass enters groundwater via two mechanisms: year-round leaching as precipitation and snow melt water percolates vertically through the ash, and occasional leaching when groundwater elevation rises to a level higher than the base of ash and flows horizontally through the material. The groundwater that seeps into the ash when water table is high likely drains vertically for an unspecified period of time after the water table returns to normal elevation.

Model Approach

A three-dimensional transient groundwater flow and transport model was calibrated to represent the conceptual flow system described above. Modeling begins in the year 2000, and mass that entered the aquifer prior to 2000 was simulated by specifying initial concentrations in groundwater. The model was calibrated to match groundwater elevation and concentration trends observed between 2000 and 2009 (Run 19). Prediction simulations were then performed to evaluate the effect of the synthetic cap, which was assumed to be present beginning in 2011. The following scenarios were simulated:

- No Action (Run 19pna): The calibrated model was extended 27 years into the future without placement of the cap;
- Base Case (Run 19pbc): The calibrated model was extended to July 2011 (estimate of when the geomembrane portion of the cap will be constructed). Starting in August 2011 the cap was simulated 25 years into the future. The cap covers the former ponds and berms.
- Case 1 (Run 19pc1): Similar to the base case, the calibrated model was extended to July 2011, then the cap was simulated another 25 years in the future. This scenario differs from the base case in that the cap covers the former ponds but leaves the eastern and southern berms uncapped.

Transport of boron was modeled because it is an indicator parameter for coal ash leachate, it is mobile in groundwater, and its concentration in downgradient monitoring wells is higher than its Class I groundwater quality standard.

This model was complicated by the need to simulate the fluctuations in elevation and flow direction caused by changes in Mississippi River stage. To accommodate these fluctuations, four stress periods were used for each calendar year in the model from the first year of calibration (2000) to the final year of prediction (2035), for a total of 144 stress periods.

- The first stress period of each year, from August through February simulated base flow conditions.
- The second stress period covered, March and April, represented a period of higher than normal stage.
- The third stress period, May, represented flood stage.
- The fourth stress period, June and July, again represented a period of higher than normal stage.

As described in more detail in the subsection titled “River Parameters”, these four stress periods simulate the average long-term transient fluctuations of the Mississippi River and its effects on groundwater flow near the site.

Three model codes were used to simulate groundwater flow and contaminant transport:

- Leachate percolation from the ponds and aquifer recharge south of the ponds was modeled using the Hydrologic Evaluation of Landfill Performance (HELP) model;
- Groundwater flow was modeled in three dimensions using MODFLOW; and
- Contaminant transport was modeled in three dimensions using MT3DMS.

Percolation and Recharge Modeling Using HELP

The Hydrologic Evaluation of Landfill Performance (HELP) code was developed by the U.S. Environmental Protection Agency and is used extensively in waste facility assessments. HELP predicts one-dimensional vertical percolation from a landfill or soil column based on precipitation, evapotranspiration, runoff, and the geometry and hydrogeologic properties of a layered soil and waste profile.

HELP (Version 3.07; Schroeder et. al, 1994) was used to estimate percolation through the former ash ponds after construction of the synthetic cap. HELP was also used to estimate aquifer recharge in the field south of the former ash ponds. This field lies in a closed depression ringed by soil berms that form the levee, railroad tracks, and the south berm of the former ash ponds. The hydrologic data required by and entered into HELP are listed in Table 1 and described in the following paragraphs.

Help Model Approach

Modeling of existing conditions was described in NRT Technical Memorandum No. 5 (2010) (described as “Current” in this technical memorandum). For this modeling effort, three configurations of synthetic cap placement were simulated, based on the texture of the protective soil layer (Silty, Sandy, and Clayey). All scenarios were modeled for a period of 20 years. Since the ponds are already dewatered, dewatering was not considered. Infiltration and recharge in the field south of the former ash ponds was also simulated with HELP for a period of 20 years (Field).

Input Data

Most climatic input variables were synthetically generated by the model using default values for East St. Louis, IL, and a latitude of 38.65° N for the Venice ash ponds. The only exception was precipitation, which was based on model defaults for St. Louis, MO because HELP does not have synthetic precipitation defaults for East St. Louis. Modeling was performed assuming poor vegetation on the currently uncapped ash ponds and fair vegetation for the cap scenarios and field scenario.

Physical input data were based on a combination of measured and assumed soil properties. Hydrogeologic properties for the ash and cap soils were selected from the HELP database. Initial moisture content and initial water were calculated by the model. Cap slope and design were not finalized at the time of the modeling; therefore, conservative estimates were used (slope of 0.01 and mid-drains placed every 300 feet).

The HELP modeling assumed no ponded water within the impoundment, the cap materials and ash had uniform texture and hydraulic properties, there was no lateral groundwater flow into or out of the impoundment, and all leakage to groundwater was vertical. Other assumptions inherent in the model are listed in Schroeder et al. (1994).

Help Model Results

Help model results are discussed below in the MODFLOW recharge subsection. A disk containing model files is attached to the back of the report.

Flow and Transport Modeling

Model Descriptions

MODFLOW uses a finite difference approximation to solve a three-dimensional head distribution in a transient, multi-layer, heterogeneous, anisotropic, variable-gradient, variable-thickness, confined or unconfined flow system—given user-supplied inputs of hydraulic conductivity, aquifer/layer thickness, recharge, wells, and boundary conditions. The program also calculates water balance at wells, rivers, and drains.

MODFLOW was developed by the United States Geological Survey (McDonald and Harbaugh, 1988) and has been updated several times since. Major assumptions of the code are: 1) groundwater flow is governed by Darcy's law; 2) the formation behaves as a continuous porous medium; 3) flow is not affected by chemical, temperature, or density gradients; and 4) hydraulic properties are constant within a grid cell. Other assumptions concerning the finite difference equation can be found in McDonald and Harbaugh (1988).

MT3DMS (Zheng and Wang, 1998) is an update of MT3D. It calculates concentration distribution for a single dissolved solute as a function of time and space. Concentration is distributed over a three-dimensional, non-uniform, transient flow field. Solute mass may be input at discrete points (wells, drains, river nodes, constant head cells), or areally distributed evenly or unevenly over the land surface (recharge).

MT3DMS accounts for advection, dispersion, diffusion, first-order decay, and sorption. Sorption can be calculated using linear, Freundlich, or Langmuir isotherms. First-order decay terms may be differentiated for the adsorbed and dissolved phases.

The program uses a finite difference solution, third-order total-variation-diminishing (TVD) solution, or one of three Method of Characteristics (MOC) solutions. The finite difference solution can be prone to numerical dispersion for low-dispersivity transport scenarios, and the MOC solutions sometimes fail to conserve mass. The TVD solution is not subject to numerical dispersion and conserves mass well, but is computationally intensive.

For this modeling, the finite difference solution was used. Zheng and Wang (1998) indicated that the effects of numerical dispersion are minimal when grid Peclet[1] numbers are smaller than 4.0. Since a Peclet number of 2.0 was maintained for this analysis,[2] the finite difference solution is acceptable.

Major assumptions are: 1) changes in the concentration field do not affect the flow field; 2) changes in the concentration of one solute do not affect the concentration of another solute; 3) chemical and hydraulic properties are constant within a grid cell; and 4) sorption is instantaneous and fully reversible, and decay is not reversible.

Model Sequence

MODFLOW was calibrated to groundwater elevation data collected between March 2000 and February 2009 (nine years). This timeframe was chosen because it represents current conditions and there was adequate data for calibration of this transient groundwater flow system. Next, MT3DMS was run, and model-predicted concentrations were calibrated to observed boron concentration values at the monitoring wells. Multiple iterations of MODFLOW and MT3DMS calibration were performed to achieve an acceptable match to observed data.

Once calibrated, additional simulations were performed to simulate the prediction scenarios. With the exception of the No Action scenario (which has no cap) the percolation rate and concentration value assigned to the cap was the same for all prediction scenarios (25 mg/L), only the distribution of the cap was varied between the Base Case and Case 1.

Model Setup

Grid and Boundaries

A five layer, 127 by 78 node grid was established with variable grid spacing ranging from 225 feet to 50 feet in length parallel and perpendicular to the primary flow direction (Figure 3).[3] The largest node spacings were near the upgradient and lateral model boundaries, and the finest node spacings were along the river and near the former ash ponds.

[1] Peclet number (Pe) = Grid spacing divided by longitudinal dispersivity.

[2] Pe = 50 ÷ 25 = 2.0

[3] Figures 3 through 15 are at the end of this memorandum.

Flow and transport boundaries were the same for all calibration and prediction scenarios (Figure 3). The upgradient (east) edge of the model was a MODFLOW general head boundary. A general head boundary was selected for the upgradient edge of the model to allow flow reversals to occur throughout the model grid. The bottom (bedrock surface) and lateral (north and south) boundaries were no-flow boundaries. The downgradient (west) boundaries were either MODFLOW river boundaries (layer 1) or no flow (layers 2-5).[4] The top boundary (land surface) was a time-dependent specified flux boundary, with specified flux rates equal to the recharge rate outside the ponds or the rate of percolation within the former ash ponds.

Two types of transport boundaries were used. Specified mass flux boundaries were used to simulate downward percolation of solute mass in areas where ash is above the water table, and constant concentration boundaries were used in areas where ash is seasonally below the water table. The former boundary condition assigns a specified concentration to recharge water entering the cell, and in this application the resulting concentration in the cell is a function of the relative rate and concentration of water percolating from the ash compared to the rate and concentration of groundwater flow. The latter boundary type assigns the specified concentration to all water passing through the cell, although as described later, this boundary was not turned on during all stress periods.

MODFLOW Input Values

MODFLOW input values are listed in Table 2 and described below.

Layer Top/Bottom

The top of layer 1 was set at an elevation of 414 feet, a value above the highest modeled Mississippi River stage (410 feet) and within the range of land surface elevations in the area outside of the ash ponds. The top of layers 2-5 was the base of the overlying layer, which were all flat with the exception of layer 1. The bottom elevation of layer 1 was set at 371 feet in most areas of the model so that all of the water table monitoring wells were in the same layer.

Model layer 1 also included a zone with hydraulic conductivity representing coal ash. This zone was used as a source area representing seasonally saturated ash during transport modeling. The base elevation of this zone was determined from boring logs and cross sections (Attachment 1). The base elevation of

[4] Use of no-flow boundaries beneath the river boundary representing the Mississippi River inherently assumes that

coal ash below the ponds occurs just above 400 feet; however, the base of ash was modeled at a lower elevation (394 feet) so the cells would be saturated during the elevated river stages (March through July).[5] Conceptually, the ash above 400 feet is only saturated (and only contributes mass to the model) during flood-stage (when the river was modeled at elevation greater than 400 feet). Therefore, the constant concentration boundary used to represent the source area was setup as a transient boundary active during the flood stage stress period (May) and the subsequent stress period (June and July). The constant concentration boundary was extended into June and July, which allows for addition of mass to the model as these cells dewater. Because this representation results in a greater thickness of saturated ash (down to 394 feet) than the observed condition (ash down to 400 feet), it inputs more mass to groundwater than might otherwise be expected and is therefore conservative.

Layer 2 was created to model the alluvial deposits beneath the ash in layer 1. As such, layer 2 was set at a thickness of 24 feet within the ponds and 1 foot outside of the ponds. The bottom of layer 2 was set at a flat elevation of 370 feet. Layers 3, 4, and 5 were split evenly into 12-foot layers to make the total aquifer thickness equal to 80 feet (estimated depth to bedrock). The base of layer 3 was at elevation 358 feet, the base of layer 4 was at 346 feet, and the base of layer 5 was at 334 feet.

Hydraulic Conductivity

Hydraulic conductivity values (Figures 4 and 5) were derived from field measured values reported in Hanson (2000) for the upper sand units. Hydraulic conductivity for the lower sand and gravel unit was determined during calibration and is consistent with published values for sand and gravel (Anderson and Woessner, 1992). No horizontal or vertical anisotropy was assumed.

Storage

No field data defining these terms were available, so representative values for similar materials were obtained from Fetter (1988).

there is no groundwater flow across the river.

[5] The transport model proved unstable when the base of ash was simulated at 400 feet; setting it at 394 feet maintained model stability.

Recharge

Recharge rates were modeled using results from HELP or established during calibration (Figure 6). The recharge value for the dewatered ponds was provided by HELP modeling described in NRT Technical Memorandum No. 5. The recharge value for the field south of the former ash ponds and the area between the eastern edge of the ponds and the paved area of the railroad yard was determined using HELP modeling performed for this model.

The other four recharge zones were determined during calibration:

- Recharge zone 5 was created for areas of the model known to have pavement and/or storm water management.
- Recharge zone 4 was created over the floodplain on the river side of the levee, to simulate additional recharge as a result of frequent flooding.
- Recharge zone 6 was created to simulate recharge through the berms surrounding the former ash ponds, this zone had the same flux as the ambient zone but includes a mass component for transport modeling.
- Recharge zone 1 was created as ambient recharge for the rest of the model area.

Cap placement scenarios were simulated using recharge zone 7. The highest of the three percolation rates (0.0024 in/yr) from the HELP synthetic cap simulations (Table 1) was applied to this recharge zone. A concentration mass component was also applied to this zone for transport modeling.

River Parameters

The Mississippi River was represented by head-dependant flux nodes that required inputs for river stage, width, bed thickness, and bed hydraulic conductivity. The latter three parameters were used to calculate a conductance term for the boundary node. This conductance term was determined by adjusting hydraulic conductivity during model calibration, while bed thickness was set at 10 feet. River stage was sloped downward toward the south based on observed data from US Army Corps of Engineers (USACE) tail-water readings at Lock and Dam 27 (located 2.6 river miles upstream) and data collected at the site.

River stage data obtained from the USACE (Table 3) from 1999 through 2008 were reviewed and it was determined that 390 feet was an appropriate break point between high-stage and base-stage river flow. Months with a mean monthly river stage in excess of 390 feet were included as high-stage; months with a mean monthly river stage below 390 feet were included as base stage. It was also determined that an additional period of flood-stage was required to simulate periods when ash could become saturated. The month of May had the most monthly mean averages in excess of 410 feet (high enough elevation to saturate ash at 400 feet beneath the ponds).

Table of Annual Stress Periods		
Name	**Months**	**Stage near site (feet)**
High-Stage1	March – April	396.71
Flood-Stage	May	410.01
High-Stage2	June – July	396.71
Base-Stage	August – February	385.41

MT3DMS Input Values

MT3DMS input values are listed in Table 4 and described below.

Initial Concentration

An initial concentration array was used for the calibration run to simulate mass released from the ash ponds prior to the model period (before 2000). Initial concentration for prediction simulations was the ending concentration of the calibration run. Initial concentrations for the calibration run (Figures 7 and 8) were estimated from data collected at site monitoring wells and refined during calibration. The highest concentration zones were placed just below the ash ponds and lower concentration zones were placed in a ring around the ponds. Layer 1 had an initial concentration of 25 mg/L below the ponds (ash, source) and a concentration of 5 mg/L in the ring around the ponds. Layers 2 and 3 had a concentration of 15 mg/L below the ponds and a concentration of 3 mg/L in the ring around the ponds.

Source Concentration

Three types of sources were simulated for calibration: percolation through the ponds, percolation through the berms, and seasonally saturated ash. All three were assigned a concentration of 25 mg/L. Percolation through the ponds and access roads was constant through time. The seasonally saturated ash was simulated using constant concentration cells that were active during flood-stage and high-stage2. Site boring logs suggested that the deepest accumulations of ash (area most likely to become saturated) lie along the eastern edge of the ponds. Constant concentration cells (Figure 9) were placed along the eastern edge of the ponds to simulate these areas of saturated ash. An alternative model was also developed where the entire footprint of the ash ponds could be seasonally saturated. This alternative presented a more-conservative approach to simulating seasonal saturation than the base case alternative.

Effective Porosity

Effective porosity values were based on ranges provided by Mercer and Waddel (1993).

Dispersivity

Longitudinal dispersivity (25 ft.) was determined using the approach of Xu and Eckstein (1995). Transverse dispersivity was set at 1/5 longitudinal (5 ft.). Vertical dispersivity was set at 1/10 transverse (0.5 ft.). These values are higher than standard estimates for these constituents (1/10 and 1/100, respectively) because they account for additional macroscopic dispersion caused by gradient reversals and large vertical fluctuations in groundwater elevation, both of which result from Mississippi River flood events.

Retardation

It was assumed that boron would not have any reactions with the soils resulting in retardation of mass transport (K_d was set to 0).

Input Data Assumptions

Simplifying assumptions were made while developing this model, including:

- The cap has an instantaneous effect on percolation rate;
- Leachate is assumed to instantaneously reach groundwater (e.g., migrate through the unsaturated zone);
- The Mississippi River is assumed to behave in a consistent annual pattern;
- The general head boundary and natural recharge are assumed constant over time; and

- Leachate concentrations are assumed to remain constant over time.

Modeling Results

Results of the MODFLOW/MT3DMS modeling are presented below. A disk containing model files is attached to the back of the report. Model file folder names are listed in Table 5.

Calibration

The model was calibrated to observed conditions from 2000 through 2009. The model was first calibrated to observed groundwater elevation (head) data, and then to observed concentration data. MW-1 and MW-4 were not used for concentration calibration because those wells were installed through ash and groundwater quality results appear anomalous.

Head calibration results show that the model successfully reproduces observed seasonal fluctuations (Figure 10). MW-2 and MW-7 represented downgradient calibration; MW-1 and MW-5 represented on-site calibration; and MW-8 and MW-9 represented upgradient calibration. In all three areas, modeled and observed heads were in good agreement considering that the stress periods used in the model represent river stage in concept, rather than a historical depiction.

Concentration calibration accurately simulated observed trends at most monitoring wells (Figure 11). MW-2, MW-3, MW-7, and GP-6 represented downgradient concentrations. GP-6 is a monitoring point placed in the model to compare to a groundwater grab sample collected in the fall of 2009. MW-5 and MW-6 represented on-site conditions; and MW-8 and MW-9 represented upgradient conditions. The largest discrepancy between modeled and observed concentrations was at MW-3, where observed concentrations appear to be anomalously low given its proximity to the site in the downgradient flow path. The model also predicted slightly higher than observed concentrations at MW-6; however the modeled concentration trend matches the observed trend. Since one purpose of the model is to predict the amount of time needed for groundwater to attain Class I standards, the higher than observed modeled concentrations at MW-3 and MW-6 are conservative because it increases this prediction time.

Prediction

The No Action scenario (Figure 12) suggests that concentrations in wells MW-2 and MW-3 (downgradient, between the levee and the ponds) will stabilize around 4 to 5 mg/L boron, approximately twice the Class I standard. Concentrations in GP-6 (downgradient, about 500 feet south of ponds) will stabilize just below the Class I standard of 2 mg/L. Concentrations in well MW-7 (downgradient, about 100 feet south of the ponds) will stabilize around 3 mg/L, above the Class I standard. On-site concentrations at MW-6 will stabilize around 6 mg/L, while on-site concentrations at MW-5 will stabilize just below the Class I standard. This scenario was modeled for comparison with the two scenarios described next, and does not represent a closure alternative being considered by Ameren.

The Base Case scenario (Figure 13) suggests that concentrations in all monitoring wells will stabilize below the Class I standard within 13 to 20 years, with the exception of on-site well MW-6. Concentrations modeled at MW-6 were slowly decreasing at the end of the model period and a linear interpolation of the trend suggests that concentrations will be lower than the Class I standard 28 years after the cap is constructed.

The sensitivity of the Base Case scenario to saturated ash extent was tested by increasing the area of saturated ash to include the entire footprint of the former ash ponds (Figure 14). The results are similar with the following exception: Concentrations in MW-2 and MW-3 (downgradient, between the levee and ponds) stabilize around 4 to 5 mg/L. This suggests that if ash extent is greater than that assumed for the base case, Class I exceedances may persist west of the ash ponds, but not to the south.

The Case 1 scenario (Figure 15) suggests that concentration distribution will be similar to the Base Case scenario if the berms are not capped. The most notable exception is that concentrations at MW-5 stabilize around 1 mg/L rather than 0.4 mg/L in the Base Case. Predicted time to attain Class I standards under this scenario is 14 to 20 years, with the exception of on-site monitoring well MW-6.

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Tables

Table 1.
HELP Input Parameters
Venice Ash Ponds 2 and 3
Ameren Services

	Current	Silty	Sandy	Clayey	Field	
Input Parameter			**Existing Footprint**		**(south of ponds)**	**Notes**
Climate-General						
City	see note	see note	see note	see note	see note	East St. Louis, IL
Latitude	38.65	38.65	38.65	38.65	38.65	Plant
Evap Zone	14	21	21	21	21	poor (14), fair (21)
Leaf Index	1	2	2	2	2	poor (1), fair (2)
All Others	see note	see note	see note	see note	see note	Defaults for East St. Louis
Climate-precip/temp/ET						
All	see note	see note	see note	see note	see note	Synthetically generated using St. Louis (precipitation) or East St. Louis (ET and solar radiation) defaults
Soils-General						
Area (acres)	58	58	58	58	5	
% where runoff possible	0	100	100	100	0	
Specify Initial MC	No	No	No	No	No	Model calculated
Surface Water/Snow	Calc	Calc	Calc	Calc	Calc	Model calculated
Soils-Layers						
1	ash	native (silty)	native (sandy)	native (clayey)	native	
2	ash	drainage	drainage	drainage		
3	ash	synthetic	synthetic	synthetic		
4		ash	ash	ash		
5		ash	ash	ash		
		ash	ash	ash		
Soil Parameters--native						
Type	n/a	1	1	1	1	vertical percolation layer
Thickness (in)	n/a	36	36	36	36	
Texture	n/a	9	6	11	4	
Description	n/a	silt loam	sand loam	clay	silty sand	
Soil Parameters--drainage						
Type	n/a	2	2	2	n/a	drainage layer
Thickness (in)	n/a	0.2	0.2	0.2	n/a	
Texture	n/a	20	20	20	n/a	drainage net (pipes@300ft)
Soil Parameters--synthetic						
Type	n/a	3	3	3	n/a	geomembrane
Thickness (in)	n/a	0.03	0.03	0.03	n/a	
Texture	n/a	37	37	37	n/a	PVC, defaults used
Pinhole density	n/a	1	1	1	n/a	
Installation Defects	n/a	4	4	4	n/a	
Placement Quality	n/a	3	3	3	n/a	good placement quality
Soil Parameters--ash layers						
Type	1	1	1	1	n/a	vertical percolation layer
Thickness (in)	60	60	60	60	n/a	
Texture	30	30	30	30	n/a	coal fly ash, defaults used
Soils--Runoff						
Equation	n/a	HELP CN	HELP CN	HELP CN	n/a	HELP-calculated
Slope	n/a	1.0%	1.0%	1.0%	n/a	
Length (ft)	n/a	1000	1000	1000	n/a	
Texture	n/a	9	6	11	n/a	
Vegetation	n/a	fair	fair	fair	n/a	
Execution Parameters						
Years	20	20	20	20	20	
Report Daily	n	n	n	n	n	
Report Monthly	n	n	n	n	n	
Report Annual	y	y	y	y	y	
Percolation Rate (in/yr)	5.3	0.00122	0.0024	0.00171	7.58	
Percolation Volume (ft^3/yr)	1,121,171	257	505	360	n/a	

Table 2
MODFLOW Input Parameters
Venice Ash Ponds 2 and 3
Ameren Services

Horizontal Hydraulic Conductivity	Zone	ft/d	cm/s
Layer 1 coal ash	4	0.10	3.5E-05
Layer 1 Upper Sand	2	20	7.1E-03
Layers 1-3 Upper Sand	1	10	3.5E-03
Layers 4-5 Lower Sand and Gravel	3	150	5.3E-02

Vertical Hydraulic Conductivity		ft/d	Kh/Kv
Layer 1 coal ash	4	0.10	1.0
Layer 1 Upper Sand	2	20	1.0
Layers 1-3 Upper Sand	1	10	1.0
Layers 4-5 Lower Sand and Gravel	3	150	1.0

Recharge		ft/d	in/yr
General	1	0.00046	2.0
Former coal ash ponds uncapped	2	0.0012	5.3
Field south of ponds	3	0.00174	7.6
Upper Sand west of levee	4	3.20E-03	14.0
Surface water management (paved) areas	5	0.00023	1.0
Berms	6	0.00046	2.0
Synthetic Cap[1]	7	6.00E-07	0.003

Storage			S_y
Layer 1 coal ash	1		0.05
Layers 1-3 Upper Sand	1		0.05
Layers 4-5 Lower Sand and Gravel	2		0.10

River Parameters			Miss Riv
Bed Thickness (ft)			10
Hydraulic Conductivity (ft/d)			1
Conductance (ft^2/d, normalized per ft^2 area)			0.1
River Width (ft)			2,000
River Cell Length (ft)			variable
River stage (March-April), head in feet[2]			396.71
River stage (May), head in feet[2]			410.01
River stage (June-July), head in feet[2]			396.71
River stage (August-February), head in feet[2]			385.41
River Slope[3]			0.0001

General Head Boundary Parameters			East Boundary
Head (ft)[4]			394.12
Slope[5]			0.0017
Saturated thickness (ft)		layer 1[6]	30
Width (ft)		cell width	50-200
Distance to GHB (ft)			2,000
Hydraulic Conductivity (ft/d)		Layers 1-3	10
Hydraulic Conductivity (ft/d)		Layers 4-5	150
Conductance (ft^2/d, normalized per ft^2 area)		Layers 1-3	0.00075
Conductance (ft^2/d, normalized per ft^2 area)		Layers 4-5	0.0045

1. Synthetic ash pond recharge value used to simulate cap placement in prediction runs only
2. River stage reported for cell row 67, column 23 located near the center of the former ash ponds
3. River slope was estimated using data collected from the site and from Lock and Dam 27 Tailwater
4. GHB stage reported for cell row 67, column 78 located in the same row as the reported river stage elevations
5. GHB slope was determined through calibration
6. Layers 2-5 are below the water table therefore saturated thickness is equal to layer thickness

Table 3
Mean Monthly Mississippi River Stage from 1999 through 2008
Venice Ash Ponds 2 and 3
Ameren Services

Mean Monthly Mississippi River Stage Data for March, April, May, June, and July 1999-2008 (High and Flood Stages).

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Average[6]
March Mean Stage	395.23	389.20	401.73	390.36	384.00	396.43	388.52	386.03	399.02	403.82	393.43
April Mean Stage	403.12	387.64	404.17	395.68	387.98	394.39	395.58	395.79	404.65	409.83	397.88
May Mean Stage	411.47	389.97	409.47	411.79	401.08	396.07	393.08	395.66	405.51	410.25	402.44
June Mean Stage	407.62	399.37	410.22	402.72	393.36	407.11	396.47	388.02	397.75	415.92	401.86
July Mean Stage	400.77	398.01	396.11	390.71	393.08	396.88	387.57	382.66	391.65	409.98	394.74
	403.64	392.84	404.34	398.25	391.90	398.18	392.24	389.63	399.72	409.96	398.07

Average Mean Monthly Stage: 398.1

Site Corrected Mean Monthly Stage (High-Stage1 and High-Stage2): 396.7

Mean Monthly Mississippi River Stage Data for August, September, October, November, December, January, and February 1999-2008 (Base Stage).

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Average[6]
August Mean Stage	393.46	387.40	386.91	388.27	382.46	389.29	383.08	381.89	390.75	392.98	387.65
September Mean Stage	386.97	384.63	385.86	386.36	382.51	388.31	383.20	383.45	391.28	399.24	387.18
October Mean Stage	386.35	383.78	387.22	388.04	380.00	385.46	386.53	381.90	393.05	390.56	386.29
November Mean Stage	385.18	386.01	385.93	384.79	384.91	391.71	381.00	380.44	387.91	387.68	385.56
December Mean Stage	384.86	381.48	387.87	381.50	386.35	392.36	380.89	386.48	385.99	386.44	385.42
January Mean Stage	389.62	383.31	382.64	383.20	379.32	384.73	398.31	383.04	388.73	390.10	386.30
February Mean Stage	399.33	384.11	395.51	389.45	379.87	382.84	397.03	382.54	385.49	394.22	389.04
	389.40	384.39	387.42	385.94	382.20	387.81	387.15	382.82	389.03	391.60	386.78

Average Mean Monthly Stage: 386.8

Site Corrected Mean Monthly Stage (Base Stage): 385.4

Notes:

1. All river stage data are in feet above mean sea level
2. All river stage elevations were recorded by the United States Army Corps of Engineers from the Granite City Lock and Dam tailwater gauging station (Lock and Dam 27)
3. All river stage data were copied from the United States Army Corps of Engineers historical data published on the web at http://mvs-wc.mvs.usace.army.mil/archive/mi.html
4. 2009 river stage data was not available when this table was created in February of 2010.
5. Corrected mean monthly stage was calculated by subtracting the median difference in elevation (1.4 ft.) between Lock and Dam 27 and site observations
6. Months with an average river stage in excess of 390 feet were determined to be high stage; months with an average river stage below 390 were considered base stage

Table 4
MT3DMS Input Parameters
Venice Ash Ponds 2 and 3
Ameren Services

Initial Concentration (mg/L)	**Value**
Ambient (calibration)	0.0
Layer 1 high conc. zone (calibration)	25
Layer 1 low conc. zone (calibration)	5
Layer 2 and 3 high conc zone (calibration)	15
Layer 2 and 3 low conc zone (calibration)	3
Source Concentration - Recharge (mg/L)	**Value**
Former Ash Ponds	25
Berms	25
Synthetic Cap	25
Source Concentration - Constant (mg/L)	**Value**
Seasonally Saturated Coal Ash Nodes	25
Effective Porosity	**Value**
Layer 1 ash	0.20
Layer 1 Upper Sand	0.20
Layers 1-3 Upper Sand	0.20
Layers 4-5 Lower Sand and Gravel	0.30
Dispersivity (ft)	**Value**
Longitudinal	25
Transverse	5
Vertical	0.50
Retardation	**Value**
Entire domain	0.0

Table 5
Model Files
Venice Ash Ponds 2 and 3
Ameren Services

The disk attached to this report contains the ASCII input files and output files used and generated by HELP, MODFLOW, and MT3DMS for each scenario. The files are named as follows:

Folder / Subfolder		Initial Head Files	Comments / Description
MODFLOW_MT3DMS /			
Run 19		n/a	Calibration model
Run 19pna/	Run 19pna*	(Run 19IH)	No Action (2009 - 2017)
	Run 19pna_2018*	(Run 19pna IH)	No Action (2018 - 2026)
	Run 19pna_2027*	(Run 19pna_2018IH)	No Action (2027 - 2036)
Run 19pbc/	Run 19pbc*	(Run 19IH)	Base Case (2009 - 2017)
	Run 19pbc_2018*	(Run 19pbcIH)	Base Case (2018 - 2026)
	Run 19pbc_2027*	(Run 19pbc_2018IH)	Base Case (2027 - 2036)
Run 18_18pbc/	Run 18*	n/a	Entire footprint of seasonally saturated ash
	Run 18pbc*	(Run 18IH)	Entire footprint (2009 - 2017)
	Run 18pbc_2018*	(Run 18pbcIH)	Entire footprint (2018 - 2026)
	Run 18pbc_2027*	(Run 18pbc_2018IH)	Entire footprint (2027 - 2036)
Run 19pc1/	Run 19pc1*	(Run 19IH)	Case 1 (2009 - 2017)
	Run 19pc1_2018*	(Run 19pc1IH)	Case 1 (2018 - 2026)
	Run 19pc1_2027*	(Run 19pc1_2018IH)	Case 1 (2027 - 2036)

Help Files /		Precip	Temp	Solar Rad	ET	Soil	Output
	Current	V0	V0	V0	V0	Vbase	Vbase
	Silty	V1	V1	V1	V1	VS1	VS1
	Sandy	V1	V1	V1	V1	VS1snd	VS1snd
	Clayey	V1	V1	V1	V1	VS1cly	VS1cly
	Field	1949P1	1949T1	1949S1	1949E1	1949NR1	1949NR

Prediction runs were done by running each model file in sequence to get the desired timeframe.
*MT3DMS file names have the suffix _m (e.g., Run 19pbc_m.out)

Natural Resource Technology

Figures

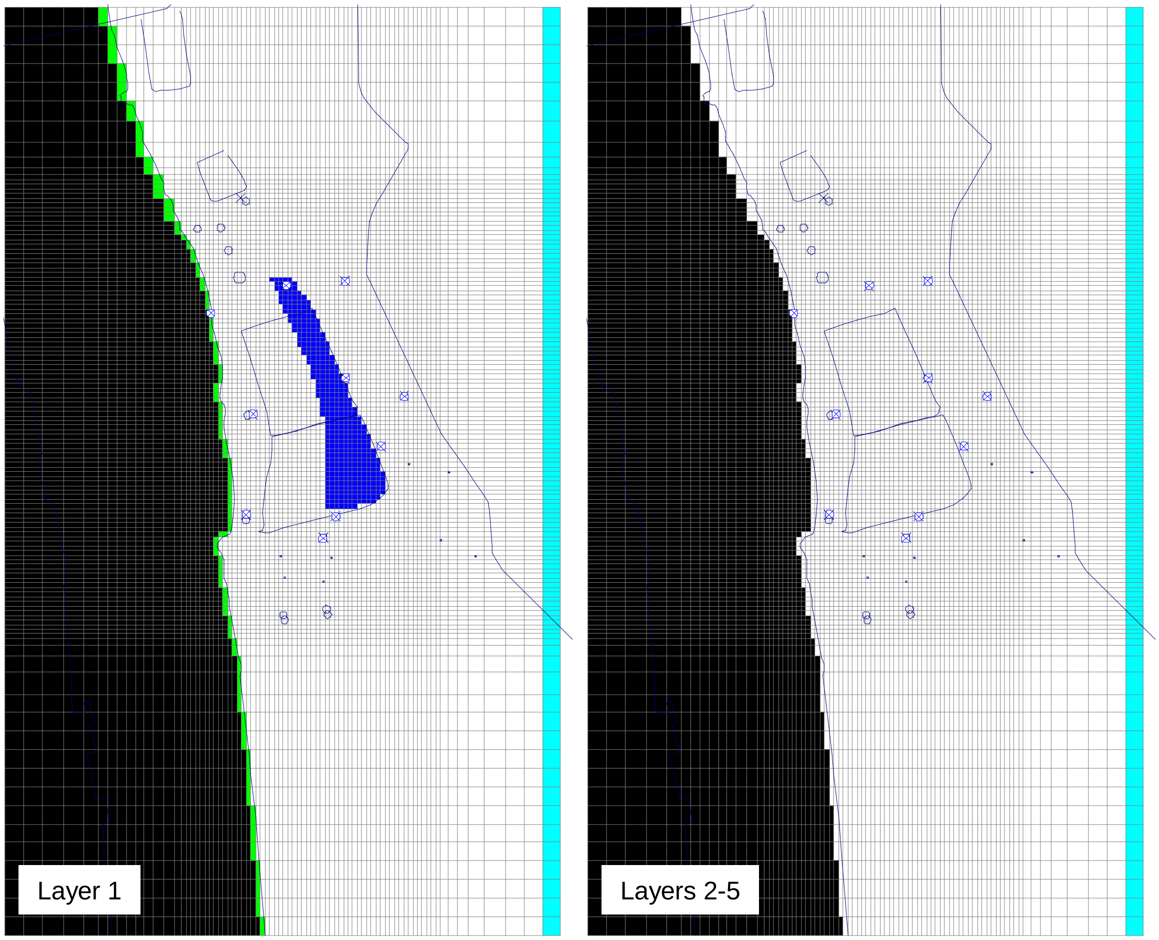


Figure 3. Grid layout. The river boundary cells (green cells on the west edge of the model) and constant concentration boundary cells (dark blue cells) were placed in layer 1 only. The general head boundary cells (light blue cells on the east edge of the model) were placed in all 5 layers of the model.

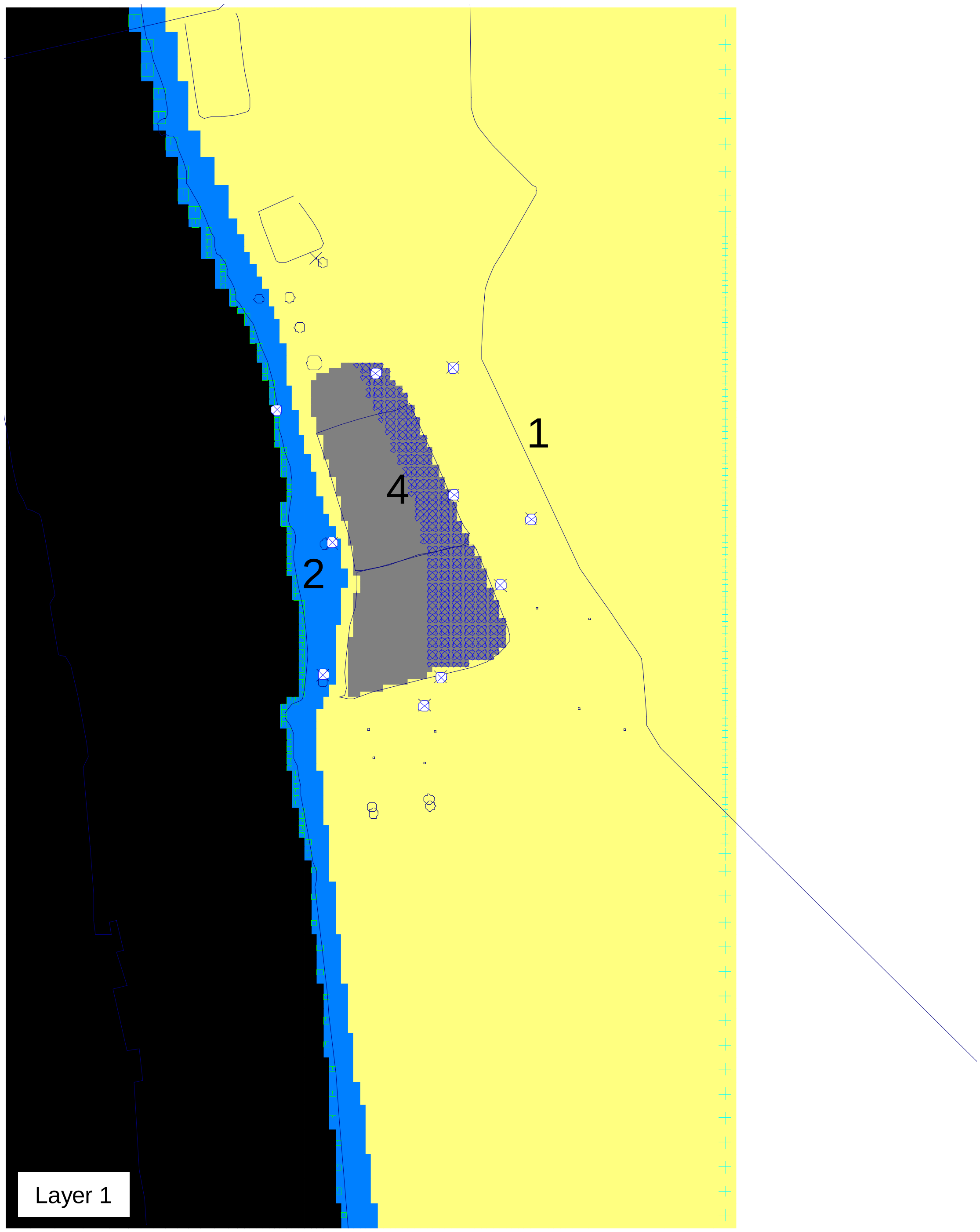


Figure 4. Hydraulic conductivity zones for layer 1. The general area was modeled as Zone 1 (Upper Sand unit), Zone 2 simulates sandy deposits west of the levee, and zone 4 simulates the coal ash material in the ponds. The squares on the left illustrate the location of the river boundary. The + signs on the right illustrate the location of the GHB.

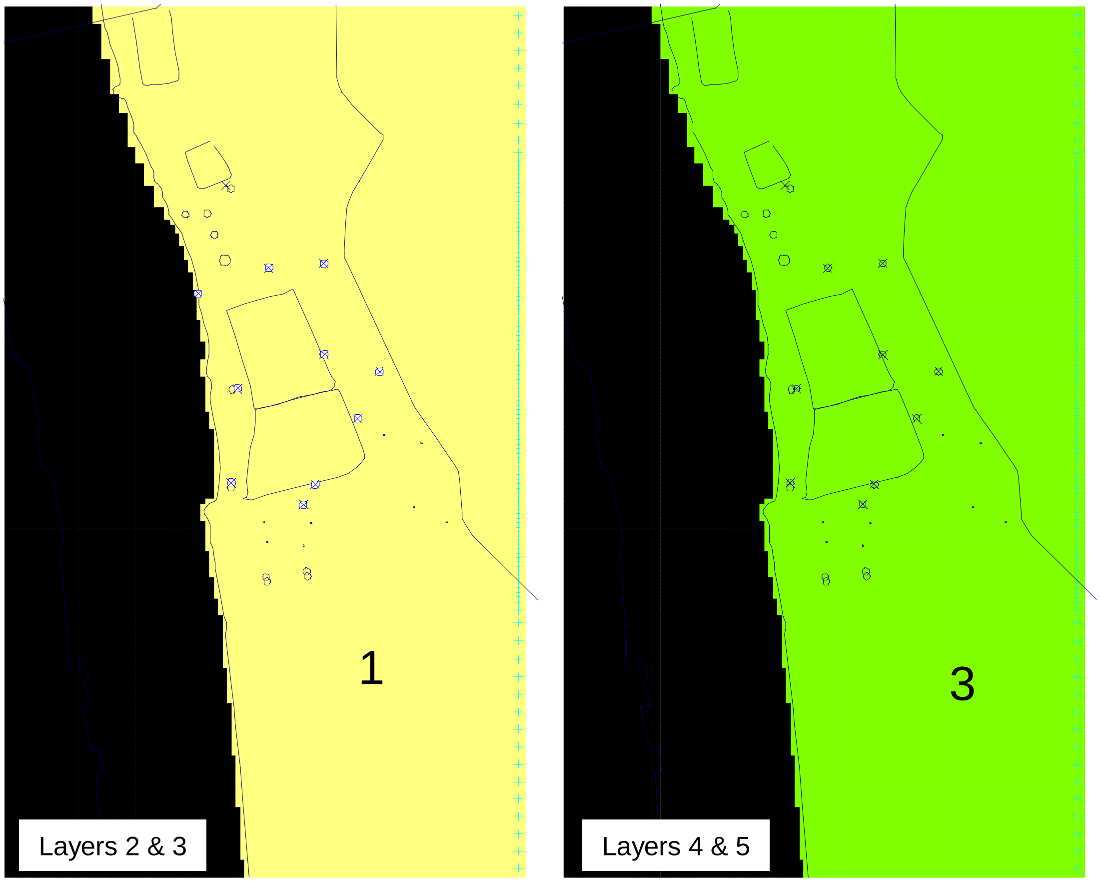


Figure 5. Hydraulic conductivity zones for layers 2 though 5. Layers 2 and 3 were both modeled as Zone 1 (Upper Sand unit). Layers 4 and 5 were both modeled as zone 3 (Lower Sand and Gravel unit). The green + signs illustrate the location of the GHB in these layers. The GHB is also present in layers 4 and 5, but the symbols are not visible.

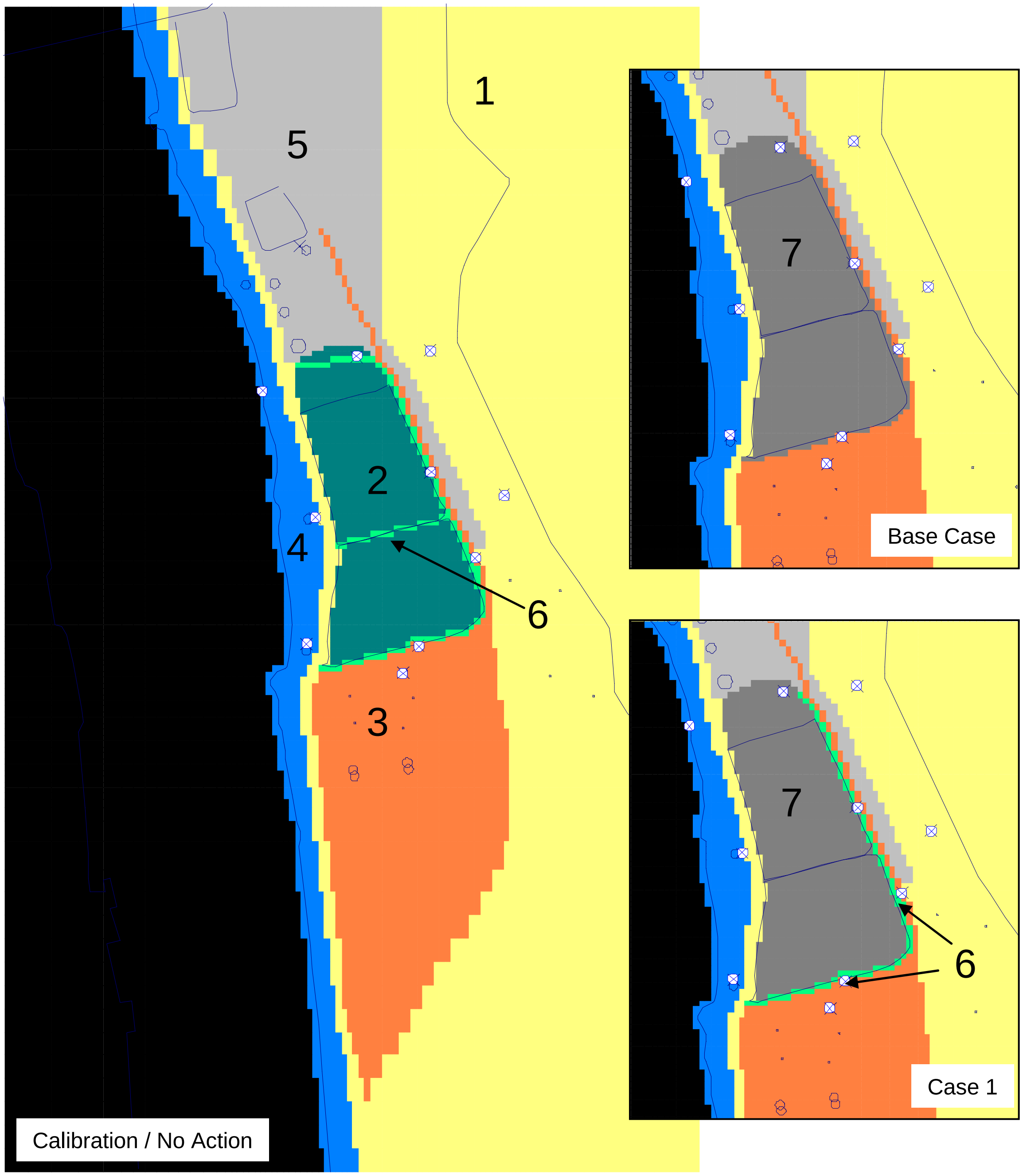


Figure 6. Recharge zones. Recharge zones 1 through 6 were applied to model runs without the cap. Zone 1 = general, Zone 2 = former ash ponds (uncapped), Zone 3 = field south of ponds, Zone 4 = upper sand west of levee, Zone 5 = surface water management (paved) areas, and zone 6 = berms. Zone 7 = synthetic cap. The Base Case inset illustrates cap placement over the berms. The Case 1 inset illustrates cap placement without covering the berms.

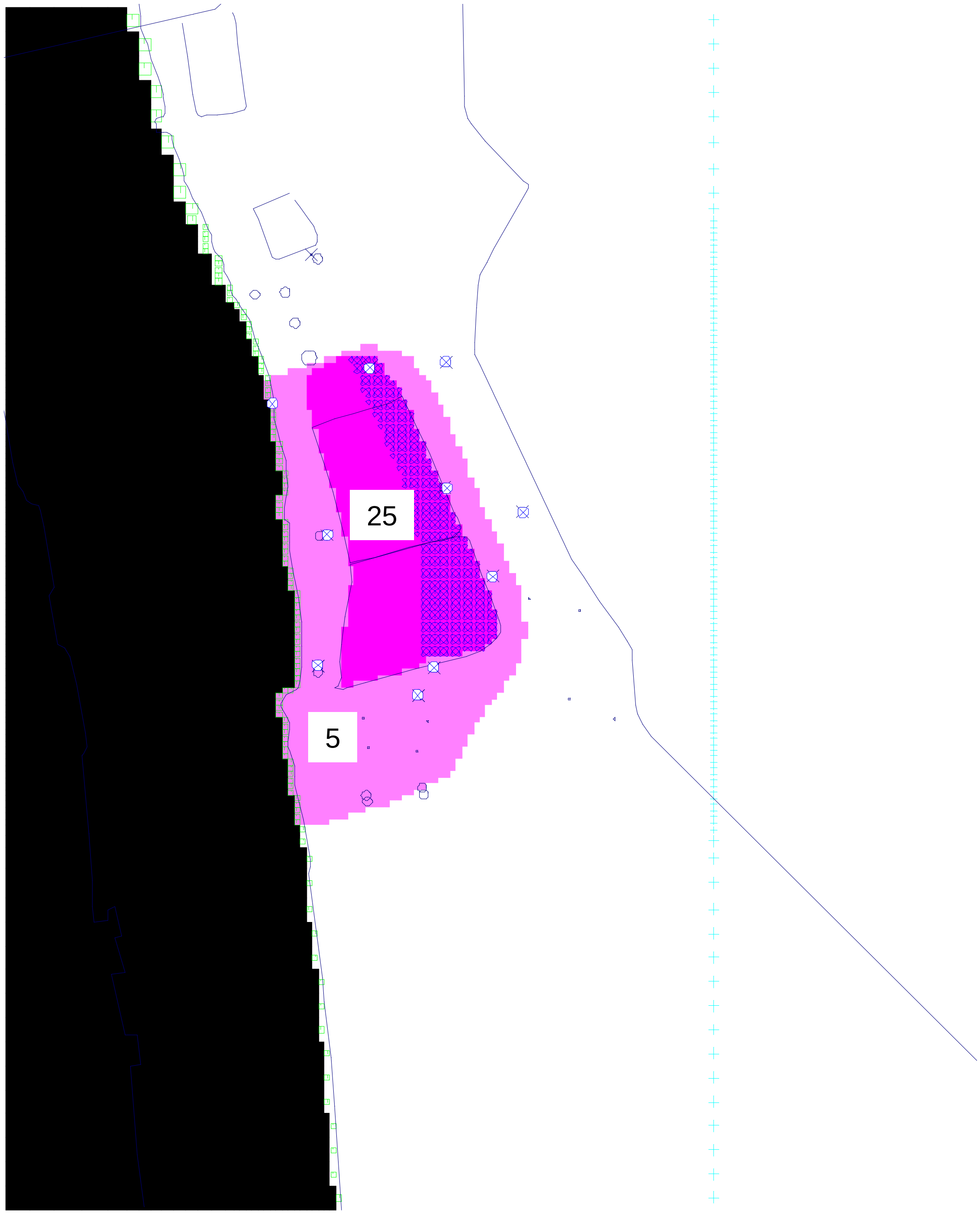


Figure 7. Initial concentrations for Layer 1. Dark pink is the higher concentration of 25 mg/L. Light pink is the lower concentration of 5 mg/L that surrounds the higher concentration zone. The blue markings within the dark pink zone are the symbols for the constant concentration cells. The boxes on the left are river cells, and the + signs on the right are the general head boundary cells.

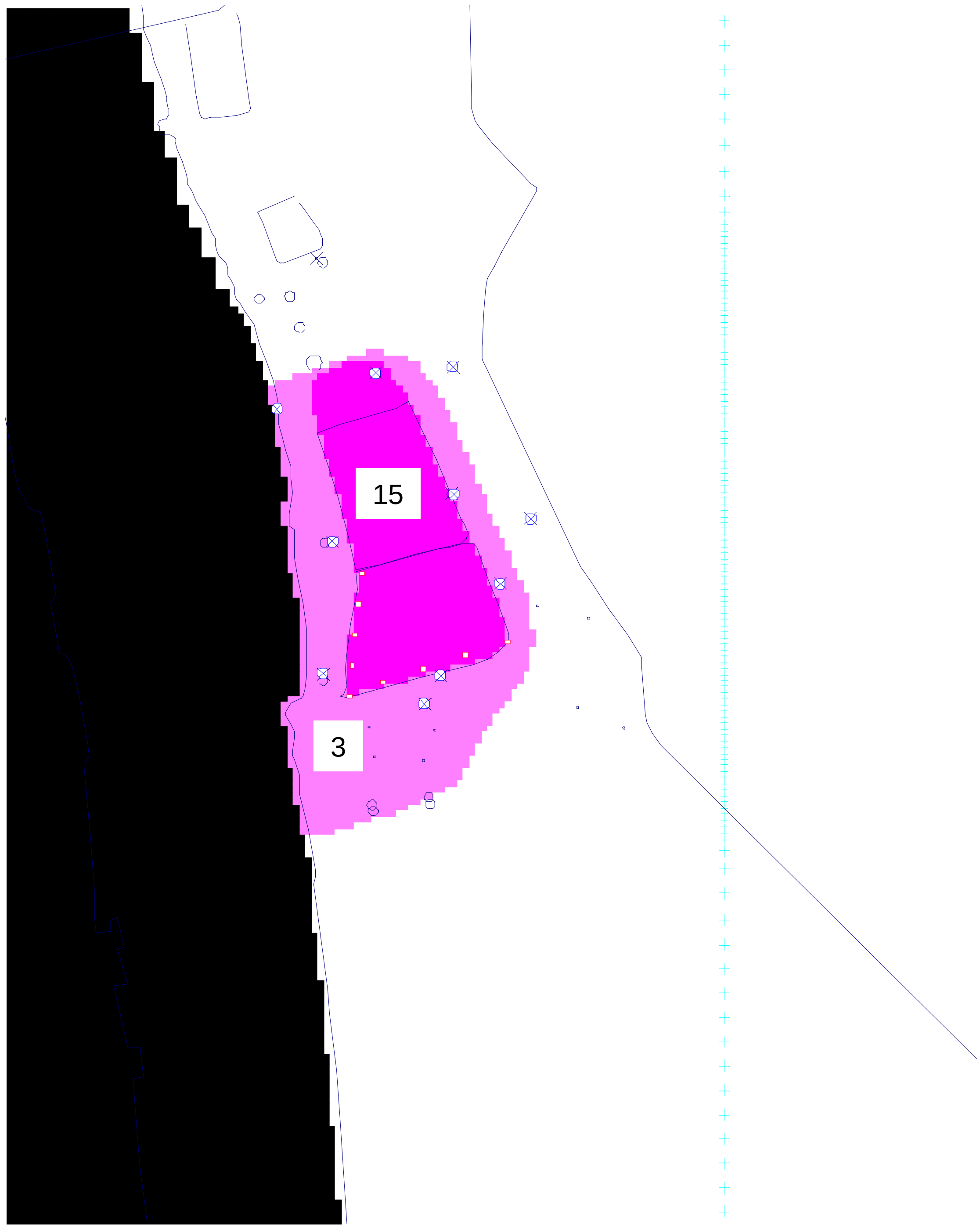


Figure 8. Initial concentrations for Layers 2 and 3. Dark pink is the higher concentration of 15 mg/L. Light pink is the lower concentration of 3 mg/L that surrounds the higher concentration zone. + signs on the right are the general head boundary cells.

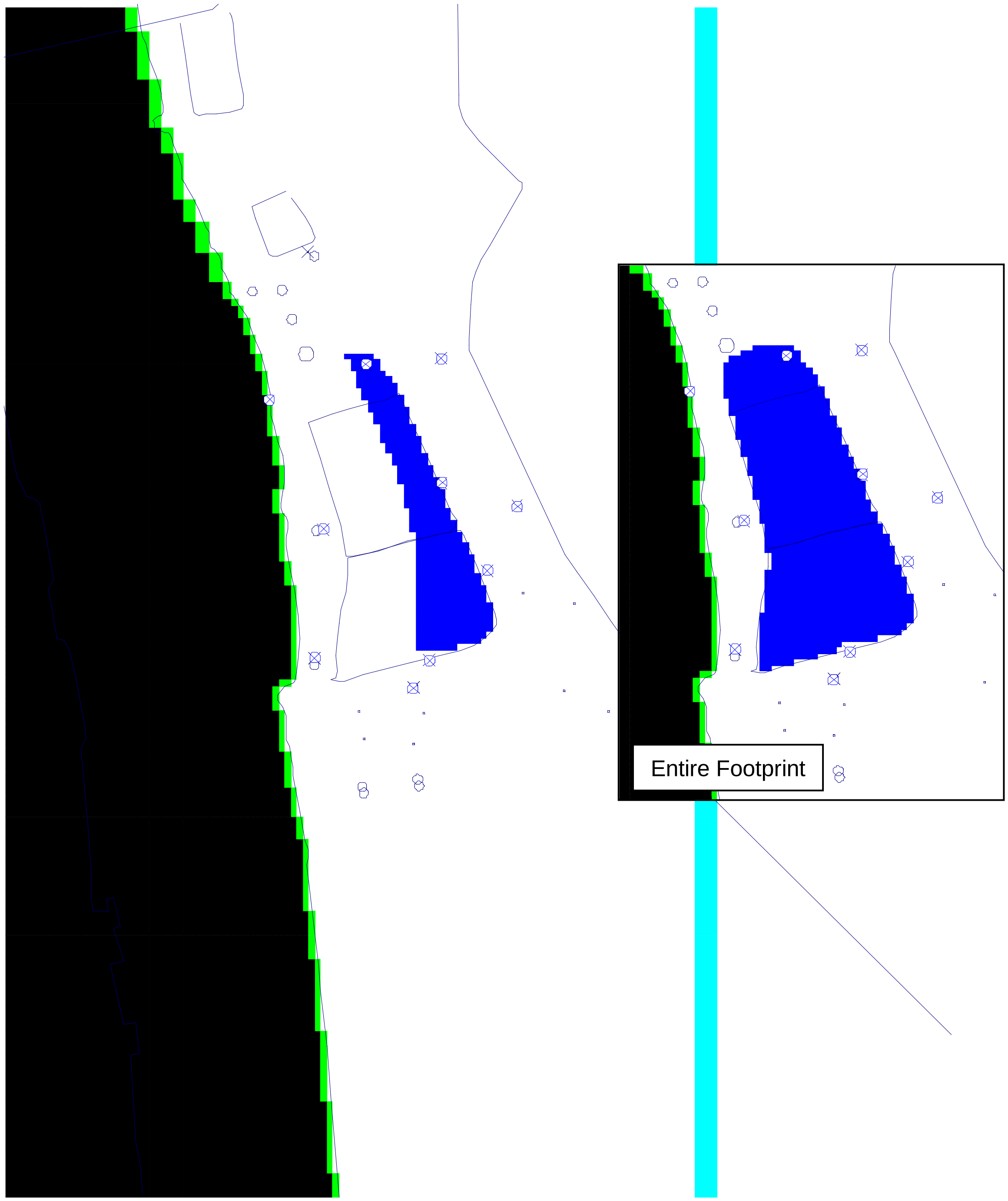


Figure 9. Constant concentration boundary. Portions of the model containing constant concentration cells (seasonally saturated ash) are dark blue. The estimated “partial footprint” area used for modeling is on the left. The more conservative “entire footprint” is in the inset. Light blue = general head boundary, Green = river boundary.

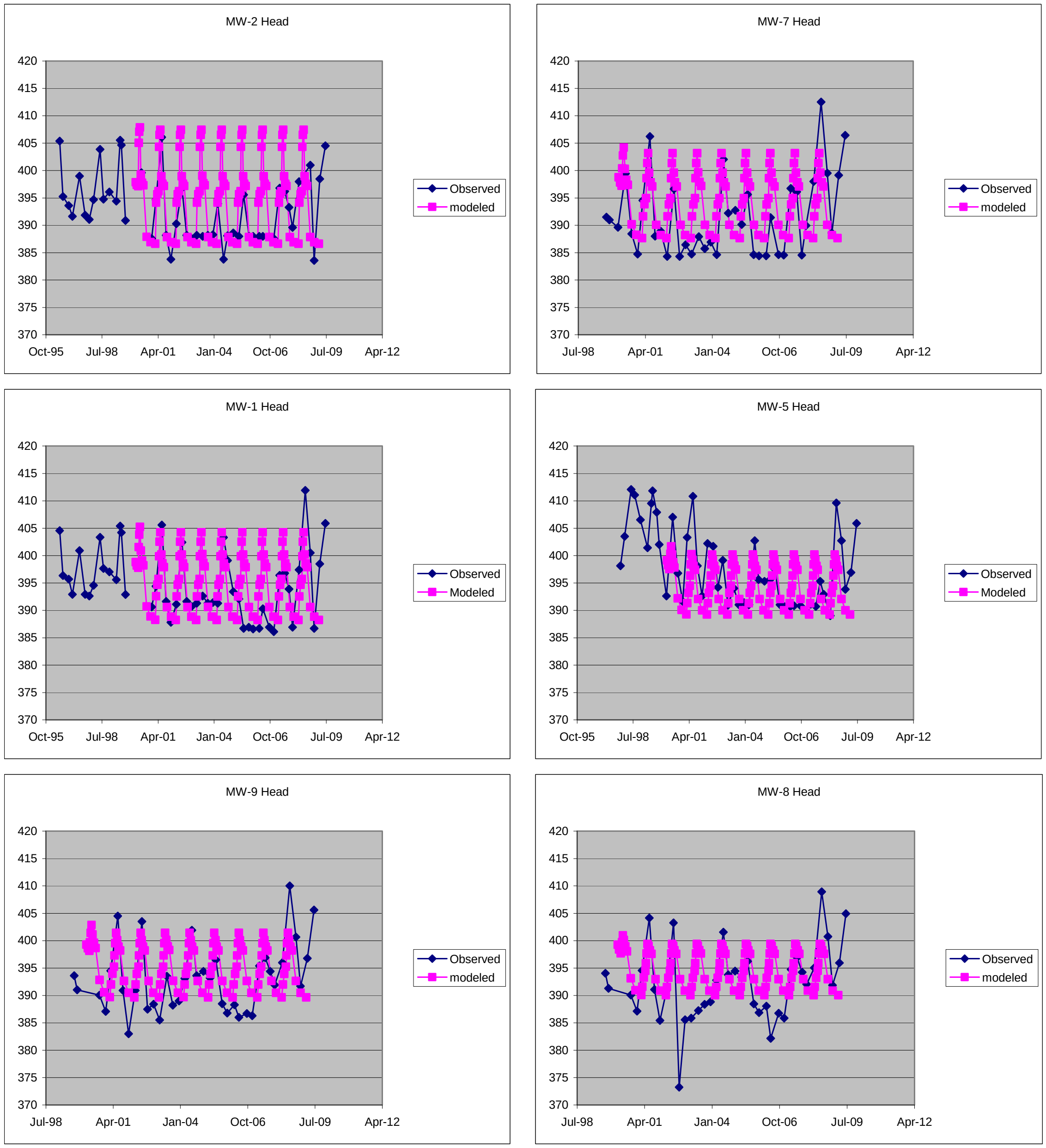


Figure 10. Head calibration graphs [Run 19]. MW-2 and MW-7 represented downgradient calibration; MW-1 and MW-5 represented on-site calibration; and MW-8 and MW-9 represented upgradient calibration.

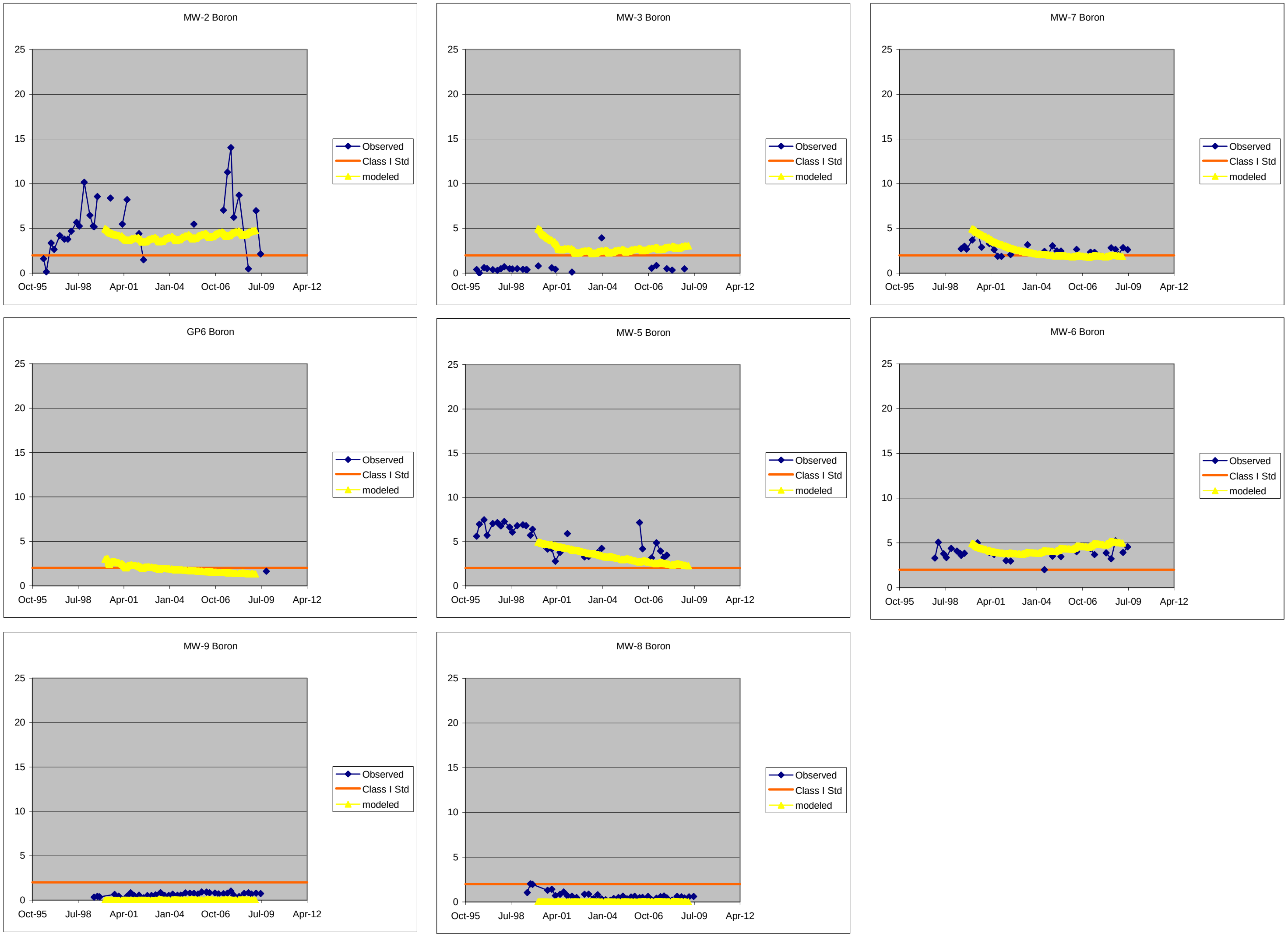


Figure 11. Concentration calibration graphs [Run 19]. MW-2, MW-3, MW-7, and GP-6 represented downgradient concentrations. GP-6 is a monitoring point placed in the model to compare to a groundwater grab sample collected in the fall of 2009. MW-5 and MW-6 represented on-site conditions; and MW-8 and MW-9 represented upgradient conditions.

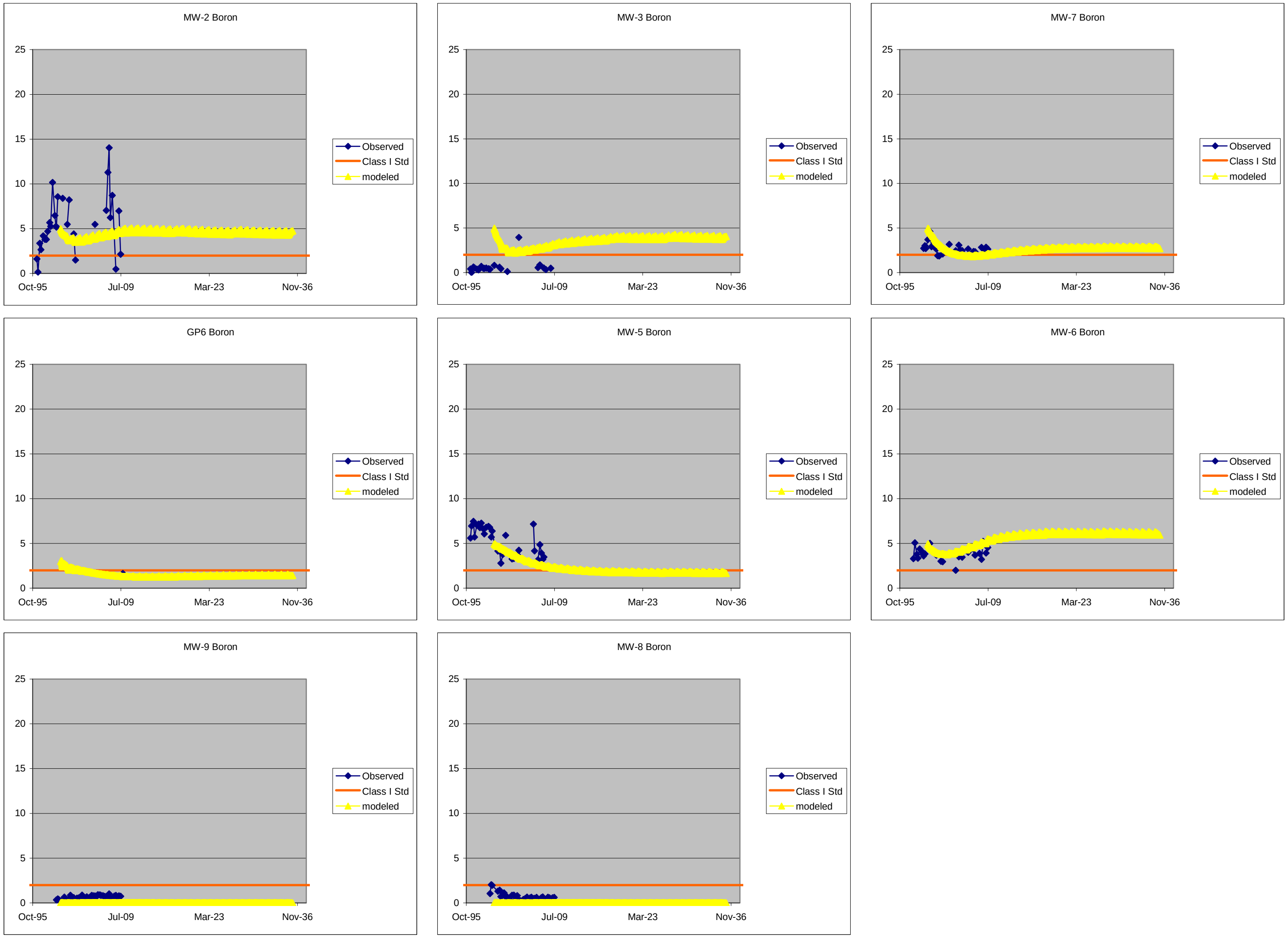


Figure 12. No Action Prediction Scenario [Run 19pna]. MW-2, MW-3, MW-7, and GP-6 represented downgradient concentrations. GP-6 is a monitoring point placed in the model to compare to a groundwater grab sample collected in the fall of 2009. MW-5 and MW-6 represented on-site conditions; and MW-8 and MW-9 represented upgradient conditions.

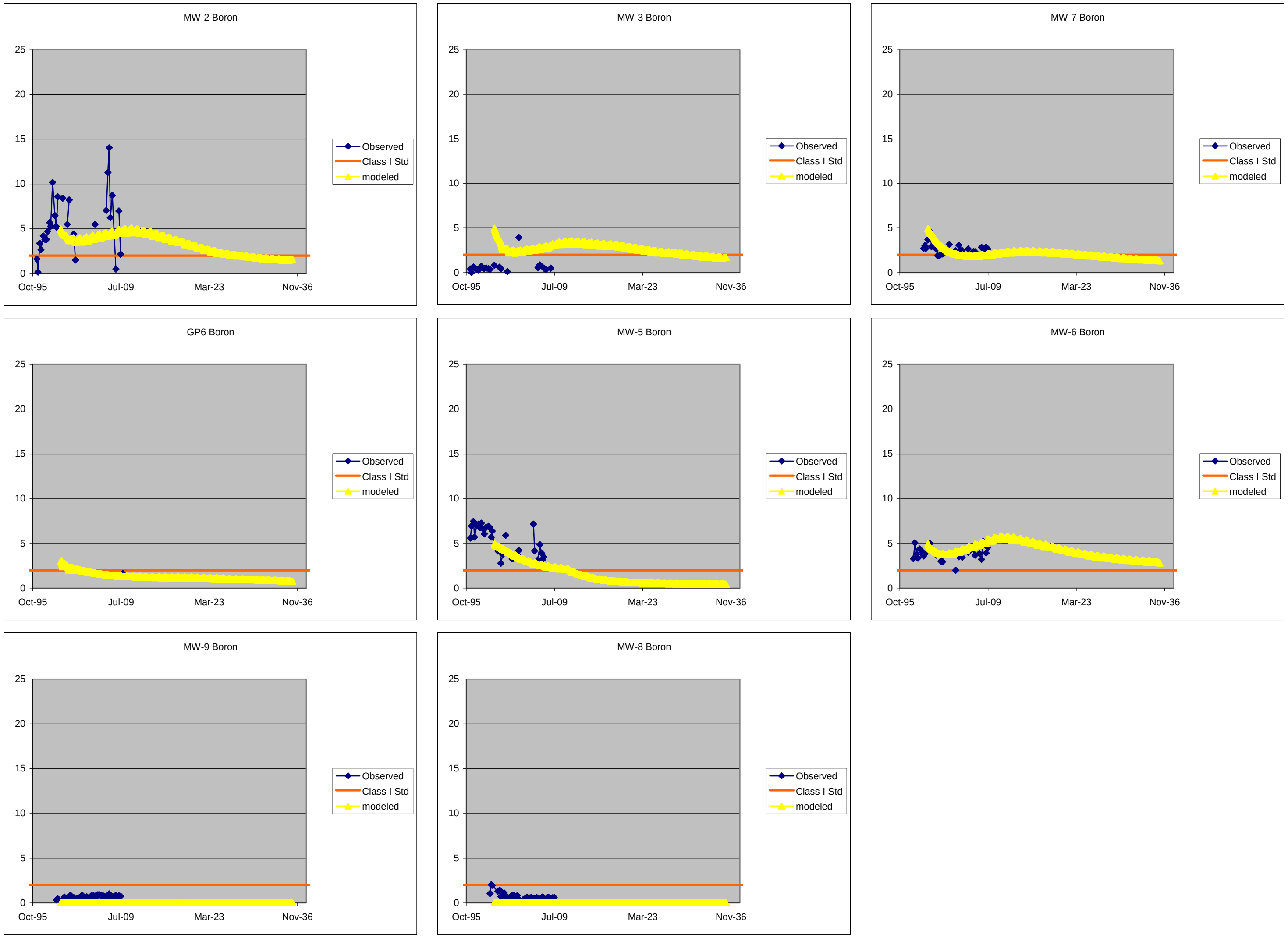


Figure 13. Base Case Prediction Scenario [Run 19pbc]. MW-2, MW-3, MW-7, and GP-6 represented downgradient concentrations. GP-6 is a monitoring point placed in the model to compare to a groundwater grab sample collected in the fall of 2009. MW-5 and MW-6 represented on-site conditions; and MW-8 and MW-9 represented upgradient conditions.

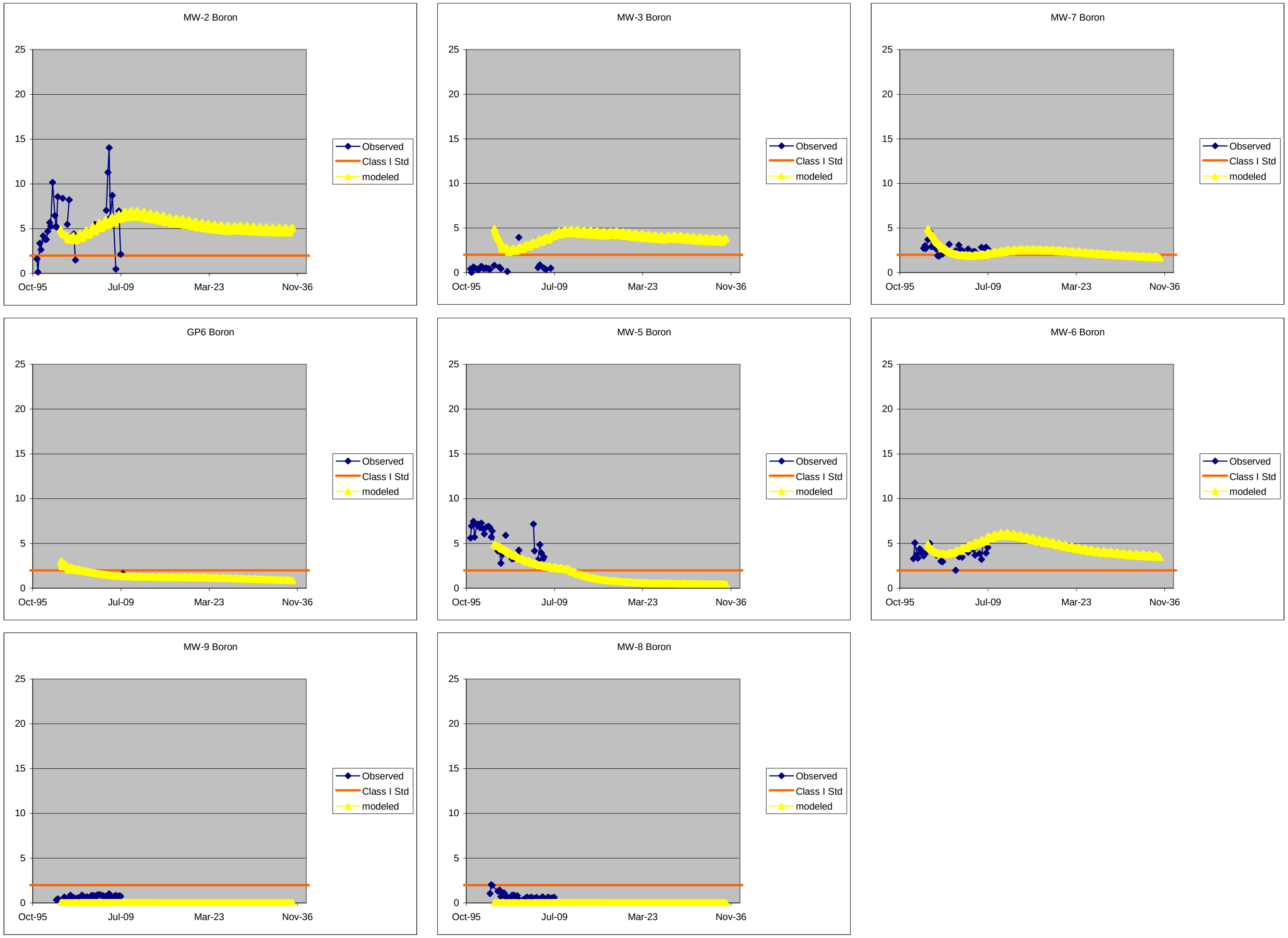


Figure 14. Base Case Prediction with entire footprint of saturated ash [Run 18pbc]. Compared to Figure 16, note that the results are similar with the following exception: Concentrations in MW-2 and MW-3 (downgradient, between the levee and ponds) stabilize around 4 to 5 mg/L, twice the Class I standard.

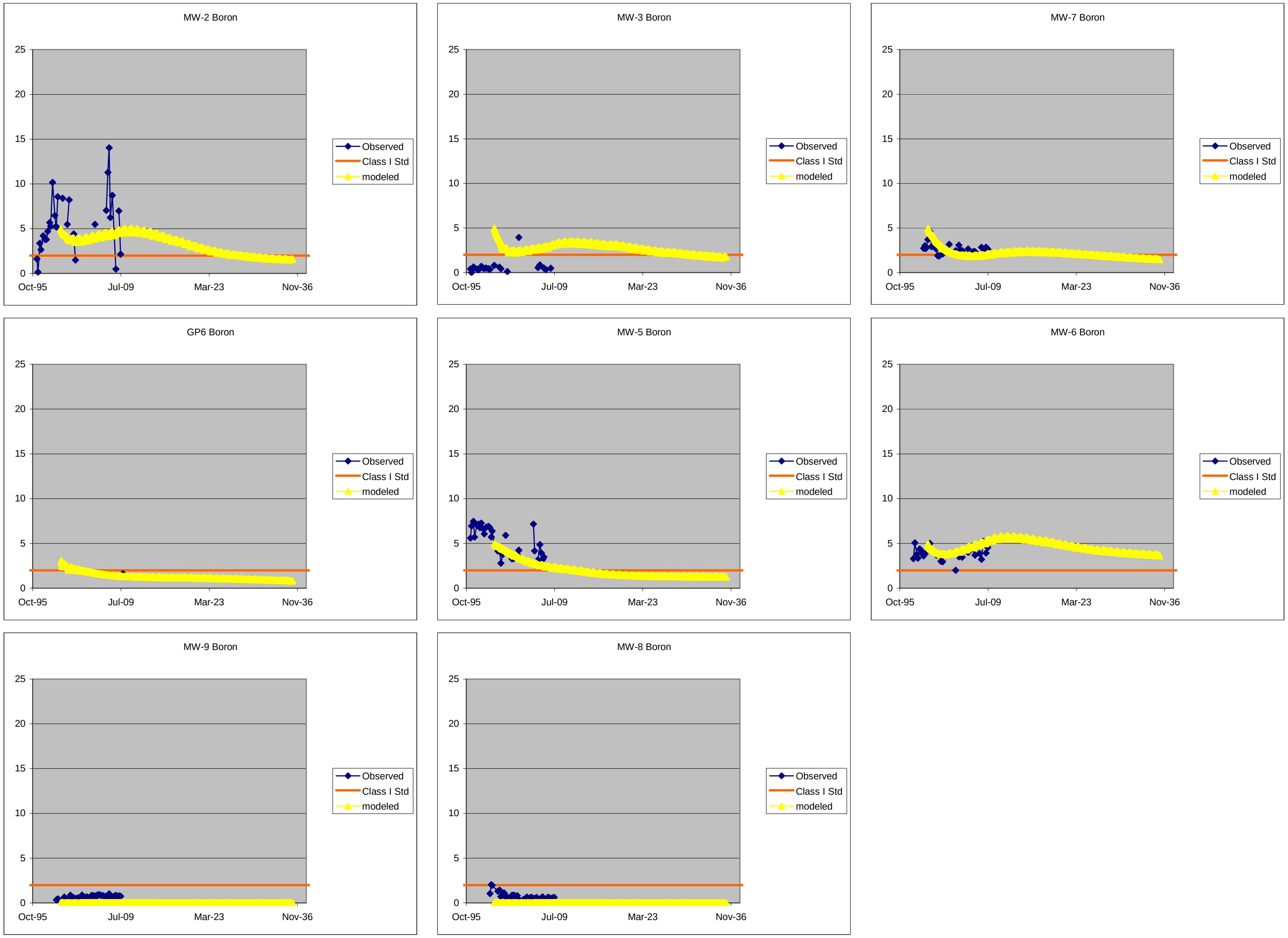
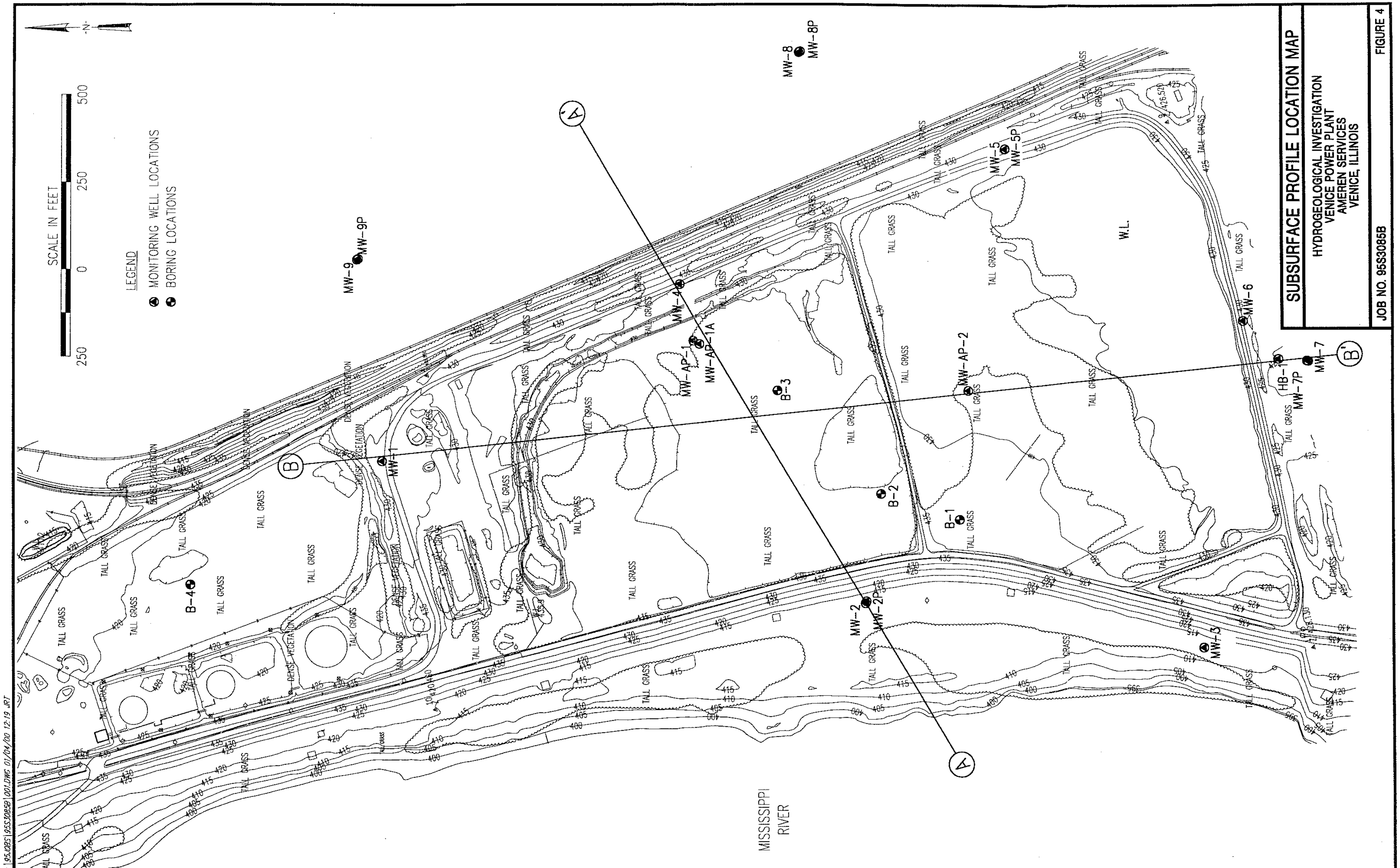
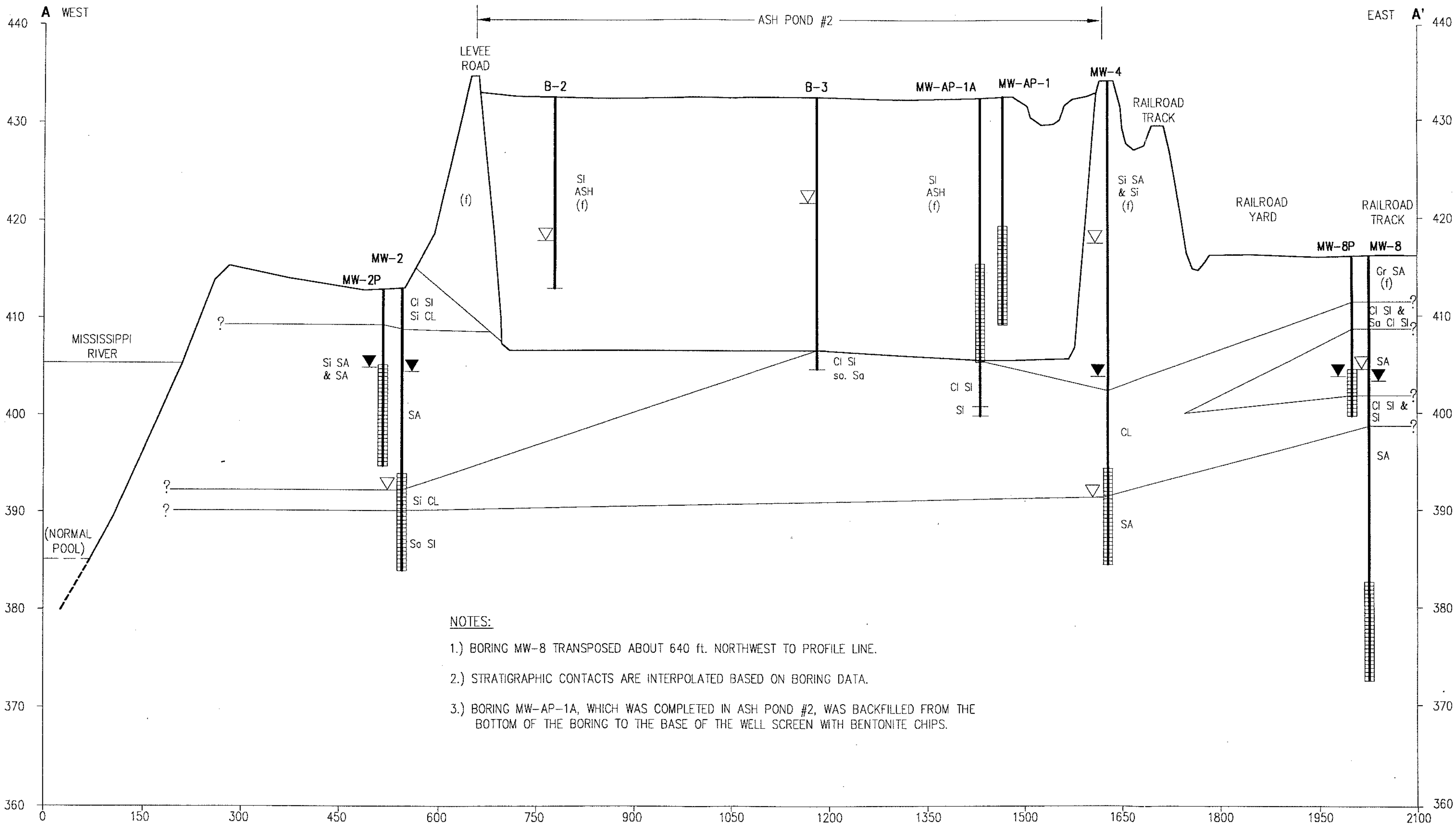


Figure 15. Case 1 Prediction Scenario [Run 19pc1]. Concentration trends were similar to the Base Case scenario, with all off-site wells below the Class I standard. The most notable exception is that MW-5 concentrations appear to stabilize closer to the Class I standard than in the Base Case.

Attachment 1
Geologic Cross-Sections
From Hanson (2000)


SUBSURFACE PROFILE LOCATION MAP
HYDROGEOLOGICAL INVESTIGATION
VENICE POWER PLANT
AMEREN SERVICES
VENICE, ILLINOIS
JOB NO. 95S3085B
FIGURE 4
SCALE IN FEET
250
0
250
500
LEGEND
MONITORING WELL LOCATIONS
BORING LOCATIONS
MW-1
MW-2
MW-2P
MW-3
MW-4
MW-5
MW-5P
MW-6
MW-7
MW-7P
MW-8
MW-8P
MW-9
MW-9P
MW-AP-1
MW-AP-1A
MW-AP-2
HB-1
B-1
B-2
B-3
B-4
A
A'
B
B'
TALL GRASS
DENSE VEGETATION
W.L.
MISSISSIPPI RIVER
I:\95JOBS\95S3085B\001.DWG 01/04/00 12:19 JRT



NOTES:

1.) BORING MW-8 TRANSPOSED ABOUT 640 ft. NORTHWEST TO PROFILE LINE.

2.) STRATIGRAPHIC CONTACTS ARE INTERPOLATED BASED ON BORING DATA.

3.) BORING MW-AP-1A, WHICH WAS COMPLETED IN ASH POND #2, WAS BACKFILLED FROM THE BOTTOM OF THE BORING TO THE BASE OF THE WELL SCREEN WITH BENTONITE CHIPS.

LEGEND

CL = CLAY
SI = SILT
SA = SAND
GR = GRAVEL
(f) = FILL
▽ = WATER LEVEL DURING DRILLING
▼ = WATER LEVEL ON JULY 8, 1999

SCALE

VERTICAL – 1 INCH = 10 FEET
HORIZONTAL – 1 INCH = 150 FEET

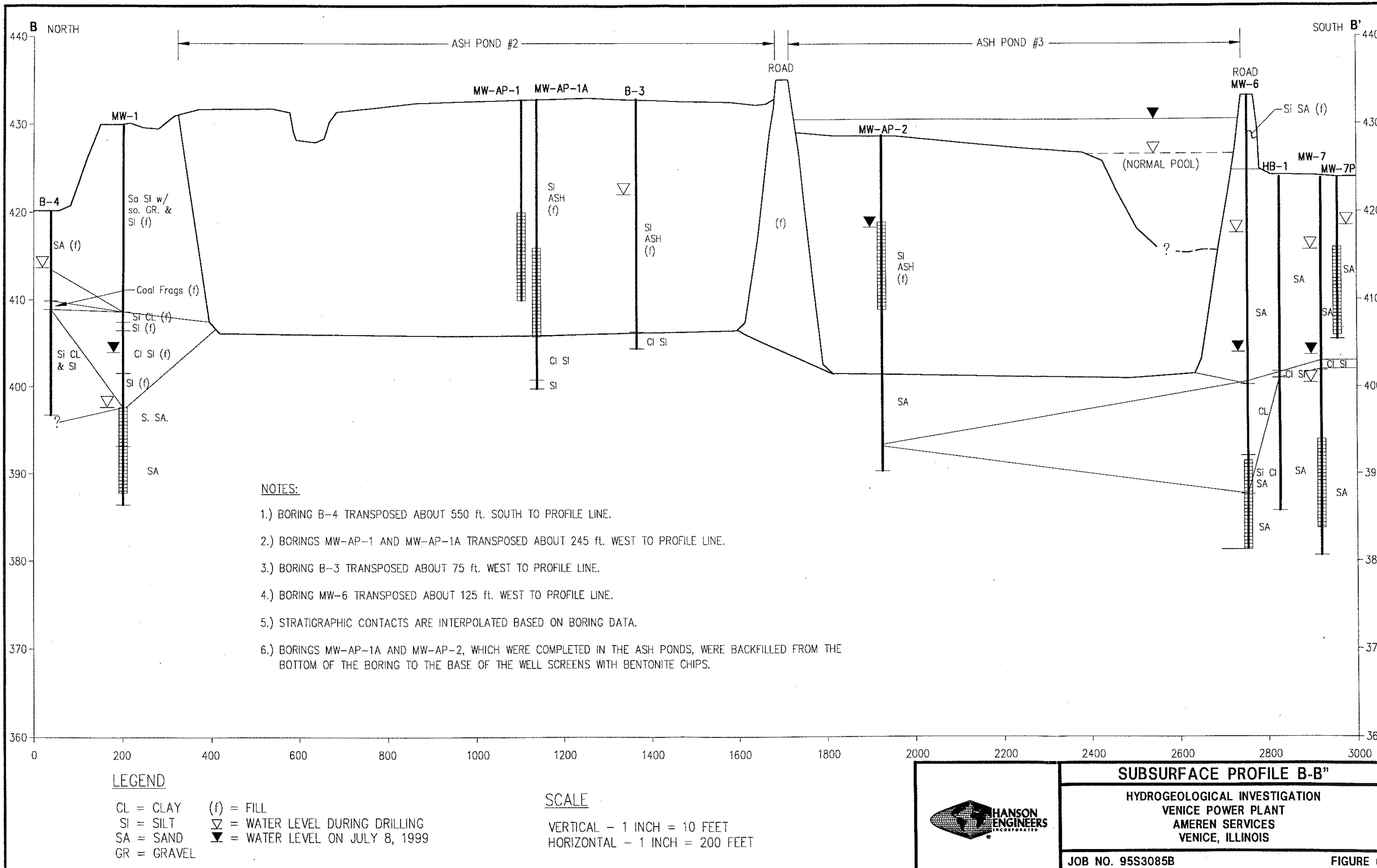
HANSON ENGINEERS INCORPORATED

SUBSURFACE PROFILE A-A'

HYDROGEOLOGICAL INVESTIGATION
VENICE POWER PLANT
AMEREN SERVICES
VENICE, ILLINOIS

JOB NO. 95S3085B **FIGURE 5**

I:\95JOBS\95S3085B\002.DWG 01/04/00 12:26 JRT


B NORTH
SOUTH B'
ASH POND #2
ASH POND #3
ROAD
ROAD
MW-6
MW-1
B-4
MW-AP-1
MW-AP-1A
B-3
MW-AP-2
HB-1
MW-7
MW-7P
Si SA (f)
(NORMAL POOL)
Sa Si w/ so. GR. & Si (f)
SA (f)
Coal Frags (f)
Si CL (f)
Si (f)
Cl Si (f)
Si CL & Si
Si (f)
S. SA.
SA
Si ASH (f)
Cl Si
Si
(f)
Cl Si
CL
Si Cl SA
440
430
420
410
400
390
380
370
360
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
NOTES:
1.) BORING B-4 TRANSPOSED ABOUT 550 ft. SOUTH TO PROFILE LINE.
2.) BORINGS MW-AP-1 AND MW-AP-1A TRANSPOSED ABOUT 245 ft. WEST TO PROFILE LINE.
3.) BORING B-3 TRANSPOSED ABOUT 75 ft. WEST TO PROFILE LINE.
4.) BORING MW-6 TRANSPOSED ABOUT 125 ft. WEST TO PROFILE LINE.
5.) STRATIGRAPHIC CONTACTS ARE INTERPOLATED BASED ON BORING DATA.
6.) BORINGS MW-AP-1A AND MW-AP-2, WHICH WERE COMPLETED IN THE ASH PONDS, WERE BACKFILLED FROM THE BOTTOM OF THE BORING TO THE BASE OF THE WELL SCREENS WITH BENTONITE CHIPS.
LEGEND
CL = CLAY
SI = SILT
SA = SAND
GR = GRAVEL
(f) = FILL
▽ = WATER LEVEL DURING DRILLING
▼ = WATER LEVEL ON JULY 8, 1999
SCALE
VERTICAL - 1 INCH = 10 FEET
HORIZONTAL - 1 INCH = 200 FEET
HANSON ENGINEERS INCORPORATED
SUBSURFACE PROFILE B-B"
HYDROGEOLOGICAL INVESTIGATION
VENICE POWER PLANT
AMEREN SERVICES
VENICE, ILLINOIS
JOB NO. 95S3085B
FIGURE 6

ATTACHMENT 23

CLOSURE PLAN:
ASH PONDS A, B, C & BOTTOM ASH POND
HUTSONVILLE POWER STATION
Project J04PT

AmerenEnergy Medina Valley Cogen, L.L.C.

Crawford County, Illinois

September 15, 2014 (Rev 0)

Revised February 23, 2015 (Rev 1)

Prepared by:

Hanson Professional Services

Ameren

Dam Safety, Hydro & Civil Engineering
314.957.3202
3700 S. Lindbergh Blvd.
St. Louis, MO 63127

1.6 Timeline of Ash Pond Actions

An approximate schedule is summarized below that outlines the time for implementation of the Closure Plan elements, as well as the timelines of previous ash pond constructions, removals, and other related operations:

- 1968 - 2000: Ash Pond A and Ash Ash Pond D were the only existing ash ponds operated on Site.
- 2000:
  a. Ash Pond D was removed from service.
  b. The ash laydown area was excavated.
  c. Construction of the interim pond (Ash Pond B) and the drainage collection pond (Ash Pond C) were finished.
- January 2013: Capping of Ash Pond D was completed.
- January 2015 (Expected): The groundwater collection trench will begin operation.
- January 2016 (Expected):
  a. Removal of Ash Pond B, Ash Pond C, and the Bottom Ash Sluice Pond will be completed.
  b. Capping of Ash Pond A will be completed.

2. Groundwater MODEL Approach

2.1 Overview

This section presents the conceptual model and the overall modeling methodology. The model was established to predict the effect of the proposed closure actions for Ash Pond A, Ash Pond B, Ash Pond C, and the Bottom Ash Sluice Pond on groundwater quality at the site. These ponds have limited impact on groundwater flow and quality, so Ash Pond D was included in the modeling for calibration purposes.

2.2 Conceptual Model

The conceptual model for the Site is schematically illustrated in Figure 3, below. Three sources of water are present: natural recharge within the model domain, percolation water from the ash ponds, and groundwater flow from the west. Groundwater in the shallow groundwater zone flows horizontally east, discharging into the Wabash River, a regional groundwater sink. Where coal ash is encountered within the shallow groundwater zone, groundwater flows horizontally through the ash. Only Ash Pond D was deep enough to have horizontal groundwater migration through the coal ash.

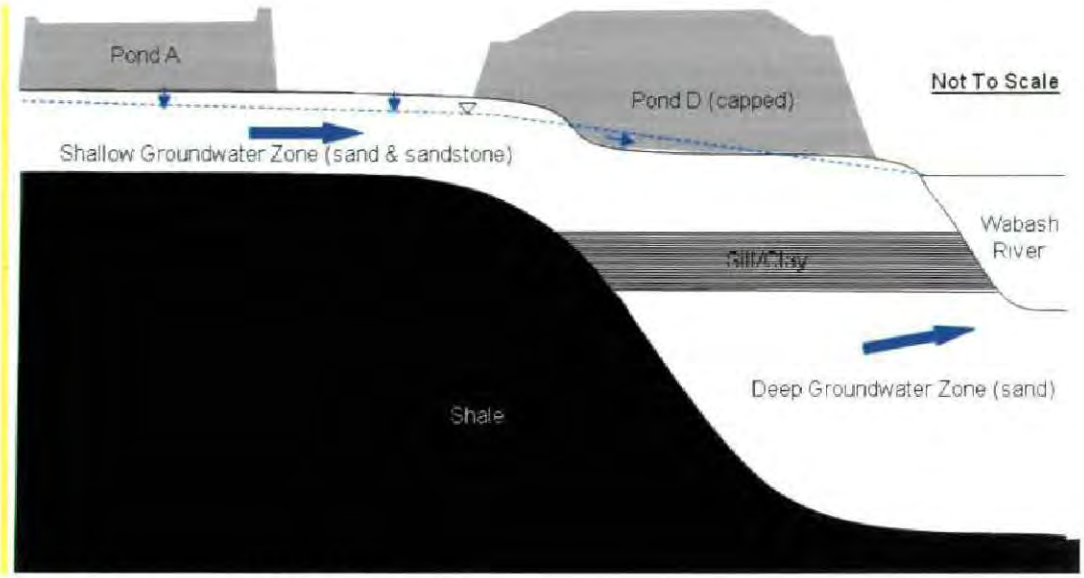


Figure 3. Conceptual Model Schematic

Boron was modeled to simulate migration of CCW leachate because it 1) has concentrations exceeding the Class I standard in a number of on-site monitoring wells, 2) is mobile in groundwater, and 3) is not chemically reactive. The conceptual model for transport assumes two boron sources: boron that leaches to recharge water during percolation through ash above the water table; and boron that leaches to groundwater as it flows through ash below the water table, which is limited to Ash Pond D. Therefore, mass is added to groundwater via vertical recharge through coal ash, and horizontal groundwater flow through coal ash where it lies below the water table. Mass is discharged at the model representation of the Wabash River. It is assumed that boron undergoes reversible adsorption and desorption within the soil matrix along its transport pathways, however no removal of mass occurs with this process. The conceptual transport model also assumes that boron concentration in leachate does not vary as a function of time, although the volume of leachate released decreases over time as a function of pond dewatering and capping.

2.3 Model Approach

Three model codes were used to simulate groundwater flow and boron transport:

- Leachate percolation after Ash Pond D closure was modeled using the Hydrologic Evaluation of Landfill Performance (HELP) model and the leachate percolation rates were applied in MODFLOW to simulate recharge beneath the pond cap.
- Groundwater flow was modeled in three dimensions using MODFLOW.
- Boron transport was modeled in three dimensions using MT3DMS (MODFLOW calculated the flow field that MT3DMS used in the transport calculations).

ATTACHMENT 24

PLACEMENT ABOVE THE UPPERMOST AQUIFER LOCATION RESTRICTIONS
LINCOLN STONE QUARRY
JOLIET #9 STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.60, KPRG and Associates, Inc (KPRG) prepared this report to document compliance with location restrictions related to placement above the uppermost aquifer for the existing Lincoln Stone Quarry (the Quarry) at the Joliet #9 Station (Site) in Joliet, Illinois.

The work presented in this report was performed under the direction of Joshua Davenport in accordance with §257.60. Richard Gnat reviewed this report in accordance with KPRG's quality assurance/quality control procedures.

1. Placement Location Restriction Determination

The base of the Quarry is elevation 501 ft amsl and the upper limit groundwater elevation is 555.35 ft amsl. The Quarry is not separated from the upper limit of the uppermost aquifer by a minimum of five (5) feet.

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by KPRG personnel and information provided to KPRG by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

Joshua D. Davenport, P.E.

Illinois Professional Engineer No. 062.061945
License Expires: 11/30/2019

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STATE OF ILLINOIS

WETLANDS LOCATION RESTRICTIONS
LINCOLN STONE QUARRY
JOLIET #9 STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.61, KPRG and Associates, Inc (KPRG) prepared this report to document compliance with location restrictions related to wetlands for the existing Lincoln Stone Quarry (the Quarry) at the Joliet #9 Station (Site) in Joliet, Illinois.

The work presented in this report was performed under the direction of Joshua Davenport in accordance with §257.61. Richard Gnat reviewed this report in accordance with KPRG's quality assurance/quality control procedures.

1. Wetlands Location Restriction Determination

In order to determine if the Quarry was located in wetlands, it was necessary to determine if wetlands are present in the area of the Quarry. Site visits to the Quarry did not identify any wetlands around the perimeter of the Quarry that would indicate if wetlands were present prior to the mining of the Quarry. The national wetlands inventory (NWI) and the Will County Geographical Information System (GIS) Data Viewer were viewed to identify the presence of wetlands around the Quarry. Neither the NWI nor the Will County GIS Data Viewer identified wetlands around the Quarry, but the NWI did identify wetlands located inside the Quarry. The wetlands identified inside the Quarry were classified as a lake habitat with a classification code of L1UBHx. The definition of each component of this classification code is as follows:

- L = System: Lacustrine. The Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, and emergent mosses or lichens with 30 percent or greater areal coverage; and (3) total area of at least 20 acres. Similar wetlands and deepwater habitats totaling less than 8 ha are also included in the Lacustrine System if an active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water depth in the deepest part of the basin equals or exceeds 8.2 ft at low water.

- 1 = Subsystem: Limnetic. This Subsystem includes all deepwater habitats (i.e., areas > 8.2 ft deep below low water) in the Lacustrine System. Many small Lacustrine Systems have no Limnetic Subsystem.

- UB = Class: Unconsolidated Bottom. Includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%.
- H = Water Regime: Permanently Flooded. Water covers the substrate throughout the year

in all years.

- x = Water Chemistry: Excavated. This Modifier is used to identify wetland basins or channels that were excavated by humans.

The active mining of the limestone and the use of this open Quarry to store CCR from the burning of coal at Joliet generating stations 9 and 29 created the necessary conditions for the wetland that has been classified inside the Quarry. The removal of the limestone created the manmade topographical depression that fulfills the first requirement for a Lacustrine System and the excavated water chemistry (x) designation as noted above. The exposure of the limestone during the mining activities removed vegetation within the area, which fulfills the second requirement for a Lacustrine System. The sluicing of CCR from the generating stations into the Quarry for storage created the standing water and the manmade depression was large enough to allow the surface of the water to be at least 20 acres in size, which meets the third requirement for a Lacustrine System. In addition, the standing water will minimize the potential for vegetation to establish itself on the CCR. The limestone was removed to a depth that allowed the stored water to achieve a depth greater than 8.2 feet deep, which is why the Limnetic Subsystem (1) designation is applicable. The manmade depression is permanently flooded because it was created in a way that does not allow for the natural drainage of the water, which is why the water regime permanently flooded (H) designation is applicable.

The wetland classification given to the standing water and the area within the Quarry is a result of the mining operation and the CCR material storage activities that took place in this area. Therefore, based on this evaluation, the Quarry is not located in a wetland, but an area classified as a wetland that was artificially created within the Quarry.

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of engineering. The contents of this report are based solely on the observations of the conditions observed by KPRG personnel and information provided to KPRG by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

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3. *References*

U.S. Fish and Wildlife Service, 2018. "National Wetlands Inventory," https://www.fws.gov/wetlands/, accessed 7 September 2018.

Will County, 2018. "GIS Data Viewer," http://www.willcogis.org/website2014/gis/applications.html, accessed 7 September 2018.

FAULT AREAS LOCATION RESTRICTIONS
LINCOLN STONE QUARRY
JOLIET #9 STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.62, KPRG and Associates, Inc (KPRG) prepared this report to document compliance with location restrictions related to fault areas for the existing Lincoln Stone Quarry (the Quarry) at the Joliet #9 Station (Site) in Joliet, Illinois.

The work presented in this report was performed under the direction of Joshua Davenport in accordance with §257.62. Richard Gnat reviewed this report in accordance with KPRG's quality assurance/quality control procedures.

1. Fault Areas Location Restriction Determination

The Quarry is not located within 200 feet (60 meters) of a mapped Holocene-aged fault, as mapped by the United States Geological Survey (USGS) Quaternary Fault Database [USGS, 2018]. Therefore, the location of the Quarry complies with the requirements outlined in §257.62(a).

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by KPRG personnel and information provided to KPRG by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

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3. References

USGS, 2018. "Quaternary Fault and Fold Database," https://earthquake.usgs.gov/hazards/qfaults/, accessed 17 September 2018.

SEISMIC IMPACT ZONES LOCATION RESTRICTIONS
LINCOLN STONE QUARRY
JOLIET #9 STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.63, KPRG and Associates, Inc (KPRG) prepared this report to document compliance with location restrictions related to seismic impact zones for the existing Lincoln Stone Quarry (the Quarry) at the Joliet #9 Station (Site) in Joliet, Illinois.

The work presented in this report was performed under the direction of Joshua Davenport in accordance with §257.63. Richard Gnat reviewed this report in accordance with KPRG's quality assurance/quality control procedures.

1. Seismic Impact Zones Location Restriction Determination

The U.S. Geological Survey (USGS) National Seismic Hazard Tool website was used to provide the peak ground acceleration based on a 2% probability in 50 years, with a land designation of 'a site on rock' with a ground acceleration of 760 m/s in the upper 30 meters. The peak ground acceleration was determined to be 0.070 g in 50 years, which is less than 0.10 g in 50 years. The Quarry complies with the location requirement in 257.63(a) and is not located in a seismic impact zone. The peak ground acceleration where the Quarry is located is 0.070 g in 50 years, which is less than 0.10 g in 50 years, which is the minimum threshold specified in the regulations.

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of engineering. The contents of this report are based solely on the observations of the conditions observed by KPRG personnel and information provided to KPRG by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

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3. References

USGS, 2018. "National Seismic Hazard Tool," https://www.earthquake.usgs.gov/hazards/interactive/, accessed 17 September 2018.

UNSTABLE AREAS LOCATION RESTRICTIONS
LINCOLN STONE QUARRY
JOLIET #9 STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.64, KPRG and Associates, Inc (KPRG) prepared this report to document compliance with location restrictions related to unstable areas for the existing Lincoln Stone Quarry (the Quarry) at the Joliet #9 Station (Site) in Joliet, Illinois.

The work presented in this report was performed under the direction of Joshua Davenport in accordance with §257.64. Richard Gnat reviewed this report in accordance with KPRG's quality assurance/quality control procedures.

1. Unstable Areas Location Restriction Determination

The Quarry is not located in unstable areas. Therefore, the location of the Quarry complies with the requirements outlined in 257.64(a).

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of engineering. The contents of this report are based solely on the observations of the conditions observed by KPRG personnel and information provided to KPRG by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

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License Expires: 11/30/2019

ATTACHMENT 25

HALEY ALDRICH

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Placement Above Uppermost Aquifer
Ash Pond No. 1
Coffeen Power Station
Coffeen, Illinois

Illinois Power Resources Generating, LLC operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The Ash Pond No. 1 (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.60 *(Placement above the uppermost aquifer)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.60); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.60).

§257.60(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.

Haley & Aldrich reviewed available information provided by Vistra including historic record drawings, and based on review and evaluation of the information provided, the results do not demonstrate compliance with the requirements of 40 CFR §257.60(a).

<u>§257.60(b):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify that the above-referenced CCR Unit does not meet the requirements of 40 CFR §257.60(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

STEVEN F. PUTRICH
062-048-779
REGISTERED
PROFESSIONAL
ENGINEER
10/16/18
STATE OF ILLINOIS

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Wetland Areas
Coffeen Power Station
Ash Pond No. 1
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located south of Coffeen, Illinois. Ash Pond No. 1 (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.61 *(Wetlands)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.61); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.61.

§257.61(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.

Based on a review of the U.S. Fish and Wildlife Service's National Wetland Inventory mapping, 0.5-meter resolution aerial imagery (2015) and the results of on-site field assessments, the Unit is not located in wetlands as defined by 40 CFR §232.2.

§257.61(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the CCR Unit is not located in wetlands as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and, therefore, meets the requirements of 40 CFR §257.61(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Fault Areas
Coffeen Power Station
Ash Pond No. 1
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located south of Coffeen, Illinois. The Ash Pond No. 1 (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.62 *(Fault Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities.* 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.62); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.62).

§257.62(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

A review of available data from the U.S. Geologic Survey, the Illinois State Geological Survey, and other available information was completed for this demonstration. The nearest known mapped faults are the Crown Fault, which is located approximately 31 miles northwest, and the Centralia Fault zone, located approximately 35 miles southeast of the Unit. The timeframe of the most recent activity on these faults is not known. Based on the available published geologic data and information reviewed, there are no active faults or fault damage zones that have had displacement in Holocene time reported or indicated within 200 feet of the Unit.

§257.62(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration that the CCR Unit is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had a displacement in Holocene time as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.62(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Seismic Impact Zone
Coffeen Power Station
Ash Pond No. 1
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located south of Coffeen, Illinois. The Ash Pond No. 1 (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.63 *(Seismic Impact Zones)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.63); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.63).

§257.63(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

A Seismic Impact Zone is defined in the CCR Rule (40 CFR §257.63) as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years". The 2014 US Geological Survey Hazard Map raw data for the Coffeen Power Station Ash Pond No. 1 indicates that the maximum expected horizontal acceleration for 2 percent probability of exceedance in 50 years is 0.21g.

The results of our evaluation indicate that the Unit is in compliance with 40 CFR §257.63(a). Although the Unit is located in a seismic impact zone, it satisfies the demonstration requirements of 40 CFR §257.63(a). The AECOM report entitled "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for the Ash Pond No. 1 at Coffeen Power Station" dated October 2016 (AECOM Report), includes engineering analysis, calculations, and findings that support the requirements of 40 CFR §257.63(a), and provides documentation that those requirements have been evaluated by AECOM for the subject CCR unit.

§257.63(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, that the CCR Unit is located in a seismic impact zone as included in the CCR Rule Location Restrictions memorandum dated 12 October 2018 and satisfies all requirements of 40 CFR §257.63(a).

By providing this certification demonstration statement, we are not stating or inferring that we have verified or certified the details, assumptions, calculations and/or site condition models developed by AECOM in the subject report; those elements of the report are considered the professional opinions and determinations of AECOM.

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

STEVEN F. PUTRICH
062-048-779
REGISTERED
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ENGINEER
10/16/18
STATE OF ILLINOIS

HALEY ALDRICH

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Unstable Areas
Coffeen Power Station
Ash Pond No. 1
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located south of Coffeen, Illinois. The Ash Pond No. 1 (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.64 *(Unstable Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities.* 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.64); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.64).

§257.64(a): An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

§257.64(b): The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;
(2) On-site or local geologic or geomorphologic features; and
(3) On-site or local human-made features or events (both surface and subsurface).

Determination of compliance with §257.64(b)(1) - Conditions associated with the potential for significant differential settlement due to liquefaction were not identified in the area where the Plant is located. A separate report completed by AECOM entitled "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for the Ash Pond No. 1 at Coffeen Power Station" dated October 2016 concluded that the coarse-grained soils beneath the Unit are not susceptible to liquefaction and soft clays beneath the Unit were susceptible to cyclic softening (strength loss). The post-earthquake stability analysis performed by AECOM to model the stability of the impoundment slopes following an earthquake and soil strength loss produced acceptable factors of safety.

Determination of compliance with §257.64(b)(2) - Based on available United States Geological Survey (USGS) and Illinois State Geological Survey (ISGS) information, karst topography or physiographic features such as sinkholes, vertical shafts, sinking streams, caves, large springs, or blind valleys do not exist at the Plant. To evaluate the susceptibility of landslides, we reviewed readily available USGS and ISGS data. The USGS data indicates that the Plant is in an area of low landslide incidence and the closest document landslide is more than 10 miles from the site. Accordingly, it is our opinion that the Unit is not located in an area that has high susceptibility to landslides.

Determination of compliance with §257.64(b)(3) - An abandoned underground coal mine is located below the Unit, however an evaluation by AECOM (2016) concluded that the presence of this underground mine does not negatively affect the stability of the Unit.

§257.64(c): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration indicating the CCR Unit is not located in an unstable area as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.64(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

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ATTACHMENT 26

HALEY & ALDRICH, INC.
6500 Rockside Road
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216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Placement Above Uppermost Aquifer
Coffeen Power Station
GMF Gypsum Stack Pond
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The GMF Gypsum Stack Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.60 *(Placement above the uppermost aquifer)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.60); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.60).

§257.60(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.

Haley & Aldrich reviewed available information provided by Vistra including historic record drawings, design drawings, and boring logs, and based on review and evaluation of the information provided, the results do not demonstrate compliance with the requirements of 40 CFR §257.60(a).

<u>*§257.60(b):*</u> *The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.*

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify that the above-referenced CCR Unit does not meet the requirements of 40 CFR §257.60(a).

Signed: ________________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

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HALEY & ALDRICH, INC.
6500 Rockside Road
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216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Wetland Areas
Coffeen Power Station
GMF Gypsum Stack Pond
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The GMF Gypsum Stack Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.61 *(Wetlands)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.61); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.61.

§257.61(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.

Based on a review of the U.S. Fish and Wildlife Service's National Wetland Inventory mapping, 0.5-meter resolution aerial imagery (2015) and the results of on-site field assessments, the Unit is not located in wetlands as defined by 40 CFR §232.2.

§257.61(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the CCR Unit is not located in wetlands as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and, therefore, meets the requirements of 40 CFR §257.61(a).

Signed: ____________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

STEVEN F. PUTRICH
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MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Fault Areas
Coffeen Power Station
GMF Gypsum Stack Pond
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The GMF Gypsum Stack Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.62 *(Fault Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities.* 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.62); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.62).

§257.62(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

A review of available data from the U.S. Geologic Survey, the Illinois State Geological Survey, and other available information was completed for this demonstration. The nearest known mapped faults are the Crown Fault, which is located approximately 31 miles northwest, and the Centralia Fault zone, located approximately 35 miles southeast of the Unit. The timeframe of the most recent activity on these faults is not known. Based on the available published geologic data and information reviewed, there are no active faults or fault damage zones that have had displacement in Holocene time reported or indicated within 200 feet of the Unit.

§257.62(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration that the CCR Unit is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had a displacement in Holocene time as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.62(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

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MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Seismic Impact Zone
Coffeen Power Station
GMF Gypsum Stack Pond
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The GMF Gypsum Stack Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.63 *(Seismic Impact Zones)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.63); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.63).

§257.63(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

A Seismic Impact Zone is defined in the CCR Rule (40 CFR §257.63) as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years". The 2014 US Geological Survey Hazard Map raw data for the Coffeen Power Station GMF Gypsum Stack Pond indicates that the maximum expected horizontal acceleration for 2 percent probability of exceedance in 50 years is 0.21g.

The results of our evaluation indicate that the Unit is in compliance with 40 CFR §257.63(a). Although the Unit is located in a seismic impact zone, it satisfies the demonstration requirements of 40 CFR §257.63(a). The AECOM report entitled "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for the GMF Pond at Coffeen Power Station" dated October 2016 (AECOM Report), includes engineering analysis, calculations, and findings that support the requirements of 40 CFR §257.63(a), and provides documentation that those requirements have been evaluated by AECOM for the subject CCR unit.

<u>§257.63(b):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, that the CCR Unit is located in a seismic impact zone as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and satisfies all requirements of 40 CFR §257.63(a).

By providing this certification demonstration statement, we are not stating or inferring that we have verified or certified the details, assumptions, calculations and/or site condition models developed by AECOM in the subject report; those elements of the report are considered the professional opinions and determinations of AECOM.

Signed: ____________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY & ALDRICH, INC.
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Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Unstable Areas
Coffeen Power Station
GMF Gypsum Stack Pond
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The GMF Gypsum Stack Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.64 *(Unstable Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.64); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.64).

<u>§257.64(a)</u>: An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

§257.64(b): The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;
(2) On-site or local geologic or geomorphologic features; and
(3) On-site or local human-made features or events (both surface and subsurface).

Determination of compliance with §257.64(b)(1) - Conditions associated with the potential for significant differential settlement due to liquefaction were not identified in the area where the Plant is located. A separate report completed by AECOM entitled "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for the GMF Pond at Coffeen Power Station" dated October 2016 concluded that a 1-ft thick layer of liqueifiable material existed below the impoundment and post-liquefaction stability analyses performed by AECOM concluded that the impoundment slopes would remain stable if that layer liquefied during the design seismic event.

Determination of compliance with §257.64(b)(2) - Based on available United States Geological Survey (USGS) and Illinois State Geological Survey (ISGS) information, karst topography or physiographic features such as sinkholes, vertical shafts, sinking streams, caves, large springs, or blind valleys do not exist at the Plant. To evaluate the susceptibility of landslides, we reviewed readily available USGS and ISGS data. The USGS data indicates that the Plant is in an area of low landslide incidence and the closest document landslide is more than 10 miles from the site. Accordingly, it is our opinion that the Unit is not located in an area that has high susceptibility to landslides.

Determination of compliance with §257.64(b)(3) - An inactive underground mine is located below the Unit, however an evaluation by AECOM (2016) concluded that the presence of this underground mine does not negatively affect the stability of the Unit.

<u>§257.64(c):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration indicating the CCR Unit is not located in an unstable area as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.64(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 27

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Placement Above Uppermost Aquifer
GMF Recycle Pond
Coffeen Power Station
Coffeen, Illinois

Illinois Power Resources Generating, LLC operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The GMF Recycle Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.60 *(Placement above the uppermost aquifer)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.60); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.60).

§257.60(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.

Haley & Aldrich reviewed available information provided by Vistra including historic record drawings, and based on review and evaluation of the information provided, the results do not demonstrate compliance with the requirements of 40 CFR §257.60(a).

<u>§257.60(b):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify that the above-referenced CCR Unit does not meet the requirements of 40 CFR §257.60(a).

Signed: ________________________
Consulting Engineer

Print Name:	<u>Steven F. Putrich</u>
Illinois License No.:	<u>62048779</u>
Title:	<u>Vice President</u>
Company:	<u>Haley & Aldrich, Inc.</u>

Professional Engineer's Seal:

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HALEY & ALDRICH, INC.
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MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Wetland Areas
Coffeen Power Station
GMF Recycle Pond
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The GMF Recycle Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.61 *(Wetlands)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.61); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.61.

§257.61(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.

Based on a review of the U.S. Fish and Wildlife Service's National Wetland Inventory mapping, 0.5-meter resolution aerial imagery (2015) and the results of on-site field assessments, the Unit is not located in wetlands as defined by 40 CFR §232.2.

<u>§257.61(b):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the CCR Unit is not located in wetlands as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and, therefore, meets the requirements of 40 CFR §257.61(a).

Signed: ______________________________
Consulting Engineer

Print Name:	<u>Steven F. Putrich</u>
Illinois License No.:	<u>62048779</u>
Title:	<u>Vice President</u>
Company:	<u>Haley & Aldrich, Inc.</u>

Professional Engineer's Seal:

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MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Fault Areas
Coffeen Power Station
GMF Recycle Pond
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The GMF Recycle Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.62 *(Fault Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities.* 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.62); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.62).

§257.62(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

A review of available data from the U.S. Geologic Survey, the Illinois State Geological Survey, and other available information was completed for this demonstration. The nearest known mapped faults are the Crown Fault, which is located approximately 31 miles northwest, and the Centralia Fault zone, located approximately 35 miles southeast of the Unit. The timeframe of the most recent activity on these faults is not known. Based on the available published geologic data and information reviewed, there are no active faults or fault damage zones that have had displacement in Holocene time reported or indicated within 200 feet of the Unit.

<u>§257.62(b):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration that the CCR Unit is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had a displacement in Holocene time as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.62(a).

Signed: ______________________
Consulting Engineer

Print Name:	<u>Steven F. Putrich</u>
Illinois License No.:	<u>62048779</u>
Title:	<u>Vice President</u>
Company:	<u>Haley & Aldrich, Inc.</u>

Professional Engineer's Seal:

STEVEN F. PUTRICH
062-048-779
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HALEY & ALDRICH, INC.
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216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Seismic Impact Zone
Coffeen Power Station
GMF Recycle Pond
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The GMF Recycle Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.63 *(Seismic Impact Zones)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.63); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.63).

§257.63(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

A Seismic Impact Zone is defined in the CCR Rule (40 CFR §257.63) as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years". The 2014 US Geological Survey Hazard Map raw data for the Coffeen Power Station GMF Recycle Pond indicates that the maximum expected horizontal acceleration for 2 percent probability of exceedance in 50 years is 0.21g.

The results of our evaluation indicate that the Unit is in compliance with 40 CFR §257.63(a). Although the Unit is located in a seismic impact zone, it satisfies the demonstration requirements of 40 CFR §257.63(a). The Hanson report entitled "CCR Documentation Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan, GMF Recycle Pond, Coffeen Power Station" dated October 2016 (Hanson Report), includes engineering analysis, calculations, and findings that support the requirements of 40 CFR §257.63(a), and provides documentation that those requirements have been evaluated by Hanson for the subject CCR unit.

§257.63(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, that the CCR Unit is located in a seismic impact zone as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and satisfies all requirements of 40 CFR §257.63(a).

By providing this certification demonstration statement, we are not stating or inferring that we have verified or certified the details, assumptions, calculations and/or site condition models developed by Hanson in the subject report; those elements of the report are considered the professional opinions and determinations of Hanson.

Signed: ____________________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Unstable Areas
Coffeen Power Station
GMF Recycle Pond
Coffeen, Illinois

Illinois Power Generating Company operates the coal-fired Coffeen Power Station (Plant) located near Coffeen, Illinois. The GMF Recycle Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.64 *(Unstable Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.64); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.64).

§257.64(a): An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

§257.64(b): The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;
(2) On-site or local geologic or geomorphologic features; and
(3) On-site or local human-made features or events (both surface and subsurface).

Determination of compliance with §257.64(b)(1) - Conditions associated with the potential for significant differential settlement due to liquefaction were not identified in the area where the Plant is located. A separate report completed by Hanson Professional Services, Inc. (Hanson) entitled "CCR Documentation Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan, GMF Recycle Pond, Coffeen Power Station" dated October 2016 concluded that the soils beneath the Unit are not susceptible to liquefaction.

Determination of compliance with §257.64(b)(2) - Based on available United States Geological Survey (USGS) and Illinois State Geological Survey (ISGS) information karst topography or physiographic features such as sinkholes, vertical shafts, sinking streams, caves, large springs, or blind valleys do not exist at the Plant. To evaluate the susceptibility of landslides, we reviewed readily available USGS and ISGS data. The USGS data indicates that the Plant is in an area of low landslide incidence and the closest document landslide is more than 10 miles from the site. Accordingly, it is our opinion that the Unit is not located in an area that has high susceptibility to landslides.

Determination of compliance with §257.64(b)(3) - There are no documented surface or subsurface anthropogenic activities that would be indicative of creating unstable foundation conditions.

§257.64(c): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration indicating the CCR Unit is not located in an unstable area as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.64(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

ATTACHMENT 28

CITY WATER, LIGHT AND POWER
CCR SURFACE IMPOUNDMENT LOCATION RESTRICTIONS

The following information provides an evaluation of the CCR locations standards with respect to closure or retrofitting the CCR surface impoundments.

The locations restrictions consist of:

1. Placement Above the Uppermost Aquifer (§257.60)
2. Wetlands (§257.61)
3. Fault Areas (§257.62)
4. Seismic Impact Zones (§257.63)
5. Unstable Areas (§257.64)

Documentation showing compliance with the location standards must be placed in the operational record by October 17, 2018. If compliance cannot be certified, closure requirements of §257.101(b)(1) will apply. Each restriction is discussed separately below. The Lakeside and Dallman ash ponds are both considered CCR impoundments.

Placement Above the Uppermost Aquifer

The impoundments must be constructed with a base that is located no less than 5 feet above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to fluctuations in the groundwater elevations. If the demonstration cannot be made by the aforementioned date, the facility must cease accepting the CCR and begin closure activities pursuant to §257.101(b)(1).

Definitions of relevant terms in the paragraph above include (from §257.53):

> "*Aquifer* means a geologic formation, group of formations, or portion of a formation capable of yielding usable quantities of groundwater to wells or springs."
>
> "*Uppermost Aquifer* means the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary. Upper limit is measured at a point nearest to the natural ground surface to which the aquifer rises during the wet season."

It is debatable whether the deposits beneath the ash ponds are capable of yielding "usable" quantities of groundwater as the term is vague. Therefore, since the term "aquifer" is part of "uppermost aquifer," it can also be debatable if the unconsolidated deposits overlying the bedrock but beneath the ash ponds constitute an uppermost aquifer.

There are fine-grained sediments (silty clay/clayey silt) present beneath the ponds that do have confining hydraulic properties. However, there are also sand/sandy deposits that are water-bearing with potentiometric surfaces within 5 feet of the bottom of the ponds.

Documents from Hanson Engineers (1987) indicate the base of the Lakeside ash pond is approximately 535 feet above mean sea level (msl). Design drawings from Burns & McDonnell (1976) show the base of the Dallman ash pond to be approximately 533 feet above msl, with some variability. The potentiometric surfaces along the perimeter of the impoundments are largely above those elevations with the exception of the wells adjacent to (north and west) the Dallman ash pond. However, because the water level in the pond is approximately 548 feet above msl, an outward hydraulic gradient is present which fully saturates the soils beneath the impoundment. There is a direct hydraulic connection with the water table.

The term "uppermost aquifer" is contained in the RCRA Subtitle D regulations that were used when creating the CCR regulations. Additionally, the "uppermost aquifer" was incorporated into the 35 Illinois Administrative Code (IAC) Part 814, Subpart C regulations, which apply to the FGDS onsite landfill. The uppermost aquifer at the landfill site does include the water-bearing deposits beneath the landfill, which also extend beneath and adjacent to the ash ponds.

Based on the potentiometric surfaces and the bottom elevations of the Dallman and Lakeside ash ponds, it is likely the ponds would be found not to meet the location standard of §257.60. Therefore, either retrofit or closure must be implemented pursuant to §257.101(b)(1).

<u>Wetlands</u>

The applicable units must not be located in wetlands. The existing and potential applicable units are listed on the wetland inventory map as a wetland. Clarification with the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers (USACE) should adequately address any issues. It is Andrews' experience that no USACE permit will be necessary for any of the operational ponds (CCR or process) and that the wetlands can be disturbed or removed.

<u>Fault Areas</u>

The applicable surface impoundments must not be located within 200 feet of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates that an alternative setback distance of less than 200 feet will prevent damage to the structural integrity of the CCR unit.

The fault areas for the FGDS landfill were identified as part of the initial Significant Modification Application (Log No. 1995-243-LFM). The study area incorporates that of the surface impoundments. There are no fault areas in the vicinity of the surface impoundments.

<u>Seismic Impact Zones</u>

The applicable units must not be located in seismic impact zones unless the owner or operator demonstrates that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

The seismic impact zones were evaluated as part of the initial Significant Modification Application (Log No. 1995-243-LFM) to Unit 2 of the FGDS landfill, including evaluation of the slope and mass stability. The study area includes the location of the impoundments. The ponds are not located within a seismic impact zone that would pose a threat to the structural integrity of the impoundments.

Unstable Areas

The applicable units must not be located in an unstable area unless it can be demonstrated that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR units to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

Unstable area means a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of the structural components responsible for preventing releases from the CCR unit. The preamble implies these issues will specifically relate to foundation conditions resulting in mass movement of soils, or karst terrains where bedrock is involved.

The hazard potential classification assessment with oversight from the Illinois Department of Natural Resources, and structural integrity assessments, did not indicate any unstable areas in the immediate surface impoundment area. Geotechnical analyses were conducted for both the Lakeside and Dallman ponds, and for the FGDS landfill as part of the permitting process. As provided in the differing reports, the soil characteristics were adequate to support the structures designed for the Lakeside and Dallman ash ponds.

COMPLIANCE

Of the five location requirements, four appear to comply with the specific rules. However, unlined ponds are placed directly above and within 5 feet of the high water table for the uppermost aquifer. Either it must be demonstrated that there will not be intermittent, reoccurring or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer, or cessation of disposal and closure must begin.

Hydraulic separation can be shown by retrofitting the ponds. A composite liner consisting of a two-foot (minimum) low hydraulic conductivity ($< 1.0 \times 10^{-7}$ cm/sec) clayey material overlain by a minimum 30 mil geomembrane (or equivalent) will be adequate to demonstrate hydraulic separation. Part or all of the impoundments can be retrofitted to meet the location requirement.

ATTACHMENT 29

HALEY
ALDRICH

HALEY & ALDRICH, INC.
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216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Placement Above Uppermost Aquifer
Ash Pond
Edwards Power Station
Bartonville, Illinois

Illinois Power Resources Generating, LLC operates the coal-fired Edwards Power Station (Plant) located near Bartonville, Illinois. The Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.60 *(Placement above the uppermost aquifer)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.60); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.60).

§257.60(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.

Haley & Aldrich reviewed available information provided by Vistra including historic record drawings, design drawings, and boring logs, and based on review and evaluation of the information provided, the results do not demonstrate compliance with the requirements of 40 CFR §257.60(a).

§257.60(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify that the above-referenced CCR Unit does not meet the requirements of 40 CFR §257.60(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

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MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Wetland Areas
Edwards Power Station
Ash Pond
Bartonville, Illinois

Illinois Power Resources Generating, LLC operates the coal-fired Edwards Power Station (Plant) located near Bartonville, Illinois. The Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.61 *(Wetlands)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.61); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.61.

§257.61(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.

Based on a review of the U.S. Fish and Wildlife Service's National Wetland Inventory mapping, 0.5-meter resolution aerial imagery (2016) and the results of on-site field assessments, the Unit is not located in wetlands as defined by 40 CFR §232.2.

<u>§257.61(b):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the CCR Unit is not located in wetlands as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and, therefore, meets the requirements of 40 CFR §257.61(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

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HALEY & ALDRICH, INC.
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MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Fault Areas
Edwards Power Station
Ash Pond
Bartonville, Illinois

Illinois Power Resources Generating, LLC operates the coal-fired Edwards Power Station (Plant) located near Bartonville, Illinois. The Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.62 *(Fault Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities.* 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.62); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.62).

§257.62(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

A review of available data from the U.S. Geologic Survey, the Illinois State Geological Survey, and other available information was completed for this demonstration. The nearest known mapped faults are four unnamed faults associated with the Troy Grove Dome, which are located approximately 63 miles northeast and the timeframe of the most recent activity on this fault is not known. Based on the available published geologic data and information reviewed, there are no active faults or fault damage zones that have had displacement in Holocene time reported or indicated within 200 feet of the Unit.

<u>§257.62(b):</u> *The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.*

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration that the CCR Unit is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had a displacement in Holocene time as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.62(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

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216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Seismic Impact Zone
Edwards Power Station
Ash Pond
Bartonville, Illinois

Illinois Power Resources Generating, LLC operates the coal-fired Edwards Power Station (Plant) located near Bartonville, Illinois. The Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.63 *(Seismic Impact Zones)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.63); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.63).

§257.63(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of a CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

A Seismic Impact Zone is defined in the CCR Rule (40 CFR §257.63) as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years". The 2014 US Geological Survey Hazard Map raw data for the E.D. Edwards Power Station Ash Pond indicates that the maximum expected horizontal acceleration for 2 percent probability of exceedance in 50 years is 0.06g. Accordingly, the Unit is not located in a seismic impact zone and a demonstration that the structural components have been designed to resist the maximum horizontal acceleration in lithified earth material for the site is not required.

§257.63(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, that the CCR Unit is not located in a seismic impact zone as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and, therefore, satisfies all requirements of 40 CFR §257.63(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

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MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Unstable Areas
Edwards Power Station
Ash Pond
Bartonville, Illinois

Illinois Power Resources Generating, LLC operates the coal-fired Edwards Power Station (Plant) located near Bartonville, Illinois. The Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.64 *(Unstable Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities.* 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.64); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.64).

§257.64(a): An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

§257.64(b): The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;
(2) On-site or local geologic or geomorphologic features; and
(3) On-site or local human-made features or events (both surface and subsurface).

Determination of compliance with §257.64(b)(1) - Conditions associated with the potential for significant differential settlement due to liquefaction were not identified in the area where the Plant is located. A separate report completed by AECOM entitled "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for the Ash Pond at E.D. Edwards Power Station" dated October 2016 concluded that the soils beneath the Unit are not susceptible to liquefaction.

Determination of compliance with §257.64(b)(2) - Based on available United States Geological Survey (USGS) and Illinois State Geological Survey (ISGS) information, karst topography or physiographic features such as sinkholes, vertical shafts, sinking streams, caves, large springs, or blind valleys do not exist at the Plant. To evaluate the susceptibility of landslides, we reviewed readily available USGS and ISGS data. The USGS data indicates that the Plant is in an area of high landslide incidence, however more detailed ISGS data indicates that there has not been a documented landslide occurrence at the

Unit. The ISGS documented landslide occurrences near the site are along U.S. Highway 24 and appear to be associated with roadside landslides. Accordingly, it is our opinion that the Unit is not located in an area that has high susceptibility to landslides.

Determination of compliance with §257.64(b)(3) - There are no documented surface or subsurface anthropogenic activities that would be indicative of creating unstable foundation conditions.

§257.64(c): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration indicating the CCR Unit is not located in an unstable area as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.64(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

STEVEN F. PUTRICH
062-048-779
REGISTERED
PROFESSIONAL
ENGINEER
10/16/18
STATE OF ILLINOIS

ATTACHMENT 30

HALEY ALDRICH

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Placement Above Uppermost Aquifer
East Ash Pond
Havana Power Station
Havana, Illinois

Dynegy Midwest Generating, LLC operates the coal-fired Havana Power Station (Plant) located near Havana, Illinois. The East Ash Pond (Unit), consisting of four sub-units (Cell 1 through Cell 4) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.60 *(Placement above the uppermost aquifer)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.60); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.60).

§257.60(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.

Haley & Aldrich reviewed available information provided by Vistra including historic design drawings and based on review and evaluation of the information provided, the results do not demonstrate compliance with the requirements of 40 CFR §257.60(a).

§257.60(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify that the above-referenced CCR Unit does not meet the requirements of 40 CFR §257.60(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Wetland Areas
Havana Power Station
East Ash Pond
Havana, Illinois

Dynegy Midwest Generating, LLC operates the coal-fired Havana Power Station (Plant) located near Havana, Illinois. The East Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.61 *(Wetlands)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.61); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.61.

§257.61(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.

Based on a review of the U.S. Fish and Wildlife Service's National Wetland Inventory mapping, 0.5-meter resolution aerial imagery (2016) and the results of on-site field assessments, the Unit is not located in wetlands as defined by 40 CFR §232.2.

§257.61(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the CCR Unit is not located in wetlands as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and, therefore, meets the requirements of 40 CFR §257.61(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

STEVEN F. PUTRICH
062-048-779
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HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Fault Areas
Havana Power Station
East Ash Pond
Havana, Illinois

Dynegy Midwest Generating, LLC operates the coal-fired Havana Power Station (Plant) located near Havana, Illinois. The East Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.62 (*Fault Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities.* 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.62); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.62).

§257.62(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

A review of available data from the U.S. Geologic Survey, the Illinois State Geological Survey, and other available information was completed for this demonstration. The nearest known mapped fault is the Sicily Fault, which is located approximately 55 miles southeast and the timeframe of the most recent activity on these faults is not known. Based on the available published geologic data and information reviewed, there are no active faults or fault damage zones that have had displacement in Holocene time reported or indicated within 200 feet of the Unit.

<u>§257.62(b):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration that the CCR Unit is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had a displacement in Holocene time as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.62(a).

Signed: ______________________
Consulting Engineer

Print Name:	<u>Steven F. Putrich</u>
Illinois License No.:	<u>62048779</u>
Title:	<u>Vice President</u>
Company:	<u>Haley & Aldrich, Inc.</u>

Professional Engineer's Seal:

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Seismic Impact Zone
Havana Power Station
East Ash Pond
Havana, Illinois

Dynegy Midwest Generating, LLC. operates the coal-fired Havana Power Station (Plant) located near Havana, Illinois. The East Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.63 *(Seismic Impact Zones)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.63); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.63).

§257.63(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

A Seismic Impact Zone is defined in the CCR Rule (40 CFR §257.63) as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years." The 2014 US Geological Survey Hazard Map raw data for the Havana Power Station East Ash Pond indicates that the maximum expected horizontal acceleration for 2 percent probability of exceedance in 50 years is 0.07g. Accordingly, the Unit is not located in a seismic impact zone and a demonstration that the structural components have been designed to resist the maximum horizontal acceleration in lithified earth material for the site is not required.

§257.63(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, that the CCR Unit is not located in a seismic impact zone as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and, therefore, satisfies all requirements of 40 CFR §257.63(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

STEVEN F. PUTRICH
062-048-779
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STATE OF ILLINOIS
10/16/18

HALEY ALDRICH

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Unstable Areas
Havana Power Station
East Ash Pond
Havana, Illinois

Dynegy Midwest Generating, LLC operates the coal-fired Havana Power Station (Plant) located near Havana, Illinois. The East Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.64 (*Unstable Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.64); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.64).

§257.64(a): An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

§257.64(b): The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;
(2) On-site or local geologic or geomorphologic features; and
(3) On-site or local human-made features or events (both surface and subsurface).

Determination of compliance with §257.64(b)(1) - Conditions associated with the potential for significant differential settlement due to liquefaction were not identified in the area where the Plant is located. A separate report completed by AECOM entitled "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for the East Ash Pond at Havana Power Station" dated October 2016 concluded that factor of safety against liquefaction for the silty soils are generally above 1.2 for the design seismic event.

Determination of compliance with §257.64(b)(2) - Based on available United States Geological Survey (USGS), Illinois State Geological Survey (ISGS) information, and communication with Vistra representatives familiar with the Plant's history, karst topography or physiographic features such as sinkholes, vertical shafts, sinking streams, caves, large springs, or blind valleys do not exist at the Plant. To evaluate the susceptibility of landslides, we reviewed readily available USGS and ISGS data. The USGS data indicates that the Plant is in an area of high landslide susceptibility and low incidence, however more detailed ISGS data indicates that there has not been a documented landslide occurrence at or near the Unit. The closest documented landslide is approximately 5 miles away. Accordingly, it is our opinion that the Unit is not located in an area that has high susceptibility to landslides.

Determination of compliance with §257.64(b)(3) - There are no documented surface or subsurface anthropogenic activities that would be indicative of creating unstable foundation conditions.

§257.64(c): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration indicating the CCR Unit is not located in an unstable area as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.64(a).

Signed: ____________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

ATTACHMENT 31

HALEY
ALDRICH

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Placement Above Uppermost Aquifer
East Ash Pond
Hennepin Power Station
Hennepin, Illinois

Dynegy Midwest Generating, LLC operates the coal-fired Hennepin Power Station (Plant) located near Hennepin, Illinois. The East Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.60 *(Placement above the uppermost aquifer)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.60); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.60).

§257.60(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.

Haley & Aldrich reviewed available information provided by Vistra including historic record drawings and design drawings and based on review and evaluation of the information provided, the results do not demonstrate compliance with the requirements of 40 CFR §257.60(a).

§257.60(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify that the above-referenced CCR Unit does not meet the requirements of 40 CFR §257.60(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

STEVEN F. PUTRICH
062-048-779
REGISTERED
PROFESSIONAL
ENGINEER
STATE OF ILLINOIS

HALEY ALDRICH

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Wetland Areas
Hennepin Power Station
East Ash Pond
Hennepin, Illinois

Dynegy Midwest Generation, LLC operates the coal-fired Hennepin Power Station (Plant) located near Hennepin, Illinois. The East Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.61 *(Wetlands)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.61); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.61.

§257.61(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.

Based on a review of the U.S. Fish and Wildlife Service's National Wetland Inventory mapping, 0.5-meter resolution aerial imagery (2016) and the results of on-site field assessments, the Unit is not located in wetlands as defined by 40 CFR §232.2.

<u>§257.61(b):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineers or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the CCR Unit is not located in wetlands as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and, therefore, meets the requirements of 40 CFR §257.61(a).

Signed: ______________________

Consulting Engineer

Print Name:	<u>Steven F. Putrich</u>
Illinois License No.:	<u>62048779</u>
Title:	<u>Vice President</u>
Company:	<u>Haley & Aldrich, Inc.</u>

Professional Engineer's Seal:

STEVEN F. PUTRICH
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HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
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216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Fault Areas
Hennepin Power Station
East Ash Pond
Hennepin, Illinois

Dynegy Midwest Generation, LLC operates the coal-fired Hennepin Power Station (Plant) located near Hennepin, Illinois. The East Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.62 *(Fault Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities.* 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.62); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.62).

§257.62(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

A review of available data from the U.S. Geologic Survey, the Illinois State Geological Survey, and other available information was completed for this demonstration. The nearest known mapped faults area a series of four unnamed faults associated with the Troy Grove Dome, which is located approximately 11 miles northeast and the timeframe of the most recent activity on these faults is not known. Based on the available published geologic data and information reviewed, there are no active faults or fault damage zones that have had displacement in Holocene time reported or indicated within 200 feet of the Unit.

§257.62(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration that the CCR Unit is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had a displacement in Holocene time as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.62(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY ALDRICH

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Seismic Impact Zone
Hennepin Power Station
East Ash Pond
Hennepin, Illinois

Dynegy Midwest Generation, LLC operates the coal-fired Hennepin Power Station (Plant) located near Hennepin, Illinois. The East Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment This demonstration addresses the requirements of 40 CFR §257.63 *(Seismic Impact zones)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.63); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.63).

§257.63(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

A Seismic Impact Zone is defined in the CCR Rule (40 CFR §257.63) as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years." The 2014 US Geological Survey Hazard Map raw data for the Hennepin Power Station East Ash Pond indicates that the maximum expected horizontal acceleration for 2 percent probability of exceedance in 50 years is 0.07g. Accordingly, the Unit is not located in a seismic impact zone and a demonstration that the structural components have been designed to resist the maximum horizontal acceleration in lithified earth material for the site is not required.

<u>§257.63(b):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, that the CCR Unit is not located in a seismic impact zone as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and, therefore, satisfies all requirements of 40 CFR §257.63(a).

Signed: ____________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Unstable Areas
Hennepin Power Station
East Ash Pond
Hennepin, Illinois

Dynegy Midwest Generation, LLC operates the coal-fired Hennepin Power Station (Plant) located near Hennepin, Illinois. The East Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.64 *(Unstable Areas)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.64); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.64).

§257.64(a): An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

§257.64(b): The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;
(2) On-site or local geologic or geomorphologic features; and
(3) On-site or local human-made features or events (both surface and subsurface).

Determination of compliance with §257.64(b)(1) - Conditions associated with the potential for significant differential settlement due to liquefaction were not identified in the area where the Plant is located. A separate report completed by AECOM entitled "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for the East Ash Pond at Hennepin Power Station" dated October 2016 concluded that the soils beneath the Unit are not susceptible to liquefaction.

Determination of compliance with §257.64(b)(2) - Based on available United States Geological Survey (USGS), Illinois State Geological Survey (ISGS) information, and communication with Vistra representatives familiar with the Plant's history, karst topography or physiographic features such as sinkholes, vertical shafts, sinking streams, caves, large springs, or blind valleys do not exist at the Plant. To evaluate the susceptibility of landslides, we reviewed readily available USGS and ISGS data. The USGS data indicates that the Plant is in an area of high landslide susceptibility and low landslide incidence, however more detailed ISGS data indicates that there has not been a documented landslide occurrence at the Unit. The closest ISGS documented landslide occurrences are approximately 3.5 to 5 miles away from the site and appear to be roadway landslides associated with Illinois Route 26 and Illinois Route 89. Accordingly, it is our opinion that the Unit is not located in an area that has high susceptibility to landslides.

Determination of compliance with §257.64(b)(3) - There are no documented surface or subsurface anthropogenic activities that would be indicative of creating unstable foundation conditions.

§257.64(c): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration indicating the CCR Unit is not located in an unstable area as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.64(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 32

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Placement Above Uppermost Aquifer
Ash Pond
Kincaid Power Station
Kincaid, Illinois

Kincaid Generation, LLC operates the coal-fired Kincaid Power Station (Plant) located near Kincaid, Illinois. The Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.60 *(Placement above the uppermost aquifer)* of the US Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.60); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.60).

§257.60(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table). The owner or operator must demonstrate by the dates specified in paragraph (c) of this section that the CCR unit meets the minimum requirements for placement above the uppermost aquifer.

Haley & Aldrich reviewed available information provided by Vistra including historic design reference documents, field investigations, and laboratory reports, and based on review and evaluation of the information provided, the results do not demonstrate compliance with the requirements of 40 CFR §257.60(a).

§257.60(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify that the above-referenced CCR Unit does not meet the requirements of 40 CFR §257.60(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY & ALDRICH, INC.
6500 Rockside Road
Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Wetland Areas
Kincaid Power Station
Ash Pond
Kincaid, Illinois

Kincaid Generating, LLC operates the coal-fired Kincaid Power Station (Plant) located near Kincaid, Illinois. The Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.61 *(Wetlands)* of the US Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities.* 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.63); Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.63).

§257.61(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraphs (a)(1) through (5) of this section.

Based on a review of the U.S. Fish and Wildlife Service's National Wetland Inventory mapping, 0.5-meter resolution aerial imagery (2015) and the results of on-site field assessments, the Unit is not located in wetlands as defined by 40 CFR §232.2.

<u>§257.61(b):</u> The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the CCR Unit is not located in wetlands as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 and, therefore, meets the requirements of 40 CFR §257.61(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

STEVEN F. PUTRICH
062-048-779
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ENGINEER
10/16/18
STATE OF ILLINOIS

HALEY & ALDRICH, INC.
6500 Rockside Road
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216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration - Fault Areas
Kincaid Power Station
Ash Pond
Kincaid, Illinois

Dynegy operates the coal-fired Kincaid Power Station (Plant) located approximately 3 miles west of the City of Kincaid, Christian County, Illinois. The Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment at the Plant. This demonstration addresses the requirements of 40 CFR §257.62 *(Fault Areas)* of the US Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.62); 83 Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.62)

§257.62(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit.

A review of available data from the U.S. Geologic Survey, the Illinois State Geological Survey, and other available information was completed for this demonstration. The nearest known mapped fault is the Sicily Fault which is located approximately 2 miles east and the known timeframe of the most recent activity on this fault is not known. Based on the available published geologic data and information reviewed, there are no active faults or fault damage zones that have had displacement in Holocene time reported or indicated within 200 feet of the Unit.

§257.62(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration that the CCR Unit is not located within 60 meters (200 feet) of the outermost damage zone of a fault that has had a displacement in Holocene time as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.62(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY & ALDRICH, INC.
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Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Seismic Impact Zone
Kincaid Power Station
Ash Pond
Kincaid, Illinois

Kincaid Generation, LLC operates the coal-fired Newton Power Station (Plant) located near Kincaid, Illinois. The Primary Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment. This demonstration addresses the requirements of 40 CFR §257.63 *(Seismic Impact Zones)* of the U.S. Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.63); Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.63).

§257.63(a): New CCR landfills, existing and new CCR surface impoundments, and all lateral expansions of CCR units must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site.

The results of our evaluation indicate that the Unit is in compliance with 40 CFR §257.63(a). Although the Unit is located in a seismic impact zone, it satisfies the demonstration requirements of 40 CFR §257.63(a). The AECOM report entitled "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for the Kincaid Ash Pond at Kincaid Power Station" dated October 2016 (AECOM Report), includes engineering analysis, calculations, and findings that support the requirements of 40 CFR §257.63(a), and provides documentation that those requirements have been evaluated by AECOM for the subject CCR unit.

§257.63(b): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify that the CCR Unit is located in a seismic impact zone as included in the CCR Rule Location Restriction Evaluation memorandum dated 12 October 2018 and satisfies all requirements of 40 CFR §257.63(a).

By providing this certification demonstration statement, we are not stating or inferring that we have verified or certified the details, assumptions, calculations and/or site condition models developed by AECOM in the subject report; those elements of the report are considered the professional opinions and determinations of AECOM.

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

HALEY & ALDRICH, INC.
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Suite 200
Cleveland, OH 44131
216.739.0555

MEMORANDUM

16 October 2018
File No. 129788

SUBJECT: Location Restriction Demonstration – Unstable Areas
Kincaid Power Station
Ash Pond
Kincaid, Illinois

Vistra Energy/Dynegy operates the coal-fired Kincaid Power Station (Plant) located near Kincaid, Illinois. The Ash Pond (Unit) is an existing coal combustion residuals (CCR) surface impoundment at the Plant. This demonstration addresses the requirements of 40 CFR §257.64 *(Unstable Areas)* of the US Environmental Protection Agency's (EPA) rule entitled *Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities*. 80 Fed. Reg. 21,302 (Apr. 17, 2015) (promulgating 40 CFR §257.63); Fed. Reg. 36,435 (July 30, 2018) (amending 40 CFR §257.63).

<u>§257.64(a)</u>: An existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.

§257.64(b): The owner or operator must consider all of the following factors, at a minimum, when determining whether an area is unstable:

(1) On-site or local soil conditions that may result in significant differential settling;
(2) On-site or local geologic or geomorphologic features; and
(3) On-site or local human-made features or events (both surface and subsurface).

Determination of compliance with §257.64(b)(1) - Conditions associated with the potential for significant differential settlement were not identified in the area where the Plant is located. A separate report completed by AECOM entitled "CCR Certification Report: Initial Structural Stability Assessment, Initial Safety Factor Assessment, and Initial Inflow Design Flood Control System Plan for the Kincaid Ash Pond at Kincaid Power Station" dated October 2016 concluded that the soils under the Unit are not susceptible to liquefaction.

Determination of compliance with §257.64(b)(2) - Based on available United States Geological Survey (USGS) and Illinois State Geological Survey (ISGS) information, karst topography or physiographic features such as sinkholes, vertical shafts, sinking streams, caves, large springs, or blind valleys do not exist at the Plant. In addition, communication with ISGS indicated that karst features are not common in Christian County, where the Unit is located. To evaluate the susceptibility of landslides, we reviewed readily available USGS and Illinois Department of Energy and Natural Resources (IDENR) data. The USGS data indicates that the Plant is in an area of low landslide incidence. A review of IDENR data indicated that there has not been a landslide occurrence at or near the Unit. Accordingly, it is our opinion that the Unit is not located in an area that has high susceptibility to landslides.

Determination of compliance with §257.64(b)(3) - An inactive underground mine is located below the Unit, however an evaluation by AECOM (2016) concluded that the presence of this underground mine does not negatively affect the stability of the Unit.

§257.64(c): The owner or operator of the CCR unit must obtain a certification from a qualified professional engineer or approval from the Participating State Director or approval from EPA where EPA is the permitting authority stating that the demonstration meets the requirements of paragraph (a) of this section.

I, Steven F. Putrich, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this certification has been prepared in accordance with the accepted practice of engineering. I certify, for the above-referenced CCR Unit, that the demonstration indicating the CCR Unit is not located in an unstable area as included in the CCR Rule Location Restrictions Evaluation memorandum dated 12 October 2018 meets the requirements of 40 CFR §257.64(a).

Signed: ______________________
Consulting Engineer

Print Name:	Steven F. Putrich
Illinois License No.:	62048779
Title:	Vice President
Company:	Haley & Aldrich, Inc.

Professional Engineer's Seal:

STEVEN F. PUTRICH
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10/16/18
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ATTACHMENT 33

Geosyntec consultants

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www.geosyntec.com

PLACEMENT ABOVE THE UPPERMOST AQUIFER LOCATION RESTRICTIONS
SOUTH ASH PONDS 2S AND 3S
WILL COUNTY STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.62, Geosyntec Consultants (Geosyntec) prepared this report to document compliance with location restrictions related to placement above the uppermost aquifer for the existing South Ash Pond 2S and South Ash Pond 3S (the Ponds) at the Will County Station (Site) in Romeoville, Illinois.

The work presented in this report was performed under the direction of Mr. Jesse Varsho, P.G., P.E., of Geosyntec. Ms. Jane Soule, P.E., reviewed this report in accordance with Geosyntec's senior review policy.

1. Placement

South Ash Pond 2S and South Ash Pond 3S are not separated from the upper limit of the uppermost aquifer by a minimum of five (5) feet.

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

Jesse Varsho, P.E.
Illinois Professional Engineer No. 062.067766
License Expires: 11/30/19

Geosyntec consultants

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WETLANDS LOCATION RESTRICTIONS
SOUTH ASH PONDS 2S AND 3S
WILL COUNTY STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.61, Geosyntec Consultants (Geosyntec) prepared this report to document compliance with location restrictions related to wetlands for the existing South Ash Pond 2S and South Ash Pond 3S (the Ponds) at the Will County Station (Site) in Romeoville, Illinois.

The work presented in this report was performed under the direction of Mr. Jesse Varsho, P.G., P.E., of Geosyntec in accordance with §257.61. Ms. Jane Soule, P.E., reviewed this report in accordance with Geosyntec's senior review policy.

1. Wetlands Location Restriction Determination

South Ash Pond 2S and South Ash Pond 3S are not located in mapped wetlands included in the National Wetlands Inventory – Version 2 presented by the U.S. Fish and Wildlife Service (USFW) [USFW, 2018]. Therefore, the locations of the Ponds are in compliance with the requirements outlined in §257.61(a).

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

LICENSED PROFESSIONAL ENGINEER
JESSE PAUL
VARSHO
062-059069
STATE OF ILLINOIS

Jesse Varsho, P.E.
Illinois Professional Engineer No. 062.067766
License Expires: 11/30/19

3. References

USFS, 2018. "National Wetlands Inventory, Version 2," https://www.fws.gov/wetlands/data/Mapper.html, updated 1 May 2018, accessed 28 August 2018.

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FAULT AREAS LOCATION RESTRICTIONS
SOUTH ASH PONDS 2S AND 3S
WILL COUNTY STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.62, Geosyntec Consultants (Geosyntec) prepared this report to document compliance with location restrictions related to fault areas for the existing South Ash Pond 2S and South Ash Pond 3S (the Ponds) at the Will County Station (Site) in Romeoville, Illinois.

The work presented in this report was performed under the direction of Mr. Jesse Varsho, P.G., P.E., of Geosyntec in accordance with §257.62. Ms. Jane Soule, P.E., reviewed this report in accordance with Geosyntec's senior review policy.

1. Fault Areas Location Restriction Determination

South Ash Pond 2S and South Ash Pond 3S are not located within 200 feet (60 meters) of a mapped Holocene-aged fault, as mapped by the United States Geological Survey (USGS) Quaternary Fault Database [USGS, 2018]. Therefore, the locations of the Ponds are in compliance with the requirements outlined in §257.62(a).

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

LICENSED PROFESSIONAL ENGINEER
JESSE PAUL
VARSHO
062-059069
STATE OF ILLINOIS

Jesse Varsho, P.E.
Illinois Professional Engineer No. 062.067766
License Expires: 11/30/19

3. References

USGS, 2018. "Quaternary Fault and Fold Database," https://earthquake.usgs.gov/hazards/qfaults/, accessed 28 August 2018.

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SEISMIC IMPACT ZONES LOCATION RESTRICTIONS
SOUTH ASH PONDS 2S AND 3S
WILL COUNTY STATION
OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.63, Geosyntec Consultants (Geosyntec) prepared this report to document compliance with location restrictions related to seismic impact areas for the existing South Ash Pond 2S and South Ash Pond 3S (the Ponds) at the Will County Station (Site) in Romeoville, Illinois.

The work presented in this report was performed under the direction of Mr. Jesse Varsho, P.G., P.E., of Geosyntec in accordance with §257.63. Ms. Jane Soule, P.E., reviewed this report in accordance with Geosyntec's senior review policy.

1. Seismic Impact Zones Restriction Determination

South Ash Pond 2S and South Ash Pond 3S are not located within a seismic impact zone as defined in §257.53 and as mapped by the United States Geological Survey (USGS) [USGS, 2014]. Therefore, the locations of the Ponds are in compliance with the requirements outlined in §257.63(a).

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised by scientists and engineers performing similar tasks in the field of civil engineering. The contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

LICENSED PROFESSIONAL ENGINEER
JESSE PAUL
VARSHO
062-059069
STATE OF ILLINOIS

Jesse Varsho, P.E.
Illinois Professional Engineer No. 062.067766
License Expires: 11/30/19

3. References

USGS, 2014. "2014 U.S. Geological Survey National Seismic Hazard Maps, PGA 2% in 50 Years," https://earthquake.usgs.gov/hazards/hazmaps/conterminous/index.php#2014, accessed 28 August 2018.

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UNSTABLE AREAS LOCATION RESTRICTIONS SOUTH ASH PONDS 2S AND 3S WILL COUNTY STATION OCTOBER 2018

Pursuant to Code of Federal Regulations Title 40, Part 257, Subpart D (40 CFR), Section 257.64, Geosyntec Consultants (Geosyntec) prepared this report to document compliance with location restrictions related to unstable areas for the existing South Ash Pond 2S and South Ash Pond 3S (the Ponds) at the Will County Station (Site) in Romeoville, Illinois.

The work presented in this report was performed under the direction of Mr. Jesse Varsho, P.G., P.E., of Geosyntec in accordance with §257.64. Ms. Jane Soule, P.E., reviewed this report in accordance with Geosyntec's senior review policy.

1. Unstable Areas Restriction Determination

South Ash Pond 2S and South Ash Pond 3S are not located in unstable areas based on a review of subsurface investigations at the site [Patrick, 2011], published liquefaction maps [ISGS, 2008] and a site visit by Geosyntec. Therefore, the locations of the Ponds are in compliance with the requirements outlined in §257.64(a).

2. Limitations and Certification

This report was prepared in accordance with current practices and the standard of care exercised contents of this report are based solely on the observations of the conditions observed by Geosyntec personnel and information provided to Geosyntec by Midwest Generation. Consistent with applicable professional standards of care, our opinions and recommendations were based in part on data furnished by others, which was consistent with other information that we developed in the course of our performance of the scope of services. The information contained in this report is intended for use solely by Midwest Generation and their subconsultants.

LICENSED PROFESSIONAL ENGINEER
JESSE PAUL VARSHO
062-059069
STATE OF ILLINOIS

Jesse Varsho, P.E.
Illinois Professional Engineer No. 062.067766
License Expires: 11/30/19

3. References

Illinois State Geological Survey (ISGS), 2008. "Illinois USGS I-2789 Map," accessed as GIS shape file, downloaded from http://isgs.illinois.edu/earthquake-consortium/digital-maps, 26 September 2018.

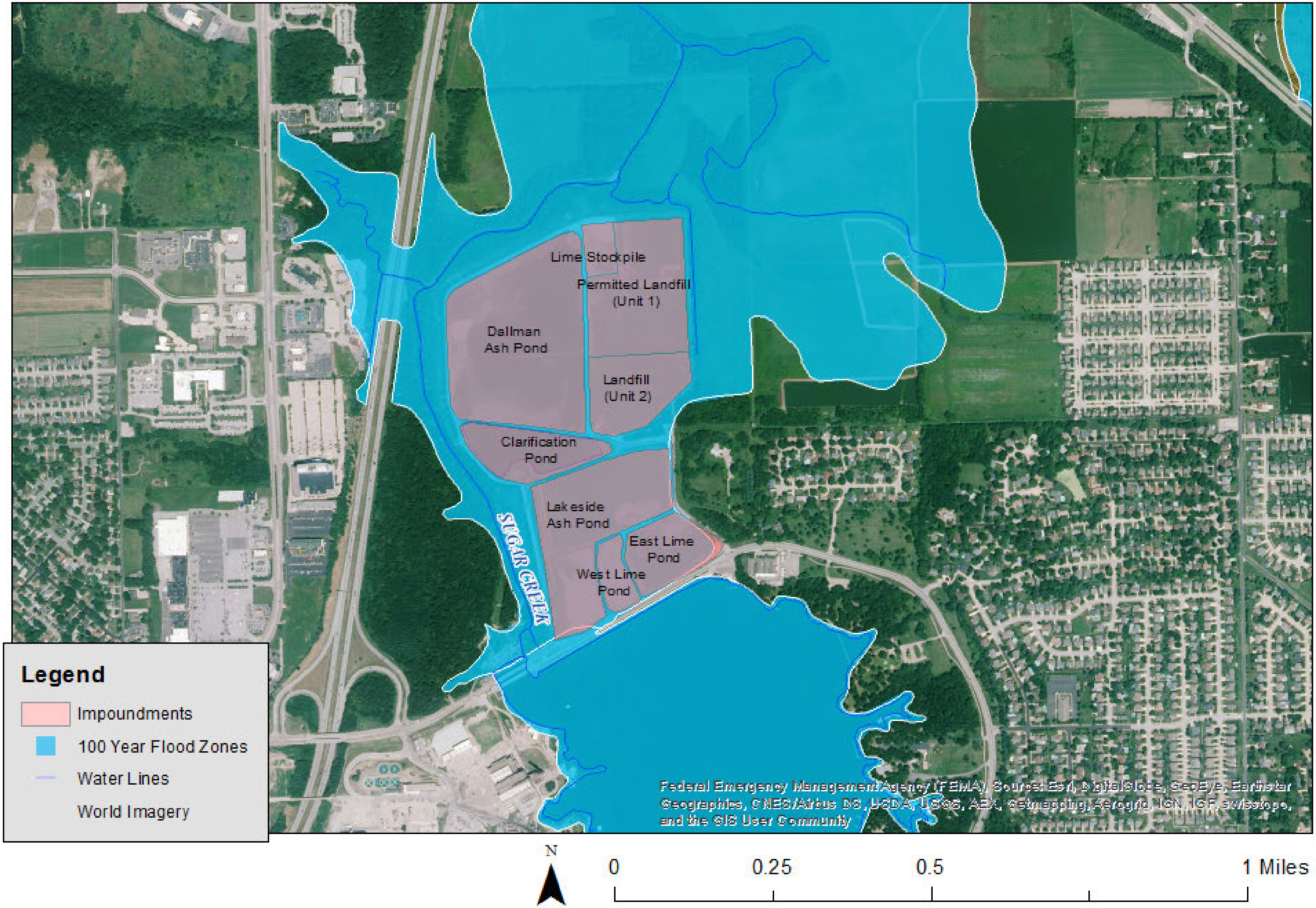
Patrick Engineering, 2011. "Hydrogeologic Assessment Report, Will County Generating Station, Romeoville, Illinois," Patrick Project Number 21053.070, February.

ATTACHMENT 34

Dallman Power Station

Flood Risk

Andrew Rehn, Prairie Rivers Network
Source: FEMA 100-Year Floodplain

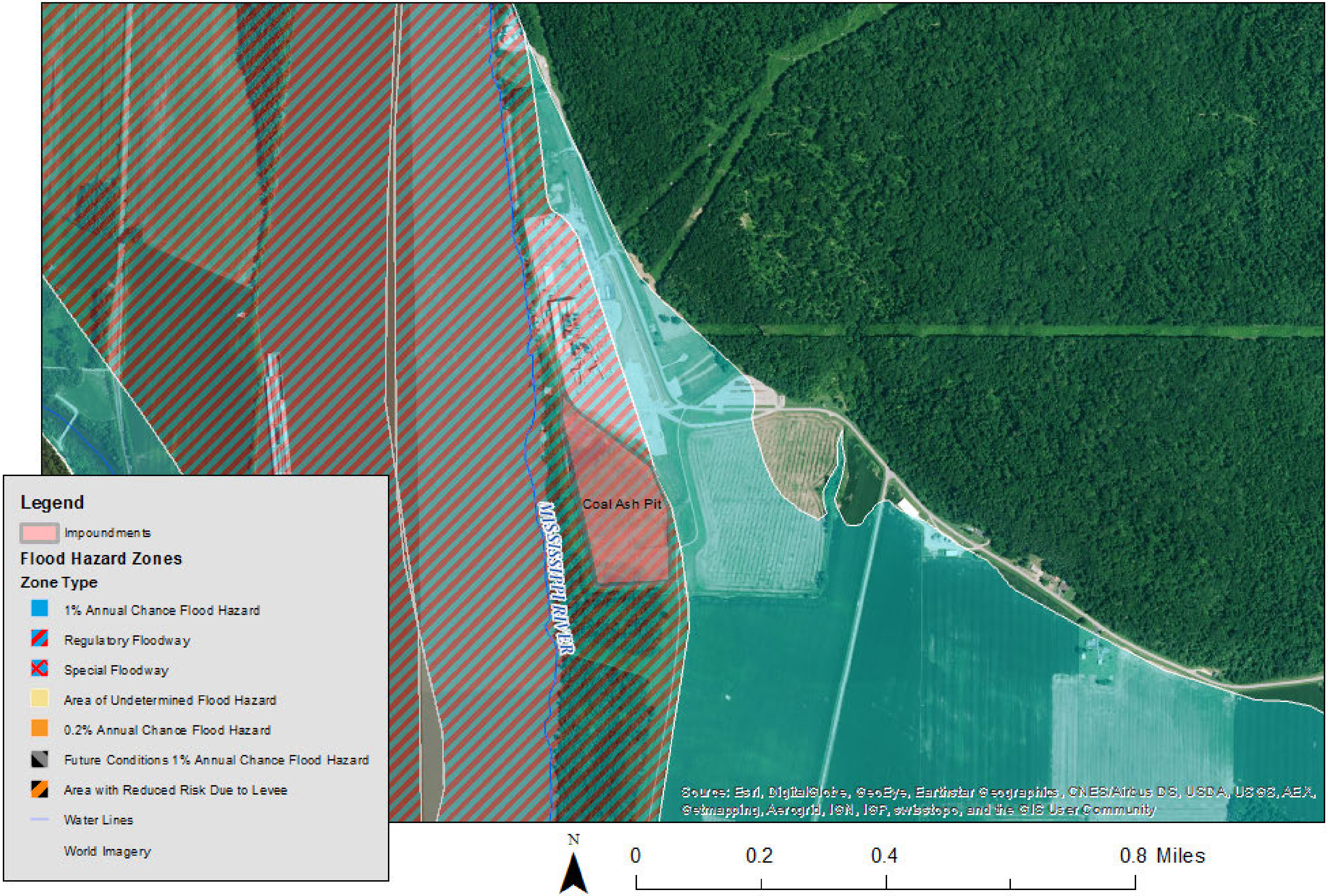


ATTACHMENT 35

Grand Tower Power Station

Flood Risk

Andrew Rehn, Prairie Rivers Network
Source: FEMA 100-Year Floodplain

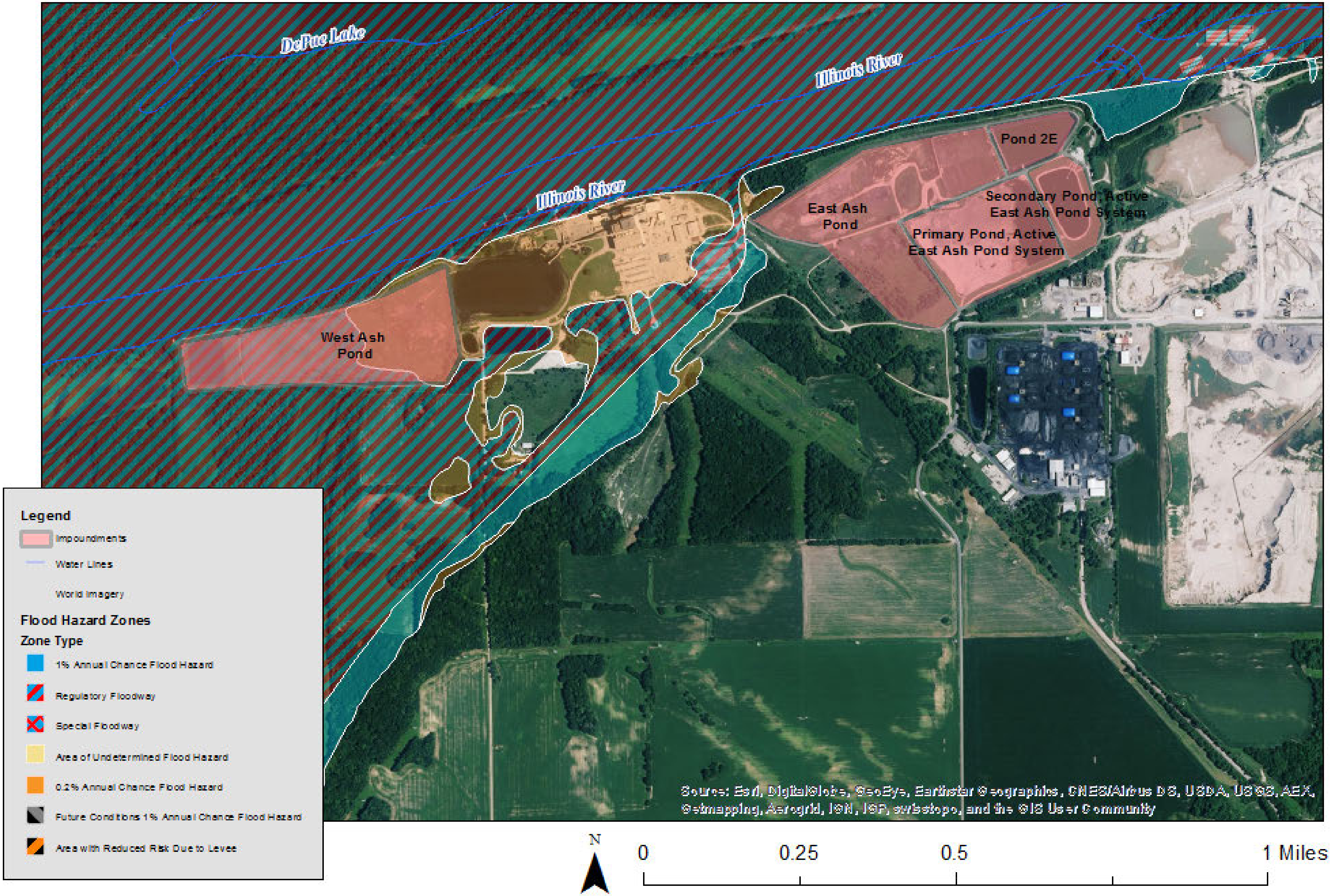


ATTACHMENT 36

Hennepin Power Station

Flood Risk

Andrew Rehn, Prairie Rivers Network
Source: FEMA 100-Year Floodplain

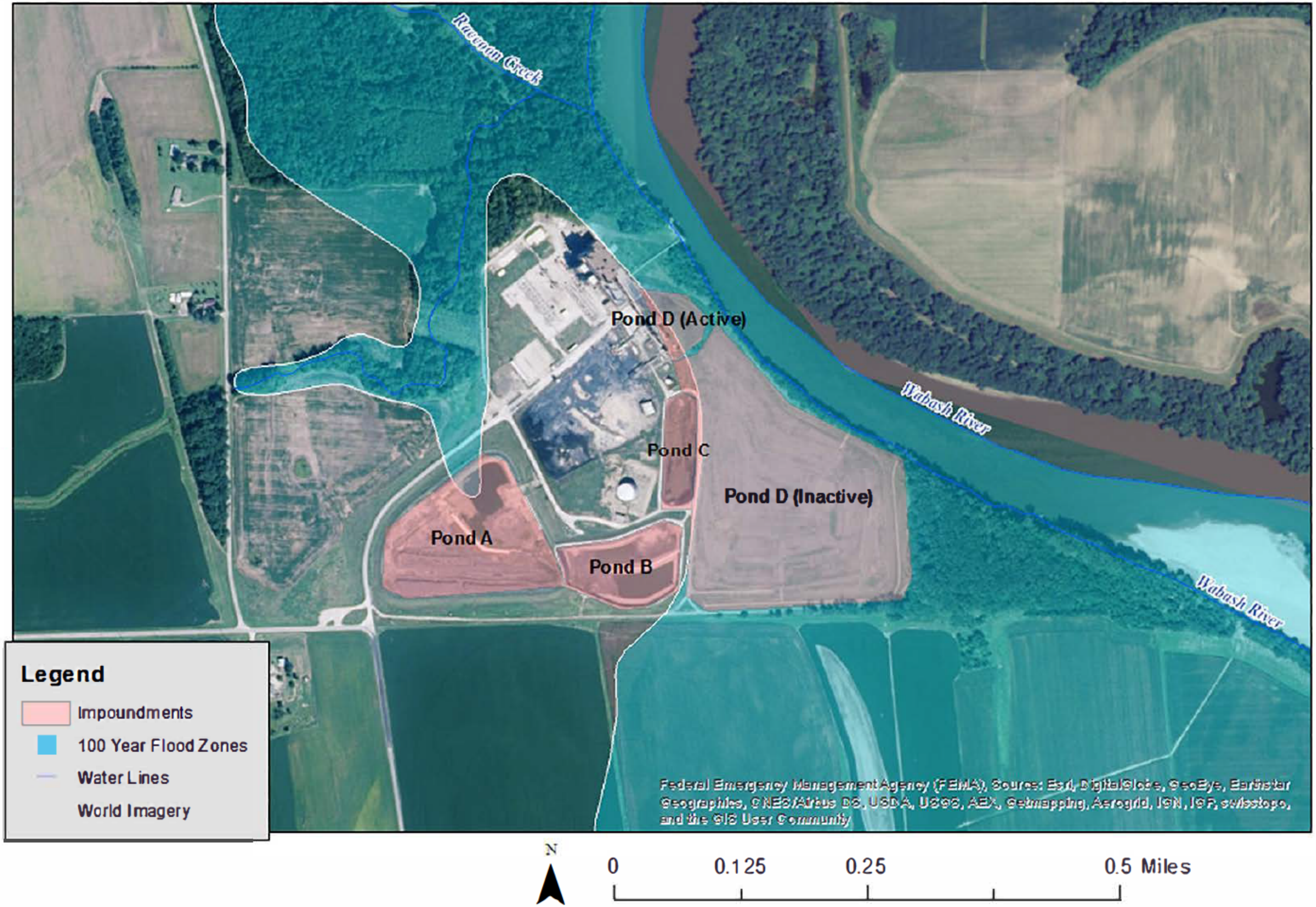


ATTACHMENT 37

Hutsonville Power Station

Flood Risk

Andrew Rehn, Prairie Rivers Network
Source: FEMA 100-Year Floodplain

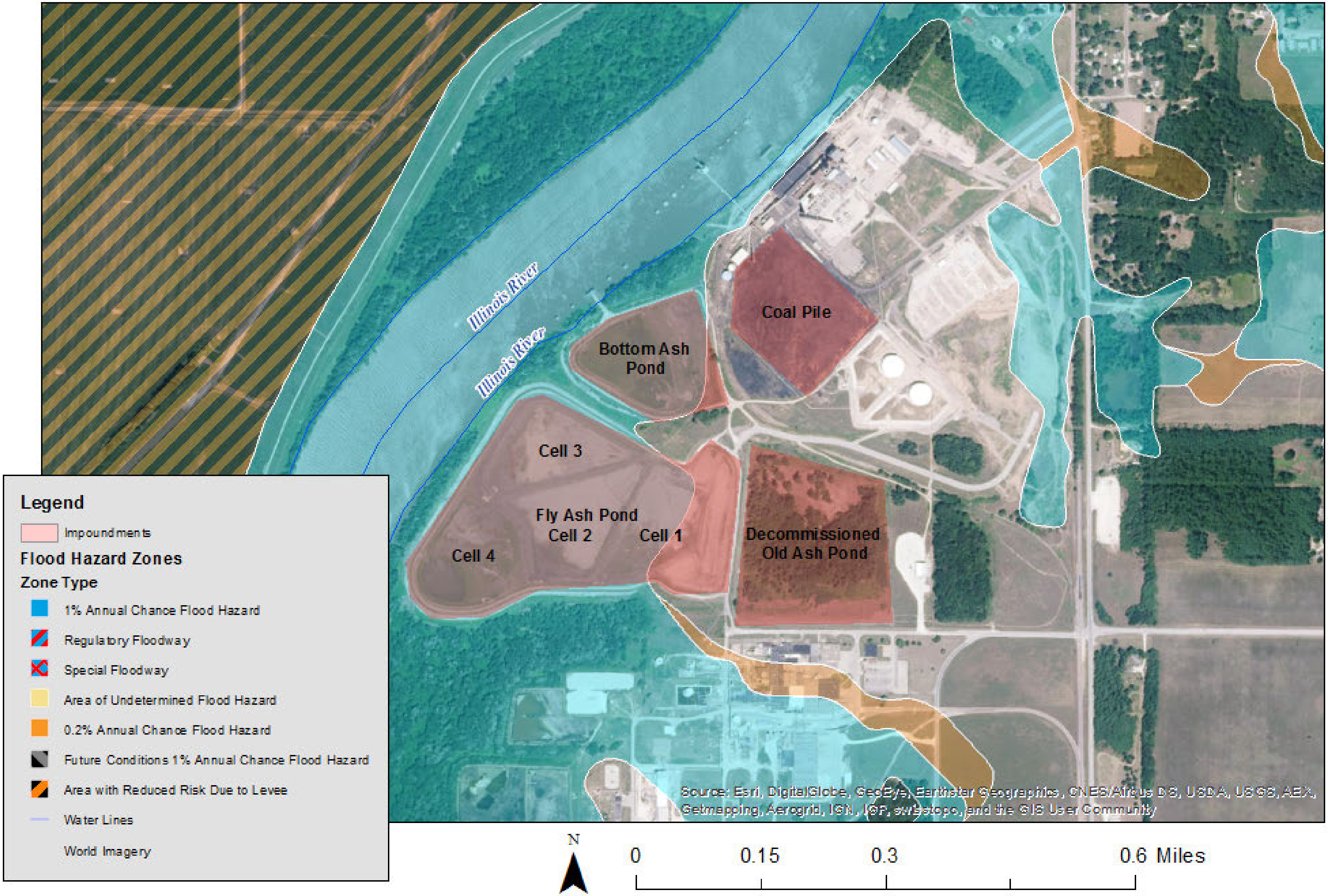


ATTACHMENT 38

Meredosia Power Station

Flood Risk

Andrew Rehn, Prairie Rivers Network
Source: FEMA 100-Year Floodplain



ATTACHMENT 39

Pearl Station
Flood Risk

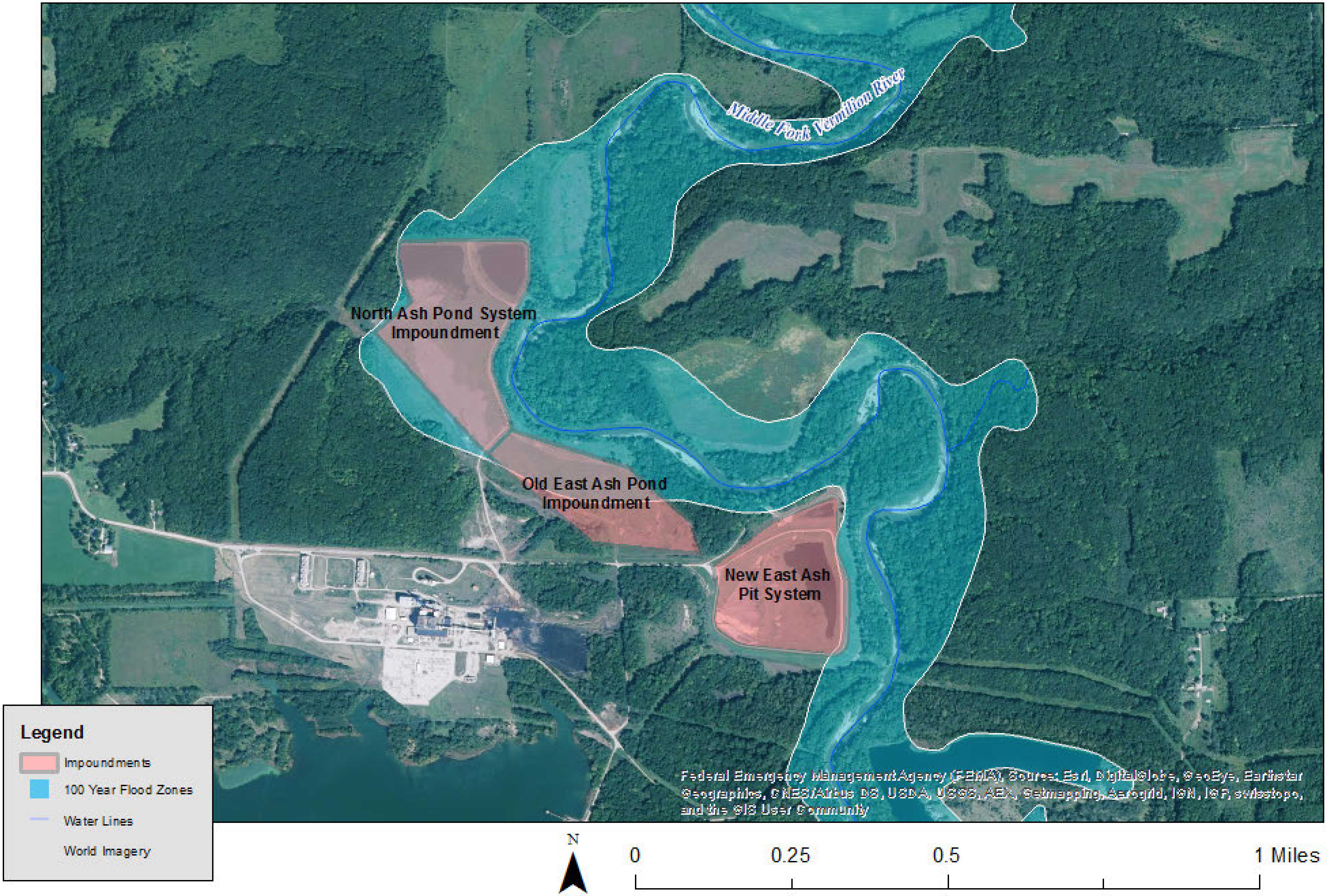
Andrew Rehn, Prairie Rivers Network
Source: FEMA 100-Year Floodplain

ATTACHMENT 40

Vermilion Power Station

Flood Risk

Andrew Rehn, Prairie Rivers Network
Source: FEMA 100-Year Floodplain



The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 41

I S W S C O N T R A C T R E P O R T 2019-05

Frequency Distributions of Heavy Precipitation in Illinois: Updated Bulletin 70

James Angel and Momcilo Markus

March 2019

ILLINOIS
Illinois State Water Survey
PRAIRIE RESEARCH INSTITUTE

Frequency Distributions of Heavy Precipitation in Illinois: Updated Bulletin 70

James Angel and Momcilo Markus

Illinois State Water Survey

Prairie Research Institute

University of Illinois

Prepared for the

Illinois Department of Commerce and Economic Opportunity

March 2019

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Table of Contents

Acknowledgments ii
Table of Contents iii
List of Figures iv
List of Tables vi
Introduction 1
  Previous Studies 3
  Climate Change and Its Impact on Heavy Precipitation in Illinois 5
Precipitation Data Used in the Study 8
Methodology Description 13
  Annual Maximum and Partial Duration Series 13
  Constrained vs. Unconstrained Daily Precipitation 14
  Sub-Daily Precipitation Frequency Conversions 14
  Stationary Regional Frequency Analysis 15
  Nonstationary Temporal Trend Analysis 16
Results 17
  Frequency Estimates 17
  Confidence Limits 27
  Comparisons with Existing Sources 39
  Final Remarks 39
References 61

List of Figures

Figure 1 Climatic sections used in developing Illinois frequency estimates 2
Figure 2 Differences in precipitation totals between Bulletin 70 and NOAA Atlas 14 for the 100-year, 24-hour storm 4
Figure 3 Statewide average annual precipitation for Illinois from 1895 to 2017. The green line shows the year-to-year variability. The blue line is a linear trend showing an increase of 4.14 inches over the past century. Source: NOAA NCEI, 2018 6
Figure 4 The observed annual number of days with precipitation greater than 2 inches for 1900–2014 on average over 5-year periods (Source: Frankson et al., 2017).. 7
Figure 5 Daily precipitation stations used in this study 9
Figure 6 Hourly precipitation stations used in this study 11
Figure 7 Precipitation stations in the Cook County Precipitation Network (CCPN) 12
Figure 8 Frequency distributions of precipitation for Illinois climatic sections Northwest and Northeast for storm periods of 1 hour to 240 hours days and recurrence intervals of 2 to 100 years................. 22
Figure 9 Frequency distributions of precipitation for Illinois climatic sections west and central for storm periods of 1 hour to 240 hours and recurrence intervals of 2 to 100 years 23
Figure 10 Frequency distributions of precipitation for Illinois climatic sections east and west southwest for storm periods of 1 hour to 240 hours and recurrence intervals of 2 to 100 years........................ 24
Figure 11 Frequency distributions of precipitation for Illinois climatic sections east southeast and southwest for storm periods of 1 hour to 240 hours and recurrence intervals of 2 to 100 years 25
Figure 12 Frequency distributions of precipitation for Illinois climatic sections southeast and south for storm periods of 1 hour to 240 hours and recurrence intervals of 2 to 100 years 26
Figure 13 Differences in inches between this study and Bulletin 70 for a 1-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.. 40
Figure 14 Differences in inches between this study and Bulletin 70 for a 2-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.. 41
Figure 15 Differences in inches between this study and Bulletin 70 for a 3-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.. 42
Figure 16 Differences in inches between this study and Bulletin 70 for a 6-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70. 43
Figure 17 Differences in inches between this study and Bulletin 70 for a 12-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.. 44
Figure 18 Differences in inches between this study and Bulletin 70 for an 18-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.. 45
Figure 19 Differences in inches between this study and Bulletin 70 for a 24-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.. 46
Figure 20 Differences in inches between this study and Bulletin 70 for a 48-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.. 47

Figure 21 Differences in inches between this study and Bulletin 70 for a 72-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70 48
Figure 22 Differences in inches between this study and Bulletin 70 for a 120-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70 49
Figure 23 Differences in inches between this study and Bulletin 70 for a 240-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70 50
Figure 24 Differences in inches between this study and NOAA Atlas 14 for a 1-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14. 51
Figure 25 Differences in inches between this study and NOAA Atlas 14 for a 2-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14. 52
Figure 26 Differences in inches between this study and NOAA Atlas 14 for a 3-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14. 53
Figure 27 Differences in inches between this study and NOAA Atlas 14 for a 6-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14. 54
Figure 28 Differences in inches between this study and NOAA Atlas 14 for a 12-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14. 55
Figure 29 Differences in inches between this study and NOAA Atlas 14 for a 24-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14. 56
Figure 30 Differences in inches between this study and NOAA Atlas 14 for a 48-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14. 57
Figure 31 Differences in inches between this study and NOAA Atlas 14 for a 72-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14. 58
Figure 32 Differences in inches between this study and NOAA Atlas 14 for a 120-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14. 59
Figure 33 Differences in inches between this study and NOAA Atlas 14 for a 240-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14. 60

List of Tables

Table 1 Conversion from Constrained to Unconstrained Precipitation Adopted in this Study..... 14
Table 2 X-hr:24-hr Ratios 15
Table 3 Temporal Trend Adjustment Factors for 10 Sections... 16
Table 4 Storm and Sectional Codes for Table 5 17
Table 5 Rainfall Frequencies 18
Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals 27

Introduction

This study was designed to update the Illinois State Water Survey (ISWS) Bulletin 70, evaluating rainfall frequency relations in Illinois using current precipitation datasets. The study primarily used the National Oceanic and Atmospheric Administration (NOAA) daily precipitation data from 1948 to 2017 to perform regional frequency analysis (RFA) using the L-moments approach. Additional information on precipitation relationships for less than 24 hours were obtained from NOAA hourly precipitation data from 1948 to 2014 and Cook County Precipitation Network (CCPN) data from 1989 to 2016. Precipitation frequency relations were developed for storm durations from 1 to 240 hours and for recurrence intervals from 2 to 500 years. The results are presented for the same 10 geographic sections as in Bulletin 70 (Figure 1) to maintain the continuity of hydrologic studies and compatibility with regulations.

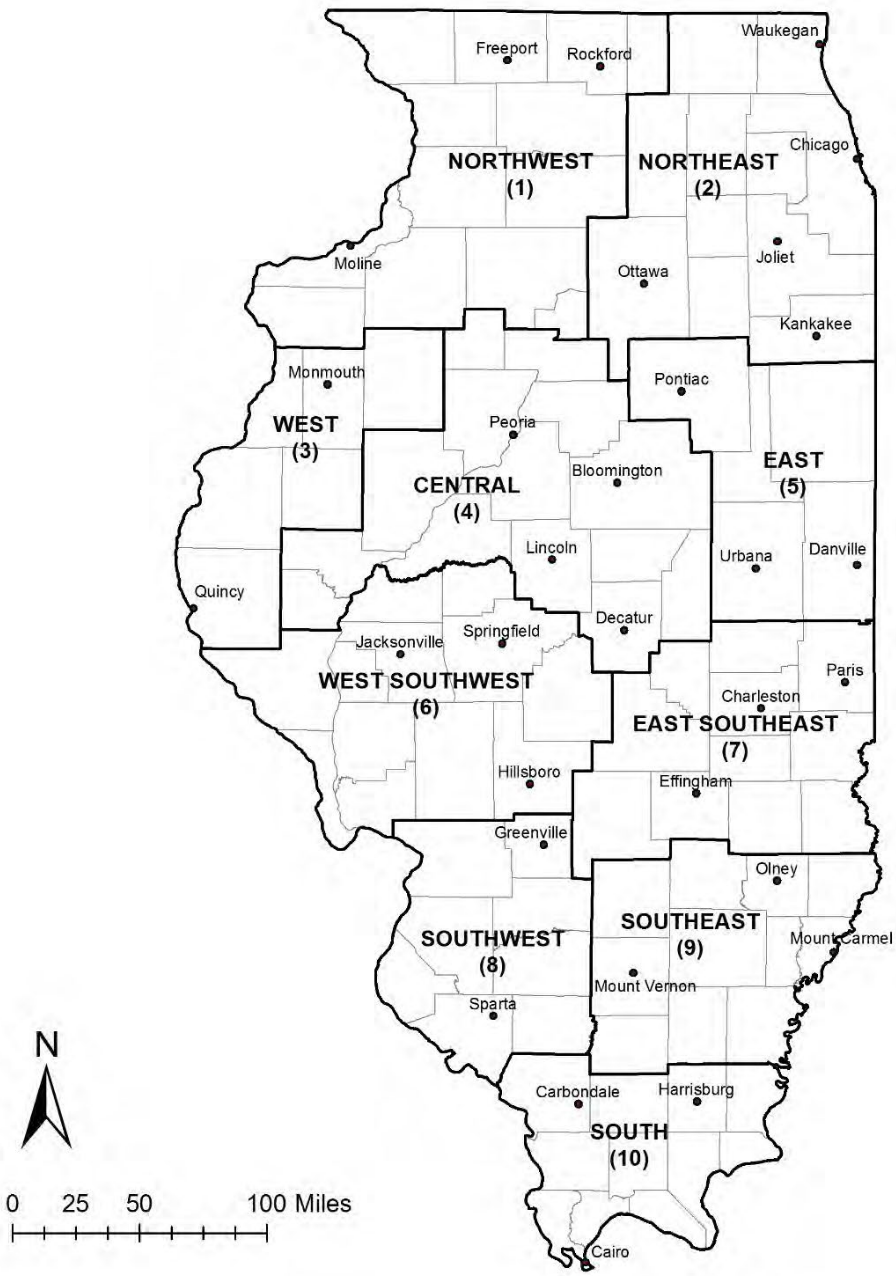


Figure 1 Climatic sections used in developing Illinois frequency estimates

Previous Studies

Several previous studies have examined precipitation frequencies related to Illinois, including Yarnell (1935), ISWS Bulletin 46 (Huff and Neil, 1959), and the U.S. Weather Bureau Technical Paper 40 (Hershfield, 1961).

The two studies currently applicable to Illinois are the ISWS Bulletin 70 (Huff and Angel, 1989) and NOAA Atlas 14 (Bonnin et al., 2006). ISWS Bulletin 70 is the current state standard for expected extreme rainfall events. The Illinois Department of Natural Resources (IDNR), Office of Water Resources (OWR) requires the use of Bulletin 70 for flood studies requiring state permits. Many Illinois county and community stormwater ordinances require that designs are based on Bulletin 70 as well. Bulletin 70 was based on analyses of precipitation data from 1901 to 1983, and the distributions were adjusted for the observed increases in the number of heavy precipitation events in Illinois.

In 2006, the NOAA National Weather Service (NWS) published NOAA Atlas 14 (Bonnin et al., 2006) for several states, including Illinois. The period of record for the data included in these analyses extends to 2000, providing 17 years of additional data over that available for Bulletin 70. However, the resulting frequency analysis yielded unexpected results of lowered precipitation estimates, especially at longer return periods.

Figure 2 shows a comparison of precipitation totals for an event of 24 hours in duration and a 1 percent annual chance probability (100-year storm). Positive (blue) numbers signify that the Atlas 14 study's total precipitation values are higher than the Bulletin 70 values, and negative (brown) numbers indicate that the Atlas 14 study's total precipitation values are lower than the Bulletin 70 values. Despite the additional 20 years of data that should have reflected the continued trend toward heavier events, the Atlas 14 study produced smaller values at many locations. Similar differences were found at other storm durations and probabilities. These results have hampered its acceptance in Illinois for design purposes.

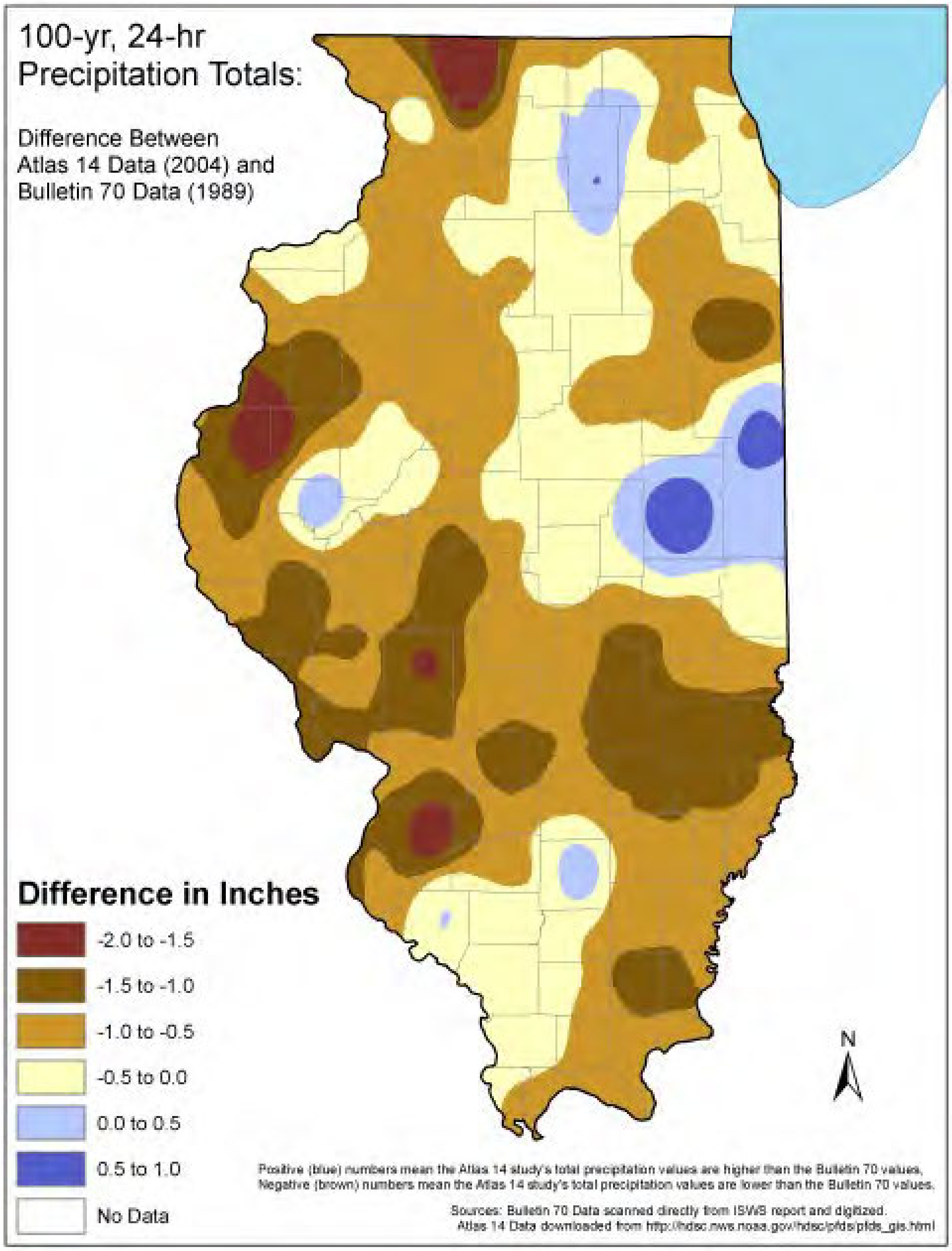


Figure 2 Differences in precipitation totals between Bulletin 70 and NOAA Atlas 14 for the 100-year, 24-hour storm

Climate Change and Its Impact on Heavy Precipitation in Illinois

Observed state increases in precipitation in general and heavy precipitation in particular have been a concern for several decades. As noted previously, a climate change adjustment was made in Bulletin 70 to address the trends already observed in the 1980s. In 2015, the IDNR, in cooperation with the Illinois State Water Survey, produced a report for the Urban Flooding Awareness Act outlining the impacts of increased precipitation in Illinois (Winters et al., 2015). Over a 10-year period, the IDNR documented $2.3 billion dollars in costs in urban areas. Some $1.6 billion in damages resulted from five severe storms. More than 90 percent of these damages occurred outside the mapped 1 percent annual chance floodplain.

Historical records for the statewide average annual precipitation for Illinois from 1895 to 2017 are shown in Figure 3. Based on a linear trend, Illinois precipitation has increased from 36 to 40 inches, or 11 percent over the past century. Illinois has become more likely to experience exceptionally wet years in recent decades. The year 1993 was the wettest on record with 51.18 inches of precipitation. The next two wettest years were 2009 with 50.96 inches and 2008 with 50.18 inches. All of these years were noted for widespread flooding across Illinois.

Temperatures in Illinois have warmed by about 1.2 degrees Fahrenheit over the past century. Warmer air can increase evaporation into the atmosphere by almost 4 percent with each degree increase in air temperature, meaning that on average, storms have more water available for precipitation. A longer warm season would increase the opportunity for thunderstorms. Additional work suggests that the increasingly intensive agricultural practices of the Midwest (more acreage and more plants per acre) have elevated summer humidity levels as well (Alter et al., 2017).

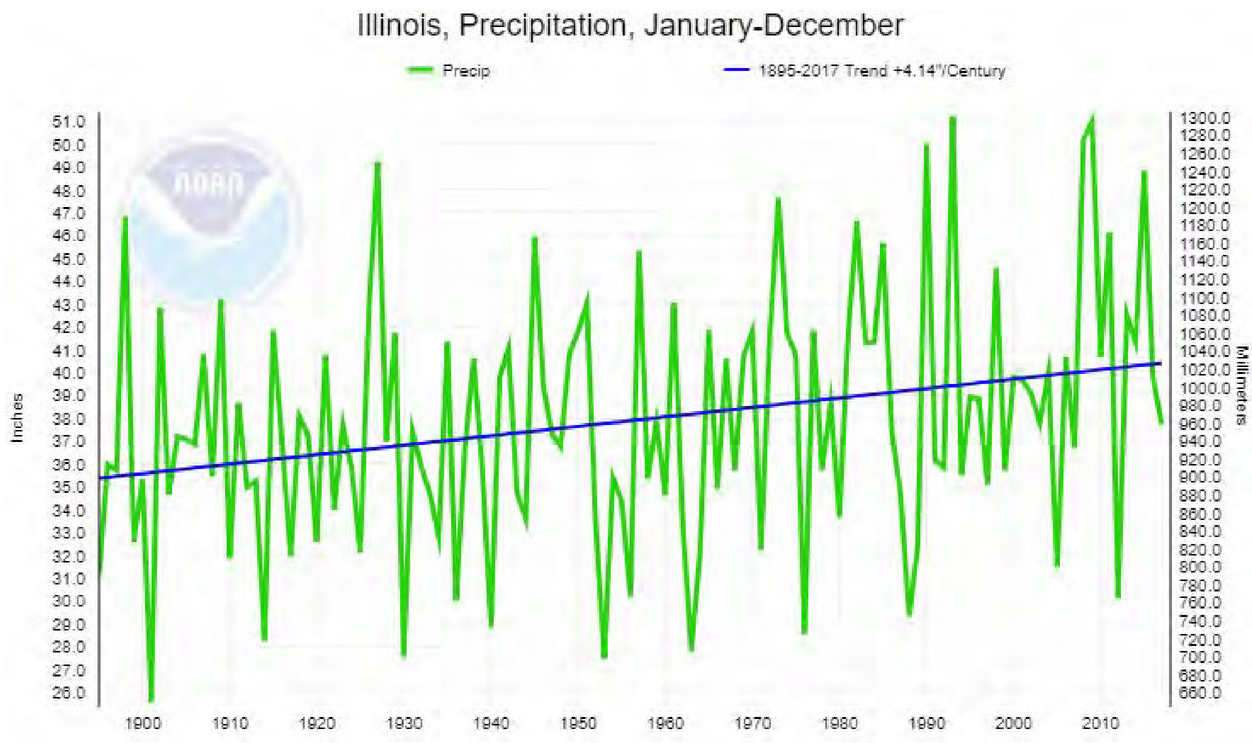


Figure 3 Statewide average annual precipitation for Illinois from 1895 to 2017. The green line shows the year-to-year variability. The blue line is a linear trend showing an increase of 4.14 inches over the past century. Source: NOAA NCEI, 2018.

Not only have the amounts of annual and seasonal precipitation increased, but so too have the numbers of extreme precipitation events (Frankson et al., 2017). Figure 4 shows the observed annual number of days with precipitation greater than 2 inches per station for 1900–2014 on average over 5-year periods. These values are averaged over 43 available long-term stations in Illinois. The average number of annual events has been above the long-term average for most 5-year periods since the 1960s. During the most recent 5-year period (2010–2014), Illinois experienced a record number of events in which stations averaged more than two 2-inch events annually. The dark horizontal line in Figure 4 is the 1900–2014 average of approximately 1.6 days per year. This pattern of heavier precipitation events has continued since the 2014 cutoff in the figure.

Conventional analyses of the frequency of extreme precipitation assumed a stationary time series (e.g., NOAA Atlas 14). This assumption meant that the longest period of record was always desired for the analysis. However, considerable evidence shows that the assumption of stationarity cannot be met (DeGaetano, 2009; Groisman et al., 2012). A concern of the current study was that an upward trend in precipitation could result in an underestimation of the current frequency of heavy precipitation by sampling earlier, drier years in the record.

For this study, the problem was minimized by using only the more recent records. As a result, the period of record selected for this report extended from 1948 to 2017. A recent study (DeGaetano and Castellano, 2018) supported this notion, showing that using 70 years of data or less can minimize the impacts from trends in precipitation. The selection of this period had the added benefit of yielding significantly more stations available for the study. In general, the number of stations increased significantly in Illinois after World War II, greatly improving the spatial coverage across the state.

The following sections of the report provide more details on the data sources and quality control, describe the methodology, and provide the results for the 10 geographic sections in tables, graphs, and maps. Additional research results on precipitation relationships will be shared in a second report to be published in 2019. That report will revisit the distribution of precipitation within the storm, also known as the Huff curves, along with the relationship between point and areal precipitation patterns out to 400 square miles.

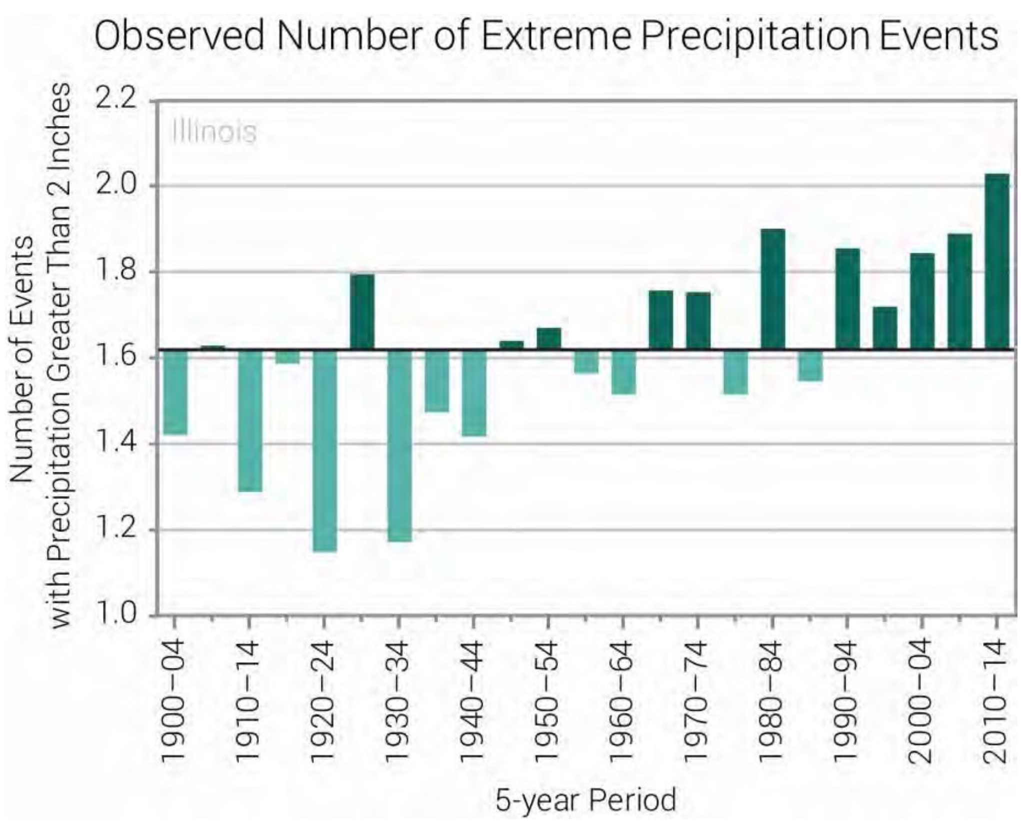


Figure 4 The observed annual number of days with precipitation greater than 2 inches for 1900–2014 on average over 5-year periods (Source: Frankson et al., 2017)

Precipitation Data Used in the Study

Three precipitation data sources were used in this study. As in Bulletin 70, the primary data source was the Global Historical Climatology Network Daily (GHCN-Daily), available through the NOAA National Center for Environmental Information (NCEI). This network of daily quality-controlled cooperative observers with the National Weather Service (NWS) is the longest serving network with the widest coverage across the state. The NWS provides equipment, training, and forms for observers, as well as the first level of quality assurance as the observations are reported. A more detailed description of this data source can be found at https://www.ncdc.noaa.gov/ghcn-daily-description. Data were downloaded using the CRAN R package 'rnoaa'. A total of 761 stations was downloaded from Illinois and from adjacent counties of neighboring states (Missouri, Iowa, Wisconsin, Indiana, and Kentucky) for consideration in this study. From this pool of stations, several criteria were applied to achieve the final list of stations.

As noted in the Introduction, the period since 1948 was notably wetter than earlier time periods and had more heavy precipitation events. To minimize the potential for underestimating the frequency of heavy precipitation events from sampling the earlier, drier period, only the data from the 1948–2017 period were considered in this study. From this pool of stations, only the stations with 30 years of data during the 1948–2017 period were selected. A minimum of 30 years was needed to develop reliable statistics for a station. In addition, data from each of those years had to be 90 percent complete. This was a common requirement in many climatological studies to strike a balance between the negative effects of missing data versus rejecting years with nearly complete records. A total of 176 stations met the criteria of the study. The map of daily stations used in this report is shown in Figure 5.

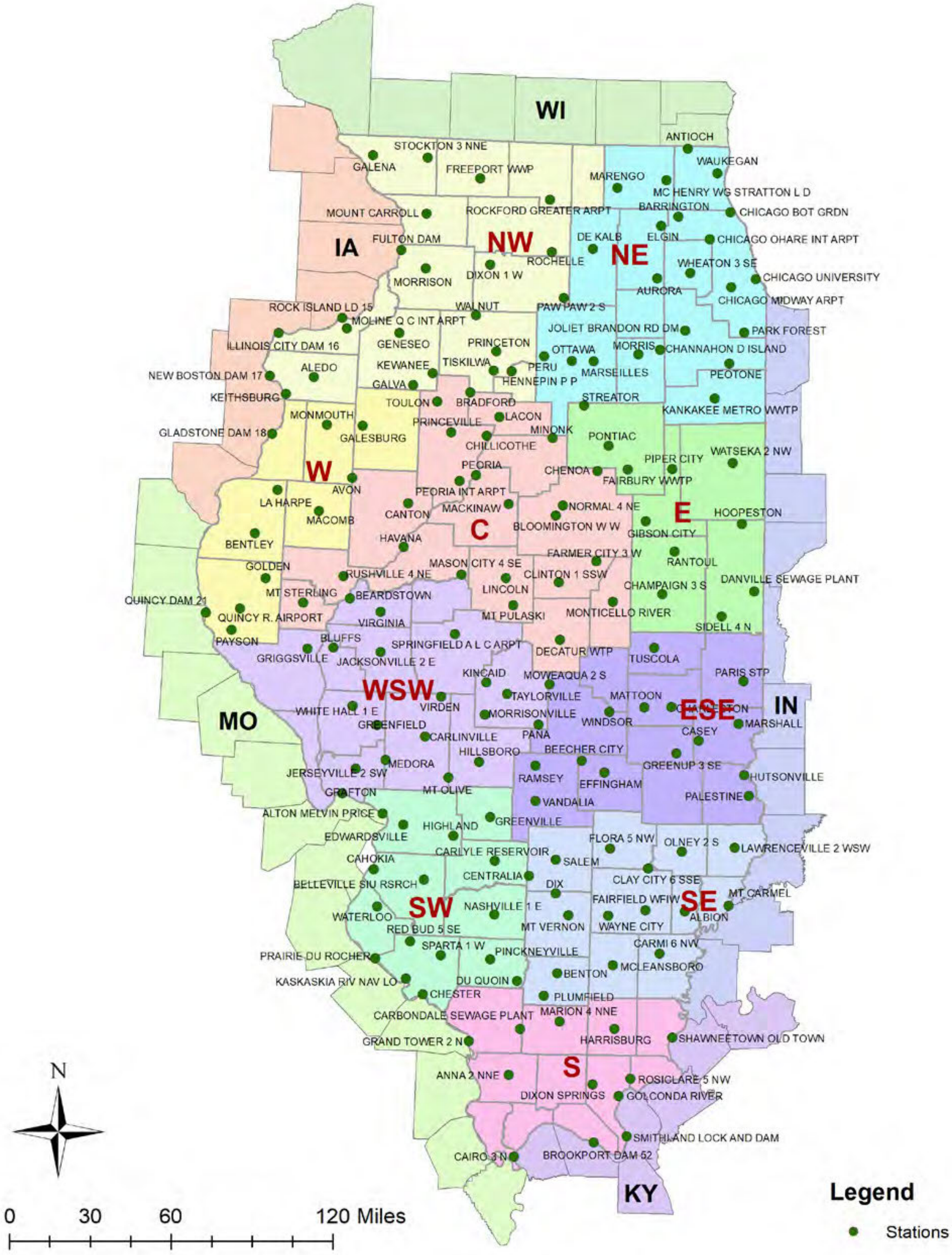


Figure 5 Daily precipitation stations used in this study

The second data source was the hourly precipitation dataset from NOAA. These data have been collected from automated gages since 1948. Unfortunately, the gages required a higher level of maintenance, which resulted in a much higher rate of missing data than that from the daily data network. As a result, the data were of limited use in this study. Their primary use for this report was to confirm earlier relationships developed between 24-hour and less than 24-hour amounts used in Bulletin 70 and NOAA Atlas 14. These relationships are documented later in this report. A total of 73 stations were examined in this study. A map of those stations with hourly data is shown in Figure 6.

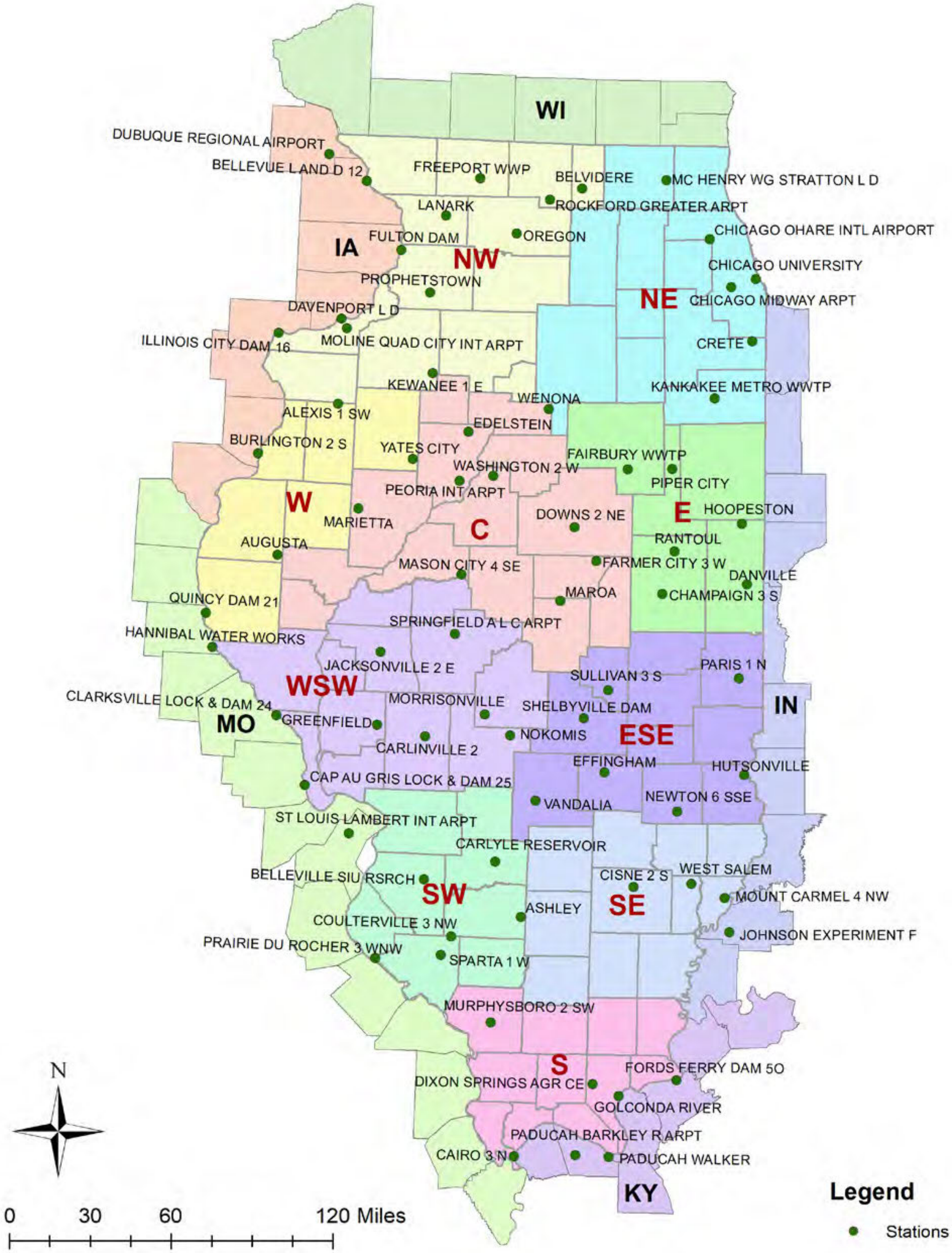


Figure 6 Hourly precipitation stations used in this study

The final data source for this study was the Cook County Precipitation Network (CCPN). This network is a collaborative study between ISWS and the US Army Corps of Engineers to produce consistent and accurate data for the Chicagoland region. The 25 recording gages have an average grid spacing of 5 to 7 miles (Bauer, 2018). A map of the stations is shown in Figure 7. As with the NOAA hourly data, the CCPN hourly data were used for this report to confirm earlier relationships developed between 24-hour and less than 24-hour amounts.

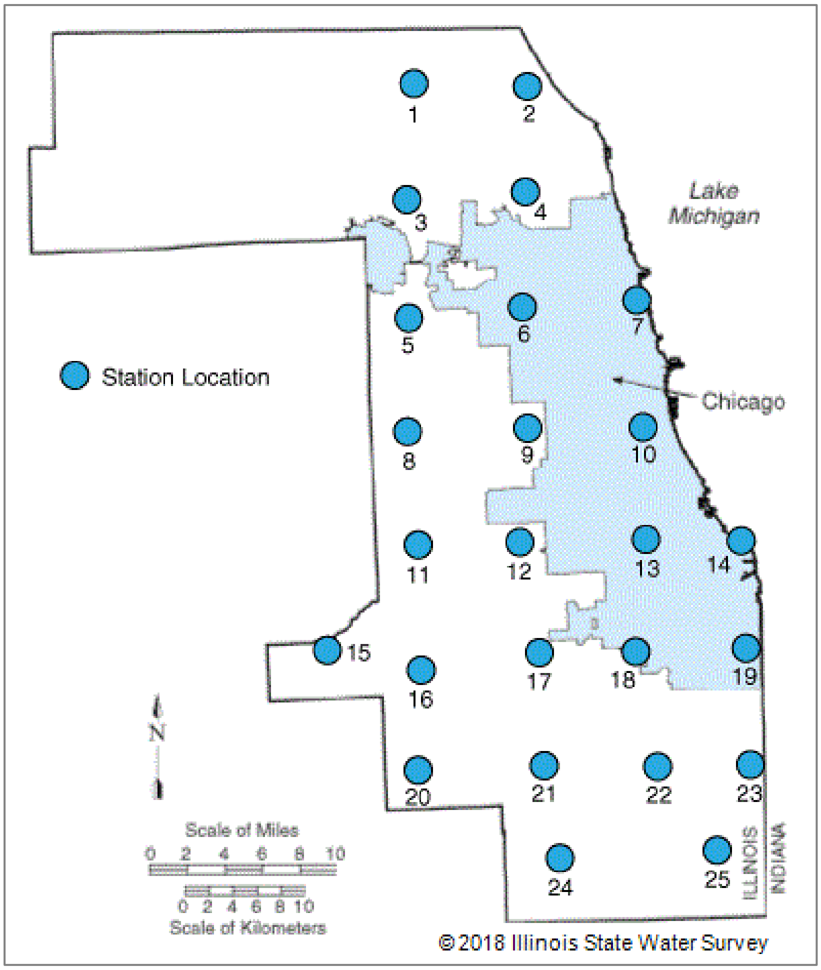


Figure 7 Precipitation stations in the Cook County Precipitation Network (CCPN)

Methodology Description

For each region (section), the annual maximum series (AMS) data observed at each station were used as inputs to produce regional (sectional) statistical frequency estimates for storm durations from 1 hour to 240 hours and for recurrence intervals from 2 to 500 years. For each duration of 24 hours or more, the frequency analysis was based on the L-moments method and Langbein's formula for debiasing. Due to significant uncertainty in hourly data, the frequency analysis for durations shorter than 24 hours was replaced by the application of newly calculated x-hour:24-hour ratios. This approach was similar to that of the original Bulletin 70. To maintain consistency with the format of the original Bulletin 70, the site estimates were averaged for each section, adjusted for temporal trends, and presented in the final tables appearing later in this text.

Annual Maximum and Partial Duration Series

Frequency estimates at a station can be calculated based on either an annual maximum series (AMS) or a partial duration series (PDS). The AMS-based method involves selecting the largest precipitation amount from each year on record for each duration of interest. In the PDS-based method, a given number of rainfall totals are selected that are larger than a predefined threshold for all durations independently of the year of occurrence. With this method, multiple events can occur in the same calendar year. Selected events need to be screened for independence, i.e., to determine if two precipitation peaks can be considered coming from the same event before inclusion in the final dataset. The PDS method uses the available precipitation information more completely than the AMS-based method does. As a result, the AMS method estimates are biased, particularly for smaller recurrence intervals. On the other hand, no method has been widely accepted for threshold selection and accounting for dependence between the events in the PDS-based approach, making the method somewhat subjective. To reconcile the strengths and weaknesses of the two methods, many precipitation frequency studies (Perica et al., 2011) used the AMS approach and then corrected for the bias using the Langbein's equation (Langbein, 1949). Similarly, in this study, the Langbein's equation (Eq. 1) was used to convert frequencies associated with AMS data to the ones with PDS data, thus providing unbiased frequency estimates.

$$T_{AMS} = \frac{1}{(1 - \exp(-\frac{1}{T_{PDS)}})} \tag{1}$$

where T_{AMS} and T_{PDS} are the recurrence intervals (return periods) associated with AMS and PDS data, respectively. After conversion, the AMS-based frequencies of 2.54, 5.52, 10.51, 25, 50, and 100 years correspond to the PDS-based 2, 5, 10, 25, 50, and 100-year frequencies, respectively. For example, the unbiased estimate of a 2-year recurrence interval rainfall can be calculated using the AMS approach for a recurrence interval of 2.54 years.

Constrained vs. Unconstrained Daily Precipitation

Daily rainfall data include all precipitation that was recorded on a given calendar day between the fixed monitoring times, such as between 7 a.m. on a certain day and 7 a.m. on the following day. This amount may be smaller than the maximum rainfall in a given 24-hour period. Instances will occur in which the maximum 24-hour rainfall will span more than a single calendar day. Adjustment factors to account for this difference have been determined through a comparative analysis of Hershfield (1961), Huff and Neil (1959), Huff and Angel (1989), Markus et al. (2007), and Perica et al. (2011). The conversion factors are shown in Table 1. To avoid confusion between the constrained and unconstrained precipitation, all results in this report are presented in hours (e.g., 24-hour or 240-hour precipitation).

Table 1 Conversion from Constrained to Unconstrained Precipitation Adopted in this Study

From	1 day	2 days	3 days	5 days	10 days
To	24 hours	48 hours	72 hours	120 hours	240 hours
Conversion factor	1.13	1.04	1.02	1.01	1.00

Sub-Daily Precipitation Frequency Conversions

As for Bulletin 70, sub-daily precipitation frequencies were obtained for this study based on x-hour to 24-hour type conversions. The direct regional frequency analysis of sub-daily data produced significantly variable and uncertain results because of numerous factors, such as the number/spatial coverage of hourly stations, their shorter record lengths, missing/incomplete data, and questionable quality of the data at some of these stations.

To determine the conversion factors, an extensive study of the average ratios of x-hour to 24-hour rainfall was performed using the hourly data. The ratios obtained in this study by running a regional frequency analysis (RFA) for 1948 to 2017 were compared with ISWS Bulletin 70 and NOAA Atlas 14, and the differences among the ratios were not found to be significant (Table 2). The adopted conversion factors were identical to those in Bulletin 70.

Table 2 X-hr:24-hr Ratios

Storm Duration (hours)	RFA 1948-2017	Bulletin 70	Atlas 14	Adopted
1	0.42	0.47	0.47	0.47
2	0.56	0.58	0.57	0.58
3	0.64	0.64	0.63	0.64
6	0.76	0.75	0.75	0.75
12	0.87	0.87	0.86	0.87
18	0.94	0.94	N/A	0.94

Stationary Regional Frequency Analysis

Although the observed precipitation datasets were nonstationary, the authors first performed the stationary frequency analysis based on the L-moments (Hosking, 2000; Hosking and Wallis, 1997), and then adjusted the results to account for trends. The method accounting for trends was adopted from the original Bulletin 70 and described in the Nonstationary Temporal Trend Analysis section. The L-moments methodology first computed the point rainfall depths for each duration and recurrence interval at each raingage. For consistency with Bulletin 70, these depths were then averaged for each section and expressed as sectional frequencies (see the Results section). Past research results (Vogel and Fennessey, 1993) indicate that regional frequency analysis based on the L-moments is more robust and better identifies the parent distribution compared to other more traditional estimation techniques, particularly for regional studies. This methodology was also adopted by NOAA (Bonnin et al., 2006; Perica et al., 2011) and applied in previous studies in Illinois (Markus et al., 2007; Hejazi and Markus, 2009). The L-moments method uses the discordancy measure (Hosking and Wallis, 1997) to identify statistically unusual (discordant) sites in a region and the heterogeneity measure to assess if the region is homogeneous. Next, for each region, the method finds the best-fit statistical distribution among the following distributions (Hosking, 2000): Exponential, Gamma, Gumbel, Normal, Generalized Pareto, Generalized Extreme Value, Generalized Logistic, Generalized Normal, Pearson 3, and Wakeby. To construct 90 percent confidence limits, 500 synthetic datasets that have the same statistical features as the adopted distribution were generated using a Monte Carlo simulation technique (Hosking and Wallis, 1997). In this method, each synthetic dataset produces a quantile. The upper confidence limit separates the upper 5 percent and the lower 95 percent, and similarly, the lower confidence limit separates the lower 5 from the top 95 percent of all generated quantiles.

Nonstationary Temporal Trend Analysis

Traditional hydroclimatologic studies typically relied on long-term precipitation records, which have been used to estimate the probability of heavy precipitation events that will occur in the future. The underlying assumption was that the precipitation data were stationary, or in other words, that future variability will be similar to the past variability. However, numerous studies have indicated that the frequency and intensity of precipitation in Illinois have been increasing in the past several decades and will continue to increase in the future (Winters et al., 2015). Therefore, because of climate change, precipitation stationarity cannot be assumed. To account for nonstationarity, the approach used in the original Bulletin 70 was adopted. The Bulletin 70 approach divides the whole period, in this case 1948–2017, into two equal periods, 1948–1982 and 1983–2017, and then estimates frequency quantiles (e.g. 24-hour 100-year storm) for the first half (RFA_1), the second half (RFA_2), and the whole period (RFA_0). The nonstationary adjustment factor NAF is defined as

$$NAF = \frac{RFA_2}{RFA_1} \tag{2}$$

The frequency quantile RFA, which accounts for the trend in peaks, is given by

$$RFA = NAF \cdot RFA_0 = RFA_0 \frac{RFA_2}{RFA_1} \tag{3}$$

The trend adjustment factors used in this study are shown in Table 3. A companion report, to be published in 2019, will provide more in-depth information through nonstationarity analysis and comparisons with other approaches that have been designed to determine frequency as a function of time (e.g., Salas et al., 2018; Serago and Vogel, 2018; Cheng et al., 2014).

Table 3 Temporal Trend Adjustment Factors for 10 Sections

	Climatic section	24 hrs	48 hrs	72 hrs	120 hrs	240 hrs		Average
1	Northwest	1.07	1.07	1.03	1.05	1.12		1.07
2	Northeast	1.06	1.12	1.13	1.18	1.21		1.14
3	West	1.00	0.96	0.91	0.92	1.02		0.96
4	Central	1.02	0.94	0.94	0.97	1.08		0.99
5	East	0.99	0.94	0.92	0.96	1.02		0.97
6	West Southwest	0.99	0.97	0.98	1.02	1.10		1.01
7	East Southeast	1.05	0.97	1.02	1.01	1.12		1.03
8	Southwest	1.11	1.09	1.10	1.13	1.26		1.14
9	Southeast	1.07	1.09	1.04	1.03	1.09		1.06
10	South	0.96	1.02	1.06	1.03	0.99		1.01

Results

Frequency Estimates

To determine the precipitation frequency, the previously described regional frequency analysis was applied to the AMS data. The results were then converted to the PDS domain based on the relationship defined in Eq. 1 and adjusted for the trend (Eq. 3). These results, however, still had occasional minor inconsistencies caused by several factors, such as variable data length for different durations, which resulted in irregular frequency curves. To produce the final curves, these irregularities had to be smoothed out, which was done based on the authors' professional judgment and knowledge of specific regions and gages.

The results for all sections are shown in the following tables. Table 4 displays the key for the codes used in Table 5, where the results are presented numerically. The results are shown graphically in Figures 8–12.

Table 4 Storm and Sectional Codes for Table 5

Storm Code		*Sectional Code*	
1	240 hours	1	Northwest
2	120 hours	2	Northeast
3	72 hours	3	West
4	48 hours	4	Central
5	24 hours	5	East
6	18 hours	6	West Southwest
7	12 hours	7	East Southeast
8	6 hours	8	Southwest
9	3 hours	9	Southeast
10	2 hours	10	South
11	1 hour		

Table 5 Rainfall Frequencies

		Rainfall (inches) for given recurrence interval						
Storm code	*Section code*	*2-year*	*5-year*	*10-year*	*25-year*	*50-year*	*100-year*	*500-year*
1	1	5.48	6.86	7.98	9.55	10.84	12.14	15.65
1	2	5.60	7.09	8.25	9.90	11.26	12.65	16.00
1	3	5.62	7.00	8.10	9.60	10.65	11.64	13.99
1	4	5.46	6.87	8.04	9.53	10.55	11.50	13.65
1	5	5.50	6.84	7.90	9.35	10.45	11.55	13.96
1	6	6.00	7.38	8.47	9.95	10.99	11.95	14.08
1	7	6.57	7.86	8.90	10.20	11.20	12.06	13.95
1	8	6.75	8.18	9.30	10.80	11.95	13.10	15.95
1	9	7.06	8.30	9.22	10.37	11.21	11.96	13.75
1	10	6.36	7.65	8.76	10.40	11.66	12.96	16.20
2	1	4.35	5.51	6.46	7.88	8.96	10.20	13.33
2	2	4.42	5.63	6.68	8.16	9.39	10.66	13.81
2	3	4.51	5.66	6.62	7.94	8.93	9.83	11.99
2	4	4.27	5.42	6.42	7.75	8.72	9.60	11.54
2	5	4.34	5.43	6.41	7.73	8.79	9.80	11.93
2	6	4.49	5.60	6.49	7.77	8.69	9.57	11.53
2	7	5.00	6.11	7.01	8.23	9.11	9.95	11.71
2	8	5.31	6.51	7.47	8.79	9.81	10.84	13.45
2	9	5.73	6.78	7.60	8.64	9.47	10.20	11.97
2	10	5.18	6.30	7.29	8.69	9.78	10.91	13.84
3	1	3.90	4.95	5.87	7.21	8.30	9.45	12.30
3	2	3.97	5.08	6.05	7.49	8.64	9.85	12.81
3	3	4.11	5.18	6.08	7.34	8.31	9.18	11.27
3	4	3.88	4.96	5.90	7.17	8.09	8.98	10.81
3	5	3.88	4.90	5.78	7.04	8.01	8.93	11.00
3	6	4.00	5.00	5.83	7.01	7.91	8.73	10.61
3	7	4.35	5.37	6.19	7.34	8.19	8.97	10.57
3	8	4.74	5.82	6.71	7.96	8.89	9.86	12.32
3	9	5.13	6.09	6.86	7.87	8.63	9.34	10.93
3	10	4.54	5.61	6.50	7.78	8.79	9.86	12.55

Table 5 (continued)

Storm code	Section code	Rainfall (inches) for given recurrence interval 2-year	5-year	10-year	25-year	50-year	100-year	500-year
4	1	3.61	4.59	5.43	6.72	7.73	8.83	11.53
4	2	3.66	4.71	5.62	6.99	8.13	9.28	12.10
4	3	3.76	4.76	5.62	6.81	7.72	8.60	10.58
4	4	3.59	4.61	5.47	6.65	7.55	8.40	10.21
4	5	3.54	4.49	5.32	6.48	7.38	8.27	10.26
4	6	3.66	4.61	5.38	6.48	7.33	8.11	9.93
4	7	3.92	4.85	5.61	6.67	7.46	8.21	9.76
4	8	4.28	5.29	6.10	7.25	8.15	9.08	11.40
4	9	4.64	5.54	6.27	7.24	7.94	8.58	10.06
4	10	4.06	5.02	5.86	7.04	8.01	9.02	11.56
5	1	3.34	4.22	5.03	6.20	7.20	8.25	10.84
5	2	3.34	4.30	5.15	6.45	7.50	8.57	11.24
5	3	3.48	4.45	5.24	6.38	7.25	8.06	9.91
5	4	3.32	4.30	5.10	6.20	7.05	7.85	9.53
5	5	3.12	3.97	4.71	5.78	6.62	7.43	9.32
5	6	3.23	4.07	4.76	5.79	6.56	7.31	9.04
5	7	3.49	4.33	5.00	5.98	6.71	7.40	8.84
5	8	3.69	4.56	5.27	6.30	7.14	7.96	10.06
5	9	4.07	4.89	5.55	6.42	7.06	7.68	8.99
5	10	3.63	4.52	5.28	6.38	7.29	8.23	10.57
6	1	3.14	3.97	4.73	5.83	6.77	7.75	10.19
6	2	3.14	4.04	4.84	6.06	7.05	8.06	10.57
6	3	3.27	4.18	4.93	6.00	6.82	7.58	9.32
6	4	3.12	4.04	4.79	5.83	6.63	7.38	8.96
6	5	2.93	3.73	4.43	5.43	6.22	6.98	8.76
6	6	3.04	3.83	4.47	5.44	6.17	6.87	8.50
6	7	3.28	4.07	4.70	5.62	6.31	6.96	8.31
6	8	3.47	4.29	4.95	5.92	6.71	7.48	9.45
6	9	3.83	4.60	5.22	6.03	6.64	7.22	8.45
6	10	3.41	4.25	4.96	6.00	6.85	7.73	9.93

Table 5 (continued)

		Rainfall (inches) for given recurrence interval						
Storm code	*Section code*	*2-year*	*5-year*	*10-year*	*25-year*	*50-year*	*100-year*	*500-year*
7	1	2.91	3.67	4.38	5.40	6.26	7.18	9.43
7	2	2.91	3.74	4.48	5.61	6.53	7.46	9.78
7	3	3.03	3.87	4.56	5.55	6.31	7.01	8.62
7	4	2.89	3.74	4.44	5.39	6.13	6.83	8.29
7	5	2.71	3.45	4.10	5.03	5.76	6.46	8.11
7	6	2.81	3.54	4.14	5.04	5.71	6.36	7.86
7	7	3.04	3.77	4.35	5.20	5.84	6.44	7.69
7	8	3.21	3.97	4.58	5.48	6.21	6.93	8.75
7	9	3.54	4.25	4.83	5.59	6.14	6.69	7.82
7	10	3.16	3.93	4.59	5.55	6.34	7.16	9.19
8	1	2.51	3.17	3.77	4.65	5.40	6.19	8.13
8	2	2.51	3.23	3.86	4.84	5.63	6.43	8.43
8	3	2.61	3.34	3.93	4.79	5.44	6.05	7.43
8	4	2.49	3.23	3.83	4.65	5.29	5.89	7.15
8	5	2.34	2.98	3.53	4.34	4.97	5.57	6.99
8	6	2.42	3.05	3.57	4.34	4.92	5.48	6.78
8	7	2.62	3.25	3.75	4.49	5.03	5.55	6.63
8	8	2.77	3.42	3.95	4.73	5.36	5.97	7.54
8	9	3.05	3.67	4.16	4.82	5.30	5.76	6.74
8	10	2.72	3.39	3.96	4.79	5.47	6.17	7.92
9	1	2.14	2.70	3.22	3.97	4.61	5.28	6.94
9	2	2.14	2.75	3.30	4.13	4.80	5.49	7.20
9	3	2.23	2.85	3.35	4.08	4.64	5.16	6.34
9	4	2.12	2.75	3.26	3.97	4.51	5.02	6.10
9	5	2.00	2.54	3.01	3.70	4.24	4.76	5.97
9	6	2.07	2.60	3.05	3.71	4.20	4.68	5.79
9	7	2.23	2.77	3.20	3.83	4.29	4.74	5.66
9	8	2.36	2.92	3.37	4.03	4.57	5.09	6.44
9	9	2.60	3.13	3.55	4.11	4.52	4.92	5.75
9	10	2.32	2.89	3.38	4.09	4.66	5.26	6.76

Table 5 (continued)

		Rainfall (inches) for given recurrence interval						
Storm code	*Section code*	*2-year*	*5-year*	*10-year*	*25-year*	*50-year*	*100-year*	*500-year*
10	1	1.94	2.45	2.92	3.60	4.17	4.78	6.29
10	2	1.94	2.49	2.99	3.74	4.35	4.97	6.52
10	3	2.02	2.58	3.04	3.70	4.21	4.67	5.75
10	4	1.93	2.49	2.96	3.60	4.09	4.55	5.53
10	5	1.81	2.30	2.73	3.35	3.84	4.31	5.41
10	6	1.87	2.36	2.76	3.36	3.80	4.24	5.24
10	7	2.02	2.51	2.90	3.47	3.89	4.29	5.13
10	8	2.14	2.64	3.06	3.65	4.14	4.62	5.83
10	9	2.36	2.84	3.22	3.72	4.09	4.46	5.21
10	10	2.10	2.62	3.06	3.70	4.23	4.77	6.13
11	1	1.57	1.98	2.36	2.92	3.38	3.88	5.09
11	2	1.57	2.02	2.42	3.03	3.53	4.03	5.28
11	3	1.64	2.09	2.46	3.00	3.41	3.79	4.66
11	4	1.56	2.02	2.40	2.91	3.31	3.69	4.48
11	5	1.47	1.87	2.21	2.72	3.11	3.49	4.38
11	6	1.52	1.91	2.24	2.72	3.08	3.44	4.25
11	7	1.64	2.04	2.35	2.81	3.15	3.48	4.15
11	8	1.73	2.14	2.48	2.96	3.36	3.74	4.73
11	9	1.91	2.30	2.61	3.02	3.32	3.61	4.23
11	10	1.71	2.12	2.48	3.00	3.43	3.87	4.97

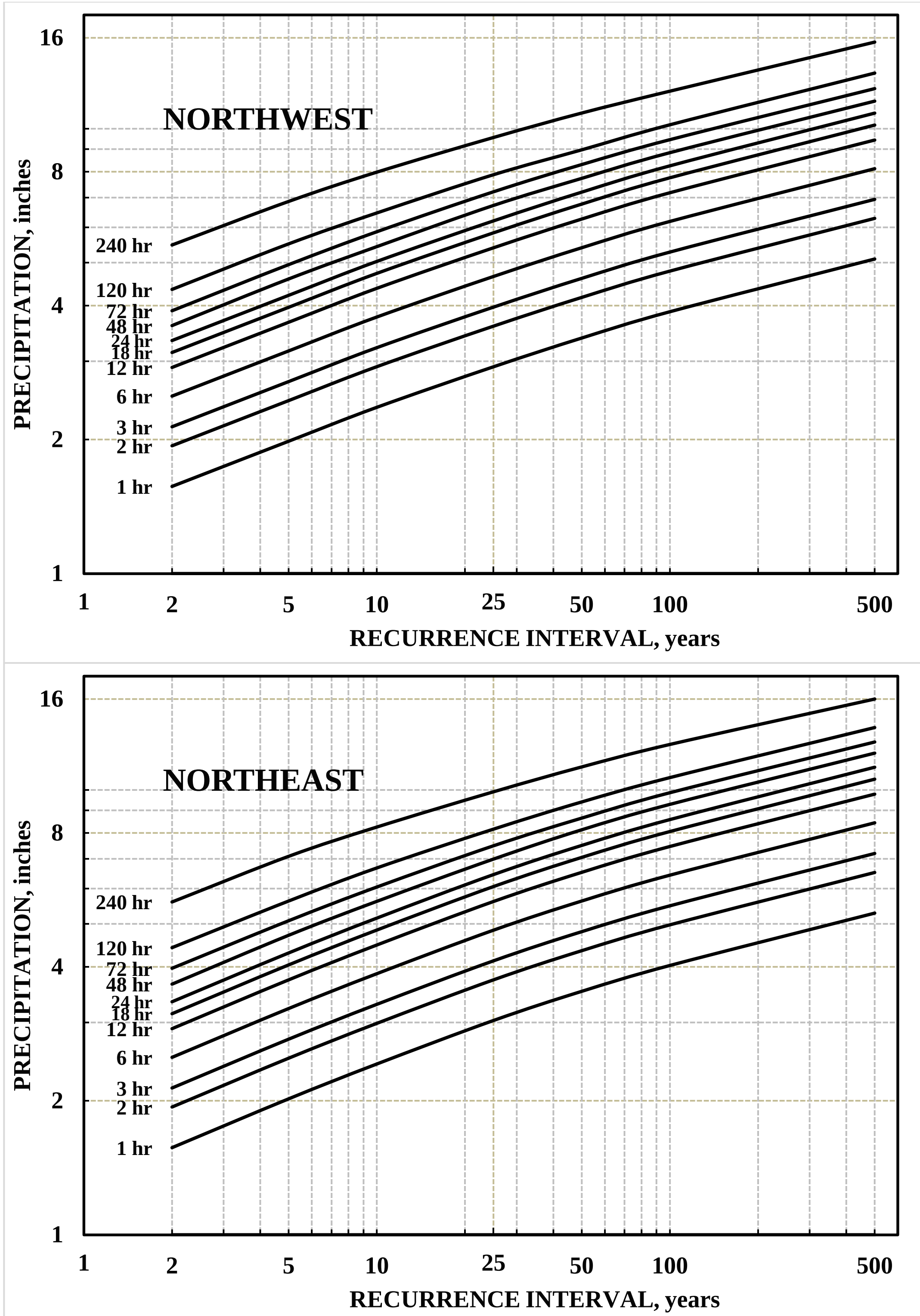


Figure 8 Frequency distributions of precipitation for Illinois climatic sections Northwest and Northeast for storm periods of 1 hour to 240 hours days and recurrence intervals of 2 to 100 years.

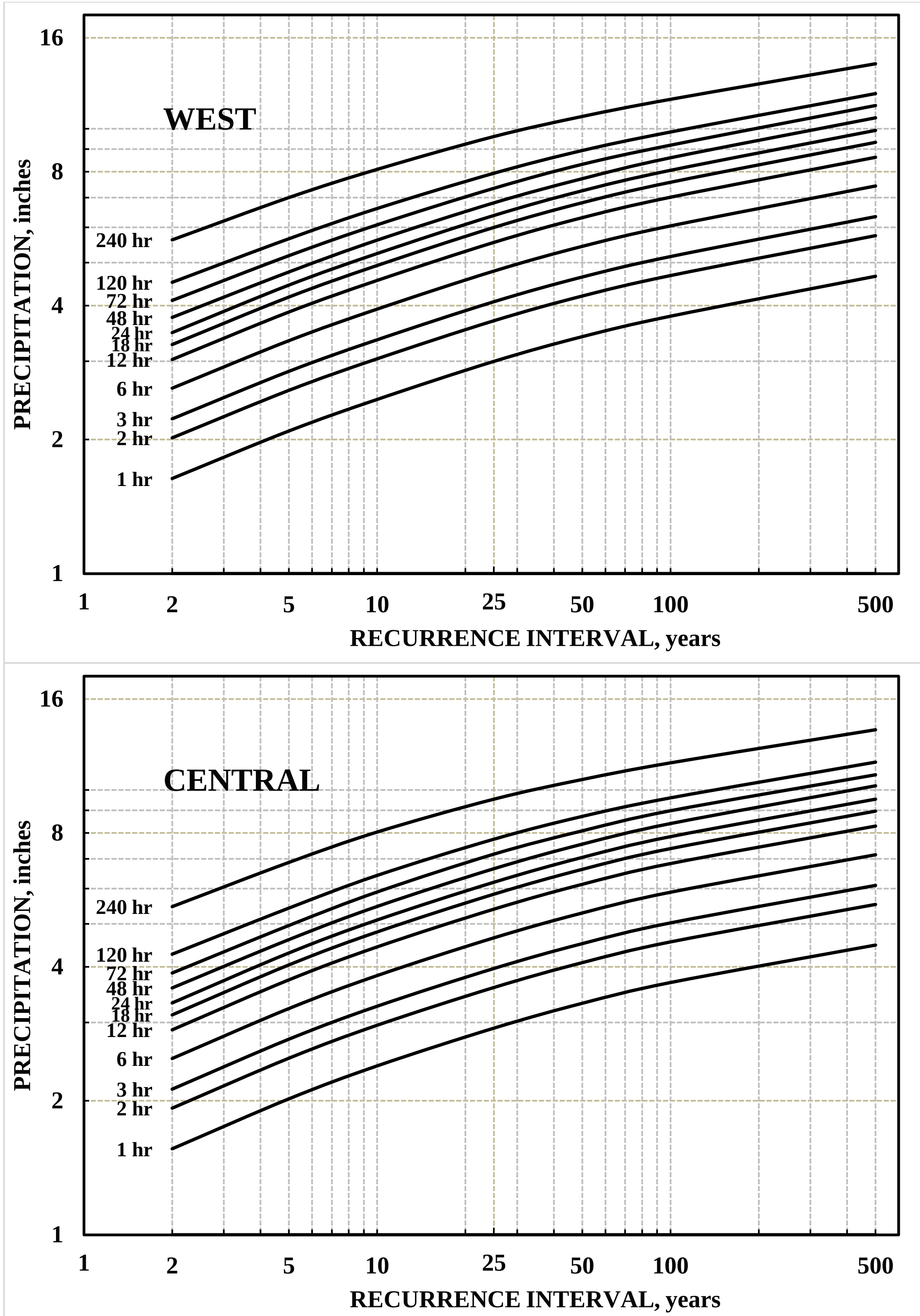
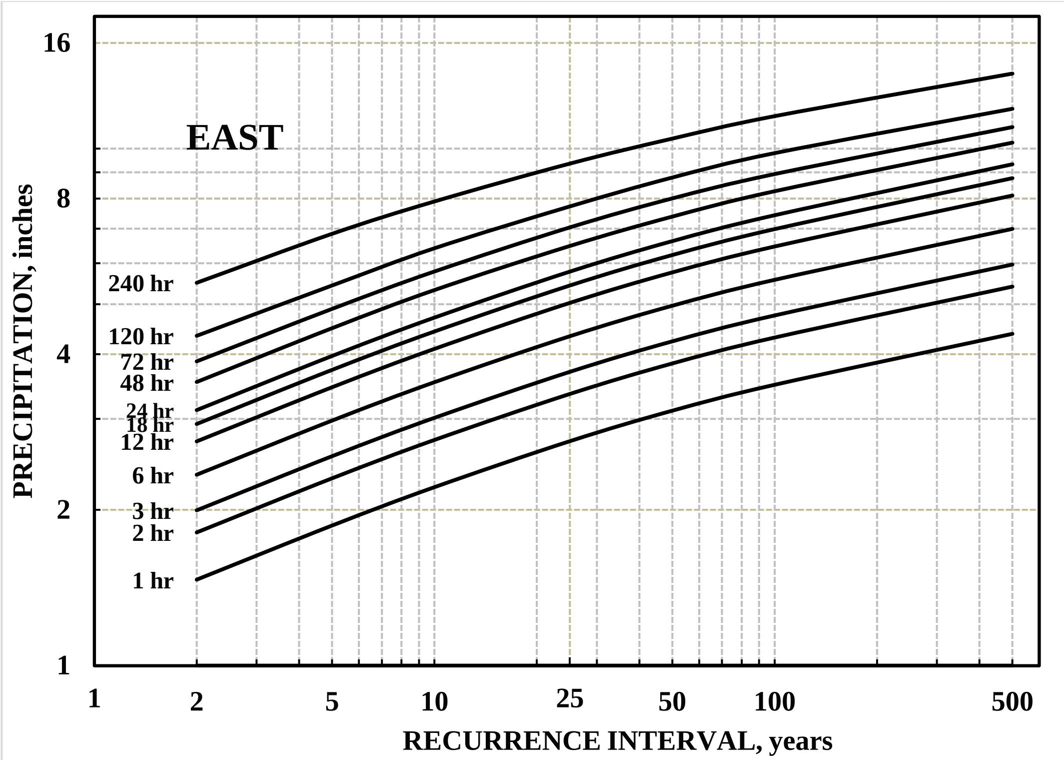


Figure 9 Frequency distributions of precipitation for Illinois climatic sections west and central for storm periods of 1 hour to 240 hours and recurrence intervals of 2 to 100 years



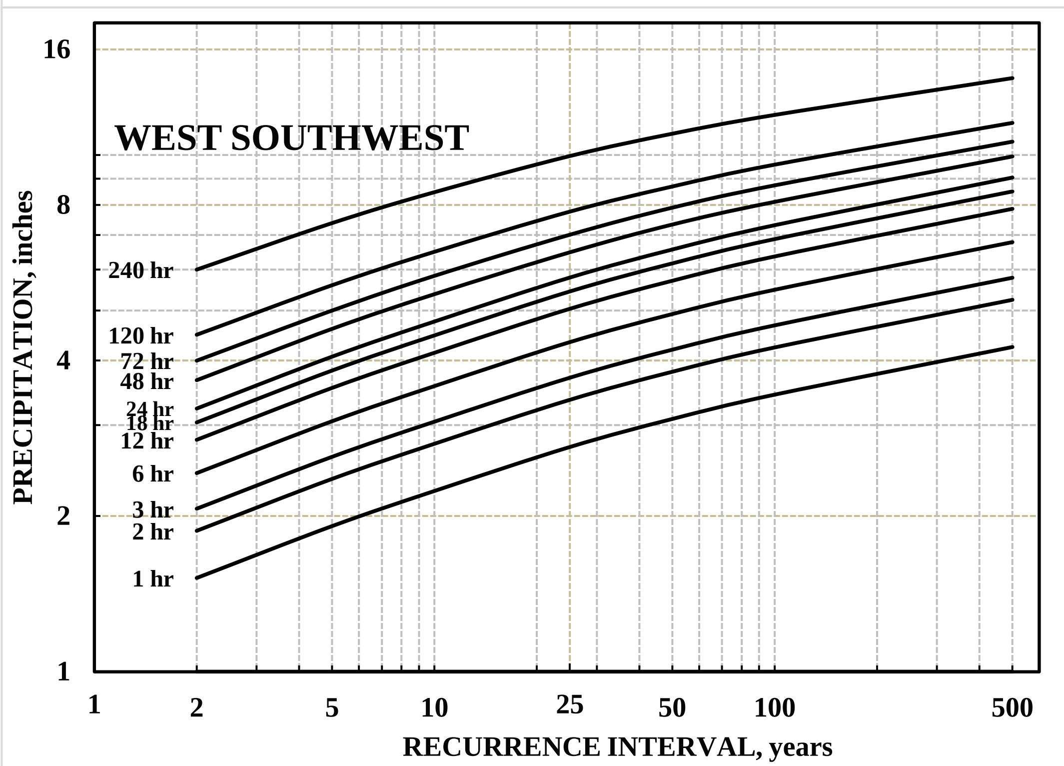
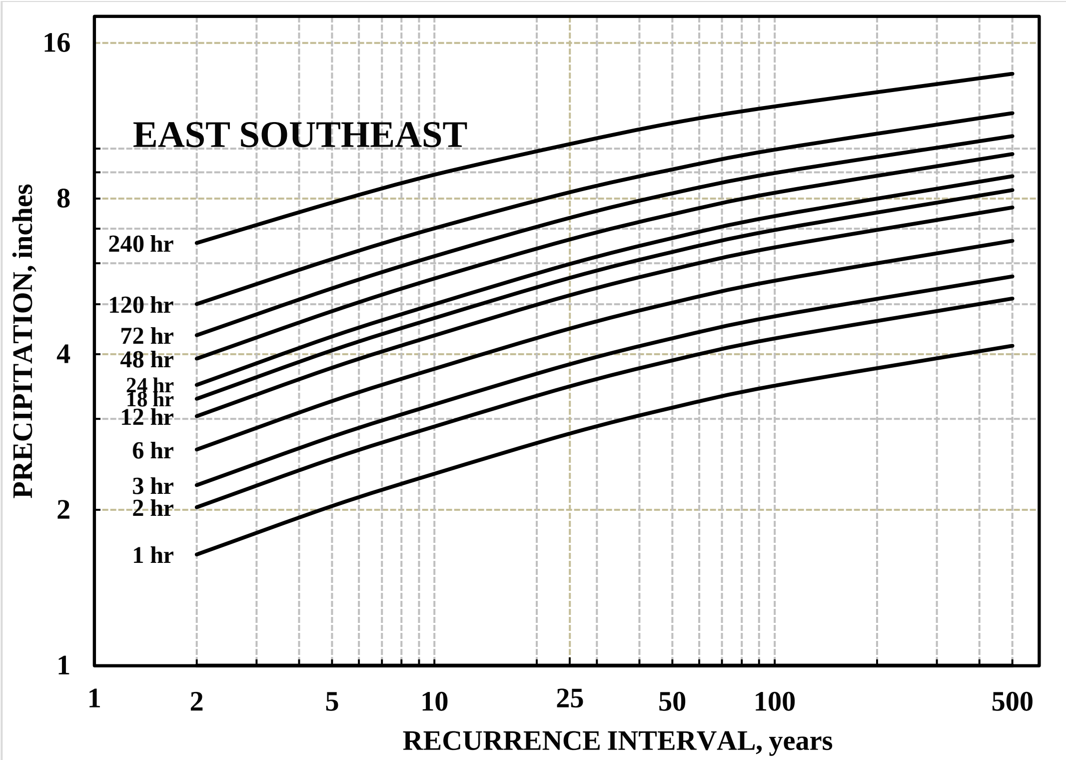


Figure 10 Frequency distributions of precipitation for Illinois climatic sections east and west southwest for storm periods of 1 hour to 240 hours and recurrence intervals of 2 to 100 years



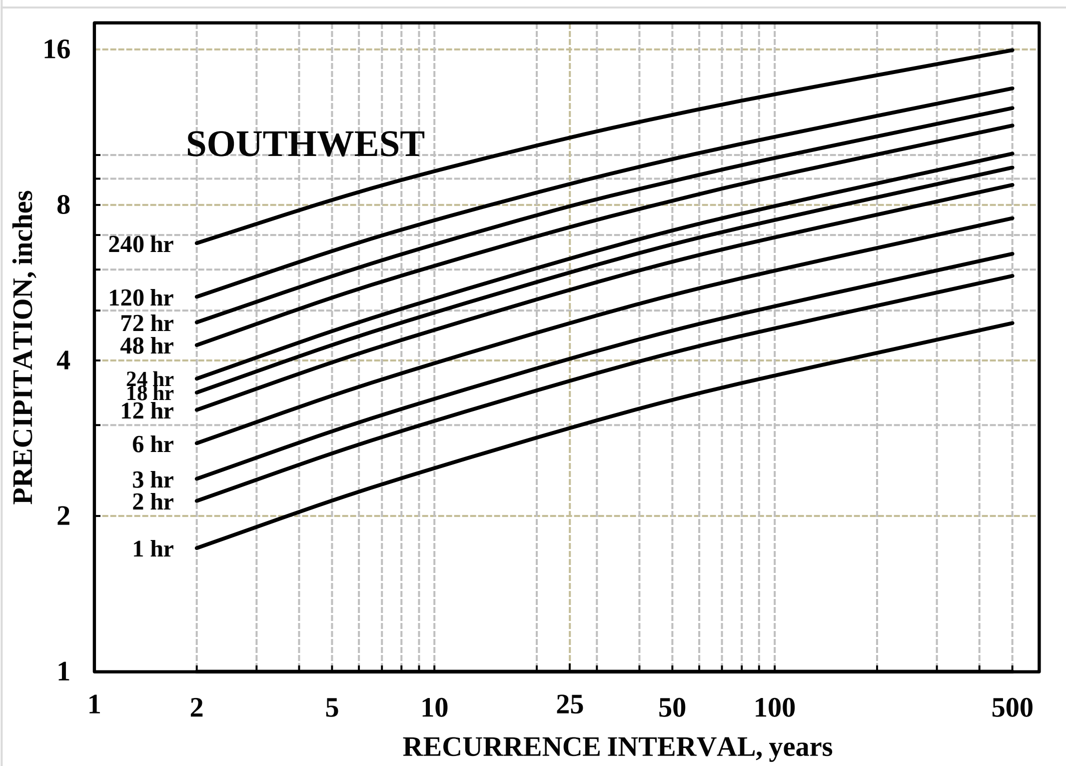
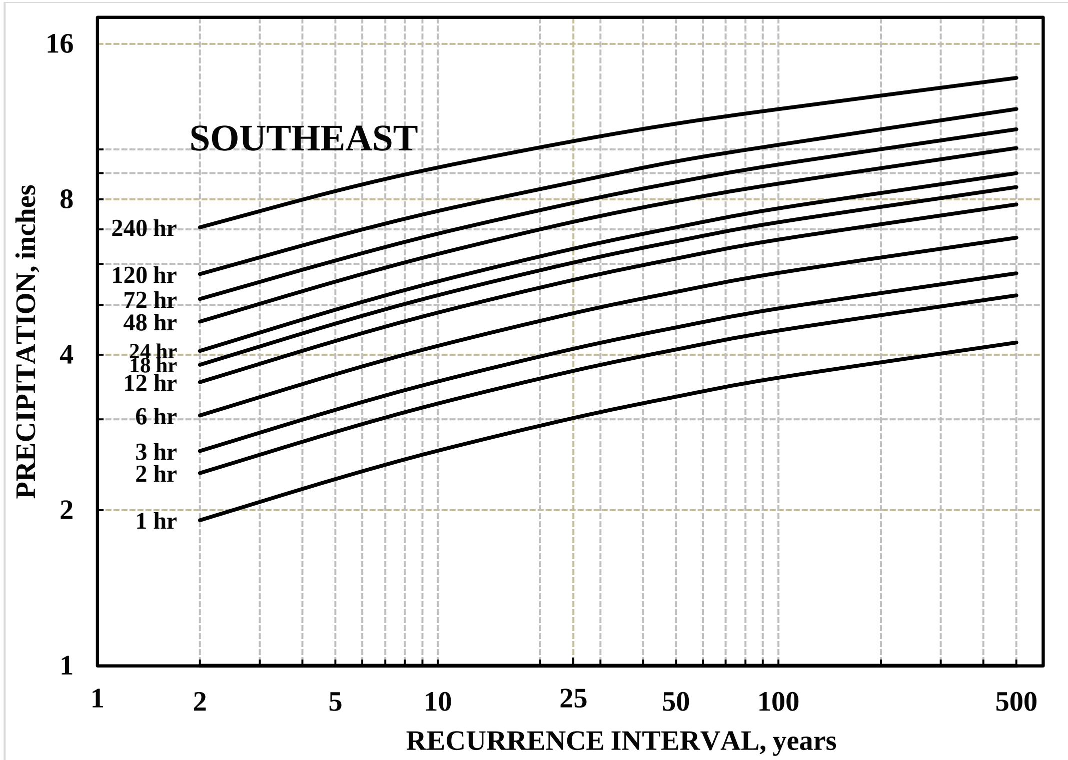


Figure 11 Frequency distributions of precipitation for Illinois climatic sections east southeast and southwest for storm periods of 1 hour to 240 hours and recurrence intervals of 2 to 100 years



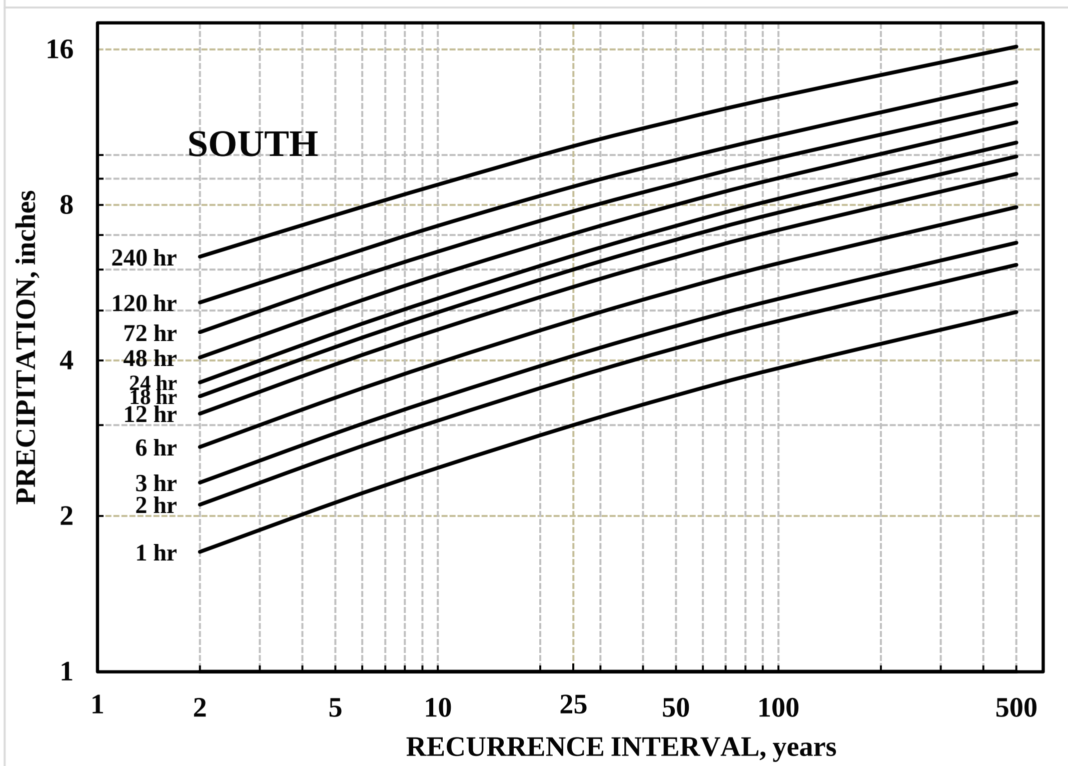


Figure 12 Frequency distributions of precipitation for Illinois climatic sections southeast and south for storm periods of 1 hour to 240 hours and recurrence intervals of 2 to 100 years

Confidence Limits

Confidence limits were calculated based on the methodology described in the previous Frequency Estimates section. Confidence limits are provided for section codes 1–10 and for storm codes 1–11 (Table 4), and are shown in Table 6.

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
1	1	**5.48** (5.04 - 5.95)	**6.86** (6.30 - 7.48)	**7.98** (7.30 - 8.73)	**9.55** (8.67 - 10.53)	**10.84** (9.76 - 12.06)	**12.14** (10.82 - 13.63)	**15.65** (13.53 - 18.10)
1	2	**5.60** (5.14 - 6.09)	**7.09** (6.48 - 7.75)	**8.25** (7.49 - 9.08)	**9.90** (8.89 - 11.04)	**11.26** (10.01 - 12.72)	**12.65** (11.08 - 14.51)	**16.00** (13.40 - 19.13)
1	3	**5.62** (5.21 - 6.11)	**7.00** (6.47 - 7.62)	**8.10** (7.44 - 8.86)	**9.6** (8.73 - 10.58)	**10.65** (9.59 - 11.84)	**11.64** (10.34 - 13.05)	**13.99** (11.96 - 16.14)
1	4	**5.46** (5.07 - 5.90)	**6.87** (6.36 - 7.43)	**8.04** (7.43 - 8.71)	**9.53** (8.75 - 10.38)	**10.55** (9.62 - 11.56)	**11.5** (10.40 - 12.70)	**13.65** (12.02 - 15.40)
1	5	**5.50** (5.14 - 5.89)	**6.84** (6.38 - 7.34)	**7.9** (7.34 - 8.50)	**9.35** (8.64 - 10.12)	**10.45** (9.60 - 11.40)	**11.55** (10.52 - 12.71)	**13.96** (12.39 - 15.72)
1	6	**6.00** (5.55 - 6.51)	**7.38** (6.82 - 8.02)	**8.47** (7.81 - 9.21)	**9.95** (9.11 - 10.88)	**10.99** (9.97 - 12.09)	**11.95** (10.74 - 13.26)	**14.08** (12.31 - 15.96)
1	7	**6.57** (6.03 - 7.14)	**7.86** (7.22 - 8.55)	**8.90** (8.16 - 9.72)	**10.20** (9.29 - 11.27)	**11.20** (10.09 - 12.49)	**12.06** (10.71 - 13.62)	**13.95** (11.94 - 16.28)
1	8	**6.75** (6.10 - 7.44)	**8.18** (7.35 - 9.06)	**9.30** (8.26 - 10.40)	**10.80** (9.38 - 12.30)	**11.95** (10.16 - 13.87)	**13.10** (10.84 - 15.56)	**15.95** (12.28 - 20.09)
1	9	**7.06** (6.45 - 7.73)	**8.30** (7.54 - 9.12)	**9.22** (8.32 - 10.19)	**10.37** (9.21 - 11.62)	**11.21** (9.75 - 12.71)	**11.96** (10.18 - 13.74)	**13.75** (11.06 - 16.40)
1	10	**6.36** (5.81 - 6.92)	**7.65** (6.94 - 8.38)	**8.76** (7.87 - 9.67)	**10.40** (9.19 - 11.69)	**11.66** (10.07 - 13.35)	**12.96** (10.92 - 15.16)	**16.20** (12.63 - 20.04)

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals (continued)

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
2	1	**4.35** (3.96 - 4.77)	**5.51** (5.00 - 6.07)	**6.46** (5.84 - 7.16)	**7.88** (7.07 - 8.80)	**8.96** (7.99 - 10.12)	**10.20** (9.01 - 11.67)	**13.33** (11.44 - 15.78)
2	2	**4.42** (4.02 - 4.83)	**5.63** (5.09 - 6.18)	**6.68** (6.01 - 7.38)	**8.16** (7.26 - 9.12)	**9.39** (8.25 - 10.63)	**10.66** (9.22 - 12.22)	**13.81** (11.44 - 16.42)
2	3	**4.51** (4.14 - 4.92)	**5.66** (5.18 - 6.19)	**6.62** (6.03 - 7.29)	**7.94** (7.16 - 8.86)	**8.93** (7.97 - 10.12)	**9.83** (8.66 - 11.33)	**11.99** (10.11 - 14.43)
2	4	**4.27** (3.92 - 4.66)	**5.42** (4.97 - 5.92)	**6.42** (5.87 - 7.02)	**7.75** (7.03 - 8.53)	**8.72** (7.84 - 9.67)	**9.6** (8.54 - 10.73)	**11.54** (10.02 - 13.21)
2	5	**4.34** (4.00 - 4.71)	**5.43** (5.00 - 5.90)	**6.41** (5.89 - 6.99)	**7.73** (7.06 - 8.49)	**8.79** (7.98 - 9.75)	**9.8** (8.81 - 11.01)	**11.93** (10.42 - 13.87)
2	6	**4.49** (4.13 - 4.90)	**5.60** (5.14 - 6.12)	**6.49** (5.95 - 7.13)	**7.77** (7.06 - 8.59)	**8.69** (7.84 - 9.69)	**9.57** (8.54 - 10.78)	**11.53** (9.93 - 13.35)
2	7	**5.00** (4.60 - 5.45)	**6.11** (5.60 - 6.68)	**7.01** (6.41 - 7.70)	**8.23** (7.45 - 9.11)	**9.11** (8.16 - 10.19)	**9.95** (8.80 - 11.27)	**11.71** (9.95 - 13.69)
2	8	**5.31** (4.83 - 5.86)	**6.51** (5.90 - 7.23)	**7.47** (6.74 - 8.37)	**8.79** (7.82 - 9.97)	**9.81** (8.62 - 11.29)	**10.84** (9.36 - 12.68)	**13.45** (11.00 - 16.39)
2	9	**5.73** (5.19 - 6.31)	**6.78** (6.12 - 7.50)	**7.60** (6.81 - 8.49)	**8.64** (7.63 - 9.84)	**9.47** (8.23 - 10.99)	**10.20** (8.67 - 12.09)	**11.97** (9.50 - 14.95)
2	10	**5.18** (4.71 - 5.71)	**6.30** (5.71 - 6.99)	**7.29** (6.56 - 8.18)	**8.69** (7.68 - 9.94)	**9.78** (8.47 - 11.41)	**10.91** (9.22 - 13.02)	**13.84** (10.96 - 17.59)

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals (continued)

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
3	1	**3.9** (3.52 - 4.28)	**4.95** (4.47 - 5.46)	**5.87** (5.28 - 6.52)	**7.21** (6.46 - 8.12)	**8.30** (7.39 - 9.46)	**9.45** (8.33 - 10.91)	**12.30** (10.56 - 14.76)
3	2	**3.97** (3.60 - 4.36)	**5.08** (4.59 - 5.60)	**6.05** (5.44 - 6.71)	**7.49** (6.69 - 8.39)	**8.64** (7.66 - 9.78)	**9.85** (8.63 - 11.29)	**12.81** (10.82 - 15.18)
3	3	**4.11** (3.77 - 4.50)	**5.18** (4.74 - 5.71)	**6.08** (5.53 - 6.76)	**7.34** (6.61 - 8.27)	**8.31** (7.39 - 9.50)	**9.18** (8.05 - 10.70)	**11.27** (9.42 - 13.83)
3	4	**3.88** (3.55 - 4.25)	**4.96** (4.53 - 5.45)	**5.90** (5.37 - 6.51)	**7.17** (6.48 - 7.98)	**8.09** (7.25 - 9.09)	**8.98** (7.97 - 10.21)	**10.81** (9.30 - 12.69)
3	5	**3.88** (3.57 - 4.19)	**4.9** (4.50 - 5.32)	**5.78** (5.30 - 6.32)	**7.04** (6.42 - 7.77)	**8.01** (7.24 - 8.94)	**8.93** (7.98 - 10.10)	**11** (9.56 - 12.94)
3	6	**4.00** (3.65 - 4.38)	**5.00** (4.55 - 5.49)	**5.83** (5.28 - 6.44)	**7.01** (6.28 - 7.81)	**7.91** (7.01 - 8.91)	**8.73** (7.64 - 9.96)	**10.61** (8.93 - 12.54)
3	7	**4.35** (3.99 - 4.74)	**5.37** (4.91 - 5.87)	**6.19** (5.65 - 6.80)	**7.34** (6.65 - 8.14)	**8.19** (7.34 - 9.16)	**8.97** (7.94 - 10.13)	**10.57** (9.02 - 12.32)
3	8	**4.74** (4.31 - 5.23)	**5.82** (5.27 - 6.45)	**6.71** (6.04 - 7.48)	**7.96** (7.07 - 8.94)	**8.89** (7.78 - 10.10)	**9.86** (8.47 - 11.35)	**12.32** (10.09 - 14.72)
3	9	**5.13** (4.66 - 5.65)	**6.09** (5.51 - 6.74)	**6.86** (6.17 - 7.65)	**7.87** (6.95 - 8.89)	**8.63** (7.49 - 9.87)	**9.34** (7.95 - 10.87)	**10.93** (8.80 - 13.29)
3	10	**4.54** (4.09 - 5.01)	**5.61** (5.04 - 6.23)	**6.50** (5.80 - 7.27)	**7.78** (6.86 - 8.83)	**8.79** (7.62 - 10.16)	**9.86** (8.38 - 11.63)	**12.55** (10.05 - 15.65)

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals (continued)

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
4	1	**3.61** (3.26 - 3.97)	**4.59** (4.14 - 5.09)	**5.43** (4.89 - 6.06)	**6.72** (6.01 - 7.59)	**7.73** (6.87 - 8.84)	**8.83** (7.78 - 10.25)	**11.53** (9.84 - 13.98)
4	2	**3.66** (3.31 - 4.02)	**4.71** (4.26 - 5.20)	**5.62** (5.06 - 6.24)	**6.99** (6.25 - 7.87)	**8.13** (7.21 - 9.26)	**9.28** (8.15 - 10.73)	**12.10** (10.33 - 14.56)
4	3	**3.76** (3.46 - 4.10)	**4.76** (4.36 - 5.19)	**5.62** (5.13 - 6.15)	**6.81** (6.17 - 7.52)	**7.72** (6.92 - 8.62)	**8.6** (7.63 - 9.73)	**10.58** (9.06 - 12.40)
4	4	**3.59** (3.26 - 3.94)	**4.61** (4.18 - 5.07)	**5.47** (4.96 - 6.04)	**6.65** (5.99 - 7.41)	**7.55** (6.77 - 8.48)	**8.40** (7.47 - 9.53)	**10.21** (8.86 - 11.92)
4	5	**3.54** (3.25 - 3.83)	**4.49** (4.12 - 4.89)	**5.32** (4.87 - 5.82)	**6.48** (5.90 - 7.14)	**7.38** (6.67 - 8.22)	**8.27** (7.41 - 9.32)	**10.26** (8.94 - 12.01)
4	6	**3.66** (3.35 - 4.01)	**4.61** (4.19 - 5.06)	**5.38** (4.88 - 5.94)	**6.48** (5.84 - 7.22)	**7.33** (6.55 - 8.24)	**8.11** (7.18 - 9.21)	**9.93** (8.53 - 11.62)
4	7	**3.92** (3.57 - 4.27)	**4.85** (4.41 - 5.30)	**5.61** (5.09 - 6.16)	**6.67** (6.02 - 7.39)	**7.46** (6.68 - 8.35)	**8.21** (7.28 - 9.28)	**9.76** (8.39 - 11.36)
4	8	**4.28** (3.88 - 4.73)	**5.29** (4.77 - 5.86)	**6.1** (5.46 - 6.81)	**7.25** (6.43 - 8.20)	**8.15** (7.14 - 9.34)	**9.08** (7.85 - 10.56)	**11.4** (9.42 - 13.79)
4	9	**4.64** (4.22 - 5.12)	**5.54** (5.02 - 6.15)	**6.27** (5.63 - 7.01)	**7.24** (6.42 - 8.22)	**7.94** (6.92 - 9.16)	**8.58** (7.34 - 10.07)	**10.06** (8.13 - 12.37)
4	10	**4.06** (3.66 - 4.45)	**5.02** (4.51 - 5.53)	**5.86** (5.22 - 6.50)	**7.04** (6.22 - 7.95)	**8.01** (6.98 - 9.20)	**9.02** (7.72 - 10.56)	**11.56** (9.38 - 14.33)

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals (continued)

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
5	1	**3.34** (3.00 - 3.69)	**4.22** (3.79 - 4.68)	**5.03** (4.50 - 5.61)	**6.20** (5.51 - 6.99)	**7.20** (6.34 - 8.21)	**8.25** (7.20 - 9.54)	**10.84** (9.16 - 13.00)
5	2	**3.34** (3.00 - 3.69)	**4.30** (3.85 - 4.77)	**5.15** (4.60 - 5.73)	**6.45** (5.71 - 7.26)	**7.50** (6.59 - 8.55)	**8.57** (7.46 - 9.93)	**11.24** (9.48 - 13.63)
5	3	**3.48** (3.19 - 3.79)	**4.45** (4.07 - 4.86)	**5.24** (4.79 - 5.74)	**6.38** (5.81 - 7.05)	**7.25** (6.56 - 8.09)	**8.06** (7.23 - 9.07)	**9.91** (8.61 - 11.47)
5	4	**3.32** (3.01 - 3.65)	**4.30** (3.89 - 4.74)	**5.10** (4.61 - 5.64)	**6.20** (5.58 - 6.91)	**7.05** (6.31 - 7.93)	**7.85** (6.99 - 8.92)	**9.53** (8.31 - 11.16)
5	5	**3.12** (2.86 - 3.38)	**3.97** (3.64 - 4.31)	**4.71** (4.30 - 5.15)	**5.78** (5.25 - 6.38)	**6.62** (5.97 - 7.39)	**7.43** (6.63 - 8.41)	**9.32** (8.08 - 10.96)
5	6	**3.23** (2.95 - 3.54)	**4.07** (3.71 - 4.47)	**4.76** (4.32 - 5.26)	**5.79** (5.21 - 6.45)	**6.56** (5.85 - 7.37)	**7.31** (6.45 - 8.30)	**9.04** (7.73 - 10.59)
5	7	**3.49** (3.18 - 3.80)	**4.33** (3.93 - 4.74)	**5.00** (4.53 - 5.50)	**5.98** (5.39 - 6.64)	**6.71** (6.00 - 7.54)	**7.40** (6.54 - 8.42)	**8.84** (7.58 - 10.44)
5	8	**3.69** (3.36 - 4.04)	**4.56** (4.15 - 5.01)	**5.27** (4.78 - 5.82)	**6.3** (5.67 - 7.03)	**7.14** (6.37 - 8.03)	**7.96** (7.03 - 9.05)	**10.06** (8.60 - 11.78)
5	9	**4.07** (3.71 - 4.44)	**4.89** (4.45 - 5.35)	**5.55** (5.03 - 6.10)	**6.42** (5.79 - 7.12)	**7.06** (6.32 - 7.91)	**7.68** (6.80 - 8.70)	**8.99** (7.73 - 10.51)
5	10	**3.63** (3.29 - 4.00)	**4.52** (4.08 - 5.01)	**5.28** (4.73 - 5.88)	**6.38** (5.66 - 7.21)	**7.29** (6.36 - 8.36)	**8.23** (7.07 - 9.59)	**10.57** (8.67 - 13.03)

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals (continued)

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
6	1	**3.14** (2.82 - 3.47)	**3.97** (3.56 - 4.40)	**4.73** (4.23 - 5.28)	**5.83** (5.18 - 6.57)	**6.77** (5.96 - 7.71)	**7.75** (6.77 - 8.96)	**10.19** (8.61 - 12.22)
6	2	**3.14** (2.82 - 3.47)	**4.04** (3.62 - 4.48)	**4.84** (4.32 - 5.39)	**6.06** (5.37 - 6.82)	**7.05** (6.19 - 8.03)	**8.06** (7.01 - 9.33)	**10.57** (8.91 - 12.81)
6	3	**3.27** (3.00 - 3.57)	**4.18** (3.83 - 4.57)	**4.93** (4.50 - 5.40)	**6.00** (5.46 - 6.62)	**6.82** (6.16 - 7.60)	**7.58** (6.80 - 8.53)	**9.32** (8.09 - 10.78)
6	4	**3.12** (2.83 - 3.43)	**4.04** (3.66 - 4.46)	**4.79** (4.34 - 5.31)	**5.83** (5.24 - 6.50)	**6.63** (5.93 - 7.46)	**7.38** (6.57 - 8.39)	**8.96** (7.81 - 10.49)
6	5	**2.93** (2.69 - 3.18)	**3.73** (3.42 - 4.06)	**4.43** (4.04 - 4.84)	**5.43** (4.94 - 6.00)	**6.22** (5.61 - 6.94)	**6.98** (6.23 - 7.90)	**8.76** (7.59 - 10.30)
6	6	**3.04** (2.77 - 3.32)	**3.83** (3.48 - 4.20)	**4.47** (4.06 - 4.94)	**5.44** (4.90 - 6.06)	**6.17** (5.50 - 6.93)	**6.87** (6.06 - 7.81)	**8.50** (7.26 - 9.95)
6	7	**3.28** (2.99 - 3.57)	**4.07** (3.70 - 4.45)	**4.70** (4.26 - 5.17)	**5.62** (5.07 - 6.25)	**6.31** (5.64 - 7.09)	**6.96** (6.15 - 7.91)	**8.31** (7.13 - 9.81)
6	8	**3.47** (3.16 - 3.80)	**4.29** (3.90 - 4.71)	**4.95** (4.49 - 5.47)	**5.92** (5.33 - 6.60)	**6.71** (5.99 - 7.55)	**7.48** (6.61 - 8.51)	**9.45** (8.08 - 11.07)
6	9	**3.83** (3.49 - 4.17)	**4.6** (4.19 - 5.03)	**5.22** (4.73 - 5.74)	**6.03** (5.44 - 6.70)	**6.64** (5.94 - 7.43)	**7.22** (6.39 - 8.18)	**8.45** (7.26 - 9.88)
6	10	**3.41** (3.10 - 3.76)	**4.25** (3.83 - 4.71)	**4.96** (4.45 - 5.53)	**6** (5.32 - 6.78)	**6.85** (5.98 - 7.86)	**7.73** (6.64 - 9.02)	**9.93** (8.15 - 12.25)

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals (continued)

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
7	1	**2.91** (2.61 - 3.21)	**3.67** (3.29 - 4.07)	**4.38** (3.92 - 4.88)	**5.40** (4.80 - 6.08)	**6.26** (5.52 - 7.14)	**7.18** (6.26 - 8.30)	**9.43** (7.97 - 11.31)
7	2	**2.91** (2.61 - 3.21)	**3.74** (3.35 - 4.15)	**4.48** (4.00 - 4.99)	**5.61** (4.97 - 6.32)	**6.53** (5.73 - 7.44)	**7.46** (6.49 - 8.64)	**9.78** (8.25 - 11.86)
7	3	**3.03** (2.78 - 3.30)	**3.87** (3.54 - 4.23)	**4.56** (4.17 - 5.00)	**5.55** (5.05 - 6.13)	**6.31** (5.70 - 7.03)	**7.01** (6.29 - 7.89)	**8.62** (7.49 - 9.98)
7	4	**2.89** (2.62 - 3.18)	**3.74** (3.39 - 4.13)	**4.44** (4.01 - 4.91)	**5.39** (4.85 - 6.01)	**6.13** (5.49 - 6.90)	**6.83** (6.08 - 7.76)	**8.29** (7.23 - 9.71)
7	5	**2.71** (2.49 - 2.94)	**3.45** (3.16 - 3.75)	**4.10** (3.74 - 4.48)	**5.03** (4.57 - 5.55)	**5.76** (5.19 - 6.43)	**6.46** (5.77 - 7.32)	**8.11** (7.03 - 9.53)
7	6	**2.81** (2.56 - 3.08)	**3.54** (3.23 - 3.89)	**4.14** (3.76 - 4.57)	**5.04** (4.53 - 5.61)	**5.71** (5.09 - 6.41)	**6.36** (5.61 - 7.23)	**7.86** (6.72 - 9.21)
7	7	**3.04** (2.76 - 3.31)	**3.77** (3.42 - 4.12)	**4.35** (3.94 - 4.79)	**5.2** (4.69 - 5.78)	**5.84** (5.22 - 6.56)	**6.44** (5.69 - 7.32)	**7.69** (6.60 - 9.08)
7	8	**3.21** (2.93 - 3.51)	**3.97** (3.61 - 4.36)	**4.58** (4.16 - 5.06)	**5.48** (4.93 - 6.11)	**6.21** (5.54 - 6.99)	**6.93** (6.11 - 7.88)	**8.75** (7.48 - 10.25)
7	9	**3.54** (3.23 - 3.86)	**4.25** (3.87 - 4.66)	**4.83** (4.38 - 5.31)	**5.59** (5.03 - 6.20)	**6.14** (5.50 - 6.88)	**6.69** (5.91 - 7.57)	**7.82** (6.72 - 9.14)
7	10	**3.16** (2.86 - 3.48)	**3.93** (3.55 - 4.36)	**4.59** (4.12 - 5.12)	**5.55** (4.92 - 6.27)	**6.34** (5.54 - 7.27)	**7.16** (6.15 - 8.35)	**9.19** (7.55 - 11.34)

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals (continued)

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
8	1	**2.51** (2.25 - 2.77)	**3.17** (2.84 - 3.51)	**3.77** (3.38 - 4.21)	**4.65** (4.14 - 5.24)	**5.4** (4.76 - 6.15)	**6.19** (5.40 - 7.15)	**8.13** (6.87 - 9.75)
8	2	**2.51** (2.25 - 2.77)	**3.23** (2.89 - 3.57)	**3.86** (3.45 - 4.30)	**4.84** (4.28 - 5.45)	**5.63** (4.94 - 6.41)	**6.43** (5.60 - 7.44)	**8.43** (7.11 - 10.22)
8	3	**2.61** (2.39 - 2.85)	**3.34** (3.06 - 3.65)	**3.93** (3.59 - 4.31)	**4.79** (4.36 - 5.29)	**5.44** (4.92 - 6.06)	**6.05** (5.42 - 6.81)	**7.43** (6.46 - 8.60)
8	4	**2.49** (2.26 - 2.74)	**3.23** (2.92 - 3.56)	**3.83** (3.46 - 4.23)	**4.65** (4.18 - 5.18)	**5.29** (4.74 - 5.95)	**5.89** (5.24 - 6.69)	**7.15** (6.23 - 8.37)
8	5	**2.34** (2.15 - 2.54)	**2.98** (2.73 - 3.24)	**3.53** (3.23 - 3.86)	**4.34** (3.94 - 4.78)	**4.97** (4.47 - 5.54)	**5.57** (4.97 - 6.31)	**6.99** (6.06 - 8.22)
8	6	**2.42** (2.21 - 2.65)	**3.05** (2.78 - 3.35)	**3.57** (3.24 - 3.94)	**4.34** (3.91 - 4.83)	**4.92** (4.39 - 5.53)	**5.48** (4.84 - 6.23)	**6.78** (5.80 - 7.94)
8	7	**2.62** (2.38 - 2.85)	**3.25** (2.95 - 3.55)	**3.75** (3.40 - 4.13)	**4.49** (4.04 - 4.98)	**5.03** (4.50 - 5.66)	**5.55** (4.91 - 6.31)	**6.63** (5.69 - 7.83)
8	8	**2.77** (2.52 - 3.03)	**3.42** (3.11 - 3.76)	**3.95** (3.59 - 4.37)	**4.73** (4.25 - 5.27)	**5.36** (4.78 - 6.02)	**5.97** (5.27 - 6.79)	**7.54** (6.45 - 8.83)
8	9	**3.05** (2.78 - 3.33)	**3.67** (3.34 - 4.02)	**4.16** (3.78 - 4.58)	**4.82** (4.34 - 5.34)	**5.3** (4.74 - 5.93)	**5.76** (5.10 - 6.53)	**6.74** (5.79 - 7.88)
8	10	**2.72** (2.47 - 3.00)	**3.39** (3.06 - 3.76)	**3.96** (3.55 - 4.41)	**4.79** (4.24 - 5.41)	**5.47** (4.77 - 6.27)	**6.17** (5.30 - 7.20)	**7.92** (6.51 - 9.77)

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals (continued)

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
9	1	**2.14** (1.92 - 2.36)	**2.7** (2.42 - 3.00)	**3.22** (2.88 - 3.59)	**3.97** (3.53 - 4.48)	**4.61** (4.06 - 5.25)	**5.28** (4.61 - 6.10)	**6.94** (5.86 - 8.32)
9	2	**2.14** (1.92 - 2.36)	**2.75** (2.46 - 3.05)	**3.30** (2.94 - 3.67)	**4.13** (3.66 - 4.65)	**4.80** (4.22 - 5.47)	**5.49** (4.78 - 6.35)	**7.20** (6.07 - 8.72)
9	3	**2.23** (2.04 - 2.43)	**2.85** (2.61 - 3.11)	**3.35** (3.07 - 3.68)	**4.08** (3.72 - 4.51)	**4.64** (4.20 - 5.17)	**5.16** (4.63 - 5.81)	**6.34** (5.51 - 7.34)
9	4	**2.12** (1.93 - 2.34)	**2.75** (2.49 - 3.04)	**3.26** (2.95 - 3.61)	**3.97** (3.57 - 4.42)	**4.51** (4.04 - 5.08)	**5.02** (4.47 - 5.71)	**6.1** (5.32 - 7.14)
9	5	**2.00** (1.83 - 2.16)	**2.54** (2.33 - 2.76)	**3.01** (2.75 - 3.29)	**3.70** (3.36 - 4.08)	**4.24** (3.82 - 4.73)	**4.76** (4.24 - 5.38)	**5.97** (5.17 - 7.01)
9	6	**2.07** (1.89 - 2.26)	**2.60** (2.37 - 2.86)	**3.05** (2.76 - 3.36)	**3.71** (3.33 - 4.12)	**4.20** (3.74 - 4.72)	**4.68** (4.13 - 5.32)	**5.79** (4.95 - 6.78)
9	7	**2.23** (2.03 - 2.43)	**2.77** (2.52 - 3.03)	**3.20** (2.90 - 3.52)	**3.83** (3.45 - 4.25)	**4.29** (3.84 - 4.83)	**4.74** (4.19 - 5.39)	**5.66** (4.85 - 6.68)
9	8	**2.36** (2.15 - 2.58)	**2.92** (2.65 - 3.21)	**3.37** (3.06 - 3.73)	**4.03** (3.63 - 4.50)	**4.57** (4.08 - 5.14)	**5.09** (4.50 - 5.79)	**6.44** (5.50 - 7.54)
9	9	**2.60** (2.38 - 2.84)	**3.13** (2.85 - 3.43)	**3.55** (3.22 - 3.91)	**4.11** (3.70 - 4.56)	**4.52** (4.04 - 5.06)	**4.92** (4.35 - 5.57)	**5.75** (4.95 - 6.73)
9	10	**2.32** (2.11 - 2.56)	**2.89** (2.61 - 3.21)	**3.38** (3.03 - 3.77)	**4.09** (3.62 - 4.62)	**4.66** (4.07 - 5.35)	**5.26** (4.52 - 6.14)	**6.76** (5.55 - 8.34)

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals (continued)

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
10	1	**1.94** (1.74 - 2.14)	**2.45** (2.20 - 2.72)	**2.92** (2.61 - 3.26)	**3.60** (3.20 - 4.06)	**4.17** (3.68 - 4.76)	**4.78** (4.17 - 5.53)	**6.29** (5.31 - 7.54)
10	2	**1.94** (1.74 - 2.14)	**2.49** (2.23 - 2.76)	**2.99** (2.67 - 3.32)	**3.74** (3.31 - 4.21)	**4.35** (3.82 - 4.96)	**4.97** (4.33 - 5.76)	**6.52** (5.50 - 7.90)
10	3	**2.02** (1.85 - 2.20)	**2.58** (2.36 - 2.82)	**3.04** (2.78 - 3.33)	**3.70** (3.37 - 4.09)	**4.21** (3.80 - 4.69)	**4.67** (4.19 - 5.26)	**5.75** (4.99 - 6.65)
10	4	**1.93** (1.74 - 2.12)	**2.49** (2.26 - 2.75)	**2.96** (2.68 - 3.27)	**3.60** (3.24 - 4.01)	**4.09** (3.66 - 4.60)	**4.55** (4.05 - 5.17)	**5.53** (4.82 - 6.47)
10	5	**1.81** (1.66 - 1.96)	**2.30** (2.11 - 2.50)	**2.73** (2.50 - 2.99)	**3.35** (3.05 - 3.70)	**3.84** (3.46 - 4.29)	**4.31** (3.85 - 4.88)	**5.41** (4.69 - 6.35)
10	6	**1.87** (1.71 - 2.05)	**2.36** (2.15 - 2.59)	**2.76** (2.50 - 3.05)	**3.36** (3.02 - 3.74)	**3.80** (3.39 - 4.28)	**4.24** (3.74 - 4.82)	**5.24** (4.48 - 6.14)
10	7	**2.02** (1.84 - 2.21)	**2.51** (2.28 - 2.75)	**2.90** (2.63 - 3.19)	**3.47** (3.13 - 3.85)	**3.89** (3.48 - 4.37)	**4.29** (3.79 - 4.88)	**5.13** (4.40 - 6.05)
10	8	**2.14** (1.95 - 2.34)	**2.64** (2.41 - 2.91)	**3.06** (2.77 - 3.38)	**3.65** (3.29 - 4.08)	**4.14** (3.69 - 4.66)	**4.62** (4.08 - 5.25)	**5.83** (4.99 - 6.83)
10	9	**2.36** (2.15 - 2.58)	**2.84** (2.58 - 3.11)	**3.22** (2.92 - 3.54)	**3.72** (3.36 - 4.13)	**4.09** (3.66 - 4.59)	**4.46** (3.94 - 5.05)	**5.21** (4.48 - 6.10)
10	10	**2.1** (1.91 - 2.32)	**2.62** (2.37 - 2.91)	**3.06** (2.74 - 3.41)	**3.7** (3.28 - 4.18)	**4.23** (3.69 - 4.85)	**4.77** (4.10 - 5.56)	**6.13** (5.03 - 7.56)

Table 6 Precipitation Frequency Estimates (in inches) with 90% Confidence Intervals (continued)

Storm Code	Section Code	Recurrence interval						
		2-year	5-year	10-year	25-year	50-year	100-year	500-year
11	1	**1.57** (1.41 - 1.74)	**1.98** (1.78 - 2.20)	**2.36** (2.12 - 2.64)	**2.92** (2.59 - 3.29)	**3.38** (2.98 - 3.86)	**3.88** (3.38 - 4.48)	**5.09** (4.30 - 6.11)
11	2	**1.57** (1.41 - 1.73)	**2.02** (1.81 - 2.24)	**2.42** (2.16 - 2.69)	**3.03** (2.69 - 3.41)	**3.53** (3.10 - 4.02)	**4.03** (3.51 - 4.67)	**5.28** (4.46 - 6.40)
11	3	**1.64** (1.50 - 1.78)	**2.09** (1.91 - 2.29)	**2.46** (2.25 - 2.70)	**3.00** (2.73 - 3.31)	**3.41** (3.08 - 3.80)	**3.79** (3.40 - 4.26)	**4.66** (4.05 - 5.39)
11	4	**1.56** (1.41 - 1.72)	**2.02** (1.83 - 2.23)	**2.4** (2.17 - 2.65)	**2.91** (2.62 - 3.25)	**3.31** (2.97 - 3.73)	**3.69** (3.28 - 4.19)	**4.48** (3.91 - 5.24)
11	5	**1.47** (1.35 - 1.59)	**1.87** (1.71 - 2.03)	**2.21** (2.02 - 2.42)	**2.72** (2.47 - 3.00)	**3.11** (2.80 - 3.47)	**3.49** (3.12 - 3.95)	**4.38** (3.80 - 5.15)
11	6	**1.52** (1.38 - 1.66)	**1.91** (1.74 - 2.10)	**2.24** (2.03 - 2.47)	**2.72** (2.45 - 3.03)	**3.08** (2.75 - 3.46)	**3.44** (3.03 - 3.90)	**4.25** (3.63 - 4.98)
11	7	**1.64** (1.49 - 1.79)	**2.04** (1.85 - 2.23)	**2.35** (2.13 - 2.59)	**2.81** (2.53 - 3.12)	**3.15** (2.82 - 3.54)	**3.48** (3.07 - 3.96)	**4.15** (3.56 - 4.91)
11	8	**1.73** (1.58 - 1.90)	**2.14** (1.95 - 2.36)	**2.48** (2.25 - 2.74)	**2.96** (2.66 - 3.30)	**3.36** (2.99 - 3.77)	**3.74** (3.30 - 4.26)	**4.73** (4.04 - 5.54)
11	9	**1.91** (1.75 - 2.09)	**2.3** (2.09 - 2.52)	**2.61** (2.37 - 2.87)	**3.02** (2.72 - 3.35)	**3.32** (2.97 - 3.72)	**3.61** (3.19 - 4.09)	**4.23** (3.63 - 4.94)
11	10	**1.71** (1.55 - 1.88)	**2.12** (1.92 - 2.35)	**2.48** (2.22 - 2.77)	**3.00** (2.66 - 3.39)	**3.43** (2.99 - 3.93)	**3.87** (3.32 - 4.51)	**4.97** (4.08 - 6.13)

Comparisons with Existing Sources

The frequency analysis in this study was compared with Bulletin 70 (Huff and Angel, 1989) and NOAA Atlas 14 (Bonnin et al., 2006). Study results were formatted similar to those of Bulletin 70, and the comparisons were made for each section, as shown in Figures 13–23. Similar comparisons with Atlas 14 were not possible, however, because Atlas 14 did not provide values for the sections defined in Bulletin 70. Instead, the frequency estimates for each county (represented by its centroid) in a section were averaged and compared with the results for the same section in this study, meaning that some additional uncertainty was introduced. Nonetheless, this comparison still provides usable information on general trends. The comparisons between the new frequency analyses (updated Bulletin 70) and Atlas 14 are presented in Figures 24–33.

Bulletin 70, NOAA Atlas 14, and this study have numerous differences, such as the selection of gages, periods of record, data processing, methods used for frequency analysis, and methods for trend adjustment. Despite these differences, comparisons made with the existing studies (spanning 30 years) still provide a general idea about the changes in precipitation frequency with time.

Final Remarks

This study used updated data through 2017 and techniques (L-Moments) to provide an update to the original Bulletin 70, published in 1989. Compared with the original Bulletin 70 (Huff and Angel, 1989), the results of this study generally show increasing precipitation amounts at selected frequencies for most of the sections with some relatively smaller decreases in the southern and western sections of Illinois. The present study shows consistent increases compared with NOAA Atlas 14 (Bonnin et al., 2006) and better reflects the current risk of heavier precipitation events.

The changing climate of heavy precipitation observed in Illinois and the Midwest presents a significant challenge for storm water management. The observed increases noted in this report, along with the expectation of continued increases over the 21st Century (Easterling et al. 2017), will necessitate more frequent assessments of precipitation frequency, as suggested by Winters et al. (2015). To help plan for future climate change, this analysis, representing the present time, should be accompanied with frequency analysis of climate model-generated data for future time horizons (Markus et al., 2017, 2018).

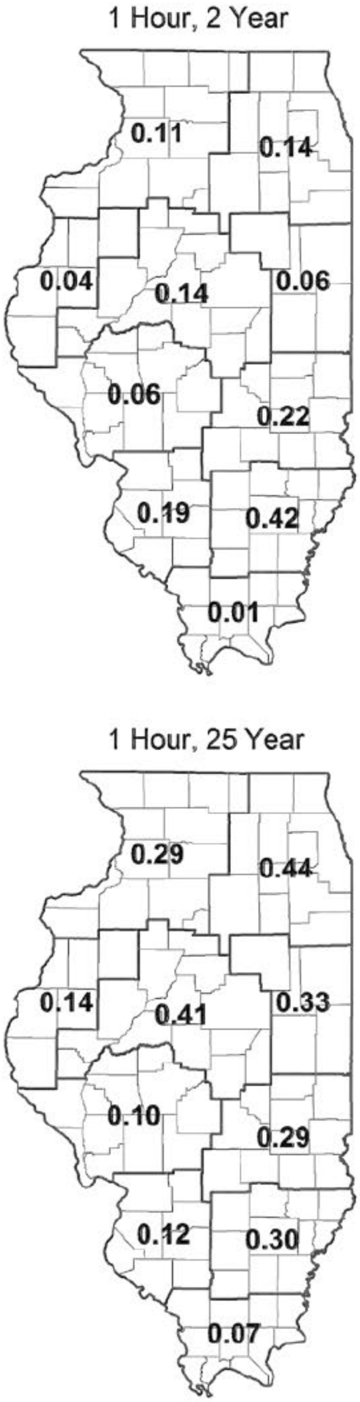


Figure 13 Differences in inches between this study and Bulletin 70 for a 1-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

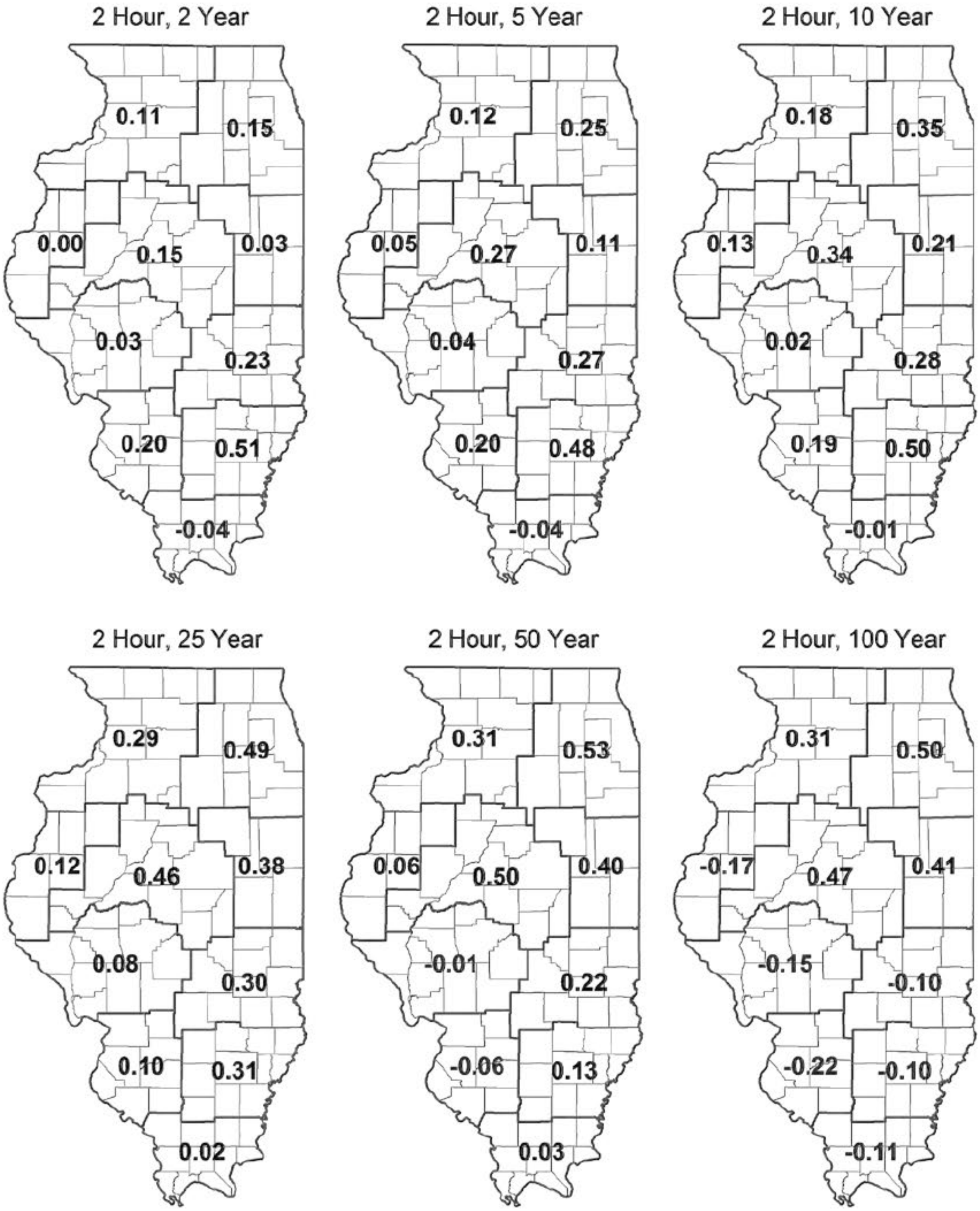


Figure 14 Differences in inches between this study and Bulletin 70 for a 2-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

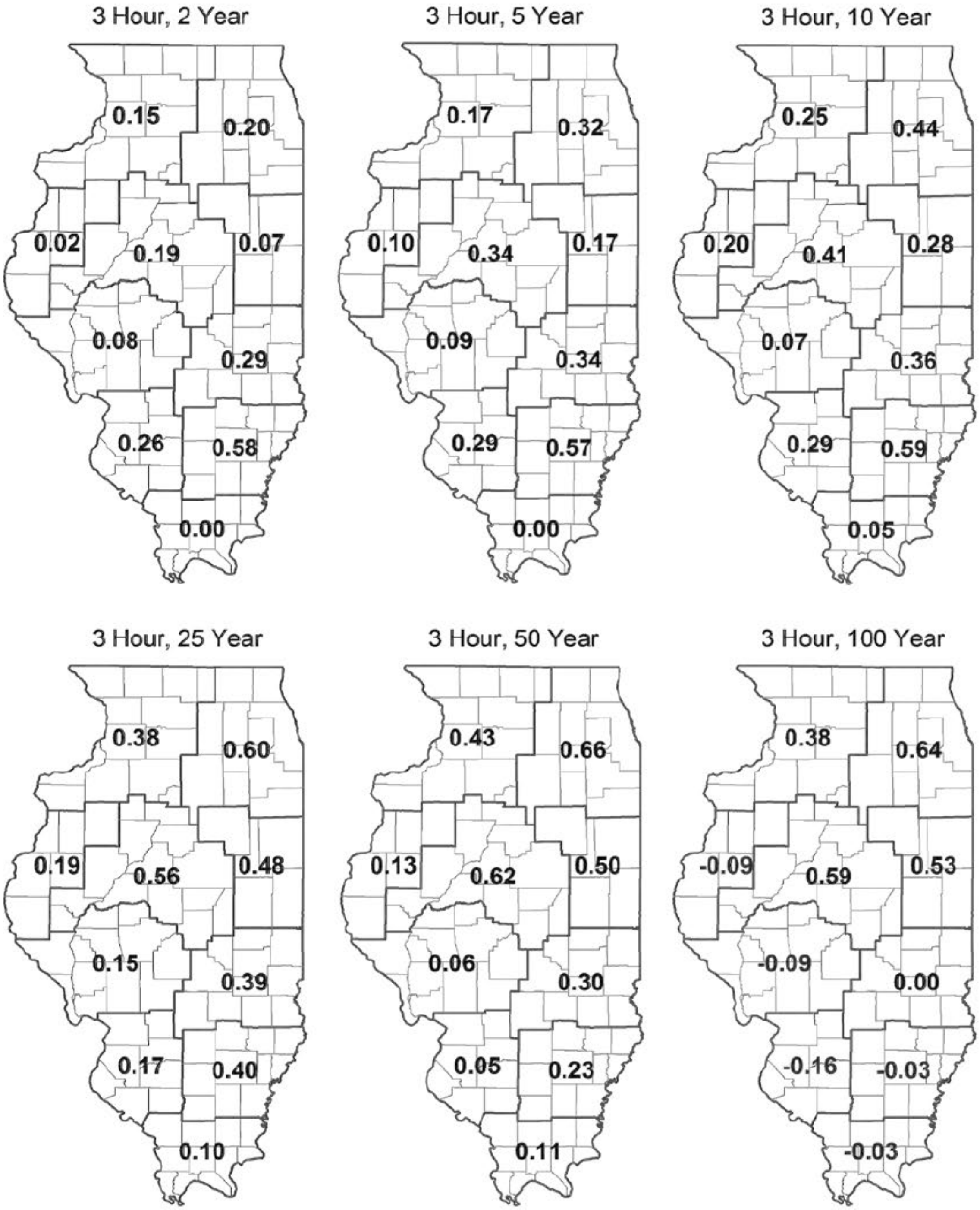


Figure 15 Differences in inches between this study and Bulletin 70 for a 3-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

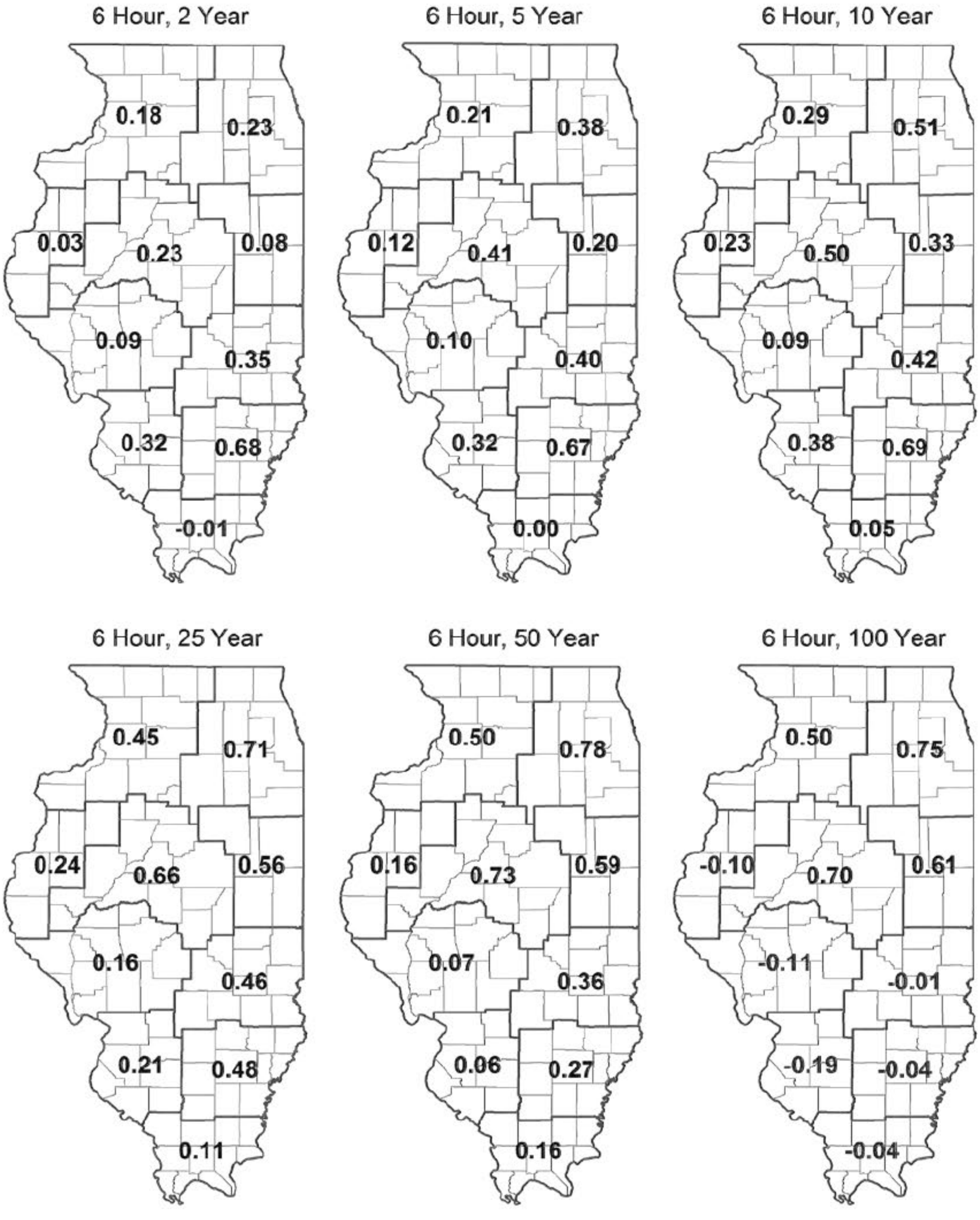


Figure 16 Differences in inches between this study and Bulletin 70 for a 6-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

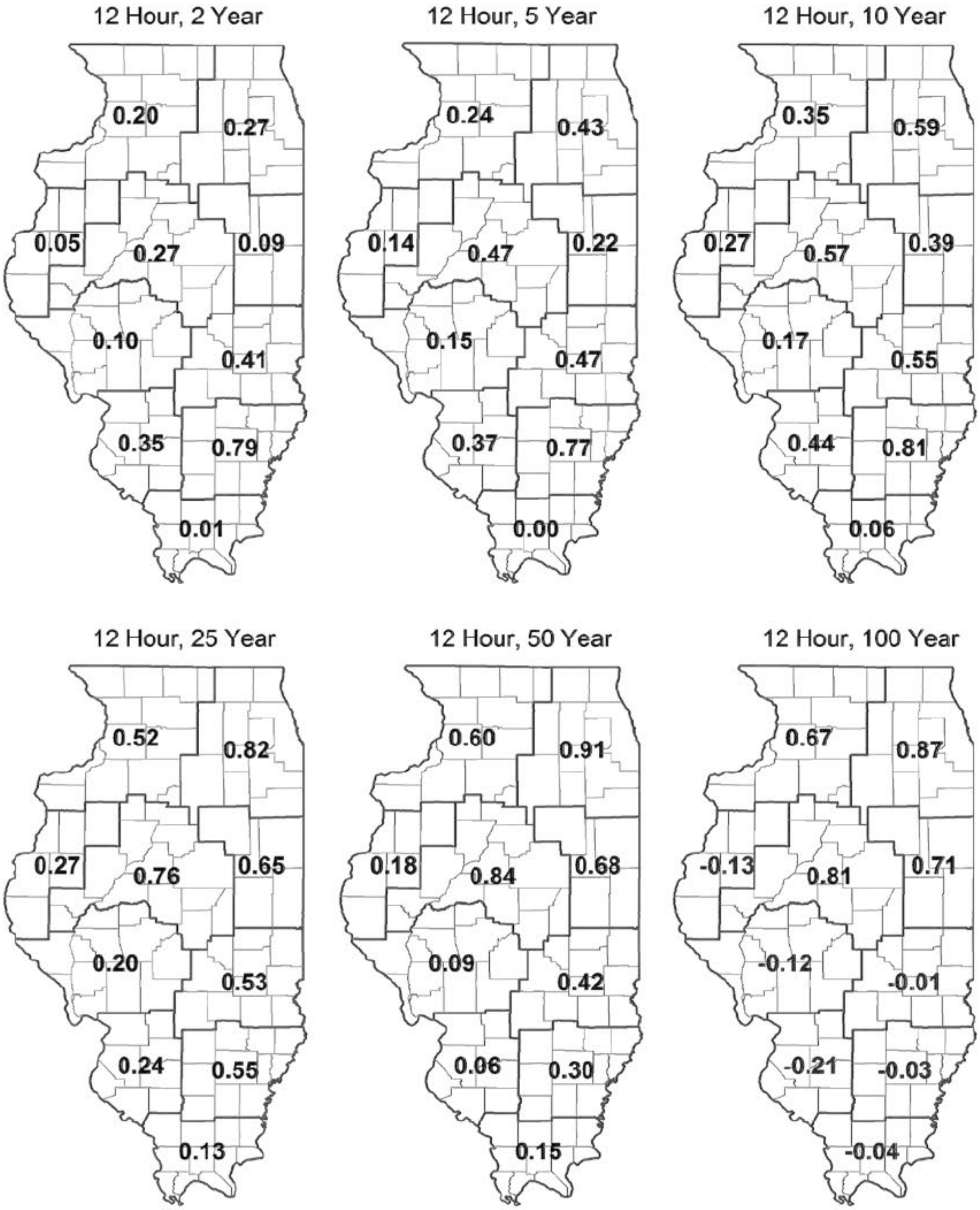


Figure 17 Differences in inches between this study and Bulletin 70 for a 12-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

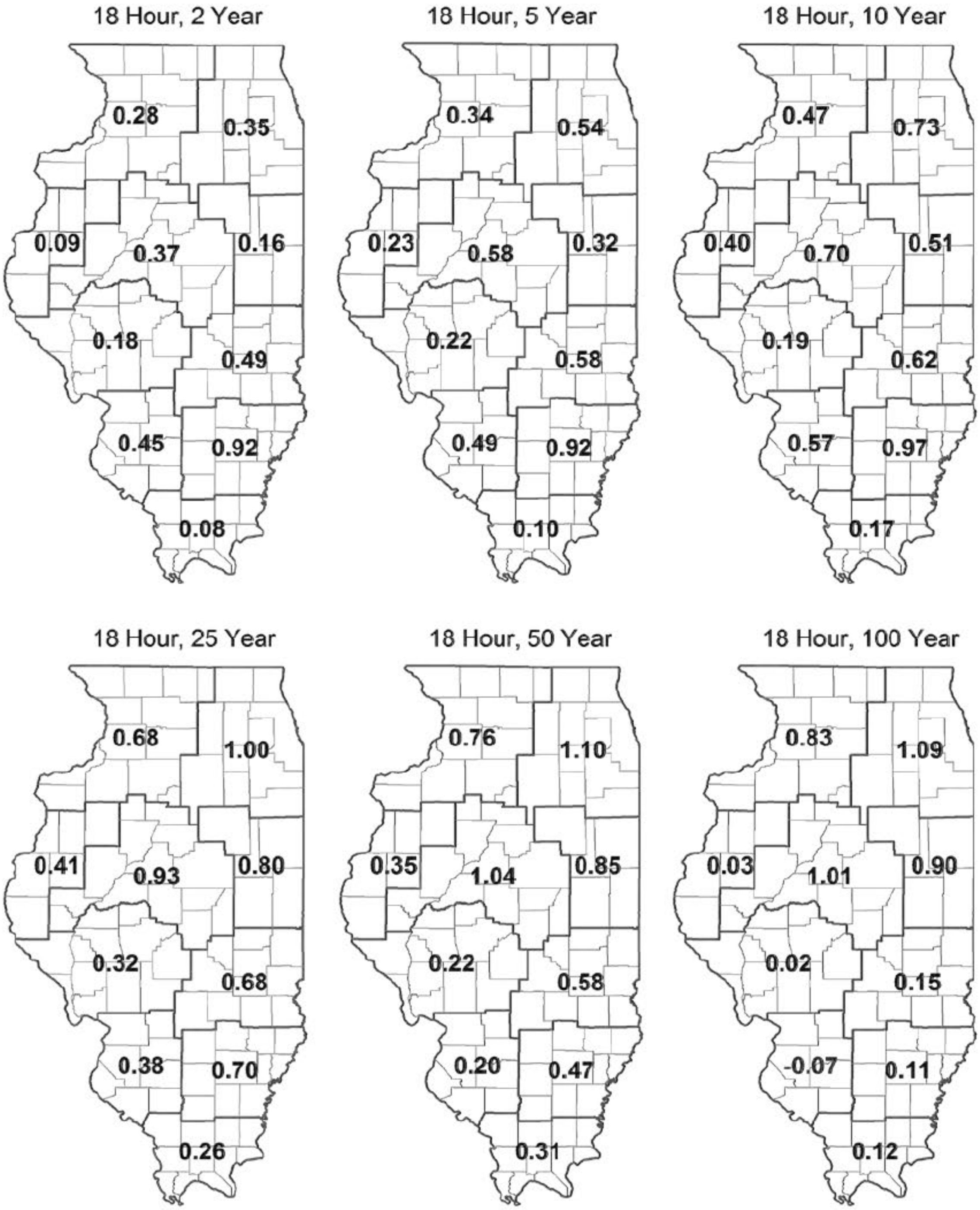


Figure 18 Differences in inches between this study and Bulletin 70 for an 18-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

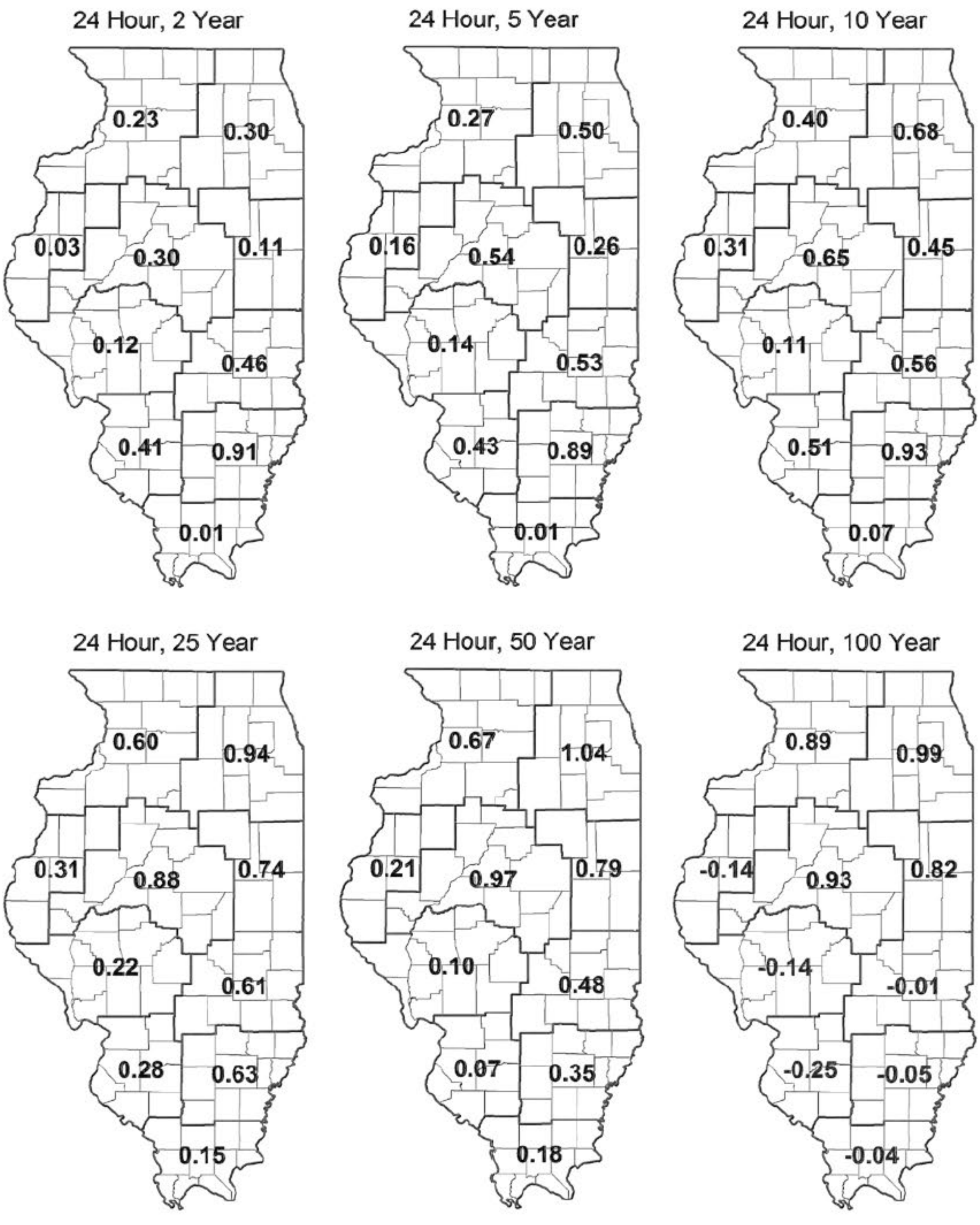


Figure 19 Differences in inches between this study and Bulletin 70 for a 24-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

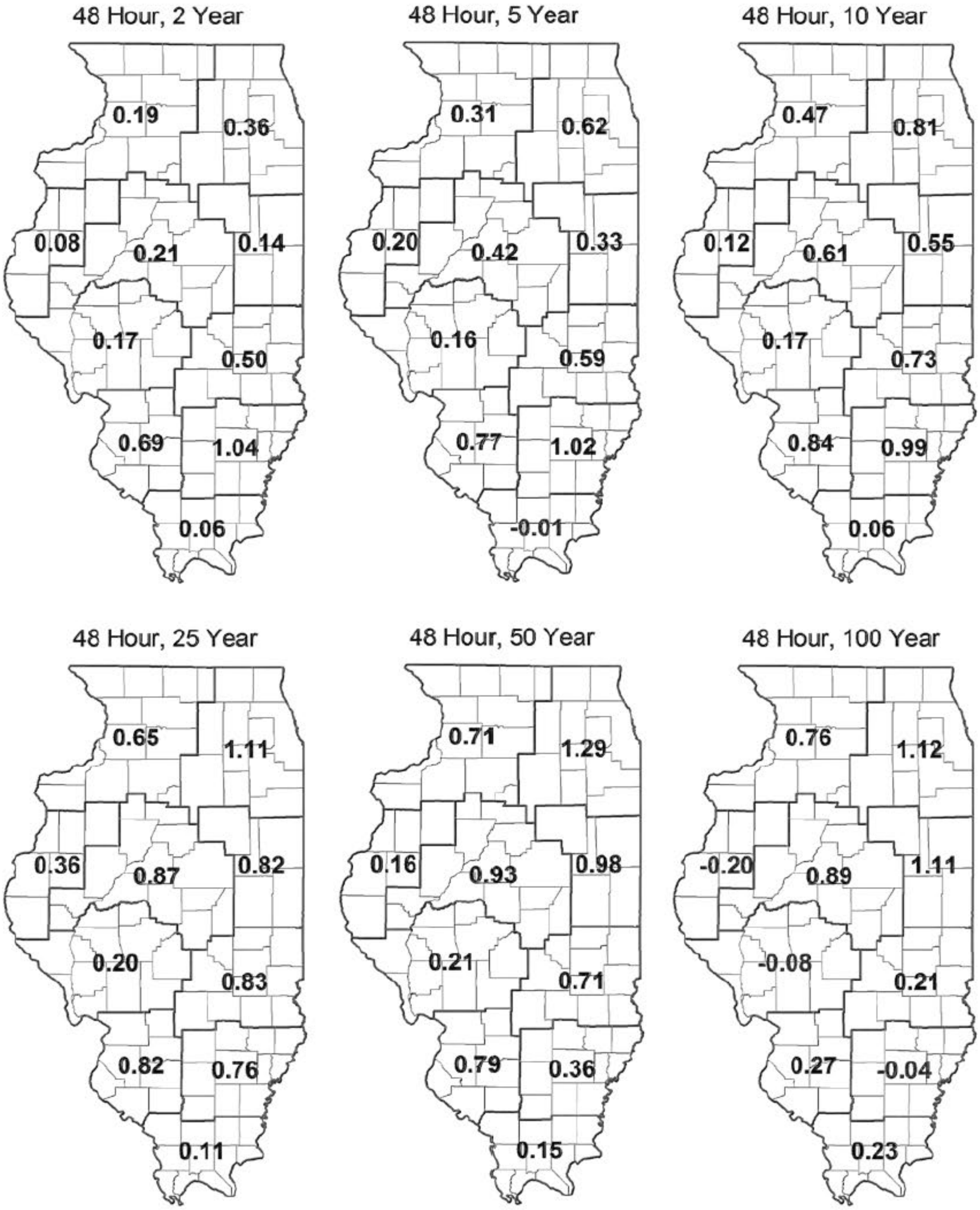


Figure 20 Differences in inches between this study and Bulletin 70 for a 48-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

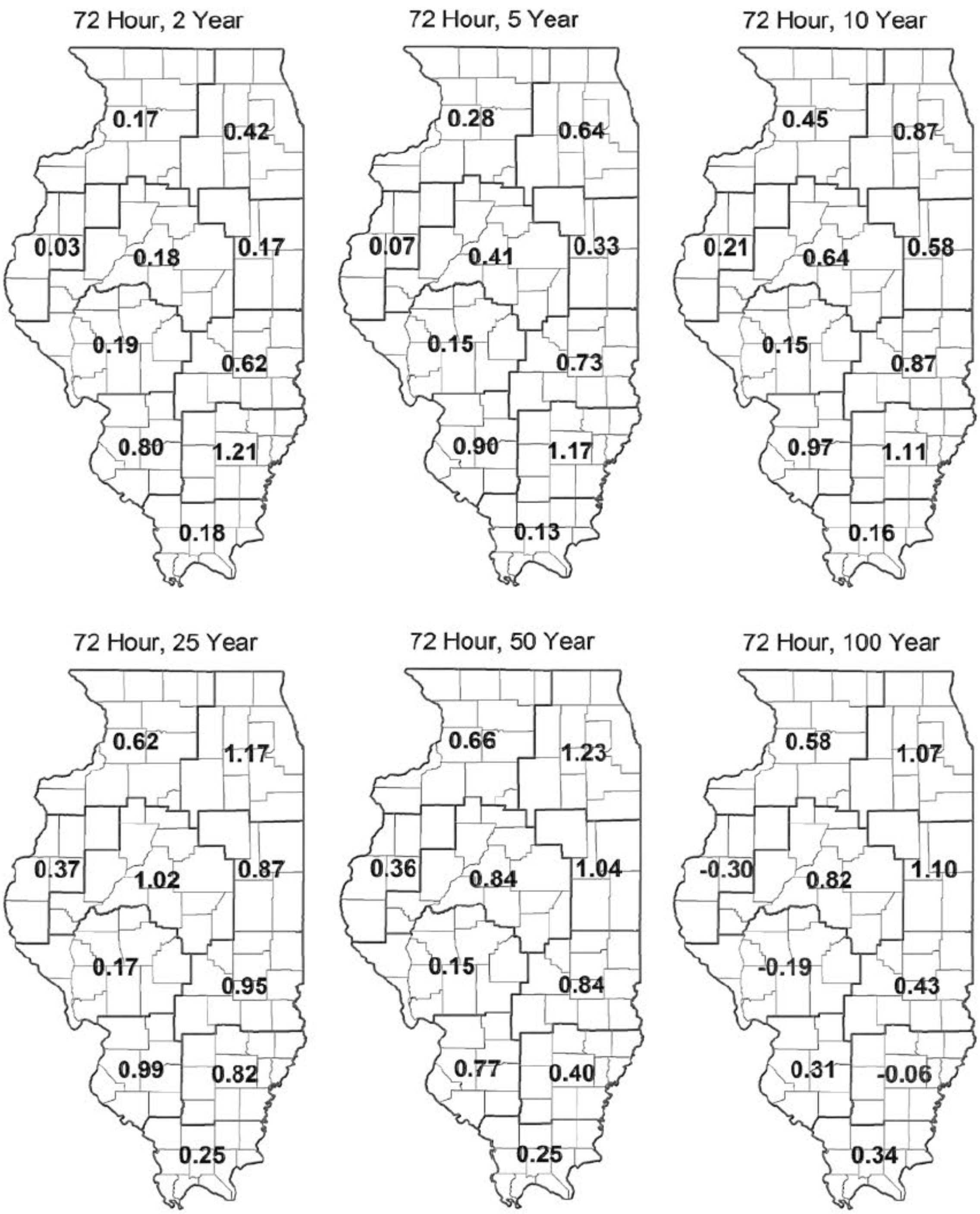


Figure 21 Differences in inches between this study and Bulletin 70 for a 72-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

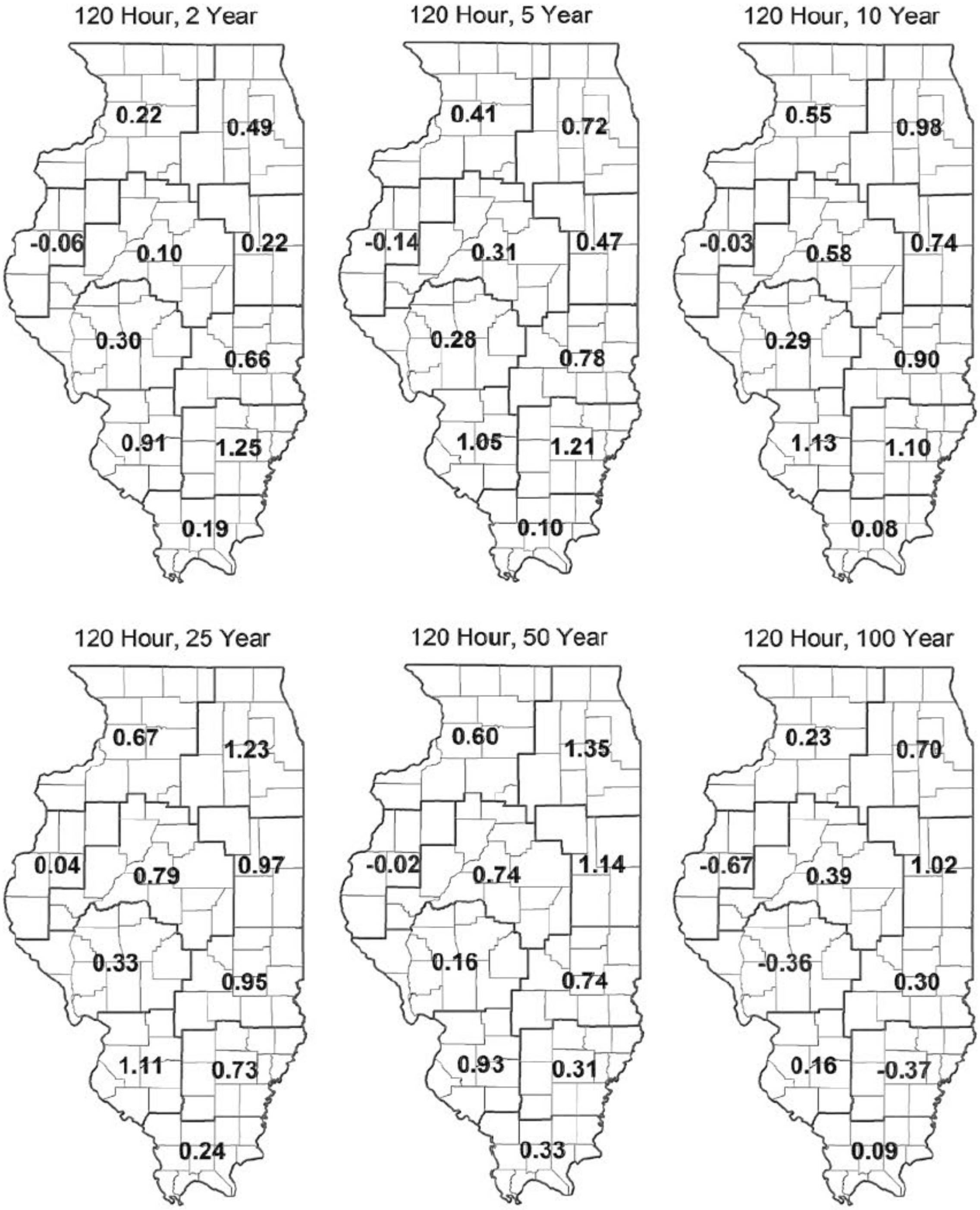


Figure 22 Differences in inches between this study and Bulletin 70 for a 120-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

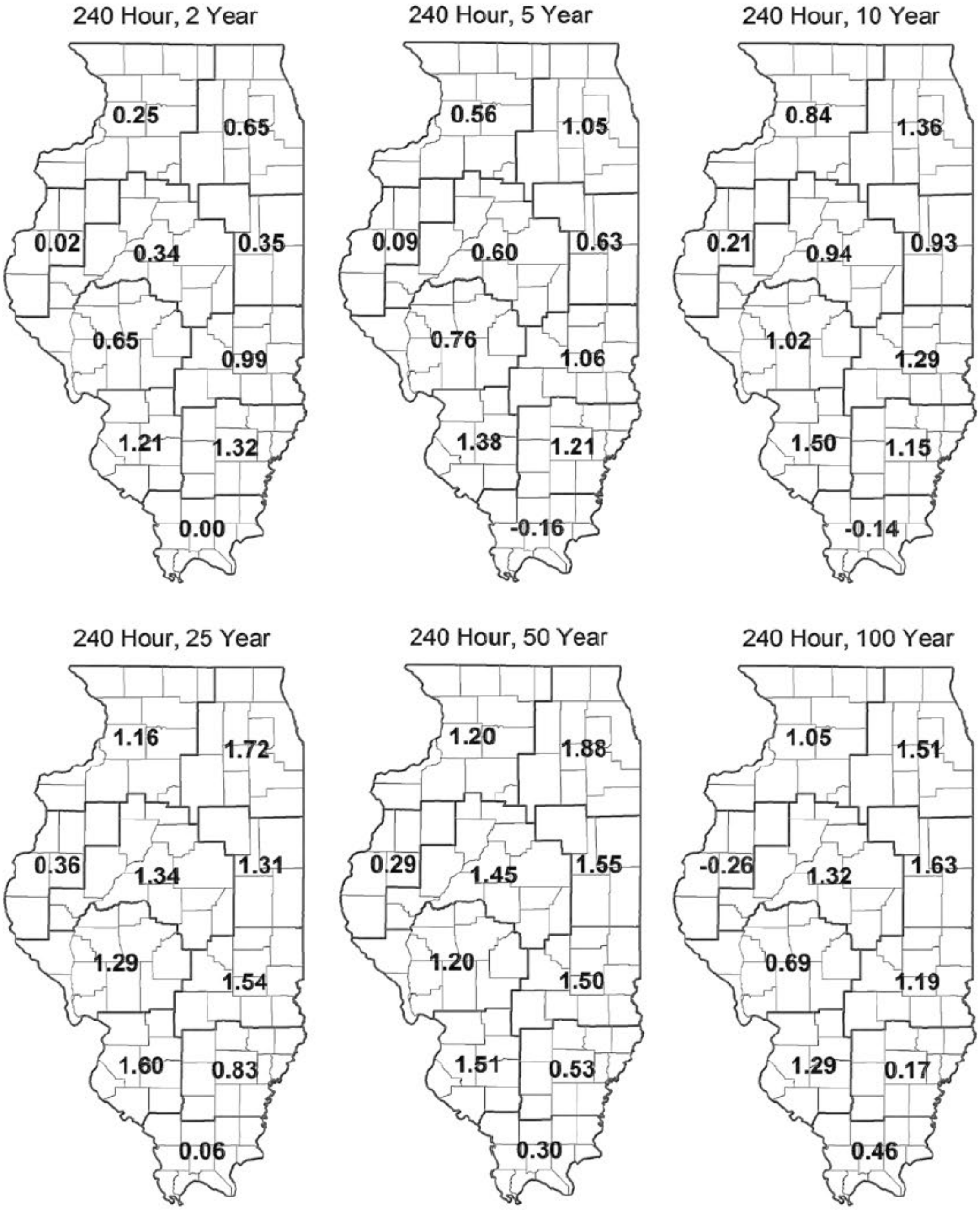


Figure 23 Differences in inches between this study and Bulletin 70 for a 240-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Bulletin 70.

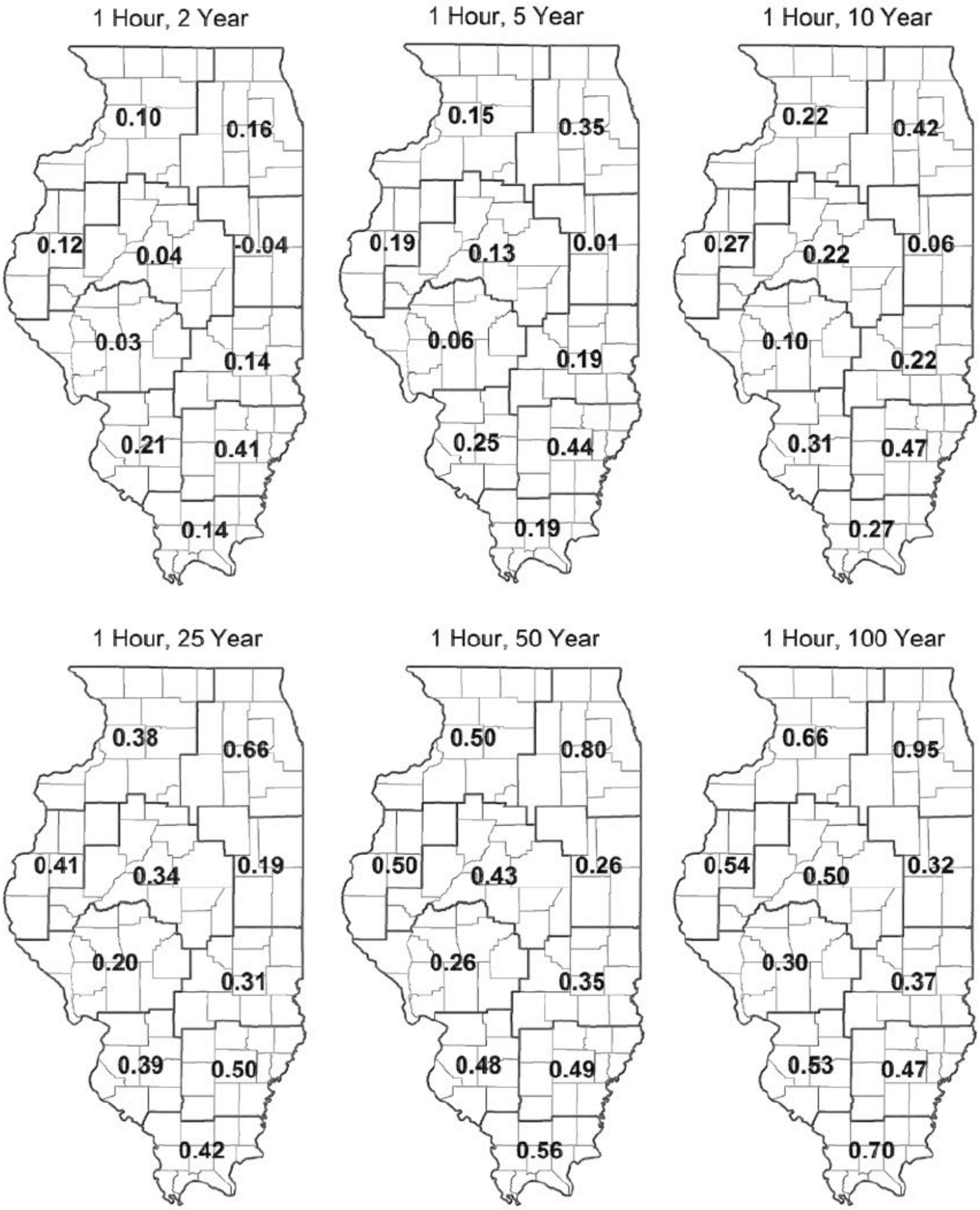


Figure 24 Differences in inches between this study and NOAA Atlas 14 for a 1-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14.

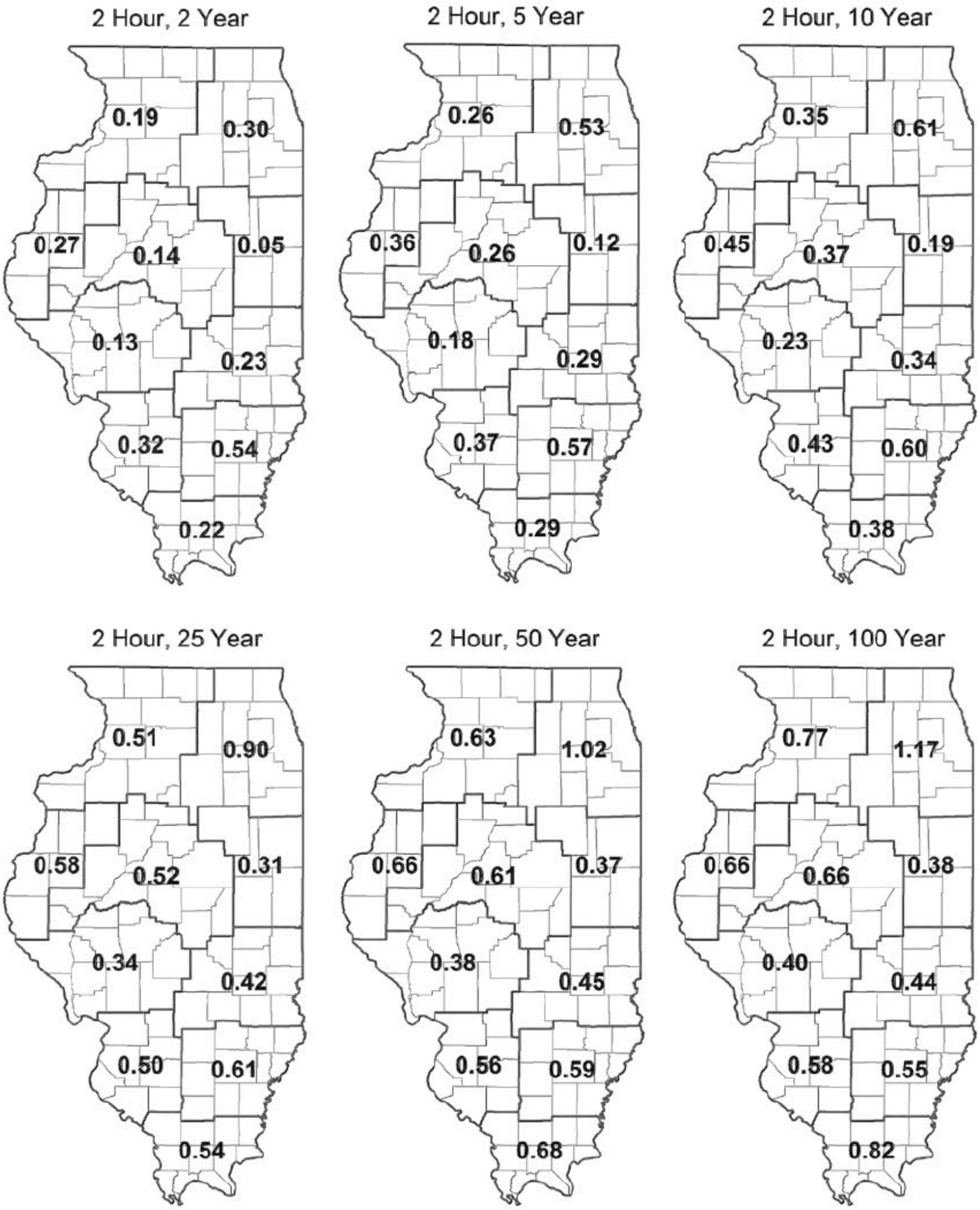


Figure 25 Differences in inches between this study and NOAA Atlas 14 for a 2-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14.

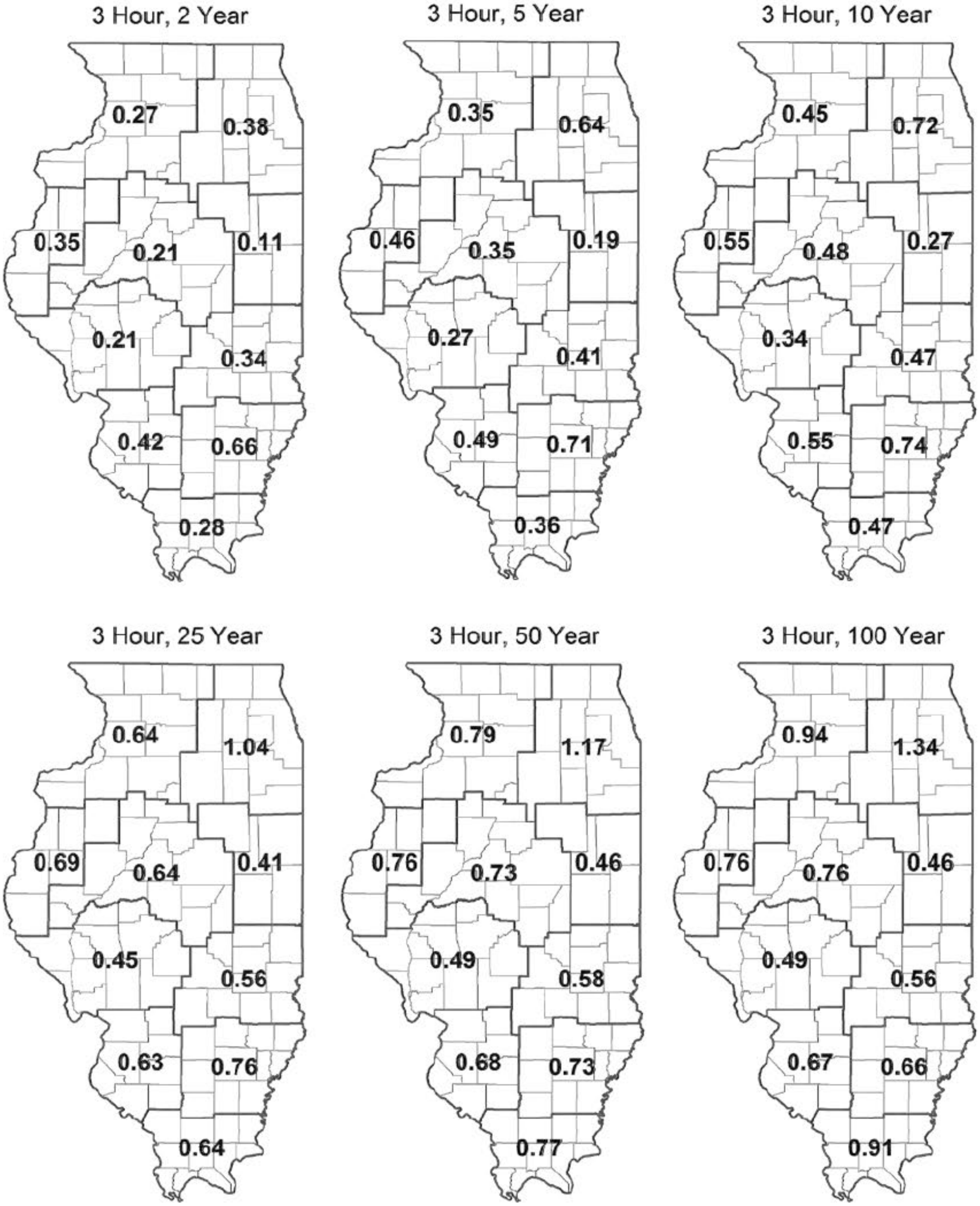


Figure 26 Differences in inches between this study and NOAA Atlas 14 for a 3-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14.

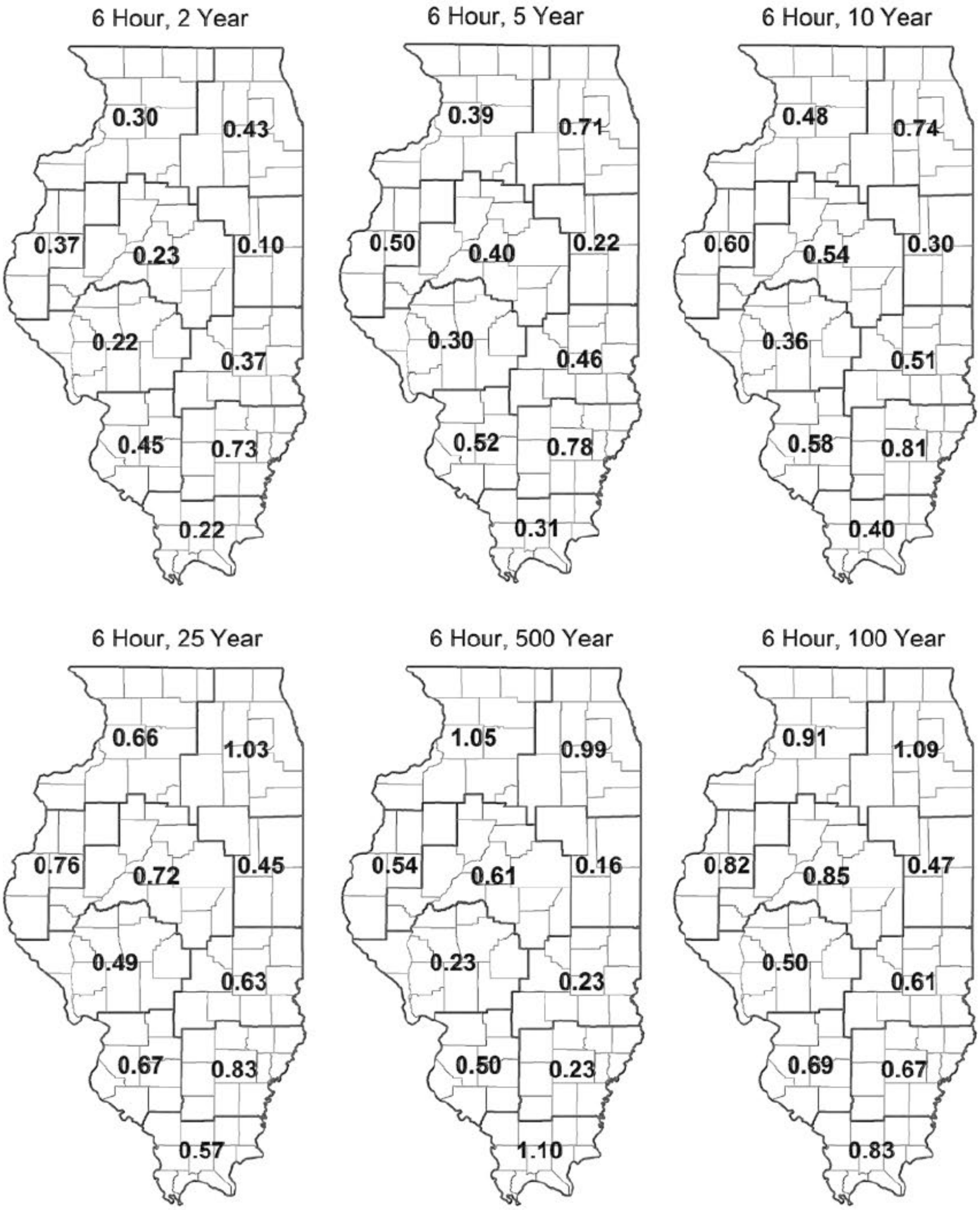


Figure 27 Differences in inches between this study and NOAA Atlas 14 for a 6-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14.

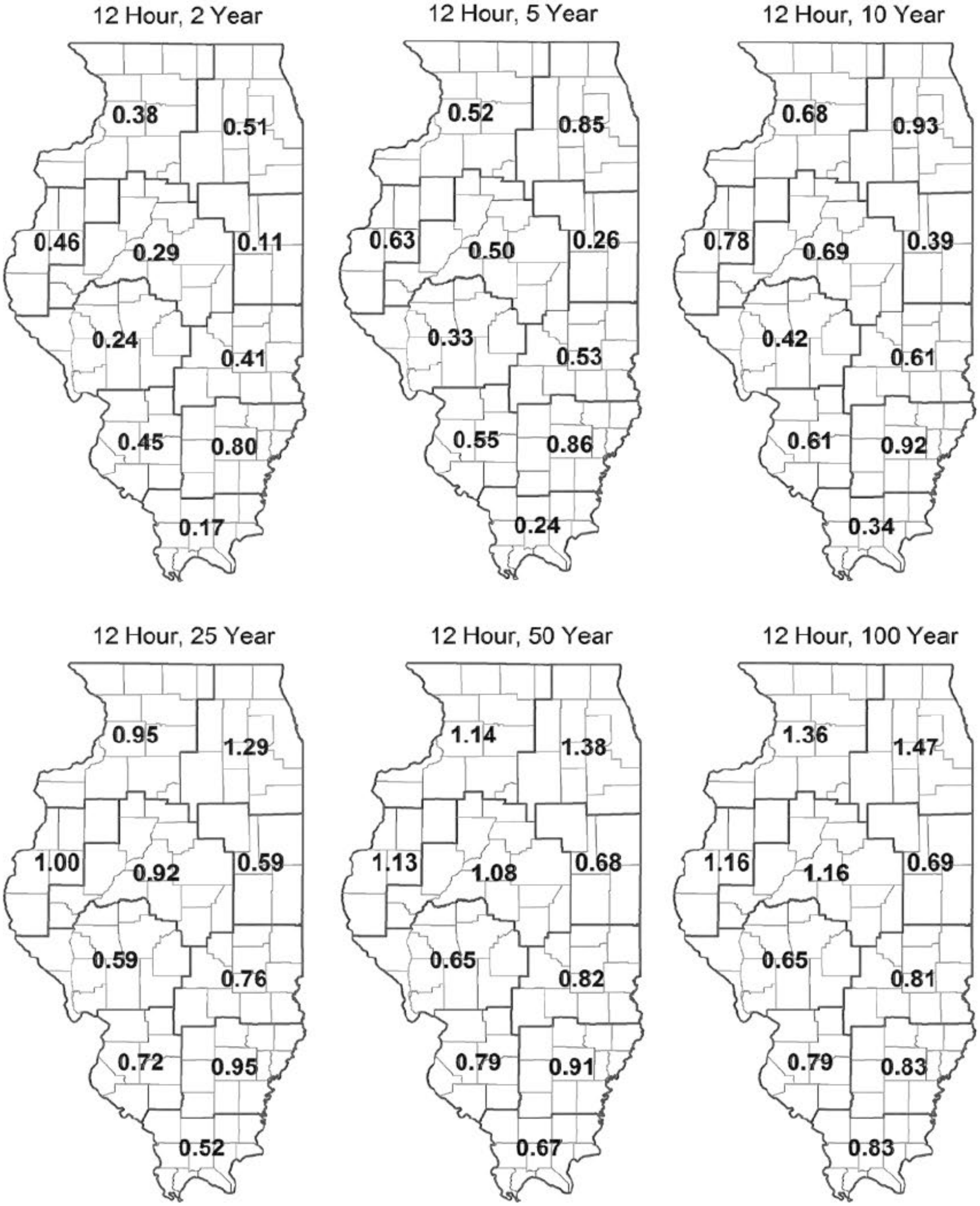


Figure 28 Differences in inches between this study and NOAA Atlas 14 for a 12-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14.

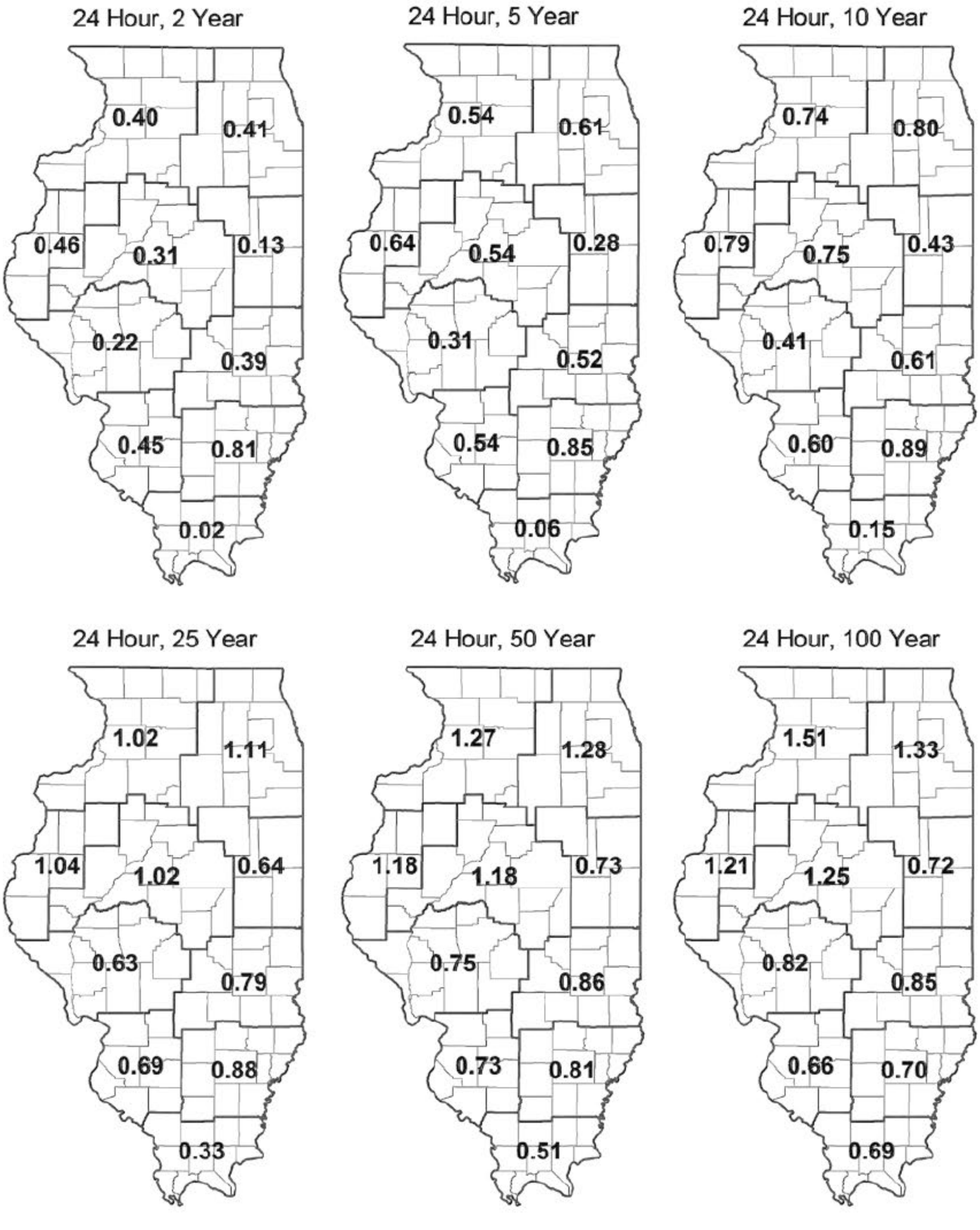


Figure 29 Differences in inches between this study and NOAA Atlas 14 for a 24-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14.

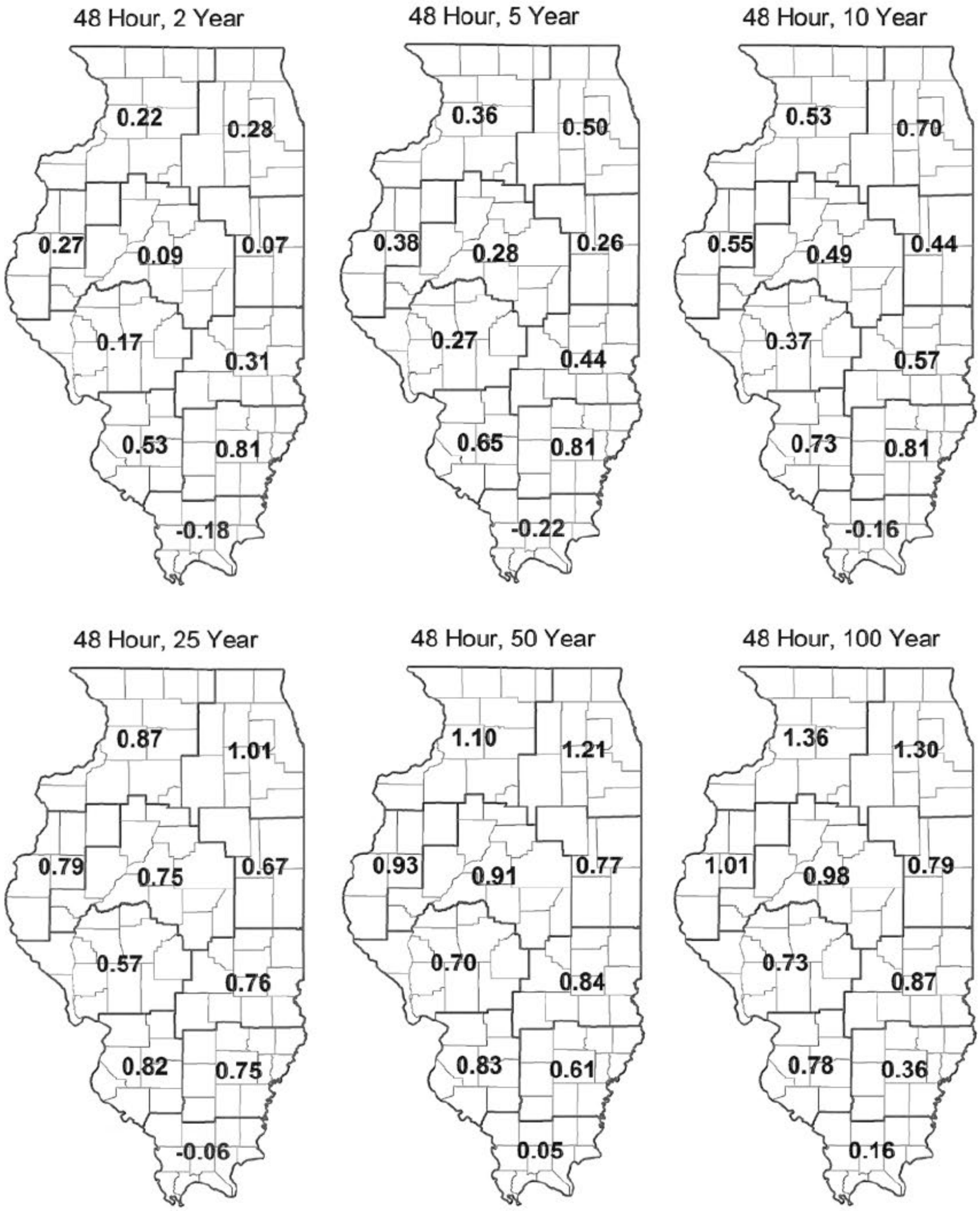


Figure 30 Differences in inches between this study and NOAA Atlas 14 for a 48-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14.

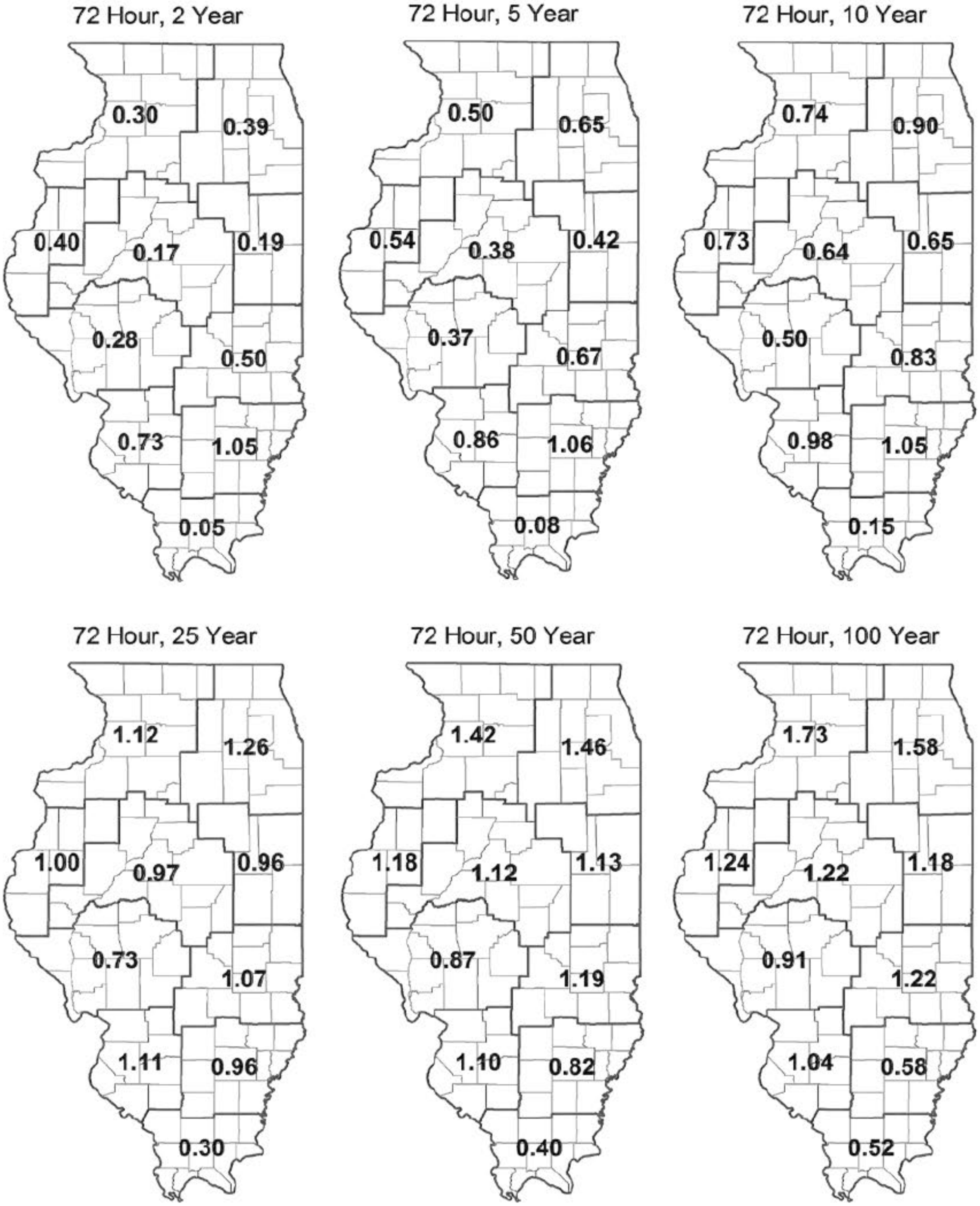


Figure 31 Differences in inches between this study and NOAA Atlas 14 for a 72-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14.

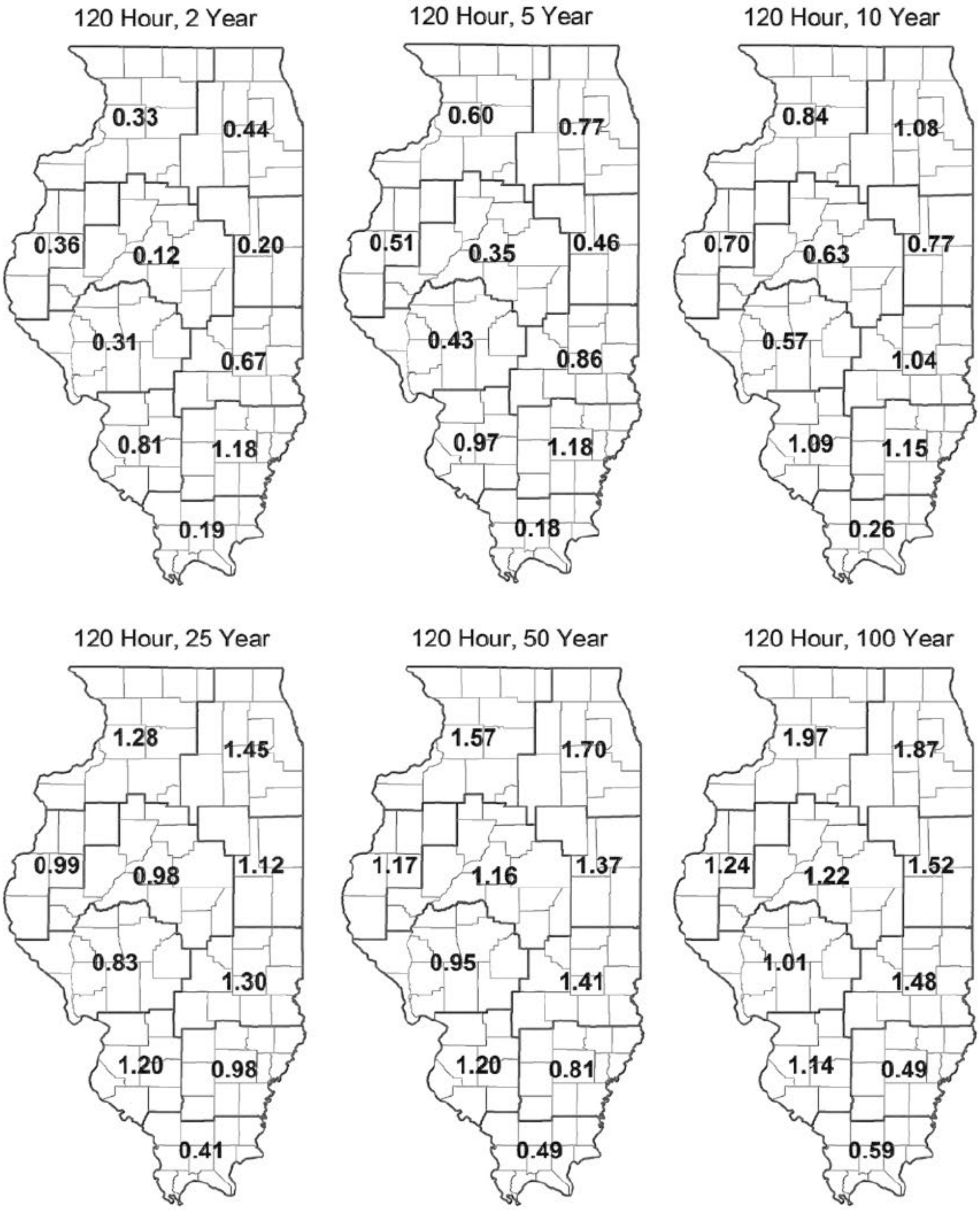


Figure 32 Differences in inches between this study and NOAA Atlas 14 for a 120-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14.

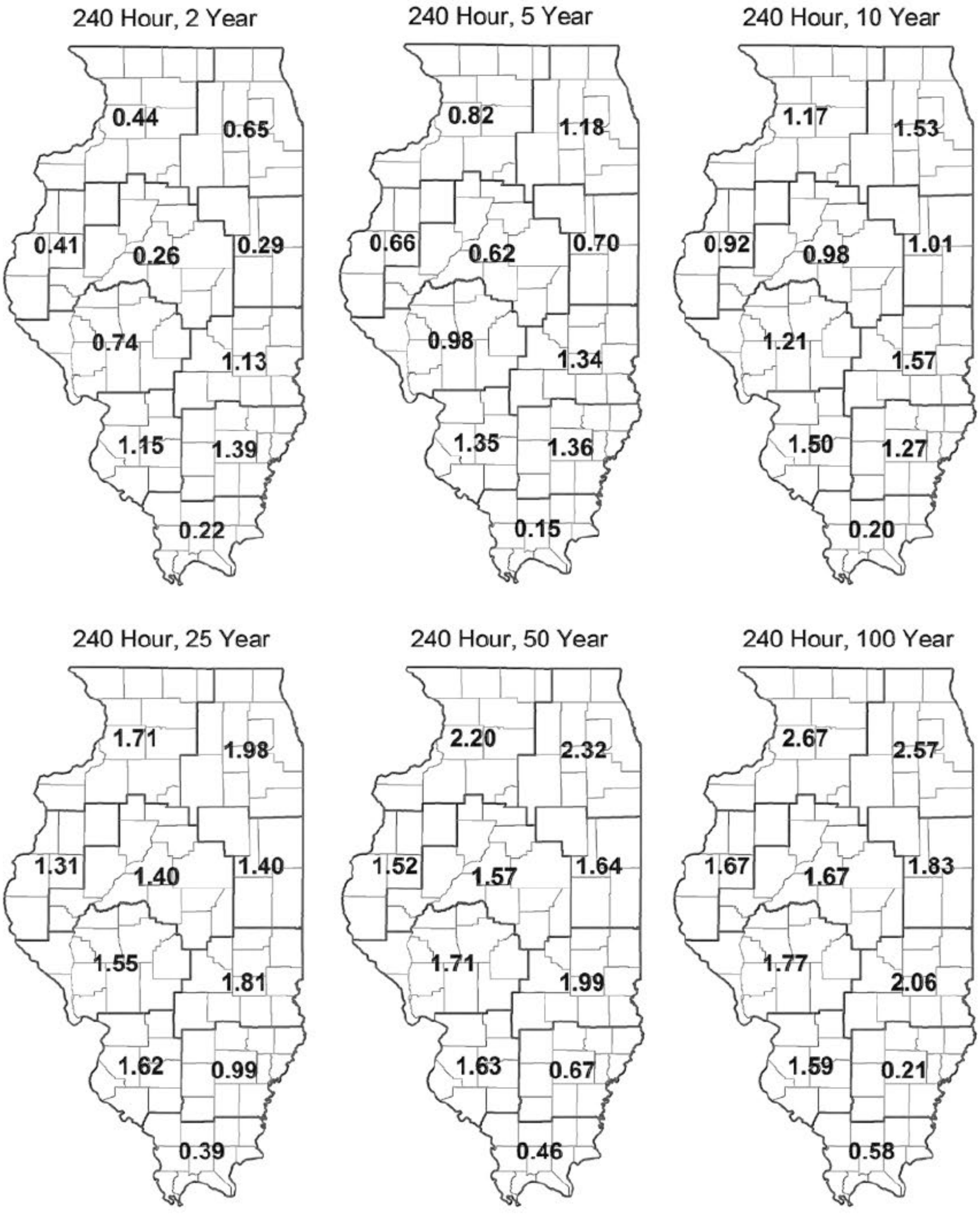


Figure 33 Differences in inches between this study and NOAA Atlas 14 for a 240-hour duration and 2-, 5-, 10-, 25-, 50-, and 100-year frequencies for 10 sections in Illinois. Positive numbers denote an increase and negative numbers show a decrease compared with Atlas 14.

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The following are attachments to the testimony of Andrew Rehn.

ATTACHMENT 42

21 Midwest

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Chapter Lead
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21 Midwest

Carson, Wisconsin

Key Message 1

Agriculture

The Midwest is a major producer of a wide range of food and animal feed for national consumption and international trade. Increases in warm-season absolute humidity and precipitation have eroded soils, created favorable conditions for pests and pathogens, and degraded the quality of stored grain. Projected changes in precipitation, coupled with rising extreme temperatures before mid-century, will reduce Midwest agricultural productivity to levels of the 1980s without major technological advances.

Key Message 2

Forestry

Midwest forests provide numerous economic and ecological benefits, yet threats from a changing climate are interacting with existing stressors such as invasive species and pests to increase tree mortality and reduce forest productivity. Without adaptive actions, these interactions will result in the loss of economically and culturally important tree species such as paper birch and black ash and are expected to lead to the conversion of some forests to other forest types or even to non-forested ecosystems by the end of the century. Land managers are beginning to manage risk in forests by increasing diversity and selecting for tree species adapted to a range of projected conditions.

Key Message 3

Biodiversity and Ecosystems

The ecosystems of the Midwest support a diverse array of native species and provide people with essential services such as water purification, flood control, resource provision, crop pollination, and recreational opportunities. Species and ecosystems, including the important freshwater resources of the Great Lakes, are typically most at risk when climate stressors, like temperature increases, interact with land-use change, habitat loss, pollution, nutrient inputs, and nonnative invasive species. Restoration of natural systems, increases in the use of green infrastructure, and targeted conservation efforts, especially of wetland systems, can help protect people and nature from climate change impacts.

Key Message 4

Human Health

Climate change is expected to worsen existing health conditions and introduce new health threats by increasing the frequency and intensity of poor air quality days, extreme high temperature events, and heavy rainfalls; extending pollen seasons; and modifying the distribution of disease-carrying pests and insects. By mid-century, the region is projected to experience substantial, yet avoidable, loss of life, worsened health conditions, and economic impacts estimated in the billions of dollars as a result of these changes. Improved basic health services and increased public health measures—including surveillance and monitoring—can prevent or reduce these impacts.

Key Message 5

Transportation and Infrastructure

Storm water management systems, transportation networks, and other critical infrastructure are already experiencing impacts from changing precipitation patterns and elevated flood risks. Green infrastructure is reducing some of the negative impacts by using plants and open space to absorb storm water. The annual cost of adapting urban storm water systems to more frequent and severe storms is projected to exceed $500 million for the Midwest by the end of the century.

Key Message 6

Community Vulnerability and Adaptation

At-risk communities in the Midwest are becoming more vulnerable to climate change impacts such as flooding, drought, and increases in urban heat islands. Tribal nations are especially vulnerable because of their reliance on threatened natural resources for their cultural, subsistence, and economic needs. Integrating climate adaptation into planning processes offers an opportunity to better manage climate risks now. Developing knowledge for decision-making in cooperation with vulnerable communities and tribal nations will help to build adaptive capacity and increase resilience.

Executive Summary

The Midwest is home to over 60 million people, and its active economy represents 18% of the U.S. gross domestic product.[1] The region is probably best known for agricultural production. Increases in growing-season temperature in the Midwest are projected to be the largest contributing factor to declines in the productivity of U.S. agriculture.[2] Increases in humidity in spring through mid-century[3,4] are expected to increase rainfall, which will increase the potential for soil erosion[5,6] and further reduce planting-season workdays due to waterlogged soil.[7]

Forests are a defining characteristic of many landscapes within the Midwest, covering more than 91 million acres. However, a changing climate, including an increased frequency of late-growing-season drought conditions, is worsening the effects of invasive species, insect pests, and plant disease as trees experience periodic moisture stress. Impacts from human activities, such as logging, fire suppression, and agricultural expansion, have lowered the diversity of the Midwest's forests from the pre-Euro-American settlement period. Natural resource managers are taking steps to address these issues by increasing the diversity of trees and introducing species suitable for a changing climate.[8]

The Great Lakes play a central role in the Midwest and provide an abundant freshwater resource for water supplies, industry, shipping, fishing, and recreation, as well as a rich and diverse ecosystem. These important ecosystems are under stress from pollution, nutrient and sediment inputs from agricultural systems, and invasive species.[9,10] Lake surface temperatures are increasing,[11,12] lake ice cover is declining,[12,13,14] the seasonal stratification of temperatures in the lakes is occurring earlier in the year,[15] and summer evaporation rates are increasing.[13,16] Increasing storm impacts and declines in coastal water quality can put coastal communities at risk. While several coastal communities have expressed willingness to integrate climate action into planning efforts, access to useful climate information and limited human and financial resources constrain municipal action.

Land conversion, and a wide range of other stressors, has already greatly reduced biodiversity in many of the region's prairies, wetlands, forests, and freshwater systems. Species are already responding to changes that have occurred over the last several decades,[17,18,19] and rapid climate change over the next century is expected to cause or further amplify stress in many species and ecological systems in the Midwest.[20,21,22] The loss of species and the degradation of ecosystems have the potential to reduce or eliminate essential ecological services such as flood control, water purification, and crop pollination, thus reducing the potential for society to successfully adapt to ongoing changes. However, understanding these relationships also highlights important climate adaptation strategies. For example, restoring systems like wetlands and forested floodplains and implementing agricultural best management strategies that increase vegetative cover (cover crops and riparian buffers) can help reduce flooding risks and protect water quality.[23,24,25]

Midwestern populations are already experiencing adverse health impacts from climate change, and these impacts are expected to worsen in the future.[26,27] In the absence of mitigation, ground-level ozone concentrations are projected to increase across most of the Midwest, resulting in an additional 200–550 premature deaths in the region per year by 2050.[28] Exposure to high temperatures impacts workers' health, safety, and productivity.[29] Currently, days over 100°F in Chicago are rare. However, they could become increasingly more common by late century in both the lower and higher scenarios (RCP4.5 and RCP8.5).

The Midwest also has vibrant manufacturing, retail, recreation/tourism, and service sectors. The region's highways, railroads, airports, and navigable rivers are major modes for commerce activity. Increasing precipitation, especially heavy rain events, has increased the overall flood risk, causing disruption to transportation and damage to property and infrastructure. Increasing use of green infrastructure (including nature-based approaches, such as wetland restoration, and innovations like permeable pavements) and better engineering practices are beginning to address these issues.

Conservation Practices Reduce Impact of Heavy Rains

Integrating strips of native prairie vegetation into row crops has been shown to reduce sediment and nutrient loss from fields, as well as improve biodiversity and the delivery of ecosystem services.[33] Iowa State University's STRIPS program is actively conducting research into this agricultural conservation practice.[34] The inset shows a close-up example of a prairie vegetation strip. *From Figure 21.2 (Photo credits: [main photo] Lynn Betts, [inset] Farnaz Kordbacheh)*.

Citizens and stakeholders value their health and the well-being of their communities—all of which are at risk from increased flooding, increased heat, and lower air and water quality under a changing climate.[30,31] To better prevent and respond to these impacts, scholars and practitioners highlight the need to engage in risk-driven approaches that not only focus on assessing vulnerabilities but also include effective planning and implementation of adaptation options.[32]

The photo shows Menominee Tribal Enterprises staff creating opportunity from adversity by replanting a forest opening caused by oak wilt disease with a diverse array of tree and understory plant species that are expected to fare better under future climate conditions. *From Figure 21.4 (Photo credit: Kristen Schmitt)*.

Background

The Midwest is home to more than 60 million people, and its active economy represents 18% of the U.S. gross domestic product.[1] In this report, the Midwest covers Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. The region is probably best known for agricultural production. Trends toward warmer, wetter, and more humid conditions provide challenges for field work, increase disease and pest pressure, and reduce yields to an extent that these challenges can be only partially overcome by technology.[35] The Midwest contains large tracts of federal, state, and private forests and preserves that provide significant economic and ecological benefits to the region. However, as a changing climate results in shifting precipitation patterns, altered disturbance regimes, and increased frequency of late-growing-season moisture stress, the effects of existing stressors such as invasive species, insect pests, and plant disease are amplified.[36] Natural resource managers are taking steps to address these issues by increasing the diversity of trees and introducing species suitable for a changing climate.[8]

The Midwest also has vibrant manufacturing, retail, recreation/tourism, and service sectors. The region's highways, railroads, airports, and navigable rivers are major modes for commercial activity. Increasing precipitation, especially heavy rain events, has increased the overall flood risk, causing disruption to transportation and damage to property and infrastructure (e.g., Winters et al. 2015[37]). Increasing use of green infrastructure (including nature-based approaches, such as wetland restoration, and innovations like permeable pavements) and better engineering practices are beginning to address these issues (e.g., City of Chicago 2015[38]).

Tourism and outdoor recreation are major economic activities that may be affected by climate change, particularly in coastal towns that are at risk from algal bloom impacts and in areas that host winter sports that are especially vulnerable to warming winters. For example, ice fishing was limited due to mild temperatures in the winters of 2015–2016 and 2016–2017, and the American Birkebeiner cross-country ski race in Wisconsin was cancelled due to a lack of snow in February 2017. Portions of Michigan, Wisconsin, and Minnesota contain ceded territory of many tribes, and these are used for hunting, fishing, and gathering native plants, all of which play vital roles in maintaining cultural heritage. Projected changes in climate and ecosystems will have strong impacts on these activities.[39]

The Great Lakes play a central role in the Midwest and provide an abundant freshwater resource for water supplies, industry, shipping, fishing, and recreation, as well as a rich and diverse ecosystem. The same can be said for the upper Mississippi, lower Missouri, Illinois, and Ohio River systems. Episodes of widespread heavy rains in recent years have led to flooding, soil erosion, and water quality issues from nutrient runoff into those systems.[10] Land managers are beginning to change some of their practices (such as increasing the use of cover crops) to better manage excess surface water.[40]

Citizens and stakeholders in the Midwest value their health and the well-being of their communities—all of which are at risk from increased flooding, increased heat, and lower air and water quality under a changing climate.[30,31]

Energy in the Midwest

The Midwest is a major consumer of coal. In 2015, coal provided 56% of the electricity consumed in the region, and the eight states in the region accounted for 32% of the Nation's coal consumption (in BTUs). Coal's share of electricity production is declining in the Midwest, following the national trend (Ch. 4: Energy, Figure 4.3). In 2008, coal accounted for more than 70% of electricity consumption in the Midwest. Wind power is a small but growing source of electricity for the region. Iowa leads the Nation in per capita consumption of wind power, with wind providing over 30% of the state's electrical needs in 2015.[41]

Renewable energy is expanding in the Midwest. As part of a campus-wide initiative to transition to renewable energy sources, in 2017, Michigan State University established five solar carports that have an estimated annual production of 15,000 megawatt hours, representing about 5% of electricity use on campus (Figure 21.1). In addition to reducing carbon emissions, this investment is expected to save the university $10 million over 25 years.[42]

Solar Charging Stations

Figure 21.1: Solar carports were recently installed on the Michigan State University campus. Photo credit: David Rothstein.

What Is New in NCA4

Two new Key Messages are introduced (Key Messages 3 and 6). Key Message 3 recognizes the important role that ecosystems of the Midwest play in supporting a diverse array of species and providing important benefits such as flood control, crop pollination, and outdoor recreation. Key Message 6 addresses how at-risk communities in the Midwest are becoming more vulnerable to climate change impacts and how they are working to build adaptive capacity. Tribal nations are especially vulnerable because of their reliance on threatened natural resources for their cultural, subsistence, and economic needs. The four remaining Key Messages address improvements in the understanding of risks and responses to climate change since NCA3. Key Message 1 on agriculture provides more specificity about the risk to agriculture by stating that agricultural productivity (the ratio of outputs to inputs) is projected to decline by 2050 to levels of the 1980s (that is, yields may increase but at the cost of substantial increases in inputs). Key Message 2 on forestry illustrates the progress foresters and land managers have made in climate adaptation through their efforts to incorporate climate change risks into management decision-making. Key Message 5 on transportation and infrastructure highlights a growing interest in green infrastructure—the use of plants and open space in storm water management—as an option for adapting to more frequent episodes of extreme precipitation. Finally, Key Message 4 on human health identifies specific health impacts by naming expected changes in magnitude and occurrence of extreme events, exposures, and economic impacts. The message explicitly states public health actions that can be implemented to avoid or reduce the health impacts.

Key Message 1

Agriculture

The Midwest is a major producer of a wide range of food and animal feed for national consumption and international trade. Increases in warm-season absolute humidity and precipitation have eroded soils, created favorable conditions for pests and pathogens, and degraded the quality of stored grain. Projected changes in precipitation, coupled with rising extreme temperatures before mid-century, will reduce Midwest agricultural productivity to levels of the 1980s without major technological advances.

Recent Agriculturally Important Trends

The two main commodity crops in the Midwest are corn and soybeans, which are grown on 75% of the arable land. Wheat and oats are important crops grown on fewer acres. An increasing number of niche but higher-value crops (such as apples, grapes, cherries, cranberries, blueberries, and pumpkins) also are grown in the region.[43]

Over the past 30 years, increased rainfall from April to June has been the most impactful climate trend for agriculture in the Midwest,[3] providing a favorable supply of soil moisture while also reducing flexibility for timing of spring planting and increasing soil erosion.[44] In addition, wet conditions at the end of the growing season can create elevated levels of mold, fungus, and toxins.[45] The last spring frost has occurred earlier, causing the frost-free season to increase by an average of nine days since 1901.[46] However, daily maximum temperatures in summer in the Midwest have not followed the upward global trend, in part due to higher early summer rainfall on deep, water-holding soils,[47] thereby avoiding plant stress detrimental to crops. The avoidance of heat stress and longer growing seasons have favored production in some parts of and some years in the Midwest.

Daily minimum temperatures have increased in all seasons due to increasing humidity.[48,49] Elevated growing-season minimum daily temperatures are considered a factor in reducing grain weight in corn due to increased nighttime plant respiration.[50] Warming winters have increased the survival and reproduction of existing insect pests[51] and already are enabling a northward range expansion of new insect pests and crop pathogens into the Midwest.[52]

A contributing factor underpinning Midwest growing-season trends in both temperature and precipitation is the increase in water vapor (absolute humidity):[49,53] higher humidity decreases the day–night temperature range and increases warm-season precipitation. Rising humidity also leads to longer dew periods and high moisture conditions that favor many agricultural pests and pathogens for both growing plants and stored grain.

Projected Trends and Agricultural Impacts

Warm-season temperatures are projected to increase more in the Midwest than any other region of the United States.[54] The frost-free season is projected to increase 10 days by early this century (2016–2045), 20 days by mid-century (2036–2065), and possibly a month by late century (2070–2099) compared to the period 1976–2005 according to the higher scenario (RCP8.5).[46]

By the middle of this century (2036–2065), 1 year out of 10 is projected to have a 5-day period that is an average of 13°F warmer than a comparable period at the end of last century (1976–2005).[54] Current average annual 5-day maximum temperature values range from about 88°F in Northern Minnesota to 97°F in Southern Missouri. Tables 21.1 and 21.2 show that by mid-century under the higher scenario (RCP8.5), 5-day maximum temperatures are projected to have moved further above optimum conditions for many crops and closer to the reproductive failure temperature, especially for corn in the southern half of the Midwest. Higher growing-season temperatures also shorten phenological stages in crops (for example, the grain fill period for corn).[35,50] Under these temperatures, overall yield trends will be reduced because of periodic pollination failures and reduced grain fill during other years.

Increases in humidity in spring through mid-century[3,4] are expected to increase rainfall, which will increase the potential for soil erosion[5,6] and further reduce planting-season workdays due to waterlogged soil.[7] As an example, for the Cedar River Basin in Iowa, the 100-year flood (1% chance of occurring in a given year) of the 20th century is projected to be a 25-year flood (4% chance per year) in the 21st century,[55] with associated increased frequency of flooding of agricultural land.

Increased spring precipitation and higher temperatures and humidity are expected to increase the number and intensity of fungus and disease outbreaks[56,57] and the prevalence of bacterial plant diseases,[58] such as bacterial spot in pumpkin and squash.[59] Increased precipitation and soil moisture in a warmer climate also lead to increased loss of soil carbon[60] and degraded surface water quality due to loss of soil particles and nutrients.[61,62] Transitions from extremes of drought to floods, in particular, increase nitrogen levels in rivers[63] and lead to harmful algal blooms.

Current understanding of drought in the Midwest is that human activity has not been a major component in historical droughts, and it remains uncertain how droughts will behave in the future. However, future projections show that Midwest surface soil moisture likely will transition from excessive levels in spring due to increased precipitation to insufficient levels in summer driven by higher temperatures, causing more moisture to be lost through evaporation.[64]

Average Annual 5-Day Maximum Temperature

Geographic Area	Modeled Historical (1976–2005)	Mid-21st Century (2036–2065) for Lower Scenario (RCP4.5)	Mid-21st Century (2036–2065) for Higher Scenario (RCP8.5)
Northern Minnesota	88°F	93°F	95°F
Southern Missouri	97°F	102°F	103°F

Table 21.1: These modeled historical and projected average annual 5-day maximum temperatures illustrate the temperature increases projected for the middle of this century across the Midwest. Sources: NOAA NCEI and CICS-NC.

Optimum and Failure Temperatures for Vegetative Growth and Reproduction

Crop	Optimum Growth	Failure for Growth	Optimum Reproduction	Failure for Reproduction
Corn	80°F	105°F	67°F	95°F
Soybean	86°F	101°F	72°F	102°F

Table 21.2: This table shows the temperatures at which corn and soybeans reach optimum growth and reproduction as well as the temperatures at which growth and reproduction fail.[50]

Projections of mid-century yields of commodity crops[65,66] show declines of 5% to over 25% below extrapolated trends broadly across the region for corn (also known as maize) and more than 25% for soybeans in the southern half of the region, with possible increases in yield in the northern half of the region. Increases in growing-season temperature in the Midwest are projected to be the largest contributing factor to declines in the productivity of U.S. agriculture.[2] In particular, heat stress in maize during the reproductive period is projected by crop models to reduce yields in the second half of the 21st century.[67] These losses may be mitigated by enhanced photosynthesis and reduced crop water use, although the magnitude is uncertain.[68,69] Elevated atmospheric CO_2 is expected to partially, but not completely, offset yield declines caused by climate extremes, with effects on soybeans less than on maize.[70]

Non-commodity crops produced in the Midwest include tree fruits, sweet corn, and vegetables for farmers markets and canning. While the general impacts of climate change on specialty crops are similar to commodity crops, the more intense heat waves, excessive rain interspersed with drought, and higher humidity of a future climate likely will degrade market quality as well as yield by mid-century.[71] Although data on climate-related losses are sparse, excess moisture is emerging as a major cause of crop loss.[72] Wild rice is an annual plant harvested by tribes and others in shallow wetlands of northern Minnesota, Wisconsin, and Michigan. Stable production depends on a stable climate that maintains ecosystem diversity. Declines in production are expected, related to increases in climate extremes and climate-related disease and pest outbreaks as well as northward shifts of favorable growing regions.[73]

Longer growing seasons and the introduction of hoop buildings (low, translucent, fabric-covered structures that protect plants from extreme weather) have allowed local growers of annual vegetable crops to extend the fresh produce season. However, unsheltered perennial crops such as tree fruits may be subjected increasingly to untimely budbreak followed by cold pulses due to earlier and longer occurrences of warm conditions in late winter.

Most animal agriculture in the region is in confinement, rather than range-based without shelter, and therefore offers an opportunity for mitigating some of the effects of climate change. Without adaptive actions, breeding success and production of milk and eggs will be reduced due to projected temperature extremes by mid-century.[74,75,76]

Adaptation

Soil-erosion suppression methods in row-crop agriculture subjected to more intense rains include use of cover crops, grassed waterways, water management systems, contour farming, and prairie strips.[6,40] More diversity in planting dates, pollination periods, chemical use, and crop and cultivar selection reduces vulnerability of overall production to specific climate extremes or the changes in pests and pathogens that they cause.

An example of a highly successful program is the Iowa State Science-based Trials of Rowcrops Integrated with Prairie Strips (STRIPS) program that demonstrates that replacing 10 percent of cropland with prairie grasses reduced sediment loss 20-fold while total nitrogen concentrations were 3.3 times lower (Figure 21.2).[33] An example of a private–public response is the National Corn Growers Association's Soil Health Partnership (SHP),[77] a network of working farms across the Midwest

Conservation Practices Reduce Impact of Heavy Rains

Figure 21.2: Integrating strips of native prairie vegetation into row crops has been shown to reduce sediment and nutrient loss from fields, as well as improve biodiversity and the delivery of ecosystem services.[33] Iowa State University's STRIPS program is actively conducting research into this agricultural conservation practice.[34] The inset shows a close-up example of a prairie vegetation strip. Photo credits: (main photo) Lynn Betts, (inset) Farnaz Kordbacheh.

engaged in refining techniques for growing cover crops, implementing conservation tillage, and using science-based nutrient management to reduce erosion and nutrient loss while increasing organic matter.

Acreage under irrigation has expanded modestly since 2002,[78] mostly in the northern part of the Midwest where coarse soils of lower water-holding capacity are more vulnerable to drying under increased temperature. No strategies currently are available for maintaining historical trends in commodity agriculture production to cope with increases in spring rainfall and summer heat waves projected for mid-century.[2,65]

Key Message 2

Forestry

Midwest forests provide numerous economic and ecological benefits, yet threats from a changing climate are interacting with existing stressors such as invasive species and pests to increase tree mortality and reduce forest productivity. Without adaptive actions, these interactions will result in the loss of economically and culturally important tree species such as paper birch and black ash and are expected to lead to the conversion of some forests to other forest types or even to non-forested ecosystems by the end of the century. Land managers are beginning to manage risk in forests by increasing diversity and selecting for tree species adapted to a range of projected conditions.

Forests are a defining characteristic of many landscapes within the Midwest, covering more than 91 million acres. From the oak–hickory forests of the Missouri Ozarks to the northern hardwood forests of the Upper Midwest, forest ecosystems sustain the people and communities within the region by providing numerous ecological, economic, and cultural benefits. The economic output of the Midwest forestry sector totals around $122 billion per year.[79,80,81,82,83,84,85,86] Forest-related recreation such as hunting, fishing, hiking, skiing, camping, wildlife watching, off-highway vehicles, and many other pursuits add to the region's economy. For example, forest-based recreationists spend approximately $2.5 billion (in 1996 dollars) within Wisconsin communities.[87] Forests are fundamental to cultural and spiritual practices within tribal communities, supporting plants and animals of central cultural importance and providing food and resources for making items such as baskets, canoes, and shelters.[88]

Climate change is anticipated to have a pervasive influence on forests within this region over the coming decades.[36,89,90,91,92,93,94] Tree growth rates and forest productivity have benefited from longer growing seasons and higher atmospheric carbon dioxide concentrations, but continued benefits are expected only if adequate moisture and nutrients are available to support enhanced growth rates.[95] As growing-season temperatures rise, reduced tree growth[96,97] or widespread tree mortality[98] is expected as the frequency of drought stress increases from drier air (as a result of increases in vapor pressure deficit [VPD]; Figure 21.3) and changing patterns of precipitation. Greater tree mortality from increased VPD likely will be particularly evident where competition for water is high in dense stands of trees[99,100] or where forests naturally transition to grasslands due to limited soil moisture.[101] Late-growing-season heat- and drought-related vegetation stress is projected to shift the composition and structure of forests in the region[102] by increasing mortality of younger trees, which are sensitive to drought.[19] Warming winters will reduce snowpack that acts to insulate soil from freezing temperatures, increasing frost damage to shallow tree roots[103] and reducing tree regeneration.[104] Additionally, increases in existing biological stressors of forests are expected as temperatures rise. Effects of insect pests and tree pathogens are anticipated to intensify as winters warm, increasing winter survival of pests and allowing expansion into new regions.[105,106] Changing climate conditions and atmospheric carbon dioxide concentrations will likely favor invasive plant species over native species, potentially decreasing tree regeneration.[107,108] Overall, the increasing stress on trees from rising temperatures, drought, and frost damage raises the susceptibility of individual trees to the negative impacts from invasive plants, insect pests, and disease agents (Ch. 6: Forests, Figure 6.1).[109,110,111]

Impacts from human activities such as logging, fire suppression, and agricultural expansion have lowered the diversity of the Midwest's forests from the pre-Euro-American settlement period. The forest types that occur within the region have been altered significantly relative to presettlement forests, with greater homogeneity in tree species composition across existing forest types.[112] Changes in modern forest types also include reduced structural complexity and less diverse mixes of tree species and tree ages.[113] Forests with reduced diversity are at an increased risk of negative effects from climate change, because the potential for tree species or age classes that are resistant to impacts from biological stressors and climate change is reduced.[93] Forests composed of trees of similar size and age or with lower tree diversity are at increased risk of widespread mortality[114,115] or declines in productivity.[116] In many midwestern forests, fire suppression has decreased the prevalence of

Drying Effect of Warmer Air on Plants and Soils

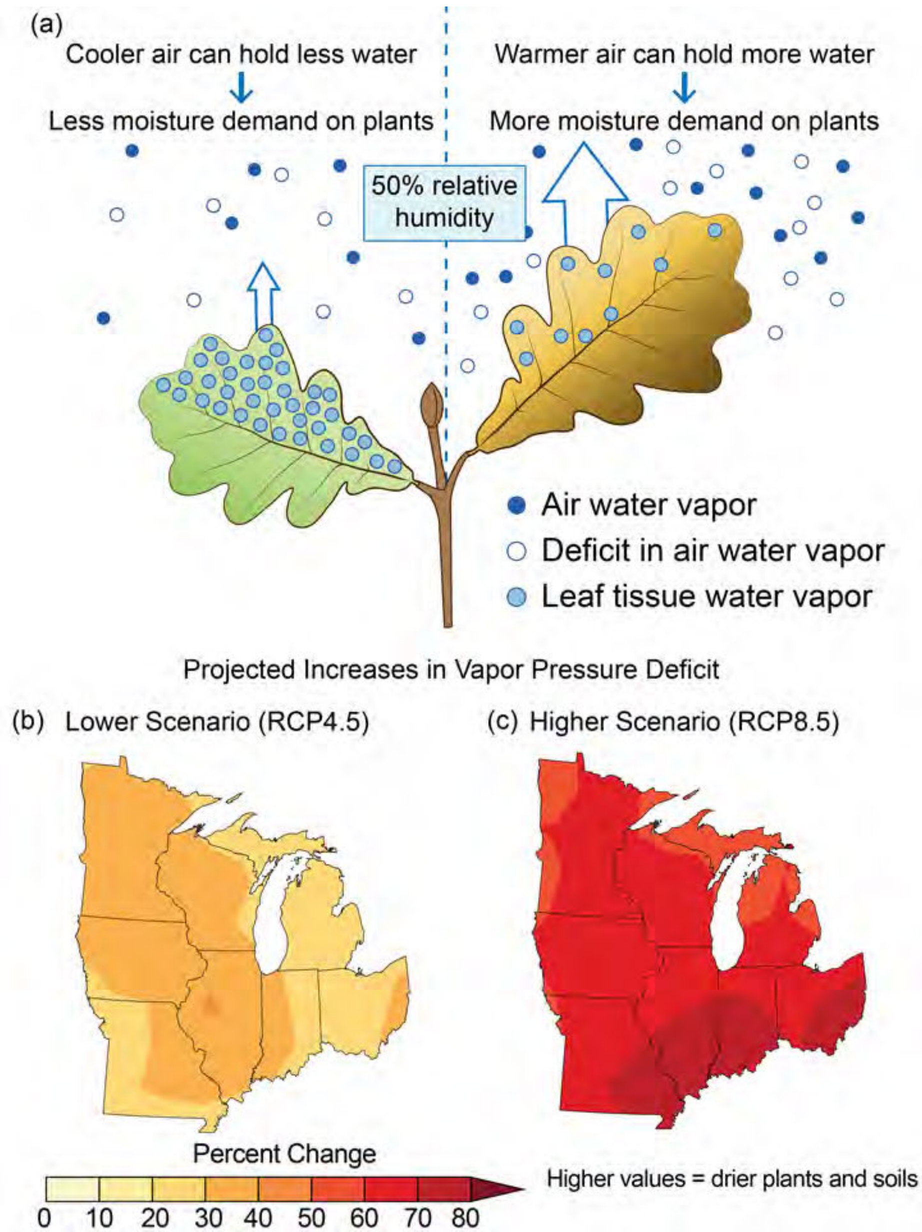

Figure 21.3: As air temperature increases in a warming climate, vapor pressure deficit (VPD) is projected to increase. VPD is the difference between how much moisture is in the air and the amount of moisture in the air at saturation (at 100% relative humidity). Increased VPD has a drying effect on plants and soils, as moisture transpires (from plants) and evaporates (from soil) into the air. (a) Cooler air can maintain less water as vapor, putting less demand for moisture on plants, while warmer air can maintain more water as vapor, putting more demand for moisture on plants. (b, c) The maps show the percent change in the moisture deficit of the air based on the projected maximum 5-day VPD by the late 21st century (2070–2099) compared to 1976–2005 for (b) lower and (c) higher scenarios (RCP4.5 and RCP8.5). Sources: U.S. Forest Service, NOAA NCEI, and CICS-NC.

the drought-tolerant tree species, such as oak, hickory, and pine, while increasing the abundance of species with higher moisture requirements, such as maples.[89,117] This results in greater risk of declines in forest health and productivity as the frequency of drought conditions increases.[118,119]

Changes in climate and other stressors are projected to result in changes in major forest types and changes in forest composition as tree species at the northern limits of their ranges decline and southern species experience increasingly suitable habitat.[120] However, the fragmentation of midwestern forests and the flatness of the terrain raise the possibility that the ranges of particular tree species will not be able to shift to future suitable habitats within the Midwest.[121] For example, to reach areas 1.8°F (1°C) cooler, species in flat terrain must move up to 90 miles (150 km) north to reach cooler habitat, whereas species in mountainous terrain can shift higher in altitude over less latitudinal (north–south) distance.[122] These changes raise the possibility of future losses of economic and cultural benefits of forests due to conversion to different forest types or the change to non-forest ecosystems.[119,123,124] Projected shifts in forest composition in the central hardwood region (southern Missouri, Illinois, Indiana, and Ohio) by the end of the century under a higher scenario (RCP8.5) would result in substantial declines in wildlife habitat and reduce economic value of timber in the region by up to $788 billion (in 2015 dollars).[125]

Changing climate conditions increasingly cause both cultural and economic impacts within the Midwest, and it is very likely these impacts will worsen in the future. For example, many tree species on which tribes depend for their culture and livelihoods—such as paper birch, northern white cedar, and quaking aspen—are highly vulnerable due to temperature increases.[90,91,92,126] Populations of the emerald ash borer, a destructive invasive insect pest that attacks native ash trees, will increase due to warming winters in the region. Mortality of black ash trees, which are important for traditional basket-making for many tribes, is highly likely as winter temperatures continue to rise.[127]

Warming winters already have economic impacts on the forest industry, as well. Forest operations (for example, site access, tree harvesting, and product transport) in many northern regions are conducted on snowpack or frozen ground to protect the site from negative impacts such as soil disturbance and compaction,[128] but the timing of suitable conditions has become shorter and more variable. In the Upper Midwest, the duration of frozen ground conditions suitable for winter harvest has been shortened by 2 to 3 weeks in the past 70 years.[129] The contraction of winter snow cover and frozen ground conditions has increased seasonal restrictions on forest operations in these areas,[130] with resulting economic impacts to both forestry industry and woodland landowners through reduced timber values.[131]

Forestry professionals in the Midwest increasingly are considering the risks to forests from climate change[132] and are responding by incorporating climate adaptation into land management.[8] There are a growing number of examples of climate adaptation in forest management developed by more than 150 organizations that have participated in the Climate Change Response Framework, an approach to climate change adaptation led by the U.S. Forest Service.[133,134,135] Management actions intended to maintain healthy and productive forests in a changing climate include a diverse suite of actions[135] but largely focus on activities that enhance species and structural diversity of existing forest communities and on management approaches that aim to increase the prevalence of species that are better suited to future climatic conditions.[8] Forest management on tribal lands and ceded territory within the region increasingly integrates Scientific Ecological Knowledge of natural resource management with Traditional Ecological Knowledge, a highly localized, place-based system of knowledge learned and observed over many generations.[136] This integration can inform the co-creation of approaches to climate adaptation important for maintaining healthy, functioning forests that continue to provide cultural and spiritual benefits (see Case Study "Adaptation in Forestry").

Case Study: Adaptation in Forestry

The Menominee Forest is well known as an exemplary forest; for generations, the Menominee Tribe has pioneered practices that have preserved nearly 220,000 acres with numerous species and varied habitats while maximizing the sustainable production of forest products. However, climate change—along with invasive species and insect pests and diseases—is creating new challenges for maintaining these diverse habitats and the sustainable supply of timber.

In response to tree mortality caused by oak wilt disease, an introduced exotic disease first identified in 1944 in Wisconsin, foresters at Menominee Tribal Enterprises (MTE) have integrated climate change adaptation into reforestation activities on severely disturbed areas created by the disease.[134] Using science guided by Traditional Ecological Knowledge of forest communities, forest openings created by oak wilt disease were replanted with a diverse array of tree and understory plant species that are expected to fare better under future climate conditions. Many of these species tolerate late-growing-season heat- and drought-related stress, while also providing important cultural benefits to the tribe such as food and medicine. The selection of locally collected plants and seeds used for restoring the oak wilt-affected openings combined scientific information on the future habitat of tree species with Indigenous knowledge of the forest communities necessary for guiding the development of diverse and healthy forests.

Figure 21.4: The photo shows Menominee Tribal Enterprises staff creating opportunity from adversity by replanting a forest opening caused by oak wilt disease with a diverse array of tree and understory plant species that are expected to fare better under future climate conditions. Photo credit: Kristen Schmitt.

> The grass, plant, and shrub species are put together to strengthen the immune system of the deep-rooted trees. We tried to emphasize the underground biotic community within these openings. A healthy underground community ensures a healthy aboveground community. The shrubs hold the key to a healthy change of species within the local plant communities.
>
> —MTE forester and tribal member

Key Message 3

Biodiversity and Ecosystems

The ecosystems of the Midwest support a diverse array of native species and provide people with essential services such as water purification, flood control, resource provision, crop pollination, and recreational opportunities. Species and ecosystems, including the important freshwater resources of the Great Lakes, are typically most at risk when climate stressors, like temperature increases, interact with land-use change, habitat loss, pollution, nutrient inputs, and nonnative invasive species. Restoration of natural systems, increases in the use of green infrastructure, and targeted conservation efforts, especially of wetland systems, can help protect people and nature from climate change impacts.

Species already are responding to environmental changes that have occurred over the last several decades,[17,18,19] and rapid climate change over the next century is expected to cause or further amplify stress in many species and ecological systems in the Midwest.[20,21,22] Land conversion and a wide range of other stressors have already greatly reduced biodiversity in many of the region's prairies, wetlands, forests, and freshwater systems. High rates of change in climate factors like air and water temperature and increasing drought risk likely will accelerate the rate of species declines and extinctions.[18,137] The Midwest region supports the world's largest freshwater ecosystem, the Great Lakes, which are at risk from rising temperatures, changes in seasonal stratification of lake temperatures, and increased summer evaporation rates, combined with stresses from pollution, nutrient inputs that promote harmful algal blooms, and invasive species (Box 21.1).

The loss of species and degradation of ecosystems have the potential to reduce or eliminate essential ecological services such as flood control, water purification, and crop pollination, thus reducing the potential for society to successfully adapt to ongoing changes.

Observations, ecological theory, experimental studies, and predictive models provide insights into how shifts in several climate factors (temperature, precipitation patterns, humidity, and moisture stress) may interact over the next several decades.[120,138,139] Vulnerability assessments for species and ecosystems quickly become complex, as species in the same ecosystem may have different climate sensitivities, and interactions with land-use change and other factors can strongly influence the level of impact (Ch. 5: Land Changes, KM 2; Ch. 17: Complex Systems, KM 1). Local expertise, input from multiple stakeholders, and tools like scenario planning can help improve assessment of vulnerability so that risks can be connected to management actions.[132,140] Changes observed in the Midwest include species range shifts (avoiding exposure to new climatic conditions by shifting location), changes in population size (indicating a change in viability in a given place), shifts in body size and growth rates, and changes in the timing of seasonal events (phenology). Since the Third National Climate Assessment,[27] the number of studies documenting these types of changes has continued to grow. For example, climate change appears to have contributed to the apparent local extinction of populations of the Federally Endangered Karner blue butterfly at sites in the southern end of its range in northern Indiana, despite active management and extensive habitat restoration efforts. While climate change cannot be singled out as the only cause, the populations disappeared following multiple years of warming conditions and a very early onset of spring in 2012.[139] New evidence of shifting ranges comes from

Wisconsin forests, where a set of 78 understory plant species sampled in the 1950s and again in the 2000s have demonstrated shifts in their abundance centroids (a measure of the distribution and local abundance of populations) of about 30 miles (49 km ± 29 km) over this 50-year period (Figure 21.5).[141] The dominant direction of this shift was to the northwest, which matches the direction of change in important climatic conditions associated with the distributions of these species. While this shift suggests the potential for successful adaptation to changing conditions, the rate of change for most species was much less than the amount of change in the climate metrics over the same time period, raising the concern that the climate is changing too fast for these species to keep up.[141] Similarly, a study of shifts in the timing of spring green-up, an indicator of when plant-feeding insects emerge, and the timing of migratory bird arrivals found that while both are shifting earlier in the Midwest, the arrival of birds is not advancing as quickly as the plants.[142] Risks to birds from this mismatch in phenology include the potential for birds to arrive after food availability has peaked or for later arrivals to be less able to compete for territories or mates. Land protection and management strategies that help maintain or increase phenological variation of plants within key migratory and breeding habitats like the Great Lakes coastlines may help increase the odds that birds can find the resources they need.[143]

The drivers of changes in species ranges or abundance can be complex and difficult to detect until key thresholds are crossed. For example, in the Midwest region, cool- and coldwater fishes in inland lakes are particularly susceptible to changes in climate because habitat with appropriate temperatures and oxygen concentrations is often limited during summer months. In lakes at the southern (warmer) end of their ranges, these fish experience a squeezing of available habitat during summer months as the water near the lake surface becomes too warm and the dissolved oxygen levels in deeper waters drop (Figure 21.6).[144,145,146] This “invisible” loss of habitat is driven by increases in water temperatures, longer duration of the stratified period (which delays the mixing of oxygen-rich water into the deeper waters), and declines in ice cover.[147,148,149,150] Recent research has identified fish kill events tied to temperature and oxygen stress from increased air temperatures, and modeling results forecast increased numbers of these events, likely leading to local extinction of cool- and coldwater fish species in some lakes and reduced geographic distribution across the Midwest.[151,152,153,154]

Climate Change Outpaces Plants’ Ability to Shift Habitat Range

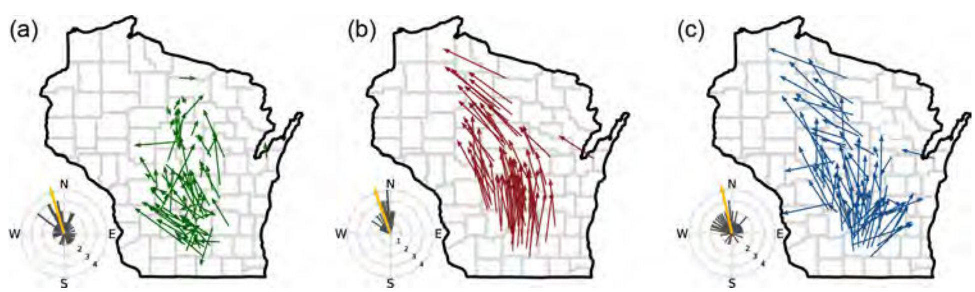

Figure 21.5: While midwestern species, such as understory plants in Wisconsin, are showing changes in range, they may not be shifting quickly enough to keep up with changes in climate. The panels here represent 78 plant species, showing (a) observed changes in the center of plant species abundances (centroids) from the 1950s to 2000s, (b) the direction and magnitude of changes in climate factors associated with those species, and (c) the lag, or difference, between where the species centroid is now located and where the change in climate factors suggests it should be located in order to keep pace with a changing climate. Source: adapted from Ash et al. 2017.[141] ©John Wiley & Sons, Ltd.

Coldwater Fish at Risk

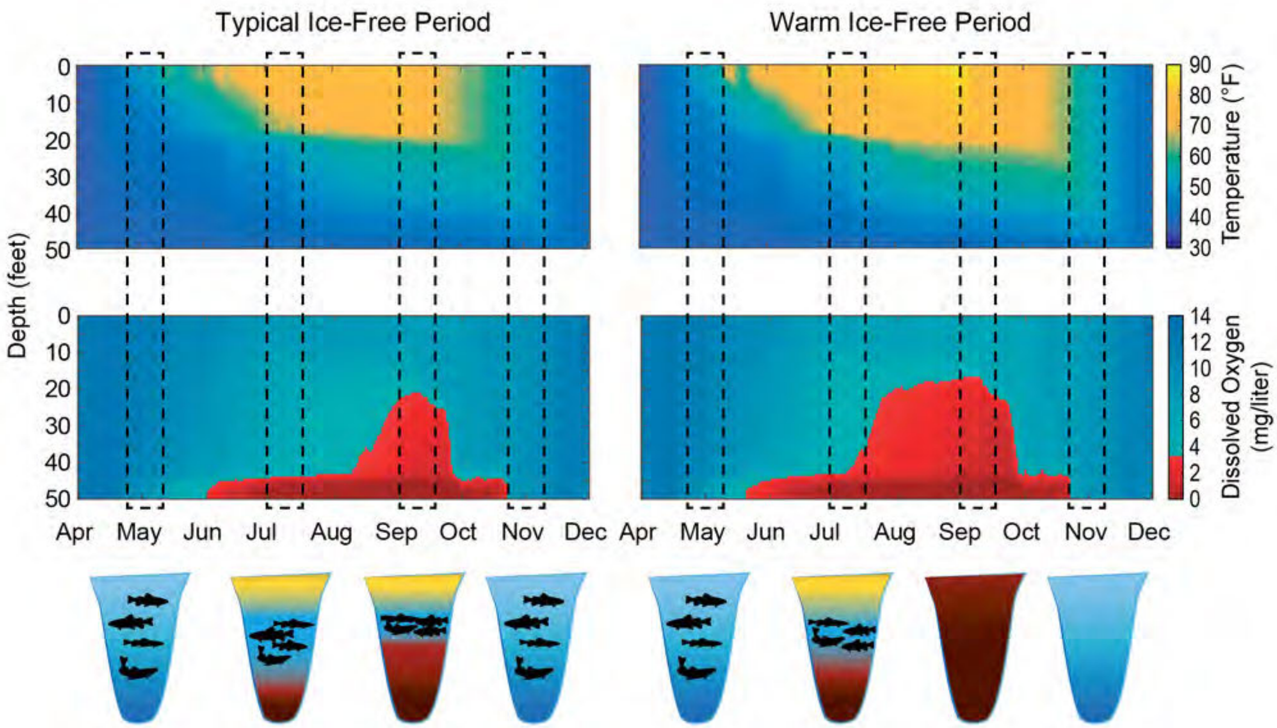

Figure 21.6: The graphic shows the oxythermal (oxygen and temperature) habitat of coldwater fish in midwestern inland lakes, illustrated by water depth under (left) a typical ice-free period and (right) a warm ice-free period (right). The top plots show water temperatures during the ice-free period, and the bottom plots show the dissolved oxygen concentrations. The schematics at the bottom illustrate the area of the lake that is ideal habitat for coldwater fish (in blue) and areas that represent water outside of the temperature or dissolved oxygen limit (in yellow and red, respectively). The left plots show how available habitat "squeezes" during a typical year, while the right plots illustrate a complete loss of suitable habitat during very warm years. Source: Madeline Magee, University of Wisconsin.

Taken individually, responses like range shifts, changes in local abundance, or changes in phenology may indicate that a species is successfully adapting to new conditions, or conversely may indicate a species is under stress. The extent to which responses indicate risk and the challenge of attributing changes to climate drivers when systems are exposed to many additional stressors are important sources of uncertainty that likely slow progress on climate change adaptation within the resource management sector.[155,156] Further, while evidence of species- and ecosystem-level responses to direct climate change impacts is increasing, many of the most immediate risks are even more challenging to track, because they relate to climate-driven enhancement of existing stressors, such as habitat loss and degradation, pollution, the spread of invasive species, and drainage and irrigation practices in agricultural landscapes.[138,157] As species are lost from midwestern ecosystems, there likely will be a net loss of biodiversity, as numerous additional stressors, especially widespread land conversion across the southern Midwest, limit opportunities for these gaps to be filled by species moving in from other regions (Ch. 7: Ecosystems, KM 1 and 2).[158,159]

While movement of species from the south-central United States could help sustain species-diverse ecosystems as some of the Midwest's current species move north, these range expansions can further stress current species. Many species and ecosystems in the Midwest, especially the Upper Midwest, are best suited to survive and compete for resources when winter conditions are harsh and growing seasons are short. As winter warms and the growing season extends, species from the south-central United States, as well as species from outside the country that are more traditionally viewed as invasive species, are expected to be able to grow faster and take advantage of these changes, increasing the rate of loss of the region's native species.[160,161] For invasive insect pests, these impacts may be compounded as extended growing seasons allow time for additional generations to be produced in a single season;[162] the same mechanism can promote higher impacts from native insect pests, as well. Given that some native species will decline in the region, to maintain or increase species diversity, some managers are beginning to plan for and even promote some native plant species that are present in a region, but more common to the south, as conditions change. While these can be important strategies for maintaining diversity and ecosystem functions, especially in isolated habitats where inward migration is not likely, careful consideration of the source of plant stocks is important when seeking to avoid introducing new or more competitive genotypes.[163] Further, as some native species decline, managers will benefit from increased vigilance in keeping potential invasive species from outside of North America from gaining a foothold.

Declines in native pollinator species are another important concern in the Midwest, as both native and managed pollinator species (typically nonnative bee species) play vital roles in supporting food production and farmer livelihoods and are critical for supporting wild plant reproduction and the diversity of ecosystems.[164,165] Key threats to this diverse group of insects, mammals, and birds include habitat loss and degradation, pathogens, pesticide use, and invasive species.[164,165,166] Most native and agricultural crops that require a pollinator are pollinated by insects, and where information is available, declines in populations of pollinator insects in the Midwest have primarily been linked to the expansion of intensive agriculture.[167,168,169,170] In addition to habitat loss, climate change is likely to act as an added stressor for many species, through many different mechanisms.[164] Many insects may be limited by their ability to shift to new habitats as conditions change; for example, many bumble bee species are showing population declines at southern range edges but not expanding as quickly at northern range edges.[171] It is likely that pollinators that specialize on one or a few species for some aspect of their life history will be particularly vulnerable.[172] Within the Midwest, observed high rates of decline in the monarch butterfly,[167] which relies on milkweed species as a host plant, are the focus of a network of outreach and ambitious multi-partner conservation efforts that are helping raise awareness of pollinator declines and links between pollinators and habitat availability.[173] These efforts, boosted by research demonstrating that habitat restoration can help sustain pollinator populations,[174,175] provide examples of how to help support the adaptation of this critical group of species.

Perhaps more than in any other region of the United States, human land use has influenced the structure and function of natural systems of the Midwest. Widespread conversion of natural systems to agriculture has changed much of the region's water and energy balance (Ch. 5: Land Changes, KM 1). When vegetation has been removed or undergoes a major change, runoff and flooding both tend to increase.[24,176,177] As land has been cleared for agriculture and cities, it simultaneously has lost the capacity to store water due to the resulting conversion to pavement, compaction of soils, and widespread loss of wetlands. More than half of the region's wetlands have been drained (Ch. 22: N. Great Plains, Case Study "Wetlands and the Birds of the Prairie Pothole Region"); in states at the southern end of the region, fewer than

10%–15% of presettlement wetlands remained in the 1980s.[178] The growth of agriculture and loss of wetlands in the Midwest mean that changes to the timing, type (snow or rain), and amount of precipitation are acting on a system that is already highly altered in ways that tend to promote flooding.[24] Climate change modeling suggests that the southern half of the Midwest likely will see increases in saturated soils, which also indicates risks to agriculture and property from inundation and flooding;[179] recent work incorporating land-use change and population changes also suggests the number of people at risk from flooding will increase across much of the Midwest.[180] However, understanding these relationships also highlights important climate adaptation strategies. For example, restoring systems like wetlands and forested floodplains and implementing agricultural best management strategies that increase vegetative cover (such as cover crops and riparian buffers) can help reduce flooding risks and protect water quality (Figure 21.7).[23,24,25]

Wetland Restoration Projects Can Help Reduce Impacts

Figure 21.7: The Blausey Tract restoration project on the U.S. Fish and Wildlife Service's Ottawa National Wildlife Refuge (Ohio) restored 100 acres of former Lake Erie coastal wetlands that were previously in row crop production. In addition to providing habitat for wildlife and fish, these wetlands help reduce climate change impacts by storing water from high-water events and by filtering nutrients and sediments out of water pumped from an adjacent farm ditch. This work was carried out by two conservation groups, The Nature Conservancy and Ducks Unlimited, in partnership with the U.S. Fish and Wildlife Service, and was funded by The Great Lakes Restoration Initiative.[186,187] (top) Shown here is the Blausey Tract restoration site in early spring of 2011, prior to the restoration activities. (bottom) In the spring of 2013, just two years after the start of restoration, the site already was providing important habitat for wildlife and fish. Photo credits: (top) ©The Nature Conservancy, (bottom) Bill Stanley, ©The Nature Conservancy.

As the flooding risk example above illustrates, understanding both the history of change and how future climate patterns can drive additional changes is useful for identifying meaningful strategies for reducing risks to both people and biodiversity through strategically protecting and restoring ecosystems. Since the Third National Climate Assessment,[27] the recognition, promotion, and implementation of green or ecosystem-based climate change adaptation solutions have expanded. While the idea of using natural systems to reduce risks and provide benefits to society is not new, efforts to document and quantify benefits, costs, and costs savings (relative to hard, or "gray," infrastructure) of these types of approaches are increasing.[181] These approaches often help replace systems that have been lost, such as Great Lakes coastal wetlands, prairies, and vegetated floodplains along rivers and streams that slow water flows and act as sponges that keep floodwaters from people, property, and infrastructure (Figure 21.7),[182,183] or tree cover that increases shade and improves urban air quality.[181,184] The important role of nature-based solutions like reforestation for mitigating climate change is also increasingly being recognized and quantified.[185] From the perspective of protecting the biodiversity of the Midwest, adaptation and mitigation strategies that incorporate protection or restoration of natural systems can be a great win-win approach, because they often add habitat and restore ecological and hydrological functions that were reduced as a result of land conversion.

Box 21.1: Focus on the Great Lakes

The Great Lakes contain 20% of the world's surface freshwater, provide drinking water and livelihood to more than 35 million people,[188] and allow for important economic and cultural services such as shipping and recreation. The Great Lakes influence regional weather and climate conditions and impact climate variability and change across the region. The lakes influence daily weather by 1) moderating maximum and minimum temperatures of the region in all seasons, 2) increasing cloud cover and precipitation over and just downwind of the lakes during winter, and 3) decreasing summertime convective clouds and rainfall over the lakes.[189,190] In recent decades, the Great Lakes have exhibited notable changes that are impacting and will continue to impact people and the environment within the region.[191] In particular, lake surface temperatures are increasing,[11,12] lake ice cover is declining,[12,13,14] the seasonal stratification of temperatures in the lakes is occurring earlier in the year,[15] and summer evaporation rates are increasing.[13,16]

Along the Great Lakes, lake-effect snowfall has increased overall since the early 20th century. However, studies have shown that the increase has not been steady, and it generally peaked in the 1970s and early 1980s before decreasing.[193] As the warming in the Midwest continues, reductions in lake ice may increase the frequency of lake-effect snows until winters become so warm that snowfall events shift to rain.[194,195]

Lake-surface temperatures increased during the period 1985–2009 in most lakes worldwide, including the Great Lakes.[196] The most rapid increases in lake-surface temperature occur during the summer and can greatly exceed temperature trends of air at locations surrounding the lakes.[197] From 1973 to 2010, ice cover on the Great Lakes declined an average of 71%;[14] although ice cover was again high in the winters of 2014 and 2015,[192] a continued decrease in ice cover is expected in the future.[198,199]

Water levels in the Great Lakes fluctuate naturally, though levels more likely than not will decline with the changing climate.[200] A period of low water levels persisted from 1998 to early 2013. A single warm winter in

Box 21.1: Focus on the Great Lakes, *continued*

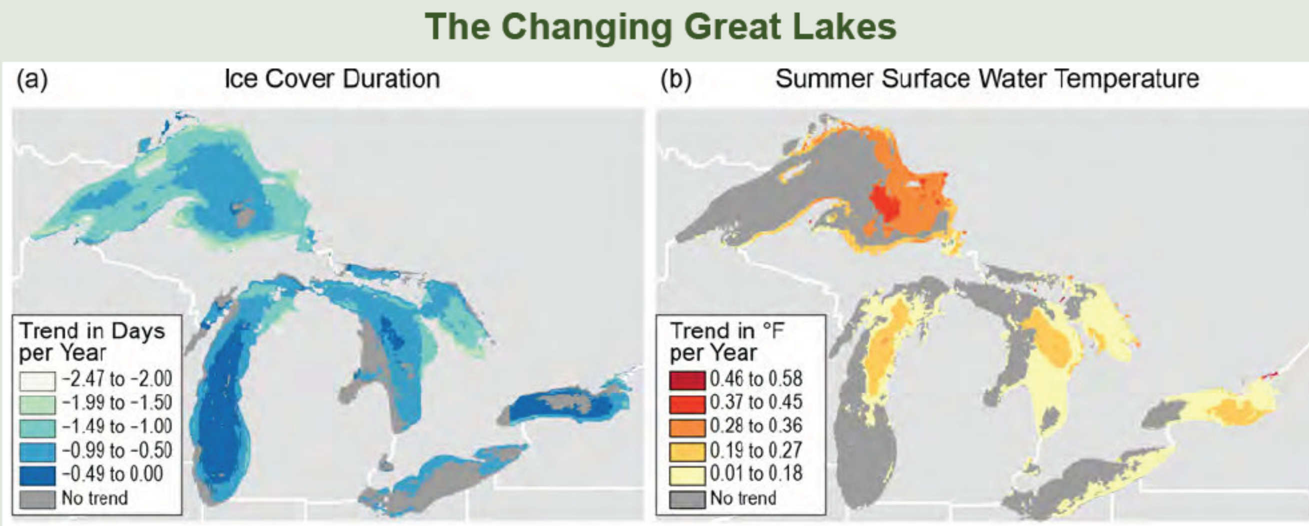

Figure 21.8: The duration of seasonal ice cover decreased in most areas of the Great Lakes between 1973 and 2013, while summer surface water temperature (SWT) increased in most areas between 1994 and 2013. (a) The map shows the rate of change in ice cover duration. The greatest rate of decrease in seasonal ice cover duration is seen near shorelines, with smaller rates occurring in the deeper central parts of Lakes Michigan and Ontario, which rarely have ice cover. (b) The map shows the rate of change in summer SWT. The greatest rates of increase in summer SWT occurred in deeper water, with smaller increases occurring near shorelines. Source: adapted from Mason et al. 2016.[192] Used with permission from Springer.

1997–1998 (corresponding to a major El Niño event) and ongoing increases in sunlight reaching the lake surface (due to reduced cloud cover) were likely strong contributors to these low water levels.[11] Following this period, water levels rose rapidly. Between January 2013 and December 2014, Lake Superior's water rose by about 2 feet (0.6 meters) and Lakes Michigan and Huron's by about 3.3 feet (1.0 meter).[201] Recent projections with updated methods of lake levels for the next several decades under 64 global model-based climate change simulations (from the Coupled Model Intercomparison Project Phase 5, or CMIP5 database, using the RCP4.5, RCP6.0, and RCP8.5 scenarios) on average show small drops in water levels over the 21st century (approximately 6 inches for Lakes Michigan and Huron and less for the other lakes), with a wide range of uncertainty.[200]

An important seasonal event for biological activity in the Great Lakes is the turnover of water, or destratification, which historically has occurred twice per year. Destratification occurs during the fall as the water temperature drops below a threshold of 39°F, the point at which freshwater attains its maximum density, and again during the spring when the water temperature rises above that threshold. The resultant mixing carries oxygen down from the lake surface and nutrients up from the lake bottom and into the water column. In a pattern that is similar to changes in duration of the growing season on land, the climate projections suggest that the overturn in spring that triggers the start of the aquatic "growing season" will happen earlier, and the fall overturn will happen later.[198,202] This trend toward a longer stratified season has been documented at locations in Lake Superior.[197,203] As the duration of the stratified period increases, the risk of impacts from low oxygen levels at depth and a lack of nutrient inputs at the surface increases, potentially leading to population declines of species in both zones. As warming trends continue, it is possible that a full overturning may not occur each year.[204] For example, lake surface temperatures failed to drop below the 39°F threshold during the winters of 2012 and 2017 in parts of southern Lake Michigan and Lake Ontario (see https://coastwatch.glerl.noaa.gov/glsea/glsea.html). When this lack of water mixing contributes to persistently low oxygen levels, the result may be reductions in the growth of phytoplankton (algae) and zooplankton (microscopic animals) that form the basis of aquatic food webs, potentially leading to cascading effects on the health and abundance of species across all levels of Great Lakes food webs.[202,205,206]

Box 21.1: Focus on the Great Lakes, *continued*

Ecological impacts of climate change in the Great Lakes occur in the context of multiple stressors, as these important ecosystems are under stress from pollution, nutrient and sediment inputs from agricultural systems, and invasive species (Ch. 17: Complex Systems, KM 1).[9,10] Human influence on habitats is another stressor. Examples include coastal wetland damage[207] and disturbance by human structures that change habitat conditions and water flow patterns.[208] Fish harvest and other management activities also have influences on populations.[209] Especially in Lake Erie, runoff from agricultural watersheds can carry large volumes of nutrients and sediments that can reduce water quality, potentially leading to hypoxia (inadequate oxygen supply),[210,211] an occurrence that is predicted to be more likely as the climate continues to change.[10] Increased water temperatures and nutrient inputs also contribute to algal blooms, including harmful cyanobacterial algae that are toxic to people, pets, and many native species.[212,213]

As with the inland lake fish described above (see Figure 21.6), climate change is expected to impact the species and fisheries of the Great Lakes.[214] However, the vast size and low temperatures in these lakes suggest that mortality events from temperature are a much lower risk. One key aspect of the influence of warming lakes on fish growth is the availability of suitable thermal habitat, as ectotherms, or cold-blooded species, can grow faster in warmer water due to temperature impacts on metabolic rates. Fish can behaviorally thermoregulate, meaning they can migrate to the portion of the water column that contains water of the particular species' preferred temperature.[215] Bottom-water temperatures in the deep parts of the lakes are expected to remain close to 39°F, while temperatures above the seasonal thermocline (the distinct temperature transition zone separating warmer surface waters from colder waters below) are expected to warm considerably.[202] This means that fish will be able to find habitats that favor higher growth rates for a longer period of time during the year. This same growth rate increase may occur for some species in smaller lakes, but the potential for exceeding critical thresholds is likely higher (Figure 21.6). If sufficient food is available, this will enhance the growth rates for economically important species like yellow perch and lake whitefish even though they are classed as cool-water and coldwater fishes, respectively.[216] It remains unclear, however, if a sufficient food supply will be available to sustain this increase in growth rates.

While some native fish may show enhanced growth, these same changes can influence the survival and growth of invasive species. Nonnative species such as alewife[217] and zebra and quagga mussels[218] have had dramatic impacts on the Great Lakes. Warmer conditions may lead to increases in invasion success and may increase the impact of invasive species that are already present. For example, sea lamprey are parasitic fish that are native to the Atlantic Ocean, and in the Great Lakes, they are the focus of several forms of control efforts.[219] Climate change has potential to reduce the effectiveness of these efforts. In the Lake Superior watershed, in years with longer growing seasons (defined as the number of days with water temperatures above 50°F), lamprey reach larger weights before spawning.[161] Larger body sizes suggest a greater impact on other fish species, because larger lamprey produce more eggs and require more food to survive.[161]

Coastal communities and several economic sectors, including shipping, transportation, and tourism, are vulnerable to the aforementioned climate impacts (Ch. 8: Coastal, KM 1). While the most recent research[200] underscores the great uncertainty in future lake levels, earlier research showed that scenarios of decreasing lake levels will increase shipping costs even if the shipping season is longer,[220] or that lower ice cover could increase the damage to coastal infrastructure caused by winter storms.[221,222] While several coastal communities have expressed willingness to integrate climate action into planning efforts, access to useful climate information and limited human and financial resources constrain municipal action. Producers and users of climate

Box 21.1: Focus on the Great Lakes, *continued*

information are working together to create customized climate information and resources, which increases trust and legitimacy, addressing this challenge (see Case Study "Great Lakes Climate Adaptation Network"). This has been demonstrated in projects, for instance, with marinas and harbors in Michigan, with ravine management in Illinois and Wisconsin, and with the Chicago Climate Action Plan in Illinois.[223,224,225,226] Although many communities in the region are taking steps to incorporate climate change and related impacts into policy and planning decisions, many more may benefit from using their existing stakeholder networks to engage with producers of climate information and build upon lessons learned from leaders in the region.[227]

Key Message 4

Human Health

Climate change is expected to worsen existing health conditions and introduce new health threats by increasing the frequency and intensity of poor air quality days, extreme high temperature events, and heavy rainfalls; extending pollen seasons; and modifying the distribution of disease-carrying pests and insects. By mid-century, the region is projected to experience substantial, yet avoidable, loss of life, worsened health conditions, and economic impacts estimated in the billions of dollars as a result of these changes. Improved basic health services and increased public health measures—including surveillance and monitoring—can prevent or reduce these impacts.

Climate change directly and indirectly impacts human health (Ch. 14: Human Health, KM 1). Midwestern populations are already experiencing adverse health impacts from climate change, and these impacts are expected to worsen in the future.[26,27] The risks are especially high for people who are less able to cope because characteristics like age, income, or social connectivity make them more vulnerable.[228]

Air Quality

Degraded air quality impacts people living in the Midwest. Increases in ground-level ozone and particulate matter are associated with the prevalence of various lung and cardiovascular diseases, which can lead to missed school days, hospitalization, and premature death (Ch. 13: Air Quality, KM 1).[26,28] Despite successful efforts to reduce particulate matter and ozone pollution, climate change could increase the frequency of meteorological conditions that lead to poor air quality.[26,229] In the absence of mitigation, ground-level ozone concentrations are projected to increase across most of the Midwest, resulting in an additional 200 to 550 premature deaths in the region per year by 2050.[28] These account for almost half of the total projected deaths due to the climate-related increase in ground-level ozone nationwide and may cost an estimated $4.7 billion (in 2015 dollars).[28]

Pollen production has been on the rise in the Midwest in recent years, with pollen seasons starting earlier and lasting longer (Ch. 13: Air Quality, KM 3).[28,230] People, particularly children, with asthma and other respiratory diseases are especially vulnerable to aeroallergens.[231] Aeroallergens can cause allergic rhinitis and exacerbate asthma and sinusitis.[231] Oak pollen may be responsible for an increase of 88 to 350 asthma-related emergency room visits by 2050 under the higher scenario (RCP8.5), with an estimated average annual cost ranging between $43,000 and $170,000 (in 2015 dollars).[28]

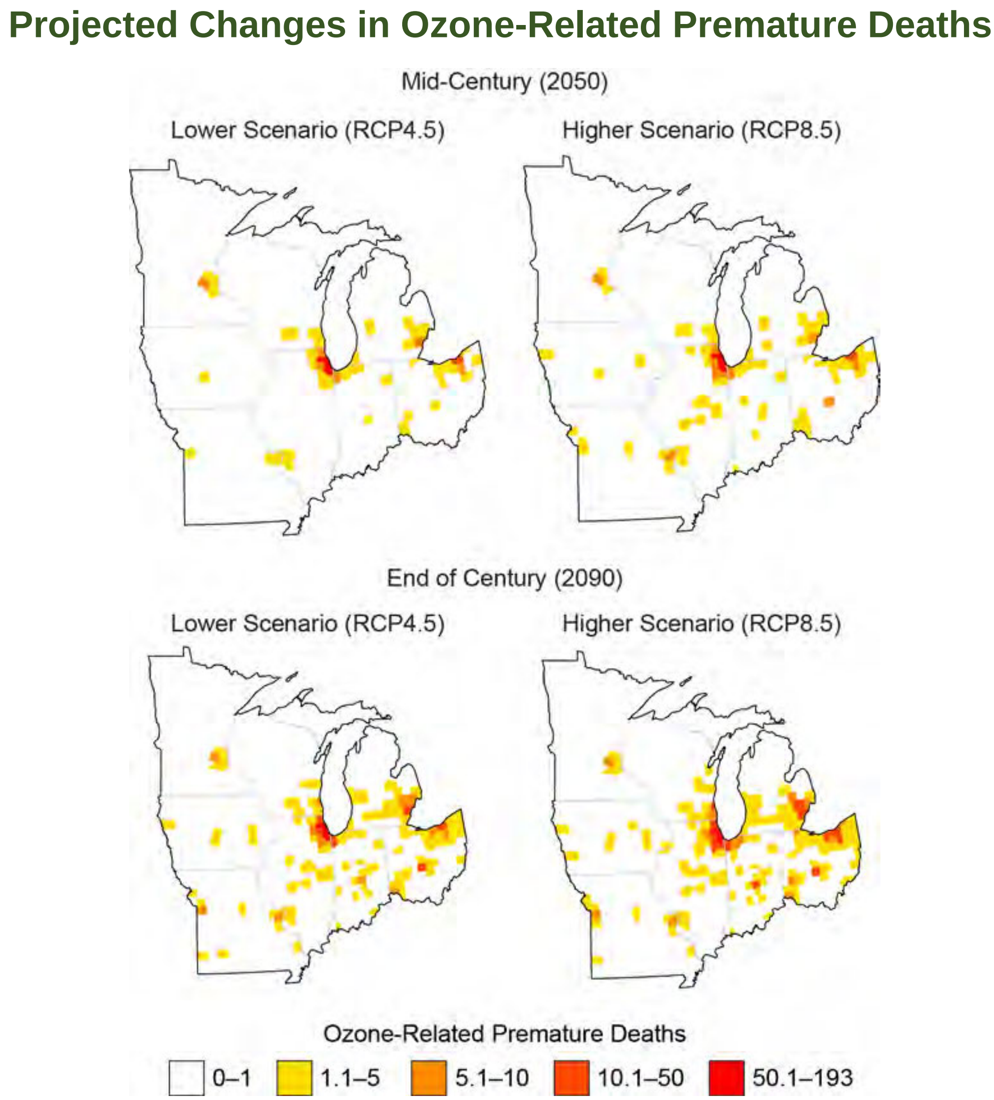

Figure 21.9: Maps show county-level estimates for the change in average annual ozone-related premature deaths over the summer months in 2050 (2045–2055) and 2090 (2085–2095) compared to 2000 (1995–2005) under the lower and higher scenarios (RCP4.5 and RCP8.5) in the Midwest. The results represent the average of five global climate models. Source: adapted from EPA 2017.[28]

Temperature

Increased daytime and nighttime temperatures are associated with heat-related diseases (for example, dehydration and heatstroke) and death in the Midwest.[26,232] Extreme heat in urban centers like Chicago, St. Louis, Cincinnati, Minneapolis/St. Paul, Milwaukee, and Detroit can cause dangerous living conditions.[26,232,233,234,235,236] High rates of heat-related illness also have been observed in rural populations,[235] where occupational exposure to heat and access to care is a concern. Exposure to high temperatures impacts workers' health, safety, and productivity.[29]

Future risk of heat-related disease could be significantly higher. As an example, Figure 21.10 shows the projected number of days over 100°F in Chicago over the 21st century using 32 models and two scenarios. Currently, days over 100°F in Chicago are rare. However, they could become increasingly more common in both the lower and higher scenarios (RCP4.5 and RCP8.5). The higher scenario (RCP8.5) yields a wider range and a higher number of days over 100°F than the lower scenario (RCP4.5), especially by 2070–2090. Near the upper end of the model results (95th percentile) at late-century, with the potential for almost 60 days per year over 100°F, conditions could be more typical of present-day Las Vegas than Chicago. While the degree of uncertainty becomes larger further into the future, all model results show an increase in heat in the last two periods of the 21st century—changes that would pose a significant challenge to Chicago and other midwestern cities.

Compared to other regions where worsening heat is also expected to occur, the Midwest is projected to have the largest increase in extreme temperature-related premature deaths under the higher scenario (RCP8.5): by 2090, 2,000 additional premature deaths per year, compared to the base period of 1989–2000, are projected due to heat alone without adaptation efforts.[28] Northern midwestern communities and vulnerable populations (see Key Message 6) that historically have not experienced high temperatures may be at risk for heat-related disease and death. Risk of death from extremely cold temperatures will decrease under most climate projection scenarios.[28]

Unabated climate change will translate into costs among the workforce and in utility bills, potentially exacerbating existing health disparities among those most at risk. By 2050, increased temperatures under the higher scenario (RCP8.5) are estimated to cost around $10 billion (in 2015 dollars) due to premature deaths and lost work hours.[28] Increased electricity demand is estimated to amount to $1.2 billion by 2090 (in 2015 dollars).[28] For those who are chronically ill or reliant on electronic medical devices, the increased cost of electricity, which contributes to energy insecurity,[28] may introduce financial and health burdens.

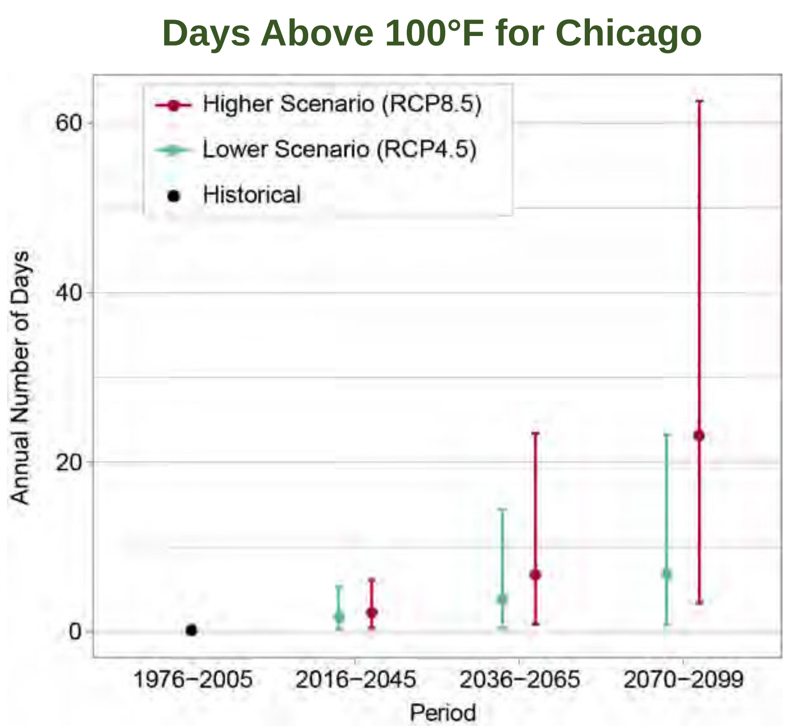

Figure 21.10: This graph shows the annual number of days above 100°F in Chicago for the historical period of 1976–2005 (black dot) and projected throughout the 21st century under lower (RCP4.5, teal) and higher (RCP8.5, red) scenarios. Increases at the higher end of these ranges would pose major heat-related health problems for people in Chicago. As shown by the black dot, the average number of days per year above 100°F for 1976–2005 was essentially zero. By the end of the century (2070–2099), the projected number of these very hot days ranges from 1 to 23 per year under the lower scenario and 3 to 63 per year under the higher scenario. For the three future periods, the teal and red dots represent the model-weighted average for each scenario, while the vertical lines represent the range of values (5th to 95th percentile). Both scenarios show an increasing number of days over 100°F with time but increasing at a faster rate under the higher scenario. Sources: NOAA NCEI and CICS-NC.

Precipitation

An increase in localized extreme precipitation and storm events can lead to an increase in flooding.[27] River flooding in large rivers like the Mississippi, Ohio, and Missouri Rivers and their tributaries can flood surface streets and low-lying areas, resulting in drinking water contamination, evacuations, damage to buildings, injury, and death.[26] Flooded buildings can experience mold growth that can trigger asthma attacks and allergies during cleanup efforts.[237] Mental stress following flooding events can cause substantial health impacts, including sleeplessness, anxiety, depression, and post-traumatic stress disorder.[238] Similarly, drought has been identified as a slow-moving stressor that contributes to acute and chronic mental health impacts such as anxiety and depression.[239]

Precipitation events can transport pathogens that cause gastrointestinal illnesses, putting populations who rely on untreated groundwater (such as wells) at an increased risk of disease,[240] particularly following large rainfall events.[241] Many midwestern communities use wells as their drinking water sources. Adaptive measures, such as water treatment installations, may substantially reduce the risk of gastrointestinal illness, in spite of climate change.[240]

Habitat Conditions

Climate-related changes in habitats (see Key Message 3) for disease-carrying insects like the mosquito found in the Midwest (*Culex pipiens* and *Culex tarsalis*) that transmits West Nile virus (WNV) and the blacklegged, or deer, tick (*Ixodes scapularis*) that transmits Lyme disease have been associated with higher rates of infection.[242,243] Northern expansion of the *Culex* species in the Midwest is expected to result in upwards of 450 additional WNV cases above the 1995 baseline by 2090 absent greenhouse gas mitigation.[28]

Harmful algal blooms (Box 21.1), such as one that occurred in August 2014 in Lake Erie, can introduce cyanobacteria into drinking and recreational water sources, resulting in restrictions on access and use.[28] Contact with and consumption of water contaminated with cyanobacteria have been associated with skin and eye irritation, respiratory illness, gastrointestinal illness, and liver and kidney damage.[26] The occurrence of conditions that encourage cyanobacteria growth, such as higher water temperatures, increased runoff, and nutrient-rich habitats, are projected to increase in the Midwest.[28]

Challenges and Opportunities

Climate-sensitive health impacts are complex and dynamic. Coordination across public health, emergency preparedness, planning, and communication agencies can maximize outreach to the most at-risk populations while directing activities to reduce health disparities and impacts.[244] Public health agencies in the Midwest have developed interdisciplinary communities of practice around climate and health adaptation efforts, effectively enhancing the resilience of the region's public health systems.[244,245,246,247,248] Activities around increased surveillance of climate-sensitive exposures and disease are gaining momentum and interest among practitioners and researchers.[249,250]

Actions tied to reducing contributions to global climate change can result in direct co-benefits related to health and other outcomes (such as economic development).[251] Reducing emissions related to energy production and transportation may involve changes to fuel sources, vehicle technology, land use, and infrastructure.[251] Active transportation, such as biking and walking, has been found to significantly decrease disease burden.[252,253,254] A study of the 11 largest midwestern metropolitan areas estimated a health benefit of nearly 700 fewer deaths per year by swapping half of short trips from car to bike.[255] As Midwest Rust Belt metropolitan areas revitalize and reinvest, there are opportunities to prioritize active living to maximally reduce climate change drivers and improve health.

Key Message 5

Transportation and Infrastructure

Storm water management systems, transportation networks, and other critical infrastructure are already experiencing impacts from changing precipitation patterns and elevated flood risks. Green infrastructure is reducing some of the negative impacts by using plants and open space to absorb storm water. The annual cost of adapting urban storm water systems to more frequent and severe storms is projected to exceed $500 million for the Midwest by the end of the century.

Climate change poses several challenges to transportation and storm water systems in the Midwest. Annual precipitation in the Midwest has increased by 5% to 15% from the first half of the last century (1901–1960) compared to present day (1986–2015).[193] Winter and spring precipitation are important to flood risk in the Midwest and are projected to increase by up to 30% by the end of this century. Heavy precipitation events in the Midwest have increased in frequency and intensity since 1901 and are projected to increase through this century.[193]

There has been an increase in extreme precipitation events that overwhelm storm water sewage systems, disrupt transportation networks, and cause damage to infrastructure and property. Runoff from extreme precipitation events can exceed the capacity of storm water systems, resulting in property damage, including basement backups (Ch. 11: Urban, KM 2).[37,256] In addition, in metropolitan areas with older sewer systems that combine sanitary sewage with storm water, extreme rain can result in the release of raw sewage into rivers and streams, posing both health and ecological risks.[257] These releases, known as combined sewer overflows (CSO), pose challenges to major sources of drinking water including the Mississippi River[258] and the Great Lakes.[259,260] On the Great Lakes, increases in CSO frequency and volume are projected under mid-high and higher scenarios (RCP6.0 and RCP8.5).[261] The U.S. Environmental Protection Agency (EPA) estimates that the cost of adapting urban storm water systems to handle more intense and frequent storms in the Midwest could exceed $480 million per year (in 2015 dollars) by the end of the century under either the lower or higher scenario (RCP4.5 or RCP8.5).[28] Extreme precipitation events also affect transportation systems (Ch. 12: Transportation, KM 1). Heavy rainstorms can result in the temporary closure of roadways. In addition, faster streamflow caused by extreme precipitation can erode the bases of bridges, a condition known as scour. A study of six Iowa bridges deemed to be critical infrastructure found that under all emissions scenarios (in the Coupled Model Intercomparison Project Phase 3), each location was projected to have increased vulnerability from more frequent episodes of overtopping and potential scour.[55] The EPA estimates that the annual cost of maintaining current levels of service on midwestern bridges in the face of increased scour damage from climate change could reach approximately $400 million in the year 2050 under either the lower or higher scenario (RCP4.5 or RCP8.5).[28]

In addition to its impacts on infrastructure, heavy precipitation also affects the operation of roadways by reducing safety and capacity while increasing travel times (Ch. 12: Transportation, KM 1). Projected increases in the number of extreme precipitation events have been linked to an increased risk of traffic crashes.[262] Intelligent Transportation Systems (ITS) use sensors and cameras to monitor road conditions. This allows for rapid deployment of emergency response vehicles and use of electronic signage to reroute traffic. Such systems allow transportation agencies to minimize the adverse impacts associated with extreme weather.[263]

Flooding on major rivers also poses a challenge to Midwest communities. Major river floods differ from flash floods on smaller streams in that they affect a larger area and require longer periods of heavy precipitation to create flood conditions. The Nation's two largest rivers, the Mississippi and the Missouri, flow through the Midwest. River floods can cause loss of life, as well as significant property damage. River floods have caused the closure of interstate highways in the Midwest and temporary inundation of secondary roads. During floods in May 2017, more than 400 state roads in Missouri were closed due to flooding, including several stretches of Interstate 44 (Figure 21.11).[264] High water also disrupts barge traffic on the Mississippi River.[265,266,267,268,269,270] Billion-dollar floods in the Midwest have occurred three times in the last quarter-century.[271] Climate projections suggest an increased risk of inland flooding under either the lower or higher scenario (RCP4.5 or RCP8.5). Average annual damages from heightened flooding risk in the Midwest are projected to be in excess of $500 million (in 2015 dollars) by 2050.[28]

Changes in temperature also can pose challenges to infrastructure. Extreme heat creates material stress on road pavements, bridge expansion joints, and railroad tracks. Milder winter temperatures, however, may be expected to partially offset these damages by reducing the amount of rutting caused by the freeze–thaw cycle. Even taking into account

River Flooding in the Midwest

Figure 21.11: This composite image shows portions of Interstate 44 near St. Louis that were closed by Meramec River flooding in both 2015 and 2017. The flooding shown here occurred in May 2017. Image credit: Surdex Corporation.

the benefits of milder winters for paved surfaces, the EPA estimates that higher temperatures associated with unmitigated climate change would result in approximately $6 billion annually in added road maintenance costs and over $1 billion in impacts to rail transportation by 2090 (in 2015 dollars).[28]

Green infrastructure—the use of plants and open space to manage storm water—is helping communities in the Midwest become more resilient to challenges associated with heavy precipitation. At the site or neighborhood level, rain gardens and other planted landscape elements collect and filter rainwater in the soil, slowing runoff into sewer systems. Permeable pavements on parking lots allow water to be stored in the soil. Trees planted next to streets also provide important storm water management benefits. Larger-scale projects include preservation of wetlands. In addition to their storm water management benefits, some types of green infrastructure, such as urban trees and green roofs, contribute to climate change mitigation by acting as carbon sinks.[272,273,274]

There are many examples of green infrastructure projects in the Midwest, though not all explicitly identify climate change as a rationale. The examples below enhance resilience to the heavy rains that are projected to become more frequent.

- The Cermak/Blue Island Sustainable Streetscape Project in the Pilsen neighborhood of Chicago uses bioswales, rain gardens, and permeable pavements to reduce up to 80% of storm water runoff. It also uses street trees and other vegetation to reduce the urban heat island effect while also providing an attractive public space.[275]

- The Metropolitan Sewer District in St. Louis has embarked upon a $100 million rainscaping project designed to divert storm water runoff in the northern portion of the City of St. Louis and adjacent north St. Louis County.[276]

- The City of Minneapolis uses street trees to reduce storm water runoff through enhanced evaporation and infiltration of water into the soil.[277] The City of Cleveland also prioritizes tree planting as an adaptation strategy, with an emphasis on increasing the tree canopy in low-income neighborhoods. In addition to its storm water management benefits, urban forestry also reduces the urban heat island effect and acts as a carbon sink.[278]

At the scale of a metropolitan region, preservation and restoration of streams, floodplains, and watersheds are enhancing biodiversity while also reducing storm water runoff.

- *Open Space Preservation*: Many communities in the Midwest are recognizing that preservation of open space, particularly in floodplains, is a cost-effective method for managing storm water. Ducks Unlimited, a non-profit organization, has purchased conservation easements that restrict future development on nearly 10,000 acres of floodplain around the confluence of the Mississippi and Missouri Rivers. In the Milwaukee area, the Ozaukee Washington Land Trust has preserved more than 6,000 acres of forests, wetlands, and open space through acquisitions and the purchase of conservation easements, preserving lands important for absorbing rainwater and filtering toxins from sediment.[279,280]

- *Stream Restoration*: Several midwestern communities are turning to dechannelization (the removal of concrete linings placed in waterways) and daylighting (bringing back to the surface streams that had been previously buried in pipes) as methods of storm water management. The Milwaukee Metropolitan Sewerage District is currently undertaking a dechannelization of the Kinnickinnic River. According to the District, the concrete lining of the waterway actually makes the waterway more dangerous during heavy rain. Flooding motivated the City of Kalamazoo to daylight a 1,500-foot section of Arcadia Creek in the downtown district.[281,282]

- *Ravine Restoration*: Lake Michigan's western shore in Wisconsin and northern Illinois holds more than 50 small watersheds, known locally as ravines. Storm water runoff subjects these ravines to serious erosion, which threatens property and infrastructure. The Great Lakes Alliance has produced guides to reduce erosion through best management practices, including stream buffers, use of native plants for stabilization, and reducing the steepness or gradient of the stream bank.[223]

Key Message 6

Community Vulnerability and Adaptation

At-risk communities in the Midwest are becoming more vulnerable to climate change impacts such as flooding, drought, and increases in urban heat islands. Tribal nations are especially vulnerable because of their reliance on threatened natural resources for their cultural, subsistence, and economic needs. Integrating climate adaptation into planning processes offers an opportunity to better manage climate risks now. Developing knowledge for decision-making in cooperation with vulnerable communities and tribal nations will help to build adaptive capacity and increase resilience.

Vulnerability and Adaptation

In the Midwest, negative impacts related to climate change are projected to affect human systems, including cities, rural and coastal communities, and tribes.[28,283,284] Higher temperatures, increasing variation in precipitation patterns, and changes in lake levels are likely to increase the vulnerability of these systems to extreme events (including flooding, drought, heat waves, and more intense urban heat island effects), compounding already existing stressors such as economic downturns, shrinking cities, and deteriorating infrastructure.[285] Extreme heat such as that experienced in July 2011 (with temperatures reaching over 100°F in the majority of the Midwest) is expected to intensify,[286] and urban heat islands may cause hardships to those most vulnerable, such as the old and infirm and those without resources to control their microclimate (for example, through the use of air conditioning).[287] Under the higher scenario (RCP8.5), extreme heat is projected to result in losses in labor and associated losses in economic revenue up to $9.8 billion per year in 2050 and rising to $33 billion per year in 2090 (in 2015 dollars).[28] Expanding the use of green infrastructure and locating it properly may mitigate the negative impact of heat islands in urban settings (see Key Messages 4 and 5) (see also Ch. 11: Urban, KM 4).

To mitigate or better respond to these impacts, scholars and practitioners highlight the need to engage in risk-based approaches that not only focus on assessing vulnerabilities but also include effective planning and implementation of adaptation options (Ch. 28: Adaptation, KM 3).[32] These place-based approaches actively rely on participatory methodologies to evaluate and manage risk and to monitor and evaluate adaptation actions.[32] However, documented implementation of climate change planning and action in Midwest cities and rural communities remains low. For example, in 2015, only four counties and cities in the region—Marquette and Grand Rapids in Michigan and Dane County and Milwaukee in Wisconsin—had created formal climate adaptation plans, none of which have been implemented.[288] Moreover, a recent study of 371 cities in the Great Lakes region found that only 36 of them could identify a climate entrepreneur, that is, a public official clearly associated with pushing for climate action.[285] Attempts to assess vulnerabilities, especially for poor urban communities, face persisting environmental and social justice barriers, such as lack of participation and historical disenfranchisement,[289] despite evidence that these communities are going to be disproportionately affected by climate impacts.[290] Additionally, in-depth interviews with local decision-makers on water management across scales have suggested that a lack of political and financial support at the state and federal levels is a barrier to adaptation action in cities and counties.[291] While initiatives are underway in the Midwest to mainstream adaptation action—that is, embed and integrate climate adaptation action in what cities already do (see Case Study "Great Lakes Climate Adaptation Network") (see also Ch. 28: Adaptation, KM 5)—there are few examples in the published literature that document failure or success (but see Kalafatis et al. 2015, Vogel et al. 2016[292,293]).

Case Study: Great Lakes Climate Adaptation Network

The Great Lakes Climate Adaptation Network (GLCAN) is a regional, member-driven peer network of local government staff who work together to identify and act on the unique climate adaptation challenges of the Great Lakes region. GLCAN formed in 2015 as a regional network of the Urban Sustainability Directors' Network (USDN) to unite Great Lakes cities with universities in the region. It has been cooperating actively with a regional climate organization, the Great Lakes Integrated Sciences and Assessments (GLISA), a NOAA-supported program housed at the University of Michigan and Michigan State University, to create climate information in support of decision-making in member cities. In this example of sustained engagement, GLCAN and GLISA work as a boundary chain that moves climate information from producers at the Universities to users in the cities, as well as across cities. This minimizes transaction costs, in terms of human and financial resources, while building trust and legitimacy.[292,294] In one example of this partnership, with funding from USDN, GLCAN and GLISA worked with the Huron River Watershed Council and five Great Lakes cities (Ann Arbor, Dearborn, Evanston, Indianapolis, and Cleveland) to develop a universal vulnerability assessment template that mainstreams the adaptation planning process and results in the integration of climate-smart and equity-focused information into all types of city planning.[295] The template is publicly available;[296] its purpose is to reduce municipal workloads and save limited resources by mainstreaming existing, disparate planning domains (such as natural hazards, infrastructure, and climate action), regardless of city size or location. Based on this work, USDN funded a follow-up project for GLISA to work with additional Great Lakes and Mid-Atlantic cities and a nonprofit research group (Headwaters Economics) to develop a socioeconomic mapping tool for climate risk planning.

Linked Boundary Chain Model

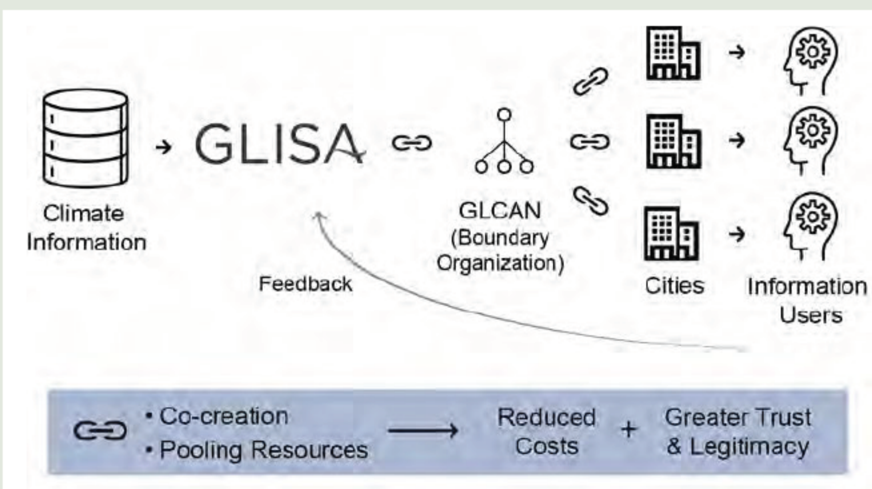

Figure 21.12: Shown here is a configuration of the boundary chain employed in the Great Lakes Climate Adaptation Network (GLCAN) Case Study. The information is tailored and moves through different boundary organizations (links in the chain) to connect science to users. By co-creating information and pooling resources throughout the chain, trust and legitimacy are built and cost is decreased. Source: adapted from Lemos et al. 2014.[294] ©American Meteorological Society.

In addition, work on estimating the cost of adaptation nationally and in the Midwest remains limited, though the EPA has estimated that the Midwest is among the regions with the largest expected damages to infrastructure, including the highest estimated damages to roads, rising from $3.3 billion per year in 2050 to $6 billion per year in 2090 (in 2015 dollars) under a higher scenario (RCP8.5), and highest number of vulnerable bridges (Key Message 5).[28] Additionally, economic models that value climate amenities—for example, offering residents the benefits of warmer winters or cooler summers—indicate that while the Midwest is among the regions with the largest predicted amenity loss, certain cities (such as Minneapolis and Minnesota) and subregions (such as upper Michigan) will be among the few places where the value of warmer winters outweighs the cost of hotter summers.[297,298] Limited evidence indicates that household consideration of climate amenities may contribute to reversing long-standing trends in out-migration from the Midwest[298] and that changes in national migration patterns will contribute to population growth in the region.[28] More research is needed to understand how cities in the Midwest might be affected by long-term migration to the region.[31]

Collaboratively Developing Knowledge and Building Adaptive Capacity

Interactions among producers of climate information (for example, universities and research institutes), end users (such as city planners, watershed managers, and natural resource managers), and intermediaries (for example, information brokers and organizations) play a critical role in increasing the integration and use of climate knowledge for adaptation.[299] In the Midwest, organizations such as the Great Lakes Integrated Sciences and Assessments (GLISA; glisa.umich.edu) and the Wisconsin Initiative on Climate Impacts (wicci.wisc.edu), and research projects such as Useful to Usable (U2U), have created mechanisms and tools, such as climate scenarios, decision support tools, and climate data, that promote the joint development of usable climate information across different types of stakeholders, including city officials, water managers, farmers, and tribal officials.[224,294,300] For example, working closely with corn farmers and climate information intermediaries, including extension agents and crop consultants, in Iowa, Nebraska, Michigan, and Indiana, an interdisciplinary team of climate scientists, agronomists, computer scientists, and social scientists have not only created a suite of decision support tools (see Key Message 1) but also significantly advanced understanding of corn farmers' perceptions of climate change,[301] willingness to adapt,[302] and opportunities for and limitations of the use of climate information in the agricultural sector.[294,303] Strategies being implemented as a result of these collaborations, including the use of green infrastructure and water conservation efforts, are proving effective at reducing sensitivity to the impacts of climate change in the Midwest.[304,305,306] In addition, binational partnerships between the United States and Canada, in support of the Great Lakes Water Quality Agreement, synthesized annual climate trends and impacts for a general audience in a pilot product for 2017 to provide a timely and succinct summary in an easy-to-understand format (Ch. 16: International, KM 4).[307] However, these organizations face challenges including the high costs in interacting with users, contextualizing and customizing climate information, and building trust.[308] The development of new forms of sustained engagement likely would increase the use of climate information in the region.

Tribal Adaptation

Tribes and Indigenous communities in the Midwest have been among the first to feel the effects of climate change as it impacts their culture, sovereignty, health, economies, and ways of life.[39] The Midwest contains ceded territory—large swaths of land in Minnesota, Wisconsin, and Michigan in which Ojibwe tribes reserved hunting, fishing, and gathering rights in treaties with the United States government.[88] Climate change presents challenges to the Ojibwe tribes in co-managing these resources with other land managers; as the climate changes, various species utilized by tribes are declining and may shift entirely outside of treaty boundaries and reserved lands.[127,309,310] In certain tribal cultures, all beings (species) are important; climate adaptation efforts that favor certain beings at the detriment of others can be problematic. Adaptation to climate change might also mean giving up on something deeply embedded in tribal culture for which no substitute exists.[31] A family sugarbush (a forest stand used for maple syrup), for example, cannot be replaced culturally, spiritually, or economically if the sugar maple range were to shift outside of treaty or reservation boundaries. As the effects of climate change become more pronounced, further research can shed light on how tribal nations are being affected.

Projected changes in climate, particularly increases in extreme precipitation events, will have pronounced impacts on tribal culture and tribal people in the Midwest.[283] Reservations often are located in isolated rural communities, meaning emergency response to flooding presents challenges in getting help to tribal citizens. Additionally, in areas of the Midwest, infestations of the invasive emerald ash borer already are devastating ash tree populations and corresponding Indigenous cultural and economic traditions.[127]

Across the United States, a number of tribal nations are developing adaptation plans, including in the Midwest (Ch. 15: Tribes, KM 3).[283] These plans bring together climate data and projections with Traditional Ecological Knowledge [311,312] of tribal members. Within Indigenous oral history lies a complex and rich documentation of local ecosystems—not found in books—that can be used to understand and document the changes that are occurring.[313] Climate change effects are not typically immediate or dramatic because they occur over a relatively long period of time, but tribal elders and harvesters have been noticing changes, such as declining numbers of waabooz (snowshoe hare), many of which Scientific Ecological Knowledge has been slower to document. The Traditional Ecological Knowledge of elders and harvesters who have lived and subsisted in a particular ecosystem can provide a valuable and nuanced understanding of ecological conditions on a smaller, more localized scale. Integrating this Traditional Ecological Knowledge with Scientific Ecological Knowledge in climate change initiatives provides a more complete understanding of climate change impacts.[136] Community input to tribal adaptation plans ensures that Traditional Ecological Knowledge can be used to produce adaptation strategies trusted by community members.[314]

Acknowledgments

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Traceable Accounts

Process Description

The chapter lead authors were identified in October 2016, and the author team was recruited in October and November 2016. Authors were selected for their interest and expertise in areas critical to the Midwest with an eye on diversity in expertise, level of experience, and gender. The writing team engaged in conference calls starting in December 2016, and calls continued on a regular basis to discuss technical and logistical issues related to the chapter. The Midwest chapter hosted an engagement workshop on March 1, 2017, with the hub in Chicago and satellite meetings in Iowa, Indiana, Michigan, and Wisconsin. The authors also considered other outreach with stakeholders, inputs provided in the public call for technical material, and incorporated the available recent scientific literature to write the chapter. Additional technical authors were added as needed to fill in the gaps in knowledge.

Discussion amongst the team members, along with reference to the Third National Climate Assessment and conversations with stakeholders, led to the development of six Key Messages based on key economic activities, ecology, human health, and the vulnerability of communities. In addition, care was taken to consider the concerns of tribal nations in the northern states of the Midwest. The Great Lakes were singled out as a special case study based on the feedback of the engagement workshop and the interests of other regional and sector chapters.

Note on regional modeling uncertainties

Interaction between the lakes and the atmosphere in the Great Lakes region (e.g., through ice cover, evaporation rates, moisture transport, and modified pressure gradients) is crucial to simulating the region's future climate (i.e., changes in lake levels or regional precipitation patterns).[315,316] Globally recognized modeling efforts (i.e., the Coupled Model Intercomparison Project, or CMIP) do not include a realistic representation of the Great Lakes, simulating the influence of the lakes poorly or not at all.[192,198,317,318,319] Ongoing work to provide evaluation, analysis, and guidance for the Great Lakes region includes comparing this regional model data to commonly used global climate model data (CMIP) that are the basis of many products practitioners currently use (i.e., NCA, IPCC, NOAA State Climate Summaries). To address these challenges, a community of regional modeling experts are working to configure and utilize more sophisticated climate models that more accurately represent the Great Lakes' lake–land–atmosphere system to enhance the understanding of uncertainty to inform better regional decision-making capacity (see http://glisa.umich.edu/projects/great-lakes-ensemble for more information).

Key Message 1

Agriculture

The Midwest is a major producer of a wide range of food and animal feed for national consumption and international trade. Increases in warm-season absolute humidity and precipitation have eroded soils, created favorable conditions for pests and pathogens, and degraded the quality of stored grain (*very likely, very high confidence*). Projected changes in precipitation, coupled with rising extreme temperatures before mid-century, will reduce Midwest agricultural productivity to levels of the 1980s without major technological advances (*likely, medium confidence*).

Description of evidence base

Humidity is increasing. Feng et al. (2016)[3] show plots of trends in surface and 850 hPa specific humidity of 0.4 and 0.2 g/kg/decade, respectively, from 1979–2014 for the April–May–June period across the Midwest. These represent increases of approximately 5% and 3% per decade, respectively. Automated Surface Observing Stations in Iowa[320] having dew point records of this length and season show dew point temperature increases of about 1°F per decade. Brown and DeGaetano (2013)[49] show increasing dew points in all seasons throughout the Midwest. Observed changes in annual average maximum temperature for the Midwest over the 20th century (Vose et al. 2017,[54] Table 6.1) have been less than 1°F. However, future projected changes in annual average temperature (Vose et al. 2017,[54] Table 6.4), as well as in both warmest day of the year and warmest 5-day 1-in-10 year events (Vose et al. 2017,[54] Table 6.5), are higher for the Midwest than in any other region of the United States.

Garbrecht et al. (2007)[321] state that precipitation changes are sufficient to require U.S. policy changes for agricultural lands. The Soil Erosion Site (http://soilerosion.net/water_erosion.html) describes the soil erosion process and provides links to soil erosion models.[322] Nearing et al. (2004)[44] report that global climate models project increases in erosivity (the ability or power of rain to cause soil loss) across the northern states of the United States over the 21st century.

Spoilage in stored grain is caused by mold growth and insect activity, which are related to the moisture content and temperature of the stored grain.[323] The ability of fungi to produce mycotoxins, including aflatoxin and fumonisins, is largely influenced by temperature, relative humidity, insect attack, and stress conditions of the plants.[57,324] Humidity has a determining influence on the growth rate of these degradation agents.[325]

Germination of wheat declined in storage facilities where moisture level increased with time.[326] Freshly harvested, high-moisture content grain must be dried to minimize (or prevent) excessive respiration and mold growth on grains.[327] The storage life of grain is shortened significantly when stored at warm temperatures. One day of holding warm, wet corn before drying can decrease storage life by 50%.[45]

Feng et al. (2016)[3] show humidity is rising in the Midwest in the warm season. Cook et al. (2008)[4] show that the factors leading to these humidity increases (warming Gulf of Mexico and strengthening of the Great Plains Low-Level Jet) will increase in a warming climate.

The ability of fungi to produce mycotoxins is largely influenced by temperature, relative humidity, insect attack, and stress conditions of the plants.[324] More extreme rainfall events would favor formation of Deoxynivalenol, also known as vomitoxin.[57]

Hatfield et al. (2011,[50] Table 1) give the relationships between temperature and vegetative function as well as reproductive capacity. This work was expanded and updated in Walthall et al. (2012).[328]

Mader et al. (2010)[74] report a comprehensive climate index for describing the effect of ambient temperature, relative humidity, radiation, and wind speed on environmental stress in animals. St-Pierre et al. (2003)[329] provide tables estimating economic losses in dairy due to reduced reproduction. The data show a strong gradient across the Midwest (with losses in Iowa, Illinois, and Indiana being three times the losses in Minnesota, Wisconsin, and Michigan under the current climate). Temperature and humidity increases projected for the Midwest will increase economic losses across the entire region. Lewis and Bunter (2010)[330] document heat stress effects of temperature on pig production and reproduction.

St-Pierre et al. (2003)[329] provide tables estimating economic losses in dairy, beef, swine, and poultry, resulting in declines from both meat/milk/egg production. The data show a strong gradient across the Midwest (with losses in Iowa, Illinois, and Indiana being twice the losses in Minnesota, Wisconsin, and Michigan under the current climate). Temperature and humidity increases projected for the Midwest will increase losses across the entire region. Babinszky et al. (2011)[75] identified temperature thresholds for meat/egg/milk production, beyond which performance declines. The adverse effects of heat stress include high mortality, decreased feed consumption, poor body weight gain and meat quality in broiler chickens, and poor laying rate, egg weight, and shell quality in laying hens.[76]

Takle et al. (2013)[65] found that by mid-century, yields of corn and soybean are projected to fall well below projections based on extrapolation of trends since 1970 even under an optimistic economic scenario, with larger interannual variability in yield and total production. Liang et al. (2017)[2] report that the ratio of measured agricultural output to measured inputs would drop by an average 3% to 4% per year under medium to high emissions scenarios and could fall to pre-1980 levels by 2050 even when accounting for present rates of innovation. Schauberger et al. (2017)[66] found that the impact of exposure to temperatures from 30°C to 36°C projected for the end of the century under RCP8.5 creates yield losses of 49% for maize and 40% for soybean.

According to Easterling et al. (2017),[193] evidence suggests that droughts have become less frequent in the Midwest as the region has become wetter. However, they note that "future higher temperatures will likely lead to greater frequencies and magnitudes of agricultural droughts throughout the continental United States as the resulting increases in evapotranspiration outpace projected precipitation increases."

Major uncertainties

Global and regional climate models do not simulate well the dynamical structure of mesoscale convective systems in the Midwest, which are the critical "end processes" that create intense precipitation from increasing amounts of moisture evaporated over the Gulf of Mexico and transported by low-level jets (LLJs) into the Midwest. Secondly, the strengthening of future LLJs depends on strengthening of both the Bermuda surface high pressure and the lee surface low over the eastern Rocky Mountains. Confirming simulations of this in future climates are needed. Global and regional climate models do simulate future scenarios having increasing temperatures for the region with high confidence (a necessary ingredient for increased humidity). There is uncertainty of the temperature thresholds for crops because, as pointed out by Schauberger et al. (2017),[66] some negative impacts of higher temperatures can be overcome through increased water availability. Agricultural yield models, productivity models, and integrated assessment models each provide different ways of looking at agricultural futures, and each of these three types of models has high levels of uncertainty. However, all point to agriculture futures that fail to maintain upward historical trends.

Description of confidence and likelihood

There is *very high confidence* that increases in warm-season absolute humidity and precipitation *very likely* have eroded soils, created favorable conditions for pests and pathogens, and degraded quality of stored grain. There is *medium confidence* that projected increases in moisture, coupled with rising mid-summer temperatures, *likely* will be detrimental to crop and livestock production and put future gains in commodity grain production at risk by mid-century. Projected changes in precipitation, coupled with rising extreme temperatures, provide *medium confidence* that by mid-century Midwest agricultural productivity *likely* will decline to levels of the 1980s without major technological advances.

Key Message 2

Forestry

Midwest forests provide numerous economic and ecological benefits, yet threats from a changing climate are interacting with existing stressors such as invasive species and pests to increase tree mortality and reduce forest productivity (*likely, high confidence*). Without adaptive actions, these interactions will result in the loss of economically and culturally important tree species such as paper birch and black ash (*very likely, very high confidence*) and are expected to lead to the conversion of some forests to other forest types (*likely, high confidence*) or even to non-forested ecosystems by the end of the century (*as likely as not, medium confidence*). Land managers are beginning to manage risk in forests by increasing diversity and selecting for tree species adapted to a range of projected conditions.

Description of evidence base

Multiple ecosystem vulnerability assessments that have been conducted for major forested ecoregions within the Midwest[89,90,91,92,93] suggest that climate change is expected to have significant direct impacts to forests through effects of warming and changes in the timing and amounts of precipitation.[96,98,103,104]

Significant indirect impacts to forests are expected as warming increases the negative effects of invasive plants, insect pests, and tree pathogens of forests.[105,106] Increasing stress on individual trees from climate changes (warming temperatures, drought, and frost damage) increases the susceptibility of trees to the impacts from invasive plants, insect pests, and disease agents.[109,111]

Direct and indirect impacts of climate change may lead to the decline of culturally[88,127] and economically important tree species,[125] as well as leading to shifts in major forest types and altered forest composition as tree species at the northern limits of their ranges decline and southern species experience increasing suitable habitat.[120] These shifts raise the possibility of future losses of economic and cultural benefits of forests due to conversion to different forest types or the change to non-forest ecosystems.[119,123,124]

Many examples of land managers implementing climate adaptation in forest management exist, suggesting significant willingness to address the impacts of a changing climate across diverse land ownerships in managed forests[134] and urban forests.[133] Forest management strategies to adapt to a changing climate highlight the importance of increasing forest diversity and managing for tree species adapted to a range of climate conditions.[8] The importance of Traditional Ecological Knowledge for informing approaches for climate adaptation on tribal lands and within ceded territory is recognized.[331]

Major uncertainties

There is significant uncertainty surrounding the ability of tree species migration rates to keep pace with changes in climate (based on temperature and precipitation) due to existing forest fragmentation and loss of habitat. Uncertainty in forest management responses, including active and widespread adaptation efforts that alter forest composition, add to the uncertainty of tree species movements. This leads to considerable uncertainty in the extent to which shifts in tree species ranges may lead to altered forest composition or loss of forest ecosystems in the future.

Due to the complex interactions among species, there is uncertainty in the extent that longer growing seasons, warming temperatures, and increased CO_2 concentrations will benefit tree species, due to both limitations in available water and nutrients, as well as limited benefits for trees relative to the positive influences of these changes on stressors (invasives, insect pests, pathogens).

Description of confidence and likelihood

There is *high confidence* that the interactions of warming temperatures, precipitation changes, and drought with insect pests, invasive plants, and tree pathogens will *likely* lead to increased tree mortality of some species, reducing productivity of some forests. There is *very high confidence* that these interactions will *very likely* result in the decline of some economically or culturally important tree species. Additionally, there is *high confidence* that suitable habitat conditions for tree species will change as temperatures increase and precipitation patterns change, making it *likely* that forest composition will be altered and forest ecosystems may shift to new forest types. Due to uncertainties on species migration rates and forest management responses to climate changes, there is *medium confidence* that by the end of the century, some forest ecosystems are *as likely as not* to convert to non-forest ecosystems.

Key Message 3

Biodiversity and Ecosystems

The ecosystems of the Midwest support a diverse array of native species and provide people with essential services such as water purification, flood control, resource provision, crop pollination, and recreational opportunities. Species and ecosystems, including the important freshwater resources of the Great Lakes, are typically most at risk when climate stressors, like temperature increases, interact with land-use change, habitat loss, pollution, nutrient inputs, and nonnative invasive species (*very likely, very high confidence*). Restoration of natural systems, increases in the use of green infrastructure, and targeted conservation efforts, especially of wetland systems, can help protect people and nature from climate change impacts (*likely, high confidence*).

Description of evidence base

Changes in climate will very likely stress many species and ecological systems in the Midwest. As a result of increases in climate stressors, which typically interact with multiple other stressors, especially in the southern half of the Midwest region, both the ecological systems and the ecological services (water purification, pollination of crops and wild species, recreational opportunities, etc.) they provide to people are at risk. We draw from a wide range of national and global scale assessments of risks to biodiversity (e.g., Maclean and Wilson 2011, Pearson et al. 2014, and the review by Staudinger et al. 2013 that covered literature included in the Third National Climate Assessment[20, 18,22]), which all agree that on the whole, we are highly likely to see increases in species declines and extinctions as a result of climate change. It is very challenging to say specifically what combination of factors will drive these responses, but the weight of evidence suggests very high confidence in the overall trends. The link to interactions with other stressors is also very strong and is described in Brook et al. (2008)[157] and Cahill et al. (2013),[17] among others. Terrestrial ecosystem connectivity, thought to be important for the adaptive capacity of many species, is very low in the southern half of the Midwest region.[158,159] This may limit the movement of species to more suitable habitats or for species from the southern United States to migrate into the Midwest. These connectivity/movement potential studies also support the idea that land-use change will constrain the potential for retaining function and overall diversity levels. The last section refers to the benefits of restoration as a mechanism for protecting people and nature from climate change impacts. While it is not possible to fully demonstrate that protection of people and nature is indeed occurring now from climate change impacts (we would need attribution of current floods, etc.), there is strong evidence that actions like restoring wetlands can reduce flooding impacts[182] and that protecting forests protects water quality and supply.

Major uncertainties

There is significant uncertainty surrounding the ability of species and ecosystems to persist and thrive under climate change, and we expect to see many different types of responses (population increases, declines, local and regional extinctions).[17] In some cases, climate change does have the potential to benefit species; for example, fish in the coldest regions of the Great Lakes (i.e., Lake Superior) are likely to show increases in productivity, at least in the short run.[332] However, as a whole, given the environmental context upon which climate change is operating, and the presence of many cold-adapted species that are close to the southern edge of their distributional range, we expect more declines than increases.

The last section of the Key Message focuses on land protection and restoration—conservation strategies intended to reduce the impacts of land-use change. Many modeling studies have called out loss of habitat in the Midwest as a key barrier to both local survival and species movement in response to climate change (Schloss et al. 2012 and Carroll et al. 2015 are two of the most recent[158,159]). Restoring habitat can restore connectivity and protect key ecological functions like pollination services and water purification. Restoring wetlands also can help protect ecosystems and people from flooding, which is the rationale for the last line in the Key Message.

Description of confidence and likelihood

In the Midwest, we already have seen very high levels of habitat loss and conversion, especially in grasslands, wetlands, and freshwater systems. This habitat degradation, in addition to the pervasive impacts of invasive species, pollution, water extraction, and lack of connectivity, all suggest that the adaptive capacity of species and systems is compromised relative to systems that are more intact and under less stress. Over time, this pervasive habitat loss and degradation has contributed to population declines, especially for wetland, prairie, and stream species. A reliance on cold surface-water systems, which often have compromised connectivity (due to dams, road-stream crossings with structures that impede stream flow, and other barriers) suggests that fresh-water species, especially less mobile species like mussels, which are already rare, are at particular risk of declines and extinction. Due to the variety of life histories and climate sensitivities of species within the region, it is very challenging to specify what mechanisms will be most important in terms of driving change. However, knowing that drivers like invasive species, habitat loss, pollution, and hydrologic modifications promote species declines, it is *very likely* that the effects of climate change will interact, and we have *very high confidence* that these interactions will tend to increase, rather than decrease, stresses on species that are associated with these threats. While there is strong evidence that investments in restoring habitat can benefit species, we currently do not have strong observational evidence of the use of these new habitats, or benefits of restored wetlands, in response to isolated climate drivers. Thus, the confidence level for this statement is lower than for the first half of the message.

Key Message 4

Human Health

Climate change is expected to worsen existing conditions and introduce new health threats by increasing the frequency and intensity of poor air quality days, extreme high temperature events, and heavy rainfalls; extending pollen seasons; and modifying the distribution of disease-carrying pests and insects (*very likely, very high confidence*). By mid-century, the region is projected to experience substantial, yet avoidable, loss of life, worsened health conditions, and economic impacts estimated in the billions of dollars as a result of these changes (*likely, high confidence*). Improved basic health services and increased public health measures—including surveillance and monitoring—can prevent or reduce these impacts (*likely, high confidence*).

Description of evidence base

There is strong evidence that increasing temperatures and precipitation in the Midwest will occur by the middle and end of the 21st century.[27] The impacts of these changes on human health are broadly captured in the 2016 U.S. Global Change Research Program's Climate and Health Assessment.[26] Air quality, including particulate matter and ground-level ozone, is positively associated with increased temperatures and has been well-documented to show deleterious impacts on morbidity and mortality.[231] Likewise, increased temperatures have been shown in communities in the Midwest, as well as across the United States, to have substantial impacts on health and well-being.[232,233,235,236,333,334] The frequency of extreme rainfall events in the Midwest has increased in recent decades, and this trend is projected to continue.[193] Studies have shown that extreme rainfall events lead to disease, injury, and death.[237] Increases in seasonal temperatures and shifting precipitation patterns have been well documented to be correlated with increased pollen production, allergenicity, and pollen season length.[230,231] Similarly, there is agreement that shifting temperature and precipitation patterns are making habitats more suitable for disease-carrying vectors to move northward toward the Midwest region.[242,243,250,335,336,337] The disease burden and economic projections primarily are based on EPA estimates.[28]

Access to basic preventive care measures quantifiably reduces disease burden for climate-sensitive exposures.[238,240] Gray literature indicates that public health practitioners are dedicated to increasing capacity for adapting to climate change through classic public health activities such as conducting vulnerability assessments, employing communication and outreach campaigns, and investing in surveillance efforts.[26,244,245,246,247,248]

Major uncertainties

While the modeling performed by the EPA was completed using the best available information, there is uncertainty around the extent to which biophysical adaptations will protect midwestern populations from heat-, air pollution-, aeroallergen-, and vector-related illness and death. Likewise, while there is a general consensus regarding habitat suitability for disease-carrying vectors in the eastern and western United States, the degree to which the disease burden may increase or decrease is largely uncertain.

Description of confidence and likelihood

Based on the evidence, there is *very high confidence* that climate change is *very likely* to impact midwesterners' health.

Key Message 5

Transportation and Infrastructure

Storm water management systems, transportation networks, and other critical infrastructure are already experiencing impacts from changing precipitation patterns and elevated flood risks (*medium confidence*). Green infrastructure is reducing some of the negative impacts by using plants and open space to absorb storm water (*medium confidence*). The annual cost of adapting urban storm water systems to more frequent and severe storms is projected to exceed $500 million for the Midwest by the end of the century (*medium confidence*).

Description of evidence base

The patterns of increased annual precipitation, and the size and frequency of heavy precipitation events in the Midwest, are shown in numerous studies and highlighted in Melillo et al. (2014)[27] and Easterling et al. (2017).[193] Increases in annual precipitation of 5% to 15% are reported across the Midwest region.[193] In addition, both the frequency and the intensity of heavy precipitation events in the Midwest have increased since 1901.[193]

For the early 21st century (2016–2045), both lower and higher scenarios (RCP4.5 and RCP8.5) indicate that average annual precipitation could increase by 1% to 5% across the Midwest, suggesting that the observed increases are likely to continue. By mid-century (2036–2065), both scenarios (RCP4.5 and RCP8.5) indicate precipitation increases of 1% to 5% in Missouri and Iowa and 5% to 10% increases in states to the north and east. By late century (2070–2089), precipitation is expected to increase by 5% to 15% over present day, with slightly larger increases in the higher scenario (RCP8.5). Model simulations suggest that most of these increases will occur in winter and spring over the 21st century. Similar to annual precipitation, the amounts from the annual maximum one-day precipitation events (a measure of heavy precipitation events) are projected to increase over time in the Midwest. The size of the events could increase by 5% to 15% by late century.[193]

Gray literature documents that heavy rains in the Midwest are overwhelming storm water management systems, leading to property damage. Kenward et al. (2016)[256] provide examples of rain-related sewage overflows in the Midwest. These include an overflow of 681 million gallons during heavy rains in April 2015 in Milwaukee and an overflow of over 100 million gallons from December 26–28, 2015, in St. Louis. Winters et al. (2015)[37] document that failure of storm water management systems in heavy rain leads to property damage, including basement backups.

The disruption of transportation networks by heavy precipitation in the Midwest has been documented by collecting contemporary news reports and by compiling state government reports. Posey (2016)[338] relates that four storms between April 2013 and April 2014 forced evacuations or damaged cars in St. Louis, Missouri. In the same period, there were 18 flood-related closures on Missouri roads, a figure that excludes closures on small local roads. Flooding in May 2017 led to the closure of more than 400 roads across Missouri, a figure that again excludes local roads. Closed roadways included multiple stretches of Interstate 44, as well as sections of I-55, affecting interstate traffic between St. Louis and Memphis.[339] News reports document that the same stretch of I-44 was shut down during the floods of December 2015–January 2016.[340]

Flood-related disruptions to Midwest barge and rail traffic in 2013 were documented by several articles in *Journal of Commerce*, a shipping trade magazine.[265,266] *WorkBoat*, a trade journal of the inland shipping industry, documents that Mississippi River navigation has been halted by flooding in 2013, 2015, 2016, and 2017. It also documents low river conditions affecting navigation in 2012 and 2015.[267,268,269,270,341] Disruptions to rail service caused by the floods of 2017 were documented in news media accounts.[342] Changon (2009)[343] documents that flooding in 2008 resulted in extensive damage to railroads in Illinois and adjacent states, with costs exceeding $150 million due to direct damage and lost revenue.

Although there is ample documentation of transportation systems in the Midwest being disrupted by floods in recent years, there is a lack of long-term time series data on disruptions with which to determine whether these incidents are becoming more frequent. Development of long-term data on transportation disruptions in the Midwest is a research need. It is clear that flood frequency and severity on major rivers in the Midwest have increased in recent decades, although additional research is needed on the relative contributions of climate change and land-use change to increases in flood risk.[344,345,346]

The EPA estimated economic costs related to infrastructure and transportation in the Midwest, including costs associated with bridge scour and pavement degradation.[28] The use of green infrastructure to reduce impacts associated with heavy precipitation is also documented in gray literature, including municipal planning documents. Using planted areas to absorb rainfall and reduce runoff has become a common approach to storm water management.[223,275,276,347,348,349,350] Dechannelization and restoration of streams as a technique for improving storm water management is described in Trice (2013)[282] and Milwaukee Metropolitan Sewer District (2017).[281] Preservation of open space is described in Ducks Unlimited (2017)[279] and the Ozaukee Washington

Land Trust (2016).[280] The use of urban forestry as an adaptation method is documented in the Minneapolis Marq2 Project (2017)[277] and the Cleveland Tree Plan (2015).[278] Projected costs to storm water systems are based on EPA projections.[28]

Major uncertainties

Although there is *very high confidence* that flood risk is increasing in the Midwest, there remains uncertainty about the relative contributions of climate change and land-use change. There is, however, sufficient evidence that changing precipitation patterns are leading to changes in hydrology in the Midwest,[351,352,353,354,355] and that heavier precipitation patterns are consistent with projections from climate models, to justify a rating of *medium confidence* to the assertion that climate change is contributing to changes in flooding risk. There is *high confidence* that local governments and nongovernmental organizations are turning to green infrastructure solutions as a response to increased flooding risk. Additional research is needed to quantify the aggregate benefits of these approaches.

While it is clear that flood frequency and severity on major rivers in the Midwest have increased in recent decades, it must be emphasized that the change in precipitation levels is not the only factor contributing to the increase in flood risk. Land-use change, particularly the destruction of floodplains by levee systems, has also been documented as a key contributor to increasing flood risk in the Midwest.[344,345,346] On smaller streams, tile drainage systems have been shown to exacerbate flood risk.[24] Determining the relative contribution of land-use change and climate change to increases in riverine flood risk is an important research need.

Description of confidence and likelihood

There is *medium confidence* that climate change is contributing to increased flood risk in the Midwest; there is *medium confidence* that green infrastructure is reducing flood risk. There is much uncertainty associated with specific numerical projections. This leads to *medium confidence* that costs will exceed $500 million. However, the EPA projections are sufficient to provide *high confidence* that increasing the capacity of existing storm water systems in order to maintain current levels of service would require significant expenditures on the part of urban sewer districts.

Key Message 6

Community Vulnerability and Adaptation

At-risk communities in the Midwest are becoming more vulnerable to climate change impacts such as flooding, drought, and increases in urban heat islands (*as likely as not, high confidence*). Tribal nations are especially vulnerable because of their reliance on threatened natural resources for their cultural, subsistence, and economic needs (*likely, medium confidence*). Integrating climate adaptation into planning processes offers an opportunity to better manage climate risks now (*medium confidence*). Developing knowledge for decision-making in cooperation with vulnerable communities and tribal nations will help to build adaptive capacity and increase resilience (*high confidence*).

Description of evidence base

Limited evidence in the scientific literature indicates that at-risk communities in the Midwest will be increasingly vulnerable to the impacts of climate change, including increased flooding resulting from increased variation in precipitation patterns and changing lake levels,[285] urban heat islands,[287] and an intensification of heat and drought (see also the impacts and associated references in the previous sections).[286]

Several recent survey reports[28,283,284] project negative climate impacts for tribal nations and Indigenous communities, especially as a result of an increased frequency of extreme precipitation events.[283] Tribal nations are especially vulnerable to climate impacts because of their reliance on natural resources,[127] the isolation of rural communities, and potential shifts of species out of sovereign land.[309,310] Climate change thus poses a threat to tribal culture, sovereignty, health, and way of life.[39]

Gray literature,[293] survey reports,[32] and scientific literature[292] point to a few initiatives to integrate adaptation into municipal planning processes and utilize participatory methodologies to evaluate and manage climate risk.

A growing body of research indicates that interaction between producers of climate information, intermediaries, and end users plays a critical role in increasing climate knowledge integration and use for adaptation in the Midwest.[224,294,300,308] Limited evidence links the implementation of adaptation actions identified as a result of these collaborations to reduced sensitivity.[304,305,306]

Major uncertainties

Limited research specific to the Midwest region contributes to uncertainty around the specific vulnerabilities of at-risk communities, including urban and rural communities and tribal nations. Though climate change planning and action in both Midwest cities and rural areas are underway, documentation remains low, few examples exist in the public literature of the failure or success of efforts to mainstream climate action into municipal governance, and attempts to assess vulnerabilities, especially in poor urban communities, frequently encounter climate justice barriers. Likewise, the number, scope, and nature of tribal adaptation plans remain undocumented, as does the degree of implementation of these plans and the manner in which Traditional Ecological Knowledge is incorporated.

Description of confidence and likelihood

There is *high confidence* that communities in the Midwest will *as likely as not* be increasingly vulnerable to climate change impacts such as flooding, urban heat islands, and drought. Similarly, there is *medium confidence* that tribal nations in the Midwest are *likely* to be especially vulnerable because of their reliance on threatened natural resources for their cultural, subsistence, and economic needs. Due to limited documentation in the literature, there is *medium confidence* that integrating adaptation into planning processes will offer an opportunity to manage climate risk better. Finally, there is *high confidence* that developing knowledge for decision-making in cooperation with vulnerable communities and tribal nations will help to decrease sensitivity and build adaptive capacity.

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