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MEMO

TO	Katie Daugherty, ODEQ
FROM	Brendan Robinson, PE, ERM; Todd Slater, LSS
DATE	17 January 2025
REFERENCE	0732445.204
SUBJECT	Groundwater Source Control Measure Monthly Performance Monitoring Report

1. INTRODUCTION

The Oregon Department of Environmental Quality (ODEQ), in its letter dated 31 May 2019 and in the subsequent meeting with Legacy Site Services LLC (LSS) and Environmental Resources Management, Inc. (ERM) on 2 July 2019, requested that LSS initiate monthly status reports associated with the onsite groundwater source control measure (GW SCM) at the Arkema site (Site) consistent with the Performance Monitoring Plan (PMP; ERM 2014[1]) beginning July 2019. The Site is located at 6400 NW Front Avenue in Portland, Oregon, and the Site location is shown on Figure 1. The 2014 PMP was prepared pursuant to the Order on Consent issued by ODEQ, signed on 31 October 2008 (ODEQ No. LQVC-NWR-08-04; Consent Order). The purpose of the PMP was to present the monitoring, reporting, and adaptive management processes used during implementation of the GW SCM. On 30 November 2021, ODEQ directed LSS that following the October 2021 Monthly Performance Monitoring Report (MPR), subsequent MPRs would be suspended pending the implementation of the Groundwater Extraction Enhancement (GEE) project in 2022. During that time, ODEQ requested monthly schedule updates in lieu of MPRs. The trench wells installed as part of the GEE project were started on 27 November 2022, and MPR writing restarted in December 2022. The purpose of the GEE project was to install new extraction capacity to achieve the Capture Zone Objectives.

On 6 June 2024, ODEQ requested that LSS and ERM reduce the scope of future MPRs to facilitate faster review. On 11 September 2024, ODEQ agreed for the first amended MPR to be the August 2024 MPR submitted in October 2024.

[1] ERM-West, Inc. 2014. *Revised Final Performance Monitoring Plan – Groundwater Source Control Measure, Arkema Inc. Facility, Portland, Oregon*. July 2014.

2. GWET SYSTEM PERFORMANCE

The average system influent flow rate was 27.53 gallons per minute (gpm) for the entire month of November 2024, including non-operational periods. The average operational influent flow during operational periods was 27.53 gpm.

Extraction wells, pumps, and conveyance lines become fouled with accumulated solids over time. A proactive pump removal and maintenance program is in place to address pump fouling. Regularly scheduled redevelopment is anticipated to maintain the productivity of the groundwater extraction trenches and recovery wells. Conveyance line cleaning will be conducted as needed based on analysis of backpressure.

Compared to October 2024, the November 2024 average system influent flow rate was 3.16 gpm greater. During this same time period, the average Shallow Zone groundwater elevation decreased by 0.89 feet, and the average Intermediate Zone groundwater elevation increased by 0.83 feet, as shown on Attachments A-1 and A-2. The increase in average monthly groundwater extraction rate in November 2024 compared to October 2024 may be a result of seasonal increases in upgradient groundwater flow onto the Site and/or changes in the river stage.

LSS is continuing to optimize extraction rates within the system to increase flow rates at each operational well until either the extraction rates specified in the *Groundwater Extraction Enhancement Final Design Report* (ERM 2022[2]) are achieved, the wells are producing the maximum quantity of water possible, or until the Capture Zone Objectives are met.

Actions taken in November 2024 to optimize flow rates included:

- Installing two packers in Trench 6, one on each vertical riser. Pump EW-12 was removed and a solid packer was installed on that side. At EW-11, a pass-through packer was installed with a pump below the packer. This approach isolated the vertical and horizontal screens from each other, concentrating extraction from the horizontal screen and lowering the pump intake. This change lowered the water level in Trench 6 from approximately 2.5 feet to 2.0 feet, and flow increased approximately 50 percent from 2 to 3 gpm. This approach will be evaluated further and considered at other extraction trench locations based on long-term monitoring results.
- Initiating an evaluation of a vibratory resonance tool to redevelop and maintain trenches during groundwater extraction by agitating silt out of the formation.
- Procuring and testing a smaller Hydropuls device to focus redevelopment of the horizontal well screens in the extraction wells. Redevelopment of the horizontal screen section is scheduled for January 2025.

2.1 GWET PLANT OPERATIONS

The groundwater extraction and treatment (GWET) plant operated within permit conditions during the reporting period. There was one shutdown:

[2] ERM-West, Inc. 2022. *Final Design Report, Arkema Inc. Facility, Portland, Oregon*. May 2022.

- 30 November 2024: The GWET system was shut down for 1 hour to repair the pressure filter (PF-2) valves.

3. CAPTURE ZONE EVALUATION

As described in the PMP, the purpose of hydraulic monitoring (i.e., groundwater elevation data) is to provide sufficient data to demonstrate an inward hydraulic gradient across the groundwater barrier wall (GWBW) and to evaluate the effective hydraulic capture produced by the GW SCM.

3.1 GROUNDWATER ELEVATION MONITORING

Groundwater elevation monitoring was completed on 8 November 2024. The Serfes (1991)[3] method was used to account for tidal variations of groundwater and river elevations as described in the PMP. Horizontal and vertical gradients were calculated and plotted over time as shown in Attachments B-1 and B-2. Groundwater elevations, horizontal gradients, and vertical gradients from 8 November 2024 are tabulated in Attachment B-3 and Attachment B-4.

3.2 POTENTIOMETRIC SURFACE, GROUNDWATER ELEVATION DIFFERENCE MAPS, AND GROUNDWATER FLOW DIRECTIONS

Groundwater elevation data collected on 8 November 2024 was used to prepare potentiometric surface maps based on manual measurements and averaged transducer groundwater elevations (Figures 2 through 4) and vertical gradient difference maps (Figures 5 and 6).

The generalized flow direction indicated by the potentiometric surface maps shows groundwater flow from upgradient toward the GWBW. Potentiometric surface maps (Figures 2, 3, and 4) show generalized groundwater movement to the extraction trenches in the Shallow, Intermediate, and Deep Zones due to GW SCM pumping, and cones of depression are apparent around the groundwater extraction trenches in the Shallow and Intermediate Zones. Horizontal gradient at gradient control cluster 2 (GCC 2) was inward in October and November 2024, nearly zero at GCC 1 and GCC 6, and decreasingly outward at GCC 3, GCC 4, and GCC 5, as shown in Attachments B-1 and B-2.

Vertical gradients were calculated for each vertical well pair and are plotted on Figures 5 and 6. Vertical groundwater gradients and trend lines are shown in Attachments B-2 and B-4. Vertical groundwater gradients exterior to the GWBW were neutral to slightly downward between the Shallow and Intermediate Zones and between the Intermediate and Deep Zones.

Vertical gradients interior to the GWBW between the Shallow Zone and Intermediate Zone were inward at GCC 2, nearly neutral at GCC 3 and GCC 5, and downward at GCC 6, GCC 4, and GCC 1. Note that the vertical gradient for GCC 1 is exaggerated as a result of the localized pressure zone where soils are tight and water is relatively immobile. Vertical gradients interior to the GWBW between the Intermediate Zone and Deep Zone upward at GCC 6, nearly neutral at GCC 2 and

[3] Serfes, Michael. 1991. "Determining the Mean Hydraulic Gradient of Ground Water Affected by Tidal Fluctuations." *Groundwater* 29(4): July–August.

GCC 4, and downward at GCC3 and GCC 5. Vertical gradient could not be calculated for GCC 1 because of a transducer failure.

River elevations are shown over time on Attachments A-1 and A-2, and in an inset on the potentiometric surface maps (Figures 2 through 4). The river elevation has generally been trending downward since January 2024. The river elevation in November 2024 had an average elevation of 9.29 feet North American Vertical Datum of 1988 (NAVD88) with a minimum elevation of 6.36 feet NAVD88 and a maximum elevation of 13.00 feet NAVD88, an increase of 2.12 feet NAVD88 compared to October 2024. This increase in river elevation is the first meaningful increase in river elevation since October 2023.

The average Shallow Zone groundwater elevation in November decreased from October by 0.89 feet and the average Intermediate Zone groundwater elevation increased from October by 0.83 feet. The contradictory movement of groundwater elevations is likely an artifact of the seasonal increases in upgradient groundwater flow.

4. CONCLUSIONS

Analysis of horizontal gradients over time indicate that the extraction wells are performing better than the historical recovery wells, and horizontal gradients are periodically inward, and the magnitude of outward gradients are decreasing over time, as shown on Attachment B-1. The extraction rates throughout the GWET system will continue to be optimized to meet Target Capture Objectives. Redevelopment of the trenches is planned to mitigate accumulation of silt in the filter pack in both the vertical and horizontal sections using impulse redevelopment techniques, and resonant technology. These efforts, as well as the packers discussed above, will be targeted at trenches that are currently underperforming, including Trenches 1, 4, 5, and 6. LSS will continue to optimize new extraction wells, including pump maintenance and upgrades. Additional modifications to the system, if needed to progress toward capture objectives, will be included in subsequent MPRs. The project schedule provided as Attachment C summarizes planned activities.

Attachment D shows the average influent groundwater flow rate from April 2019 through October 2024. As shown on this figure, the extraction trenches are removing approximately three times more water than the legacy system and achieving lower horizontal gradients over time.

Regards,

Brendan Robinson, PE
Partner

ATTACHMENTS

DRAWN BY: Jake Sullivan

SCALE: 1:1,440 when printed at 11x17

REVISED: 02/06/2023

M:\US\Projects\S-U\Total\Arkema_Portland\Groundwater Source Control\maps\PMP\GWET PMP 202212\Figure 1 Site Layout for MPR_mxd

Willamette River

Groundwater Treatment Plant

GCC1

GCC2

GCC3

GCC4

GCC5

GCC6

RG-1

MWA-63

MWA-8i

MWA-2

PA-19d

MWA-64i

MWA-61

MWA-67si

PA-05

PA-30d

PA-11i

RW-24i

RW-23

PA-36

PA-37i

RW-7

EW-3

EW-4

MWA-84

PA-35

EW-2

MWA-83

EW-1

RW-6i

PA-34i

RW-5

PA-10i

PA-33

PA-31

PA-32i

PA-17ir

PA-27d

PA-03

PA-04

PA-18d

MWA-22

RW-9i

RW-10

PA-06

RW-8

PA-21d

MWA-68si

MWA-66i

MWA-69

PA-12i

RW-11i

PA-20d

EW-5

MWA-85

EW-6

MWA-15r

MWA-11i(d)

MWA-6r

MWA-16i

RW-12

RW-13i

EW-7

MWA-86

EW-8

MWA-42

MWA-54i

MWA-18

MWA-51i

MWA-49i

MWA-46

MWA-56d

RW-16i

RW-15

RW-14

MWA-20

MWA-58d

MWA-19

MWA-34i

PA-22d

PA-13i

PA-28

EW-10

MWA-87

EW-9

RW-17

RW-18

MWA-30

MWA-32i

MWA-31i(d)

MWA-47

PA-29i

PA-24d

RW-19i

PA-14i

RW-20

PA-23d

PA-07

RW-21i

MWA-53i

MWA-29

PA-41

EW-11

MWA-88

EW-12

PA-39i

PA-40i

PA-42

MWA-43

PA-38

EW-13

RW-22

MWA-89

EW-14

PA-15i

PA-25d

PA-08

PA-44i

RW-26i

RW-25

PA-43

PA-16i

PA-09

PA-26d

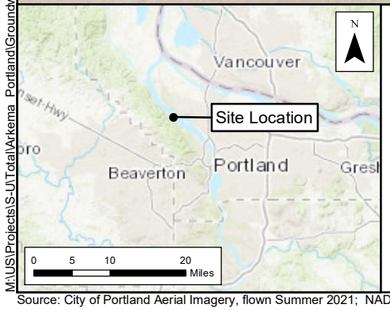
MWA-24

MWA-82

MWA-40

MWA-33

MWA-70i



Legend

- Shallow Zone Monitoring Well
- Intermediate Zone Monitoring Well
- Shallow-Intermediate Zone Monitoring Well
- Deep Zone Monitoring Well
- Shallow Zone Piezometer
- Intermediate Zone Piezometer
- Deep Zone Piezometer
- Shallow Zone Recovery Well
- River Gauge
- Trench Extraction Well
- Target Capture Zone
- Barrier Wall Alignment
- Parcel and Property Boundaries

GradientClusters

Type

- Gradient Control Cluster
- Vertical Flow Cluster
- Extraction Trench

N

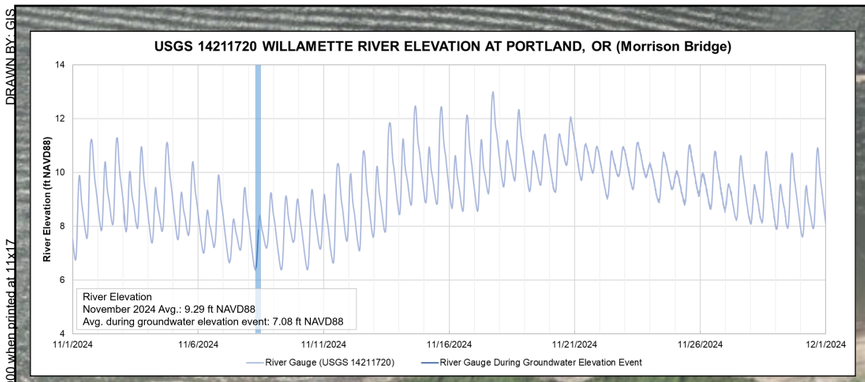
0 120 240

Feet

Figure 1
Site Layout
Monthly Progress Report
Groundwater Source Control Measure
Arkema Inc.
Portland, Oregon

Environmental Resources Management
www.erm.com

Source: City of Portland Aerial Imagery, flown Summer 2021; NAD 1983 StatePlane Oregon North FIPS 3601 Feet Intl



Legend

- Shallow Zone Piezometer
- Shallow Zone Monitoring Well
- Active Recovery Well; Not Used During Contouring
- Shallow-Intermediate Zone Monitoring Well
- 27.70 Groundwater Elevation (ft NAVD88)
- Shallow Zone Groundwater Contours (ft NAVD88) Dashed where Inferred
- Target Capture Zone
- Barrier Wall Alignment
- Extraction Trench (Not To Scale)

Notes:
* Value not used for contouring.
Water levels collected November, 2024.
ft NAVD88: feet North American Vertical Datum of 1988.
Aerial Photo: City of Portland, Summer 2017.

N

0 160 320
Feet

Figure 2
November 2024 Shallow Zone Groundwater Contours
Monthly Progress Report
Groundwater Source Control Measures
Arkema Inc.
Portland, Oregon

Environmental Resources Management
www.erm.com
ERM

NAD 1983 StatePlane Oregon North FIPS 3601 Feet Intl

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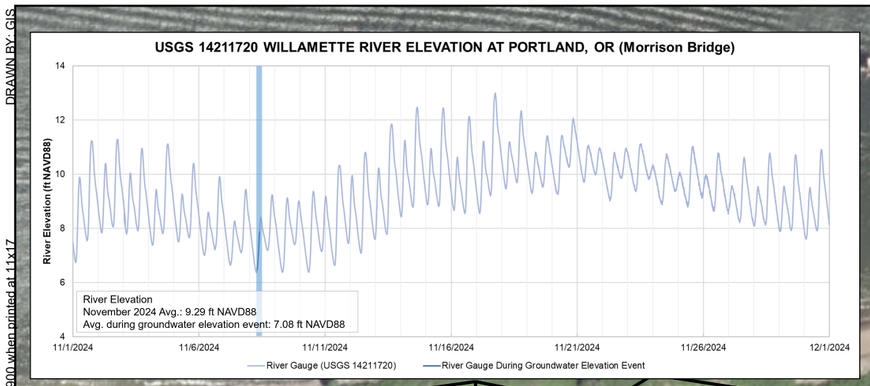

Legend

- Intermediate Zone Piezometer
- Intermediate Zone Monitoring Well
- Shallow-Intermediate Zone Monitoring Well
- 27.70 Groundwater Elevation (ft NAVD88)
- Intermediate Zone Groundwater Contours (ft NAVD88) Dashed where Inferred
- Target Capture Zone
- Barrier Wall Alignment
- Extraction Trench (Not To Scale)

Notes:
* Value not used for contouring.
Water levels collected November, 2024.
ft NAVD88: feet North American Vertical Datum of 1988.
Aerial Photo: City of Portland, Summer 2017.

N

0 160 320
Feet

Figure 3
November 2024 Intermediate Zone Groundwater Contours
Monthly Progress Report
Groundwater Source Control Measures
Arkema Inc.
Portland, Oregon

Environmental Resources Management
www.erm.com
ERM

NAD 1983 StatePlane Oregon North FIPS 3601 Feet Intl

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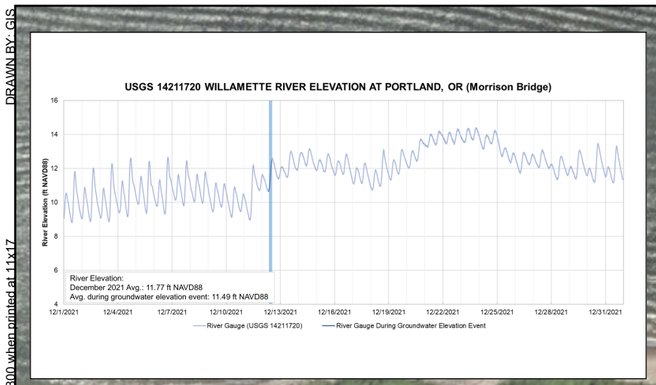

Willamette River

MWA-56d 7.66
MWA-58d 8.05
MWA-31i(d)*
PA-24d 7.96
PA-23d 7.56
PA-22d 9.17
PA-21d 8.35
PA-19d 7.33
PA-30d 8.65
PA-20d 8.79
MWA-11i(d) 9.04
PA-27d 9.94
PA-18d 9.33
PA-25d 11.18
PA-26d 10.05
MWA-12i(d) 23.06
MWA-77g*
MWA-76g*

6
8
10
12
14
16
18
20
22

Legend

- Deep Zone Piezometer
- Deep Zone Monitoring Well
- Gravel Zone Monitoring Well
- 27.70 Groundwater Elevation (ft NAVD88)
- Deep Zone Groundwater Contours (ft NAVD88) Dashed where Inferred
- Target Capture Zone
- Barrier Wall Alignment

Notes:
* Value not used for contouring.
Gravel zone wells not used in contouring.
Water levels collected November, 2024.
ft NAVD88: feet North American Vertical Datum of 1988.
Aerial Photo: City of Portland, Summer 2017.

N

0 150 300
Feet

NAD 1983 StatePlane Oregon North FIPS 3601 Feet Intl

Figure 4
November 2024 Deep Zone Groundwater Contours
Monthly Performance Report
Groundwater Source Control Measures
Arkema Inc.
Portland, Oregon

Environmental Resources Management
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ERM

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Legend

- Shallow Zone Monitoring Well
- Intermediate Zone Monitoring Well
- Shallow Zone Piezometer
- Intermediate Zone Piezometer
- Shallow Zone Recovery Well
- Trench Extraction Well
- Active Recovery Well
- Trench Extraction Well
- Target Capture Zone
- Barrier Wall Alignment
- Extraction Trench
- Gradient Control Cluster
- Vertical Flow Cluster
- Downward Gradient
- Upward Gradient

Notes:
Brown gradient: Downward gradient.
Green gradient: Upward gradient.
Vertical gradient calculated as shallow zone minus intermediate zone potentiometric surfaces.
Water levels collected November, 2024.
Aerial Photo: City of Portland, Summer 2017.

N

0 130 260
Feet

Figure 5
November 2024 Shallow to Intermediate Zone Vertical Head Difference
Monthly Progress Report
Groundwater Source Control Measures
Arkema Inc.
Portland, Oregon

Environmental Resources Management
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NAD 1983 StatePlane Oregon North FIPS 3601 Feet Intl

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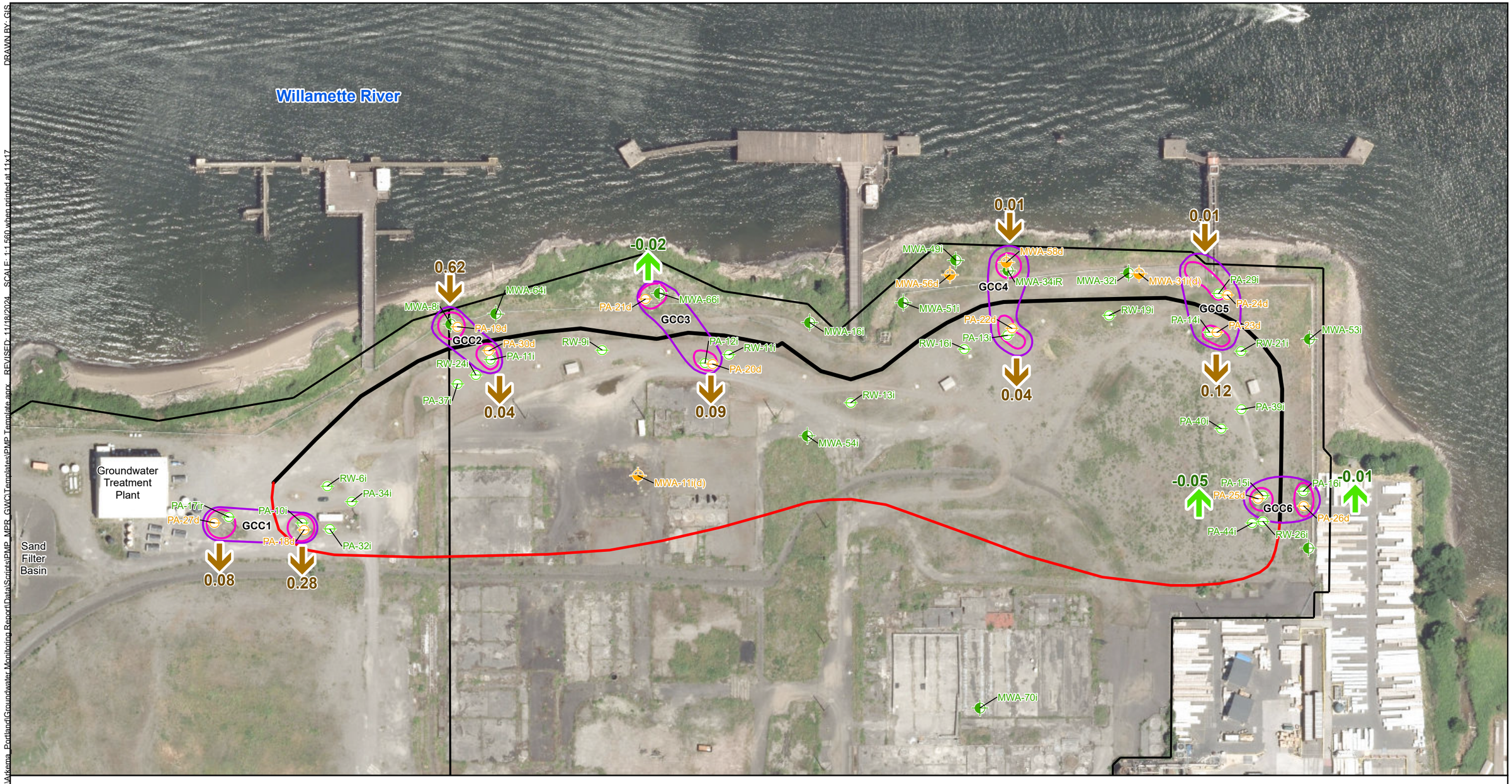

Legend

- Intermediate Zone Monitoring Well
- Deep Zone Monitoring Well
- Intermediate Zone Piezometer
- Deep Zone Piezometer
- Shallow-Intermediate Zone Monitoring Well
- Trench Extraction Well
- Active Recovery Well
- Target Capture Zone
- Barrier Wall Alignment
- Extraction Trench
- Downward Gradient
- Upward Gradient

Notes:
Brown gradient: Downward gradient.
Green gradient: Upward gradient.
Vertical gradient calculated as intermediate zone minus deep zone potentiometric surfaces.
Water levels collected November, 2024.
Aerial Photo: City of Portland, Summer 2017.

N

0 130 260
Feet

Figure 6
November 2024 Intermediate to Deep Zone Vertical Head Difference
Monthly Progress Report
Groundwater Source Control Measures
Arkema Inc.
Portland, Oregon

Environmental Resources Management
www.erm.com
ERM

NAD 1983 StatePlane Oregon North FIPS 3601 Feet Intl

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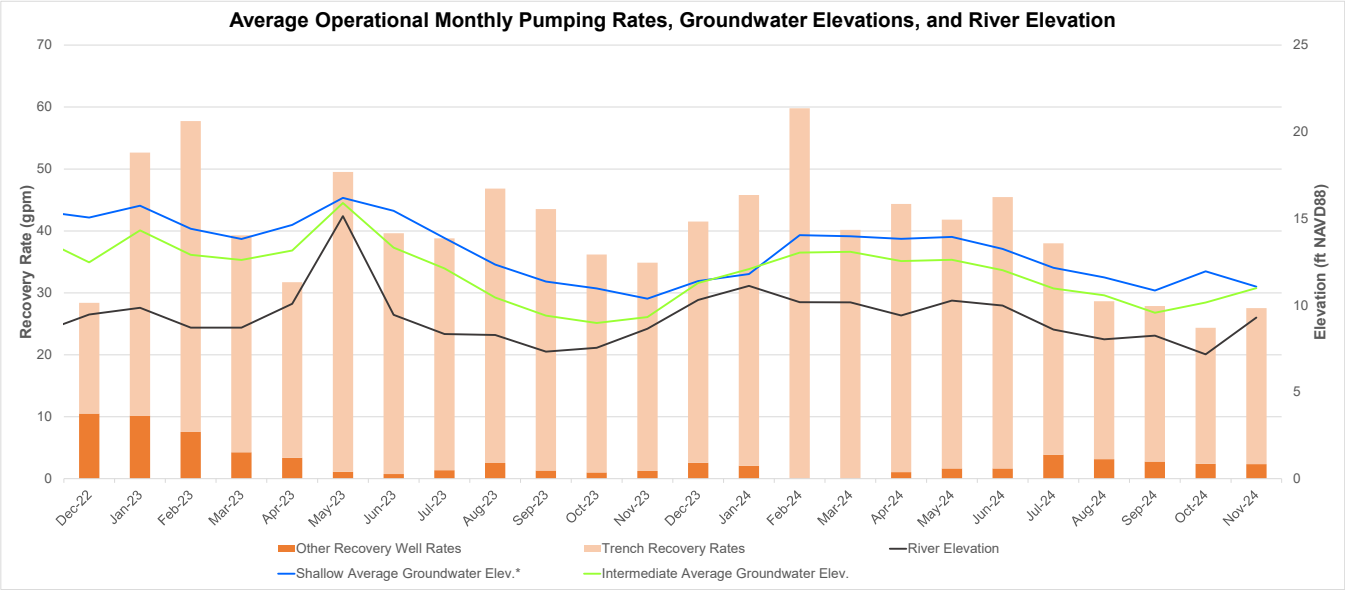
ERM

ATTACHMENT A-1 OPERATIONAL PUMPING RATE GRAPH

Attachment A-1

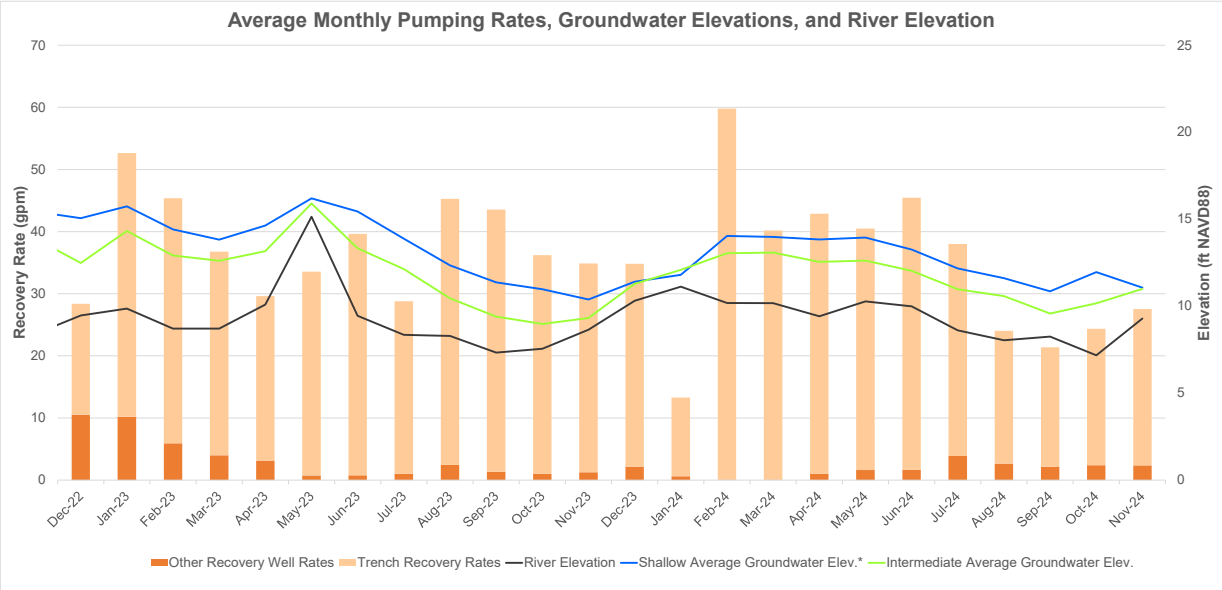
Operational Pumping Rate Graph
Arkema Inc. Facility
Portland, Oregon



ATTACHMENT A-2 AVERAGE MONTHLY PUMPING RATE GRAPH

Attachment A-2

Average Pumping Rate Graph
Arkema Inc. Facility
Portland, Oregon



ATTACHMENT A-3 GWET SYSTEM GROUNDWATER EXTRACTION RATES TABLE

Attachment A-3

GWET System Groundwater Extraction Rates Table
Arkema Inc. Facility
Portland, Oregon

Recovery Well	November 2024 Average Operational Pumping Rate (gpm)	November 2024 Average Monthly Pumping Rate (gpm)
RW-14	0.59	0.59
RW-22*	0.00	0.00
RW-23	0.62	0.62
RW-25	1.16	1.16
EW-01	0.84	0.84
EW-02*	0.00	0.00
EW-03	8.73	8.73
EW-04	0.05	0.05
EW-05*	0.00	0.00
EW-06	4.75	4.75
EW-07*	0.00	0.00
EW-08	1.76	1.76
EW-09	1.50	1.50
EW-10*	0.00	0.00
EW-11	0.57	0.57
EW-12	1.20	1.20
EW-13	5.70	5.70
EW-14	0.07	0.07
Total	27.53	27.53

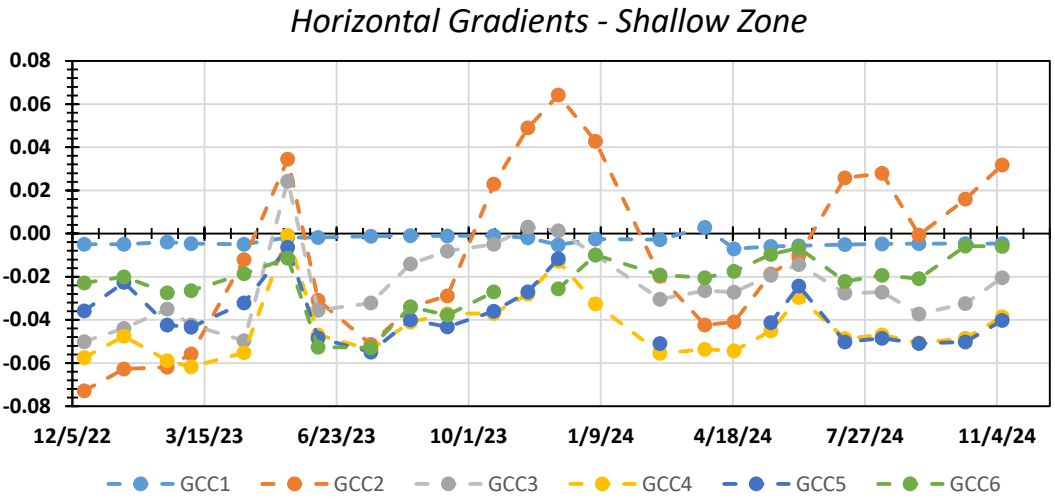
* = Recovery well not in service during reporting period

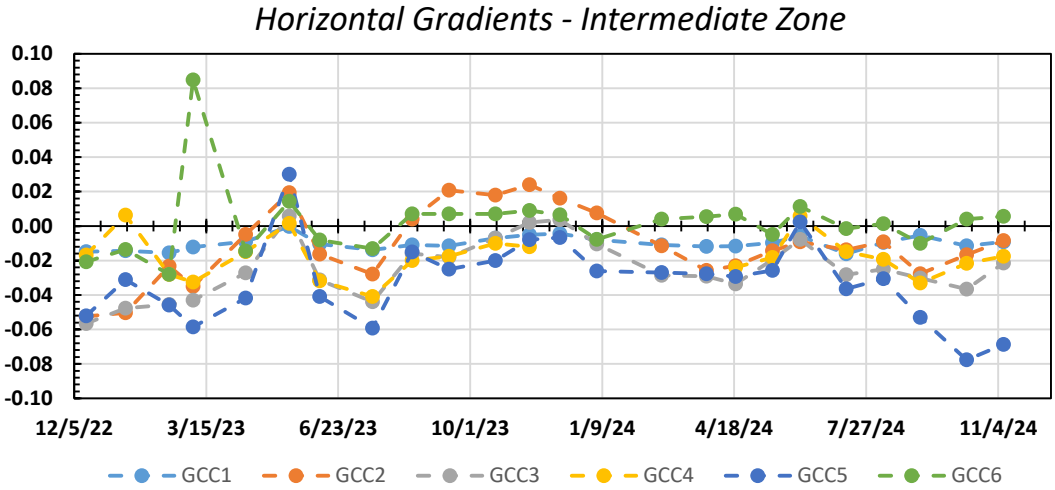
gpm = gallon per minute

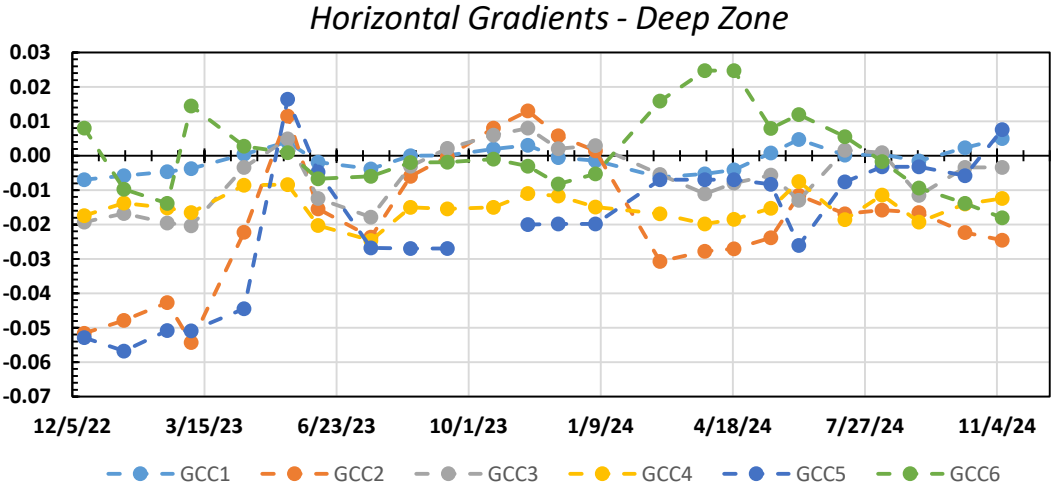
ATTACHMENT B-1 HORIZONTAL GRADIENTS SUMMARY GRAPH

Attachment B-1

Horizontal Gradients Summary: November 2024
Arkema Inc. Facility
Portland, Oregon







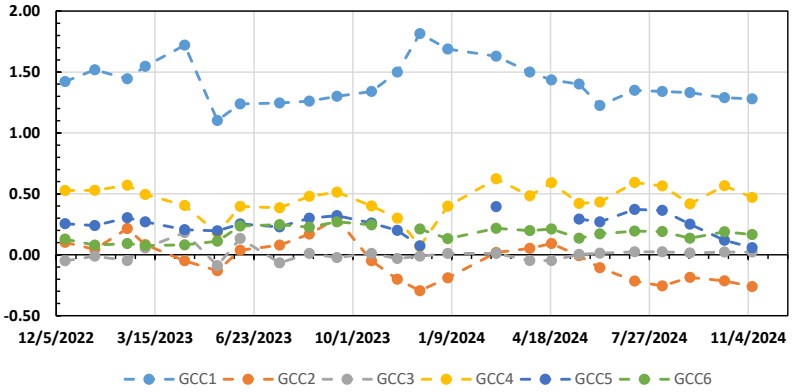
Positive horizontal gradient indicates an inward hydraulic gradient across the GWBW.

ATTACHMENT B-2 VERTICAL GRADIENTS SUMMARY GRAPH

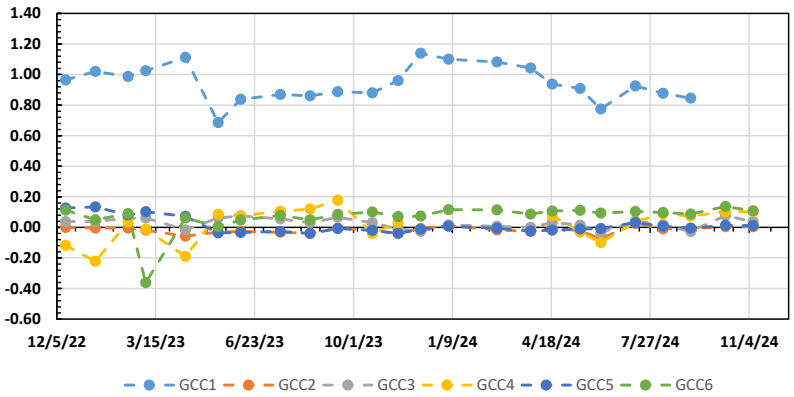
Attachment B-2

Vertical Gradients Summary: November 2024
Arkema Inc. Facility
Portland, Oregon

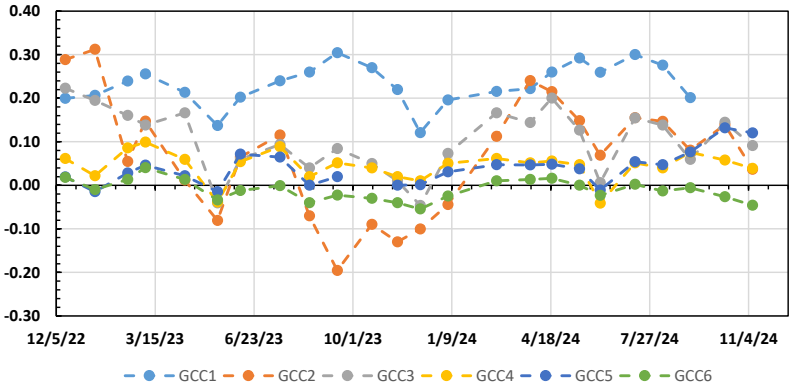
Vertical Gradients - Interior SZ-IZ



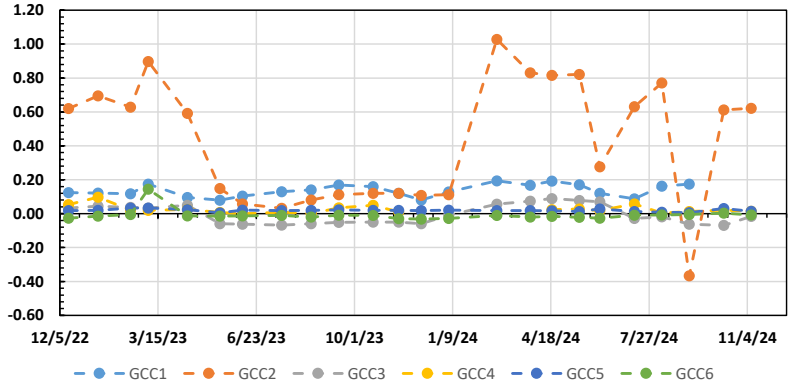
Vertical Gradients - Exterior SZ-IZ



Vertical Gradients - Interior IZ-DZ



Vertical Gradients - Exterior IZ-DZ



ATTACHMENT B-3 WATER LEVELS AND HORIZONTAL GRADIENTS TABLE

Attachment B-3

Water Levels and Horizontal Gradients Table
Arkema Inc. Facility
Portland, Oregon

Gradient Cluster	Well Pair Zone	Exterior Well	Water Elevation (ft NAVD88)	Interior Well	Water Elevation (ft NAVD88)	Horizontal Gradient (ft/ft)
GCC1	Shallow	PA-03	23.61	PA-04	24.08	-0.005
	Intermediate	PA-17iR	10.46	PA-10i	11.41	-0.009
	Deep	PA-27d	9.94	PA-18d	9.33	0.005
GCC2	Shallow	MWA-2	8.37	PA-05	6.19	0.032
	Intermediate	MWA-8i	8.29	PA-11i	8.91	-0.008
	Deep	PA-19d	7.33	PA-30d	8.65	-0.025
GCC3	Shallow	MWA-69	8.63	PA-06	10.81	-0.021
	Intermediate	MWA-66i	8.15	PA-12i	10.58	-0.021
	Deep	PA-21d	8.35	PA-20d	8.79	-0.003
GCC4	Shallow	MWA-19	9.03	PA-28	12.92	-0.039
	Intermediate	MWA-34iR	8.37	PA-13i	9.92	-0.018
	Deep	MWA-58d	8.05	PA-22d	9.17	-0.012
GCC5	Shallow	MWA-47	8.59	PA-07	12.74	-0.040
	Intermediate	PA-29i	8.48	PA-14i	12.19	-0.069
	Deep	PA-24d	7.96	PA-23d	7.56	0.008
GCC6	Shallow	PA-09	11.18	PA-08	11.51	-0.006
	Intermediate	PA-16i	9.78	PA-15i	9.47	0.006
	Deep	PA-26d	10.05	PA-25d	11.18	-0.018

Positive horizontal gradient indicates an inward hydraulic gradient across the GWBW.

Horizontal gradient calculated as (Exterior Elevation – Interior Elevation) / Horizontal distance.

* = anonalous groundwater elevation

** = horizontal gradient cannot be calculated due to anomalous elevation reading

ft NAVD88 = feet North American Vertical Datum of 1988

^{M} = manual groundwater elevation measurement

ATTACHMENT B-4 WATER LEVELS AND VERTICAL GRADIENTS TABLE

Attachment B-4

Water Levels and Vertical Gradients Table
Arkema Inc. Facility
Portland, Oregon

Region	Pair	Gradient Cluster	Upper Well	Water Elevation (ft NAVD88)	Lower Well	Water Elevation (ft NAVD88)	Vertical Gradient (ft/ft)
Interior	SZ-IZ	GCC1	PA-04	24.08	PA-10i	11.41	1.28
		GCC2	PA-05	6.19	PA-11i	8.91	-0.26
		GCC3	PA-06	10.81	PA-12i	10.58	0.02
		GCC4	PA-28	12.92	PA-13i	9.92	0.47
		GCC5	PA-07	12.74	PA-14i	12.19	0.06
		GCC6	PA-08	11.51	PA-15i	9.47	0.17
	IZ-DZ	GCC1	PA-10i	11.41	PA-18d	9.33	0.28
		GCC2	PA-11i	8.91	PA-30d	8.65	0.04
		GCC3	PA-12i	10.58	PA-20d	8.79	0.09
		GCC4	PA-13i	9.92	PA-22d	9.17	0.04
		GCC5	PA-14i	12.19	PA-23d	7.56	0.12
		GCC6	PA-15i	9.47	PA-25d	11.18	-0.05
Exterior	SZ-IZ	GCC1	PA-03	23.61	PA-17iR[M]	10.46	0.84
		GCC2	MWA-2	8.37	MWA-8i	8.29	0.00
		GCC3	MWA-69	8.63	MWA-66i	8.15	0.04
		GCC4	MWA-19	9.03	MWA-34iR	8.37	0.10
		GCC5	MWA-47	8.59	PA-29i	8.48	0.01
		GCC6	PA-09	11.18	PA-16i	9.78	0.11
	IZ-DZ	GCC1	PA-17iR[M]	10.46	PA-27d	9.94	0.08
		GCC2	MWA-8i	8.29	PA-19d	7.33	0.62
		GCC3	MWA-66i	8.15	PA-21d	8.35	-0.02
		GCC4	MWA-34iR	8.37	MWA-58d	8.05	0.01
		GCC5	PA-29i	8.48	PA-24d	7.96	0.01
		GCC6	PA-16i	9.78	PA-26d	10.05	-0.01

Positive vertical gradient indicates an donward hydraulic gradient.

Vertical gradient calculated as (Upper Elevation – Lower Elevation) / Screen Midpoint distance.

* = anonalous groundwater elevation

** = vertical gradient cannot be calculated due to anomalous elevation reading

DZ = Deep Zone

ft NAVD88 = feet North American Vertical Datum of 1988

IZ = Intermediate Zone

[M] = manual groundwater elevation measurement

SZ = Shallow Zone

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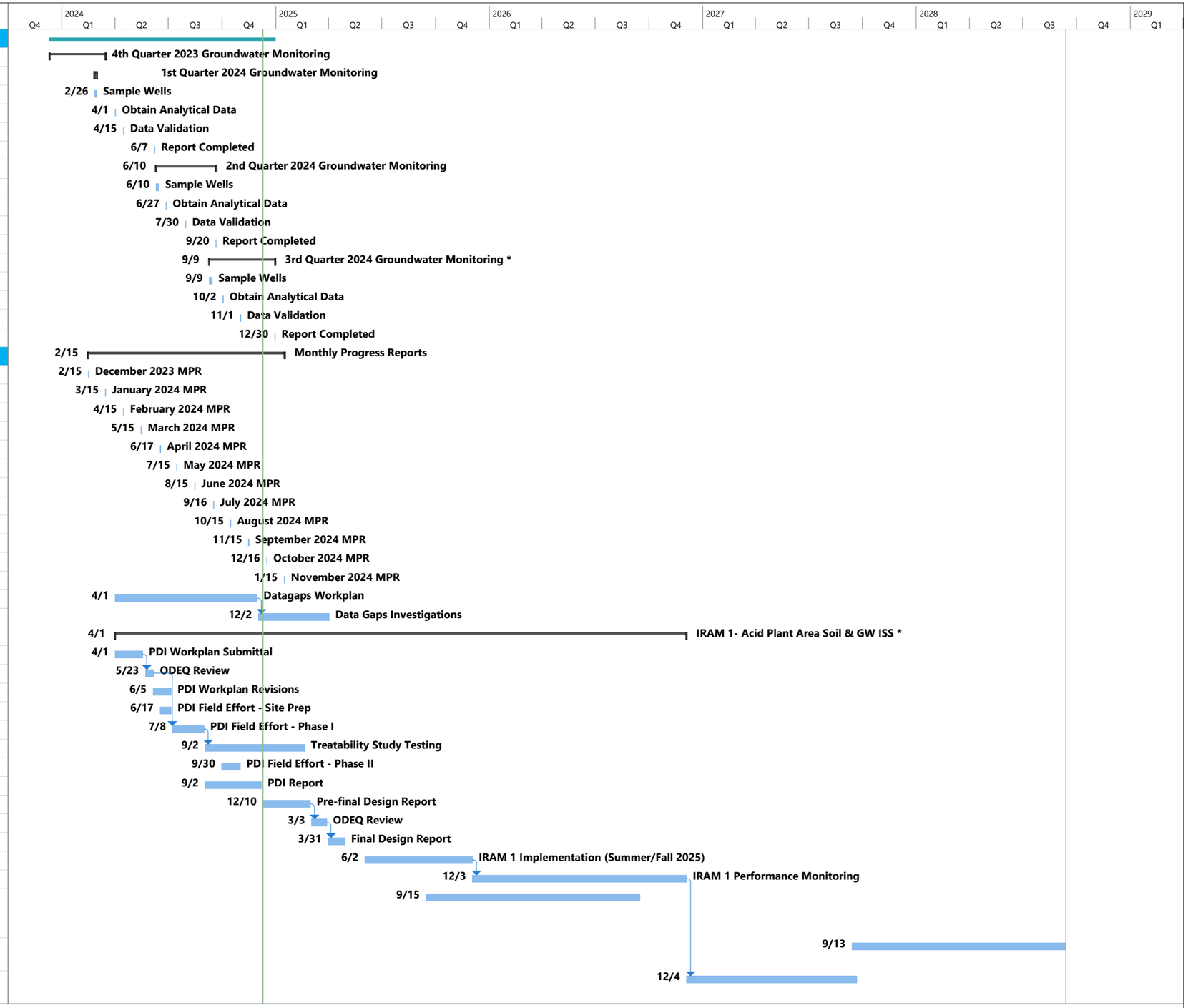
ATTACHMENT C PROJECT SCHEDULE

ID	Task Name	Duration	Start	Finish
1	**Quarterly GW Monitoring**			
2	*4th Quarter 2023 Groundwater Monitoring*	*70 days*	*Mon 12/11/23*	*Fri 3/15/24*
7	**1st Quarter 2024 Groundwater Monitoring**	**4 days**	**Mon 2/26/24**	**Thu 2/29/24**
8	*Sample Wells*	*4 days*	*Mon 2/26/24*	*Thu 2/29/24*
9	*Obtain Analytical Data*	*1 day*	*Mon 4/1/24*	*Mon 4/1/24*
10	*Data Validation*	*1 day*	*Mon 4/15/24*	*Mon 4/15/24*
11	*Report Completed*	*1 day*	*Fri 6/7/24*	*Fri 6/7/24*
12	**2nd Quarter 2024 Groundwater Monitoring**	**75 days**	**Mon 6/10/24**	**Fri 9/20/24**
13	*Sample Wells*	*5 days*	*Mon 6/10/24*	*Fri 6/14/24*
14	*Obtain Analytical Data*	*1 day*	*Thu 6/27/24*	*Thu 6/27/24*
15	*Data Validation*	*1 day*	*Tue 7/30/24*	*Tue 7/30/24*
16	*Report Completed*	*1 day*	*Fri 9/20/24*	*Fri 9/20/24*
17	**3rd Quarter 2024 Groundwater Monitoring ***	**81 days**	**Mon 9/9/24**	**Mon 12/30/24**
18	*Sample Wells*	*5 days*	*Mon 9/9/24*	*Fri 9/13/24*
19	*Obtain Analytical Data*	*1 day*	*Wed 10/2/24*	*Wed 10/2/24*
20	*Data Validation*	*1 day*	*Fri 11/1/24*	*Fri 11/1/24*
21	Report Completed	1 day	Mon 12/30/24	Mon 12/30/24
22	**Monthly Progress Reports**	**241 days**	**Thu 2/15/24**	**Wed 1/15/25**
23	*December 2023 MPR*	*1 day*	*Thu 2/15/24*	*Thu 2/15/24*
24	*January 2024 MPR*	*1 day*	*Fri 3/15/24*	*Fri 3/15/24*
25	*February 2024 MPR*	*1 day*	*Mon 4/15/24*	*Mon 4/15/24*
26	*March 2024 MPR*	*1 day*	*Wed 5/15/24*	*Wed 5/15/24*
27	*April 2024 MPR*	*1 day*	*Mon 6/17/24*	*Mon 6/17/24*
28	*May 2024 MPR*	*1 day*	*Mon 7/15/24*	*Mon 7/15/24*
29	*June 2024 MPR*	*1 day*	*Thu 8/15/24*	*Thu 8/15/24*
30	*July 2024 MPR*	*1 day*	*Mon 9/16/24*	*Mon 9/16/24*
31	*August 2024 MPR*	*1 day*	*Tue 10/15/24*	*Tue 10/15/24*
32	*September 2024 MPR*	*1 day*	*Fri 11/15/24*	*Fri 11/15/24*
33	October 2024 MPR	1 day	Mon 12/16/24	Mon 12/16/24
34	November 2024 MPR	1 day	Wed 1/15/25	Wed 1/15/25
35	**Datagaps Workplan**	175 days	Mon 4/1/24	Fri 11/29/24
36	**Data Gaps Investigations**	87 days	Mon 12/2/24	Tue 4/1/25
37	**IRAM 1- Acid Plant Area Soil & GW ISS ***	**699 days**	**Mon 4/1/24**	**Thu 12/3/26**
38	*PDI Workplan Submittal*	*35 days*	*Mon 4/1/24*	*Fri 5/17/24*
39	*ODEQ Review*	*10 days*	*Thu 5/23/24*	*Wed 6/5/24*
40	*PDI Workplan Revisions*	*23 days*	*Wed 6/5/24*	*Fri 7/5/24*
41	*PDI Field Effort - Site Prep*	*15 days*	*Mon 6/17/24*	*Fri 7/5/24*
42	PDI Field Effort - Phase I	40 days	Mon 7/8/24	Fri 8/30/24
43	Treatability Study Testing	122 days	Mon 9/2/24	Tue 2/18/25
44	PDI Field Effort - Phase II	24 days	Mon 9/30/24	Thu 10/31/24
45	PDI Report	70 days	Mon 9/2/24	Fri 12/6/24
46	Pre-final Design Report	59 days	Tue 12/10/24	Fri 2/28/25
47	ODEQ Review	20 days	Mon 3/3/25	Fri 3/28/25
48	Final Design Report	21 days	Mon 3/31/25	Mon 4/28/25
49	IRAM 1 Implementation (Summer/Fall 2025)	132 days	Mon 6/2/25	Tue 12/2/25
50	IRAM 1 Performance Monitoring	262 days	Wed 12/3/25	Thu 12/3/26
51	**IRAM 2-Enhanced ISCR Perchlorate & CrVI In Chlorate Plant Area, if needed (Summer 2026 implementation)**	261 days	Mon 9/15/25	Mon 9/14/26
52	**IRAM 3-Remove Human Health Direct Contact Hot Spots, if needed (Summer 2028 implementation)**	261 days	Mon 9/13/27	Mon 9/11/28
53	**IRAM 4-Enhanced ISCR of Acid Plant Vicinity, if needed (Summer 2027 implementation)**	207 days	Fri 12/4/26	Mon 9/20/27



Arkema Portland
Monthly Progress Report
Attachment C

Task, Split, Milestone, Summary, Project Summary, Inactive Task, Inactive Milestone, Inactive Summary, Manual Task, Duration-only, Manual Summary Rollup, Manual Summary, Start-only, Finish-only, External Tasks, External Milestone, Deadline, Progress, Manual Progress

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ATTACHMENT D

AVERAGE GROUNDWATER EXTRACTION RATE GRAPH

Attachment D

Average Groundwater Extraction Rate Graph
Arkema Inc. Facility
Portland, Oregon