Pall Corporation

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May 22, 2013

Ms. Sybil Kolon
Environmental Quality Analyst
Department of Environmental Quality
Jackson State Office Building
301 E. Louis Glick Highway
Jackson, MI 49201-1556

Re: MW-103

Dear Ms. Kolon:

Enclosed please find the Analysis of 1,4-Dioxane Trends at MW-103.

Should you have any questions or concerns, please contact me at 734-913-6130.

Sincerely,

Farsad Fotouhi

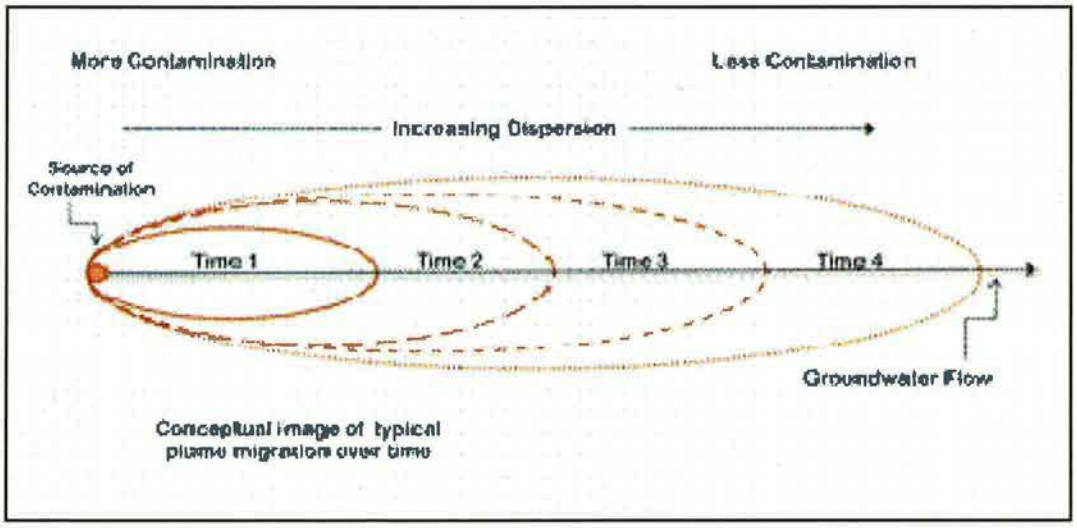
Farsad Fotouhi
Vice President
Sustainability, Safety, Environmental Engineering

cc: Ms. Celeste R. Gill, MDAG
Michael Caldwell, Esq.

Analysis of 1,4-Dioxane Trends at MW-103
Prepared May 10, 2013

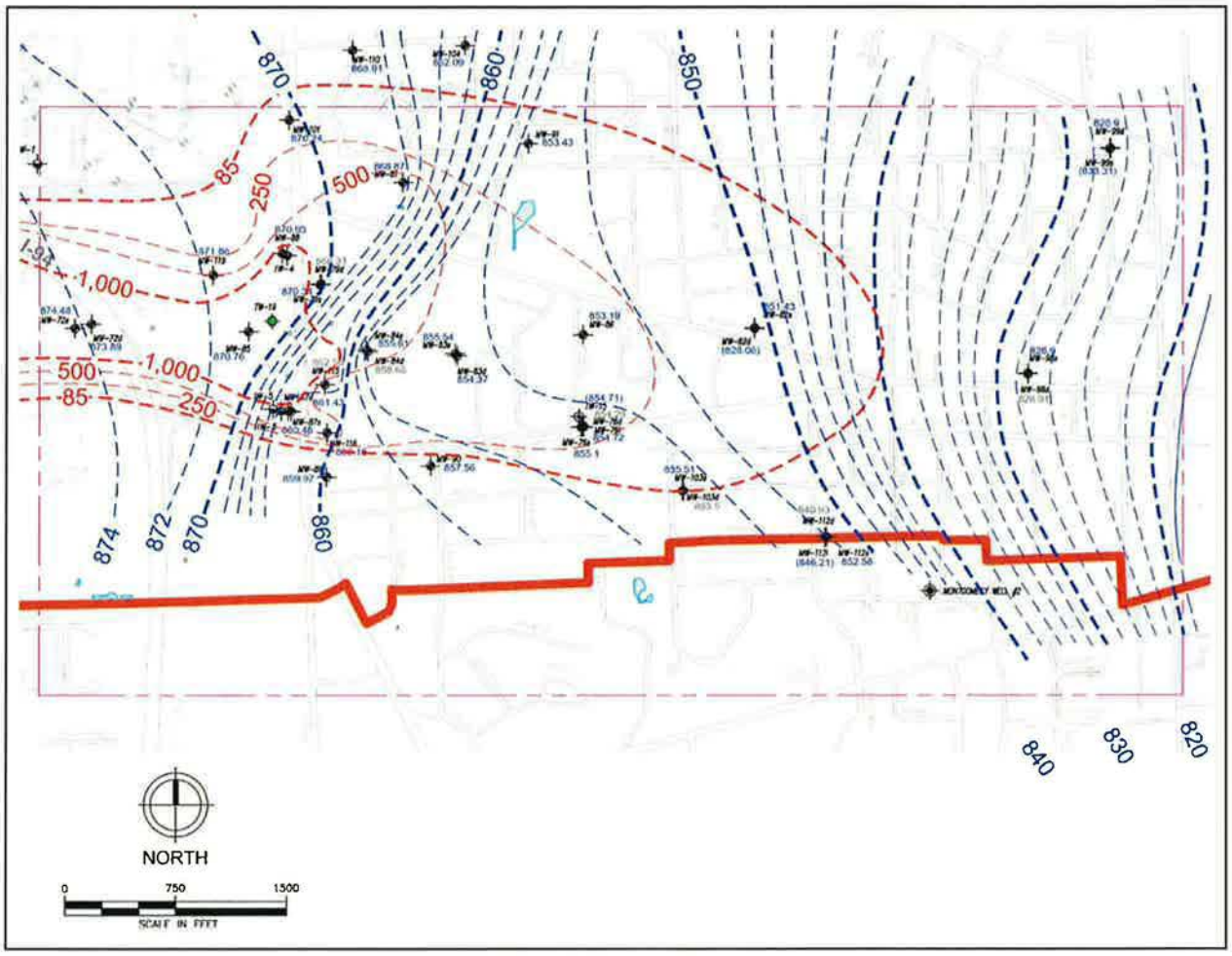
The MW-103 well cluster consist of two wells (MW-103s/MW-103d) located near the southern edge of the Unit E plume, between Jackson Road and the southern boundary of the Prohibition Zone (PZ). 1-4 Dioxane concentrations in groundwater sampled from MW-103d appear to be decreasing. In contrast, 1,4-dioxane levels in groundwater sampled from MW-103s have increased slowly over time and in late 2012, the rate of increase accelerated. Although 1,4-Dioxane levels were briefly above 85 ug/L, the latest sample showed 82 ug/L. Water quality data and graphs for MW-103s and MW-103d are provided in Attachment 1.

The increase of 1,4-dioxane levels in the area of MW-103s represents a slight widening of the Unit E plume as it continues to migrate to the east. The increase in 1,4-dioxane levels in MW-103s does not indicate that the plume is migrating hydraulically in a southerly direction. This slight widening is occurring primarily because of plume dispersion, which is a common characteristic of migrating contamination plumes and is demonstrated on the figure below. Other factors such as heterogeneities in the depositional environment likely contribute to the slight plume widening.



Source – modified from Freeze and Cherry, 1979, *Groundwater*

On the following figure, the most recent Unit E isoconcentration map has been superimposed on the March 2013 potentiometric surface map.



As this figure shows, water level data collected in the area continue to support that the primary track of the plume will be to the east, not south.

The southern boundary of the Unit E plume in this area is quite distinct. For example, relatively high 1,4-dioxane levels are found at the northwest corner of Jackson and Maple, yet much lower levels are being detected at MWs-89 and 90. This provides us some insight into how the plume may track as it moves to the east. Upgradient wells also provide some indication of how 1,4-dioxane concentrations may trend at the MW-103s location. Pall has increased its monitoring frequency of certain wells and will continue to watch trends at these wells as indicators of 1,4-dioxane levels and trends at MW-103s.

1,4-Dioxane levels at the MW-112 well cluster have been very stable since these wells were installed. Although 1,4-Dioxane levels at MW-112i has shown a very slight increase in recent months, levels remain in the 4 to 11 ppb range. Water quality data and graphs for MW-112i are provided in Attachment 1. PLS believes these wells are ideally positioned to track the plume edge and assess the likelihood of the plume migrating outside the PZ. At this time, PLS sees no value to installing additional wells south of the MW-103 cluster.

PLS will continue to collect water quality data from selected wells in this area on a monthly basis. These data will be shared with the MDEQ and used to evaluate the projected location of the plume boundary. If the data suggest the plume is likely to migrate outside the PZ, PLS will work with MDEQ to identify the appropriate actions to be taken.

Analytical Data Report: MW-103s

Aquifer: E	**Date Installed:** 03/06/2006	**Boring Depth:** 63.00 Feet bgl	**Screen 1:** 63.00 to 58.00 Feet
Map Location: M-33	**Well Driller:** Stearns Drilling	**Ground Elevation:** 903.97 Feet	**Screen 1 Length:** 5.00
X Coordinate: 13284564.15	**Well Type:** Monitoring Wells	**TOC Elevation:** 903.26 Feet	**Screen 2:** Unknown to Unknown Feet
Y Coordinate: 284811.70	**Sampling Interval:** Monthly	**TOC to screen bottom:** 63.00 Feet	
	Static Interval: Monthly	**Notes:**	

Date Collected	Time Collected	1,4-Dioxane Results (ppb)	R.L.	Bromate Results	R.L.	Bromide Results	R.L.	Static Time	Static Reading	Comments
04/29/2013	13:05	82	1.0					12:55	47.59	
03/15/2013	14:05							14:05	47.75	
03/05/2013	13:20	96	1.0					13:20	47.74	
02/12/2013	11:10	86	1.0					11:05	47.81	
01/09/2013	11:20	87	5.0					11:10	47.75	
10/09/2012	14:10	92	1.0					13:55	47.56	
09/19/2012	14:23							14:23	47.61	
08/03/2012	11:30	68	1.0					11:20	47.41	
06/05/2012	11:35	54	1.0					11:30	47.18	
03/14/2012	14:47							14:47	47.32	
02/02/2012	13:25	34	1.0					13:15	47.6	
11/02/2011	13:25	39	1.0					13:15	47.88	
09/23/2011	14:25	34	1.0					14:20	47.91	

Date Collected	Time Collected	1,4-Dioxane Results (ppb)	R.L.	Bromate Results	R.L.	Bromide Results	R.L.	Static Time	Static Reading	Comments
09/22/2011	13:40							13:40	64.62	
04/26/2011	14:20	30	1.0					14:10	48.33	
03/17/2011	14:40							14:40	48.55	
01/25/2011	14:15	55	1.0					14:05	48.63	
10/20/2010	10:40	41	1.0					10:30	48.24	
09/01/2010	14:04							14:04	47.97	
07/23/2010	13:00	46	1.0					12:50	47.89	
05/17/2010	13:00	41	1.0					12:50	48.16	
03/09/2010	11:30							11:30	48.23	
01/26/2010	10:35	46	1.0					10:25	48.21	
10/19/2009	13:30	42	1.0					13:20	47.93	
09/24/2009			1.0					14:24	47.99	
07/20/2009	11:00	29	1.0					10:50	47.86	
04/09/2009	12:15	30	1.0					11:20	48.3	
03/17/2009			1.0					14:37	48.31	
02/02/2009	12:35	35	1.0					12:25	48.65	
11/05/2008	13:25	35	1.0					13:15	48.56	
09/17/2008			1.0					13:15	48.51	
07/21/2008	12:25	28	1.0					12:15	48.24	
04/11/2008	12:55	24	1.0					12:45	48.09	
03/25/2008	09:50	27	1.0					09:40	48.3	
02/25/2008			1.0					15:09	48.36	
02/19/2008			1.0					11:15	48.53	

Date Collected	Time Collected	1,4-Dioxane Results (ppb)	R.L.	Bromate Results	R.L.	Bromide Results	R.L.	Static Time	Static Reading	Comments
11/14/2007	11:20	25	1.0					11:10	48.31	
09/13/2007			1.0					13:57	48.19	
07/18/2007	13:22	16	1.0					13:15	47.98	
05/17/2007	10:10	12	1.0					09:55	47.96	
03/13/2007			1.0					11:05	47.95	
01/19/2007	11:35	12	1.0					11:25	48.12	
10/24/2006	09:25	12	1.0					09:15	48.59	
09/15/2006			1.0					10:47	48.63	
08/03/2006	10:35	8	1.0					10:20	48.5	
04/07/2006	13:40	10	1.0					13:29	48.9	
03/22/2006			1.0					13:35	49.14	

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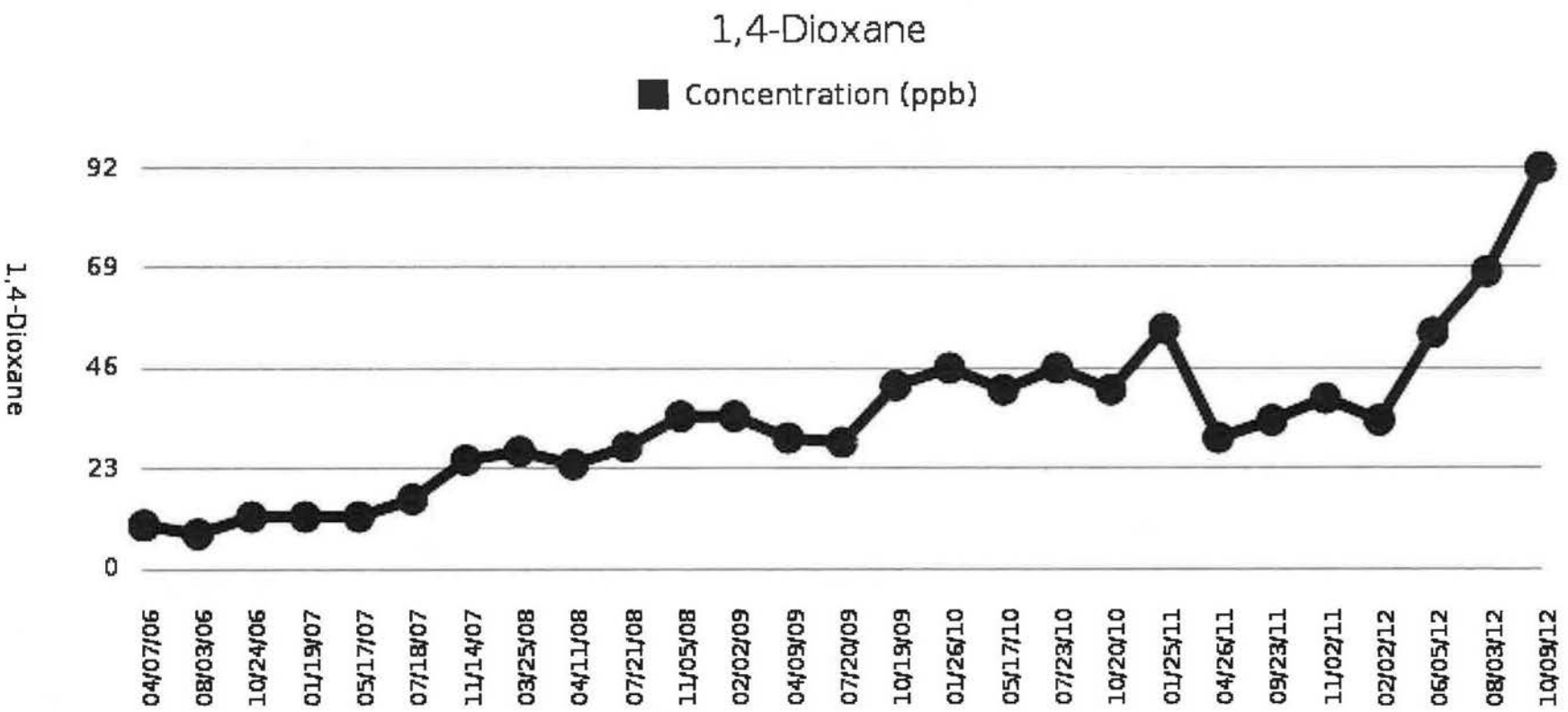
Analytical Data Graph

Printed: 01/07/2013

Well Name: MW-103s

Aquifer:	E	Date Installed:	03/06/2006	Boring Depth:	63.00 Feet bgl	Screen 1:	63.00 to 58.00 Feet
Map Location:	M-33	Well Driller:	Stearns Drilling	Ground Elevation:	903.97 Feet	Screen Length:	5.00
X Coordinate:	13284564.15	Well Type:	Monitoring Wells	TOC Elevation:	903.26 Feet	Screen 2:	Unknown to Unknown Feet
Y Coordinate:	284811.70	Sampling Interval:	Quarterly	TOC to screen bottom:	63.00 Feet		
Comments:							



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Analytical Data Report: MW-112i

Aquifer: E	**Date Installed:** 04/18/2007	**Boring Depth:** 170.00 Feet bgl	**Screen 1:** 170.00 to 165.00 Feet
Map Location: N-35	**Well Driller:** Stearns	**Ground Elevation:** 884.83 Feet	**Screen 1 Length:** 5.00
X Coordinate: 13285530.27	**Well Type:** Monitoring Wells	**TOC Elevation:** 883.89 Feet	**Screen 2:** Unknown to Unknown Feet
Y Coordinate: 284495.91	**Sampling Interval:** Monthly	**TOC to screen bottom:** 169.56 Feet	
	Static Interval: Monthly	**Notes:**	

Date Collected	Time Collected	1,4-Dioxane Results (ppb)	R.L.	Bromate Results	R.L.	Bromide Results	R.L.	Static Time	Static Reading	Comments
04/12/2013	11:05	8	1.0					10:30	37.65	
03/29/2013	09:50	7	1.0					09:10	37.73	
03/15/2013	14:22							14:22	37.68	
02/12/2013	10:50	11	1.0					10:15	37.7	
01/11/2013	11:15	5	1.0					10:35	37.64	
10/12/2012	14:35	5	1.0					14:00	37.69	
09/19/2012	14:30							14:30	37.69	
07/20/2012	14:30	6	1.0					13:50	37.67	
05/15/2012	14:10	5	1.0					13:30	37.47	
03/14/2012	15:00							15:00	37.54	
01/23/2012	11:50	5	1.0					11:15	37.57	
10/28/2011	11:20	4	1.0					10:45	37.85	
09/23/2011	13:00	5	1.0					12:25	37.89	

Date Collected	Time Collected	1,4-Dioxane Results (ppb)	R.L.	Bromate Results	R.L.	Bromide Results	R.L.	Static Time	Static Reading	Comments
09/22/2011	13:56							13:56	37.86	
04/28/2011	14:35	4	1.0					13:55	38.45	
03/17/2011	15:08							15:08	38.75	
01/25/2011	11:35	6	1.0					11:00	38.95	
11/03/2010	11:40	4	1.0					11:00	38.74	
09/01/2010	14:10							14:10	38.60	
07/19/2010	11:15	4	1.0					10:35	38.5	
04/19/2010	11:50	4	1.0					11:15	38.68	
03/09/2010	11:37							11:37	38.53	
01/15/2010	10:50	4	1.0					10:20	38.5	
10/19/2009	11:15	5	1.0					10:40	38.4	
09/24/2009			1.0					14:34	38.45	
07/16/2009	10:40	4	1.0					10:10	38.14	
04/20/2009	10:45	5	1.0					10:15	38.08	
03/17/2009			1.0					14:42	38.53	
01/30/2009	12:10	4	1.0					11:40	38.81	
10/16/2008	11:15	5	1.0					10:40	38.92	
09/17/2008			1.0					13:23	38.95	
07/22/2008	10:45	6	1.0					10:05	38.65	
04/11/2008	10:40	5	1.0					10:05	38.61	
02/25/2008			1.0					15:30	38.85	
02/19/2008			1.0					11:40	38.94	
02/05/2008	09:45	5	1.0					09:15	38.95	

Date Collected	Time Collected	1,4-Dioxane Results (ppb)	R.L.	Bromate Results	R.L.	Bromide Results	R.L.	Static Time	Static Reading	Comments
11/14/2007	13:30	6	1.0					12:55	38.98	
09/13/2007			1.0					14:09	39.07	
07/16/2007	10:55	6	1.0					10:25	38.99	
05/10/2007	13:55	6	1.0					13:19	38.7	

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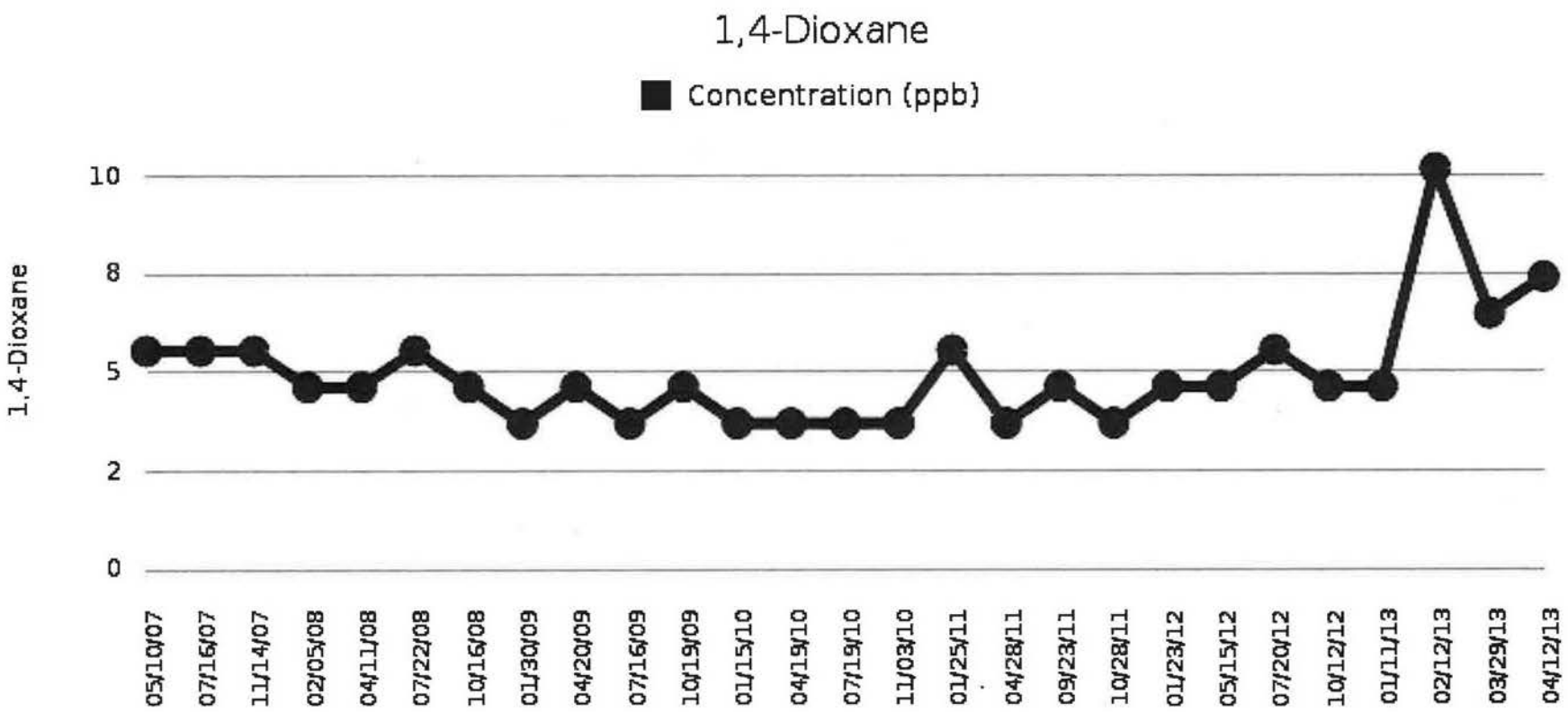
Analytical Data Graph

Printed: 05/08/2013

Well Name: MW-112i

Aquifer:	E	Date Installed:	04/18/2007	Boring Depth:	170.00 Feet bgl	Screen 1:	170.00 to 165.00 Feet
Map Location:	N-35	Well Driller:	Stearns	Ground Elevation:	884.83 Feet	Screen Length:	5.00
X Coordinate:	13285530.27	Well Type:	Monitoring Wells	TOC Elevation:	883.89 Feet	Screen 2:	Unknown to Unknown Feet
Y Coordinate:	284495.91	Sampling Interval:	Monthly	TOC to screen bottom:	169.56 Feet		
Comments:							



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