

Status of the PFC Assessment/Remediation Projects in Minnesota

Presented to: MPCA
St. Paul, MN

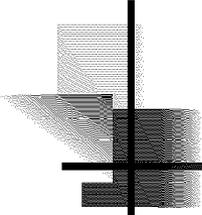
Presented by: 3M Company

&

Weston Solutions, Inc.
West Chester, PA

Date: July 23, 2013



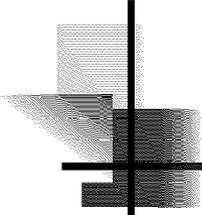


Agenda

- Status and future course of action at the following sites:
 - Oakdale, MN
 - Cottage Grove, MN
 - Woodbury, MN

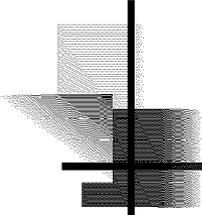


OAKDALE



Oakdale - Status

- Groundwater treatment system (GW-1)
 - System is operating and performance monitoring is on-going
 - Continued issues with power surges in beginning of year – only minor impact on operation
 - Installation of electrical surge protectors completed in June 2013
 - Extraction wells PW22, PW23, PW24 (isthmus area) rehabbed in Winter/Spring 2013
 - Annual well rehabilitation program (physical and chemical) will be performed in late summer or early fall
 - Groundwater capture has been maintained



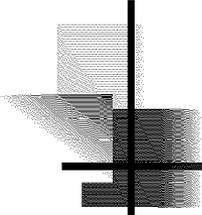
Oakdale – Status (cont.)

- Groundwater treatment system (GW-1)

- Carbon change-out in both GAC vessels performed in April 2013
- Average Monthly GWTP Flows:

January:	67 GPM
February:	68 GPM
March:	65 GPM
April:	53 GPM
May:	88 GPM
June:	88 GPM

- April flow lower due to carbon change-out and clarifier cleaning (plant temporarily out of service)
- Increased May and June flow due to higher recharge, operation of PW16 and PW18



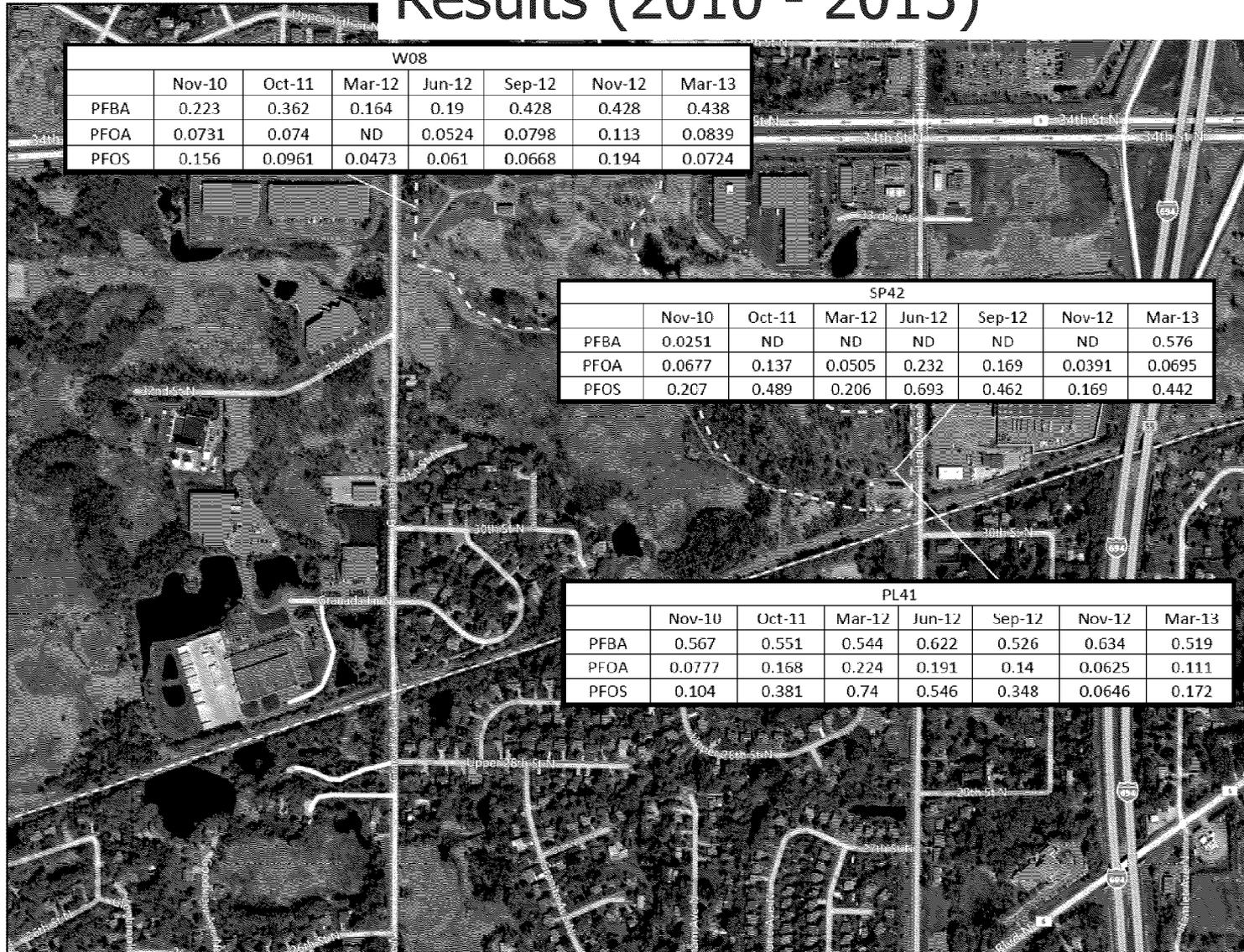
Oakdale – RA Sampling

- Pre-excavation baseline samples were collected from Raleigh Creek and site monitoring wells in November 2010
- In accordance with the November 25, 2010 Sampling Plan, routine quarterly sampling began after completing the remedy, in Q1 2012:
 - Quarterly monitor wells sampling for the first four years
 - Quarterly surface water samples from Raleigh Creek for the first year were collected in March 2012 (surface water sampling locations were dry in June 2012, September 2012, November 2012, and March 2013)
 - Quarterly surface water samples were collected in June 2013

Oakdale – Groundwater Results (2010 - 2013)



Oakdale – Groundwater Results (2010 - 2013)

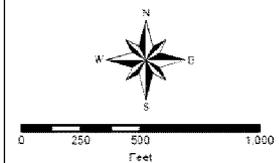


Legend

- ▲ Plattville Monitoring Well
- ⊙ St. Peter Monitoring Well
- Fenceline
- - - Inferred Limits of the Former
- ▭ Abresch Disposal Site Area

Notes:
-All sample results reported in parts per billion (ng/g)

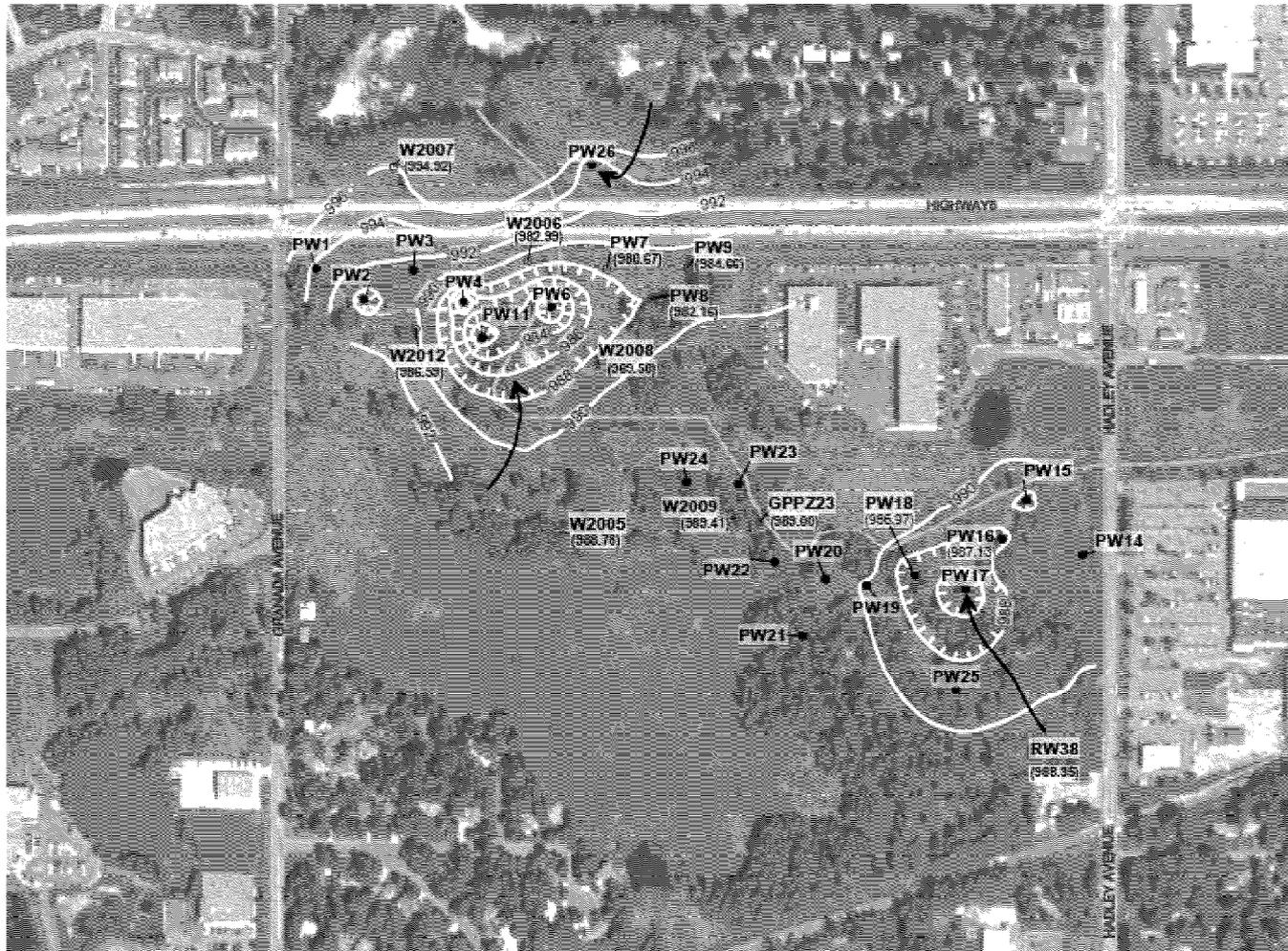
Imagery Source: ESRI Bing Mapping Service, 2011



PFBA, PFOA, and PFOS
Concentrations Detected in
Groundwater

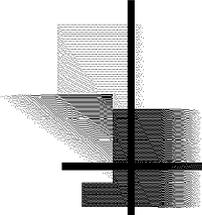
Oakdale Site
Oakdale, Minnesota

Groundwater Elevation Contour Map
Lower Alluvium Aquifer
24 January 2013 - 1st Quarter





COTTAGE GROVE



East Cove Remediation

- All construction activities are complete; CCR for excavation and backfilling was approved by MPCA in 2012.
- Report on initial planting submitted to MPCA on December 19th, 2012; a similar report was submitted to the USACOE and the MDNR, per the requirements of the permits/approvals from the agency

East Cove Sediment Removal



Cove Excavation

East Cove Sediment Removal



Backfill Activities

14

East Cove Sediment Removal



Post-Backfill

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East Cove Restoration

Planting
Activities –
Western Edge of
Main Flow
Channel
(Looking South)

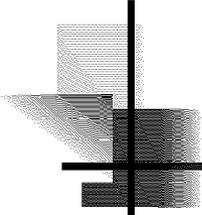


East Cove Restoration

Overview of East
Cove
(Looking North)



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Cottage Grove Groundwater Interception & Treatment

- Extended pumping test currently being performed at recovery wells PW-9 and PW-10.
- Pore water and groundwater sampled for PFCs in October 2012 to establish base line conditions.
- Quarterly Groundwater monitoring program initiated in January 2013, prior to initiating pump test.
- Surface water and pore water sampling planned for August 2013 – Mississippi River conditions permitting.

Cottage Grove Groundwater Interception & Treatment (cont.)

- Treatment system
 - Treatment system construction completed in early 2013.
 - Revised Pump Test Work Plan dated January 30, 2013 submitted to MPCA.
 - MPCA approval of Pump Test Work Plan provided via email on February 8, 2013 and in a letter dated February 21, 2013.
 - Pump test objective: Collect field data to assess extent of groundwater capture for PW-9 and PW-10 for various pumping scenarios.
 - Pump test initiated February 18, 2013
 - New monitoring wells installed end of May 2013
 - These include both replacement wells (MW-4R and MW-14R) and a new well (MW-112)
 - Re-survey of select existing wells and survey of new wells
 - Woodbury water connected to the GWTP over the Memorial Day weekend
 - 3rd Quarter 2013 groundwater sampling being performed this week



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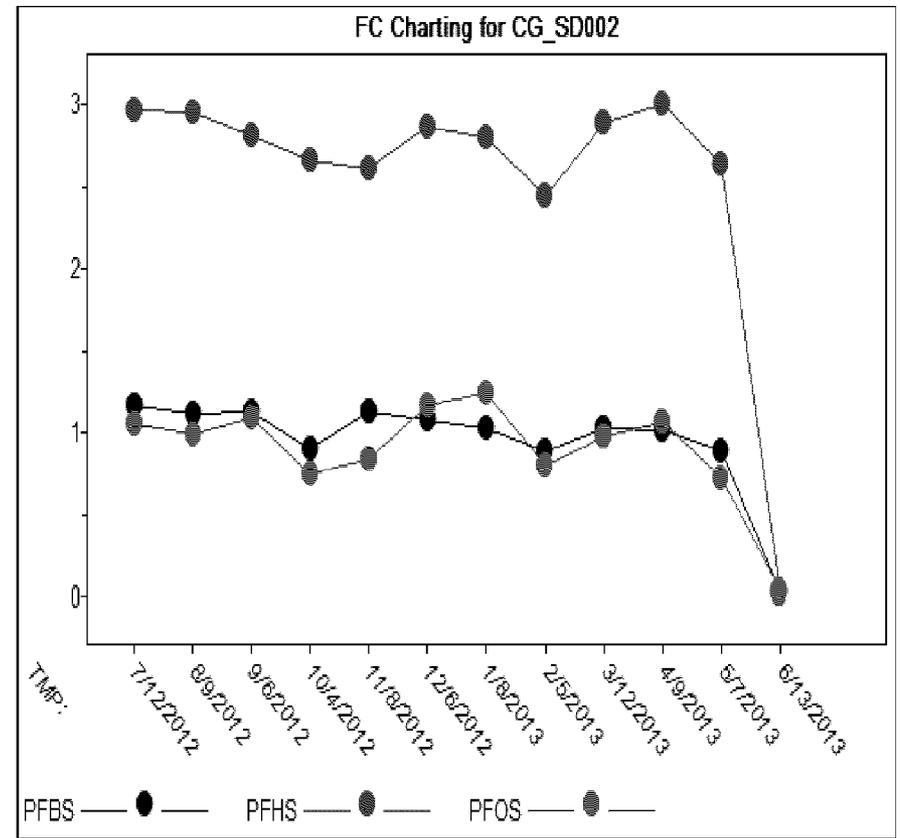
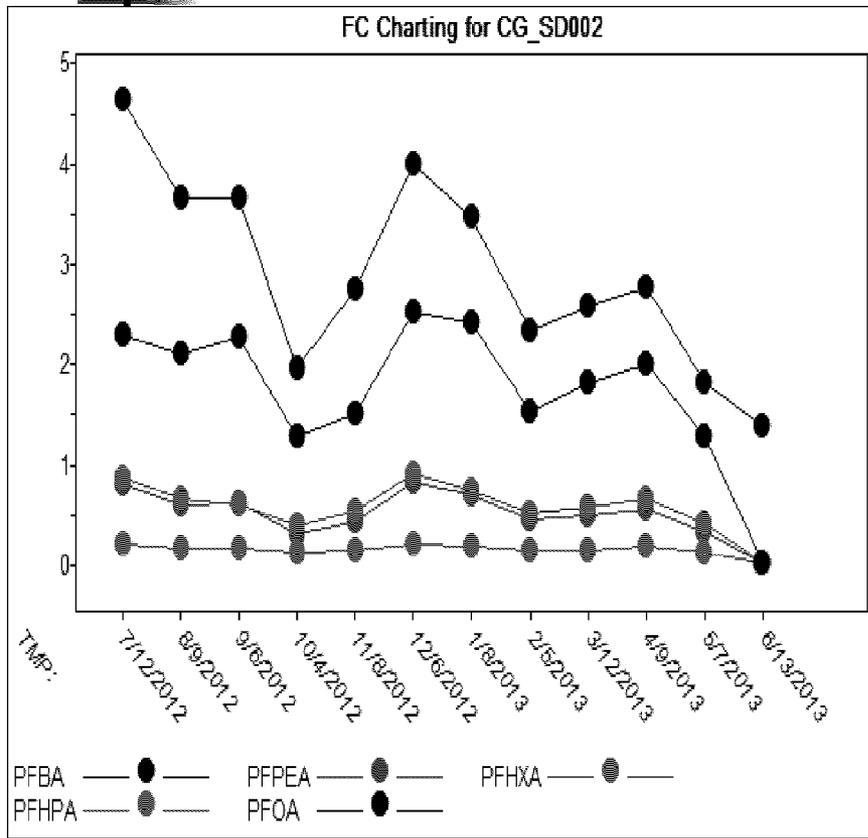
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Outfall SD002 Results



Cottage Grove New Monitoring Well Locations

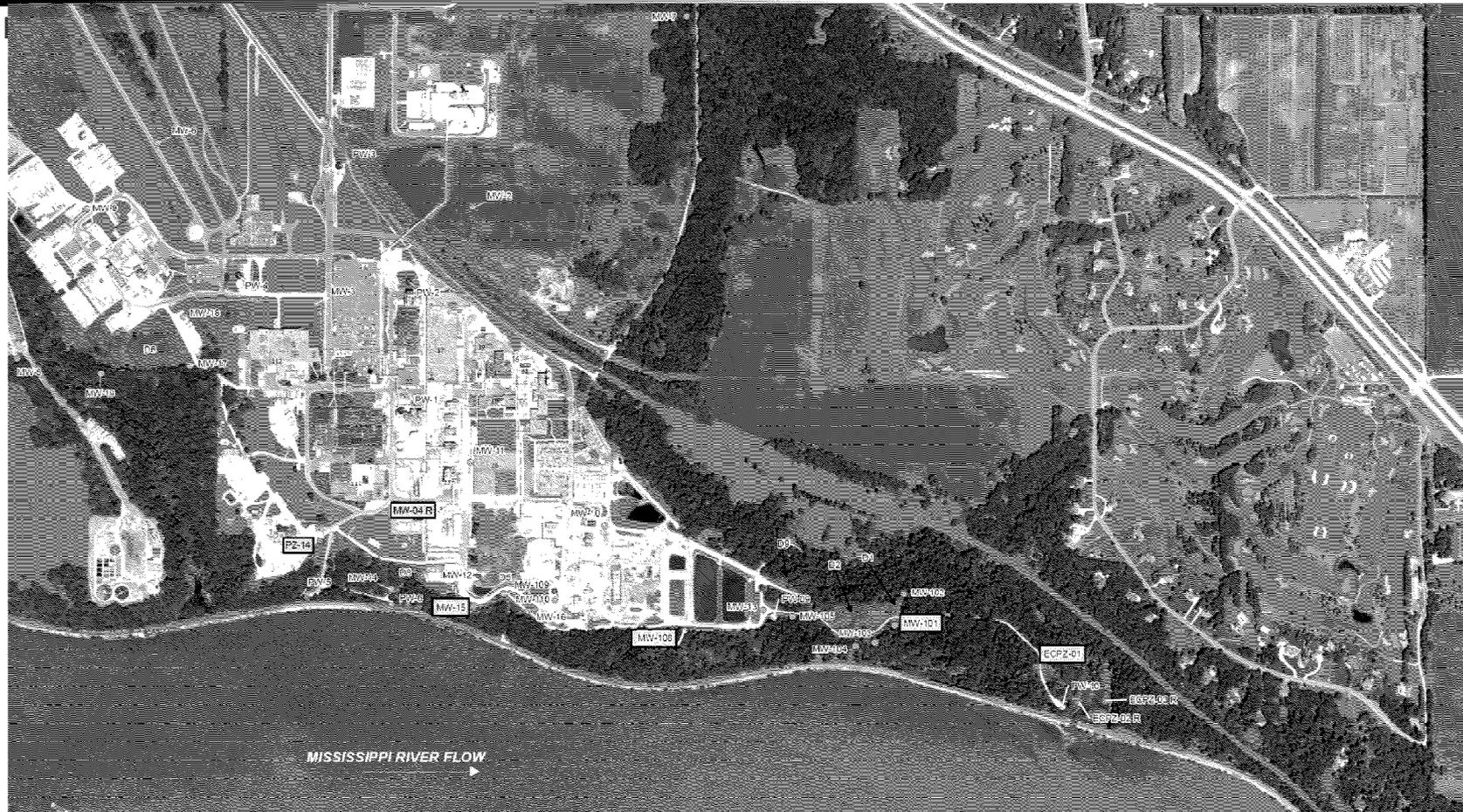


Cottage Grove Groundwater Interception & Treatment (cont.)

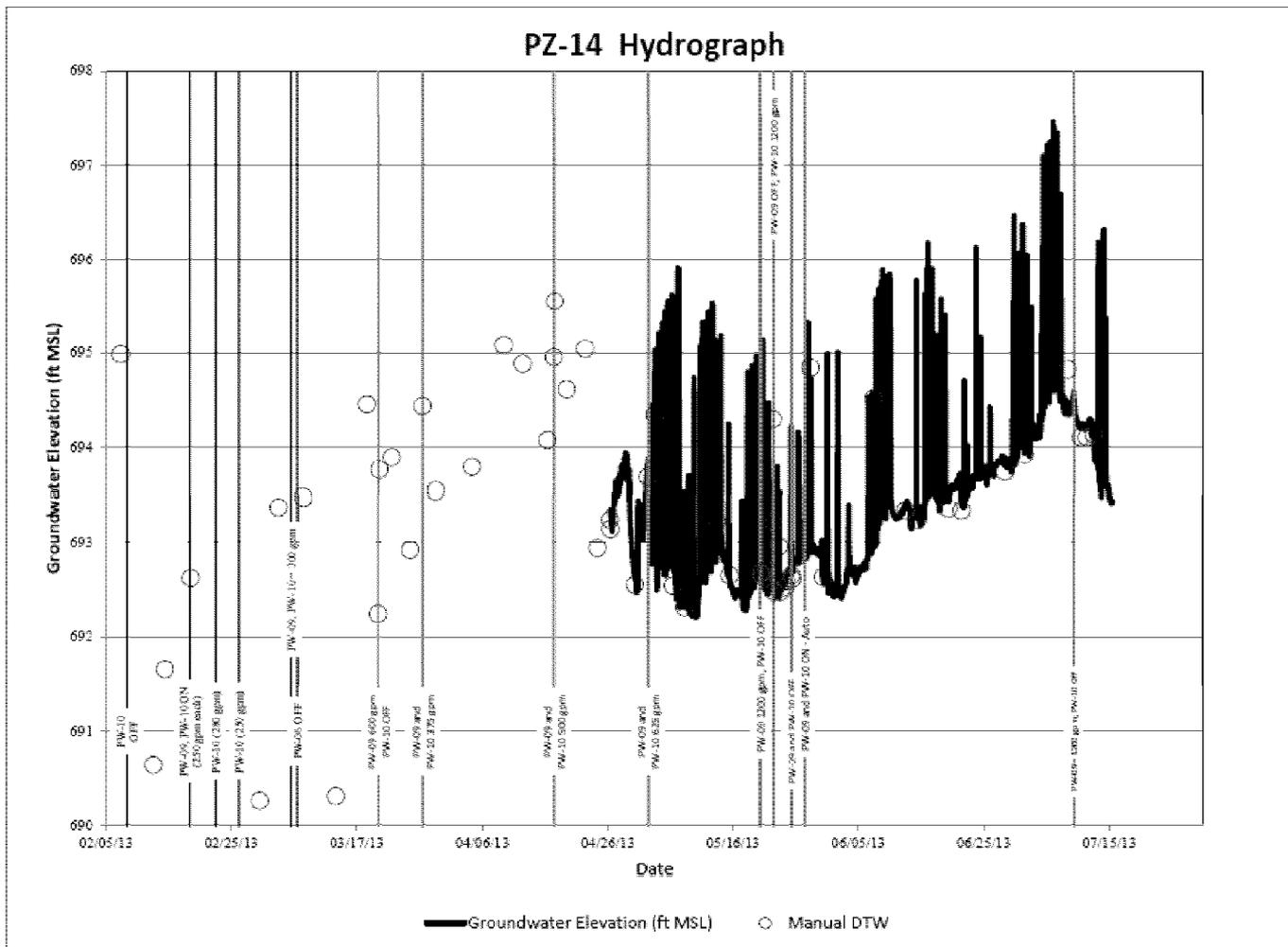
- Pump Test Status:

- 2/18/2013 – Began pumping- 250 gpm each well. Flow rates periodically adjusted and water levels measured
- Providing monthly updates to MPCA and MDH
- Groundwater elevations have risen significantly in background wells (> 10 feet over last couple of months).
- Pump test is on-going and data continues to be collected and assessed.

Cottage Grove Groundwater Hydrograph Locations



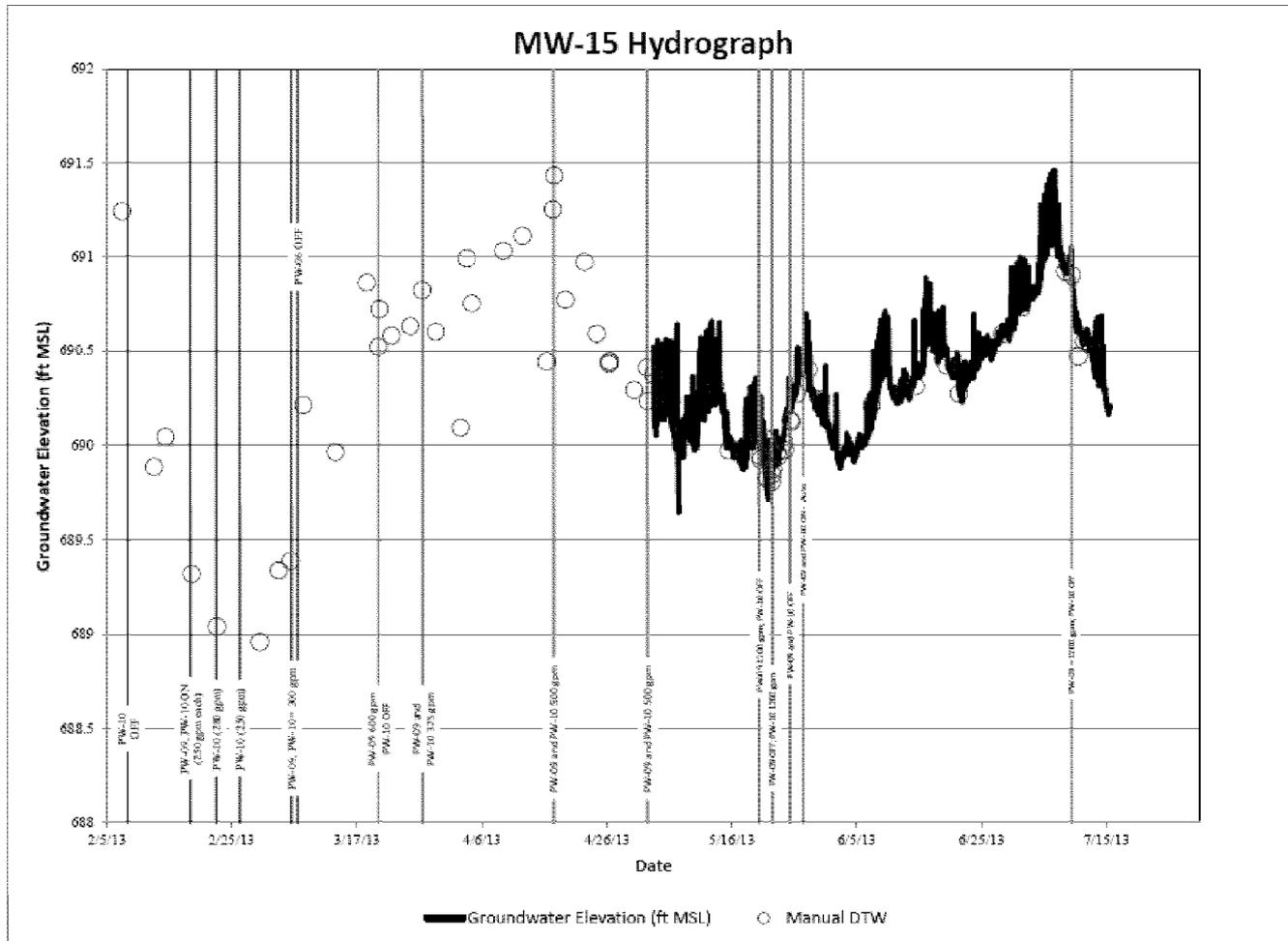
Cottage Grove Groundwater PZ-14 Hydrograph



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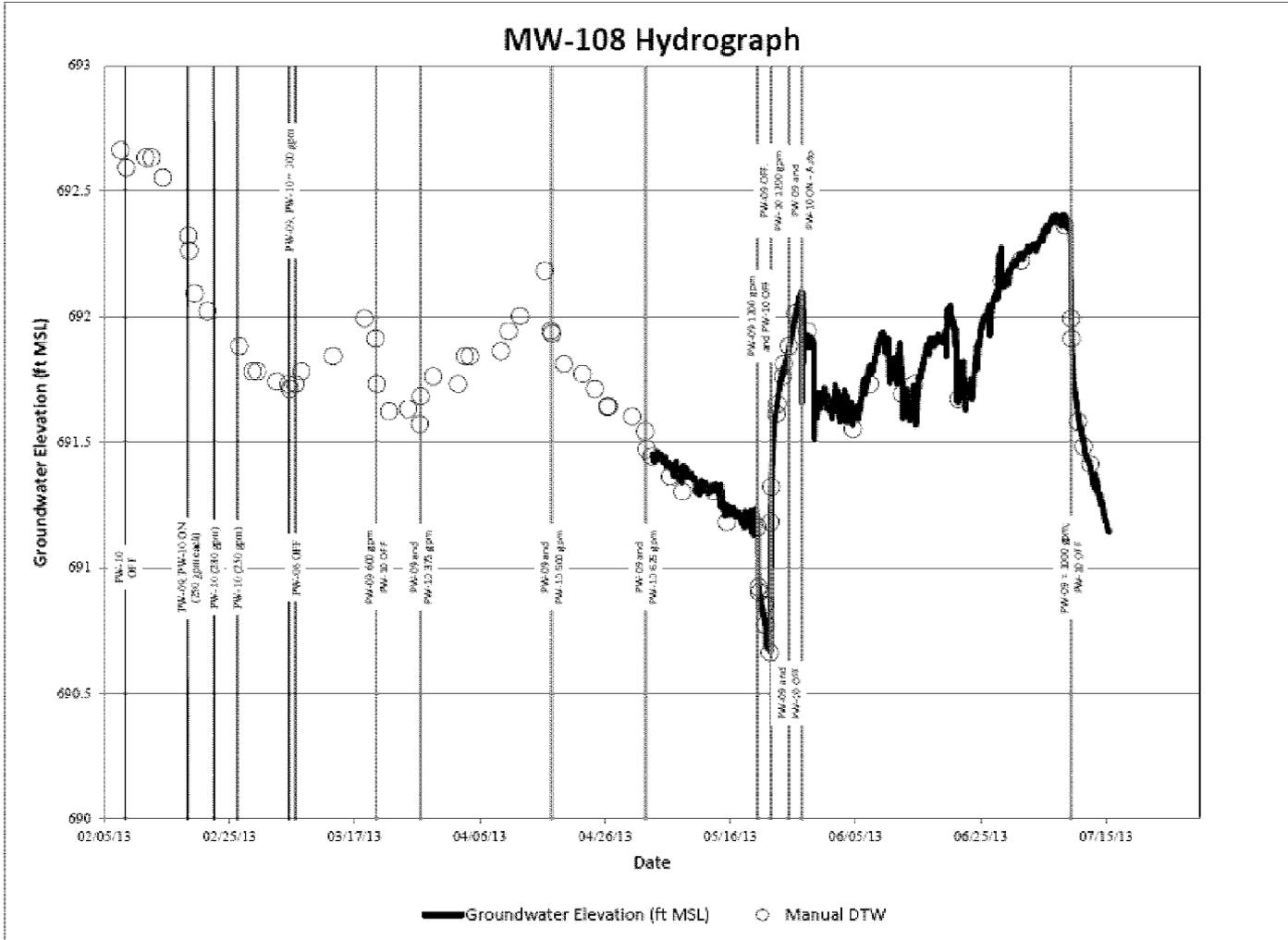
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Cottage Grove Groundwater MW-15 Hydrograph



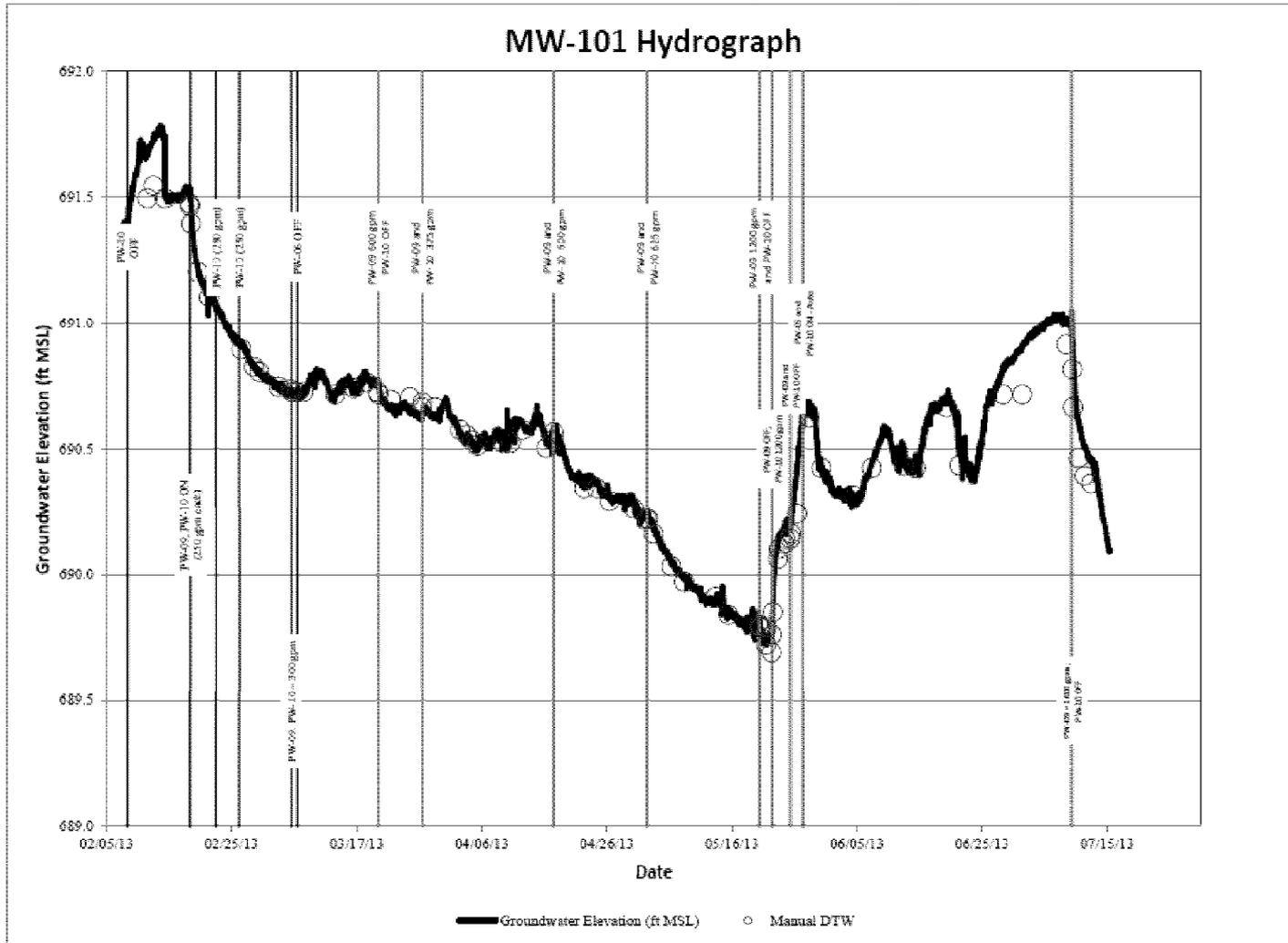
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Cottage Grove Groundwater MW-108 Hydrograph



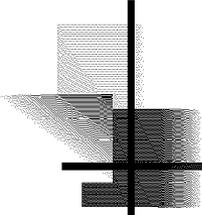
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Cottage Grove Groundwater MW-101 Hydrograph



DRAFT

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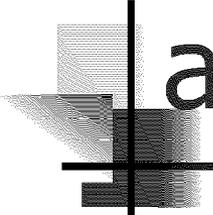
Preliminary Findings of the Pump Test

- PW- 9 and PW-10 can each sustain a maximum flow rate of 1,200 gallons per minute (gpm).
- Pumping rates of wells are being varied periodically and water levels in monitoring wells are being regularly monitored.
- Water levels are still showing downward trends, even after pumping the two wells for two weeks.
- Preliminary analytical data show that influent levels of PFOA and PFOS each remain < 0.5 ppb.
- The Woodbury site system flow rate has stabilized at approximately 2,700 gpm after connection to the GWTP.

Cottage Grove PFC Groundwater Concentrations (ug/L, ppb)

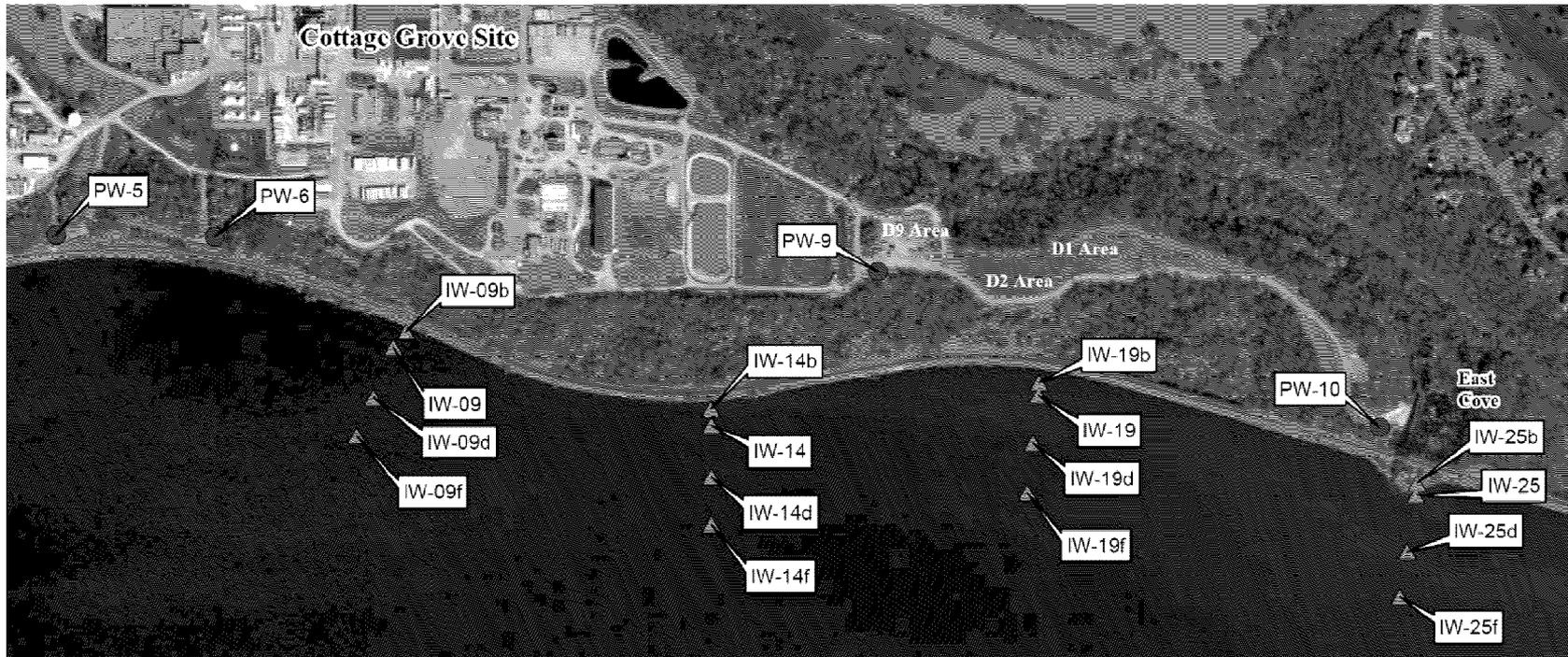


Cottage Grove Surface Water and Pore Water Sampling

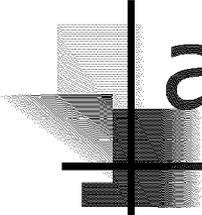


- Surface water and pore water samples collected in:
 - Sept 2006
 - June 2011
 - October 2012
- Four transects, with four samples on each transect, were common to all three sampling events
- Mid-pump test sampling scheduled for August, dependent on river condition.
- Schedule for the post-pump test sampling to be determined.

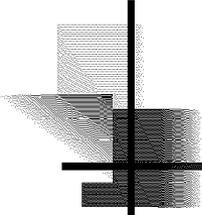
Cottage Grove Surface Water and Pore Water Sampling (cont.)



Cottage Grove Surface Water and Pore Water Sampling (cont.)



- Pore water concentrations are higher than surface water concentrations
- Locations closer to shore generally have higher pore water concentrations than those further out in the river
- June 2011 had generally the lowest surface water levels. Higher concentrations observed in October 2012
- The surface water location directly downstream of the plant discharge (IW-25) had generally higher concentrations than the upstream locations

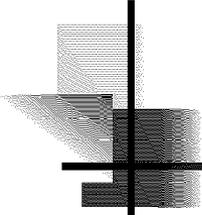


Future Site Activities

- East Cove restoration monitoring (3-5 years)
- Extended Pump Test – will be continued under different pumping scenarios to assess groundwater capture.
- Final Site CCR including Groundwater Remedy
- Site-wide long-term monitoring
- Surface water/pore water monitoring for mid-pump test and post-pump test

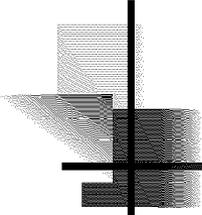


WOODBURY



Woodbury - Status Update

- On-going Quarterly and Annual groundwater sampling and reporting and monthly water level measurements.
 - As defined by the Groundwater Sampling Plan (June 2011)
- Previous status update presentation was provided to MPCA on February 6, 2013
- Reports submitted since last status update:
 - 4th Quarter/Annual 2012 report (February 2013)
 - 1st Quarter 2013 report (May 2013)
- Second Quarter 2013 groundwater data received from the laboratory.

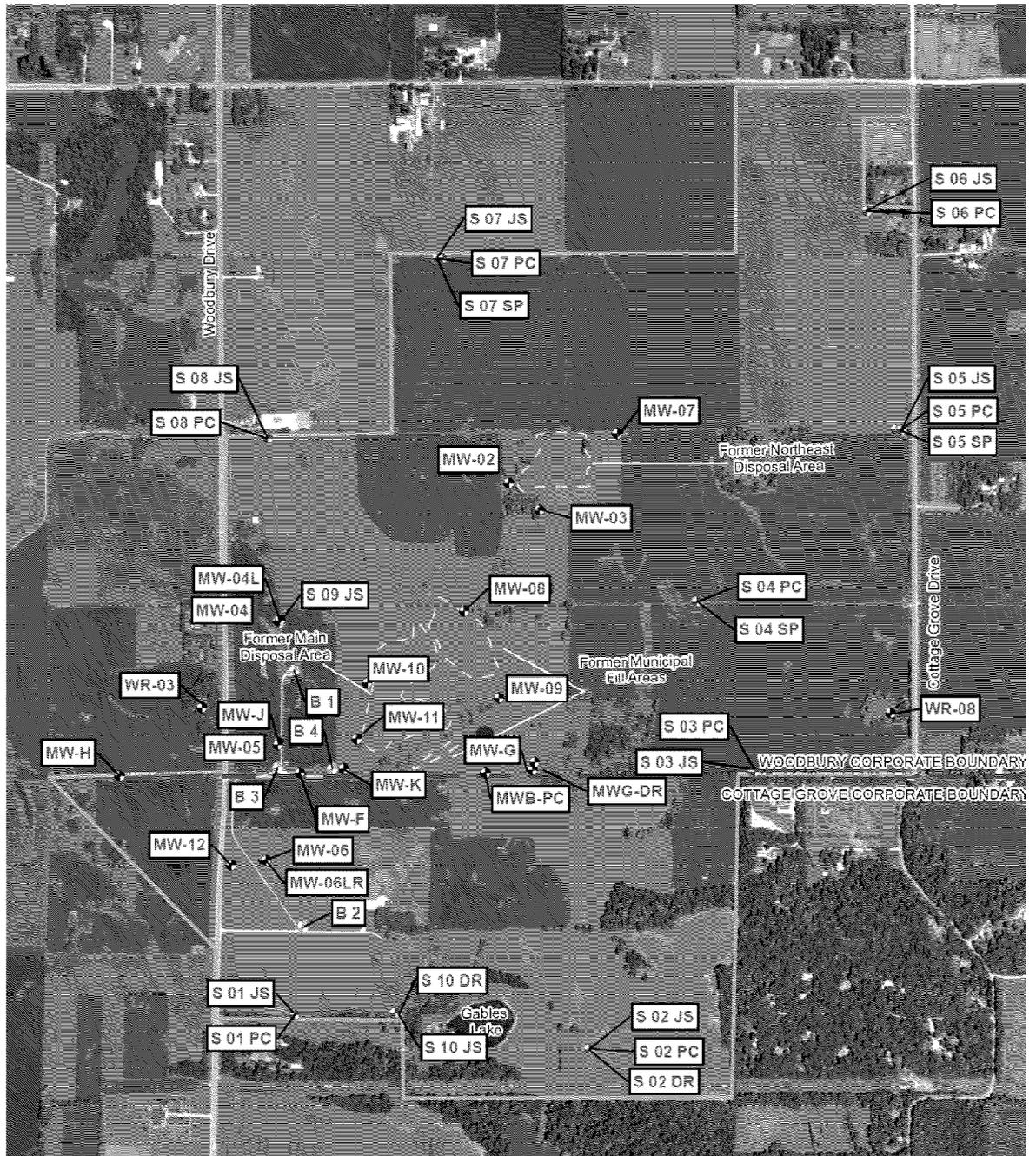


June 2013

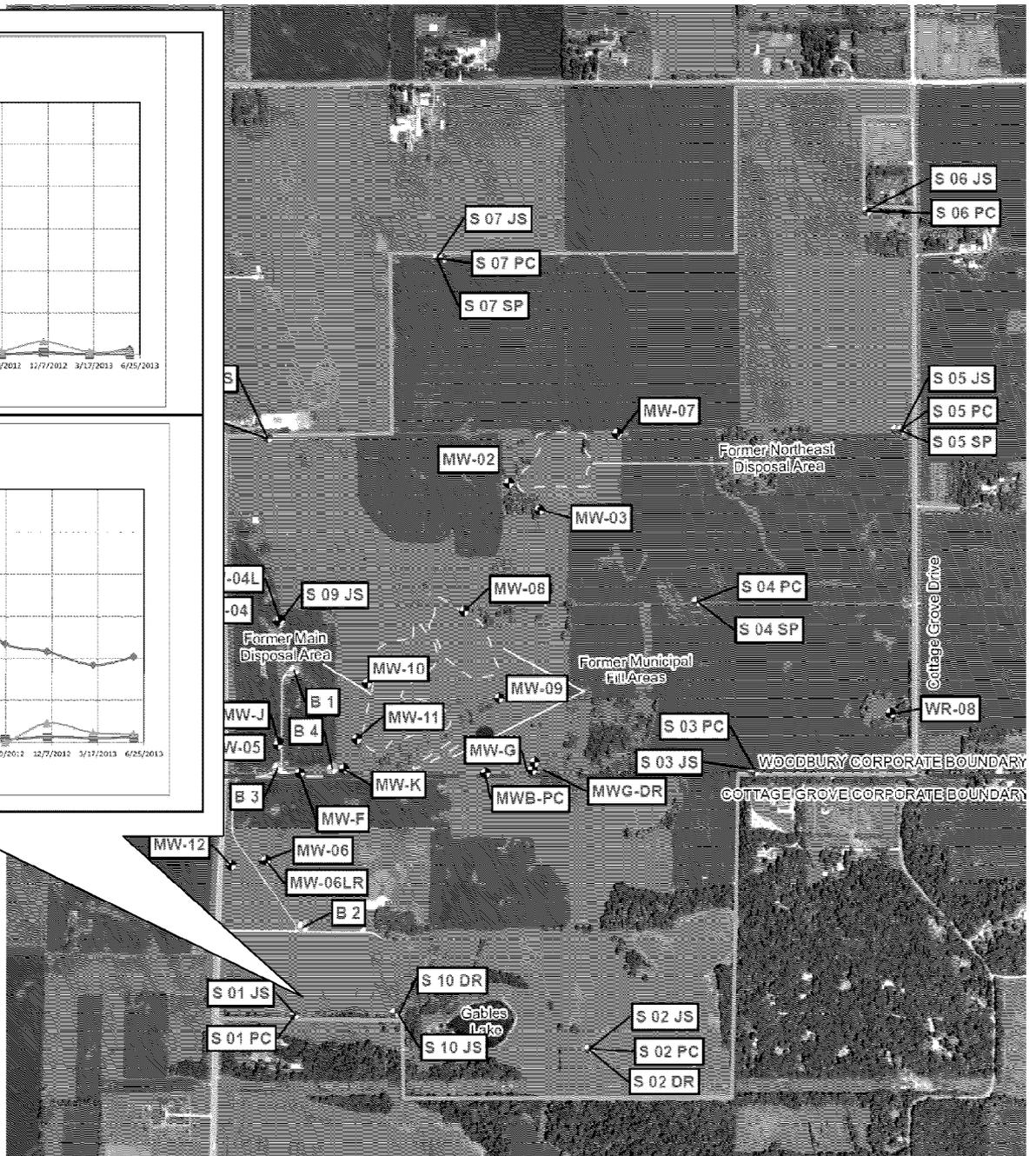
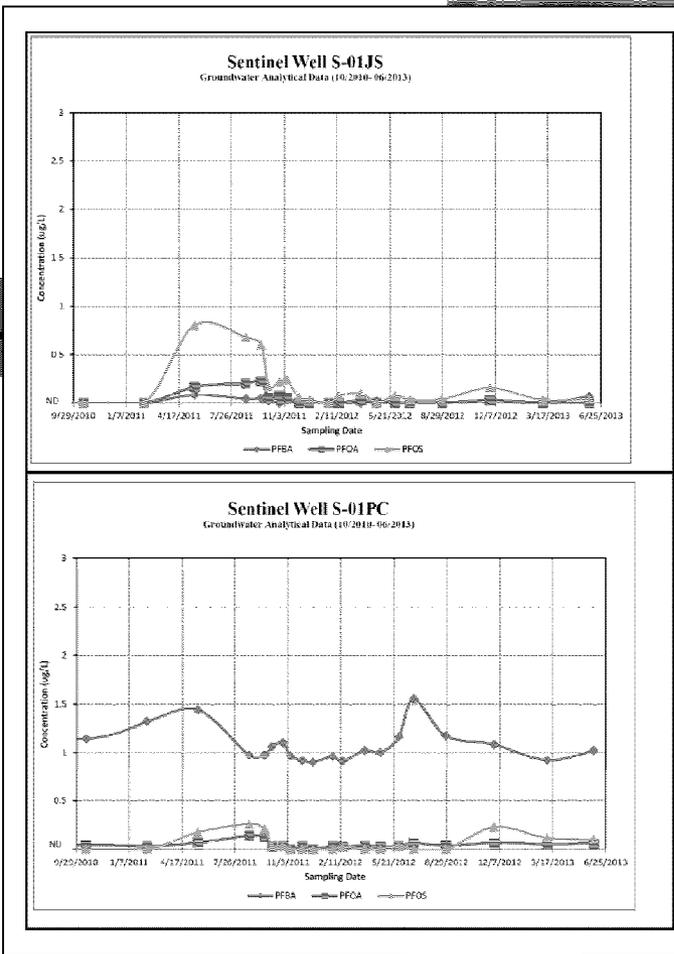
2nd Quarter Sampling

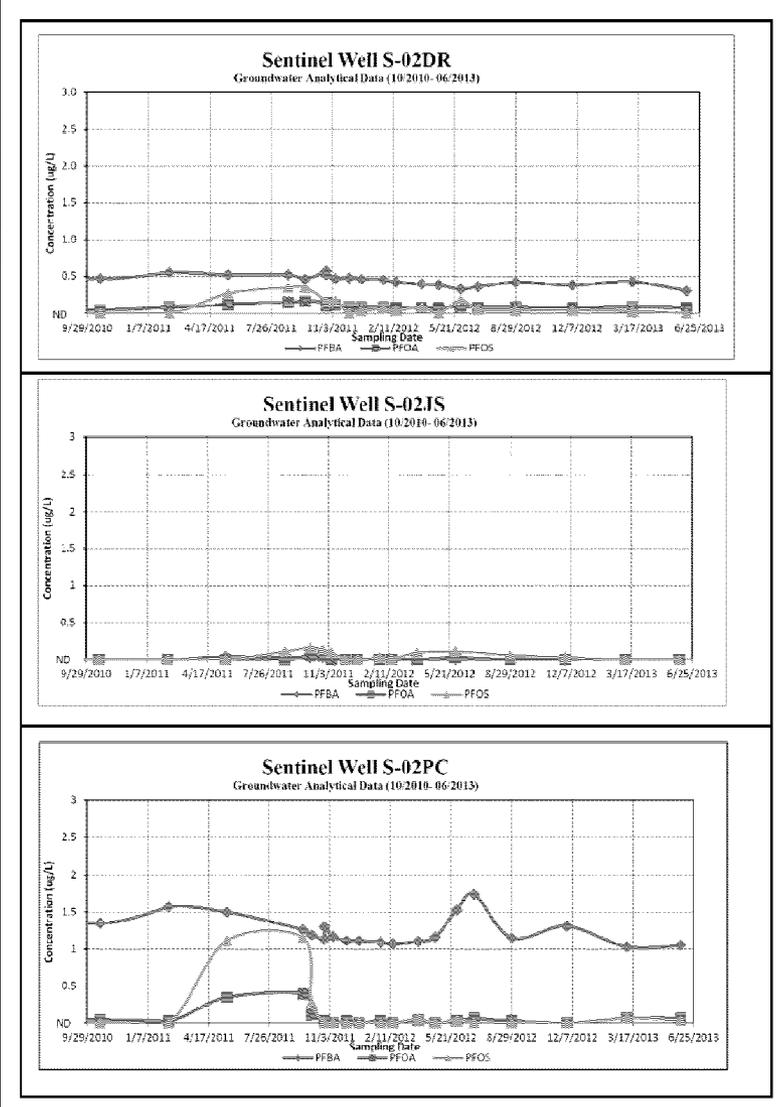
- June results were consistent or less than previous samples
- PFOA and PFOS concentrations decreased in MW 2, downgradient of Northeast Disposal Area and in SO6PC.
- Groundwater elevation data continue to show groundwater capture is being maintained.

Monitoring Well Trends

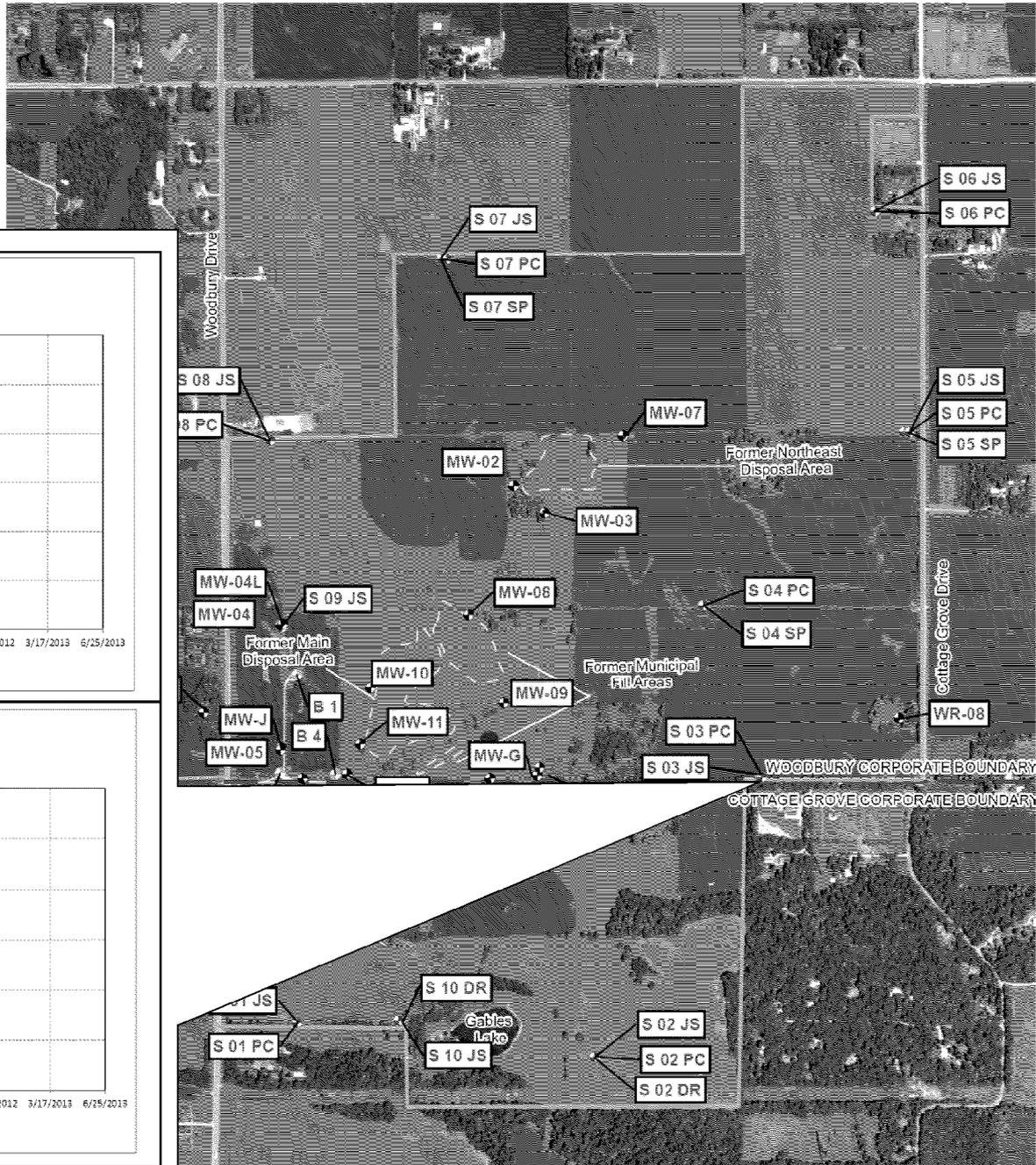
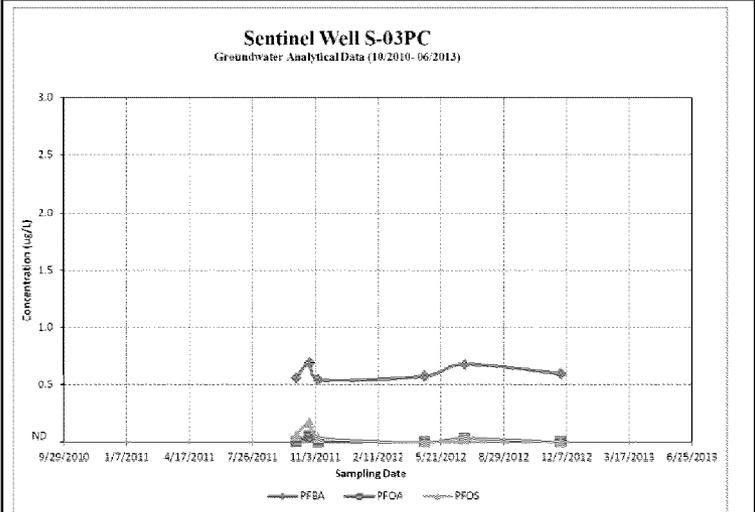
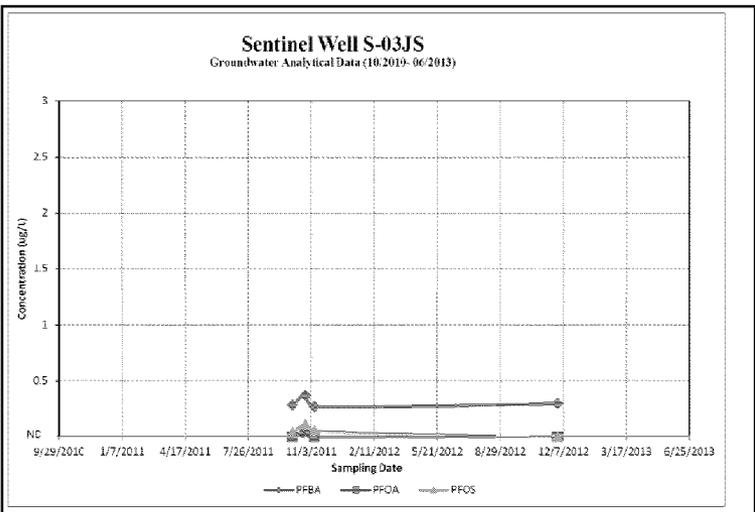


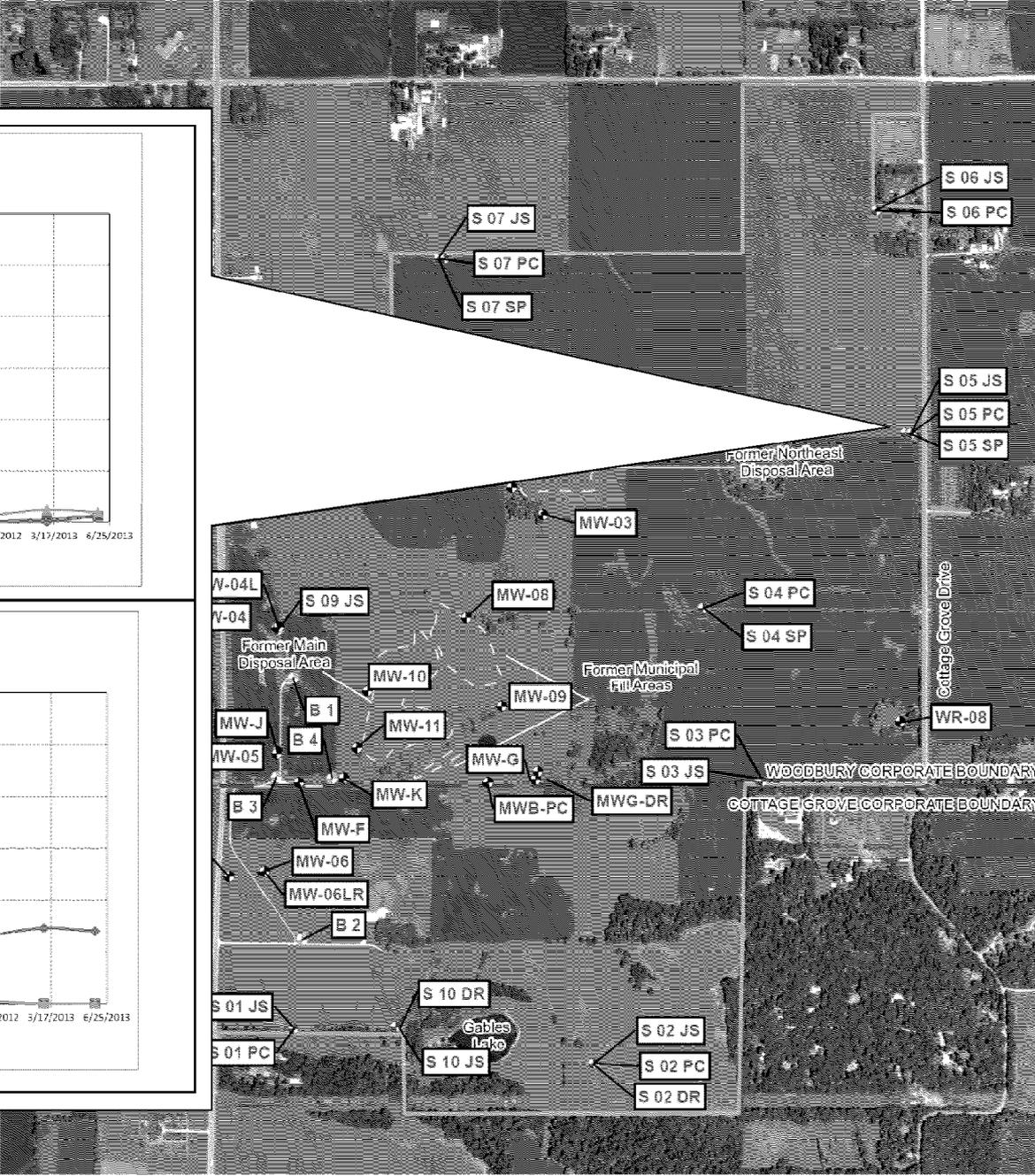
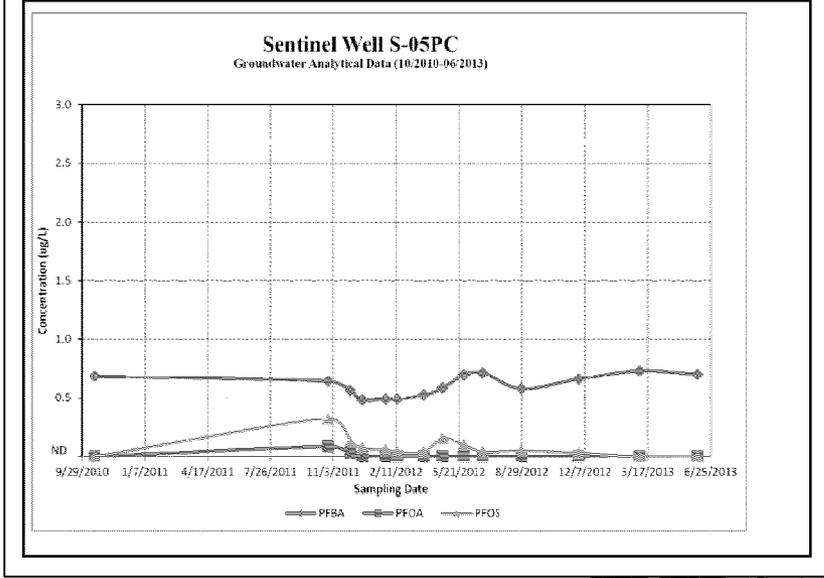
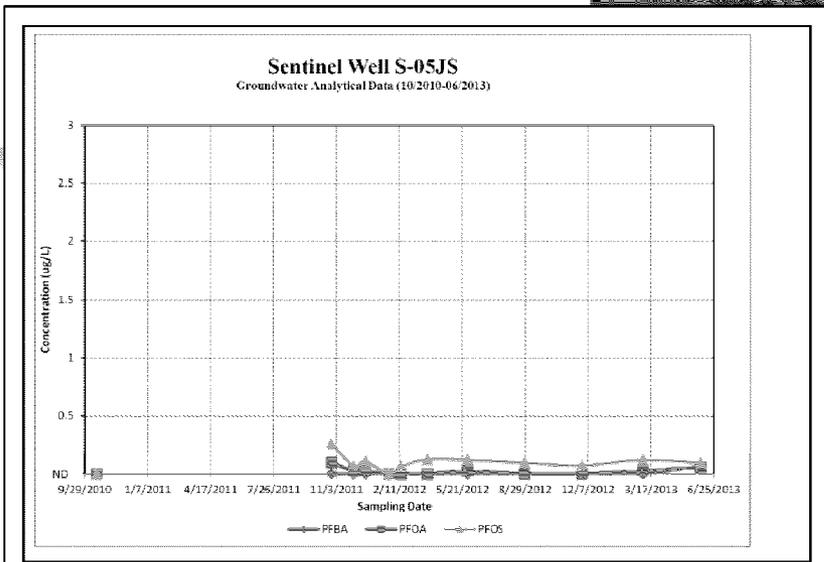
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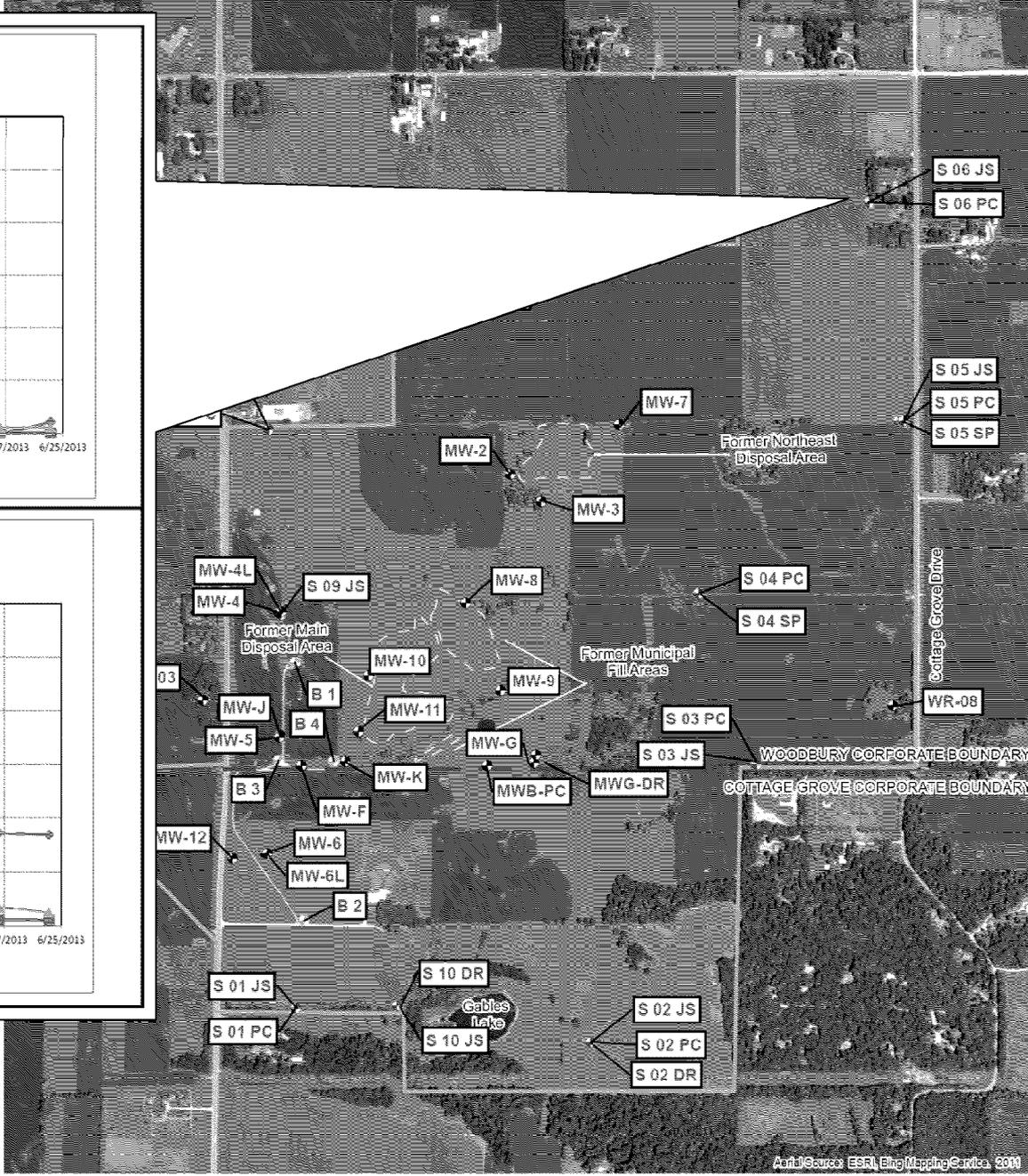
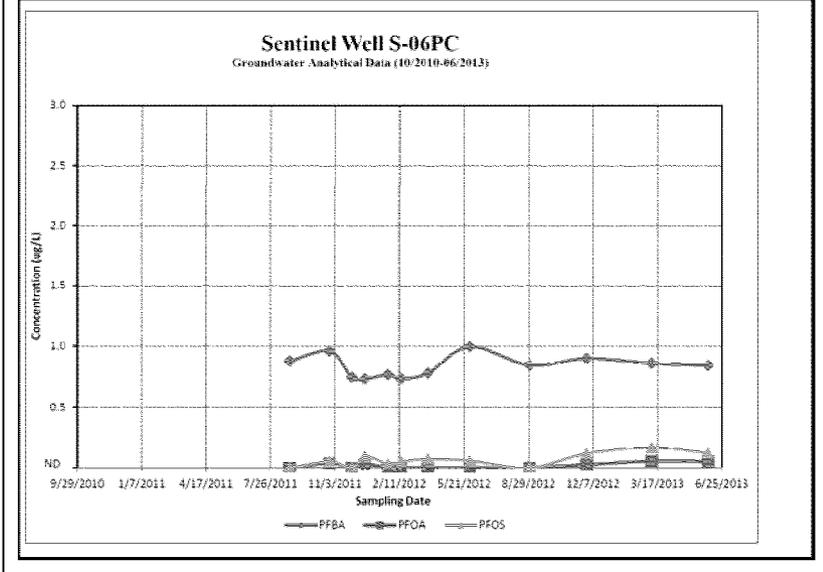
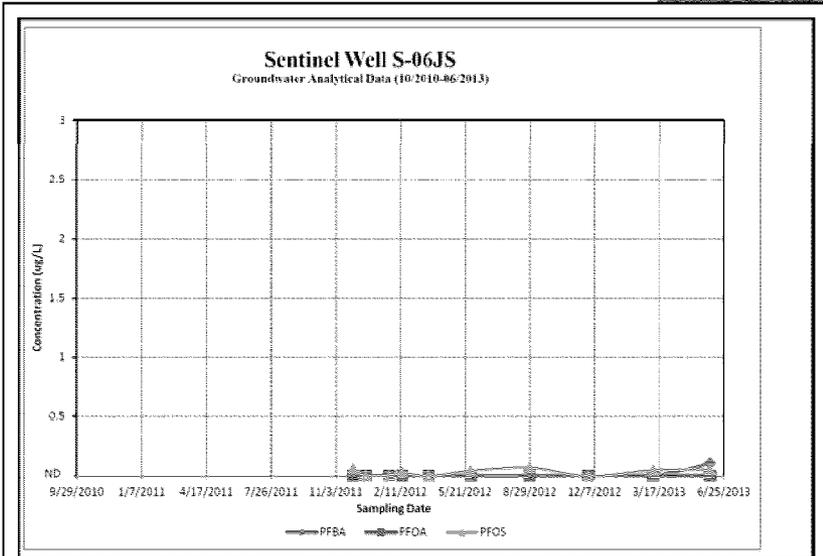




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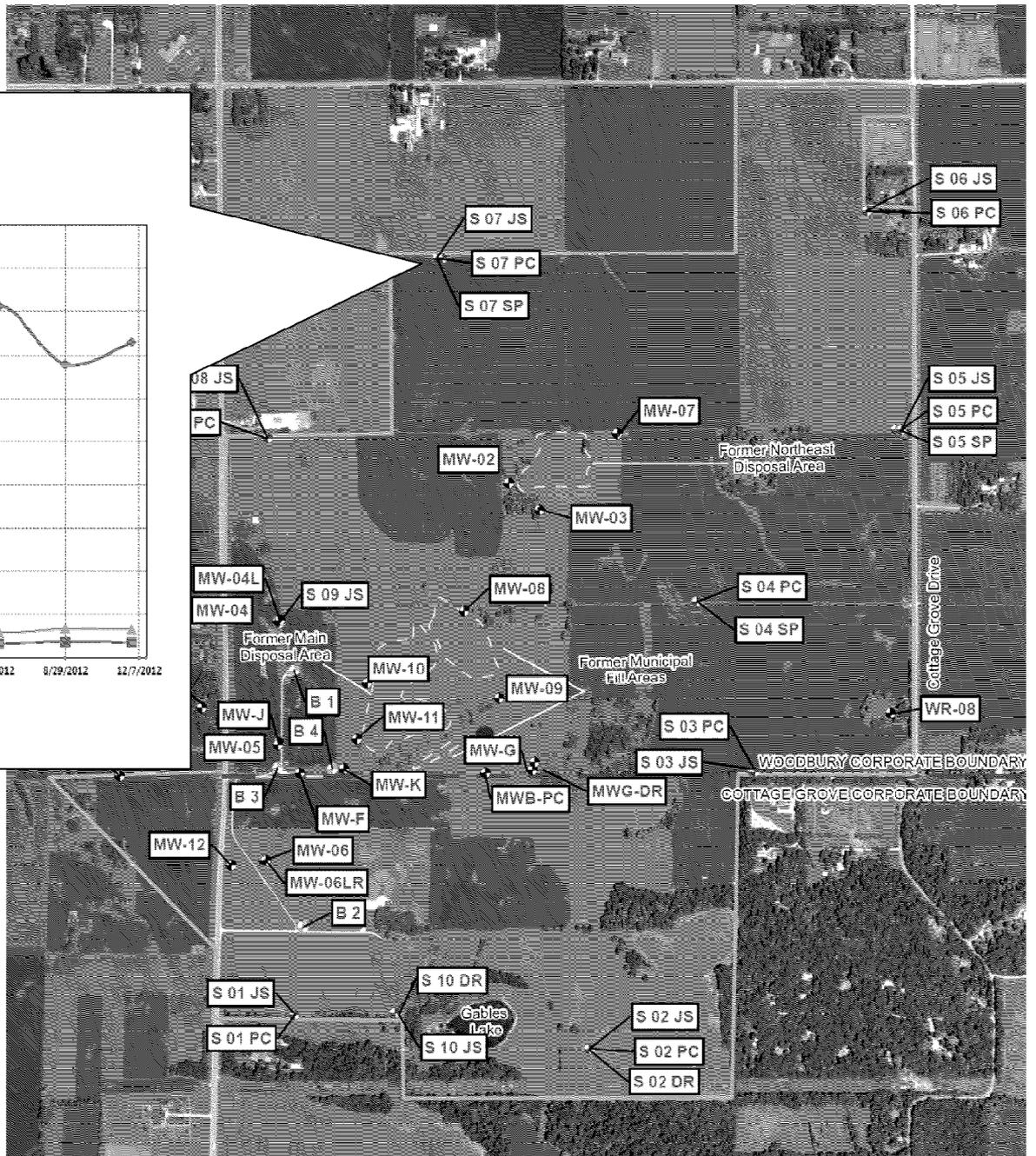
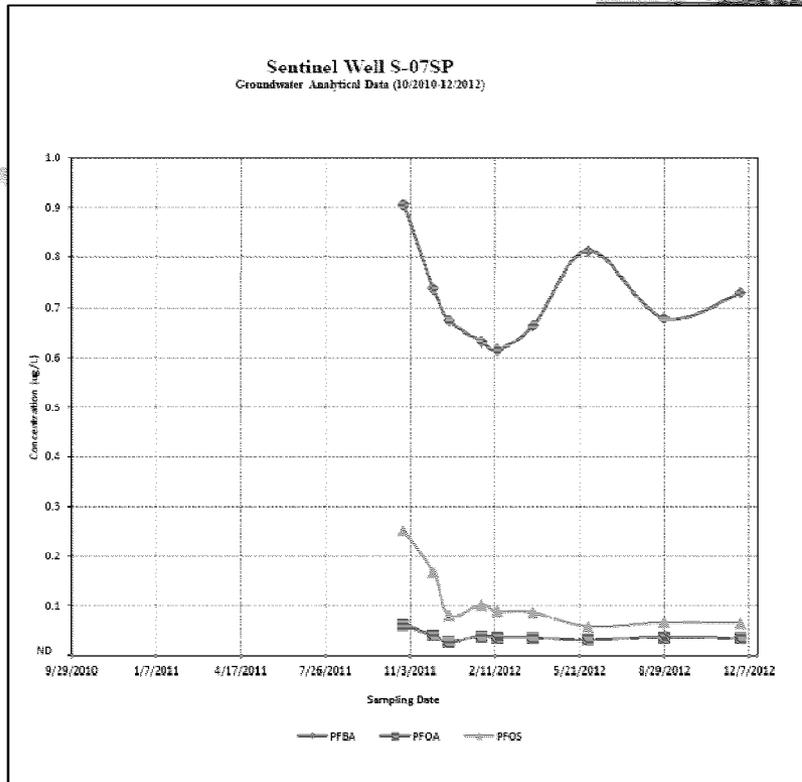


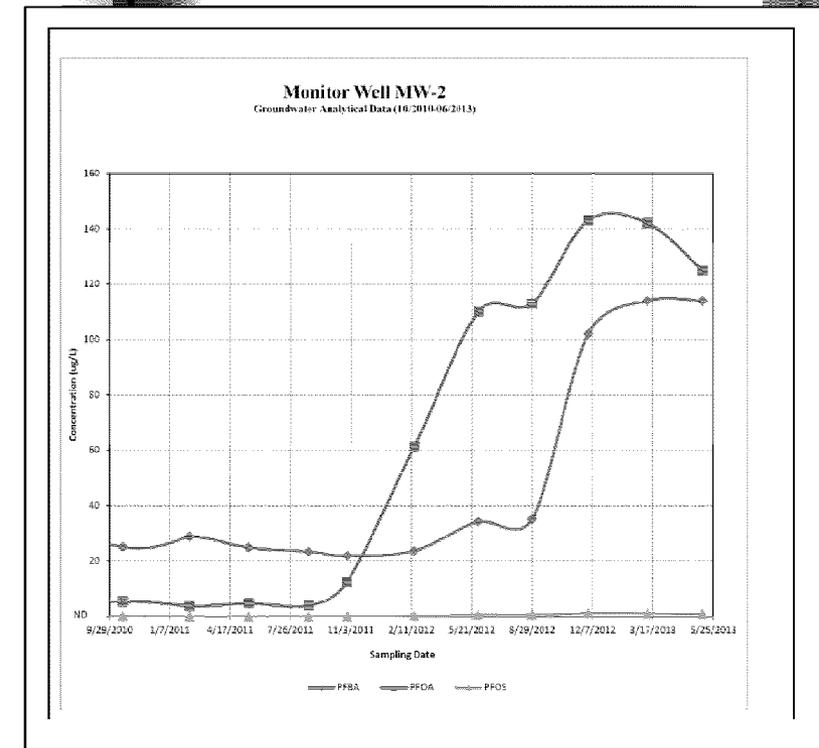




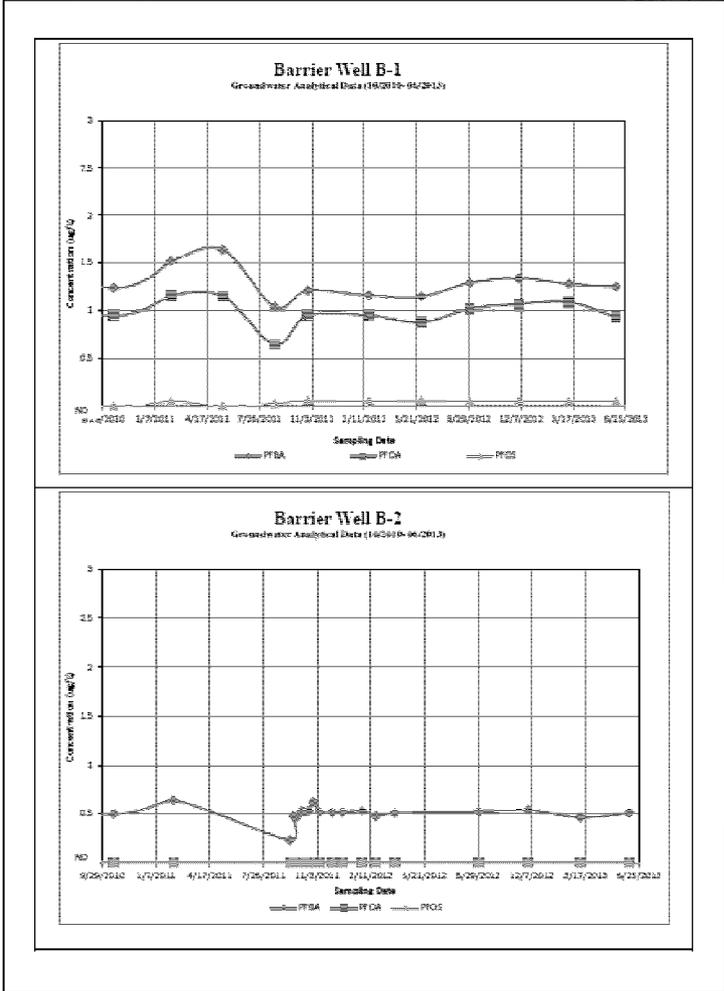
Aerial Source: ESRI, Bing Mapping Service, 2011

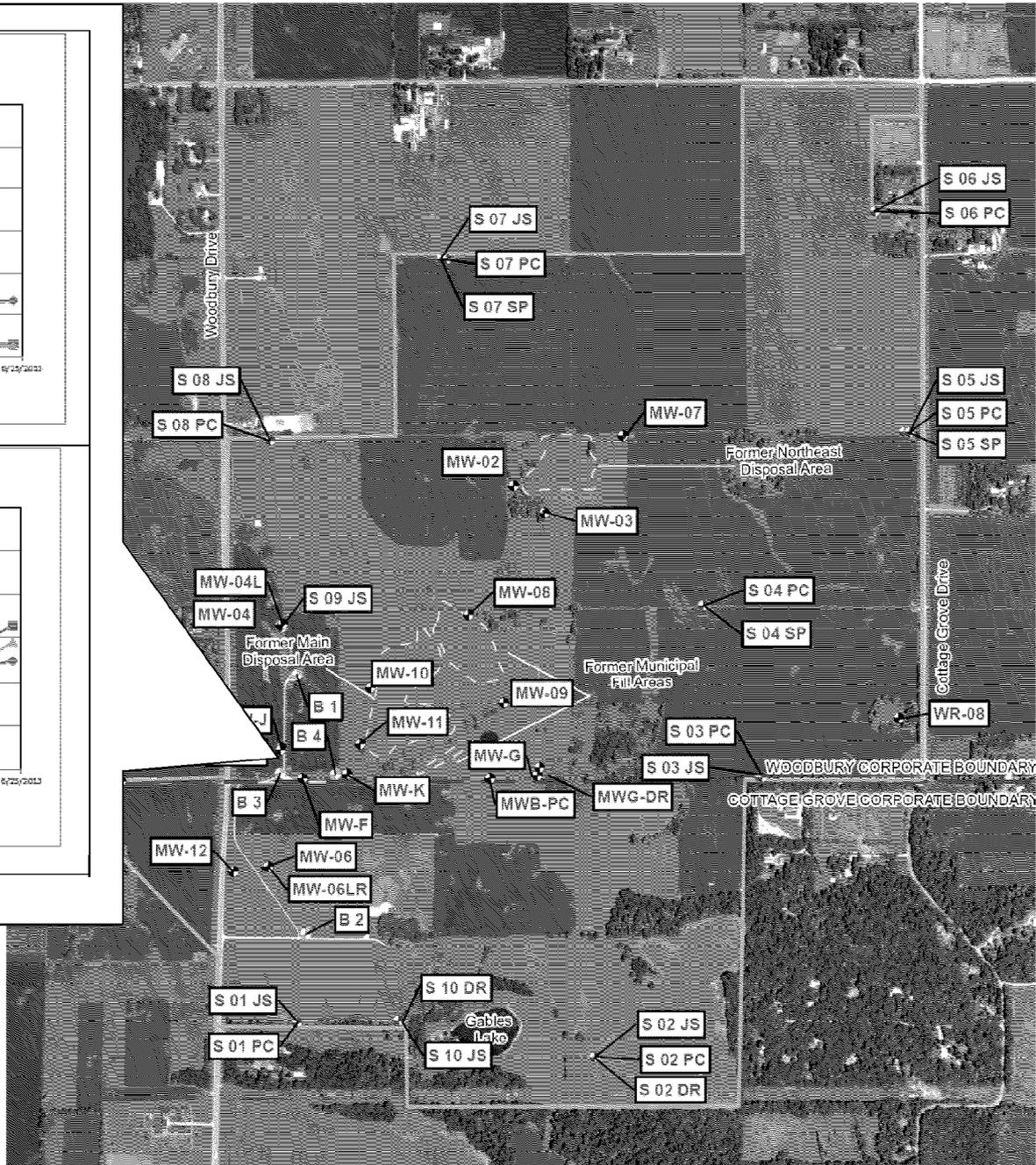
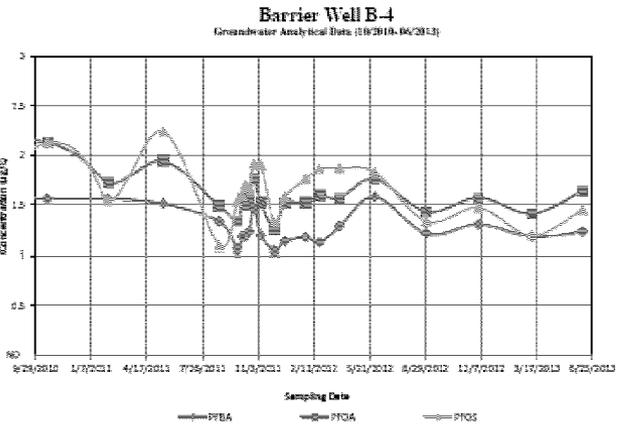
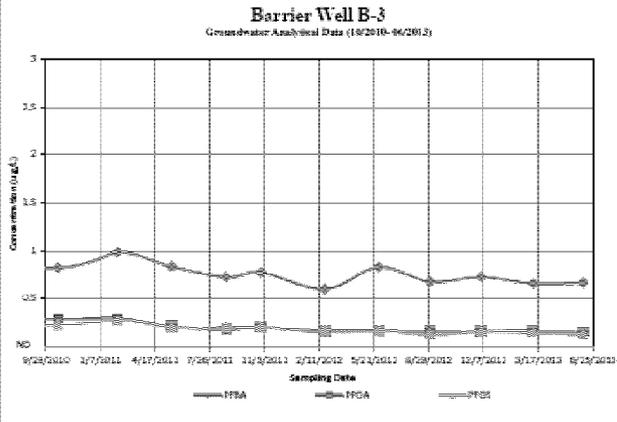
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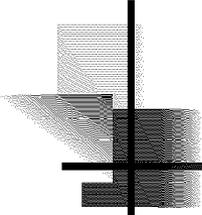




Aerial Source: ESRI, Bing Mapping Co.





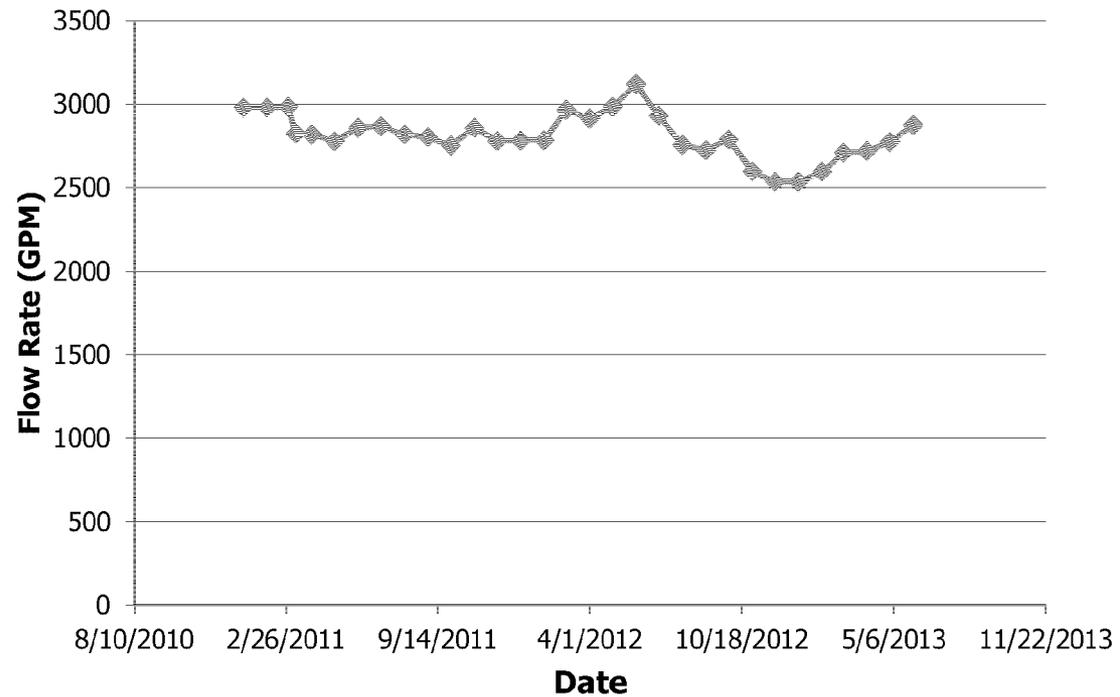


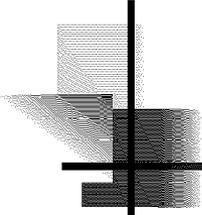
Barrier Wells

- Minor variations in flow rates have occurred historically and have decreased since Woodbury has been connected to the new carbon treatment building at Cottage Grove.
- Groundwater elevation data collected over the past two years indicates that groundwater capture is maintained under all flow rate variations observed.

Barrier Well Flow Data

Barrier Well Combined Flow Rate

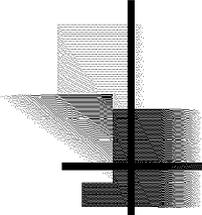




Future Course of Action

- Continue Quarterly/Annual sampling.
- Third Quarter 2013 sampling is scheduled for August 2013.
- Water levels will be monitored using transducers in newly installed wells during the next shutdown of the barrier well network
 - Transducers could not be installed over Memorial Day weekend due to activities scheduled in new carbon treatment building at Cottage Grove.
 - Anticipate barrier wells will be shut down for 2-3 days

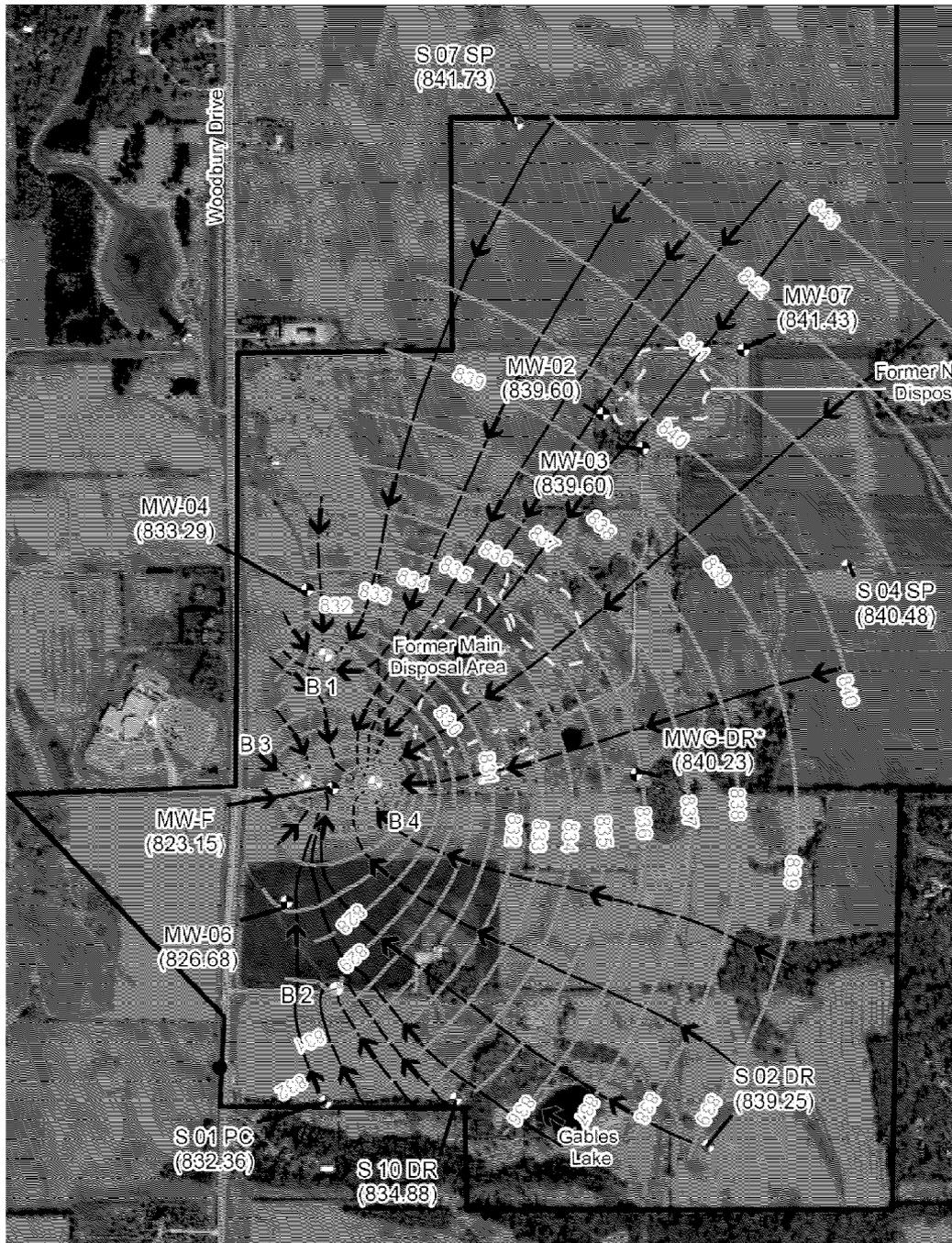
Future Course of Action (Cont'd.)



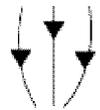
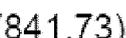
- Gradually reduce flow rate from Barrier Wells while maintaining capture. This will:
 - Conserve groundwater resources
 - Reduce treatment costs
 - Allow flexibility in operation of Cottage Grove wells

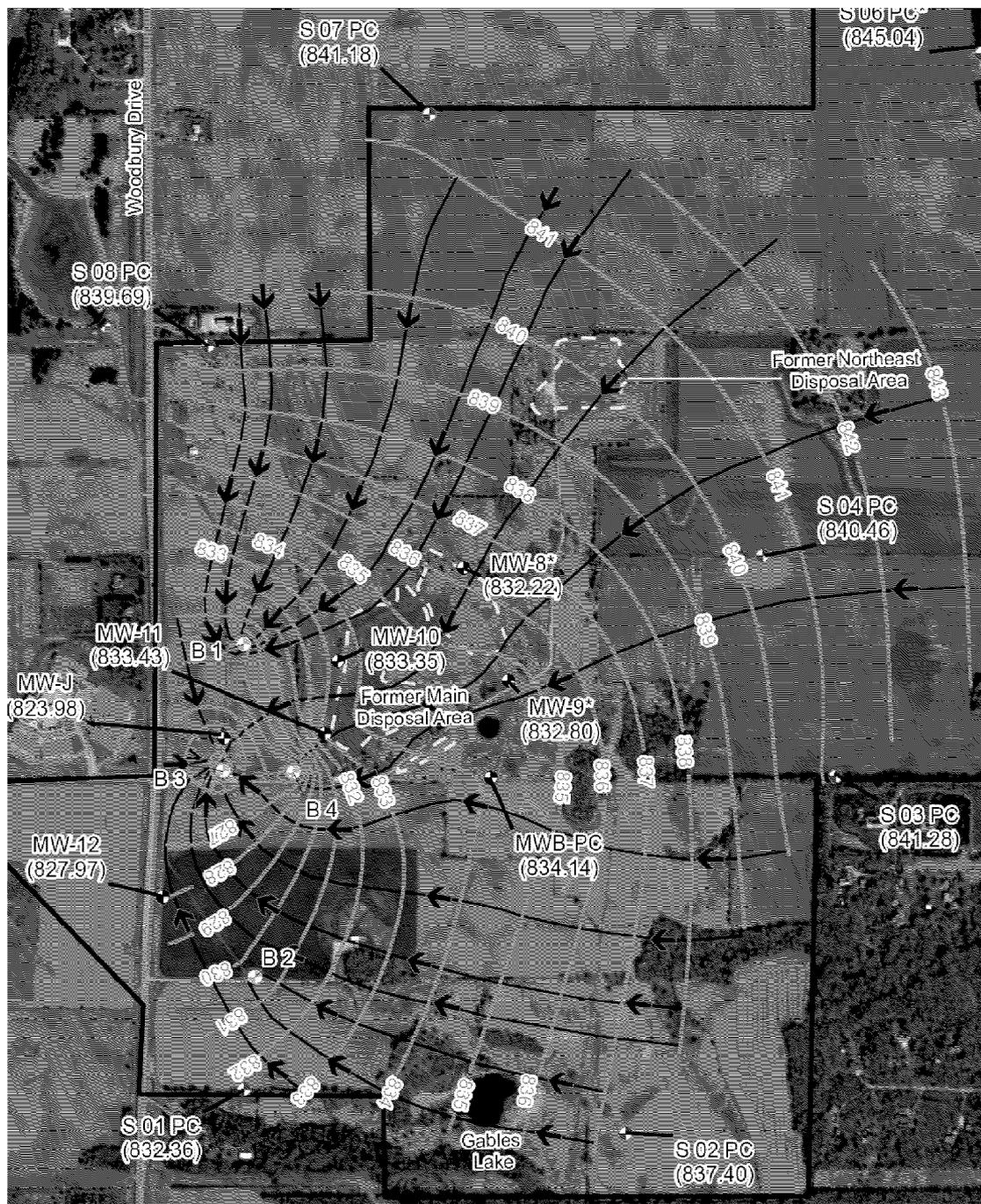
GROUNDWATER ELEVATION
 CONTOUR MAP
 SHALLOW WELLS-
 PUMPING CONDITIONS
 3 JANUARY 2013

WOODBURY SITE
 WOODBURY, MN



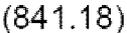
Legend:

-  Monitor Well Locations
-  Sentinel Well Locations
-  Barrier Well Locations
-  Groundwater Elevation Contour (contour interval 1 foot)
-  Groundwater Flowlines
-  (841.73) Groundwater Elevation (ft.msl)
-  Site Boundary



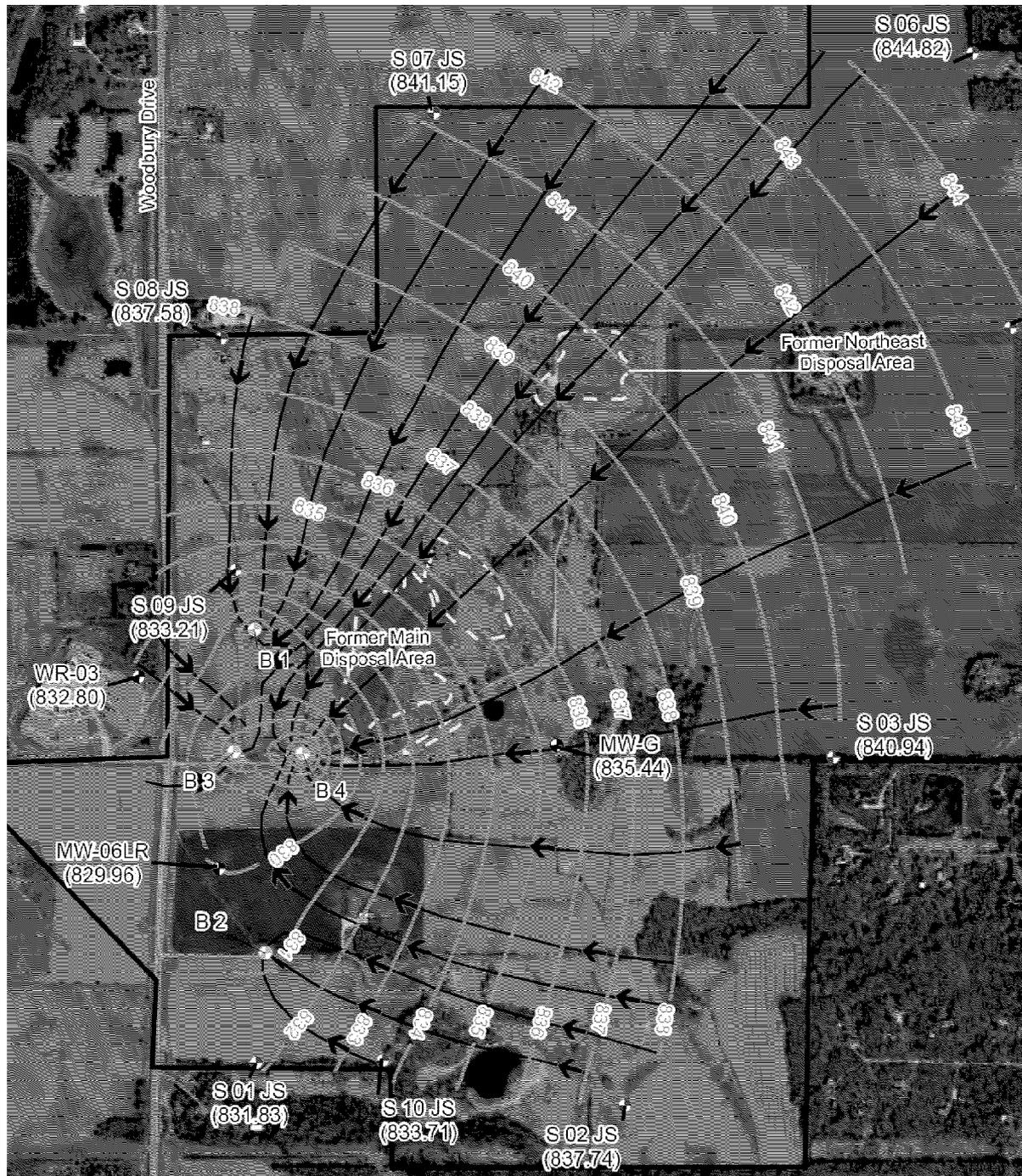
GROUNDWATER ELEVATION
 CONTOUR MAP
 SHALLOW PRAIRIE DU CHIEN WELLS
 PUMPING CONDITIONS
 03 JANUARY 2013

3M WOODBURY SITE
 WOODBURY, MN

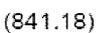
- Legend:
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 -  Site Boundary

GROUNDWATER ELEVATION
 CONTOUR MAP
 JORDAN SS MONITOR WELLS-
 PUMPING CONDITIONS
 03 JANUARY 2013

3M WOODBURY SITE
 WOODBURY, MN



Legend:

-  Monitor Well Locations
-  Sentinel Well Locations
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-  Groundwater Flowlines
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GROUNDWATER ELEVATION
 CONTOUR MAP
 SHALLOW PRAIRIE DU CHIEN WELLS
 PUMPING CONDITIONS
 4 JUNE 2013

3M WOODBURY SITE
 WOODBURY, MN

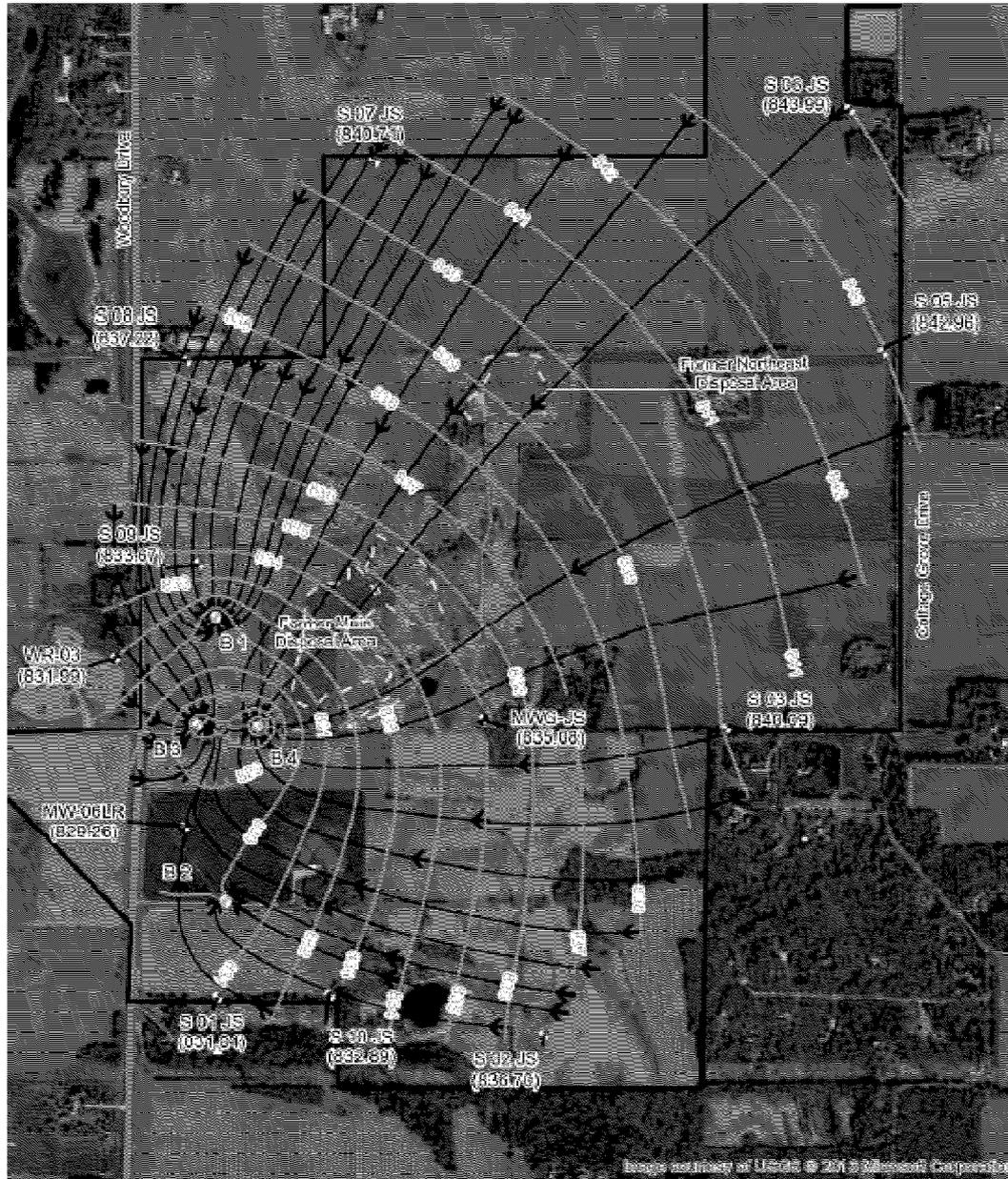


- Legend:
- Monitor Well Locations
 - Sentinel Well Locations
 - Barrier Well Locations
 - Groundwater Elevation Contour (contour interval 1 foot)
 - Groundwater Flowlines
 - (841.18) Groundwater Elevation (ft.msl)
 - Site Boundary

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GROUNDWATER ELEVATION
 CONTOUR MAP
 JORDAN SS MONITOR WELLS-
 PUMPING CONDITIONS
 4 JUNE 2013

3M WOODBURY SITE
 WOODBURY, MN



Legend:

-  Monitor Well Locations
-  Sentinel Well Locations
-  Barrier Well Locations
-  Groundwater Elevation Contour (contour interval 1 foot)
-  Groundwater Flowlines
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