Honeywell

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October 20, 2017

To: Harry Warner, NYSDEC, Region 7 (1 bound)
Stephanie Webb, NYSDEC, Region 7 (1 PDF)
Holly Sammon, Onondaga County Public Library (1 bound)
Samuel Sage, Atlantic States Legal Foundation (1 bound)
Mary Ann Coogan, Camillus Town Hall (1 bound)
Stephen Weiter, Moon Library (1 bound)
Joseph J. Heath, Esq. (1 bound)
Ann Moore, Solvay Public Library (1 bound)

Re: Letter of Transmittal – Onondaga Lake Repository Addition

The below document has been approved by the New York State Department of Environmental Conservation (NYSDEC) and is enclosed for your document holdings:

- 2015-2016 Source Control Summary for the Onondaga Lake Bottom Subsite
  May 2017

Sincerely,

John P McAuliffe

John P. McAuliffe, P.E.
Remediation Director

Enc.

cc: Don Hesler, NYSDEC Project Manager
Chris Fitch, Brown and Sanford (ecopy)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Remedial Bureau D
625 Broadway, 12th Floor, Albany, NY 12233-7013
P: (518) 402-9676 | F: (518) 402-9773
www.dec.ny.gov

August 15, 2017

Mr. John P. McAuliffe, P.E.
Honeywell International, Inc.
301 Plainfield Road
Suite 330
Syracuse, NY 13212

Re: 2015-2016 Source Control Summary for the Onondaga Lake Bottom Subsite, dated May 2017

Dear Mr. McAuliffe:

The New York State Department of Environmental Conservation (NYSDEC) has completed its review of the 2015-2016 Source Control Summary for the Onondaga Lake Bottom Subsite (and the responses to NYSDEC's previous comments), which were submitted with your July 27, 2017 cover letter.

The report has addressed NYSDEC's comments and the document is hereby approved. If you have any questions regarding these comments, please contact me at 518-402-9796.

Sincerely,

Donald J Hesler

Donald J Hesler
Section Chief

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R. Quail, NYSDEC
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July 27, 2017

Mr. Donald Hesler
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau D
625 Broadway, 12th Floor
Albany, NY 12233-7016

RE: 2015-2016 Source Control Summary for the Onondaga Lake Bottom Subsite May 2017

Dear Mr. Hesler:

Enclosed you will find one bound copy and one electronic versions (PDF & original) of the 2015-2016 Source Control Summary for the Onondaga Lake Bottom Subsite, dated May 2017. Also enclosed is the Responses to NYSDEC Comments on the 2015-2016 Source Control Summary for the Onondaga Lake Bottom site, dated December 2016, and the Responses to the NYSDEC Comments, dated October 17, 2016.

Please feel free to contact Ed Glaza at 315-451-9560 or me if you have any questions.

Sincerely,

John P. McAuliffe

John P. McAuliffe, P.E.
Program Director, Syracuse

Enclosure

cc: Timothy Larson, NYSDEC (1 bound, 1 PDF and original)
Bob Nunes, USEPA (1 bound, 3 PDF)
Mark Sergott, NYSDOH (1 bound, 1 PDF)
Maureen Schuck, NYSDOH (Cover Ltr Only)
Argie Cirillo, Esq., USEPA (Cover Ltr Only)
Mike Spera, AECOM (1 bound, 1 PDF)
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Curtis Waterman, (1 PDF)
Alma Lowry, Esq. (1 PDF)
Margaret Sheen, Esq., NYSDEC (Cover Ltr Only)
Jeanne Shenandoah, Onondaga Nation (1 bound plus ec Cover Ltr Only)
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Brian Israel, Esq., Arnold & Porter (1 PDF)
Ed Glaza, Parsons (1 bound)
Thomas Abrams, Parsons (1 bound)
Steve Miller, Honeywell (1 PDF)

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Responses to NYSDEC Comments on the "2015-2016 Source Control Summary for the Onondaga Lake Bottom Site", dated December 2016 and the Responses to the NYSDEC Comments, dated October 17, 2016.

- Comment/Response #1; Main Report, Page 2, Paragraph 3, Sentence 1. Given that hydraulic control of intermediate groundwater for the NMCHCS has not yet been established, the text needs to be revised to state "... operational and have addressed potential recontamination from shallow groundwater by... .".

  Response: The document has been revised as requested.

- Comment/Response #9; Attachment A, Pages A-9 through A-11. The added text in Attachment A in response to the comment and in the discussion of other wall sections indicates that the barrier wall is the primary hydraulic containment component keeping groundwater from flowing to the lake and that the collection trench "aids in providing the desired hydraulic gradient for the system". The text needs to be revised to state that both the wall and the collection trench are critical components of the hydraulic containment system (e.g., the barrier wall would not provide long term containment if there was not a collection system to manage the groundwater behind the wall.)

  The text states that there has not been visual evidence of contaminated groundwater overtopping the barrier wall and impacting the lake during the periods indicated in the comment. The sustained piezometer water levels above stage that were noted in the comment, however, are an indication that containment may be compromised in part(s) of the system. If the ultimate test of containment is whether or not the barrier walls are "overtopped", then there needs to be a manner in which to determine if that has occurred (i.e., if overtopping did, or does, occur along parts of the wall, would there be clear evidence of it besides high pressure heads [e.g., watermarks on wall], or could overtopping occur without leaving any trace?). It is recommended that a protocol for determining whether or not containment has been compromised be developed and provided.

  Response: Honeywell will work with NYSDEC to develop a more formalized protocol for future evaluations regarding whether or not groundwater overtops the wall.

- Comment/Response #21; Attachment C, Page 2, last sentence on this page. It is stated here that, "Based on visual inspection, no significant signs of NAPL were present in the both sets of samples." However, based on the 2014 Upper Harbor Brook IRM Annual Report, it does not appear that groundwater samples were collected from NAPL-1, -3, and -4 in 2014, as was conducted in 2015. Please revise, as may be appropriate.

  Response: The text has been modified from: "Based on visual inspection, no significant signs of NAPL were present in the both sets of samples." to "Based on visual inspection, no significant signs of NAPL were present in the 2015 samples."

  Visual inspection for NAPL occurred throughout 2014 via bi-weekly inspection of the water level probe at locations NAPL-1, -3, and -4. The probe was utilized to determine depth of water and the presence of NAPL concurrently. Sampling of each NAPL locations throughout 2015 consisted of the same bi-weekly inspection as 2014. Additionally, an annual jar sample from each NAPL monitoring location was collected in September per the Performance Verification and Monitoring plan that was approved early in 2015.

- Main Report, Page 1, Paragraph 2, Sentence 2. The text here as well as Figures 1 and 2 need to be revised to indicate that lake capping was complete in late 2016.

  Response: The document and associated Figures have been revised as requested.

- Attachment A, Page A-7, Paragraph 1, Sentence 3. Photographs are not included on the weekly inspection forms. The text needs to be revised accordingly.

  Response: The document has been revised. While photographs are not included within the form of the weekly inspection, they are taken as appropriate and maintained on file with the weekly inspection forms for reference.

- Attachment A, Page A-10, Paragraph 2, Sentence 3. The text needs to be updated with regard to the results of the "Further evaluation of the PZ 19 transducer" that was to occur in the spring of 2016.

  Response: The document text has been updated as requested.

- Attachment A, Figure A-2.b. The arrow that is labeled "Temporary Collection Trench" needs to be revised or removed.

  Response: Figure A-2.b has been revised as requested.

- Attachment D, Page 7, Paragraph 1. There are 17, not 16, passive recovery wells (designated RW-240 through RW-224). Please revise accordingly.

  Response: The document has been revised as requested.

2015 AND 2016 SOURCE CONTROL SUMMARY FOR THE ONONDAGA LAKE BOTTOM SUBSITE
Syracuse, New York

Prepared For:

Honeywell

301 Plainfield Road, Suite 330
Syracuse, New York 13212

Prepared By:

PARSONS

301 Plainfield Road, Suite 350
Syracuse, New York 13212

and

OBG

MAY 2017

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ATTACHMENTS

LIST OF ACRONYMS

CS	Collection Sump
DNAPL	Dense Non-Aqueous-Phase Liquid
GB	Geddes Brook
GWTP	Groundwater Treatment Plant
IRM	Interim Remedial Measure
LCP	Linden Chemical and Plastics
NAPL	Non-aqueous Phase Liquids
NMC	Ninemile Creek
NYSDEC	New York State Department of Environmental Conservation
OU-1	Operable Unit 1
PZ	Piezometer
ROD	Record of Decision
Willis/Semet	Willis Avenue/Semet Tar Bed Sites

2015 AND 2016 SOURCE CONTROL SUMMARY FOR THE ONONDAGA LAKE BOTTOM SUBSITE

OVERVIEW

As documented in the Onondaga Lake Record of Decision (ROD) (NYSDEC, 2005), the remediation of Onondaga Lake is being coordinated with upland remedial activities. This report provides a summary of the lake capping activities conducted in 2015, anticipated to be performed in 2016, and documents that the potential sources of recontamination to the 2015 and 2016 remediation areas that are controlled by Honeywell have been addressed.

The schedule goal for the lake remediation was to complete dredging to the extent practical in four years (beginning in 2012), and capping in five years (beginning 2012). Dredging was completed in 2014 and lake capping was completed in late 2016. Based on this completion schedule, this report addresses all capping areas, as shown in Figures 1 and 2.

As documented in the *2012 and 2013 Source Control Summary for the Onondaga Lake Bottom Subsite* (Parsons, 2013) and *2014 Source Control Summary for the Onondaga Lake Bottom Subsite* (Parsons, 2014) mitigation of the following potential sources has been demonstrated:

- Area groundwater associated with the Semet, Willis and Wastebed B/Harbor Brook East and West Wall hydraulic containment systems (Area Groundwater)
- Tributary 5A
- I-690 Storm Drain System
- Upper Harbor Brook
- East Flume
- Wastebeds 1-8 and Ditch A
- Linden Chemical and Plastics (LCP), Geddes Brook (GB), and Ninemile Creek (NMC)

Honeywell-controlled sources addressed in this report include:

- Area Groundwater- Attachment A
- Tributary 5A- Attachment B
- Upper Harbor Brook- Attachment C
- Wastebeds 1-8, Ditch A, and Ninemile Creek- Attachment D

As detailed in prior Source Control Summary Reports, remedial activities associated with the Semet, Willis, West, and East Wall hydraulic control systems have been completed consistent with New York State Department of Environmental Conservation (NYSDEC)-approved designs and that the potential for lake recontamination from these sources has been mitigated. Attachment A contains an update to the information presented in the 2012 and 2013, and 2014 source control reports documenting ongoing hydraulic control of area groundwater associated with the Semet, Willis, West, and East Wall hydraulic containment systems.

As detailed in the 2014 Source Control Summary Report, Tributary 5A remedial construction has been completed and the potential for lake recontamination from this source has been mitigated. Attachment B contains an update to the information presented in the 2014 source control reports documenting successful ongoing operation of the Tributary 5A hydraulic containment system.

As detailed in the 2014 Source Control Summary Report, the Upper Harbor Brook remedial construction has been completed and the potential for lake recontamination from this source has been mitigated. Attachment C contains an update to the information presented in the 2014 source control report documenting successful ongoing operation of the Upper Harbor Brook hydraulic containment system.

As discussed in Attachment D, the Wastebeds 1-8 hydraulic containment systems are operational and have addressed potential recontamination from shallow groundwater by controlling the shallow groundwater discharge at all three hydraulic control systems. System optimization for the passive wells located within the intermediate formation is ongoing to increase the efficiency of capture within that zone. Further, maintenance activities to mitigate Ditch A sediment migration to Onondaga Lake are ongoing as detailed in Attachment D. Installed check dams promote settlement of solids entrained in Ditch A flow which meets the WB 1-8 Integrated Interim Remedial Measure (IRM) objective to mitigate Ditch A sediment migration to Onondaga Lake. Therefore, the potential for lake recontamination from this source has been mitigated.

REFERENCES

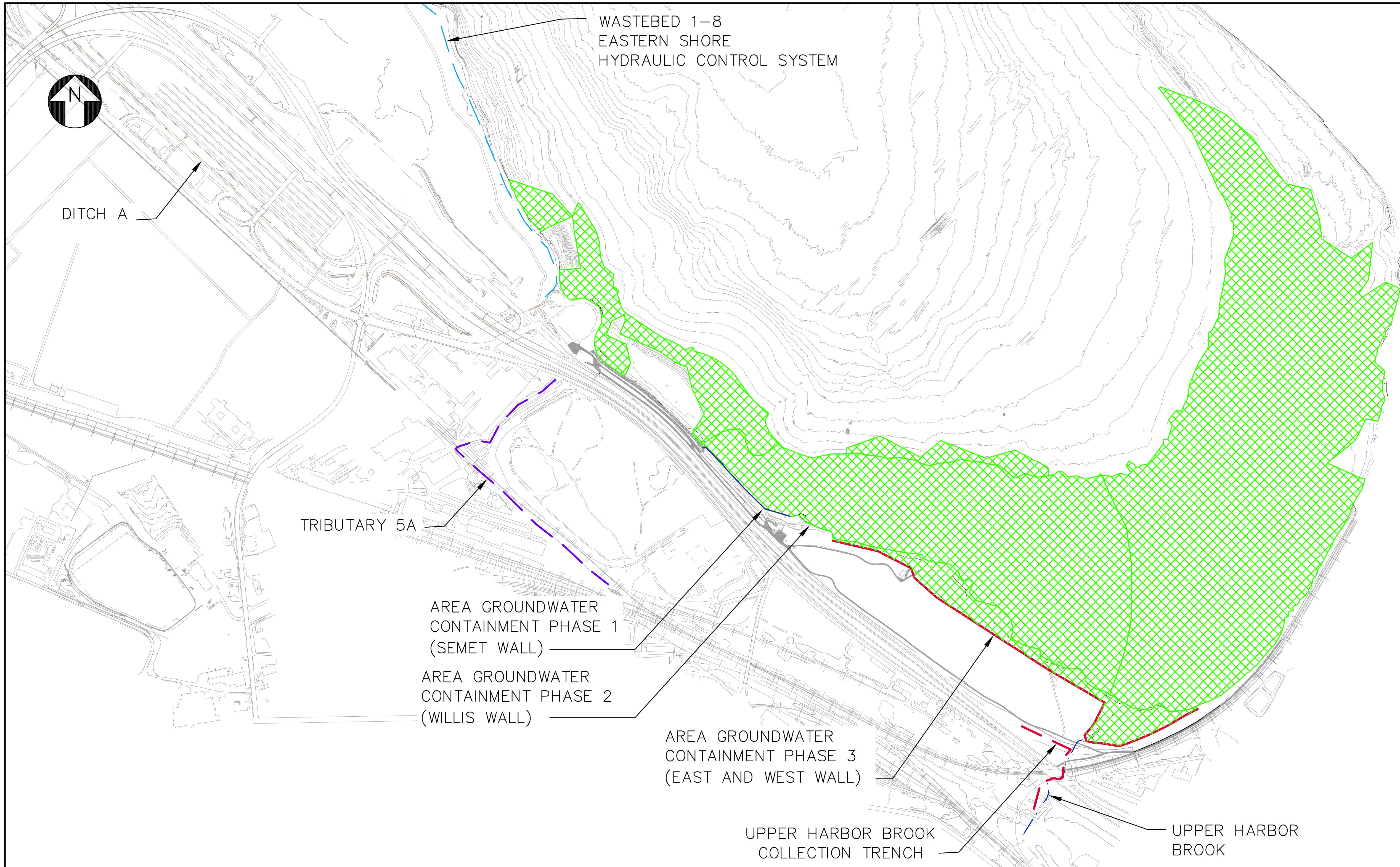
New York State Department of Environmental Conservation and United States Environmental Protection Agency Region 2, 2005. *Record of Decision. Onondaga Lake Bottom Subsite of the Onondaga Lake Superfund Site*. July 2005.

Parsons, 2012. *Onondaga Lake Capping, Dredging, Habitat and Profundal Zone (SMU 8) Final Design.* Prepared for Honeywell Inc., 2012.

Parsons, 2013. 2012 and 2013 Source Control Summary for the Onondaga Lake Bottom Subsite. Prepared for Honeywell Inc., December 2013.

Parsons, 2014. 2014 Source Control Summary for the Onondaga Lake Bottom Subsite. Prepared for Honeywell Inc., October 2014.

FIGURES



LEGEND:

REMEDIATION AREA BOUNDARIES

REMEDIATION AREAS
DREDGING COMPLETED LATE 2014
CAPPING COMPLETED LATE 2016

1000 500 0 1000 2000

SCALE: 1"=1000'

FIGURE 1

Honeywell

ONONDAGA LAKE
SYRACUSE, NY

ONONDAGA LAKE
SOUTH–EASTERN
REMEDIATION AREAS

PARSONS

301 PLAINFIELD ROAD • SUITE 350 • SYRACUSE, NY 13212 • 315/451-9560
OFFICES IN PRINCIPAL CITIES

FILE NAME: P:\HONEYWELL -SYR\448902 LAKESHORE O&M\10.0 TECHNICAL CATEGORIES\10.2 CAD\448902-SK-001.DWG
PLOT DATE: 2/29/12 PLOTTED BY: RUSSO, JILL

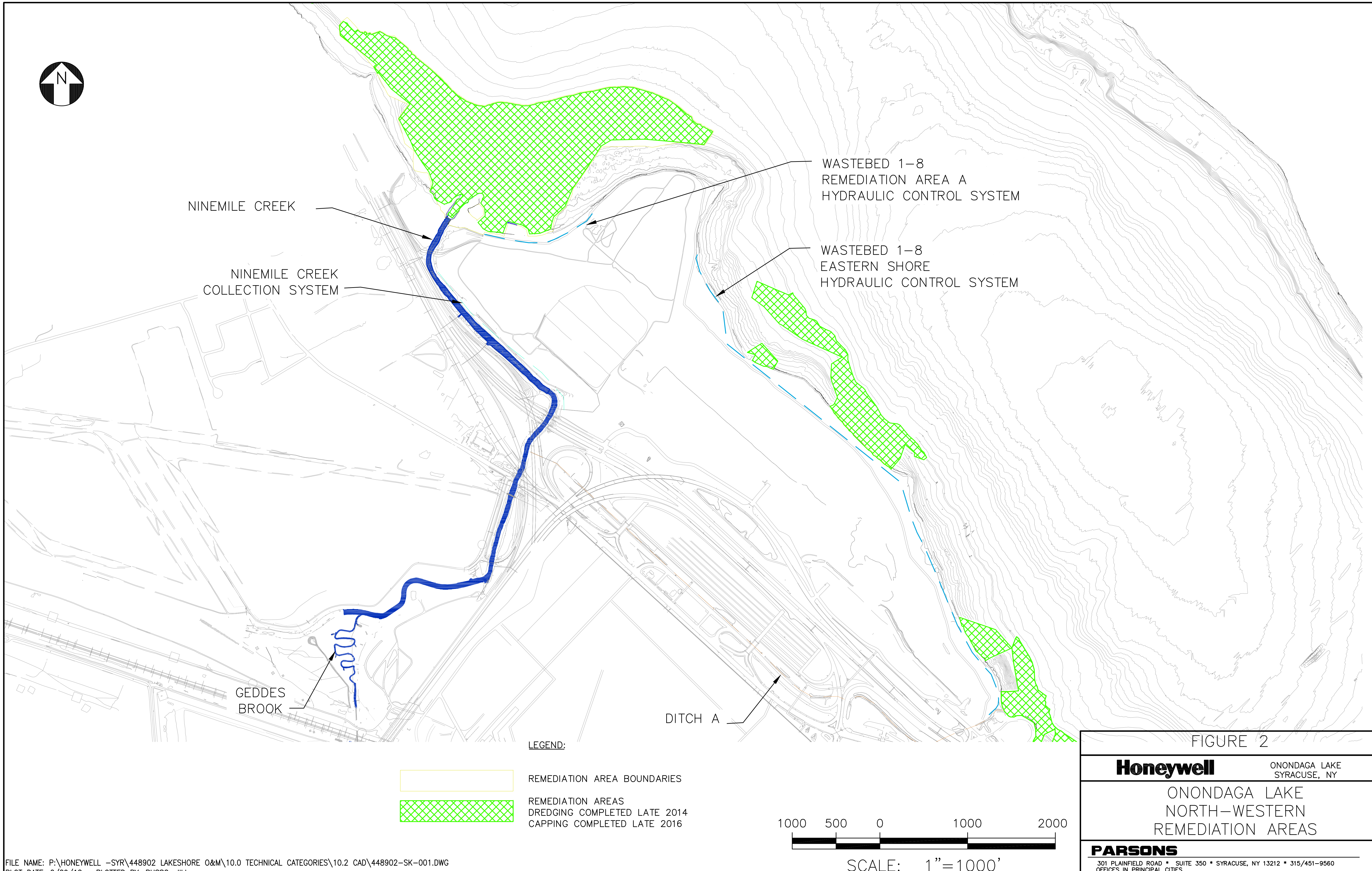


FIGURE 2

Honeywell

ONONDAGA LAKE
SYRACUSE, NY

ONONDAGA LAKE
NORTH-WESTERN
REMEDIATION AREAS

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FILE NAME: P:\HONEYWELL -SYR\448902 LAKESHORE O&M\10.0 TECHNICAL CATEGORIES\10.2 CAD\448902-SK-001.DWG
PLOT DATE: 2/29/12 PLOTTED BY: RUSSO, JILL

ATTACHMENT A

AREA GROUNDWATER

WILLIS AVENUE/ SEMET TAR BEDS SITES IRM & WASTEBED B/ HARBOR BROOK IRM BARRIER WALL AND GROUNDWATER COLLECTION SYSTEMS

Area groundwater continues to be addressed through systems constructed consistent with NYSDEC-approved designs for the Willis Avenue/Semet Tar Bed Sites (Willis/Semet) IRM and the Wastebed B/Harbor Brook IRM hydraulic containment systems including a sheet pile barrier wall, tieback and liner system, and a groundwater collection system. A typical groundwater collection trench section is illustrated in Figure A-1. These systems, constructed in three phases beginning in 2006 and finishing in 2012, were established to eliminate, to the extent practicable, the discharge of contaminated groundwater and non-aqueous phase liquids (NAPL) to Onondaga Lake, a potential source of lake recontamination from the Southwest Shoreline area. Further, the systems have addressed the potential for groundwater upwelling to impact the Onondaga Lake sediment cap consistent with the cap design assumptions for this area.

In addition to the IRMs discussed below, dense non-aqueous-phase liquid (DNAPL) collection was initiated along the lakeshore in 1993. The system was expanded to include additional collection wells in 1995 and 2002. In 2012, the system was again expanded and the entire system upgraded and optimized. To date, over 62,000 gallons of DNAPL have been recovered and transported off-site for disposal/incineration.

Construction of the IRMs included the following elements:

- Grading, as required, to establish a work platform to allow for implementation of the IRMs
- Installation of a sealed interlock sheet pile barrier wall along the lakeshore to prevent migration of contaminated groundwater and NAPL to Onondaga Lake
- Installation of a shallow (bottom elevation of 358 ft. (NAVD 88)) groundwater collection trench with wick drains to work in conjunction with the barrier wall to prevent the discharge of contaminated groundwater and NAPL to Onondaga Lake from the shallow and intermediate depth hydrogeologic units
- Backfilling, as required, behind the barrier wall to establish required grades
- Removal/abandonment of defunct utilities in conflict with the barrier wall/trench alignment
- Realignment of the Harbor Brook channel
- Pumping collected groundwater to the Honeywell Willis Avenue Groundwater Treatment Plant (GWTP) for treatment

The hydraulic control systems were constructed from west to east beginning in the vicinity of Tributary 5A and extended to the area adjacent to the CSX rail line east of Harbor Brook. The construction was completed in the following phases (Figure 1 of the main report):

- Phase 1 (Semet Wall Section) – Installation of 1,288 linear feet of barrier wall and groundwater collection system from October 2006 to May 2007.
- Phase 2 (Willis Wall Section) – Installation of 1,612 linear feet of barrier wall and groundwater collection system, placement of approximately 43,000 cy of light-weight aggregate behind the barrier wall, abandonment of existing 72 inches and 84 inches diameter Allied intake pipelines from the barrier wall alignment to the shoreline, installation of an HDPE liner system along portions of the barrier wall subject to flooding during high lake water events, and installation of a tie-back anchorage system to mitigate deflection of the barrier wall in areas with deep water present outboard of the wall from August 2008 to May 2012.
- Phase 3 (West and East Wall Sections) – Construction of a work platform, installation of a total of 4,678 linear feet of barrier wall and a groundwater collection system (1,630 ft. for the East Wall Section and 3,048 ft. for the West Wall Section), realignment of the lower reach of Harbor Brook, and replacement of the lower Harbor Brook culvert were completed from December 2009 to March 2012.

HYDRAULIC BARRIER/GROUNDWATER COLLECTION SYSTEM DESCRIPTION

The barrier walls were completed consistent with the design and prevent the discharge of contaminated groundwater and NAPL to the lake from this area through hydraulic separation between the groundwater and the lake. The hydraulic barrier wall is constructed of coated steel sheet piling. Every other interlock was factory seal welded to reduce the number of joints and minimize the potential for interruptions in the hydraulic barrier. Interlocks that are not seal welded were sealed with a hydrophilic material that swells 200 percent when in contact with water. All seal welds and interlocks were inspected by quality control technicians prior to installation. Sheet piling was installed a minimum of 3 ft. into a clay layer present across the site at depths ranging from 35 to 70 ft. below grade.

The groundwater collection system was installed up-gradient and parallel to the wall to collect groundwater captured behind the barrier wall. The collection system contributes to the prevention of contaminated groundwater and NAPL discharging to the lake by creating an inward groundwater gradient. The collection system consists of the following components:

- 6-inch diameter perforated collection pipe installed at elevation 358.00 ft. (NAVD 88) in a trench backfilled with granular material
- Wick drains to transmit intermediate depth groundwater to the collection piping
- Groundwater conveyance piping
- Groundwater pump stations

- Shallow piezometers (PZs) for monitoring groundwater levels adjacent to the collection trench (performance verification monitoring locations are illustrated on Figures A-2.a through A-2.c)

All groundwater collected by the system is pumped from the groundwater pump stations through the conveyance piping to the "Lakeshore Pump Station" and then to the Willis Avenue GWTP where it is treated prior to discharge.

Based on the containment of groundwater provided by the system as described above, concerns related to potential recontamination of the cap have been addressed.

SYSTEM OPERATION

The groundwater collection system was activated as the respective phases of construction were completed. A description of the system operational status for each section is provided below.

Semet Wall Section: Construction/activation of collection system was completed May 2007. Operation details following construction through November 2013 are provided in the final 2012 and 2013 Source Control Summary Report. Operation details from December 2013 through March 2014 are provided in the 2014 Source Control Summary Report. System operation of the Semet Wall section from April 2014 through March 2016 is illustrated graphically in Figure Series A-3 of this report.

The system operated continuously in 2014 except for intermittent shutdowns between 5/27/14 and 7/3/14 when the datalogger was taken offline for replacement and reprograming (sump pumps continued to operate during this interval), and between 10/21/14 and 10/22/14 when the collection trench was taken offline due to maintenance at the Willis Avenue GWTP. Collection trench flows were reduced on 4/23/14 due to maintenance activities at the Willis Avenue GWTP.

The system operated continuously in 2015 except for intermittent shutdowns between 2/3/15 and 2/6/15 for repair of a broken collection system force main, and between 8/22/15 and 8/28/15 when collection sump (CS) CS#1 was shut down in order to increase pumping from CS#2 to draw down the area so that force main repairs could be completed. Collection trench flows were reduced between 7/20/15 and 7/22/15 due to a multimedia filter repair at the Willis Avenue GWTP, and between 11/3/15 to 11/11/15 for system evaluation. Some data loss occurred in the beginning of March 2015 and April 2015 due to the reprogramming of the datalogger, as well as from 12/1/15 to 12/3/15 for system quality assurance inspection and the recalibration of several transducers (including PZ 2), however pumping continued during this time interval.

The system has operated continuously from January to March of 2016 except for a brief shutdown on 1/26/16 in order to install a new header and flow meter at the Willis Avenue GWTP, and intermittent shut downs during February and March due to ongoing maintenance activities at the Willis Avenue GWTP. Additionally, collection sumps were operating intermittently and at reduced flows beginning around 2/25/16 and continuing through March when lake levels began overtopping several sections of the barrier wall. As lake levels recede, the collection sumps will return to continuous operation and typical flows along the barrier wall.

Willis Wall Section: Construction/activation of the collection system was completed November 2009. Operation details following construction through November 2013 are provided in the final 2012 and 2013 Source Control Summary Report. Operation details from December 2013 through March 2014 are provided in the 2014 Source Control Summary Report. System operation of the Willis Wall section from April 2014 through March 2016 is illustrated graphically in Figure Series A-4 of this report.

The system operated continuously in 2014 except for intermittent shutdowns between 5/27/14 and 7/3/14 (until 8/1/14 for PZ 5) when the datalogger was taken offline for replacement and reprogramming (sump pumps continued to operate during this interval), as well as between 10/21/14 and 10/22/14 when the collection trench was taken offline due to maintenance at the Willis Avenue GWTP. Collection trench flows were reduced on 4/23/14 due to maintenance activities at the Willis Avenue GWTP.

The system operated continuously in 2015 except for minor shutdowns associated with maintenance or repair activities, including the replacement of CS#2 towards the end of January 2015. Collection trench flows were reduced between 7/20/15 and 7/22/15 due to a multimedia filter repair at the Willis Avenue GWTP. Some data loss occurred in the beginning of March 2015 and April 2015 due to the reprogramming of the datalogger, as well as from 12/1/15 to 12/3/15 for system quality assurance inspection and the recalibration of several transducers (including PZ 6 which is offline beginning 9/3/15 pending re-set). Pumping continued during this time interval.

The system has operated continuously from January to March of 2016 except for a brief shutdown on 1/26/16 in order to install a new header and flow meter at the Willis Avenue GWTP, and intermittent shut downs during February 2016 and March 2016 due to ongoing maintenance activities at the Willis Avenue GWTP. Additionally, collection sumps were operating intermittently and at reduced flows beginning around 2/25/16 and continuing through March 2016 when lake levels began overtopping several sections of the barrier wall. As lake levels recede, the collection sumps will return to continuous operation and typical flows along the barrier wall.

West Wall Section (Wastebed B/Harbor Brook): Construction/activation of the collection system was completed August 2011. Operation details following construction through November 2013 are provided in the final 2012 and 2013 Source Control Summary Report. Operation details from December 2013 through March 2014 are provided in the 2014 Source Control Summary Report. System operation of the West Wall section from April 2014 through March 2016 is illustrated graphically in Figure Series A-5 of this report.

The system operated continuously in 2014 except for intermittent shutdowns between 10/21/14 and 10/22/14 when the collection trench was taken offline due to maintenance at the Willis Avenue GWTP.

The system operated continuously in 2015 except for intermittent shutdowns beginning on 4/15/15 due to the lake overtopping the wall and flooding the area behind the barrier wall, between 5/19/15 and 5/24/15 due to continued flooding and ongoing maintenance at the Willis Avenue GWTP, and between 6/14/15 and 6/22/15 due to heavy rains throughout June 2015 and continued flooding from the lake overtopping the barrier wall. Collection trench flows were reduced at CS#4 through CS#6 from 5/19/15 to 5/24/15 to accommodate Willis Avenue GWTP capacity in response to high precipitation, and from 7/20/15 to 7/22/15 due to a multimedia filter repair at the Willis Avenue GWTP. A brief period of data loss occurred from 10/19/15 to 10/22/15 when sections of the West Wall were offline in order to reset several PZs, as well as from 12/1/15 to 12/3/15 for system quality assurance inspection and the recalibration of several transducers (including PZs 10, 11, 14, and 15). Pumping continued during this time interval.

The system has operated continuously from January to March of 2016 except for intermittent shutdowns between 12/3/15 and 1/1/16 collection sump (CS) (CS#6) due to high flows to the Willis Avenue GWTP, between 1/2/16 and 1/23/16 (CS#4 and CS#6) due to high flows and limited output of the Willis Avenue GWTP due to multimedia filter failure, briefly on 1/26/16 in order to install a new header and flow meter at the Willis Avenue GWTP, and intermittent shut downs during February 2016 and March 2016 due to ongoing maintenance activities at the Willis Avenue GWTP. Additionally, collection sumps were operating intermittently and at reduced flows beginning around 2/25/16 and continuing through March 2016 when lake levels began overtopping several sections of the barrier wall. As lake levels recede, the collection sumps will return to continuous operation and typical flows. It is anticipated that surface water infiltration influencing the West Wall will be reduced once the permanent cap is installed over Wastebed B.

East Wall Section (Wastebed B/Harbor Brook): Construction/activation of the collection system was completed July 2012. The East Wall Section monitoring system (i.e., recording of data) became operational in August 2013 as a result of delays from difficulties with system dataloggers. Operation details following construction through March 2014 are provided in the 2014 Source Control Summary Report. System operation of the East Wall section from April 2014 through March 2016 is illustrated graphically in Figure Series A-6 of this report.

The system operated continuously in 2014 except for intermittent shutdowns between 10/21/14 and 10/22/14 when the collection trench was taken offline due to maintenance at the Willis Avenue GWTP. Collection trench flows were reduced on 4/23/14 due to maintenance activities at the Willis Avenue GWTP.

The system operated continuously in 2015 except for intermittent shutdowns beginning on 4/15/15 due to the lake overtopping the wall and flooding the area behind the barrier wall, between

6/14/15 and 6/22/15 due to heavy rains throughout June 2015 and continued flooding from the lake overtopping the barrier wall, and through the first week of July 2015 due to continued flooding. Collection trench flows were reduced from 7/20/15 to 7/22/15 due to a multimedia filter repair at the Willis Avenue GWTP. A brief period of data loss occurred from 10/19/15 to 10/22/15 when sections of the East Wall were offline in order to reset several PZs, as well as from 12/1/15 to 12/3/15 for system quality assurance inspection and the recalibration of several transducers (including PZs 18 and 19). Pumping continued during this time interval. Between October and December 2015, the final cap was placed behind the East Wall section of the barrier wall which has contributed to a reduction of surface water infiltration to the collection system.

The system has operated continuously through March of 2016 except for intermittent shutdowns between 12/3/15 and 1/1/16 (CS#7) due to high flows to the Willis Avenue GWTP, briefly on 1/26/16 in order to install a new header and flow meter at the Willis Avenue GWTP, and intermittent shut downs during February 2016 and March 2016 due to ongoing maintenance activities at the Willis Avenue GWTP. Collection sumps were operating intermittently and at reduced flows beginning around 2/25/16 and continuing through March 2016 when lake levels began overtopping several sections of the barrier wall. As lake levels recede, the collection sumps will return to continuous operation and typical flows along the barrier wall. The installation of the permanent cap at Wastebed B is anticipated to reduce the volume of surface water infiltration influencing the East Wall section located west of Harbor Brook.

SYSTEM PERFORMANCE

Overall system performance is assessed based on groundwater elevations that are monitored in the shallow PZs located adjacent to the barrier wall (Figures A-2.a through A-2.c). Successful operation of the barrier wall/groundwater collection system is also based (in part) on the volume of groundwater collected from the trench and subsequently treated. Pumping rates from individual collection sumps along the system respond to water level settings for each sump (e.g., pumps cycle on and off depending on sump water levels). Adjustments, including water level settings and shutting pumps off, are made as needed with the primary goal of removing sufficient water to maintain collection trench levels below the lake level, while at the same time maintaining system balance based on water treatment plant capacity. Priority pumping capacity is given to trench sections where there is no barrier wall, as pumping for trench sections with barrier walls is a secondary control method.

The design goal is to maintain groundwater levels below lake levels. Weekly inspections of the barrier wall/groundwater collection system are completed in the field by CH2M HILL OMI. This inspection includes visual assessment of the general Site conditions, including: Site security, road condition, evidence of system damage or indications of potential system failure including settlement/subsidence, cracks in the soil, pooled water behind the barrier wall or flowing over the barrier wall, and/or damage to the barrier wall or the harbor brook culvert. The condition of the groundwater collection/storage system is also assessed visually, including inspections of the transfer sump and pumps, trench sump pumps, monitoring wells, electrical components and instrumentation. Lastly, the condition of the restoration area is assessed visually, including inspection of the vegetation condition and Site drainage system. Notes are included on the weekly inspection forms for acid treatments or other routine maintenance performed from week to week on the system. In addition, photographs of areas where pooled water (if any) or other pertinent indicators of system conditions are observed are maintained on file.

In addition to visual inspections, trench conditions are monitored by tracking PZ water levels logged hourly against both lake elevation and precipitation to ensure the system is functioning in compliance with operational goals. PZ water level data monitoring aids in identifying potential problem areas and/or seasonal fluctuations of the amount of water in the system. If discrepancies in the data are noted, they are investigated to determine their significance and if response actions are needed. In addition, if monitored data suggests a problem area or trench water levels are trending such that they could come out of compliance if continued on the projection, follow up inspections are initiated to investigate specific issues or areas of the system. Based on inspection conclusions, an appropriate response is determined. During normal operating periods the hydraulic containment system typically demonstrates groundwater levels below lake level, indicating that hydraulic capture and an inward hydraulic gradient are achieved.

The ability to contain groundwater was demonstrated in the 2012 and 2013 Source Control Summary Report as well as the 2014 Source Control Summary Report for the Semet, Willis, West, and East Wall Sections of the containment system. Figure series A-3 through A-6 illustrates data collected since the submittal of the 2014 report through March of 2016, and shows that containment of groundwater continues. All elevations are presented in the NAVD 88 datum. PZ water level data is illustrated as a weekly average. This interpretation of data is representative of overall conditions and trends, without capturing minor fluctuations within the collection trenches revealed by the hourly (or raw) data. Short term occurrences of water infiltrating the system and affecting trench levels observed in the hourly data set may not be apparent in the weekly average figure set, and therefore are noted separately. These occurrences are often due to wind and wave action intermittently splashing lake water over the barrier wall when lake level approaches an elevation near the top of the barrier wall, or when the lake level intermittently exceeds the top of the barrier wall. The plotted weekly average PZ data figure set demonstrates the ability to contain groundwater behind each section of the barrier wall.

Occasionally water levels in the collection trench rise above lake level, as detailed below, however these periodic increases do not affect the ability of the overall system to maintain an inward gradient and do not pose a concern unless contaminated groundwater from the trench overtops the barrier wall and reaches the lake. As detailed below, there were no occurrences where contaminated groundwater was observed to overtop the barrier wall. Whenever collection trench water levels are observed rising rapidly or approaching either lake level or top of wall level, the cause is investigated and responded to as appropriate. Findings related to collection trench groundwater level increases or atypical PZ data are noted on Figure Series A-3 through A-6 which shows PZ data represented as a weekly average plotted against both lake level and precipitation, and are summarized below:

2014 Summary:

- Weather event sequence 4/4/14, 4/7/14 through 4/8/14, and 4/13/14 through 4/15/14. During this timeframe, three precipitation (rain and snow) events of 0.32 inches, a combined 1.21 inches, and a combined 0.97 inches respectively as well as some snowmelt from above freezing temperatures resulted in increased trench levels displayed on the Willis, West, and East Wall Sections of the containment system. Hourly data indicates lake levels overtopped the barrier wall intermittently from 4/9/14 to 4/13/14 in the area of the Willis, West, and East Wall sections, contributing to higher trench levels during this time and pooled water behind the wall. When lake levels are elevated and approach the top of the wall in an area, additional water to the system can accumulate due to wind and wave action causing lake water to splash overtop the barrier wall, potentially resulting in an increase of PZ water levels.
- Weather event 5/13/14 through 5/16/14. During this timeframe, snowmelt from temperatures ranging from the high 50’s to the mid 70’s combined with 2.22 inches of precipitation resulted in increased trench levels across all sections, most notably continuing flood conditions in the area of the West and East Wall sections.
- From 5/27/14 to 7/3/14 the Semet and Willis data loggers were taken offline as a result of discrepancies between hand measurements and datalogger readings for trench water elevation. The system was offline and the area was monitored for flooding while upgrades to the datalogger were made. Additional repairs were necessary to piezometer 5 (PZ 5), returning back online 8/1/14. At this time the water level readings for PZ 5 were showing lower than normal. This discrepancy was evaluated and the transducer was replaced on 11/25/14 which corrected the data logging inconsistency.

2015 Summary:

- Weather event sequence 2/2/15, 2/8/15 through 2/9/15, 2/14/15, and 2/21/15. During this timeframe, four precipitation events of 0.39, 0.73, 0.7, and 1.1 inches of precipitation respectively resulted in increased trench levels across all sections throughout March 2015. Trench levels generally peaked above lake level in the area of the Willis and East Wall sections due to the infiltration of additional water to the system, however, trench water levels remained below corresponding wall elevations during this interval, with the exception of PZs 16 and 18. Significant infiltration of water into the collection system occurs along the Wastebed B area near the location of PZ 16, which will continue until a permanent cap is installed on Wastebed B. Significant infiltration of water into the collection system also occurred behind the East Wall area near the location of PZ 18, especially during the spring thaw, resulting in elevated water levels which will continue until a permanent cap is installed on the area.

- Both the barrier wall and collection trench are critical components of the hydraulic containment system, since the barrier wall would not provide long term containment if there was not a collection system to manage potentially contaminated groundwater behind the wall. The barrier wall prevents contaminated groundwater from flowing into the lake. The collection trench maintains the desired hydraulic gradient for long term system success. Even though PZs have reported elevated groundwater levels, there has not been visual evidence of contaminated groundwater overtopping the barrier wall and impacting the lake during this time.
- The re-setting of dataloggers resulted in periods of data loss between 4/1/15 and 4/7/15 affecting the Willis Wall section. A lack of data available for the week of 4/1/15 caused PZ water elevation weekly averages to jump abruptly, whereas hourly data suggest a smooth rise across the interval, trending similar to lake level.
- Weather event sequence throughout April 2015. Total precipitation throughout the month of April was almost 3 inches, combined with continued spring thaw and snow melt resulted in elevated trench levels maintained throughout the month, appearing to peak around the middle of April before receding significantly. Hourly data indicates lake level overtopped the barrier wall in the area of the West and East Wall sections around 4/15/15, contributing to area flooding.
- Weather event sequence 5/11/15, followed by 5/18/15 most notable affecting the West and East Wall sections. During this timeframe, two precipitation events of 1.19 and 1.06 inches of precipitation respectively resulted in increased trench levels and continued flooding. Trench levels generally peaked above lake level due to the infiltration of additional water to the system, however, in all cases trench water levels remained below corresponding wall elevations during this interval.
- Weather event sequence from 5/30/15 through 6/30/15 affecting all sections. Total precipitation during this timeframe was 8.85 inches, resulting in elevated trench levels maintained throughout this interval. Trench levels for the Willis, West, and East Wall sections generally peaked above lake level due to the infiltration of additional water to the system. In all cases, trench water levels remained below corresponding wall elevations during this interval, with the exception of PZs 9, 10, and 14 (slightly in exceedance for a brief period) located on the West Wall section, and PZs 16 and 18 on the East Wall section. PZs 9 and 10 are located approximately 50 ft. inboard and up gradient of the wall. Further, inspection in the field confirmed no visual evidence of groundwater overtopping the wall in this area. Hourly data indicates lake levels overtopped the barrier wall intermittently in the area of the East Wall section between 6/14/15 and 6/22/15 as well as the first week of July 2015, contributing to ongoing

flooding near PZs 14, 16, and 18. Visual observations during weekly inspections suggest there have been instances of pooled water behind some sections of the barrier wall, especially due to events where lake levels overtop the West and East Wall sections.

- Significant weather event on 7/26/15. One weather event producing 1.4 inches of precipitation resulted in a period of elevated trench levels on the East Wall section. Trench levels continued to peak above lake level due to the infiltration of additional water to the system, however, trench levels remained below corresponding wall elevations during this interval, with the exception of PZ 18. Even though PZ 18 reported elevated groundwater levels, there has not been visual evidence of contaminated groundwater overtopping the barrier wall during this time. Visual observations during weekly inspections suggest there have been instances of pooled water behind some sections of the barrier wall, however it is not anticipated based on visual evidence that groundwater has overtopped the barrier wall and flowed into the lake. By early August, both West and East Wall section collection systems returned to stable operating conditions.
- PZ 19, located on the East Wall section, indicates a significant upward trend in trench water levels on 11/3/15 when trench levels begin to climb above lake level, appearing to overtop the barrier wall at this location on 2/9/16, remaining above the wall through the end of the monitoring period. Field hand measurements recorded on 2/2/16 indicated trench water levels approximately 0.5 ft. lower than the measurement recorded by the datalogger for this location. Further evaluation of the PZ 19 transducer was completed to address continued “drifting” in datalogger readings. Maintenance and re-calibration was performed during June 2016, and PZ 19 datalogger water level measurements returned to normal during July 2016. However, additional water infiltration occurs around the end of the wall, generally contributing to increased water levels. The area is monitored during weekly inspections for visual evidence of trench levels overtopping the barrier wall, however none was noted.

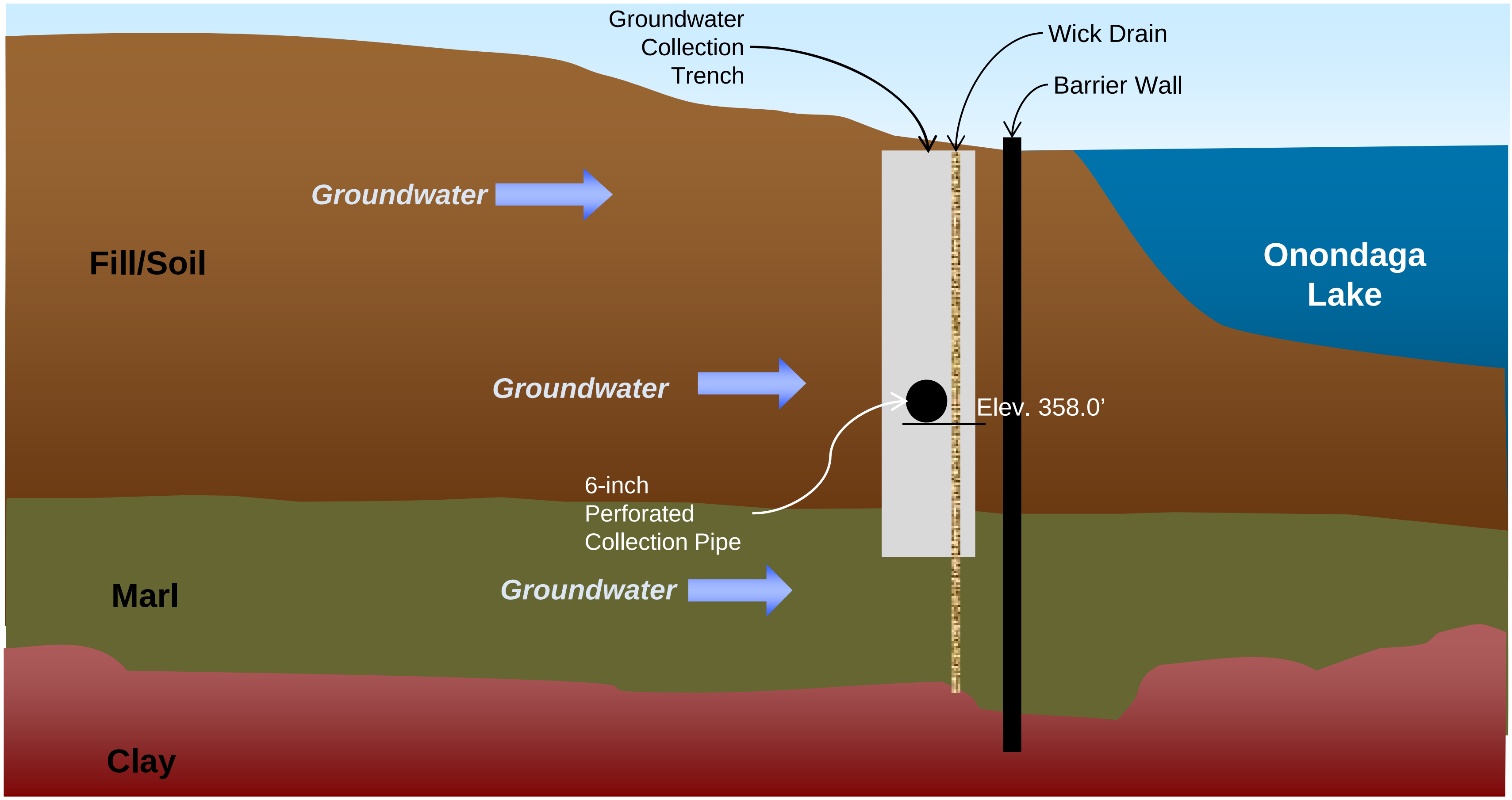
2016 Summary:

- Weather event sequence 2/16/16, followed by 2/24/16 affecting all sections. During this timeframe, two precipitation events producing 1.39 and 1.13 inches of precipitation respectively resulted in increased trench levels. Trench levels peaked above lake level in response to the infiltration of additional water to the system. Trench water levels remained below corresponding wall elevations during this interval, with the exceptions of PZs 9 and 10 (explanation above), as well as PZs 12, 14, and 15 (all slightly in exceedance for a brief period) located on the West Wall section, and PZ 19 (explanation above) located on the East Wall section. Hourly data indicates lake levels overtopped the barrier wall in the area of the West and East Wall sections beginning around 2/25/16, contributing to flooding continuing into March. Visual observations during weekly inspections suggest there have been instances of pooled water behind some sections of the barrier wall, especially due to events where lake levels overtop the West and East Wall sections.

Containment of groundwater provided by the barrier wall and the groundwater collection system addresses concerns related to potential recontamination of the adjacent cap. Even though the above discussion and associated figures suggest periods when some areas of the trench, specifically the Willis Wall Section, show groundwater elevations sustained above lake stage during times which cannot be identified as a response to periodic precipitation events, the system continues to be protective due to the primary containment, which is the barrier wall. During periods of sustained PZ water levels above lake stage as well as brief increases in response to extreme weather conditions, weekly inspections confirm there has been no visual evidence of groundwater overtopping the barrier wall and impacting the lake.

In response to occasional groundwater elevation exceedances outlined above, the hydraulic containment system operation was evaluated in order to identify areas where performance could be improved. A set of cleaning Standard Operating Procedures and associated preventative maintenance schedule was developed and implemented to minimize incidents of groundwater elevation exceedances. In addition, the performance of the Willis Wall Section was evaluated in 2016 and recommendations for system improvements are being developed.

The ability to contain groundwater and in general maintain an inward gradient, even during periods where external contributions influence groundwater levels, has been demonstrated for all three Phases of the IRM and is expected to continue indefinitely.



Note:

1. Drawing for illustrative purposes only. Refer to design drawing for specifics.

Not to Scale

Figure A-1	
Honeywell	**2015 & 2016 Source Control Summary**
TYPICAL BARRIER WALL AND GROUNDWATER COLLECTION SYSTEM SECTION	
PARSONS 301 Plainfield Road * Suite 350 * Syracuse, NY 13212 * PHONE: (315) 451-9560	

P:\Honeywell –SYR\448902\10\10.1\lakeshore 2.pptx

LEGEND:

- ONONDAGA LAKE
- BARRIER WALL
- COLLECTION TRENCH
- ACCESS ROAD
- PIEZOMETER
- CS COLLECTION SUMP
- LIMIT OF LIGHTWEIGHT FILL

200 100 0 200 400

SCALE: 1"=200'

FIGURE A-2.a

Honeywell

2015 & 2016 Source Control Summary

PERFORMANCE VERIFICATION MONITORING LOCATIONS

PARSONS

301 PLAINFIELD ROAD, SUITE 350, LIVERPOOL, N.Y. 13212, PHONE: 315-451-9560

FILE NAME: P:\HONEYWELL -SYR\448902 LAKESHORE O&M\10.0 TECHNICAL CATEGORIES\10.2 CAD\448902-SK-002.DWG
PLOT DATE: 12/6/2016 10:48 AM PLOTTED BY: RUSSO, JILL

FIGURE A-2.b

Honeywell — 2015 & 2016 Source Control Summary

PERFORMANCE VERIFICATION MONITORING LOCATIONS

PARSONS
301 PLAINFIELD ROAD, SUITE 350, LIVERPOOL, N.Y. 13212, PHONE: 315-451-9560

FILE NAME: P:\HONEYWELL -SYR\448902 LAKESHORE O&M\10.0 TECHNICAL CATEGORIES\10.2 CAD\448902-SK-002.DWG
PLOT DATE: 5/2/2017 2:45 PM PLOTTED BY: RUSSO, JILL

FIGURE A-2.c

Honeywell

2015 & 2016 Source Control Summary

PERFORMANCE VERIFICATION MONITORING LOCATIONS

PARSONS

301 PLAINFIELD ROAD, SUITE 350, LIVERPOOL, N.Y. 13212, PHONE: 315-451-9560

FILE NAME: P:\HONEYWELL -SYR\448902 LAKESHORE O&M\10.0 TECHNICAL CATEGORIES\10.2 CAD\448902-SK-002.DWG
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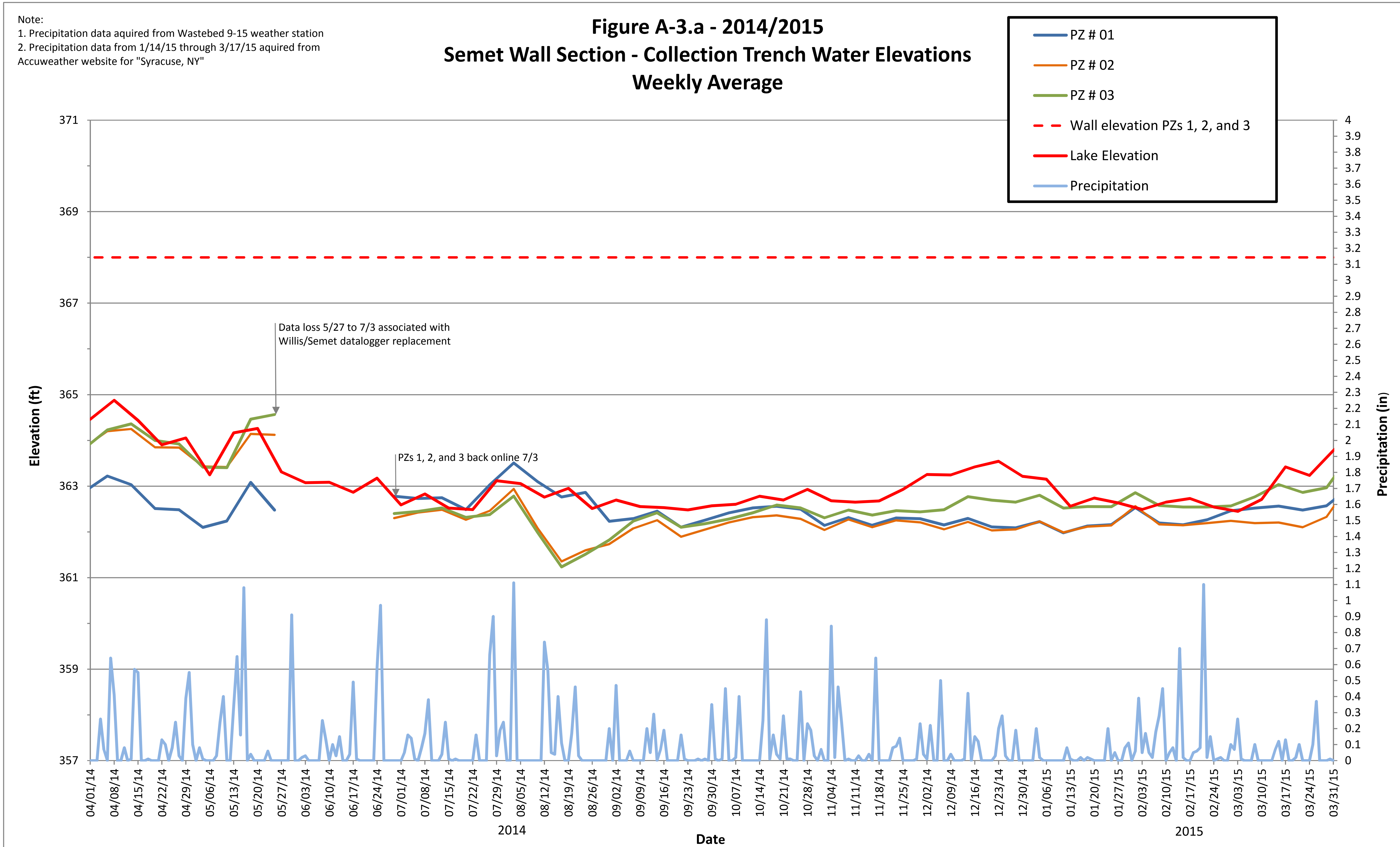
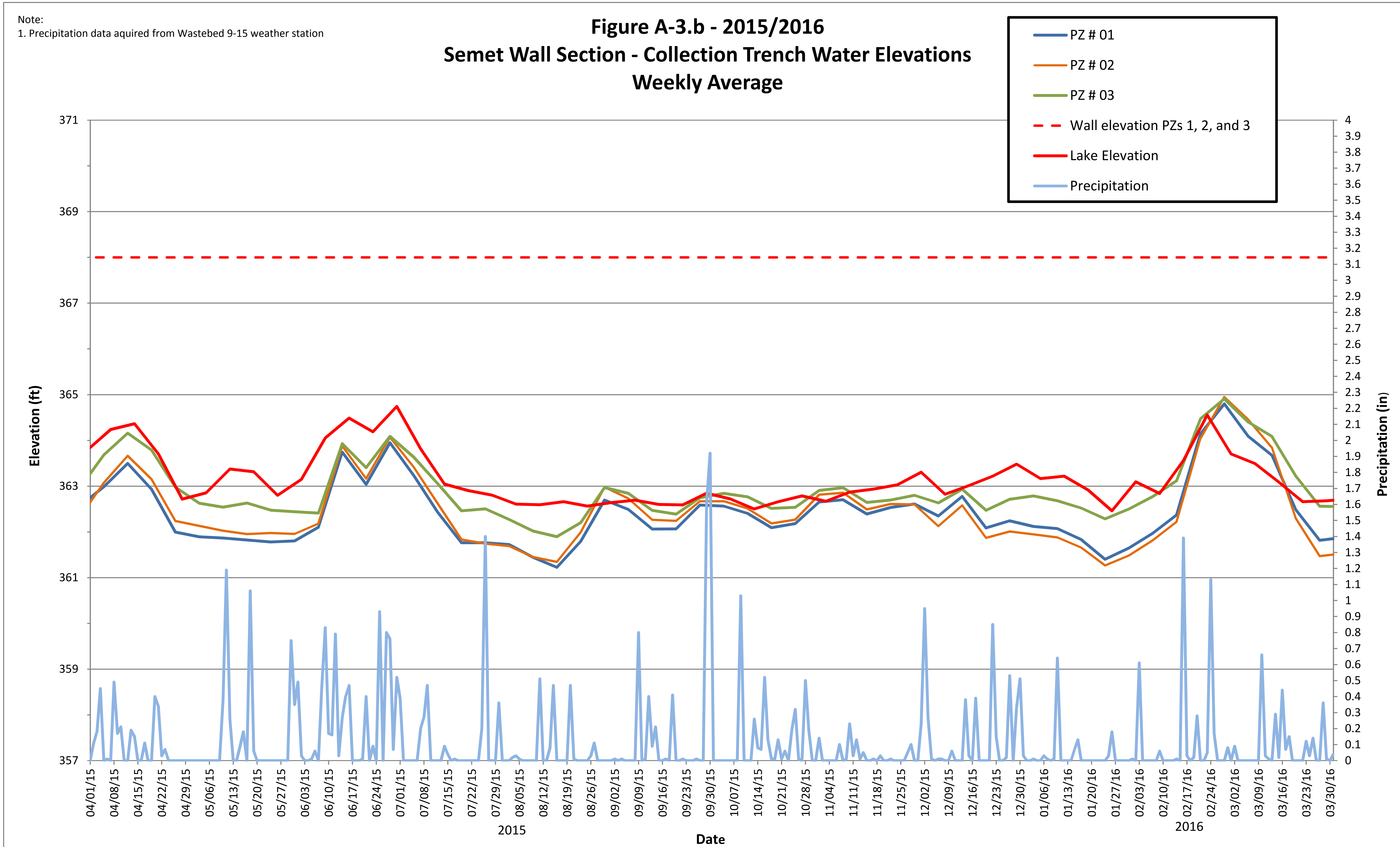
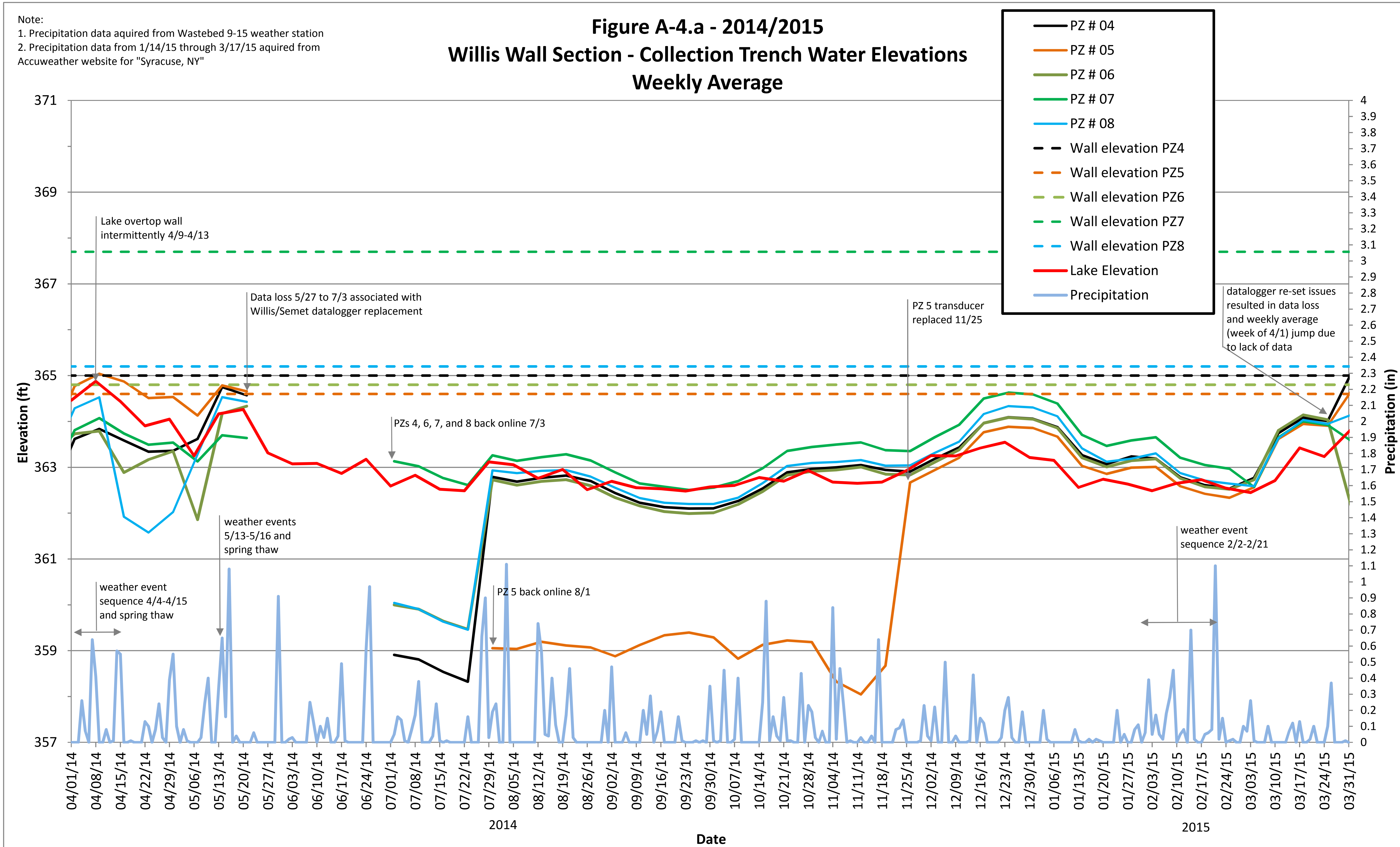


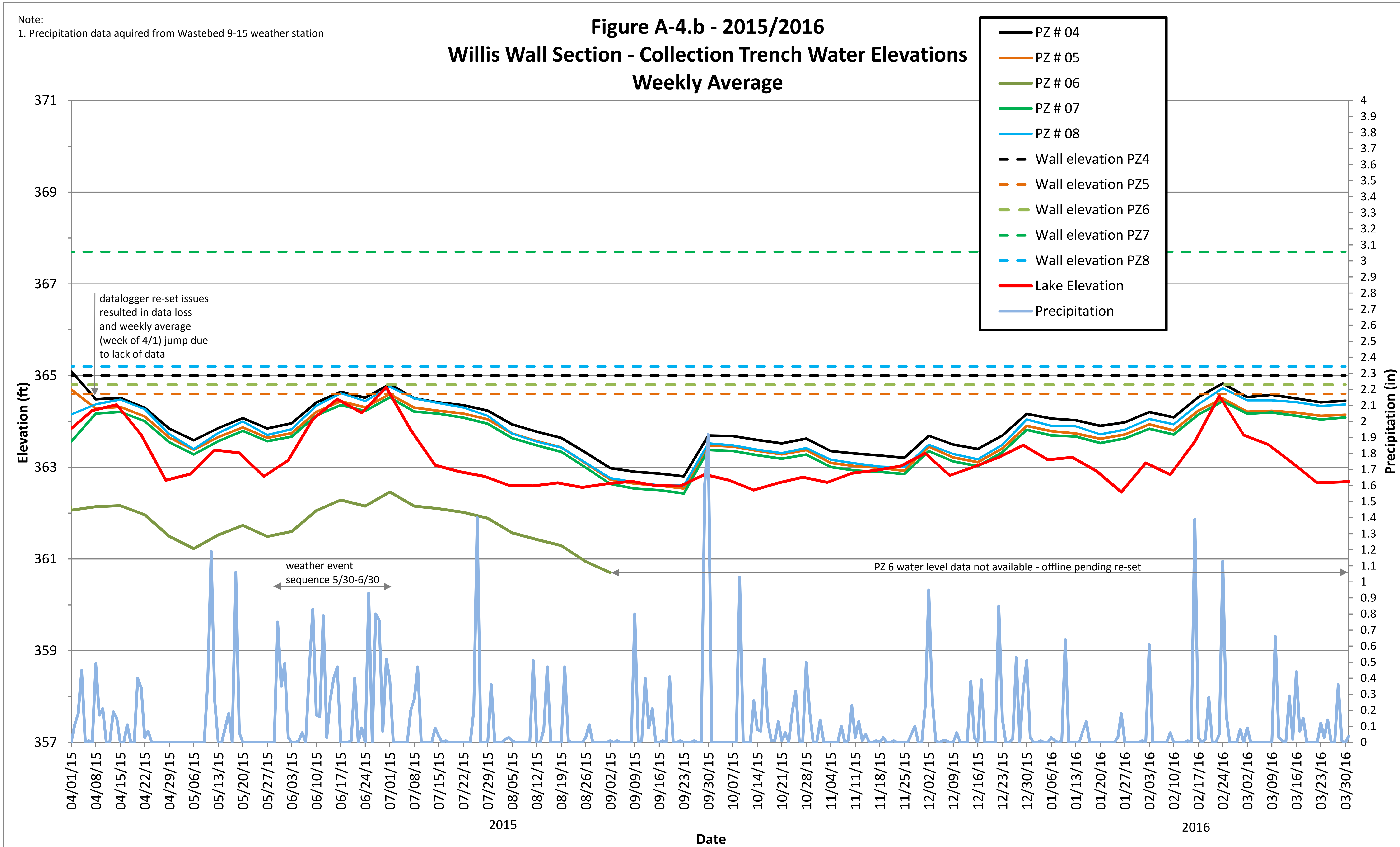
Note:
1. Precipitation data aquired from Wastebed 9-15 weather station
2. Precipitation data from 1/14/15 through 3/17/15 aquired from Accuweather website for "Syracuse, NY"
Figure A-3.a - 2014/2015
Semet Wall Section - Collection Trench Water Elevations
Weekly Average
PZ # 01
PZ # 02
PZ # 03
Wall elevation PZs 1, 2, and 3
Lake Elevation
Precipitation
Data loss 5/27 to 7/3 associated with Willis/Semet datalogger replacement
PZs 1, 2, and 3 back online 7/3
Elevation (ft)
Precipitation (in)
Date
2014
2015

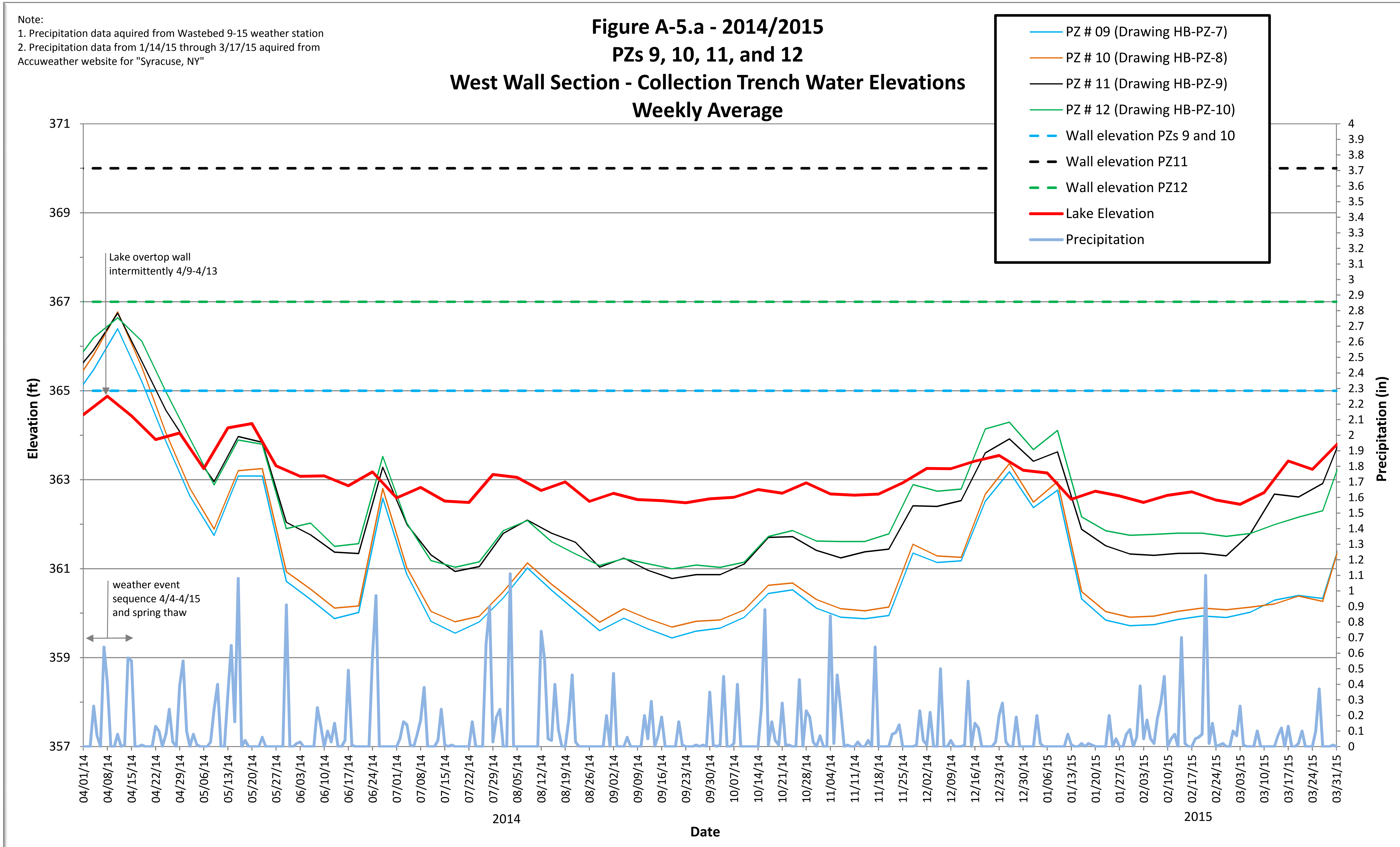
Note:
1. Precipitation data aquired from Wastebed 9-15 weather station





Note:
1. Precipitation data aquired from Wastebed 9-15 weather station
2. Precipitation data from 1/14/15 through 3/17/15 aquired from Accuweather website for "Syracuse, NY"
Figure A-4.a - 2014/2015
Willis Wall Section - Collection Trench Water Elevations
Weekly Average
PZ # 04
PZ # 05
PZ # 06
PZ # 07
PZ # 08
Wall elevation PZ4
Wall elevation PZ5
Wall elevation PZ6
Wall elevation PZ7
Wall elevation PZ8
Lake Elevation
Precipitation
Lake overtop wall intermittently 4/9-4/13
Data loss 5/27 to 7/3 associated with Willis/Semet datalogger replacement
PZs 4, 6, 7, and 8 back online 7/3
PZ 5 transducer replaced 11/25
datalogger re-set issues resulted in data loss and weekly average (week of 4/1) jump due to lack of data
weather events 5/13-5/16 and spring thaw
weather event sequence 4/4-4/15 and spring thaw
PZ 5 back online 8/1
weather event sequence 2/2-2/21
Elevation (ft)
Precipitation (in)
Date
2014
2015


Note:
1. Precipitation data aquired from Wastebed 9-15 weather station
Figure A-4.b - 2015/2016
Willis Wall Section - Collection Trench Water Elevations
Weekly Average
PZ # 04
PZ # 05
PZ # 06
PZ # 07
PZ # 08
Wall elevation PZ4
Wall elevation PZ5
Wall elevation PZ6
Wall elevation PZ7
Wall elevation PZ8
Lake Elevation
Precipitation
datalogger re-set issues resulted in data loss and weekly average (week of 4/1) jump due to lack of data
weather event sequence 5/30-6/30
PZ 6 water level data not available - offline pending re-set
Elevation (ft)
Precipitation (in)
Date
2015
2016


Note:
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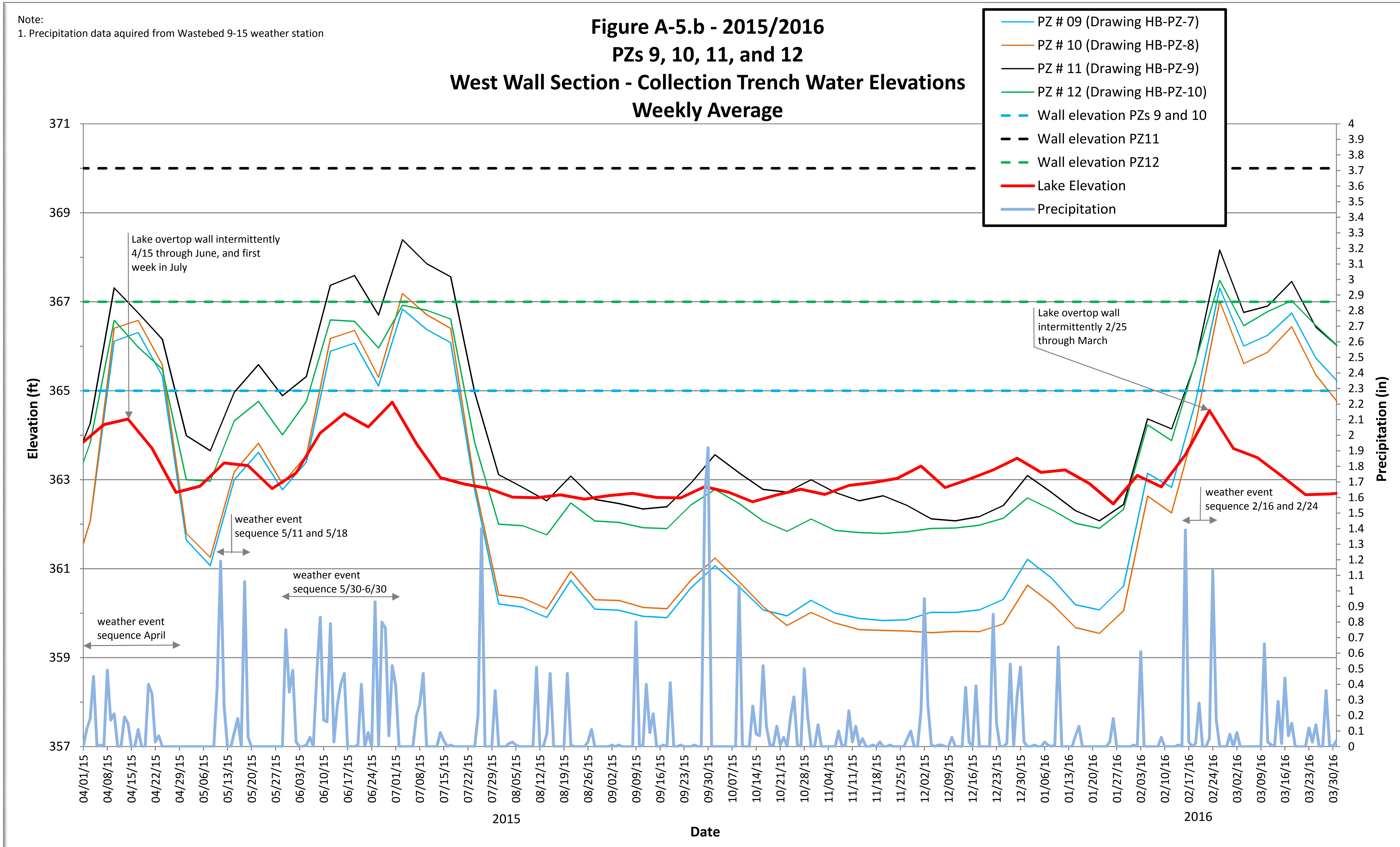
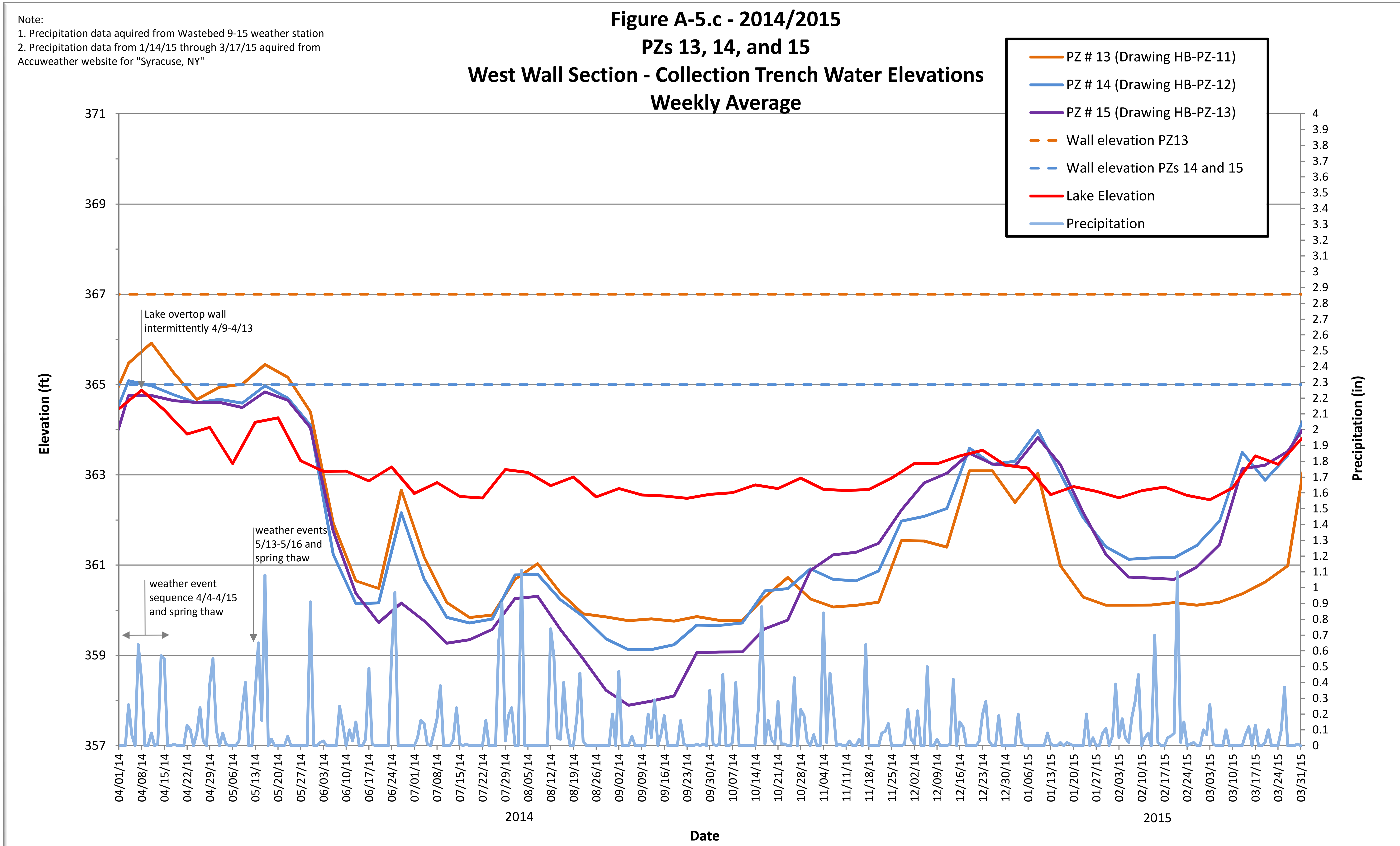
2. Precipitation data from 1/14/15 through 3/17/15 aquired from Accuweather website for "Syracuse, NY"
Figure A-5.a - 2014/2015
PZs 9, 10, 11, and 12
West Wall Section - Collection Trench Water Elevations
Weekly Average
PZ # 09 (Drawing HB-PZ-7)
PZ # 10 (Drawing HB-PZ-8)
PZ # 11 (Drawing HB-PZ-9)
PZ # 12 (Drawing HB-PZ-10)
Wall elevation PZs 9 and 10
Wall elevation PZ11
Wall elevation PZ12
Lake Elevation
Precipitation
Lake overtop wall intermittently 4/9-4/13
weather event sequence 4/4-4/15 and spring thaw
Elevation (ft)
Precipitation (in)
Date
2014
2015



Note:
1. Precipitation data aquired from Wastebed 9-15 weather station
Figure A-5.b - 2015/2016
PZs 9, 10, 11, and 12
West Wall Section - Collection Trench Water Elevations
Weekly Average
PZ # 09 (Drawing HB-PZ-7)
PZ # 10 (Drawing HB-PZ-8)
PZ # 11 (Drawing HB-PZ-9)
PZ # 12 (Drawing HB-PZ-10)
Wall elevation PZs 9 and 10
Wall elevation PZ11
Wall elevation PZ12
Lake Elevation
Precipitation
Lake overtop wall intermittently 4/15 through June, and first week in July
Lake overtop wall intermittently 2/25 through March
weather event sequence April
weather event sequence 5/11 and 5/18
weather event sequence 5/30-6/30
weather event sequence 2/16 and 2/24
Elevation (ft)
Precipitation (in)
Date
2015
2016



Note:
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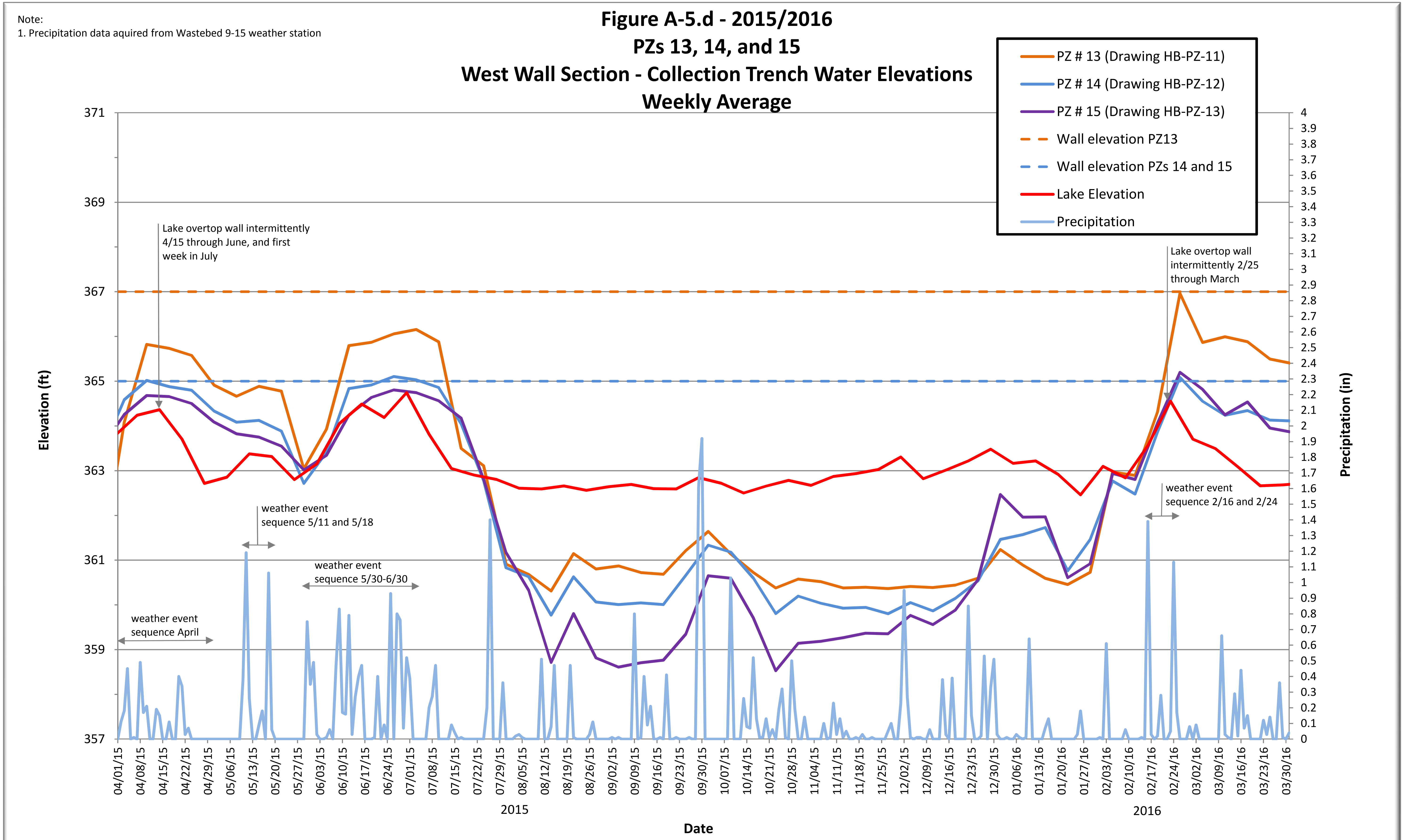
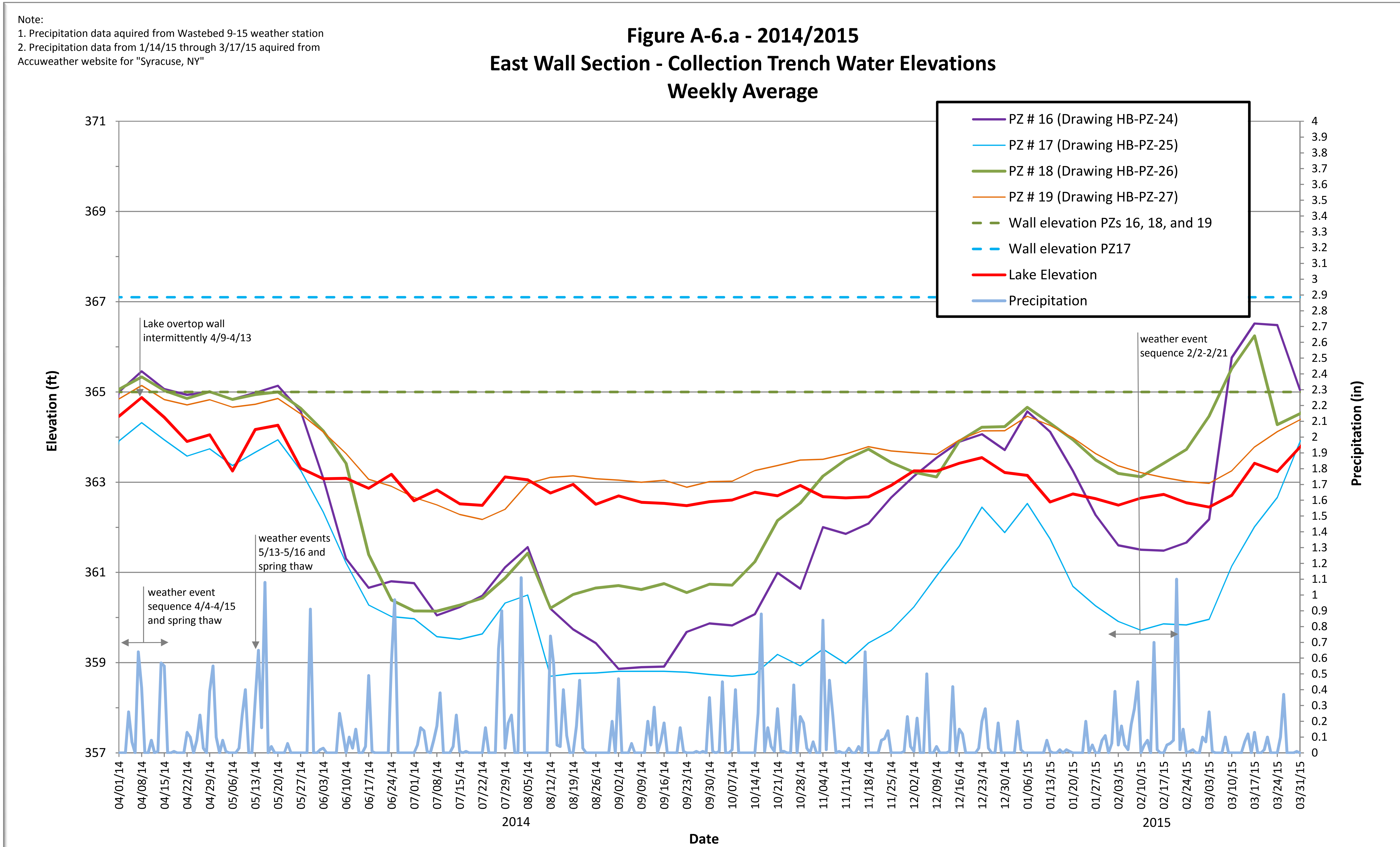
2. Precipitation data from 1/14/15 through 3/17/15 aquired from Accuweather website for "Syracuse, NY"
Figure A-5.c - 2014/2015
PZs 13, 14, and 15
West Wall Section - Collection Trench Water Elevations
Weekly Average
PZ # 13 (Drawing HB-PZ-11)
PZ # 14 (Drawing HB-PZ-12)
PZ # 15 (Drawing HB-PZ-13)
Wall elevation PZ13
Wall elevation PZs 14 and 15
Lake Elevation
Precipitation
Lake overtop wall intermittently 4/9-4/13
weather events 5/13-5/16 and spring thaw
weather event sequence 4/4-4/15 and spring thaw
Elevation (ft)
Precipitation (in)
Date
2014
2015



Note:
1. Precipitation data aquired from Wastebed 9-15 weather station
Figure A-5.d - 2015/2016
PZs 13, 14, and 15
West Wall Section - Collection Trench Water Elevations
Weekly Average
PZ # 13 (Drawing HB-PZ-11)
PZ # 14 (Drawing HB-PZ-12)
PZ # 15 (Drawing HB-PZ-13)
Wall elevation PZ13
Wall elevation PZs 14 and 15
Lake Elevation
Precipitation
Lake overtop wall intermittently 4/15 through June, and first week in July
Lake overtop wall intermittently 2/25 through March
weather event sequence 5/11 and 5/18
weather event sequence 5/30-6/30
weather event sequence April
weather event sequence 2/16 and 2/24
Elevation (ft)
Precipitation (in)
Date
2015
2016



Note:
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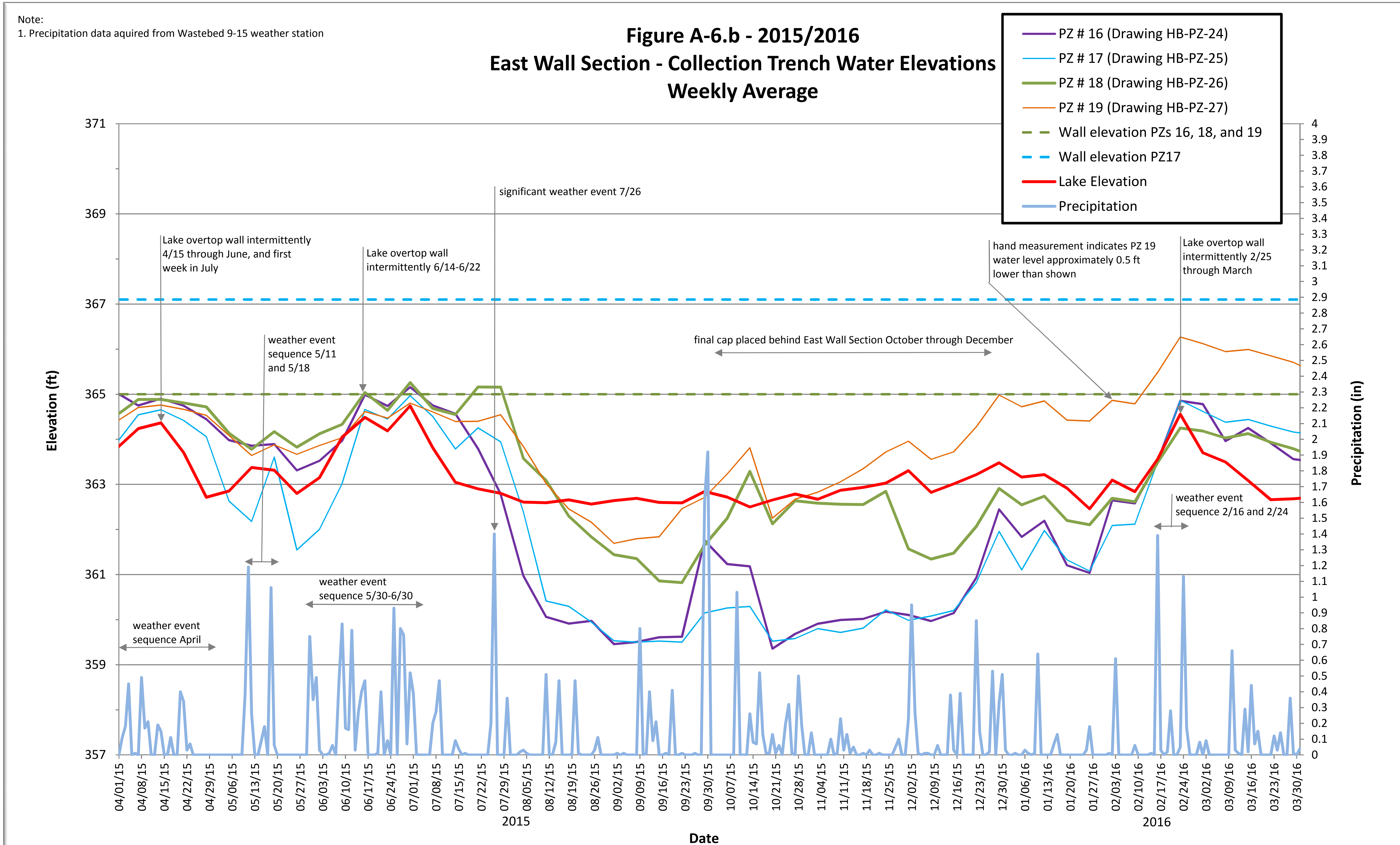
2. Precipitation data from 1/14/15 through 3/17/15 aquired from Accuweather website for "Syracuse, NY"
Figure A-6.a - 2014/2015
East Wall Section - Collection Trench Water Elevations
Weekly Average
PZ # 16 (Drawing HB-PZ-24)
PZ # 17 (Drawing HB-PZ-25)
PZ # 18 (Drawing HB-PZ-26)
PZ # 19 (Drawing HB-PZ-27)
Wall elevation PZs 16, 18, and 19
Wall elevation PZ17
Lake Elevation
Precipitation
Elevation (ft)
Precipitation (in)
Lake overtop wall intermittently 4/9-4/13
weather event sequence 2/2-2/21
weather events 5/13-5/16 and spring thaw
weather event sequence 4/4-4/15 and spring thaw
2014
2015
Date



Note:
1. Precipitation data aquired from Wastebed 9-15 weather station
Figure A-6.b - 2015/2016
East Wall Section - Collection Trench Water Elevations
Weekly Average
PZ # 16 (Drawing HB-PZ-24)
PZ # 17 (Drawing HB-PZ-25)
PZ # 18 (Drawing HB-PZ-26)
PZ # 19 (Drawing HB-PZ-27)
Wall elevation PZs 16, 18, and 19
Wall elevation PZ17
Lake Elevation
Precipitation
Elevation (ft)
Precipitation (in)
Date
2015
2016
significant weather event 7/26
Lake overtop wall intermittently 4/15 through June, and first week in July
Lake overtop wall intermittently 6/14-6/22
hand measurement indicates PZ 19 water level approximately 0.5 ft lower than shown
Lake overtop wall intermittently 2/25 through March
weather event sequence 5/11 and 5/18
final cap placed behind East Wall Section October through December
weather event sequence 2/16 and 2/24
weather event sequence 5/30-6/30
weather event sequence April

ATTACHMENT B

TRIBUTARY 5A

TRIBUTARY 5A SOURCE CONTROL SUMMARY

As documented in prior Source Control Summary reports, this remediation project was undertaken to address groundwater influences to Tributary 5A and Onondaga Lake, as well as impacted sediment migration to Onondaga Lake. To achieve these objectives, the Tributary 5A remedial action was designed, constructed, and has continued to be operational, which has mitigated this source to Onondaga Lake. The Tributary 5A remediation included the following elements:

- Two shallow groundwater collection systems (Reach-1 and Reach-2)
- Two pump stations and a force main to convey collected groundwater to the Willis Groundwater Treatment Plant (GWTP) for treatment
- Removal of sediments from the tributary channel and culverts
- Installation of an isolation barrier (geomembrane liner system) in the tributary channel
- Culvert replacement
- Restoration of the tributary banks and channel

Construction of the remedial action is further described in the *Tributary 5A Construction Completion Report* (OBG, 2013b).

SOURCE CONTROL BACKGROUND

The primary means of source control was achieved by installing a geomembrane liner or concrete liner in Reach-1 and Reach-2 of the tributary, which ultimately created an isolation barrier. Due to deterioration, a large diameter culvert connecting the two reaches was replaced with a new culvert with sealed joints. The isolation barrier is the primary engineering control that minimizes the potential for impacted groundwater to discharge into Tributary 5A and subsequently Onondaga Lake.

The groundwater collection systems provide an additional means of minimizing the potential for impacted groundwater to discharge to Tributary 5A by creating preferential groundwater flow away from the tributary and to the collection trench. See **Figure B-1** for a typical cross-section.

GROUNDWATER COLLECTION SYSTEM INFORMATION

The Tributary 5A groundwater collection systems were operational throughout 2014 and 2015. Approximately 43 million gallons of groundwater were collected and treated during these two years of operation. Performance verification and monitoring, which included data collection and interpretation was performed as described in the *Site Monitoring and Verification Plan* (OBG 2013a). Refer to the *2014 Annual Report* (OBG 2015*)* and *2015 Annual Report* (OBG 2016) for additional details on groundwater collection system operation and performance verification and monitoring. Corrective actions performed to maintain groundwater collection system performance are summarized in the *2014 Annual Report* (OBG 2015) and *2015 Annual Report* (OBG 2016), which include collection pipe and force main flushing.

This summary provides an overview of groundwater elevation data from January 2014 through March 2016.

Groundwater elevations were monitored at six total locations, three in Reach 1 (R1CO-1, R1OM-5, and R1CO-11) and three in Reach 2 (R2CO-1, R2CO-3, and R2CO-8). As part of the 2014 corrective actions, monitoring location R2OM-1 was relocated to the next downstream cleanout (R2CO-3).

Groundwater elevation data were compared to the LLDPE textured geomembrane (liner) invert elevation (below the stream channel) and tributary invert elevations, in accordance with the performance criterion (*i.e.,* to maintain groundwater elevations below the liner invert elevation) specified in the *Monitoring and Verification Plan* (OBG 2013a). Monitoring locations are shown on **Figure B-2.** The liner invert elevation is approximately 18 inches lower than tributary invert elevation due to material (*e.g.*, embankment, stone substrate) placed above the liner. The liner extends up the sides of channel side slopes on both sides where it is anchored into soil as shown in **Figure B-1**. Graphical representation of this comparison for 2014, 2015, and 2016 (January thru March) are included as **Figures B-3 – B-9, B-10 – B-15, B-16 – B-21** to this report, respectively.

Groundwater elevations fluctuated over the course of the monitoring period (January 2014 through March 2016), which may be attributable to the manner in which the pump station operates, blockages (*e.g.,* sedimentation, slots clogged or fouled), rainfall, and snow melt.

The documented maximum fluctuation in surface water elevation was approximately 0.6 ft., 1.6 ft., and 1.25 ft. in 2014, 2015, and 2016, respectively. Graph depicting the surface water elevations are provided as **Figures B-22, B-23,** and **B-24**. The average surface water elevations are shown on **Figures B-3** through **B-21**. Due to the configuration of tributary pool and riffle areas and varying invert elevations of Crucible outfalls, surface water depths vary along the alignment of the tributary.

During monitoring and maintenance events, visual inspections were performed to assess the condition of the visible portions of the collection system. These inspections included monitoring both reaches for indications of liner damage, liner floatation, and signs of erosion. Common visual indicators of damaged liners include mud boils, springs, vortexes, dry areas that are typically submerged, erosion, upwelling of water or a combination thereof. Areas proximate to the liner were inspected for preferential erosion and/or desiccation of the substrate which may be the result of groundwater migration through a damaged liner. Trends within water levels in the collection trenches, precipitation events, and surface water elevation data for the system were also utilized as an aid to indicate whether or not surface water could be migrating into the groundwater collection trench through the liner (*i.e.* high flows in collection trench during a dry spell). During early March 2015, the liner was observed to be floating (*i.e.*, the liner was visible within the tributary), which implies a buildup of head pressure beneath the liner system. No other visual cues indicative of a comprised liner system were present which implies that the liner was not damaged. Once the head pressure was alleviated by operation of a larger pump, the floatation of the liner ceased. In 2014, 2015, and the first portion of 2016 no other visual indications of impacts to the liner were noted in either reach.

REACH 1 2014

Groundwater elevations along the Reach 1 collection trench alignment fluctuated within a narrow range during the winter months of the monitoring period, but generally increased during the latter half of February 2014 and remained elevated until maintenance was performed to flush the collection pipe in September 2014.

At the R1CO-1 and R1OM-5 monitoring locations, groundwater elevations were consistently noted above the liner elevation prior to the September 2014 maintenance. While the groundwater elevations at R1CO-1 were consistently above the liner elevation, they remained below the tributary surface water elevation with the exception of the data spikes shown on **Figure B-3**. Groundwater elevations at R1OM-5 were consistently above the liner and surface water elevations (**Figure B-4**); however, visual inspection consisting of activities described above, proximate to R1OM-5 did not indicate that the liner was impacted or floating. Groundwater elevations at the R1CO-11 monitoring location were consistently below the adjacent tributary and surface water elevations with the exception of the spikes noted on **Figure B-5**. These data and visual inspection information demonstrates movement of groundwater to the collection system.

The elevated groundwater conditions in mid-2014 were attributable to blockages (*e.g.,* sedimentation, slots clogged or fouled) within the collection pipe. Maintenance was performed to flush the Reach 1 groundwater collection pipe in September 2014 and an immediate response in the form of increased pump speed and pump runtime were noted. Following maintenance, groundwater elevations trended downward and returned to conditions below the tributary invert elevation, as shown on **Figures B-3, B-4, and B-5**. During the spring months, there was rainfall and ongoing snow melt, which may have contributed to the data spikes and general increase in groundwater elevations during these periods.

Following spikes in groundwater data, the R1CO-11 groundwater elevations decreased and returned to elevations below the liner, tributary, and surface water elevations. The R1CO-1 and R1OM-5 groundwater elevation data, and visual inspections, indicate that there is not a direct connection to the tributary.

Although the 2014 data demonstrated spikes in groundwater and an increasing trend in groundwater elevations in Reach 1 that exceeded the performance verification criterion, the installed liner provides a redundant measure to minimize the potential for impacted groundwater to reach Onondaga Lake. Based on field observations, as described above and a comparison of groundwater elevations versus tributary surface water elevations, the liner appears to be intact and functioning as intended.

REACH 2 2014

Groundwater elevations along the Reach 2 collection trench alignment remained relatively stable during the monitoring period. Spikes in groundwater elevations that exceeded the tributary invert and surface water elevations were noted, but elevations returned to relatively stable conditions below the tributary invert and surface water elevations.

At the R2CO-1 monitoring location, groundwater elevations were consistently below the liner elevation; however, beginning in March 2014, data spikes exceeding the tributary invert and surface water elevations were noted (see **Figure B-6**), but elevations returned to relatively static conditions below the liner invert, tributary invert, and surface water elevations. Groundwater elevations at R2OM-1 were consistently above the liner elevation, but below the tributary invert elevation, with the exception of the data spikes noted on **Figure B-7**. As part of 2014 corrective actions, monitoring location R2OM-1 was relocated to the next downstream cleanout (R2CO-3) in October 2014. Groundwater elevations at R2CO-3 (**Figure B-8**) were noted above and below the liner invert elevation, but remained consistently below the tributary invert elevation. At the R2CO-8 monitoring location, groundwater elevations were consistently below the liner elevation, with the exception of the data spikes noted on **Figure B-9**. This data demonstrates movement of the groundwater to the collection system.

The cause of these data spikes was likely attributable to blockages (*e.g.,* sedimentation, slots clogged or fouled) within the collection pipe and scale buildup causing the pump to shut down. Maintenance was performed to flush the Reach 2 groundwater collection pipe in May 2014 and August 2014 and an immediate response in the form of increased pump speed and pump runtime were noted. Following maintenance, groundwater elevations appeared to spike less frequently. Ongoing acid addition to the pump station has continued being performed as a preventative maintenance measure to minimize potential impacts due to scaling.

Following the data spikes, groundwater elevations returned to relatively stable conditions below the tributary invert elevation, as shown on **Figures B-6, B-7, B-8,** and **B-9**. These data indicate that there is not a direct connection to the tributary.

During the 2014, there was rainfall and ongoing snow melt, which may have contributed to the data spikes and generally increasing groundwater elevations. Additionally, water was observed to be overflowing from a manhole on the Onondaga County Department of Water and Environment Protection (OCDWEP) 42-inch sanitary sewer, located in the southern end of Reach 2, which may have provided a direct input of water to the collection system as the liner adjacent to the manhole was exposed. The observations directly coincide with rainfall events on March 30, 2014 and May 16, 2014 (**Figures B-6** and **B-7**).

The 42-inch sanitary sewer manhole was repaired by OCDWEP in May 2014.

The 2014 data demonstrates spikes in groundwater that exceed the performance verification criterion; however, the installed liner provides a redundant measure to minimize the potential for impacted groundwater to reach Onondaga Lake. Based on field observations, as described above, and a comparison of groundwater elevations versus tributary surface water elevations, the liner appears to be intact and functioning as intended.

REACH 1 2015 – 2016 (JANUARY 2015 THRU MARCH 2016)

The 2015 and 2016 performance verification data demonstrates groundwater spikes and large fluctuations in groundwater elevations in Reach 1 that exceeded the performance verification criterion, but returned to conditions below the tributary and liner invert elevations following collection pipe flushing events and temporary pump installation. Following collection pipe flushing, Reach 1 monitoring locations were mostly below performance verification criteria and sections of Reach 1 that were not below performance verification criteria were re-flushed. Some data coincide with collection system shutdowns to perform troubleshooting, pump maintenance, pump repairs, and force main flushing. Ongoing acid addition to the pump station has continued being performed as a preventative maintenance measure to minimize potential impacts due to scaling.

Based on field observations, as described above, and a comparison of groundwater elevations versus tributary surface water elevations, the liner appeared to be intact and functioning as intended, which indicates that there is not a direct connection between groundwater and the tributary.

The cause of the groundwater spikes is not known, but could be attributable to an input of storm water from leaking pipes (*i.e.*, Crucible outfalls), precipitation events, snow melt, and partial blockages within the collection pipe due to scale or sediment buildup.

The cause of the large fluctuations in groundwater elevation is attributable to blockages (*e.g.,* sedimentation, slots clogged or fouled) within the collection pipe. Maintenance was performed to clean and flush the Reach 1 groundwater collection pipe on multiple occasions in 2015 and an immediate groundwater elevation response was observed. Additional flushing events were performed if sections of Reach 1 were not below performance verification criteria subsequent to initial flushing activities. Groundwater elevations returned to relatively stable conditions below the tributary invert elevation, as shown on **Figures B-10, B-11** and **B-12.** These data demonstrate movement of the groundwater to the collection system.

Groundwater elevations along the Reach 1 collection trench alignment fluctuated during 2015, but generally trended above the liner elevation during the snow melt, heavy precipitation events, and maintenance events when pumps were shut down. Beginning in late July 2015, the R1CO-1 and R1OM-5 groundwater elevations were consistently observed to be below the liner invert elevation. The groundwater elevations fluctuated in late September through December while maintenance was completed to flush the collection system piping multiple times. Following collection system maintenance, groundwater elevations at R1CO-01 and R1OM-5 remained above the liner invert elevation but below the tributary invert elevation.

Groundwater elevations at the R1CO-11 monitoring location were consistently below the adjacent tributary and surface water elevations with the exception of the spikes shown on **Figure B-12.**

Following R1CO-11 groundwater spikes, elevations decreased and returned to relatively static conditions below the liner invert elevation.

Groundwater elevations along the Reach 1 collection trench alignment fluctuated during early 2016 due to precipitation events, but were generally above the liner invert (**Figure B-16, B-17,** and **B-18**). Beginning in March 2016, a temporary diesel pump was installed to manage high flows within the collection system. After pump installation, ground water elevation responded immediately and trended downward and were maintained to below the liner invert.

Although the 2015 and early 2016 data demonstrated spikes in groundwater and an increasing trend in groundwater elevations in Reach 1 that exceeded the performance verification criterion, the installed liner provides a redundant measure to minimize the potential for impacted groundwater to reach Onondaga Lake. Based on field observations, as described above, and a comparison of groundwater elevations versus tributary surface water elevations, the liner appears to be intact and functioning as intended.

REACH 2 2015 – 2016 (JANUARY 2015 THRU MARCH 2016)

The 2015 and 2016 performance verification data demonstrates groundwater spikes and large fluctuations in groundwater elevations in Reach 2 that exceeded the performance verification criterion but generally returned to conditions below the tributary and liner invert elevations following collection pipe flushing events or maintenance, excepted where noted below. There a number of groundwater elevation spikes that exceeded the performance verification criterion, but returned to relatively static conditions above the tributary and liner invert elevations but below the surface water elevation. Groundwater elevations along the Reach 2 collection trench alignment remained relatively stable during the monitoring period, with the exception of the groundwater elevation spikes, which indicates movement of the groundwater to the collection system. Ongoing acid addition to the pump station has continued being performed as a preventative maintenance measure to minimize potential impacts due to scaling.

Based on field observations, as described above, and a comparison of groundwater elevations versus tributary surface water elevations, the liner appears to be intact and functioning as intended. This data trend indicates that there is not a direct connection to the tributary.

The cause of the groundwater elevation spikes is not known but may be attributable to storm water (*e.g.,* leaking Crucible outfalls) or flow restriction due to blockages (*e.g*., sedimentation, slots clogged or fouled) within the collection pipe. Following maintenance, the occurrence of data spikes appeared to be less frequent, as shown on **Figures B-13, B-14,** and **B-15.**

At the R2CO-1 monitoring location, groundwater elevations were consistently above the liner elevation and numerous data spikes were observed at R2CO-1 between January and June 2015 that exceeded the tributary invert and surface water elevations, but returned to relatively static conditions above the liner invert elevations, as shown on **Figure B-13.**

Groundwater elevations at R2CO-3 were consistently above the liner elevation, but below the tributary invert elevation, with the exception of the data spikes shown on **Figure B-14.**

At the R2CO-8 monitoring location, groundwater elevations were consistently below the liner elevation, with the exception of the data spikes shown on **Figure B-15.**

Groundwater elevations along the Reach 2 collection trench alignment fluctuated during early 2016, but were generally below the liner invert at R2CO-1 until early March when the temporary pump was installed at Reach 1. The temporary pump in Reach -1 restricted the flow from Reach -2 pump station, thus increased frequency of spikes indicated on **Figure B-19**. Groundwater elevations increased at

R2CO-3 and R2CO-8 and remained elevated, as a result of the Reach-1 temporary pump installation, as noted on **Figures B-20** and **B-21**.

The 2015 and early 2016 data demonstrates spikes in groundwater that exceed the performance verification criterion; however, the installed liner provides a redundant measure to minimize the potential for impacted groundwater to reach Onondaga Lake. Based on field observations, as described above, and a comparison of groundwater elevations versus tributary surface water elevations, the liner appears to be intact and functioning as intended.

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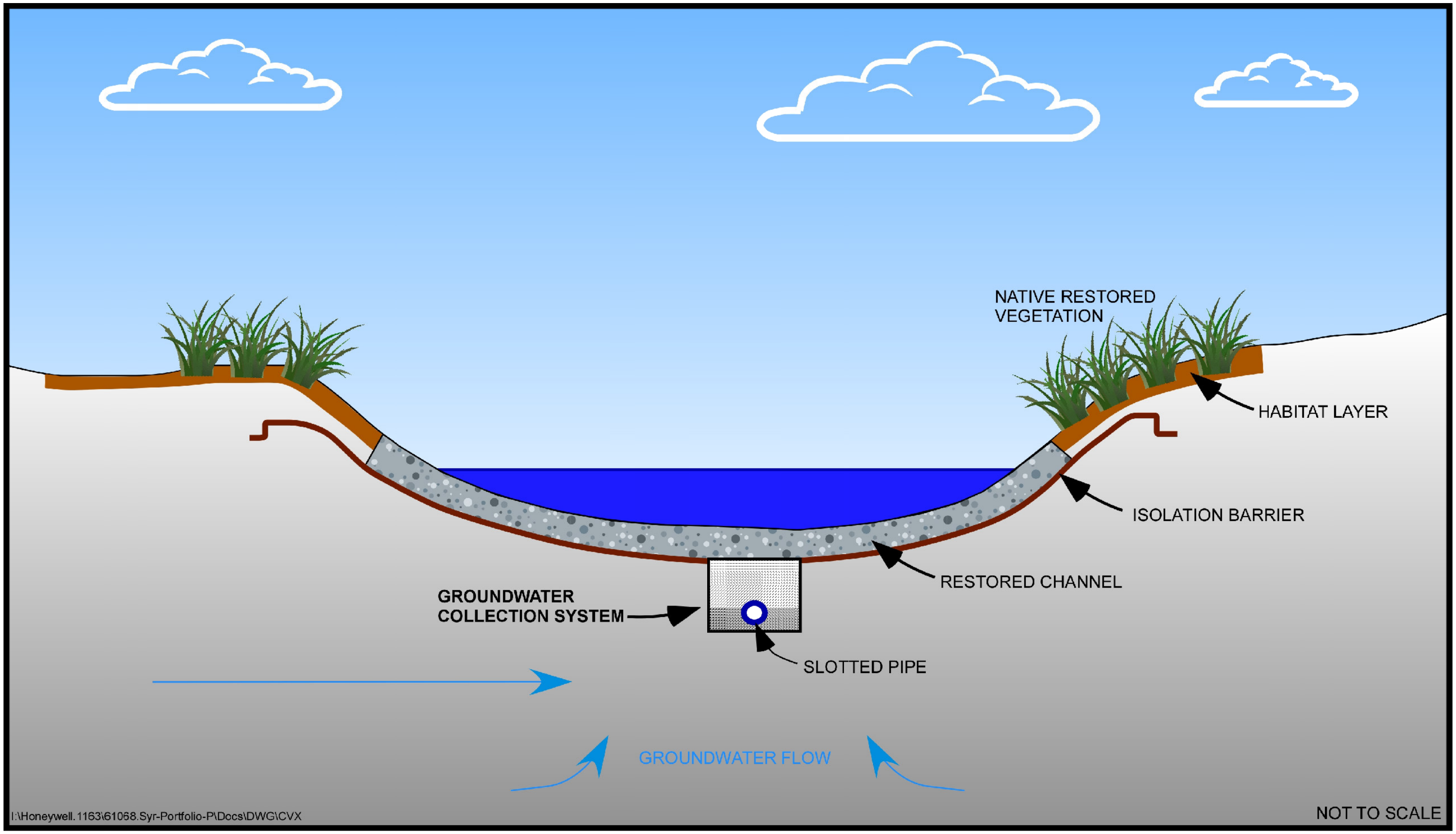
OBG. 2013a. *Site Monitoring and Verification Plan*. Semet Residue Ponds Remedial Design Groundwater Remedial Alternative, Geddes, New York. Prepared for Honeywell, Morristown, NJ. November 2013.

OBG. 2013b. *Construction Completion Report*. Semet Residue Ponds Remedial Design Groundwater Remedial Alternative, Geddes, New York. Prepared for Honeywell, Morristown, NJ. December 2013.

OBG. 2015. *2014 Tributary 5A Annual Report*. Semet Residue Ponds Remedial Design Groundwater Remedial Alternative, Geddes, New York. Prepared for Honeywell, Morristown, NJ. May 2015.

OBG. 2016. *2015 Tributary 5A Annual Report.* Semet Residue Ponds Remedial Design Groundwater Remedial Alternative, Geddes, New York. Prepared for Honeywell, Morristown, NJ. Revised October 2016.



NOTE: A PORTION OF REACH 1 GROUNDWATER COLLECTION SYSTEM AND SLOTTED PIPE IS ALIGNED ALONG NORTHERN BANK OF TRIBUTARY 5A

HONEYWELL INTERNATIONAL INC.
TRIBUTARY 5A
SYRACUSE, NEW YORK

TRIBUTARY 5A
TYPICAL ISOLATION BARRIER AND GROUNDWATER COLLECTION SYSTEM DETAIL

1163.61068
MARCH 2016

O'BRIEN & GERE ENGINEERS, INC.

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FIGURE B-2

LEGEND

- GROUNDWATER COLLECTION PIPE CLEANOUT
- GROUNDWATER COLLECTION PIPE OBSERVATION MANHOLE
- SURFACE WATER ELEVATION MONITORING POINT
- GROUNDWATER COLLECTION SYSTEM MONITORING LOCATION
- 60" CULVERT
- 72" CULVERT REHABILITATION
- COLLECTION TRENCH
- TRIBUTARY 5A
- SEMET PONDS

HONEYWELL
TRIBUTARY 5A
GEDDES, NEW YORK

PERFORMANCE VERIFICATION MONITORING LOCATIONS

0 125 250 500
Feet

APRIL 2015
1163.61068

O'BRIEN & GERE

This document was developed in color. Reproduction in B/W may not represent the data as intended.

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Figure B-3
Tributary 5A R1CO-1
2014 Groundwater Elevations

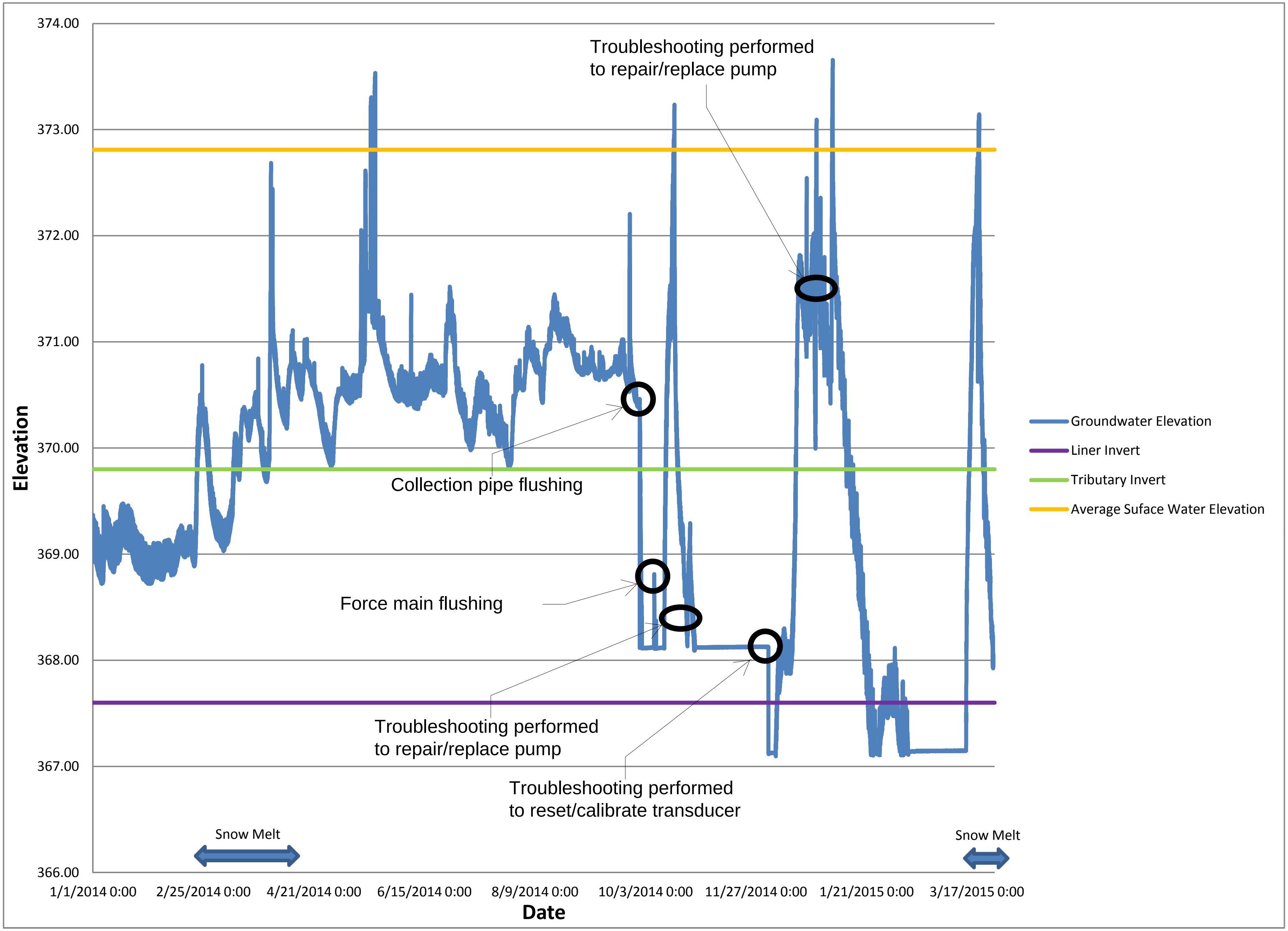

Figure B-4
Tributary 5A R1OM-5
2014 Groundwater Elevations

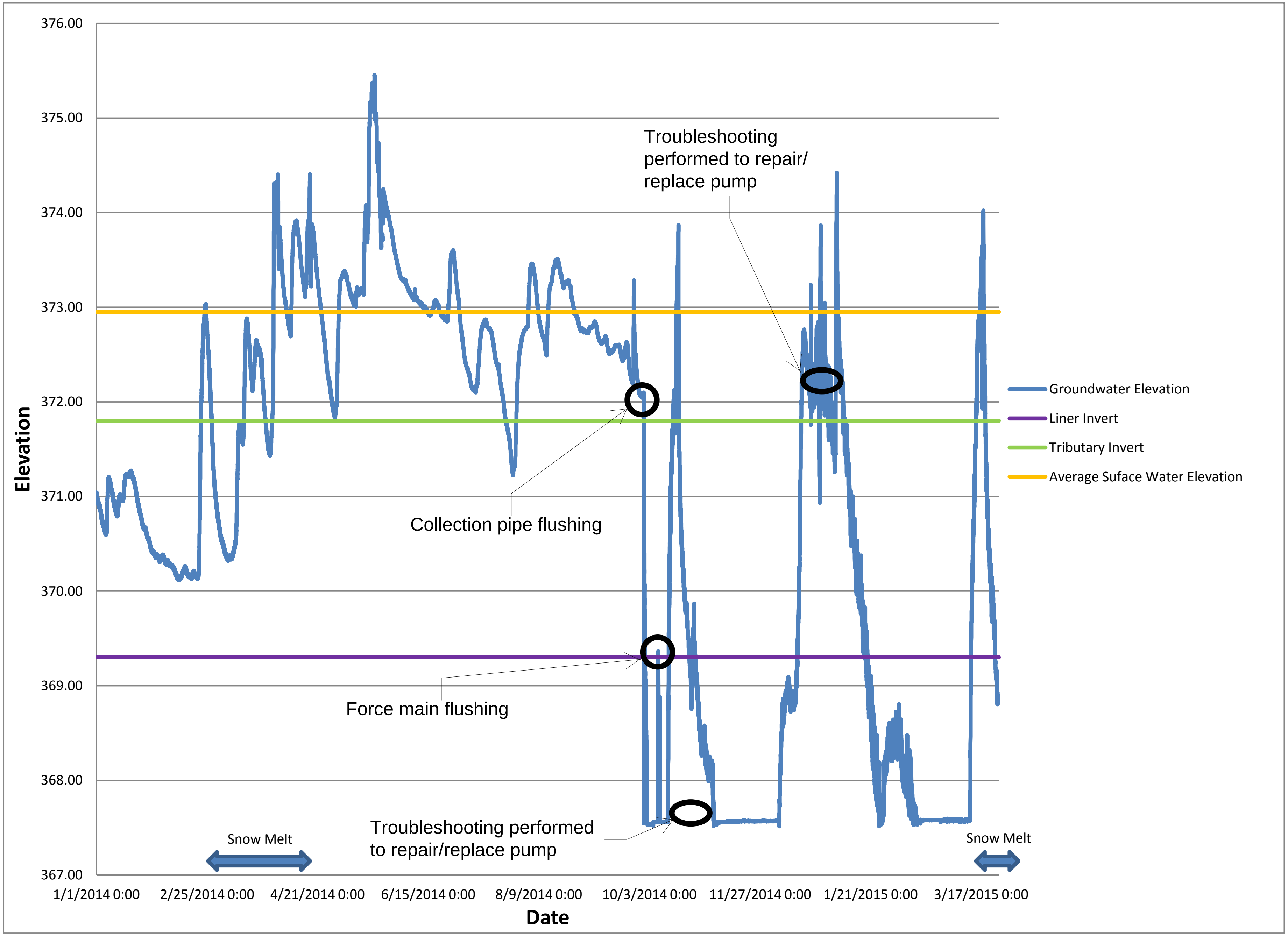

Figure B-5
Tributary 5A R1CO-11
2014 Groundwater Elevations

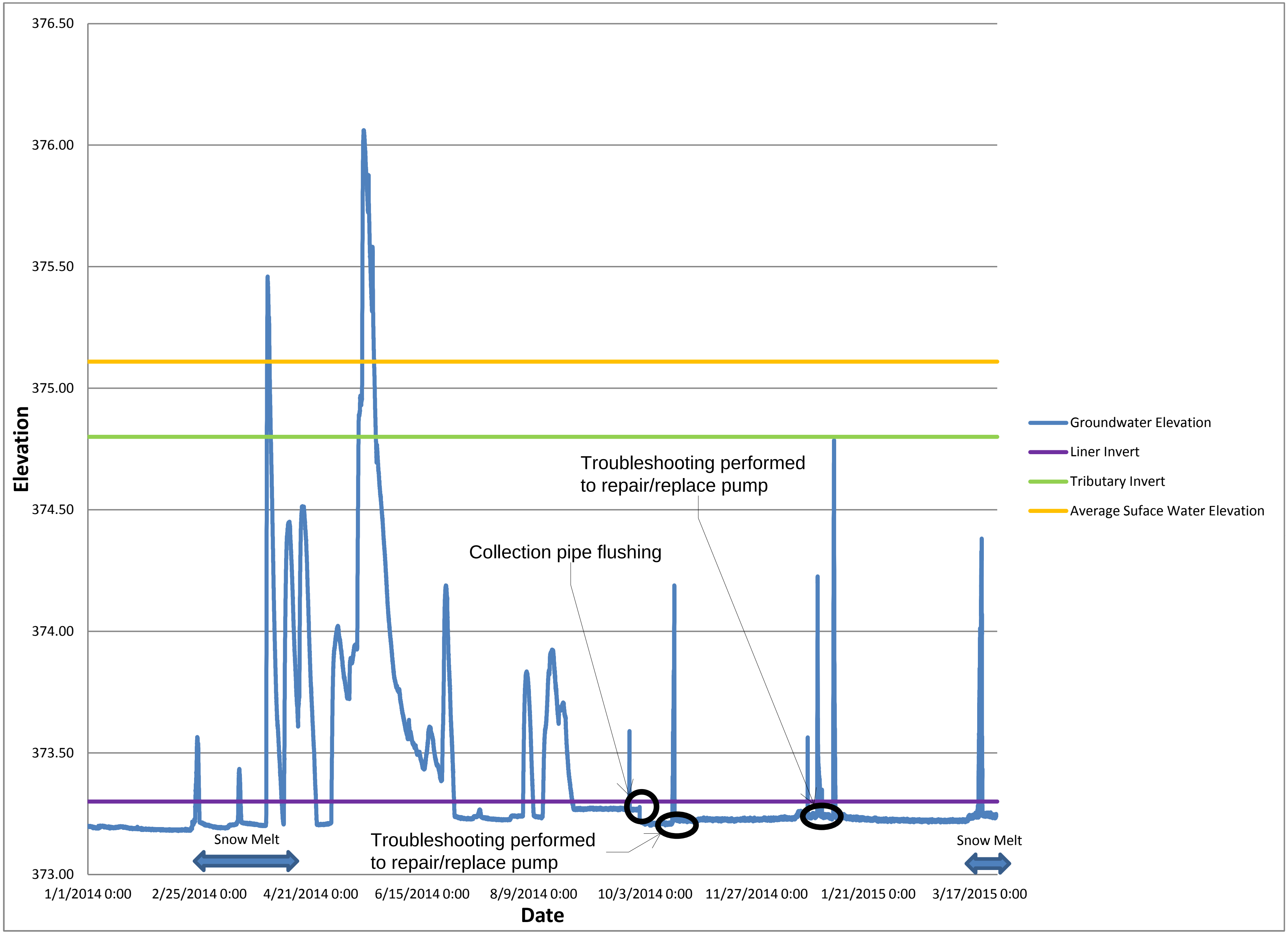

Figure B-6
Tributary 5A R2CO-1
2014 Groundwater Elevations

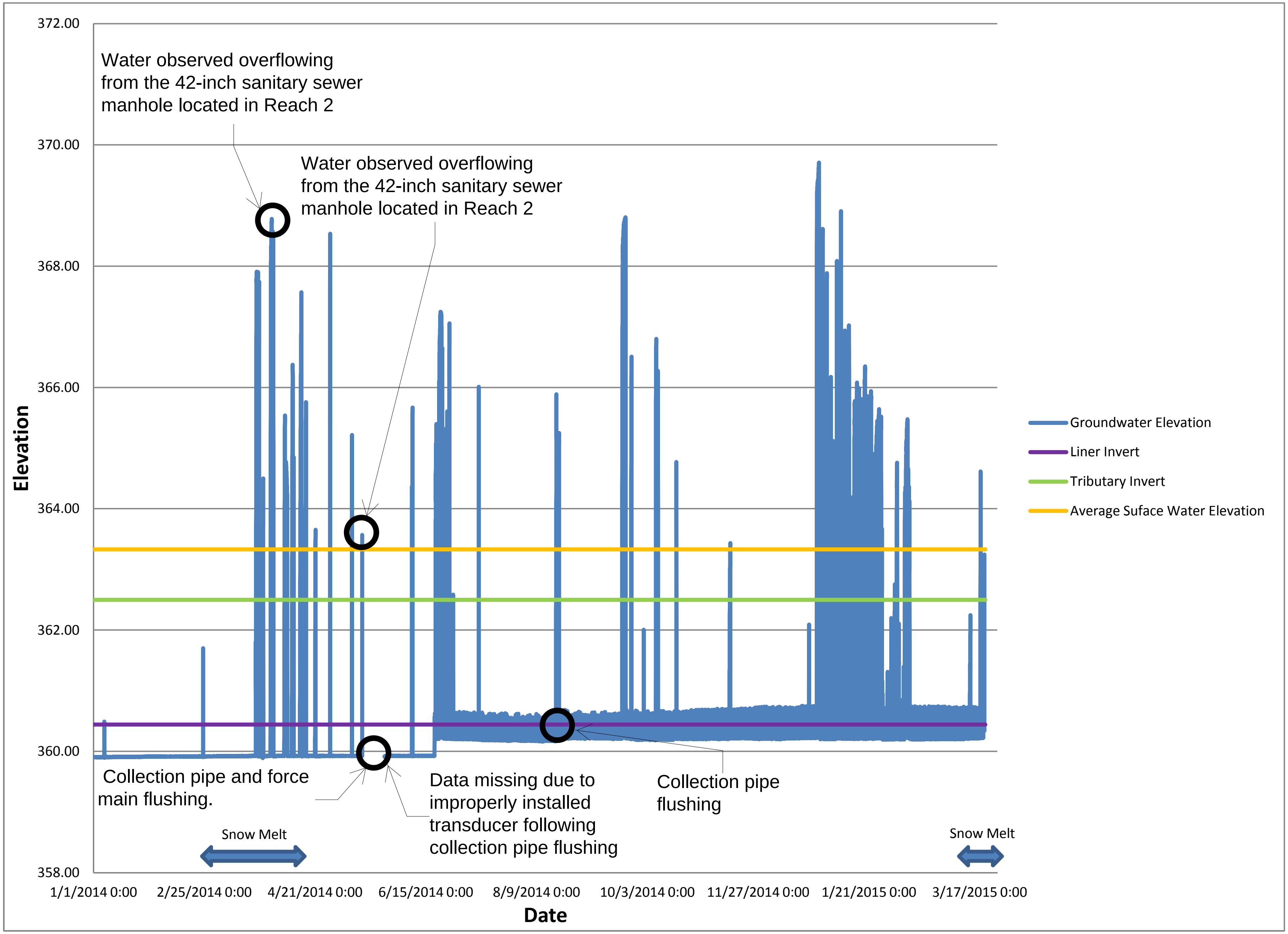

Figure B-7
Tributary 5A R2OM-1
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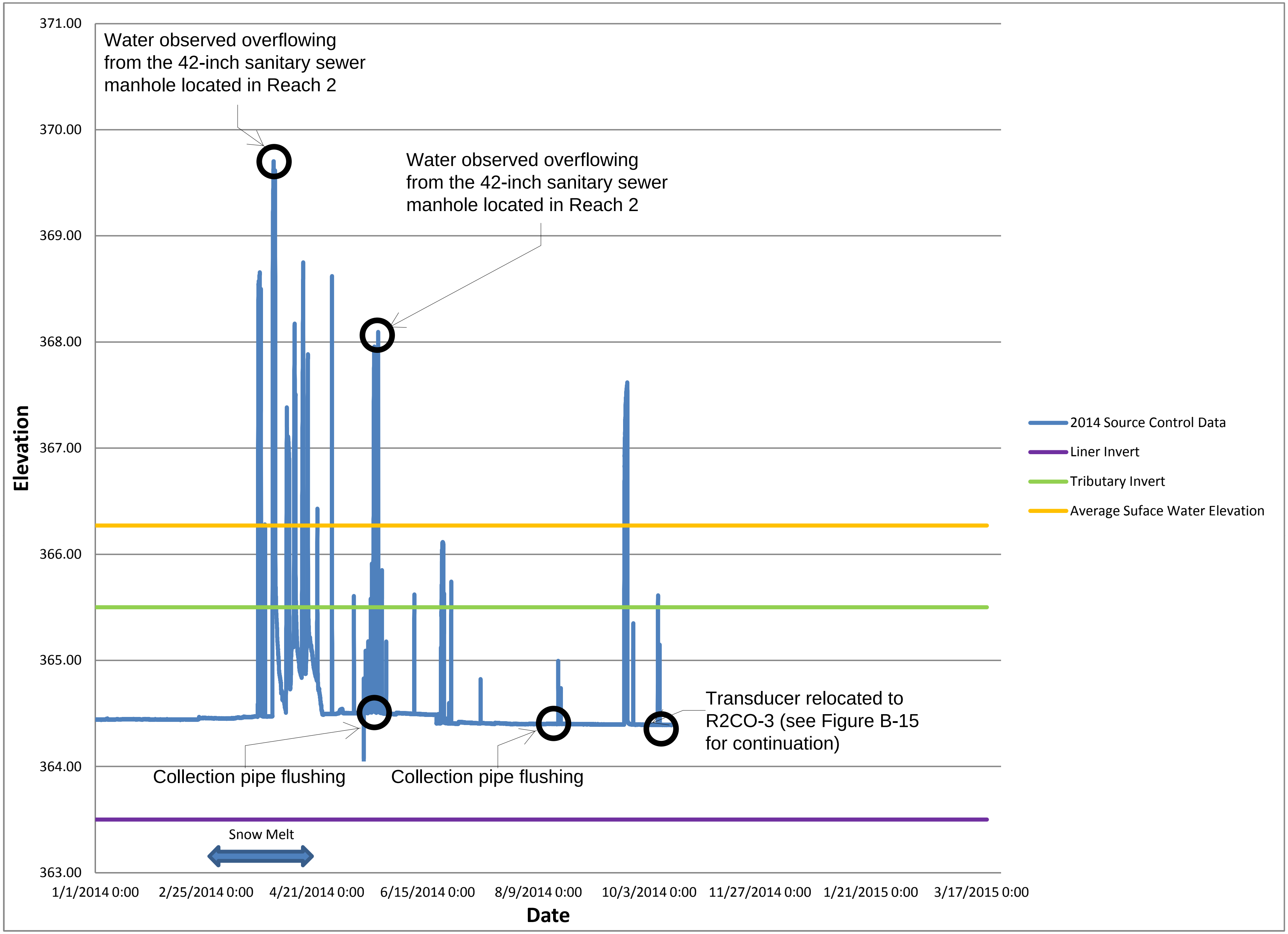

Figure B-8
Tributary 5A R2CO-3
2014 Groundwater Elevations

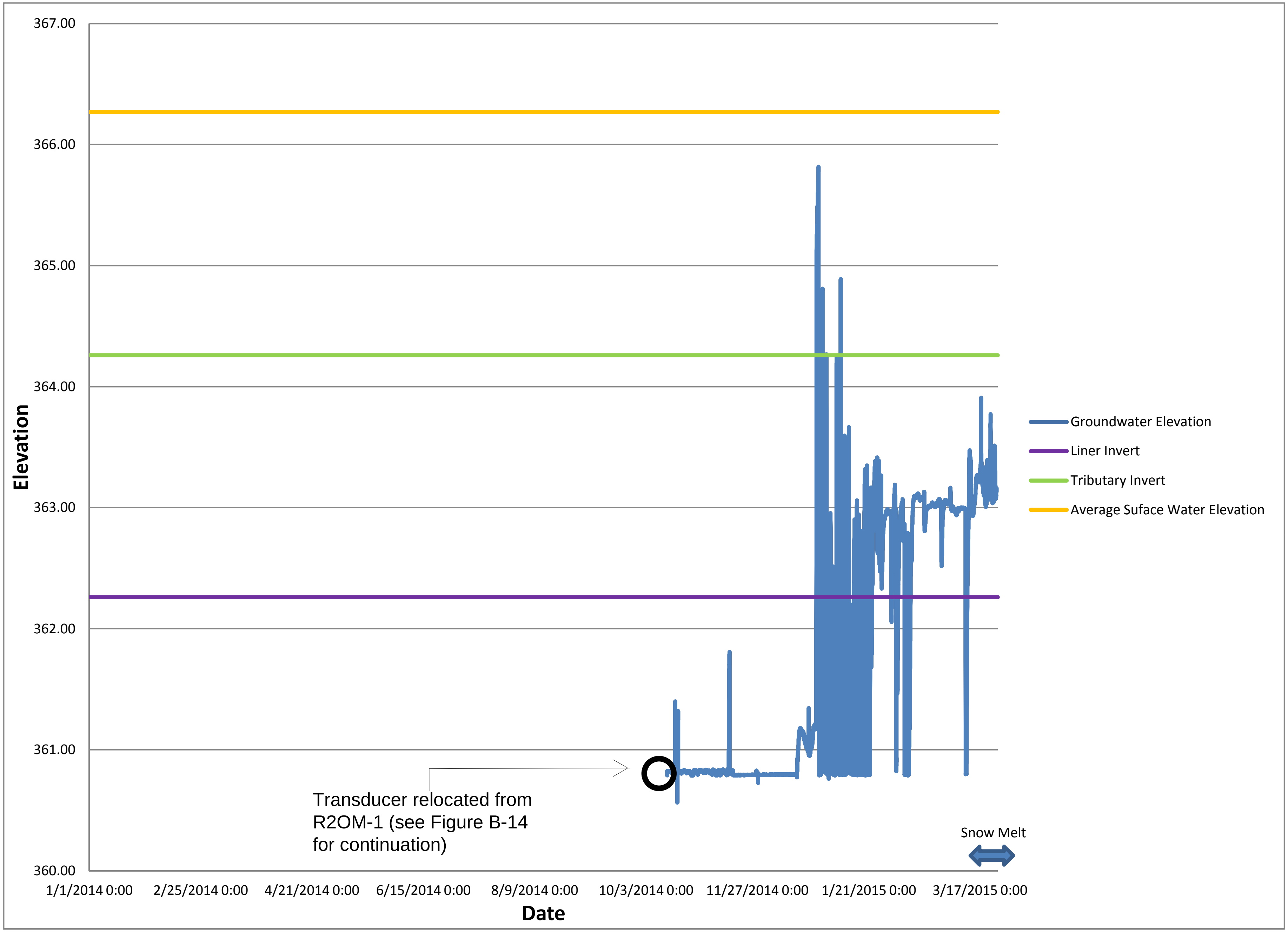

Figure B-9
Tributary 5A R2CO-8
2014 Groundwater Elevations

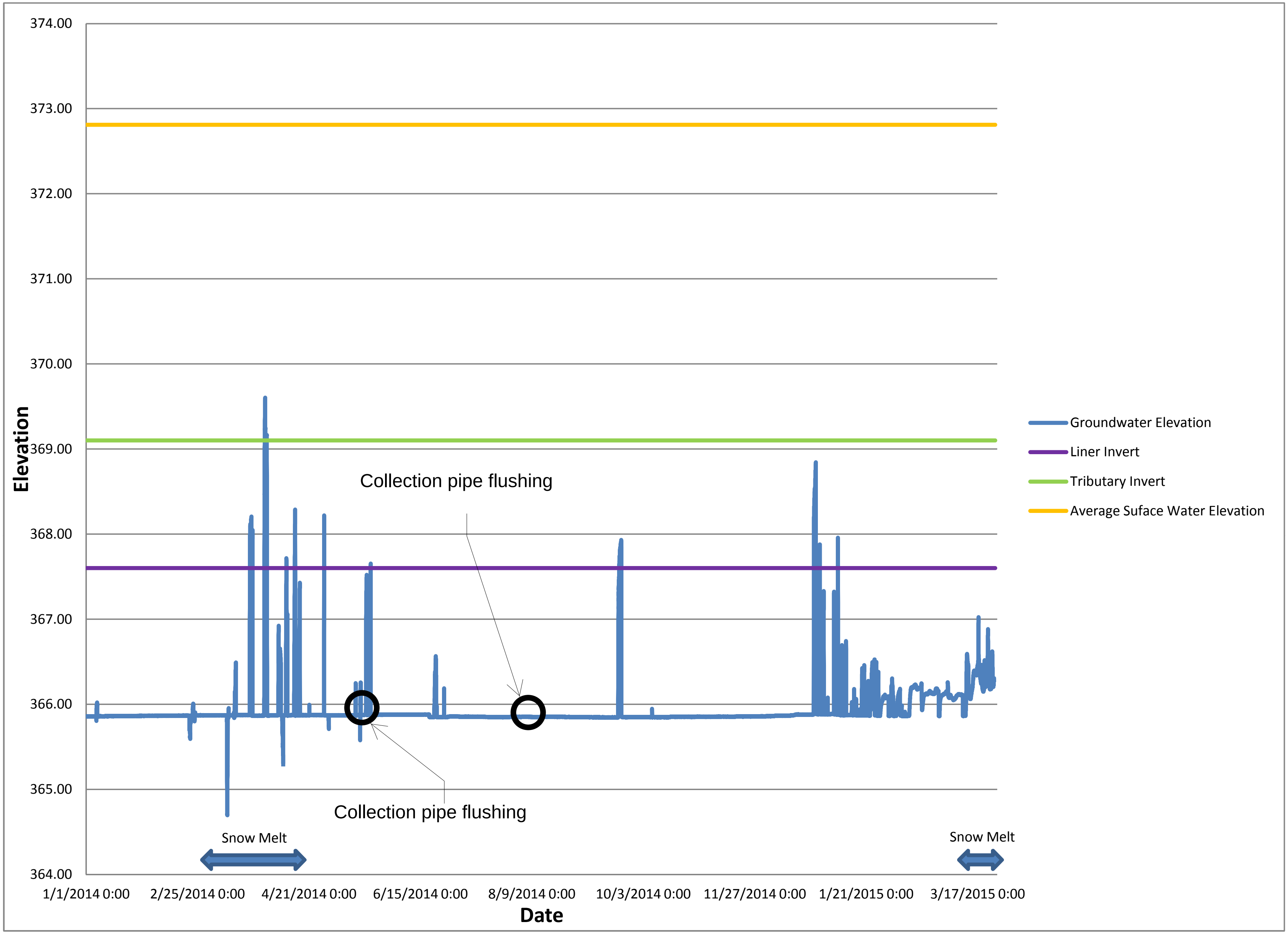

Figure B-10
Tributary 5A R1CO-1
2015 Groundwater Elevations

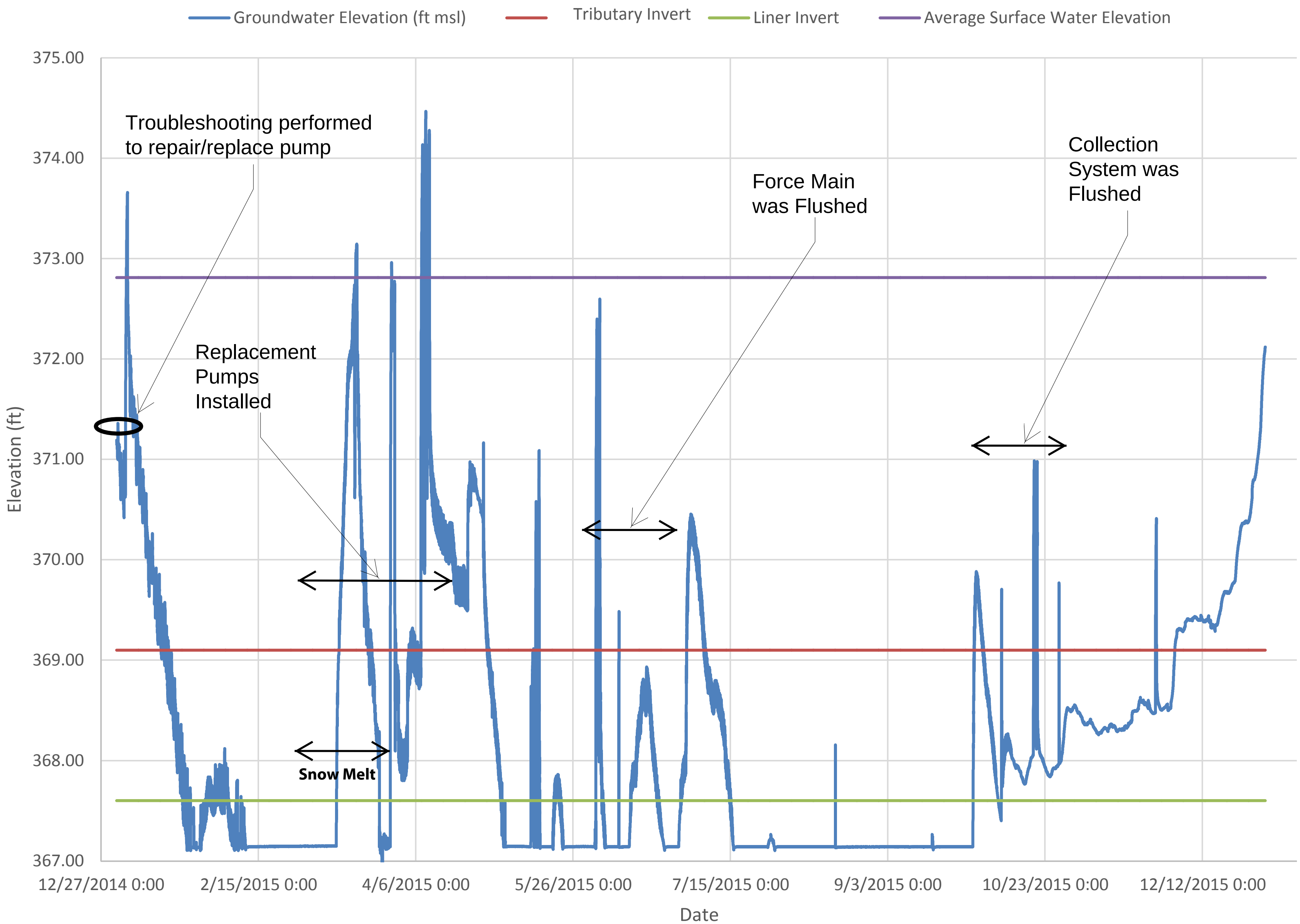

Figure B-11
Tributary 5A R1OM-5
2015 Groundwater Elevation

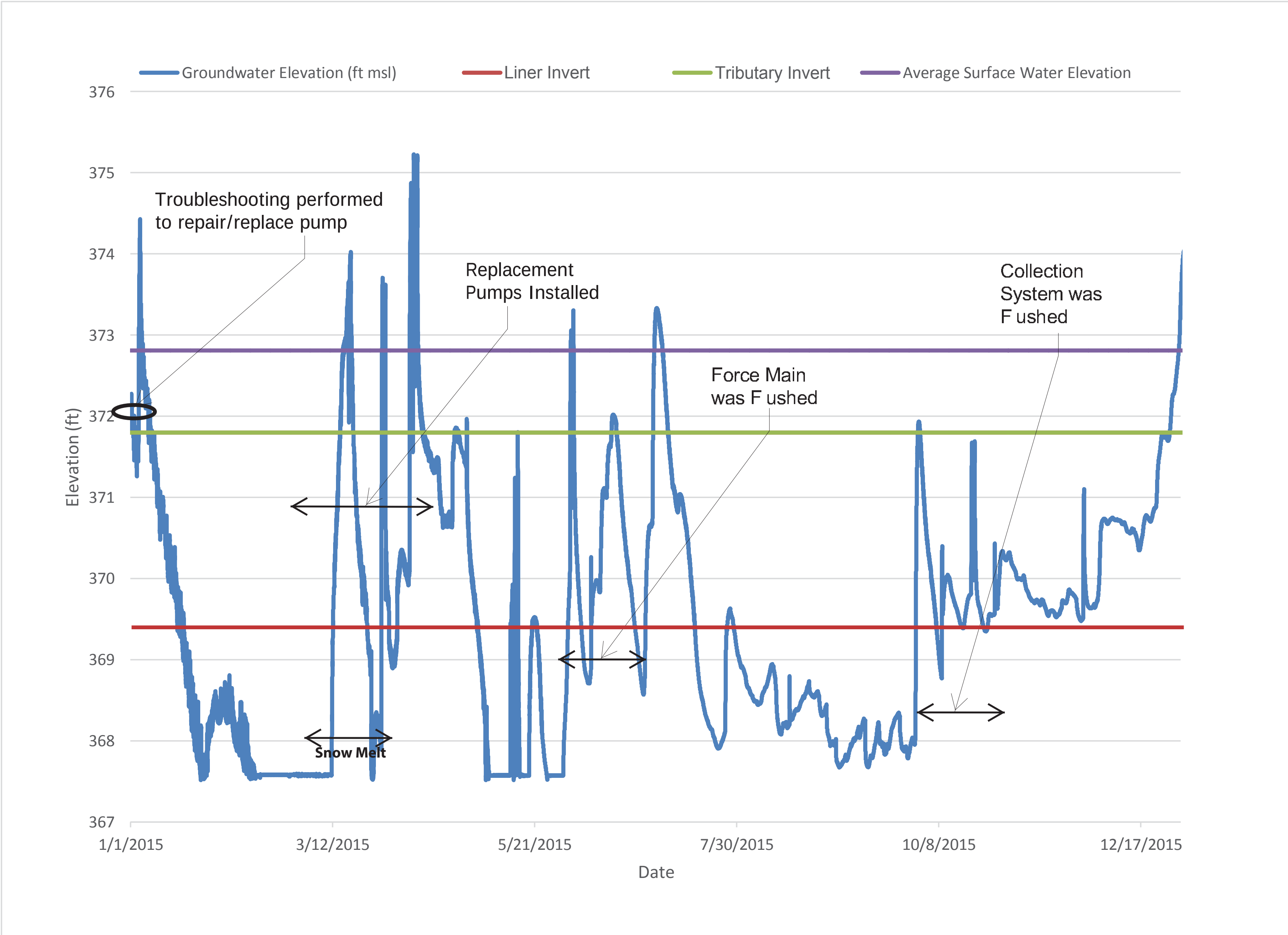

Figure B-12
Tributary 5A R1CO-11
2015 Groundwater Elevations

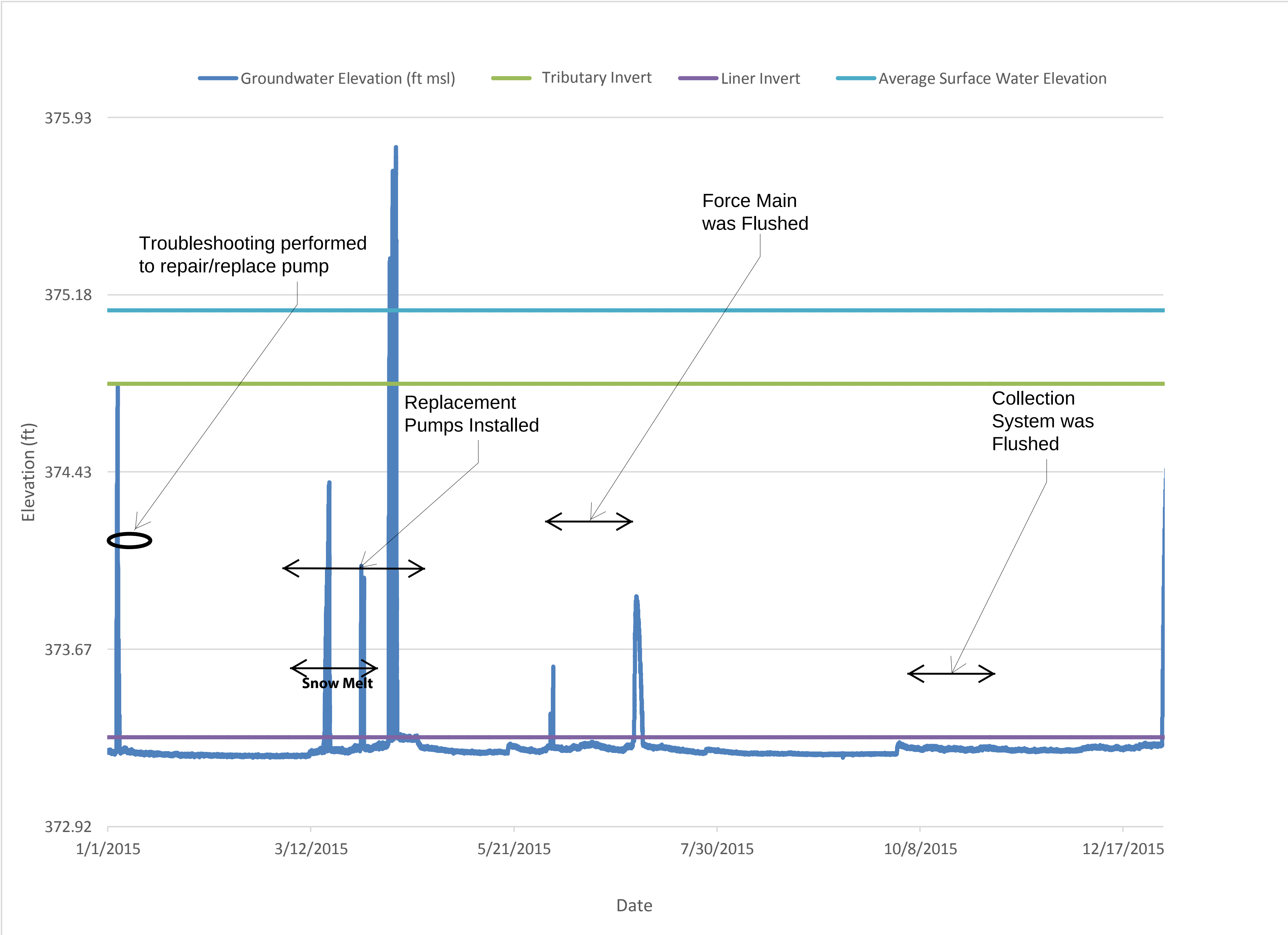

Figure B-13
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2015 Groundwater Elevations

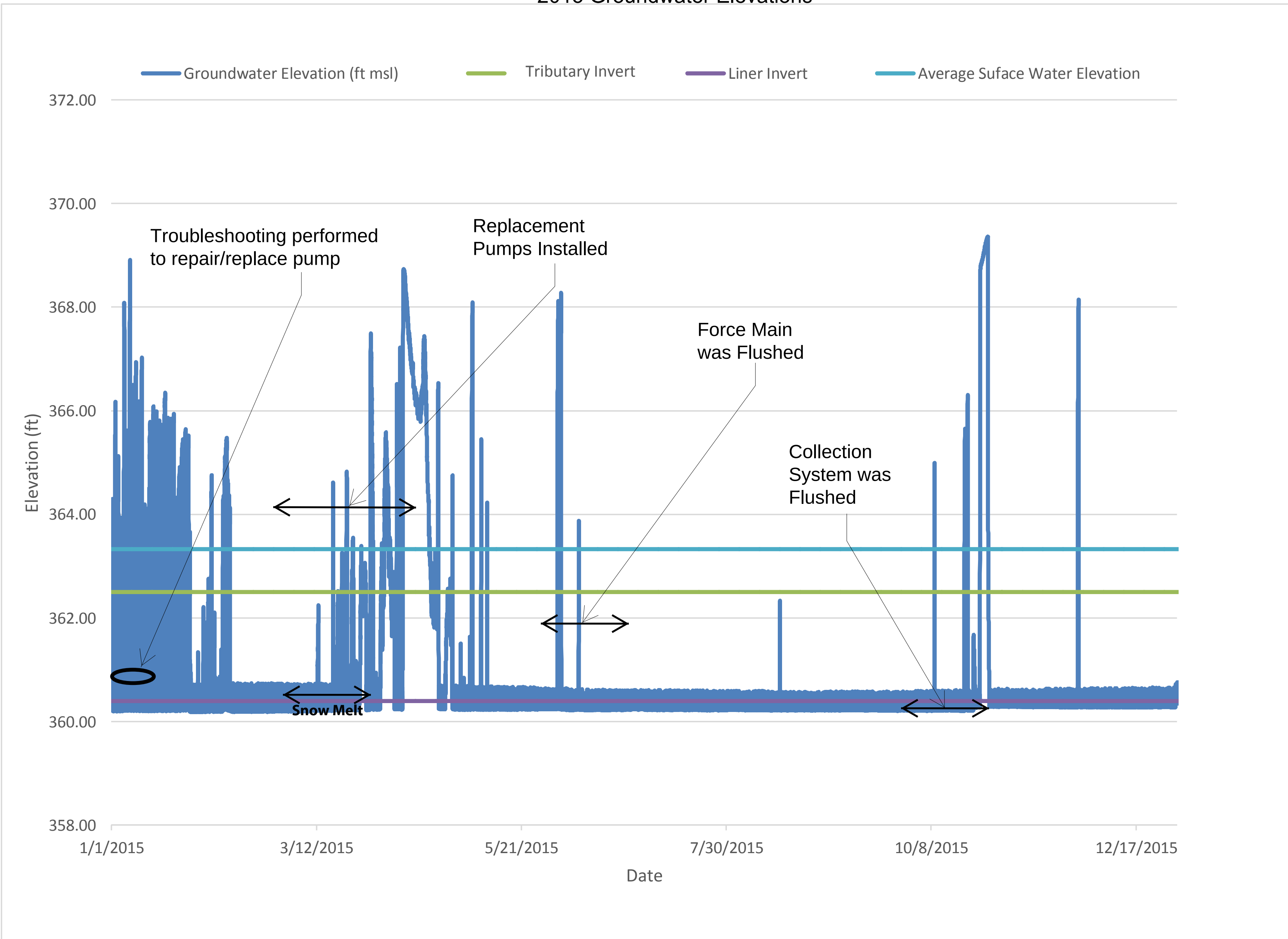


Figure B-14
Tributary 5A R2CO-3
2015 Groundwater Elevations

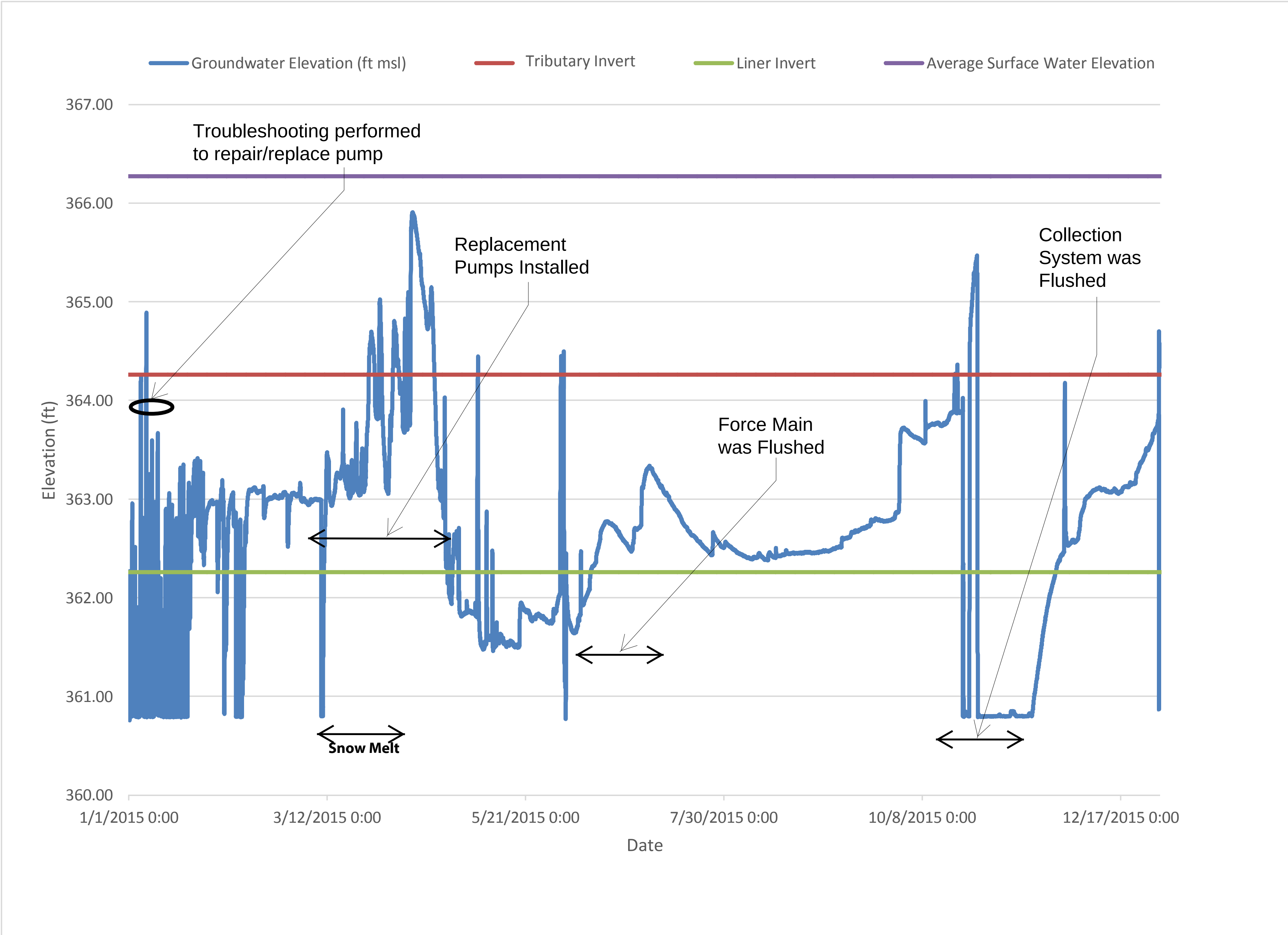


Figure B-15
Tributary 5A R2CO-8
2015 Groundwater Elevations

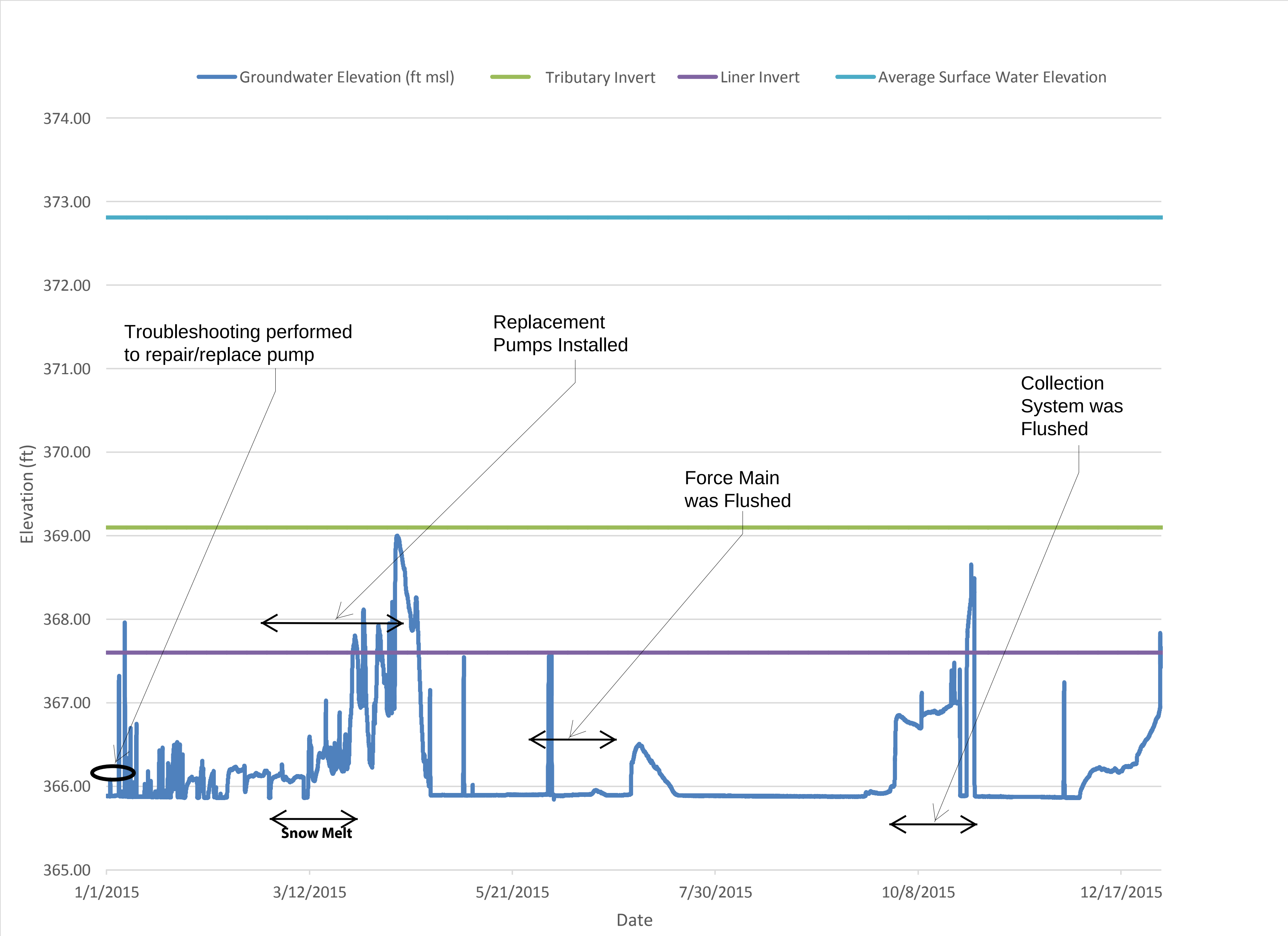


Figure B-16
Tributary 5A R1CO-1
2016 Groundwater Elevations

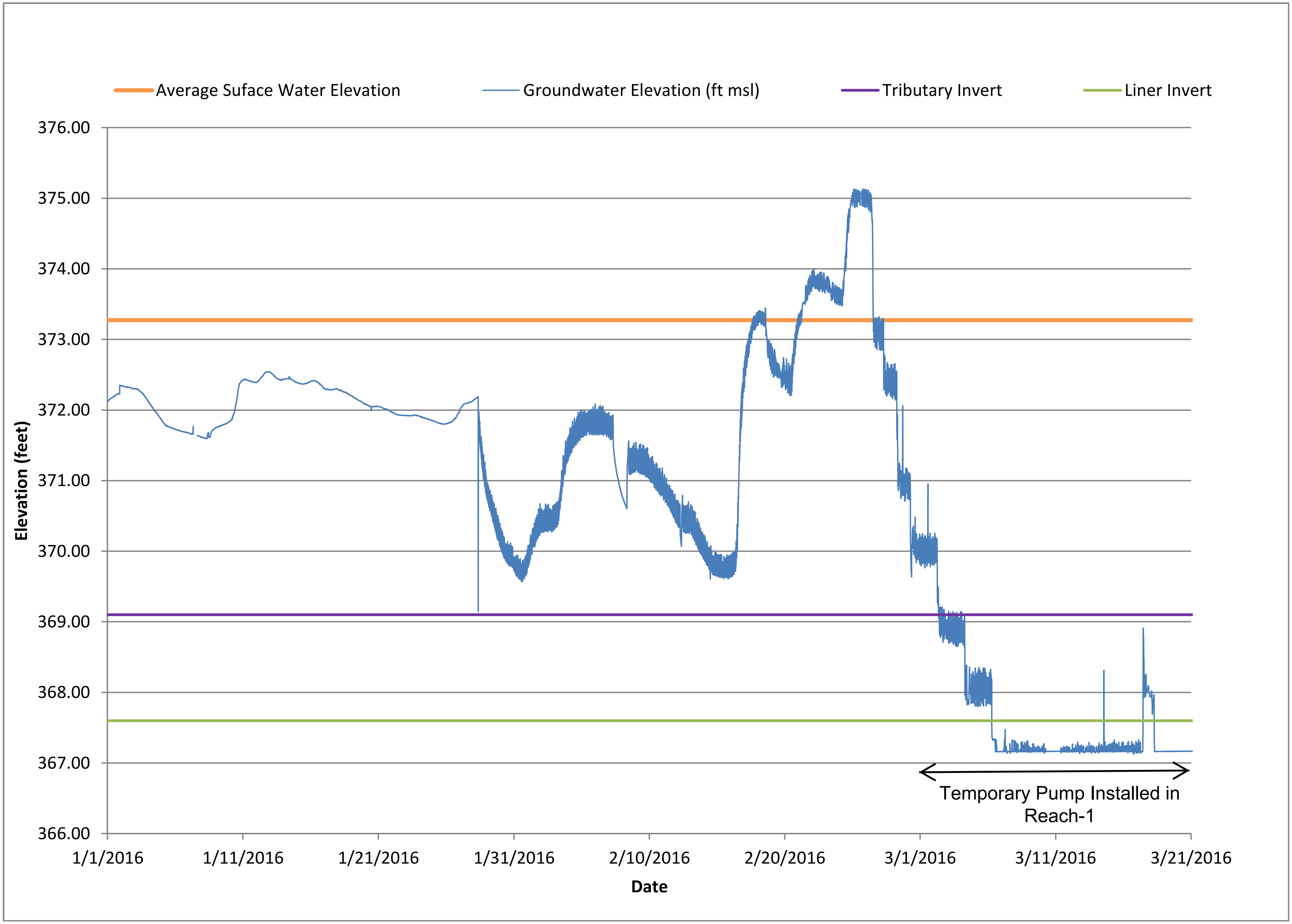


Figure B-17
Tributary 5A R1OM-5
2016 Groundwater Elevations

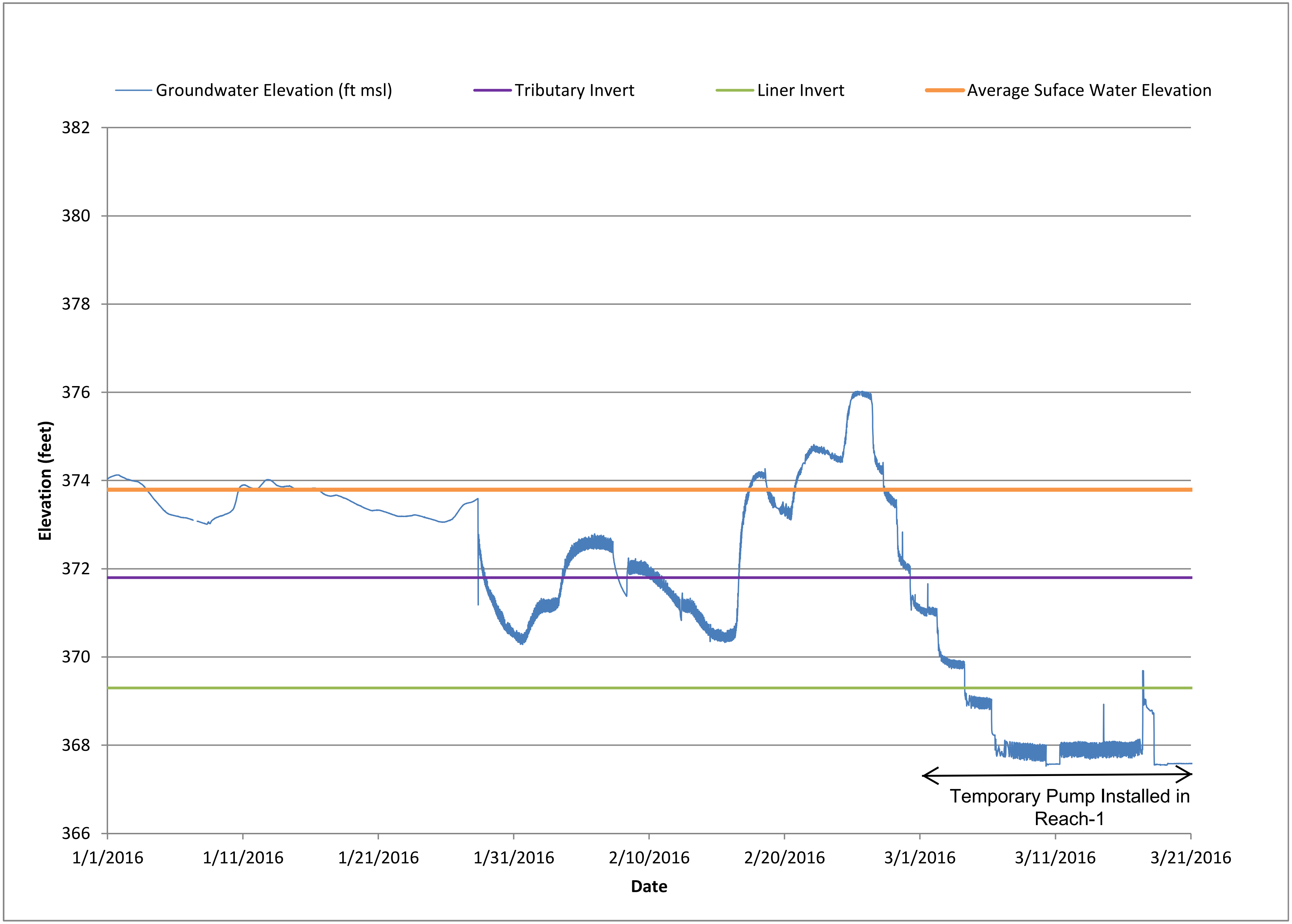


Figure B-18
Tributary 5A R1CO-11
2016 Groundwater Elevations

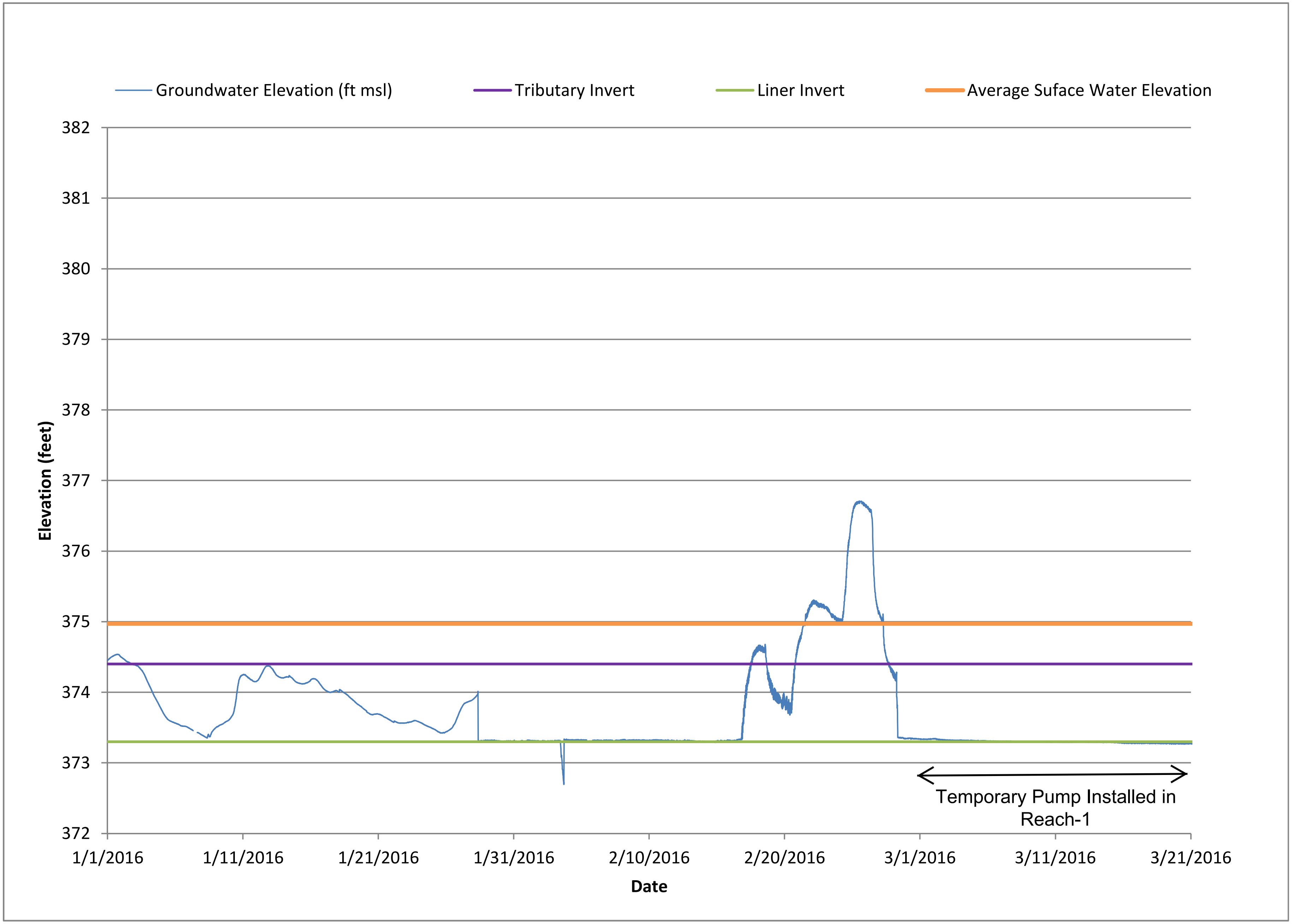


Figure B-19
Tributary 5A R2CO-1
2016 Groundwater Elevations

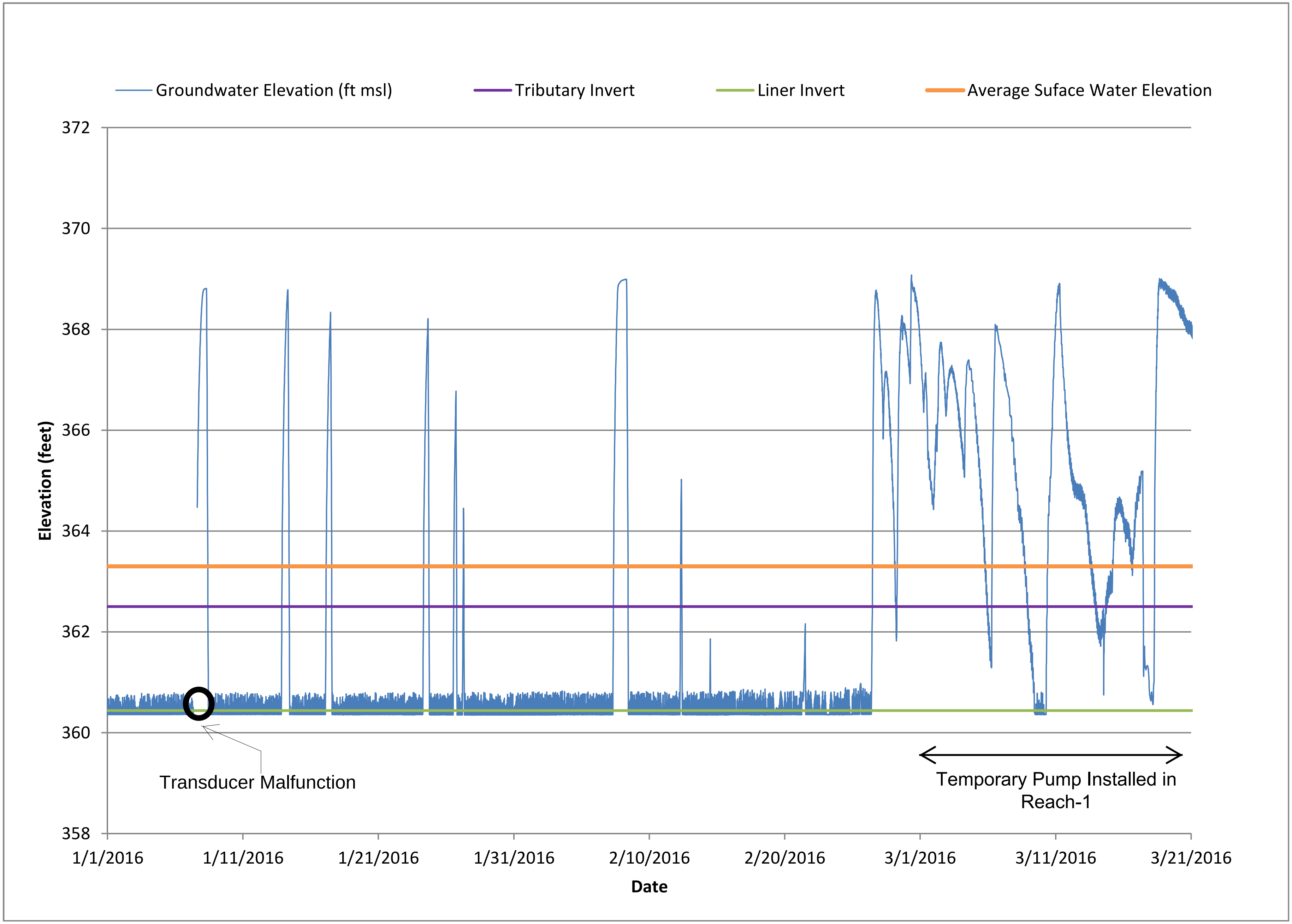


Figure B-20
Tributary 5A R2CO-3
2016 Groundwater Elevations

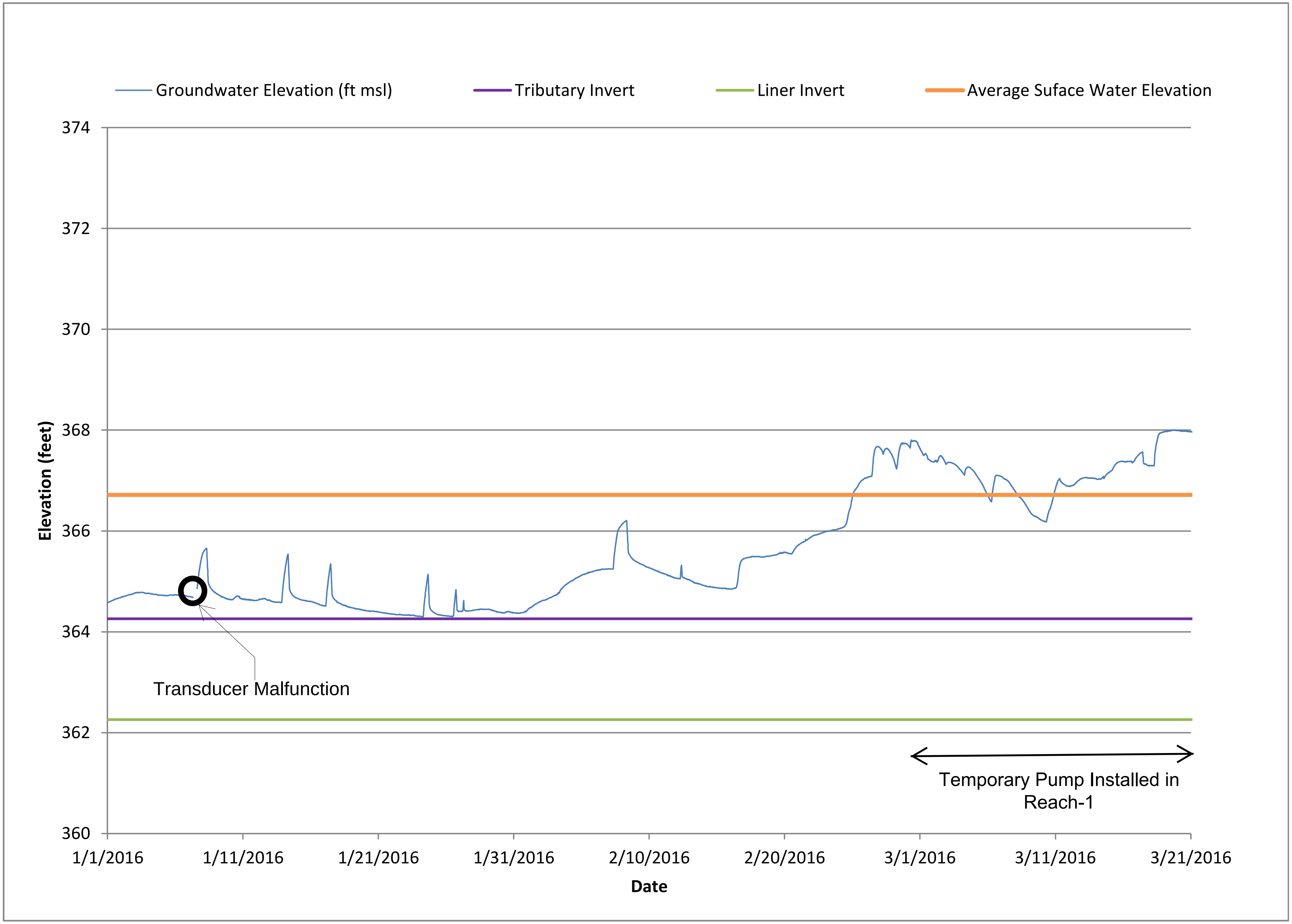


Figure B-21
Tributary 5A R2CO-8
2016 Groundwater Elevations

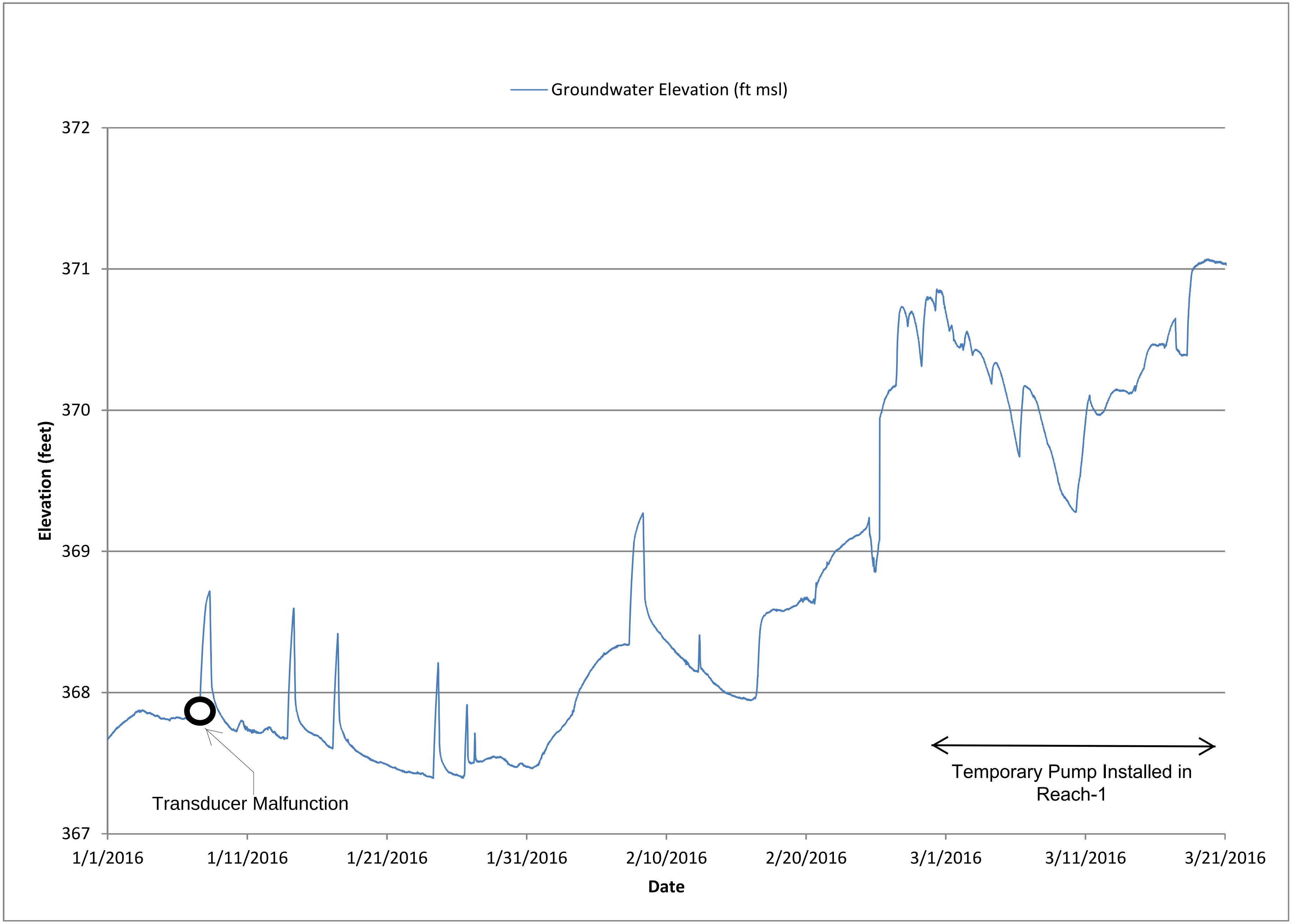


Figure B-22

Tributary 5A 2014

Surface Water Elevations

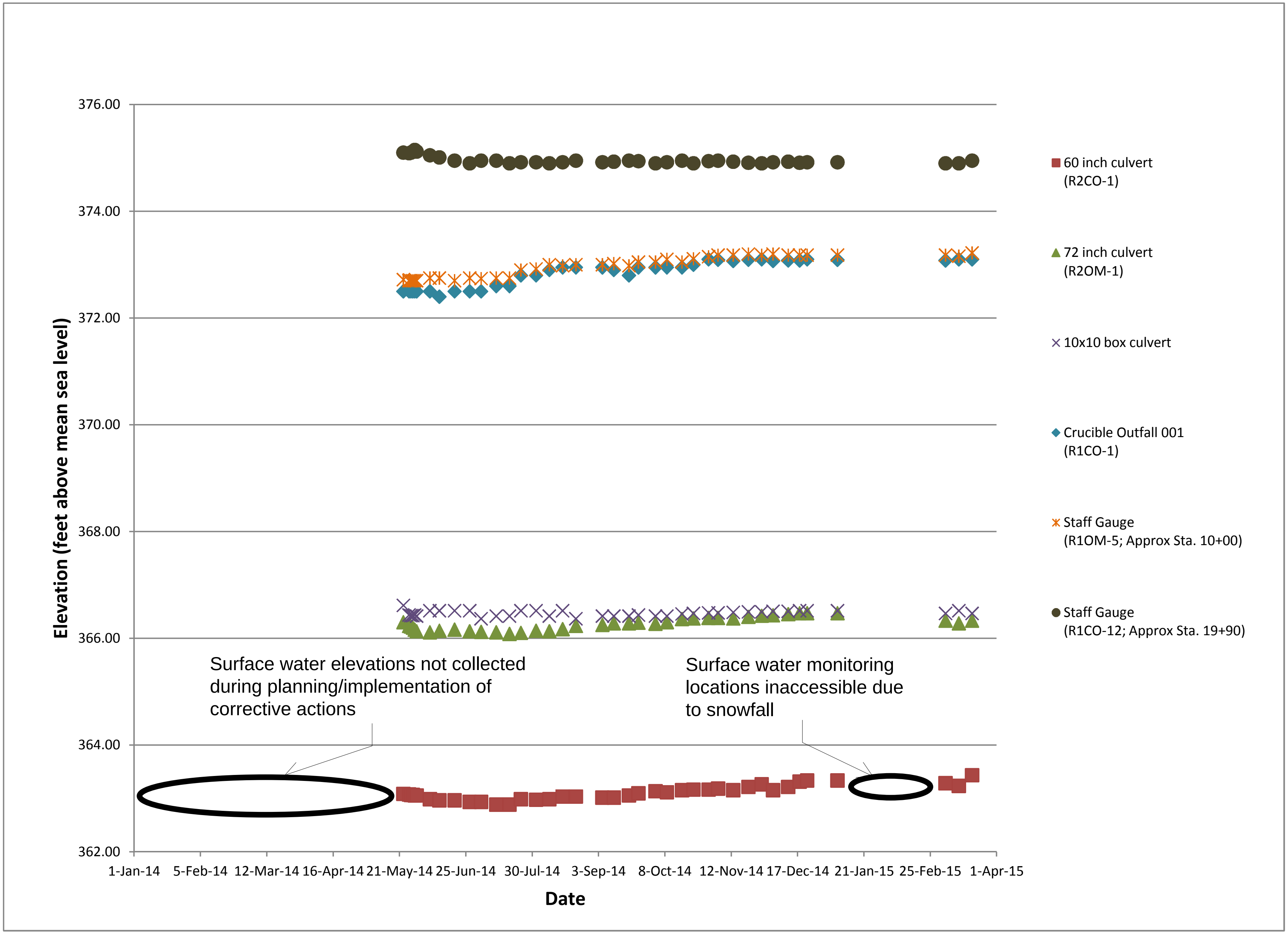


Figure B-23
Tributary 5A 2015
Surface Water Elevations

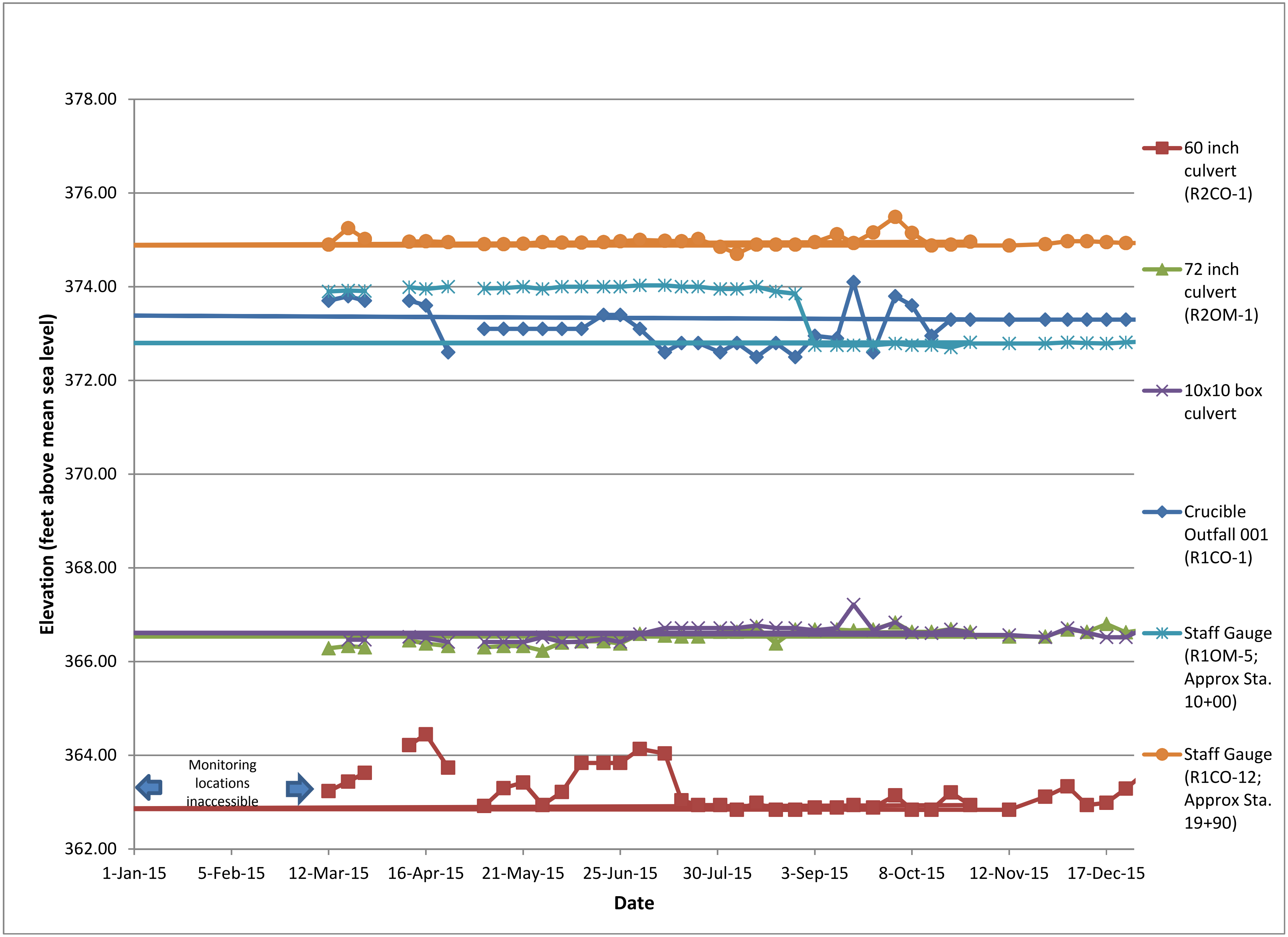
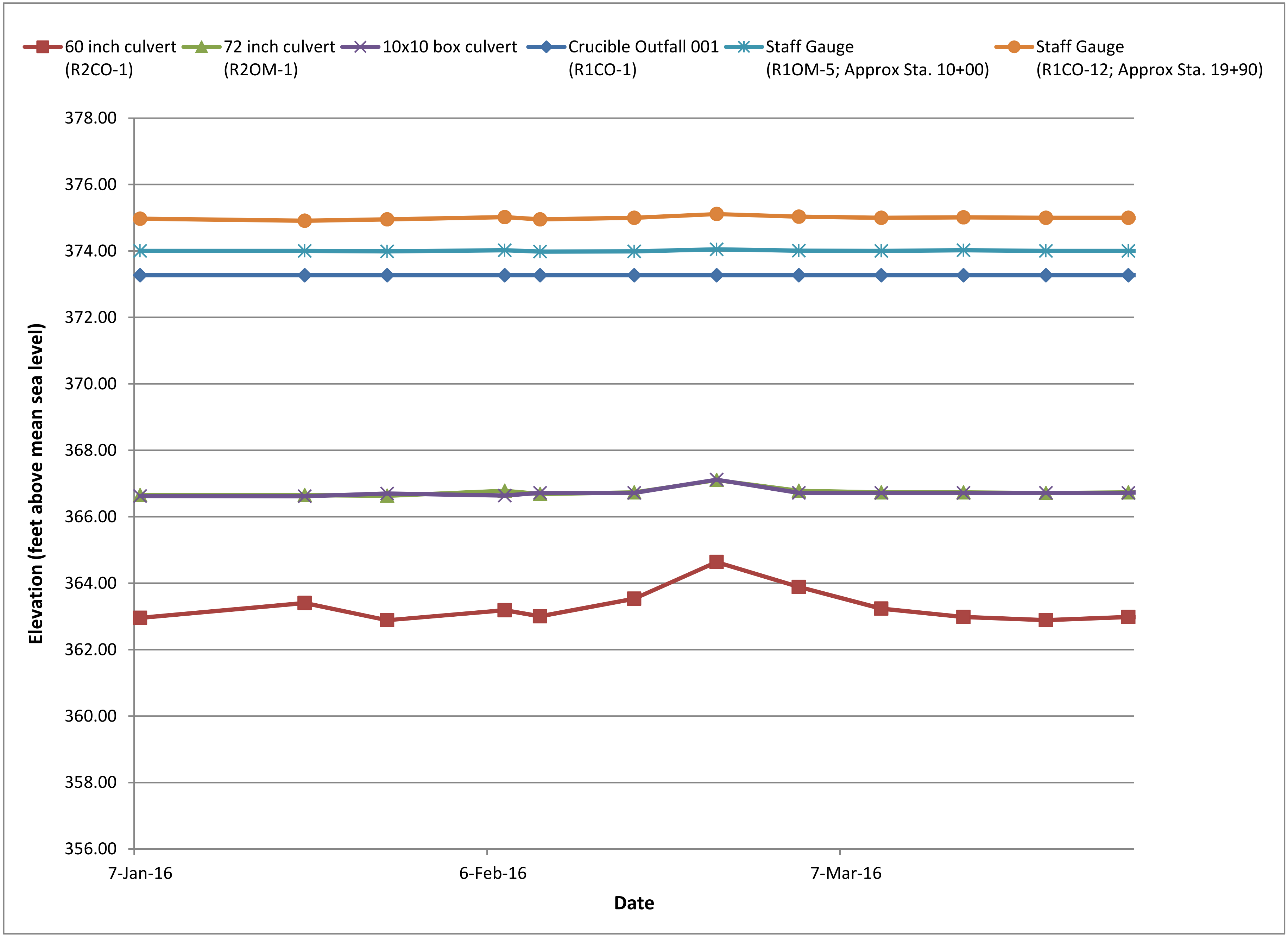


Figure B-24
Tributary 5A 2016
Surface Water Elevations



ATTACHMENT C

UPPER HARBOR BROOK

UPPER HARBOR BROOK IRM SOURCE CONTROL SUMMARY

As documented in prior Source Control Summary reports, this remediation project was undertaken to address groundwater influences to Upper Harbor Brook and Onondaga Lake, as well as impacted sediment migration to Onondaga Lake. To achieve these objectives, the Upper Harbor Brook IRM remedial action was designed, constructed, and is in operation, which has mitigated the source to Onondaga Lake. The remedial action includes the following elements:

- Three shallow groundwater collection systems (Harbor Brook -1 and -2 and the I-690 Drainage Ditch)
- Three passive non-aqueous phase liquids (NAPL) collection systems
- Two pump stations and force main to convey collected groundwater to Willis Groundwater Treatment Plant (GWTP) for treatment
- Removal of sediments from ditches, wetlands and open water areas of the brook
- Installation of an isolation barrier (geomembrane liner or concrete)
- Sealing of leaks in the culverts
- Restoration of ditches, the brook bed and wetlands.

Construction of the remedial action is further described in the *Upper Harbor Brook IRM Construction Completion Report* (OBG, 2014).

SOURCE CONTROL BACKGROUND

The primary means of source control was achieved by the installation of a geomembrane liner or concrete liner in the four open water areas of Harbor Brook, the I-690 Drainage Ditch, and a section of the D/E Drainage Ditch, which ultimately created an isolation barrier. The geomembrane liner is located beneath the open water channel bottom and extends up channel side slopes on both sides where it is anchored into the soil (See **Figure C-1** for a typical cross-section). Cracks and holes were also sealed in the culverts. The isolation barrier is the primary engineering control that minimizes the potential for impacted groundwater to discharge into Harbor Brook, and subsequently Onondaga Lake.

The groundwater collection systems provide additional means of minimizing the potential for impacted groundwater to discharge to Harbor Brook by creating preferential groundwater flow away from the brook and to the collection trench. See **Figure C-1** for a typical cross-section and **Figure C-2** for Site Plan.

The passive NAPL collection system provides a means to monitor for the presence of NAPL. The monitoring locations are shown on **Figure C-2**.

GROUNDWATER COLLECTION SYSTEM INFORMATION

The Upper Harbor Brook groundwater collection systems were operational throughout 2014, 2015, and into 2016. Approximately 43 million gallons of groundwater were collected and treated during these two years of operation. Performance verification and monitoring, which included data collection and interpretation was performed as described in the *Performance Verification and Monitoring (PV&M)* Plan (OBG 2015a). Refer to the *2014 Annual Report* (OBG 2015b*) and 2015 Annual Report* (OBG 2016) for additional details on groundwater collection system operation, performance verification and monitoring. Corrective actions performed to maintain groundwater collection system performance are summarized in the *2015 Annual Report* (OBG 2016), which included collection pipe and force main flushing. Acid additions to the pump stations has continued to be utilized as a preventative maintenance measure to minimize impacts caused by the buildup of scale.

This summary provides an overview of groundwater elevation data from January 2014 through March 2016.

The groundwater elevations in the Harbor Brook -1 and -2 collection trenches have generally been maintained below the surface water elevation in Onondaga Lake since January 2014, which is further described below:

As described in the PV&M Plan (OBG 2015), the performance verification criterion for the Harbor Brook -1 and -2 collection trenches is that the groundwater elevations in these collection trenches are maintained below the surface water elevation in Onondaga Lake. Onondaga Lake surface water elevations are obtained from a United States Geologic Survey operated gauge on Onondaga Lake at Liverpool, New York.

The operational goal is to maintain groundwater elevations in the Harbor Brook -1 and -2 collection trenches at approximately the top of the substrate in OW-3 (361.6) for Harbor Brook –1 collection trench and OW-1 (360.9) for Harbor Brook -2 collection trench. The operational goal is used as an indicator to evaluate the need for collection system cleaning before groundwater elevations reach the Onondaga Lake surface water elevations.

Figure C-3 through **Figure C-8** depict the Onondaga Lake surface water elevations, groundwater elevations, and open water channel invert elevations for the two groundwater collection systems.

During this monitoring period, the Harbor Brook – 1 and – 2 groundwater collection systems operated as designed and met the performance verification criteria except during five and nine monitoring events, respectively (See **Figures C-3** through **C-8**). Corrective actions performed were successful in achieving the performance criterion in Harbor Brook -1 and -2 collection trenches, which included flushing of collection trench and force main piping, pump maintenance via bulk acid addition to the wet well and pump replacement. The I-690 Drainage Ditch collection system was operational during the monitoring period with only a brief exceedance of the operational goals in February 2016. System flushing was performed, as necessary.

Although the data demonstrated spikes in groundwater elevations that exceeded the performance verification criteria, the installed liners provide a redundant measure to further minimize the potential for impacted groundwater to reach Onondaga Lake. Based on field observations, the liner for all three collection systems appears to be intact and functioning as intended.

PASSIVE NAPL COLLECTION SYSTEM

The passive NAPL collection systems were monitored during 2014 and 2015, as described in the *Performance Verification and Monitoring (PV&M)* Plan (OBG 2015a). Refer to the *2014 Annual Report* (OBG 2015b*) and 2015 Annual Report* (OBG 2016) for additional details.

In 2015, visual inspections were performed on groundwater samples collected from each NAPL-1, -3, and -4 (See **Figure C-2**). The visual inspection consisted of placing the groundwater samples in separate 1-liter glass jars that were allowed to settle for approximately 5 days.

Based on visual inspection, no significant signs of NAPL were present in the 2015 samples.

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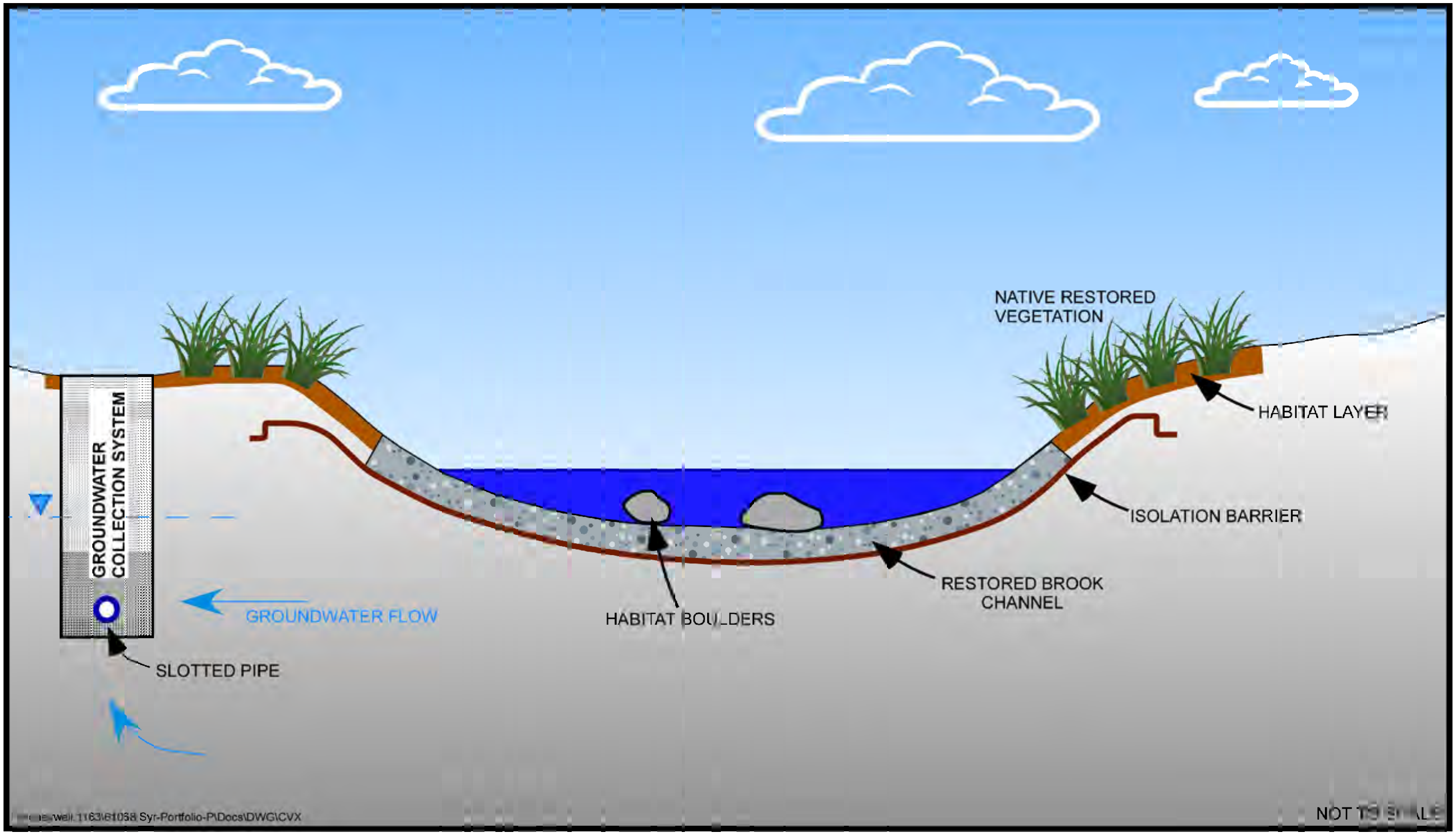
FIGURE C-1



HONEYWELL INTERNATIONAL INC.
UPPER HARBOR BROOK
SYRACUSE, NEW YORK

1163.61068
MARCH 2016

UPPER HARBOR BROOK
TYPICAL ISOLATION BARRIER AND GROUNDWATER COLLECTION SYSTEM DETAIL

O'BRIEN & GERE ENGINEERS, INC.

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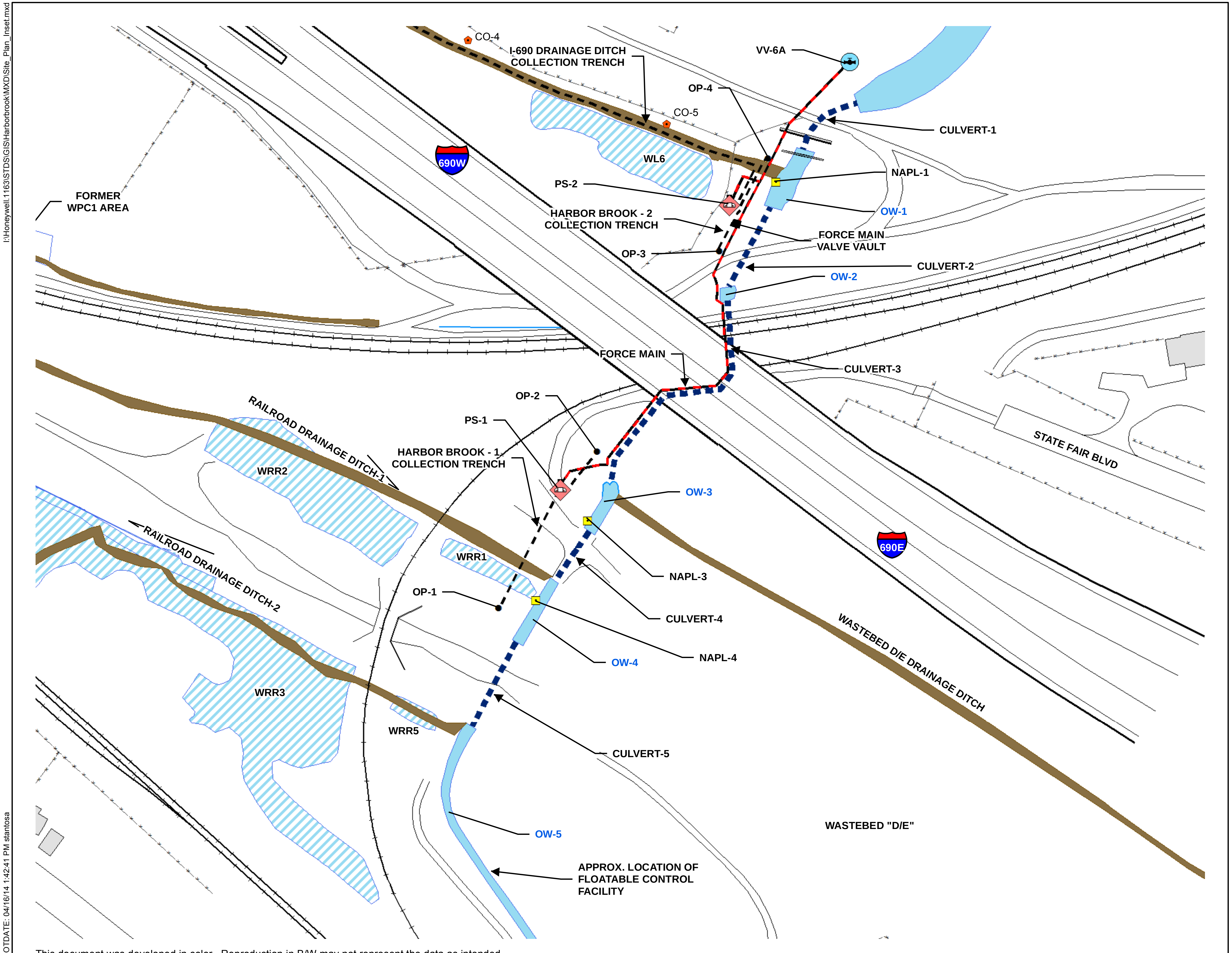
FIGURE C-2



LEGEND

- PUMPSTATION
- VALVE VAULT
- GROUNDWATER OBSERVATION PORT
- NAPL OBSERVATION PORT
- CLEAN OUT
- GROUNDWATER COLLECTION PIPE
- CULVERT
- FORCE MAIN
- FENCELINE
- RAILROAD
- HIGHWAY
- ROAD
- WETLAND
- OPEN WATER
- DITCH
- BUILDINGS

HONEYWELL INTERNATIONAL INC.
UPPER HARBOR BROOK IRM
SYRACUSE, NEW YORK

GROUNDWATER COLLECTION SYSTEMS AND PUMP STATIONS

APRIL 2014
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Figure C-3
Harbor Brook-1 2014
Groundwater Elevations

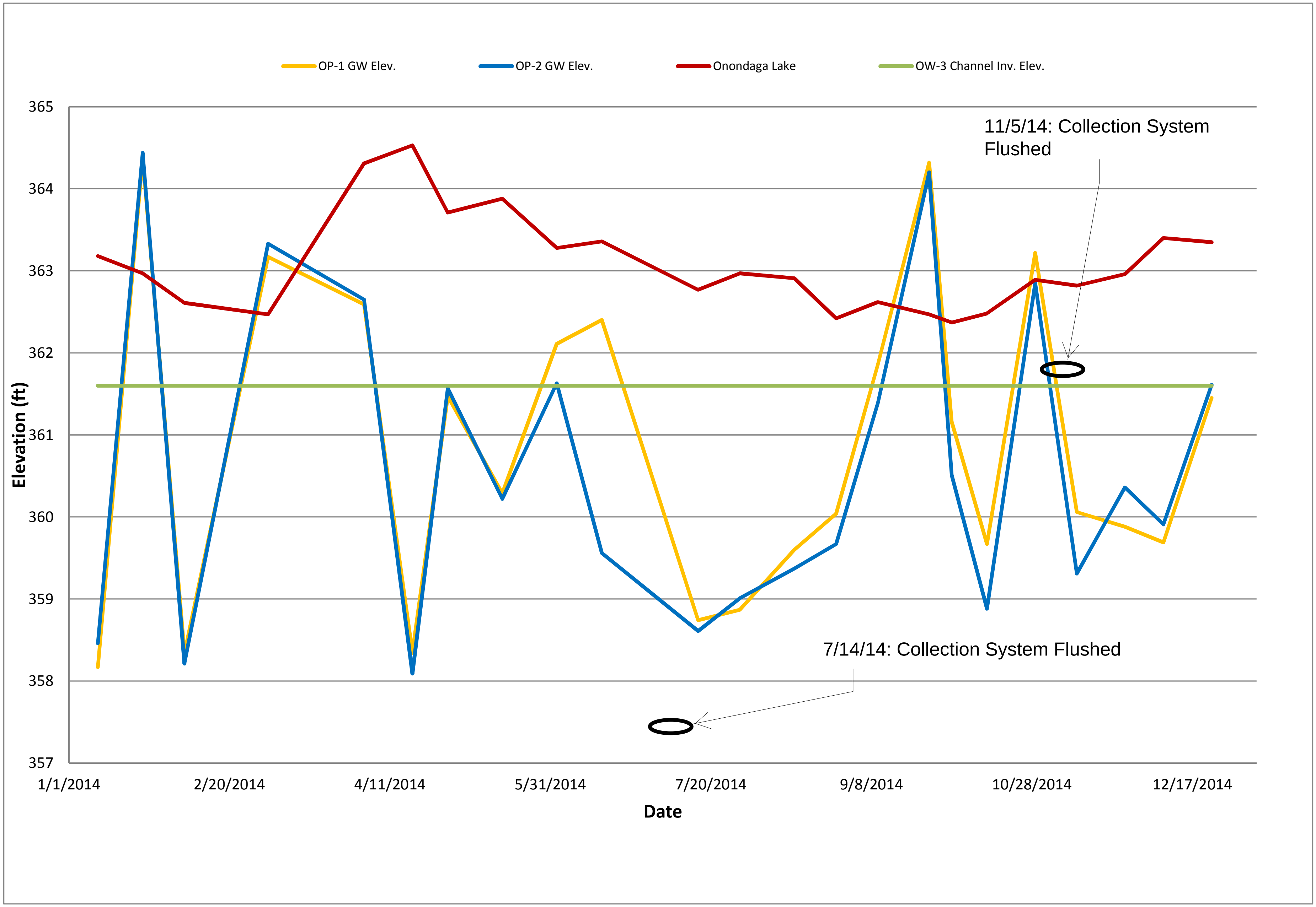


Figure C-4
Harbor Brook-2 2014
Groundwater Elevations

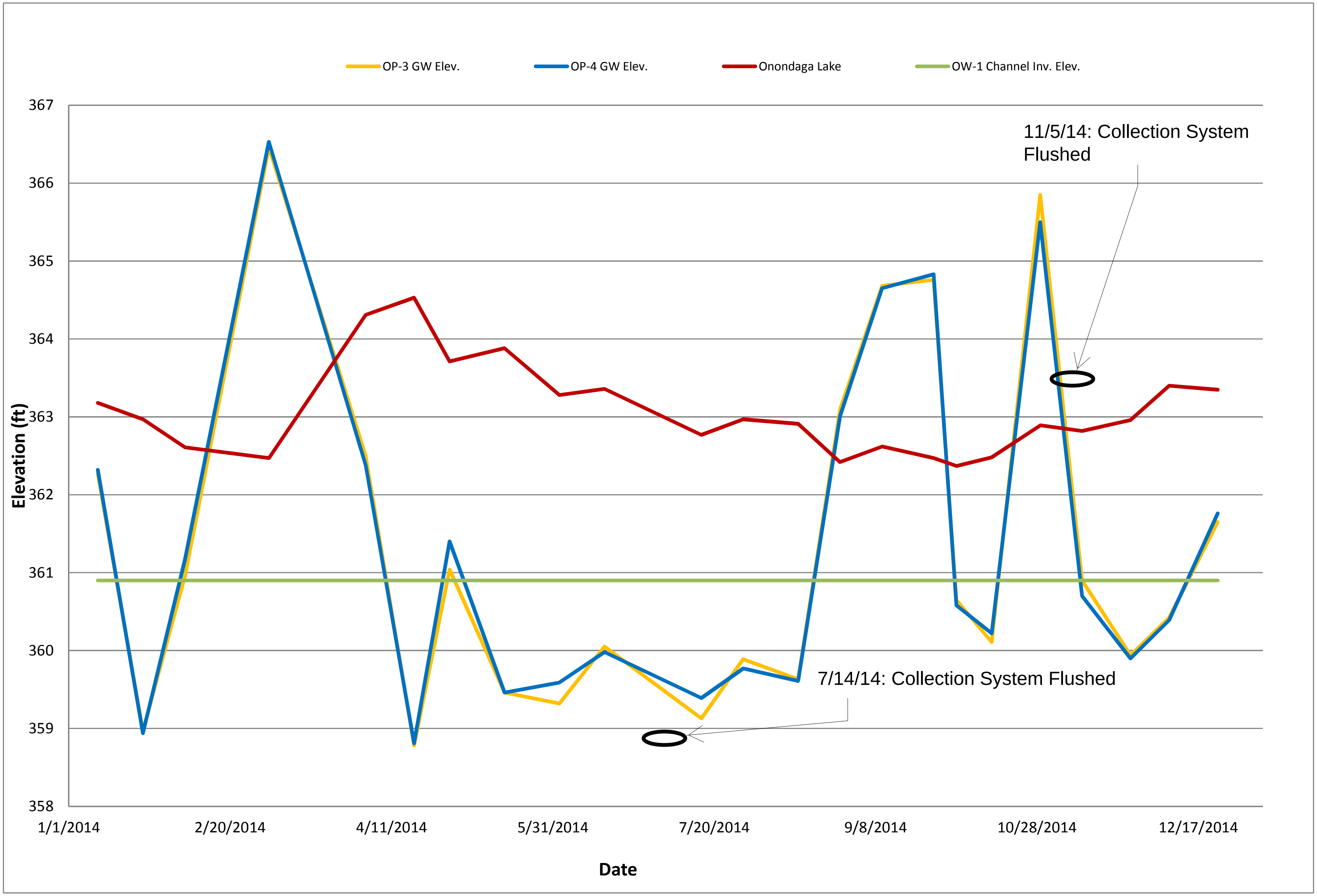


Figure C-5
Harbor Brook-1 2015
Groundwater Elevations

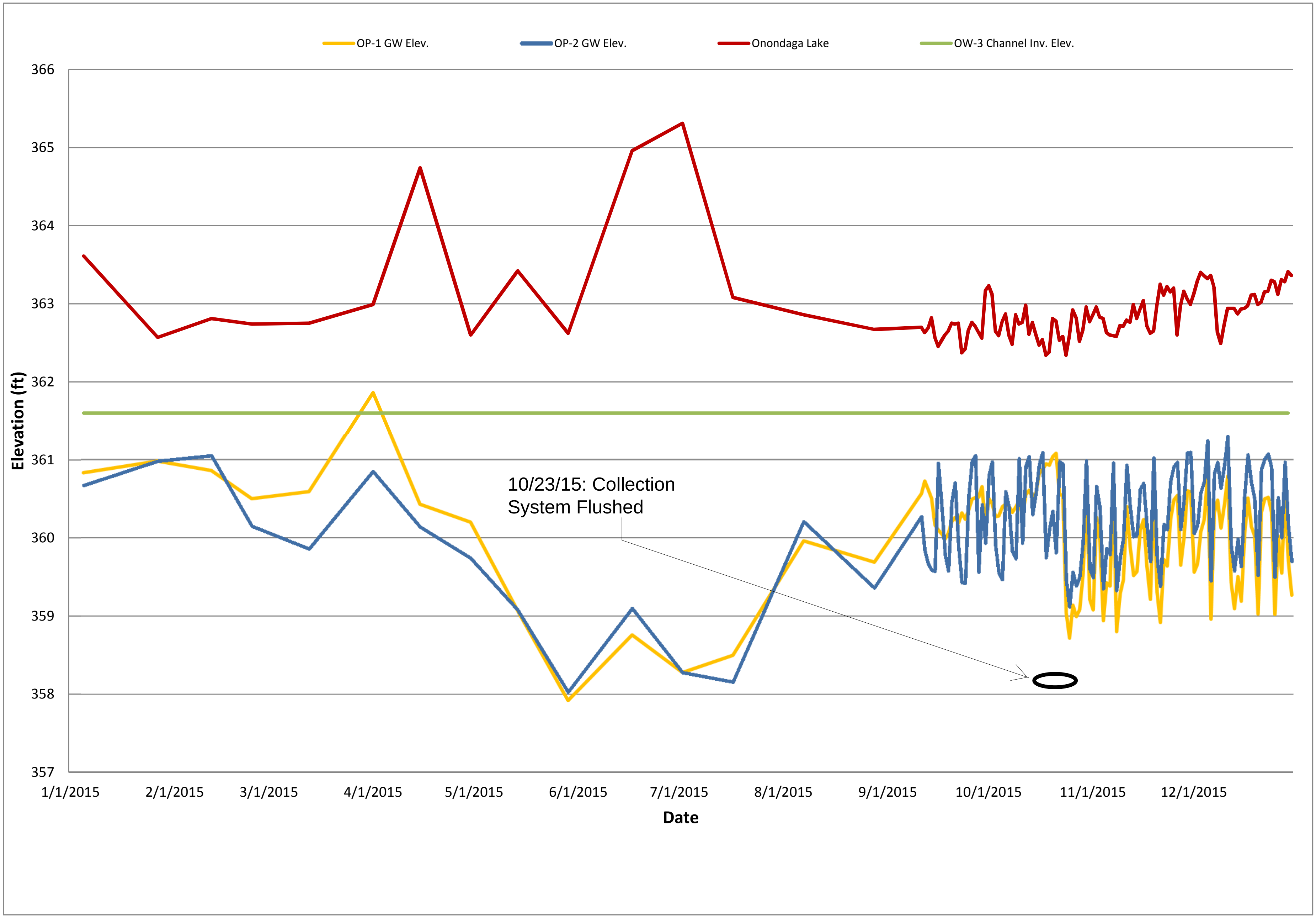


Figure C-6
Harbor Brook-2 2015
Groundwater Elevations

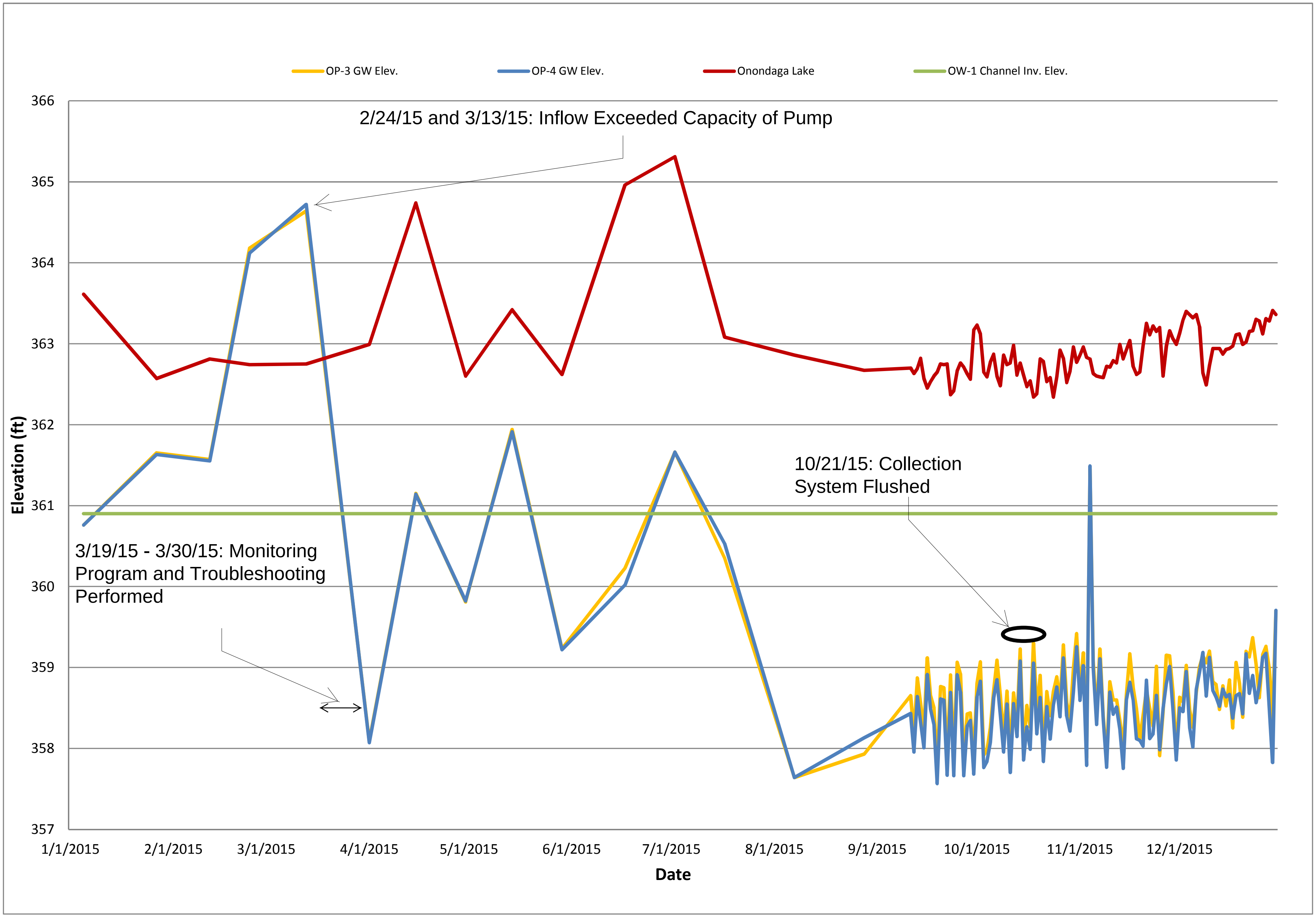


Figure C-7
Harbor Brook-1 2016
Groundwater Elevations

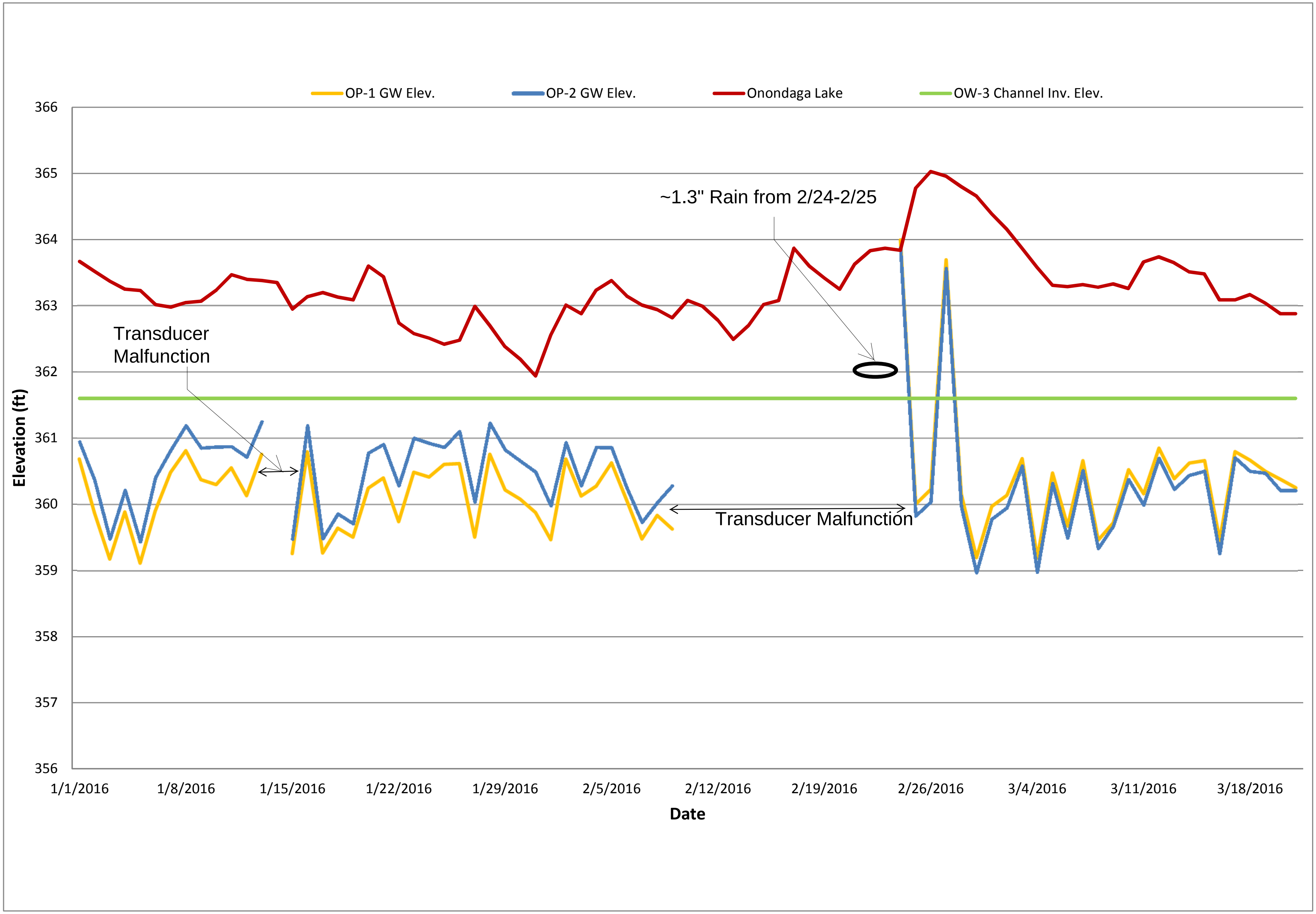
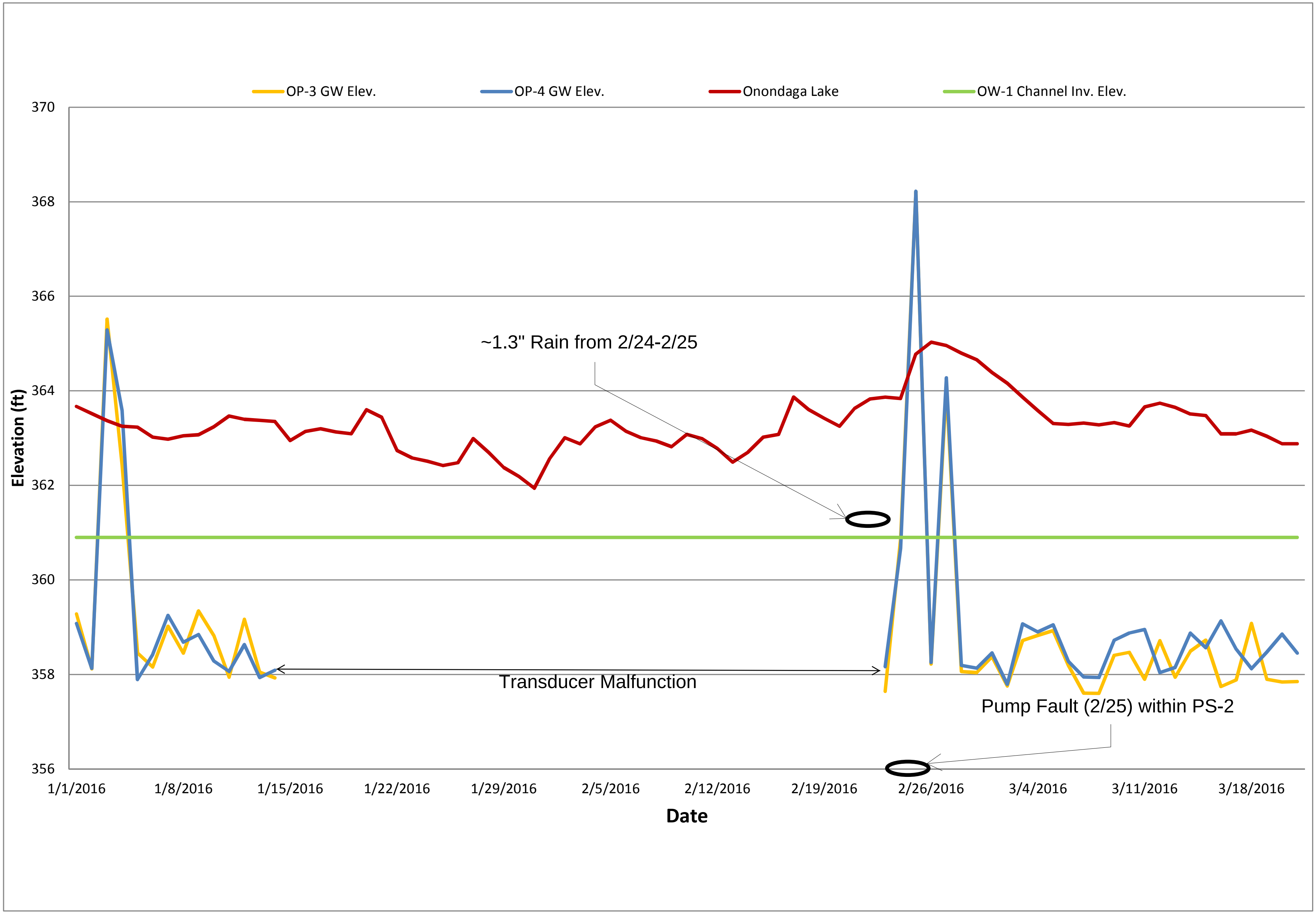


Figure C-8
Harbor Brook-2 2016
Groundwater Elevations



ATTACHMENT D

WASTEBEDS 1-8, DITCH A, AND NINEMILE CREEK

WASTEBEDS 1-8 INTEGRATED IRM SOURCE CONTROL SUMMARY

The Wastebeds 1-8 Integrated Interim Remedial Measure (IRM) was undertaken to address groundwater and seep discharges to Onondaga Lake and Ninemile Creek (NMC), as well as Ditch A solids (*e.g.,* precipitate, accumulated road run-off materials, and ditch soils, etc.) migration to Onondaga Lake and NMC (**Figure D-1**).

To achieve these objectives, the Integrated IRM included shallow and intermediate groundwater (and seep) hydraulic control, as well as Ditch A solids removal and erosion and control measure installation and maintenance, as described in the *Revised Final Design Report* (OBG 2013a). The groundwater hydraulic control systems include NMC, Eastern Shoreline, and Remediation Area A (RA-A), as detailed below.

This summary provides an overview of the groundwater hydraulic control systems construction and start-up activities (*i.e.*, operational verification) as well as Ditch A maintenance activities performed in beginning in 2014 and up through the end of March 2016.

HYDRAULIC CONTROL SYSTEMS

The hydraulic control system performance verification is separated into the following phases:

- Wet well and collection trench start-up (*i.e.*, operational verification)
- Long-term performance verification
- Optimization and modeling.

Operational verification activities were completed as described in the *WB 1-8 Integrated IRM Start-Up Plan* (OBG 2013b). The *Draft Wastebeds 1-8 Integrated IRM Performance Verification and Monitoring Plan* (OBG 2014a) provides details related to the long-term performance verification, optimization, and modeling of the hydraulic control systems. These performance verification phases provide the information necessary to demonstrate operational verification and that the hydraulic control systems meet the IRM objective to mitigate groundwater discharges to Onondaga Lake.

The purpose of the long-term performance verification is to demonstrate that the performance verification criterion (*i.e.,* the creation of an inward hydraulic gradient from Onondaga Lake to the hydraulic control system) is being achieved and that the system is operating as designed. During the early phase of long-term performance verification *(i.e.*, initial long-term performance verification), operation and monitoring data are being collected and evaluated to refine the hydraulic control system operation and optimize the system performance. Additionally, during this time, troubleshooting and scheduled maintenance are being performed to further optimize system performance.

Following operational verification, a start-up summary report will be prepared and submitted to NYSDEC for each hydraulic control system, and long-term operation and performance verification monitoring will be initiated, as described in the *Draft Wastebeds 1-8 Integrated IRM Performance Verification and Monitoring Plan* (OBG 2014a).

Water level data indicate successful shallow groundwater hydraulic control with periodic exceptions during scheduled maintenance, extreme weather conditions, and elevated lake levels. The following sections provide additional details for each of the three hydraulic controls systems.

EASTERN SHORELINE HYDRAULIC CONTROL SYSTEM

For the purpose of this summary, the Eastern Shoreline has been divided into two sections; the Lakefront section and the Ditch A section. Construction of both systems have been completed (**Figure D-2**).

The following provides a summary of operational verification and initial long-term performance verification for the Eastern Shoreline hydraulic control system Lakefront.

Eastern Shoreline Lakefront Section

The Eastern Shoreline Lakefront hydraulic control system consists of the following elements:

- Seep apron and collection system
- Hydraulic control system (*i.e*., groundwater collection system), approximately 6,600 feet long
- Pump station and force main to convey collected groundwater to the Willis Groundwater Treatment Plant (GWTP) for treatment.

In December 2014, the interim start-up phase (*i.e.,* operational verification) was completed, as described in the *Draft Wastebeds 1-8 Integrated IRM Eastern Shoreline Lakefront Section Start-Up Summary Report* (OBG 2015). As such, the Eastern Shoreline Lakefront Section is considered to be in the initial performance verification phase. During the initial verification phase, wet well elevations, pump data, groundwater elevations, and surface water elevations are collected and evaluated weekly. This information is used to aid in hydraulic control system operation process refinement and troubleshooting, which is on-going.

The initial performance verification phase summarized within this report section is for the monitoring period from January 2015 through March 2016. In 2015 and 2016, a total of approximately 150 million gallons of water were collected by both sections of the Eastern Shoreline hydraulic control system and the seep collection system. That represents an average collection rate of 228 gallons per minute (gpm). The design flow rate calculated for these systems was 133 gpm.

Water-level monitoring was performed to assess the performance of the Eastern Shoreline Lakefront hydraulic control system. Collection trench operation is evaluated by monitoring water levels at the Eastern Shoreline Pump Station (ELSPS) at the east end of the lakefront trench and observation port 20 (OP-20) at the west end of the trench. **Figure D-3** presents the water-level data obtained for the ELSPS and OP-20 during 2015 and F**igure D-4** present data for the first quarter of 2016, processed using a rolling 30-day average. For comparison, the water-level data for the lake obtained from USGS gage 04240495 Onondaga Lake are also shown. **Figure D-5 and Figure D-6** also identify unusual weather events and maintenance activities that impacted system operations. The instantaneous (*i.e.*, unprocessed) collection trench water-level data are used to determine what system maintenance activities should be performed by the O&M contractor. These water-level data are presented graphically as **Figures D-5** and **D-6**. For reference, daily precipitation (excluding snowfall) at the site is shown on **Figures D-7 and Figure D-8**, along with the instantaneous lake level data.

Water-level monitoring is also performed in piezometers installed along and below the trench. **Figure D-9 through Figure D-14** present the rolling 30-day average water-level data obtained from 12 piezometers (PZ-28 through PZ-39 and PZ-48) during 2015 and 2016. The water-level data for the piezometers are segregated into three figures coinciding with Remediation Area B (RA-B), Remediation

Area C (RA-C), and the area of lakeshore without capping activities (Non-Cap Area). For completeness, the instantaneous water-level data for the three lakeshore areas are presented graphically as **Figure D-15** through **Figure D-20.**

The data indicate general achievement of hydraulic control along the eastern lakeshore with periodic exceptions during scheduled maintenance, extreme weather conditions, and elevated lake levels. The hydraulic control system performance appears to be improving as the shoreline stabilization and restoration activities progress along the eastern lakeshore.

Ditch A Section

Eastern Shoreline Ditch A construction (**Figure D-2**) was completed in summer 2015. The Eastern Shoreline Ditch A hydraulic control system consists of the following elements:

- Hydraulic control system (*i.e*., groundwater collection system), approximately 280-feet long
- Pump station and force main to convey collected groundwater to the Willis GWTP for treatment.

As described above, the start-up phase was completed in December 2014 for the lakefront section. However, due to ongoing construction within Ditch A, this section of the hydraulic control system startup has not been initiated. In addition to PZ-27 currently being under a temporary access road, other remedial measures to prevent surface water from infiltrating into the hydraulic control system are not yet in place.

Although hydraulic control system startup has not be initiated, wet well elevations, pump data, groundwater elevations, and surface water elevations are being collected and evaluated weekly. This information is used to aid in the interim hydraulic control system operation process refinement and troubleshooting, until the startup has been completed.

Currently water-level monitoring is performed to assess the Eastern Lakeshore Ditch A hydraulic control system performance, consistent with the Eastern Lakeshore Lakefront section. Collection trench operation is evaluated by monitoring water levels at the ELSPS at the west end of the Ditch A trench and cleanout 1 (CO-01) at the east end of the trench (**Figure D-1)**. **Figure D-4** presents the water-level data from 2016, both processed using a rolling 30-day average. Comparison are consistent with the Lakefront section of the system. As described above, the instantaneous water-level data are used to determine what system maintenance activities should be performed by the O&M contractor. These data are presented graphically as **Figure D-5** and **Figure D-6**, and daily precipitation (excluding snowfall) and instantaneous lake level data are presented in **Figure D-7** and **Figure D-8.**

The data indicate general achievement of hydraulic control along Ditch A with periodic exceptions during scheduled maintenance, extreme weather conditions, and elevated lake levels. It is anticipated once construction activities within Ditch A are completed the hydraulic control system performance will improve.

REMEDIATION AREA A HYDRAULIC CONTROL SYSTEM

The RA-A hydraulic control system consists of the following elements:

- Seep apron and collection system
- Hydraulic control system (*i.e.*, groundwater collection system), approximately 1,050 feet long

- Pump station and force main to convey collected groundwater to the Eastern Shoreline pump station and then to the Willis GWTP for treatment.

The location of the Remediation Area A hydraulic control system is presented on **Figure D-1**. Between August 2014 and January 2015, a temporary vacuum pumping system was installed and operational verification was achieved, as described in the *Wastebeds 1-8 Integrated IRM Northern Shore Start-Up Plan Interim Summary* (OBG 2014b). In parallel, hydraulic control system modifications were designed and constructed to provide a dedicated intermediate groundwater conveyance pipe within the collection trench. The hydraulic control system modifications were completed in January 2015.

Following construction of the system modifications, the RA-A hydraulic control system wet well and collection trench start-up (*i.e.,* operational verification) was initiated. Based on review of start-up data, hydraulic control system maintenance to address scale buildup and sediment accumulation within the pump station and force main was initiated. This system maintenance was completed in early April 2015.

After completion of hydraulic control system maintenance, the start-up phase was re-initiated along with hydraulic control system operation. In 2015 and 2016, a total of approximately 29 million gallons of water were collected by the RA-A hydraulic control system. That represents an average collection rate of 44 gpm. The design flow rate was 23 gpm.

Water-level monitoring was performed to assess the performance of the RA-A hydraulic control system. Collection trench operation is evaluated by monitoring water levels at the North Shore Pump Station (NSPS) at the east end of the trench and an access point (VP-01) at the west end of the trench (**Figure D-29**). **Figure D-21** and **Figure D-22** present the water-level data obtained for the NSPS, CO-L01 and VP-01 during 2015 and 2016, processed using a rolling 30-day average. For comparison, the water-level data for the lake are also shown. **Figure D-21** and **Figure D-22** also identify unusual weather events and maintenance activities that impacted system operations. The instantaneous (*i.e*., unprocessed) collection trench water-level data were used to determine what maintenance activities should be performed by the O&M contractor. These water-level data are presented graphically as **Figures D-23** and **Figure D-24** along with the instantaneous lake level data. For reference, daily precipitation (excluding snowfall) at the site is shown on **Figure D-7** and **Figure D-8**, along with the instantaneous lake level data.

Water-level monitoring is also performed in piezometers installed along and below the trench. Until March 21, 2016, three long-screened piezometers (designated PZ-43, PZ-44 and PZ-45) were being monitored. **Figure D-25** presents the water-level data obtained for PZ-43, PZ-44 and PZ-45 during 2015 and **Figure D-26** presents water-level data from January 1, 2016 up to March 21, 2016, processed using a rolling 30-day average. For completeness, the instantaneous water-level data for the three piezometers are presented graphically as **Figures D-27** and **Figure D-28**.

Water quality measurements performed in the three long-screened piezometers indicated that water density varied with depth within the screens and riser pipes. Nine discrete piezometers were installed in November 2015, four located at different depths next to PZ-43 (designated PZ-49, PZ-50, PZ-51 and PZ-52), three located at different depths next to PZ-44 (designated PZ-53, PZ-54 and PZ-55), and two located at different depths next to PZ-45 (designated PZ-56 and PZ-57). These locations are shown on **Figure D-29**.

Water-level measurements collection from the new discrete piezometers began in December 2015. Comparison of water-level data from the discrete piezometers to that from the long-screened piezometers demonstrated that the data from the long-screened piezometers are not representative due to the vertical variability in density and the fact that the screens intersect and connect multiple hydrogeologic units. Based on the data, NYSDEC approved water-level monitoring from the nine discrete piezometers, only.

Additional system optimization and testing is currently underway. Specifically, the valve that controls the relative influence of the trench and intermediate header pipe is being adjusted in a stepwise manner to determine the impact on water levels in CO-L01, VP-01 and the nine discrete piezometers, the goal being to find the valve setting that provides for the best overall system performance.

The data indicate successful shallow groundwater hydraulic control along the northern shore with periodic exceptions during scheduled maintenance, extreme weather conditions, and elevated lake levels. In addition, some variability in the data can be attributed to the continued construction activities (e.g., shoreline stabilization and restoration) along the shoreline.

NINEMILE CREEK HYDRAULIC CONTROL SYSTEM

The Ninemile Creel hydraulic control system consists of the following elements:

- Seep apron and collection system
- Hydraulic control system (*i.e.*, groundwater collection system), approximately 1,800 feet long
- Pump station and force main to convey collected groundwater to the Eastern Shoreline pump station and then to the Willis GWTP for treatment.

In November 2013, the interim start-up phase (*i.e.,* operational verification) was completed, as described in the *Draft Wastebeds 1-8 Integrated IRM Ninemile Creek Start-Up Plan Interim Summary* (OBG 2013). As such, the Ninemile Creek hydraulic control system is considered to be in the initial performance verification phase. During the initial verification phase, operation (*e.g.,* wet well elevations, pump data) and monitoring (*e.g.,* groundwater elevations, surface water elevations) data are collected and evaluated weekly. This information is used to aid in hydraulic control system operation process refinement and troubleshooting, which is on-going.

Ninemile Creek remedial construction activities were ongoing during 2014 and were directly affecting the surface water elevation of Ninemile Creek. The elevated surface water was a temporary condition that increased flow within the hydraulic control system. Once the remedial construction in Ninemile Creek was completed in October 2014, flow within the hydraulic control system decreased to levels estimated during design.

The initial performance verification phase summarized within this report section is for the monitoring period from January 2015 through March 2016. In 2015 and 2016, a total of approximately 14.3 million gallons of water were collected by the hydraulic control system and the seep aprons. That represents an average collection rate of 23 gpm. The design flow rate was 29 gpm. The Ninemile Creek hydraulic control system structure locations are presented on **Figure D-30**.

Water-level monitoring was performed to assess the performance of the Ninemile Creek hydraulic control system. Collection trench operation is evaluated by monitoring water levels at the Ninemile Creek Pump Station (NMCPS) approximately 148 feet from the south end of the trench, a cleanout (CO-01) at the south end of the trench, and an observation port (OP-07) at the west end of the trench. **Figure D-31** and **Figure D-32** present the water-level data obtained for the NMCPS, CO-01 and OP-07 during 2015 and from January 1, 2016 through March 21, 2016, processed using a rolling 30-day average. For comparison, the water-level data for the lake are also shown. **Figure D-31** and **Figure D-32** also identify unusual weather events and maintenance activities that impacted system operations. The instantaneous (*i.e.*, unprocessed) collection trench water-level data are used to help determine what system maintenance activities should be performed by the O&M contractor. These water-level data are presented graphically as **Figures D-33** and **Figure D-34** along with the instantaneous lake level data. For reference, daily precipitation (excluding snowfall) at the site is shown on **Figure D-7** and **Figure D-8**, along with the instantaneous lake level data.

Water-level monitoring is also performed in five piezometers installed along and below the trench. One of these piezometers (designated PZ-46) is located within the 370 feet of trench that overlies the Ninemile Creek sand and gravel (NMCSG) unit. The other four piezometers (designated PZ-40, PZ-41, PZ-42 and PZ-47) are located in the trench to the north of the NMCSG unit. **Figure D-35** presents the water-level data obtained for PZ-40, PZ-41, PZ-42, PZ-46 and PZ-47 during 2015 and **Figure D-36** presents water-level data from January 1, 2016 up to March 21, 2016, processed using a rolling 30-day moving average. For completeness, the instantaneous water-level data for the piezometers are presented graphically as **Figures D-37** and **Figure D-38**.

Additional system maintenance and testing is being performed for the Ninemile Creek hydraulic control system. Specifically, piezometer PZ-46 and the 17 passive recovery wells (designated RW-240 through RW-224) located within the trench section that overlies the NMCSG unit will be redeveloped, and the water-level measurements collected during this work will be evaluated to monitor the effect of the redevelopment. Although not within the NMCCS unit, piezometers PZ-40, PZ-41, PZ-42 and PZ-47 will also be redeveloped, as will passive recovery well RW-239, which is located immediately west of the trench section that overlies the NMCSG unit. In addition, groundwater samples will be collected from all five piezometers for laboratory analysis to confirm constituent concentrations.

The water–level data indicate successful shallow groundwater hydraulic control (demonstrated by the lack of seeps) along Ninemile Creek with periodic exceptions during scheduled maintenance, extreme weather conditions, system shutdowns, and elevated surface water elevations (both Ninemile Creek and Onondaga Lake). In addition, some variability in the data can be attributed to continued construction activities (e.g., shoreline stabilization and restoration) along the shoreline.

LOWER AND MIDDLE REACH DITCH A

Stone check dams were constructed in Middle Ditch A, which is the area between Lower Ditch A and the culvert discharging to NMC, to promote settlement of solids entrained in Ditch A flow. Prior to check dam installation, solids were removed to restore the ditch channel to historical elevations and promote storm water flow. The check dams and subsequent check dam maintenance, as well as other activities, further described below have performed as designed to prevent impacts to Onondaga Lake.

Maintenance activities were performed in Middle Ditch A during 2014 to remove accumulated solids from behind the check dams and within culverts located within the ditch alignment. Approximately 600 cubic yards of solids were removed as part of the 2014 Middle Ditch A maintenance activities.

In 2014, stone check dams were also constructed in Lower Ditch A, which is the open water section of Ditch A immediately upstream of Onondaga Lake. As with the stone check dams installed in Middle Ditch A, these check dams were installed to promote the settlement of solids entrained in storm water flows. Prior to the check dam construction, solids were removed. In addition, a silt curtain was installed at the confluence of Ditch A with Onondaga Lake, as an additional measure to reduce to potential migration of solids from within the ditch to Onondaga Lake.

Also in 2014, nine culverts, totaling approximately 1850 feet, within Ditch A were flushed of accumulated debris and inspected for infiltration. Two additional culverts, totaling approximately 500 feet were visually inspected for infiltration. Based on the results of these inspections approximately 1200 feet of culverts were rehabilitated by installing a cured-in-place pipe liner in order to mitigate groundwater infiltration.

In 2015, inspections of the check dams occurred on a quarterly basis. Inspections revealed that the amount of accumulated solids behind the check dams did not warrant removal.

Based upon inspections and observations from 2014 and 2015, the following maintenance and adaptive changes were completed in April 2016:

- Accumulated solids behind the check dams was removed via vacuum truck
- Check dams were power washed to remove accumulated solids
- Additional rip rap was added to increase the check dams height
- Geotextile fabric was added on the upstream side of the check dams to increase solids retention
- Depressions were created upstream of the check dams to increase solids retention capacity
- The silt curtain was affixed to stakes and anchored to the ditch bottom near where Ditch A enters Onondaga Lake.

Following maintenance and adaptive changes, weekly inspections will occur and additional maintenance will be performed, as required.

Based upon the information and observations the check dams are actively meeting the design intent to promote solids settlement within Ditch A.

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HONEYWELL WASTEBEDS 1–8
INTEGRATED IRM
GEDDES, NEW YORK

SITE PLAN

FIGURE D-1

MAY 2014
FILE NO. 1163.47228.003

1"=400' 400 0 400 800

OVERALL PLAN
SCALE: 1"=400'

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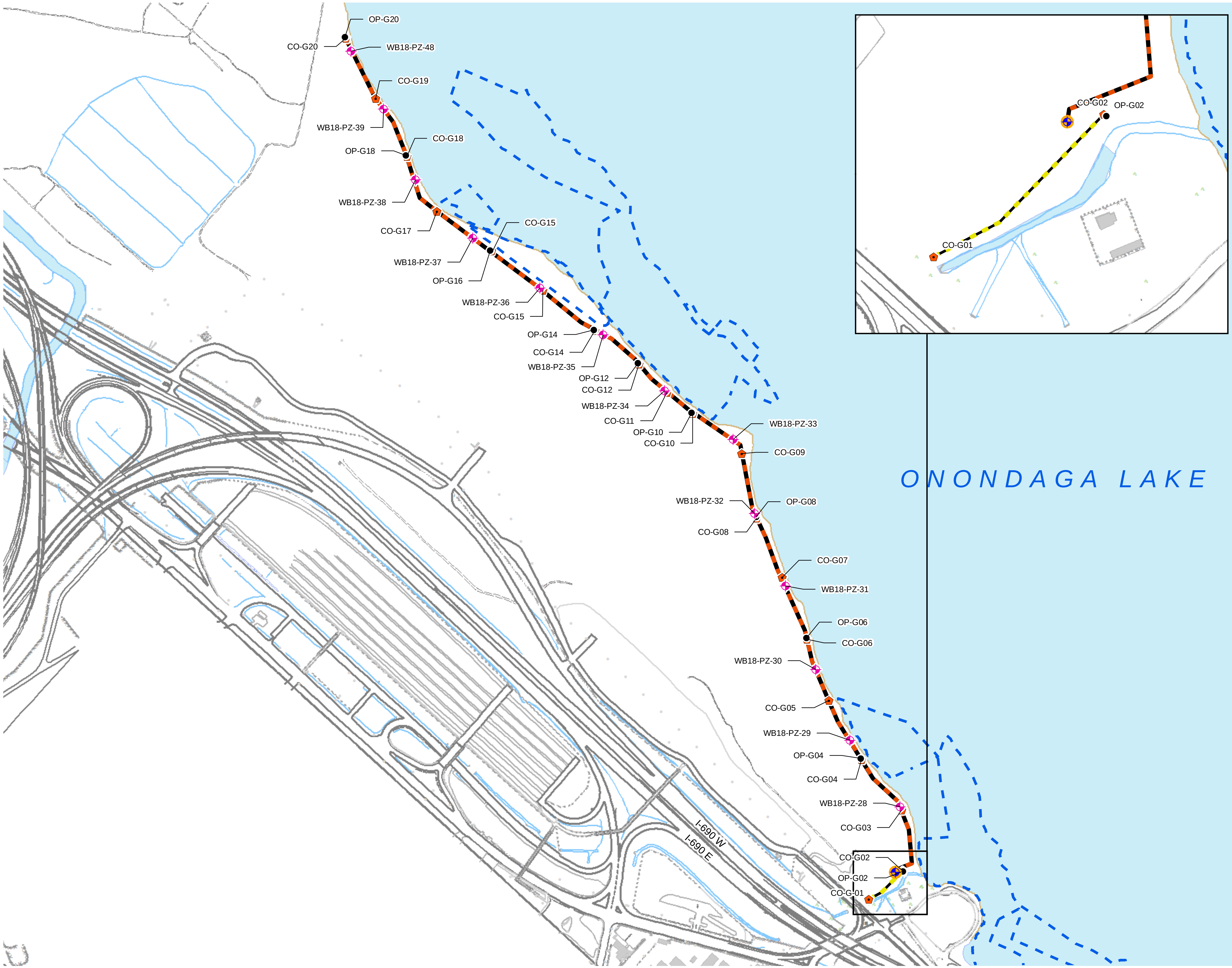

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FIGURE D-2

N

LEGEND

- CLEAN OUT
- OBSERVATION PORT
- PIEZOMETER
- WET WELL
- REMEDIATION AREA

TRENCH

- DITCH A SECTION
- LAKEFRONTSECTION

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WASTEBEDS 1-8
GEDDES, NEW YORK

EASTERN SHORE COLLECTION PIPE STRUCTURES

0 300 600 1,200
Feet

FEBRUARY 2014
1163.

O'BRIEN & GERE

Figure D-3

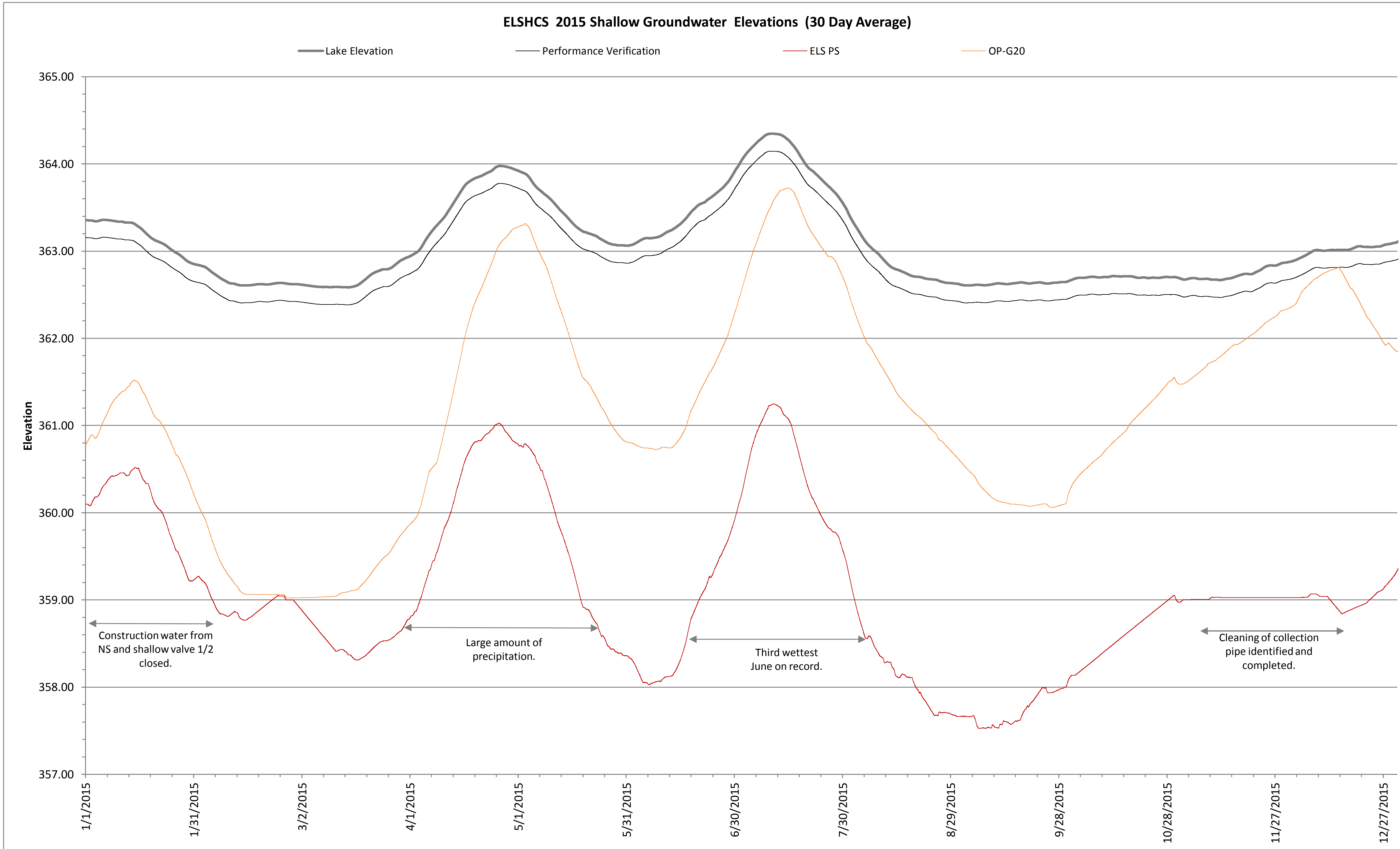
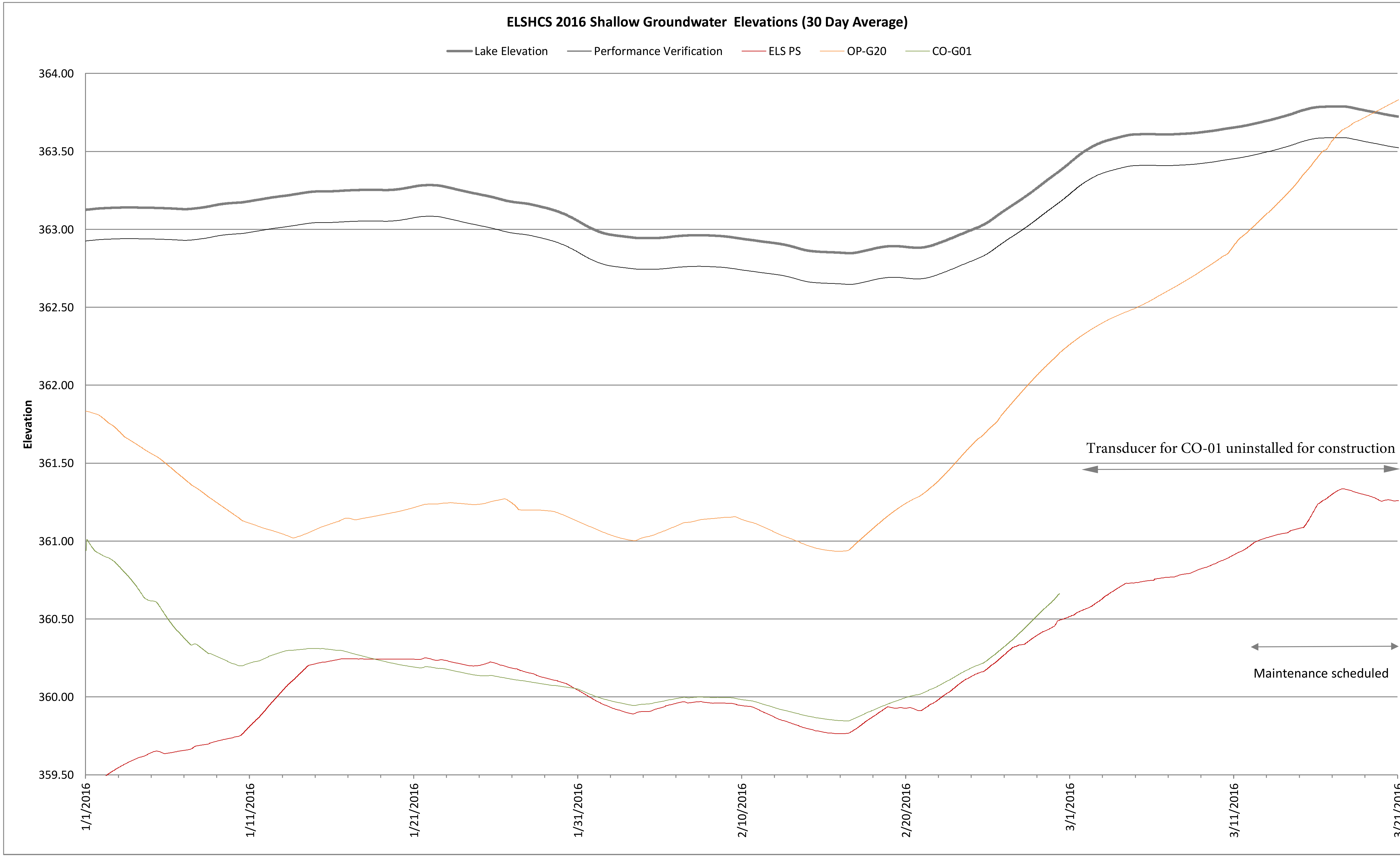

ELSHCS 2015 Shallow Groundwater Elevations (30 Day Average)
Lake Elevation
Performance Verification
ELS PS
OP-G20
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
Elevation
Construction water from NS and shallow valve 1/2 closed.
Large amount of precipitation.
Third wettest June on record.
Cleaning of collection pipe identified and completed.
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015

Figure D-4



ELSHCS 2016 Shallow Groundwater Elevations (30 Day Average)
Lake Elevation
Performance Verification
ELS PS
OP-G20
CO-G01
364.00
363.50
363.00
362.50
362.00
361.50
361.00
360.50
360.00
359.50
Elevation
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016
Transducer for CO-01 uninstalled for construction
Maintenance scheduled

Figure D-5

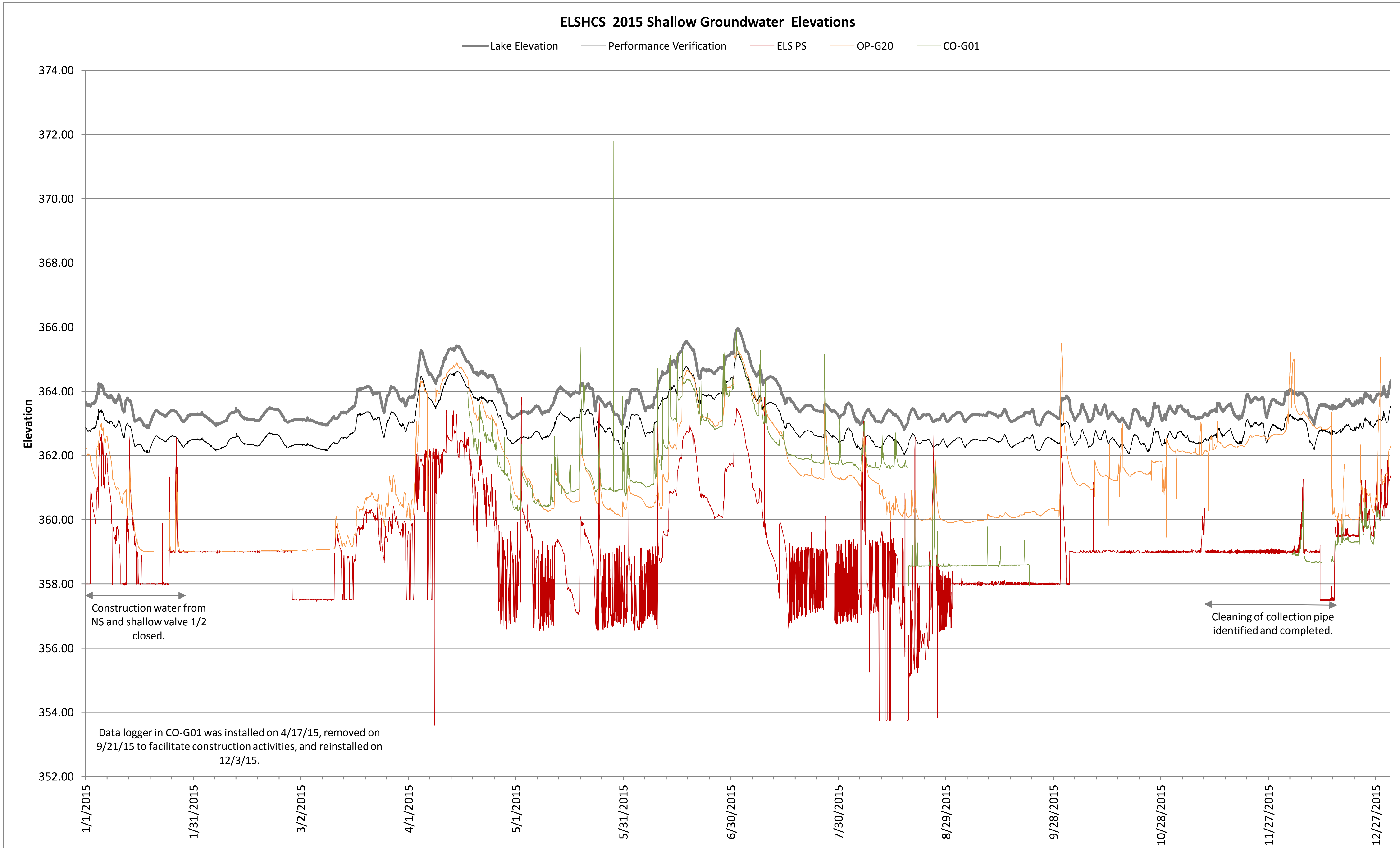

ELSHCS 2015 Shallow Groundwater Elevations
Lake Elevation
Performance Verification
ELS PS
OP-G20
CO-G01
Elevation
374.00
372.00
370.00
368.00
366.00
364.00
362.00
360.00
358.00
356.00
354.00
352.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015
Construction water from NS and shallow valve 1/2 closed.
Cleaning of collection pipe identified and completed.
Data logger in CO-G01 was installed on 4/17/15, removed on 9/21/15 to facilitate construction activities, and reinstalled on 12/3/15.

Figure D-6

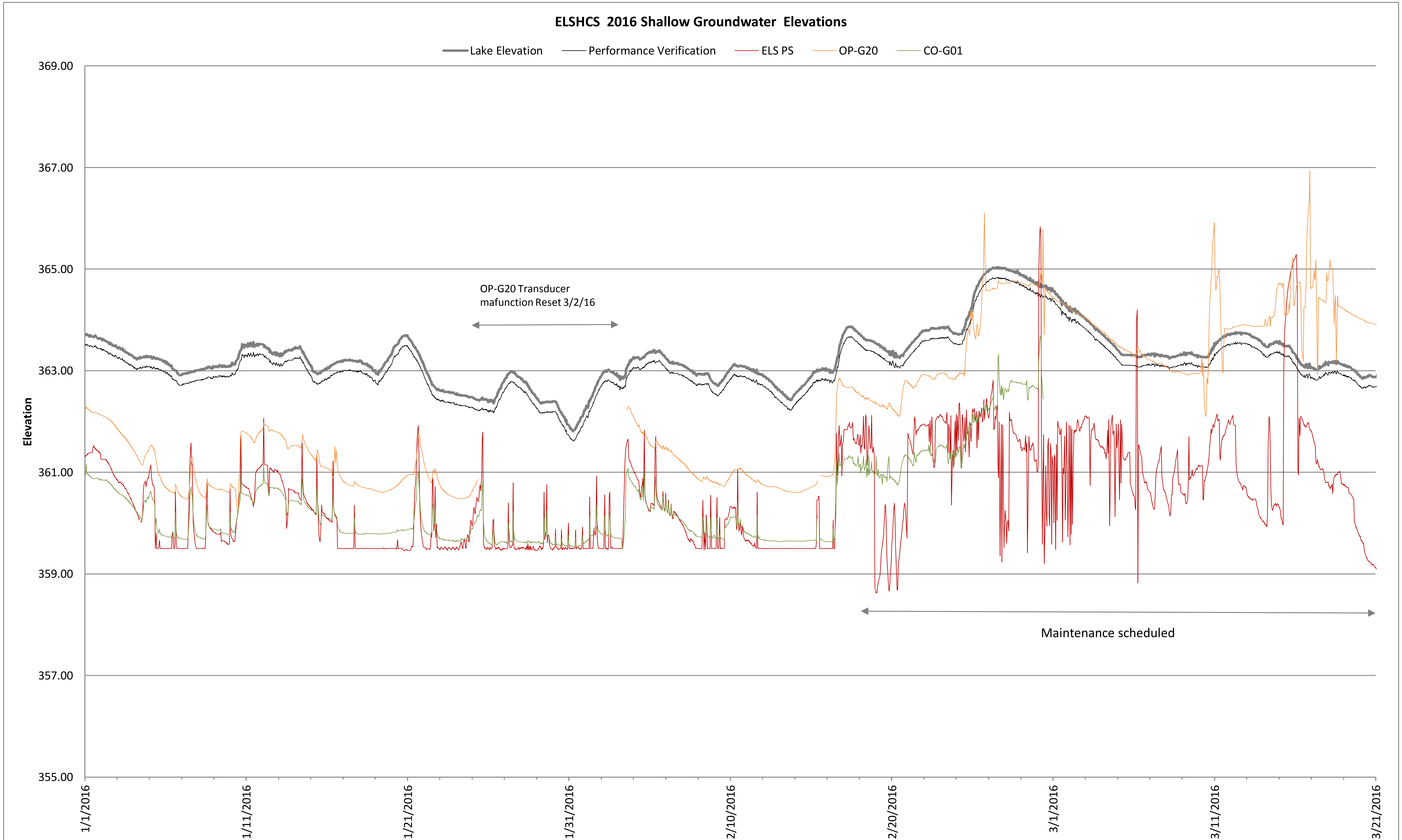
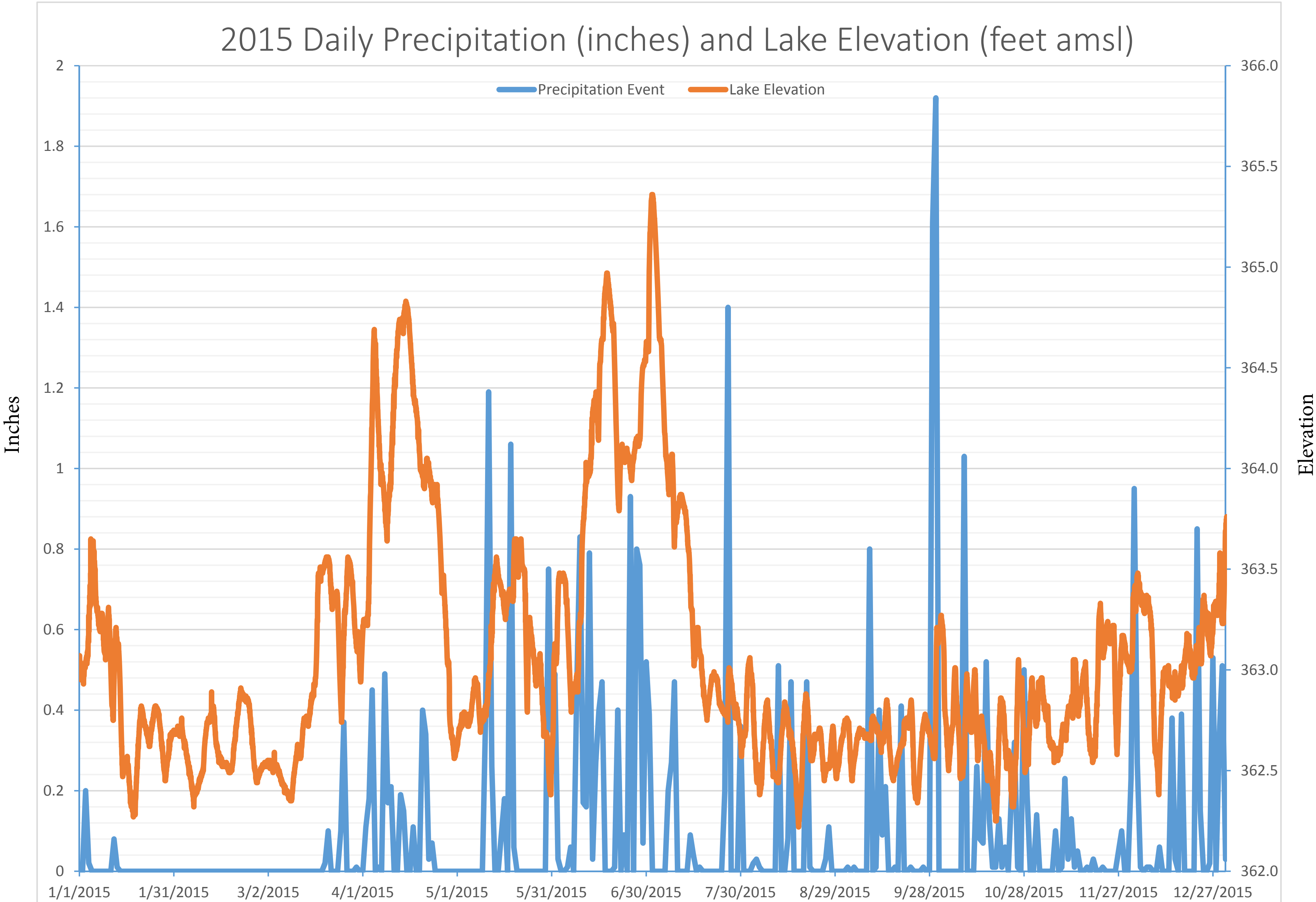
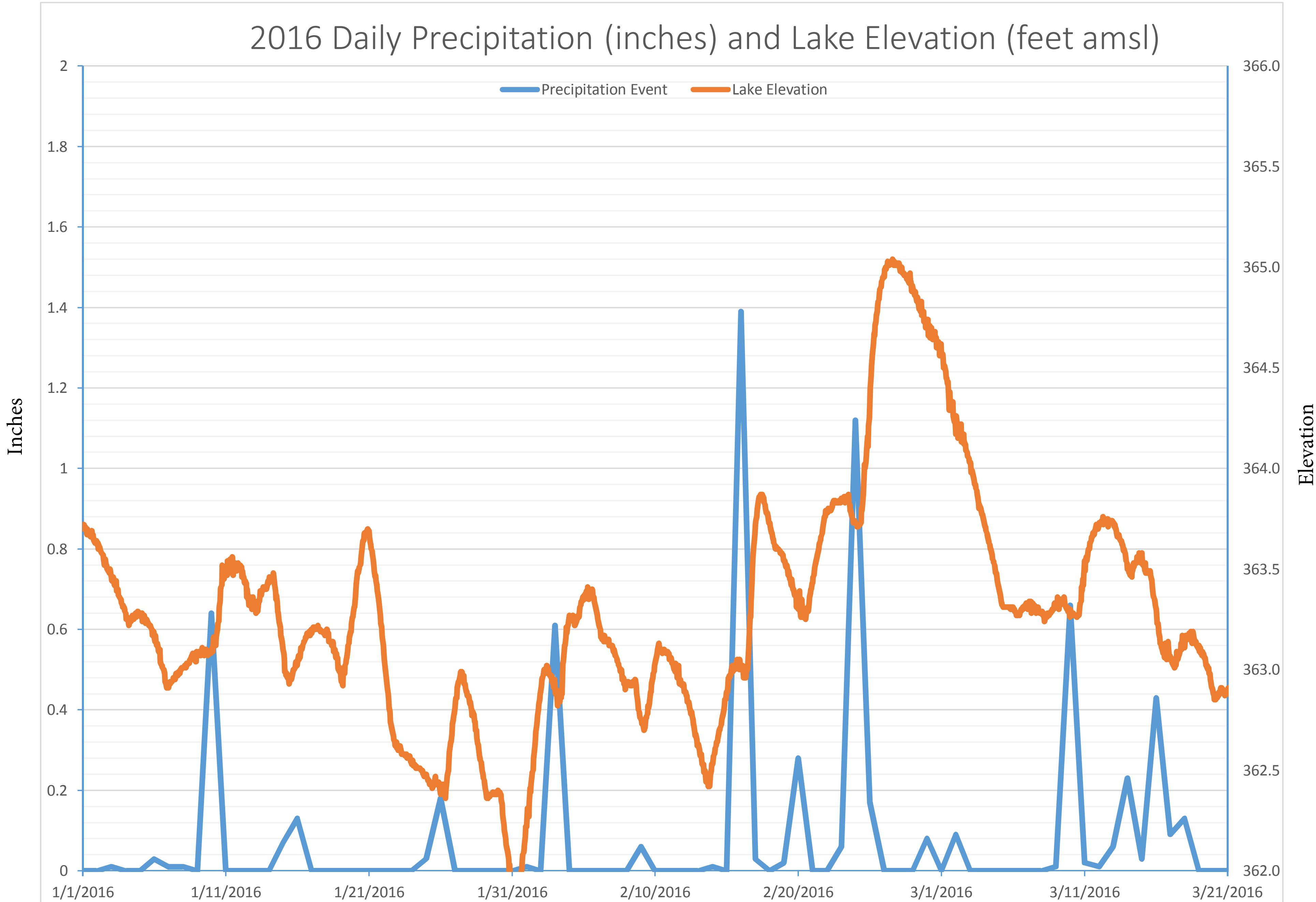

ELSHCS 2016 Shallow Groundwater Elevations
Lake Elevation
Performance Verification
ELS PS
OP-G20
CO-G01
Elevation
369.00
367.00
365.00
363.00
361.00
359.00
357.00
355.00
OP-G20 Transducer
mafunction Reset 3/2/16
Maintenance scheduled
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016

Figure D-7



2015 Daily Precipitation (inches) and Lake Elevation (feet amsl)
Precipitation Event
Lake Elevation
Inches
Elevation
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
366.0
365.5
365.0
364.5
364.0
363.5
363.0
362.5
362.0
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015

Figure D-8



2016 Daily Precipitation (inches) and Lake Elevation (feet amsl)
Precipitation Event
Lake Elevation
Inches
Elevation
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
366.0
365.5
365.0
364.5
364.0
363.5
363.0
362.5
362.0
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016

Figure D-9

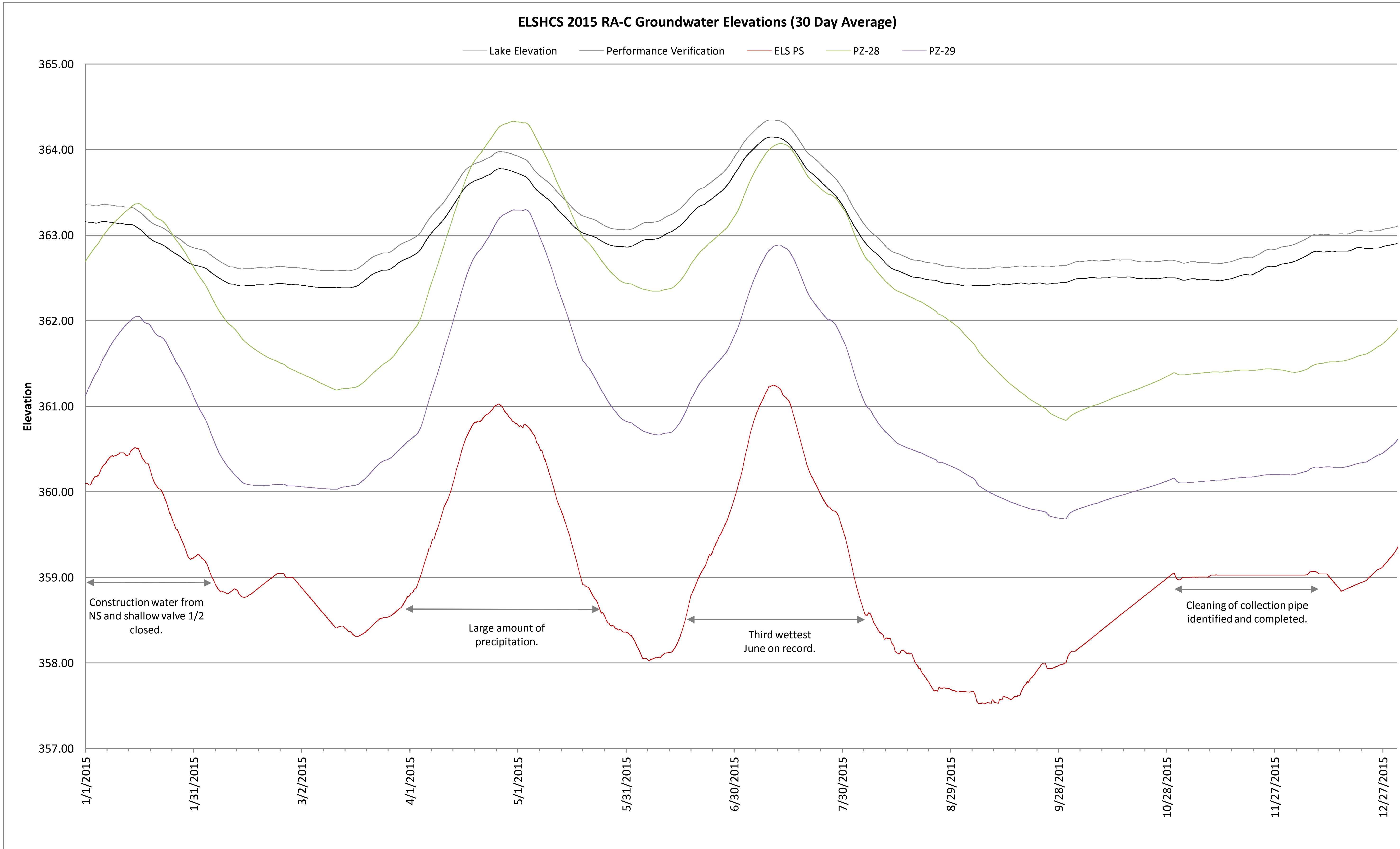
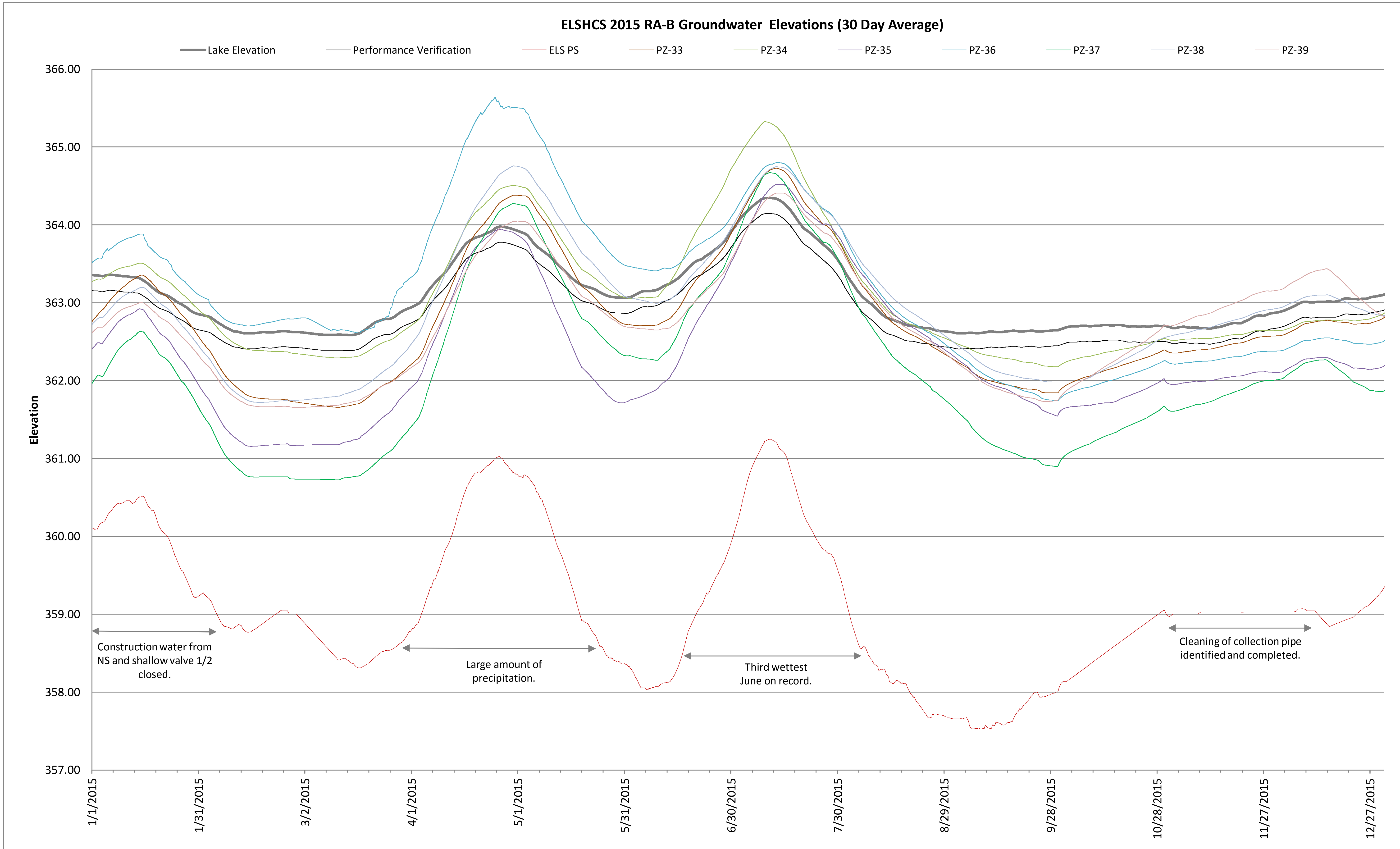
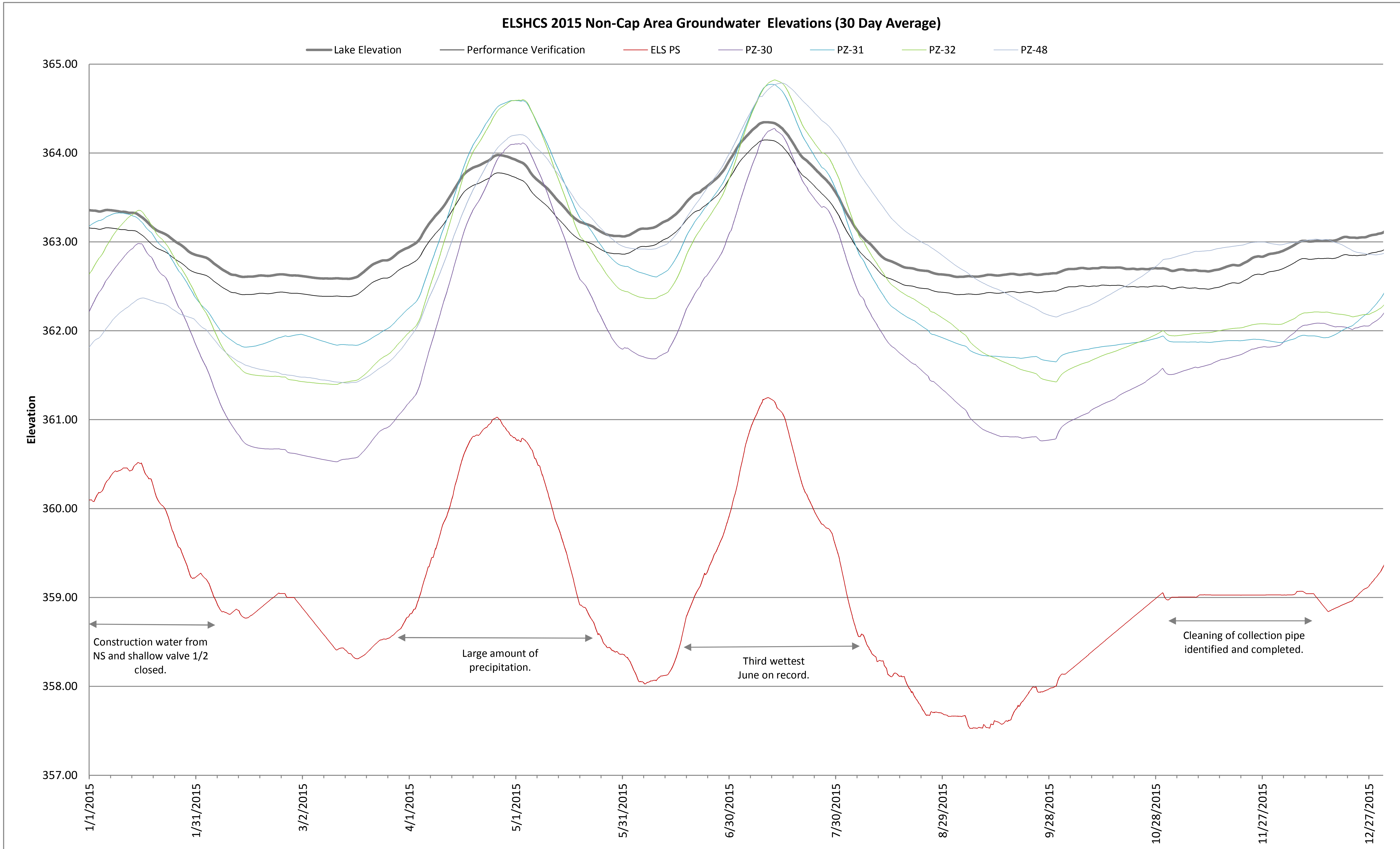

ELSHCS 2015 RA-C Groundwater Elevations (30 Day Average)
Lake Elevation
Performance Verification
ELS PS
PZ-28
PZ-29
Elevation
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015
Construction water from NS and shallow valve 1/2 closed.
Large amount of precipitation.
Third wettest June on record.
Cleaning of collection pipe identified and completed.

Figure D-10



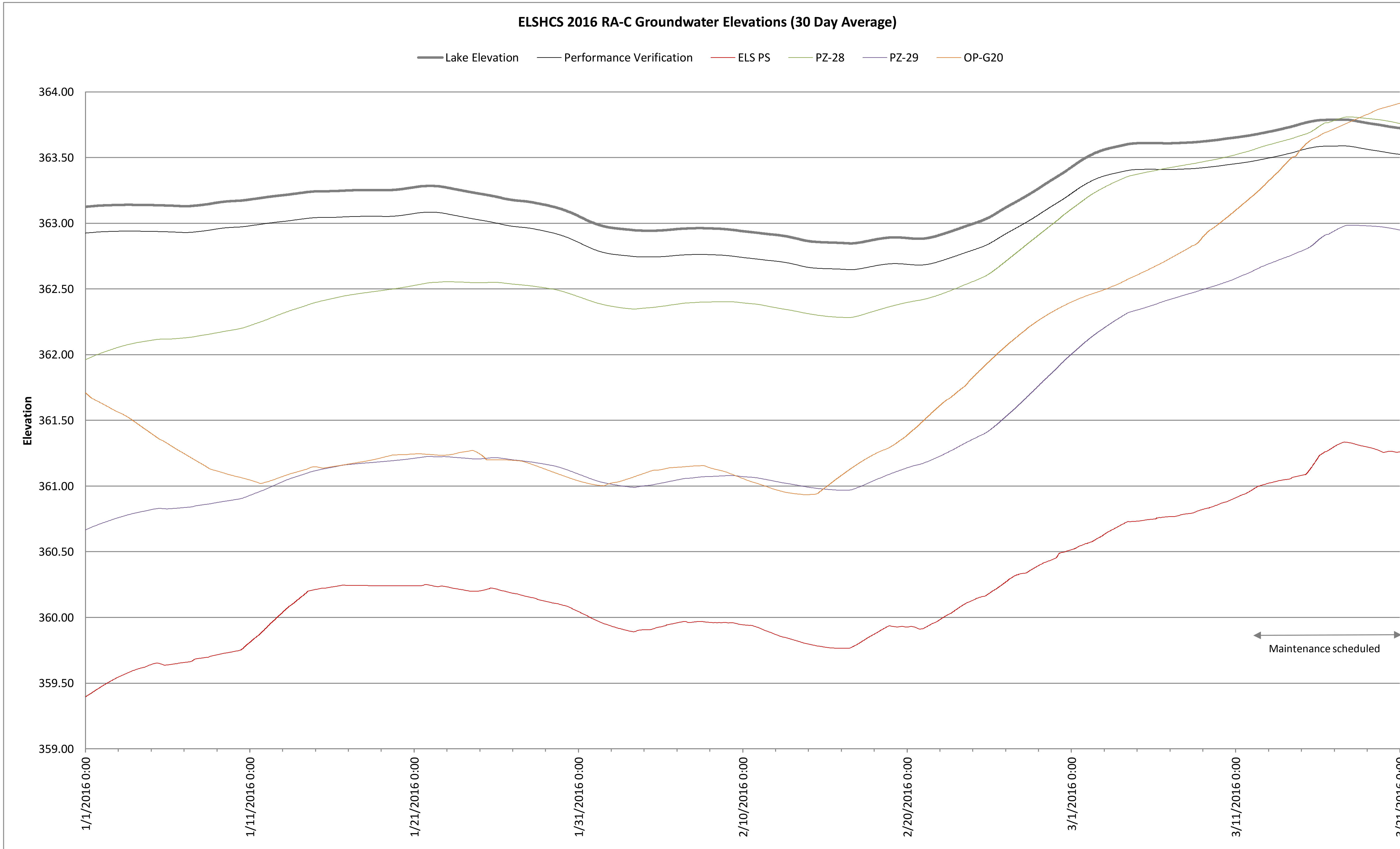
ELSHCS 2015 RA-B Groundwater Elevations (30 Day Average)
Lake Elevation
Performance Verification
ELS PS
PZ-33
PZ-34
PZ-35
PZ-36
PZ-37
PZ-38
PZ-39
Elevation
366.00
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015
Construction water from NS and shallow valve 1/2 closed.
Large amount of precipitation.
Third wettest June on record.
Cleaning of collection pipe identified and completed.

Figure D-11



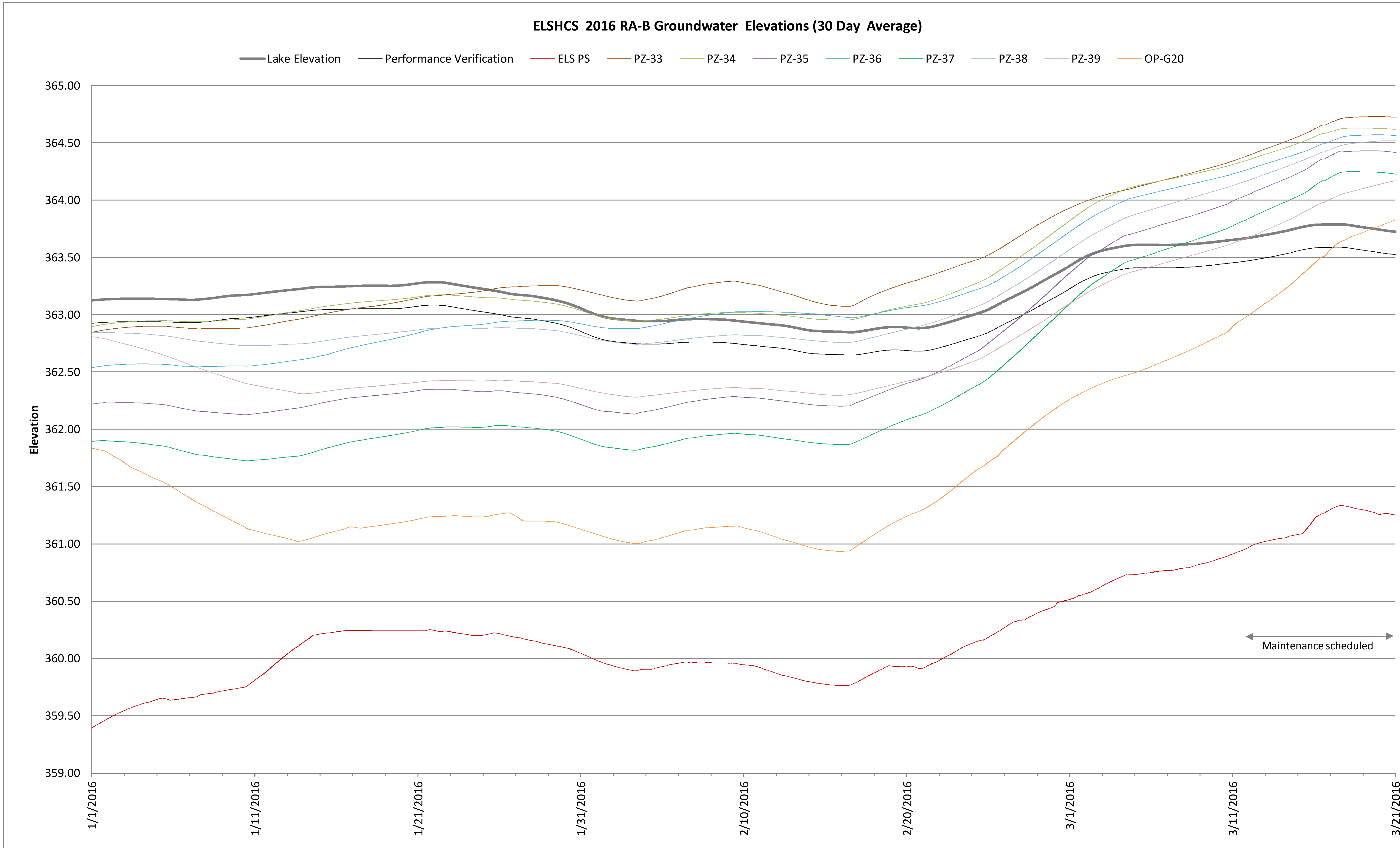
ELSHCS 2015 Non-Cap Area Groundwater Elevations (30 Day Average)
Lake Elevation
Performance Verification
ELS PS
PZ-30
PZ-31
PZ-32
PZ-48
Elevation
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015
Construction water from NS and shallow valve 1/2 closed.
Large amount of precipitation.
Third wettest June on record.
Cleaning of collection pipe identified and completed.

Figure D-12



ELSHCS 2016 RA-C Groundwater Elevations (30 Day Average)
Lake Elevation
Performance Verification
ELS PS
PZ-28
PZ-29
OP-G20
Elevation
364.00
363.50
363.00
362.50
362.00
361.50
361.00
360.50
360.00
359.50
359.00
1/1/2016 0:00
1/11/2016 0:00
1/21/2016 0:00
1/31/2016 0:00
2/10/2016 0:00
2/20/2016 0:00
3/1/2016 0:00
3/11/2016 0:00
3/21/2016 0:00
Maintenance scheduled

Figure D-13



ELSHCS 2016 RA-B Groundwater Elevations (30 Day Average)
Lake Elevation
Performance Verification
ELS PS
PZ-33
PZ-34
PZ-35
PZ-36
PZ-37
PZ-38
PZ-39
OP-G20
Elevation
365.00
364.50
364.00
363.50
363.00
362.50
362.00
361.50
361.00
360.50
360.00
359.50
359.00
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016
Maintenance scheduled

Figure D-14

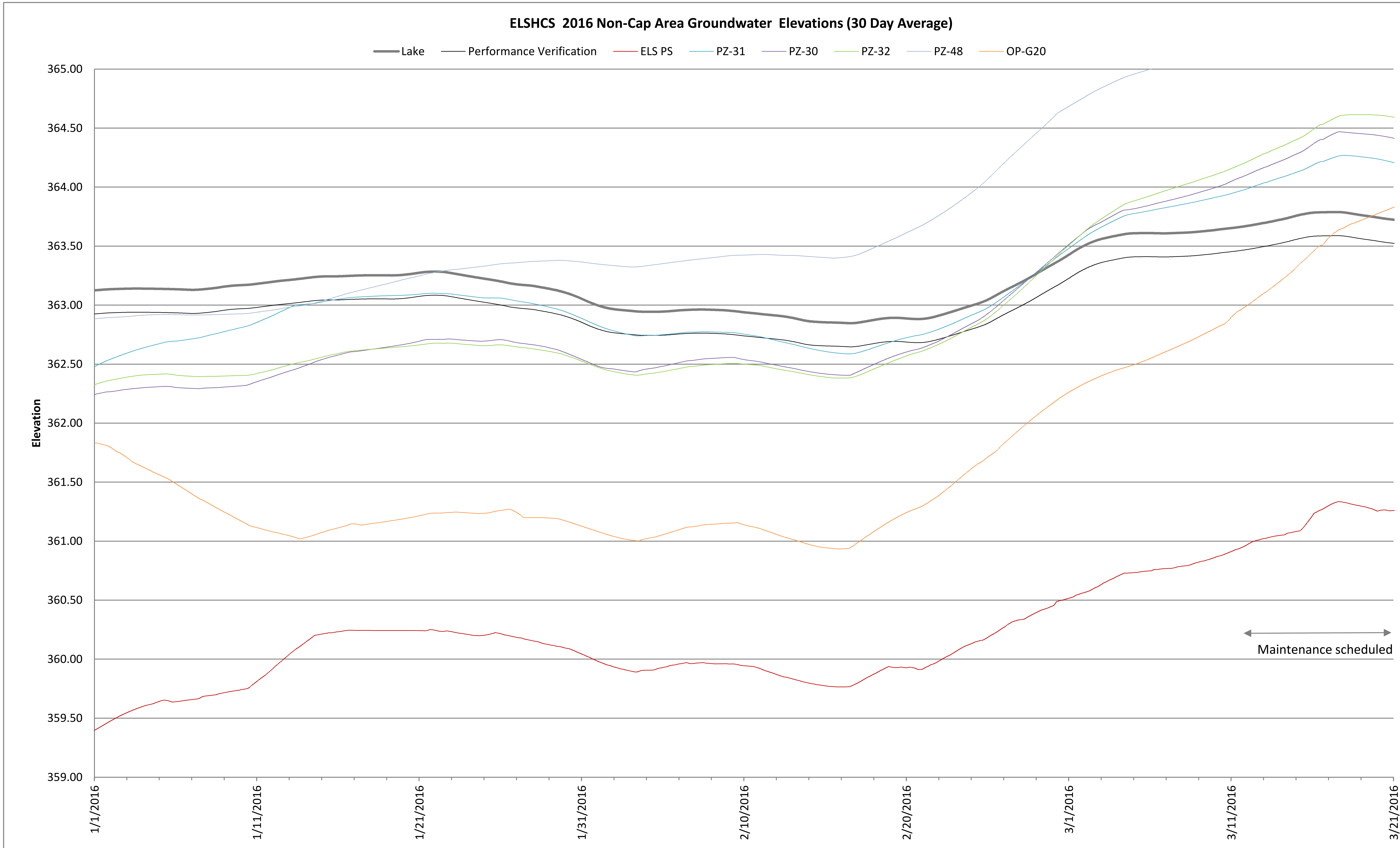

ELSHCS 2016 Non-Cap Area Groundwater Elevations (30 Day Average)
Lake
Performance Verification
ELS PS
PZ-31
PZ-30
PZ-32
PZ-48
OP-G20
Elevation
365.00
364.50
364.00
363.50
363.00
362.50
362.00
361.50
361.00
360.50
360.00
359.50
359.00
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016
Maintenance scheduled

Figure D-15

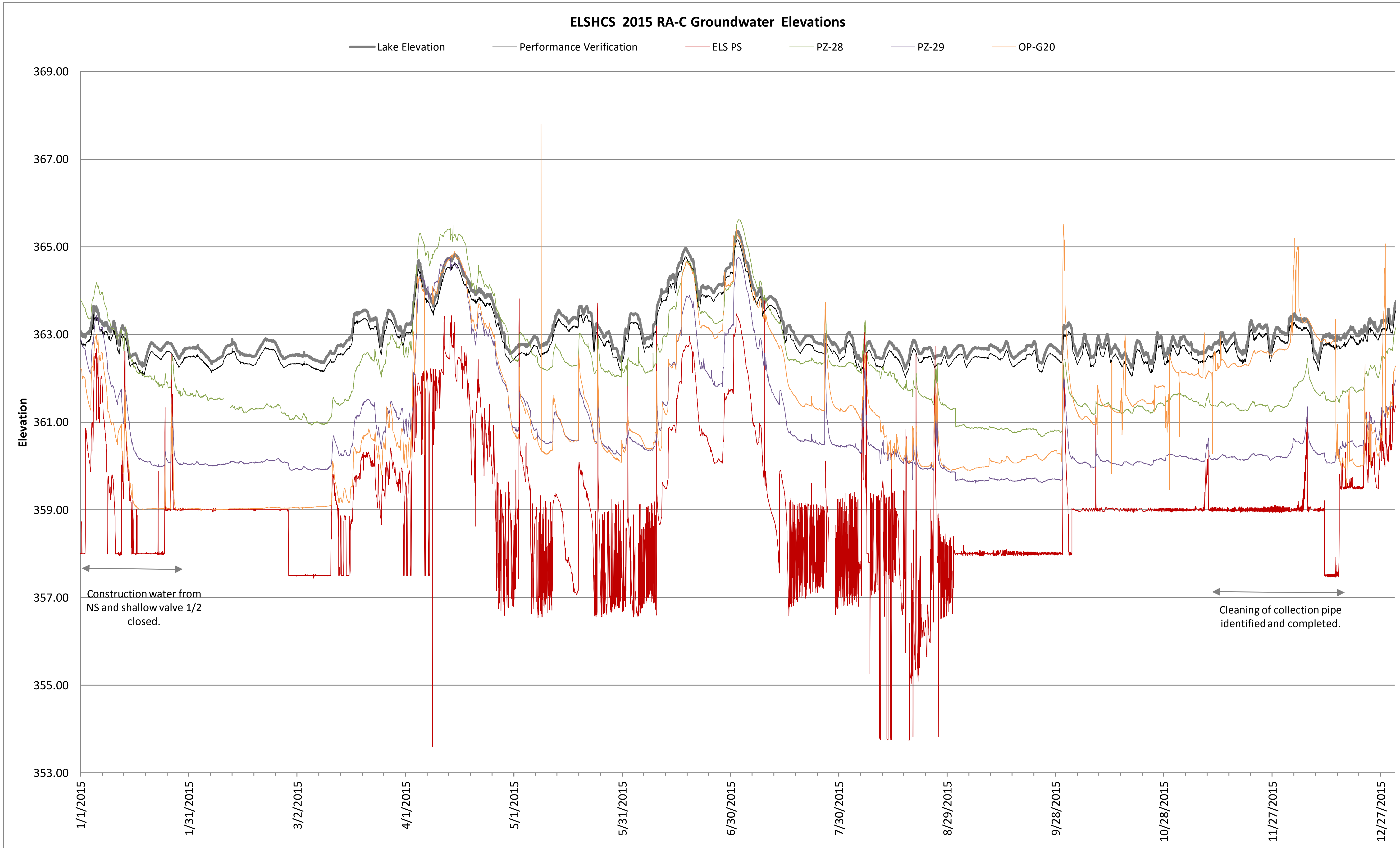
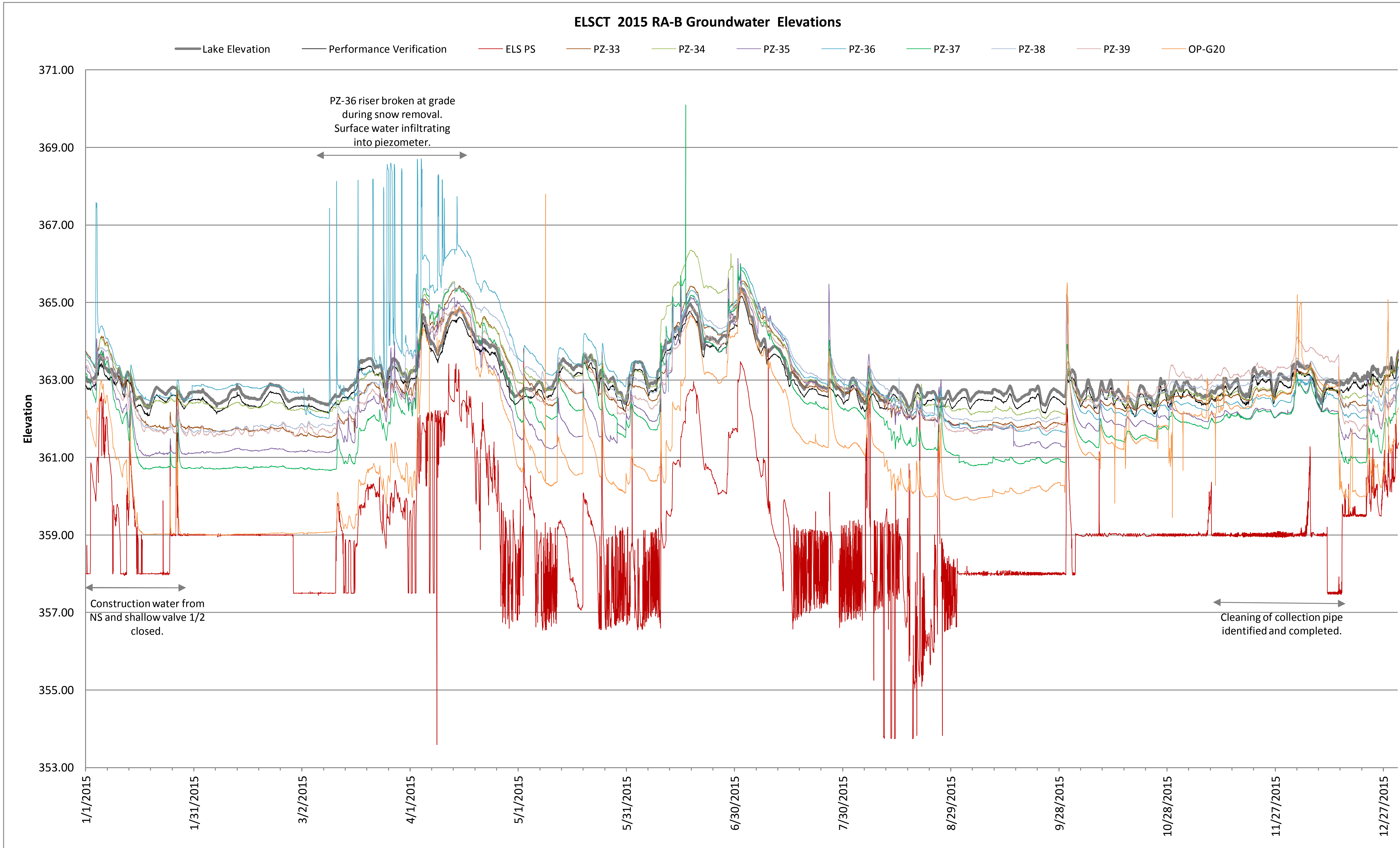
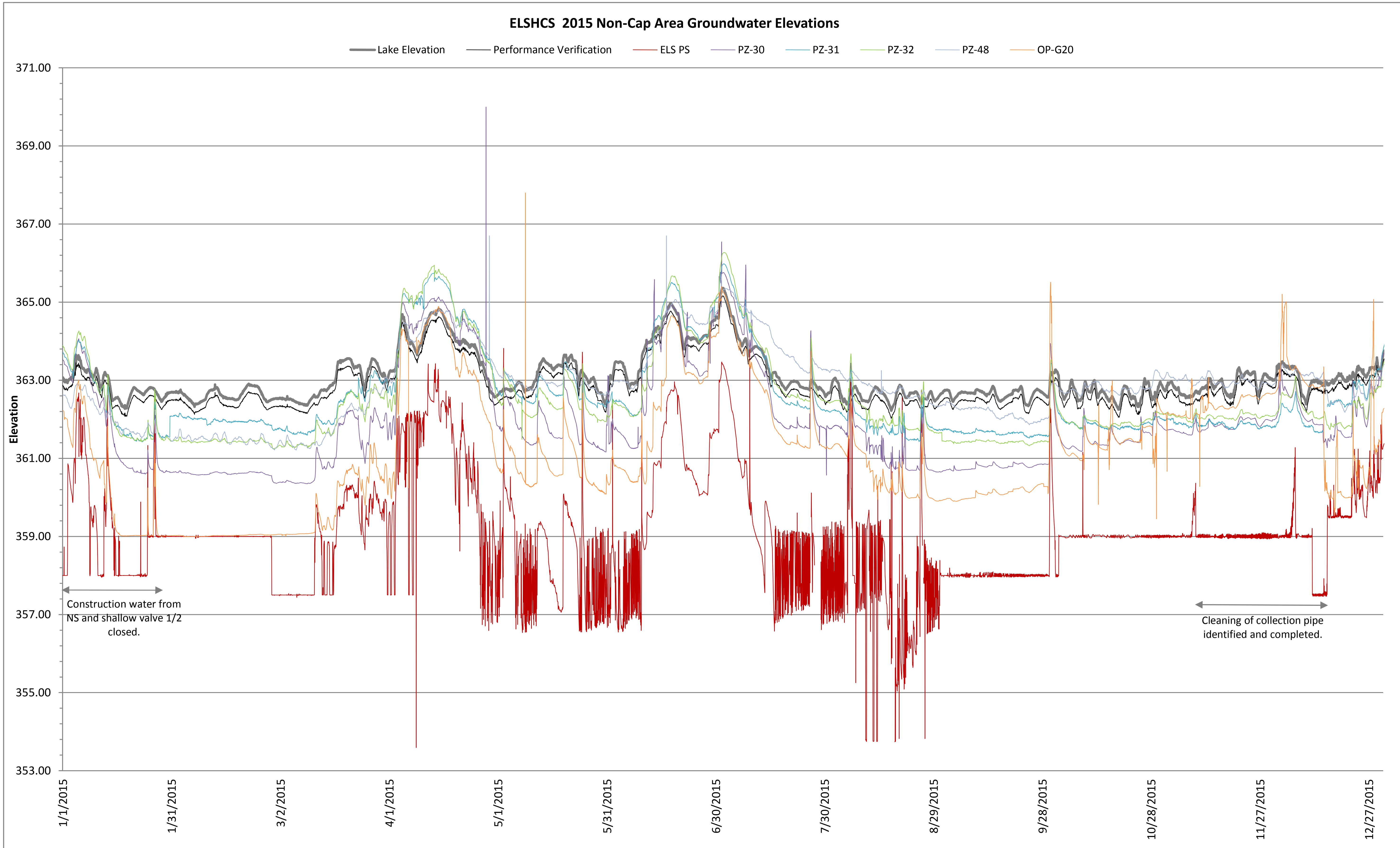

ELSHCS 2015 RA-C Groundwater Elevations
Lake Elevation
Performance Verification
ELS PS
PZ-28
PZ-29
OP-G20
Elevation
369.00
367.00
365.00
363.00
361.00
359.00
357.00
355.00
353.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015
Construction water from NS and shallow valve 1/2 closed.
Cleaning of collection pipe identified and completed.

Figure D-16



ELSCT 2015 RA-B Groundwater Elevations
Lake Elevation
Performance Verification
ELS PS
PZ-33
PZ-34
PZ-35
PZ-36
PZ-37
PZ-38
PZ-39
OP-G20
Elevation
371.00
369.00
367.00
365.00
363.00
361.00
359.00
357.00
355.00
353.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015
PZ-36 riser broken at grade during snow removal. Surface water infiltrating into piezometer.
Construction water from NS and shallow valve 1/2 closed.
Cleaning of collection pipe identified and completed.

Figure D-17



ELSHCS 2015 Non-Cap Area Groundwater Elevations
Lake Elevation
Performance Verification
ELS PS
PZ-30
PZ-31
PZ-32
PZ-48
OP-G20
Elevation
371.00
369.00
367.00
365.00
363.00
361.00
359.00
357.00
355.00
353.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015
Construction water from NS and shallow valve 1/2 closed.
Cleaning of collection pipe identified and completed.

Figure D-18

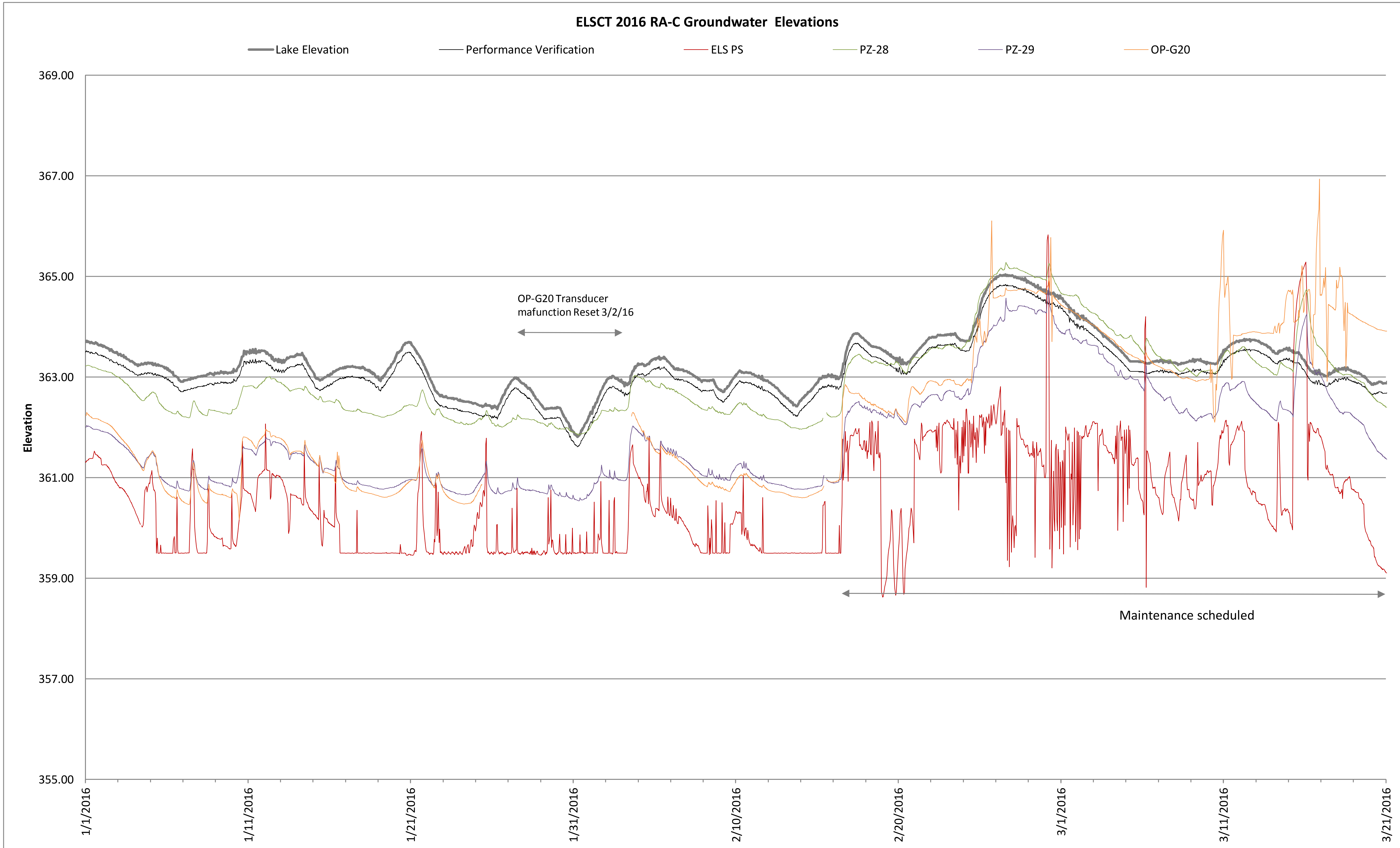

ELSCT 2016 RA-C Groundwater Elevations
Lake Elevation
Performance Verification
ELS PS
PZ-28
PZ-29
OP-G20
Elevation
369.00
367.00
365.00
363.00
361.00
359.00
357.00
355.00
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016
OP-G20 Transducer
mafunction Reset 3/2/16
Maintenance scheduled

Figure D-19

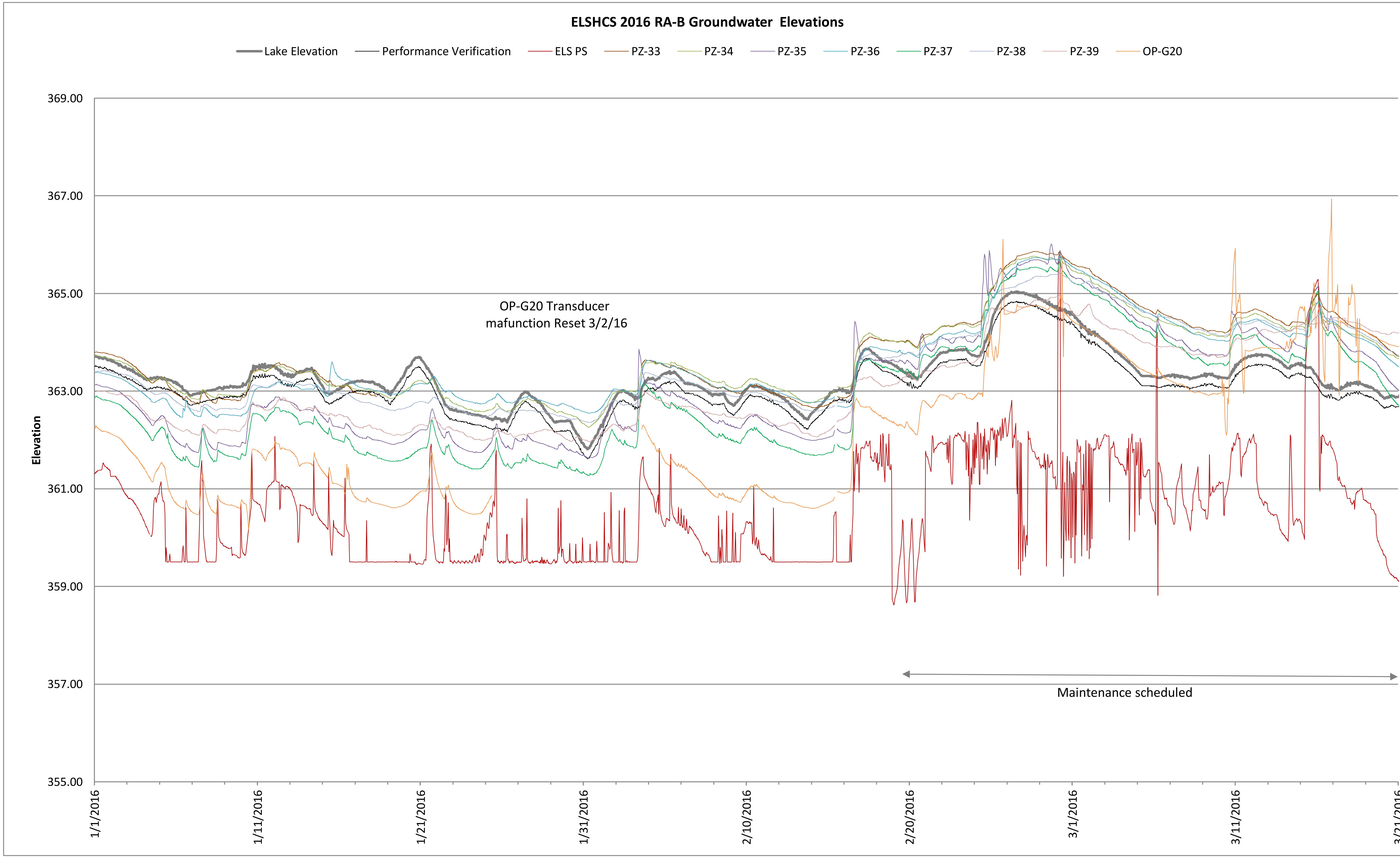

ELSHCS 2016 RA-B Groundwater Elevations
Lake Elevation
Performance Verification
ELS PS
PZ-33
PZ-34
PZ-35
PZ-36
PZ-37
PZ-38
PZ-39
OP-G20
Elevation
369.00
367.00
365.00
363.00
361.00
359.00
357.00
355.00
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016
OP-G20 Transducer
mafunction Reset 3/2/16
Maintenance scheduled

Figure D-20

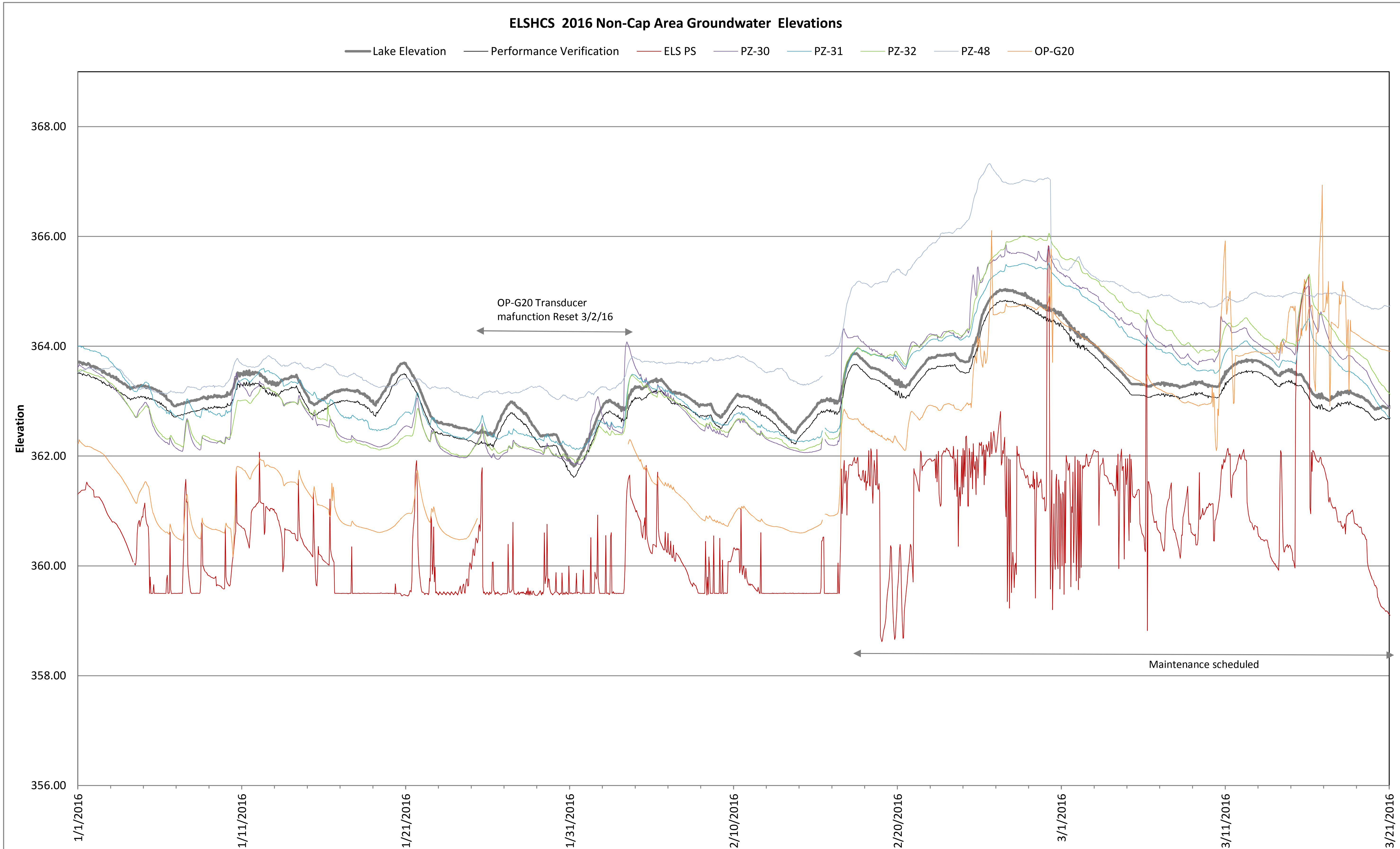
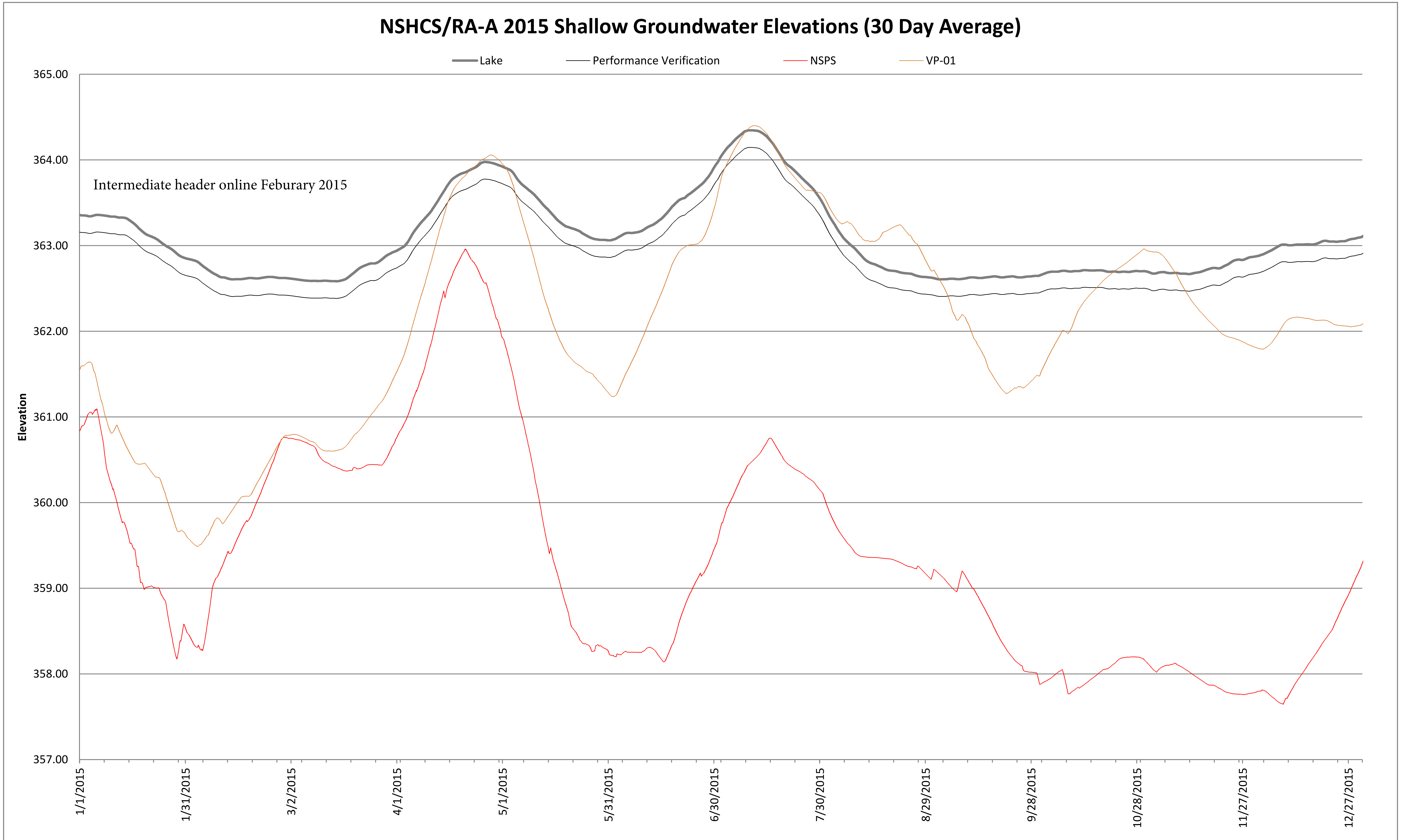

ELSHCS 2016 Non-Cap Area Groundwater Elevations
Lake Elevation
Performance Verification
ELS PS
PZ-30
PZ-31
PZ-32
PZ-48
OP-G20
Elevation
368.00
366.00
364.00
362.00
360.00
358.00
356.00
OP-G20 Transducer
mafunction Reset 3/2/16
Maintenance scheduled
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016

Figure D-21



NSHCS/RA-A 2015 Shallow Groundwater Elevations (30 Day Average)
Lake
Performance Verification
NSPS
VP-01
Elevation
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
Intermediate header online Feburary 2015
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015

Figure D-22

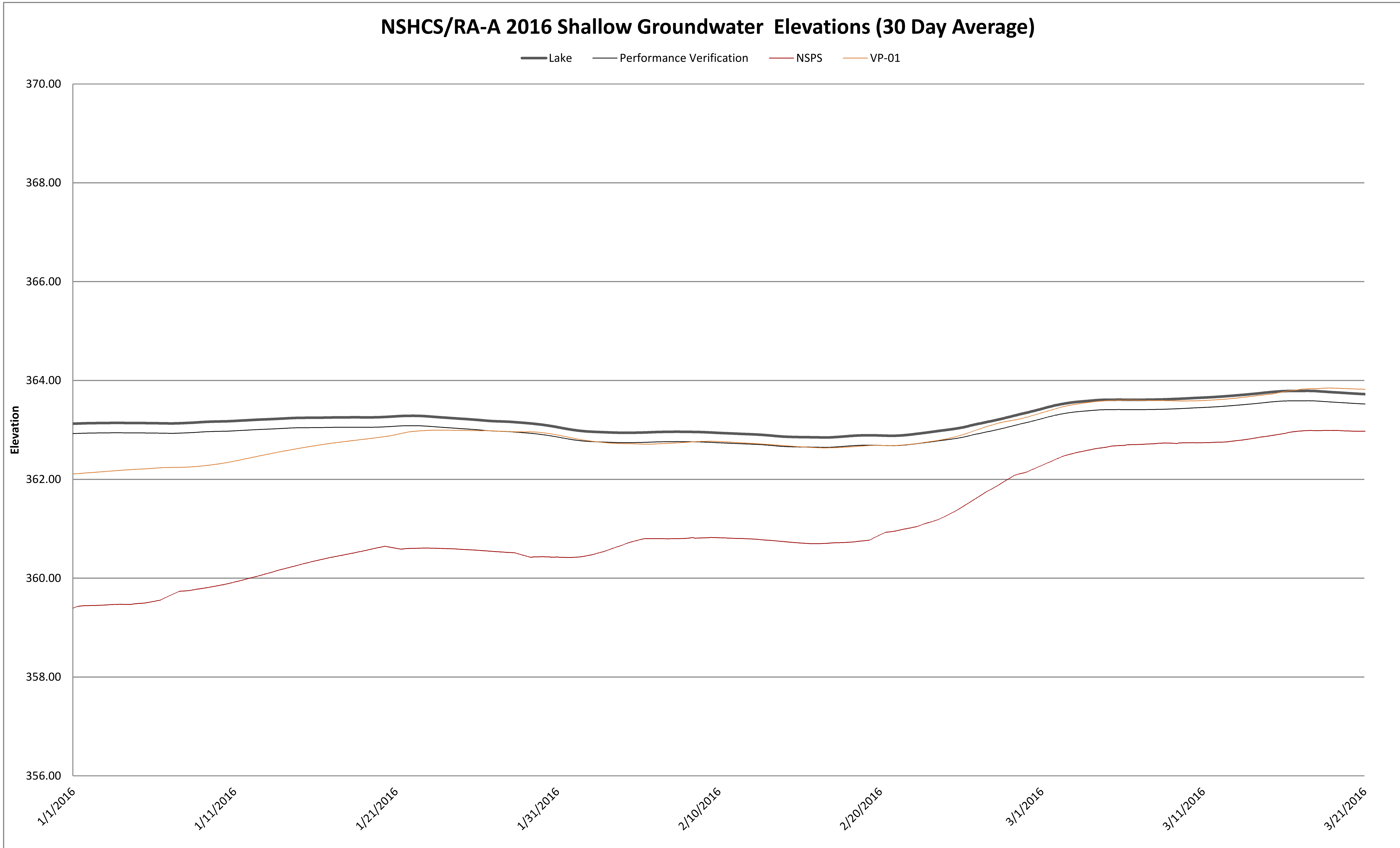

NSHCS/RA-A 2016 Shallow Groundwater Elevations (30 Day Average)
Lake
Performance Verification
NSPS
VP-01
370.00
368.00
366.00
364.00
362.00
360.00
358.00
356.00
Elevation
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016

Figure D-23

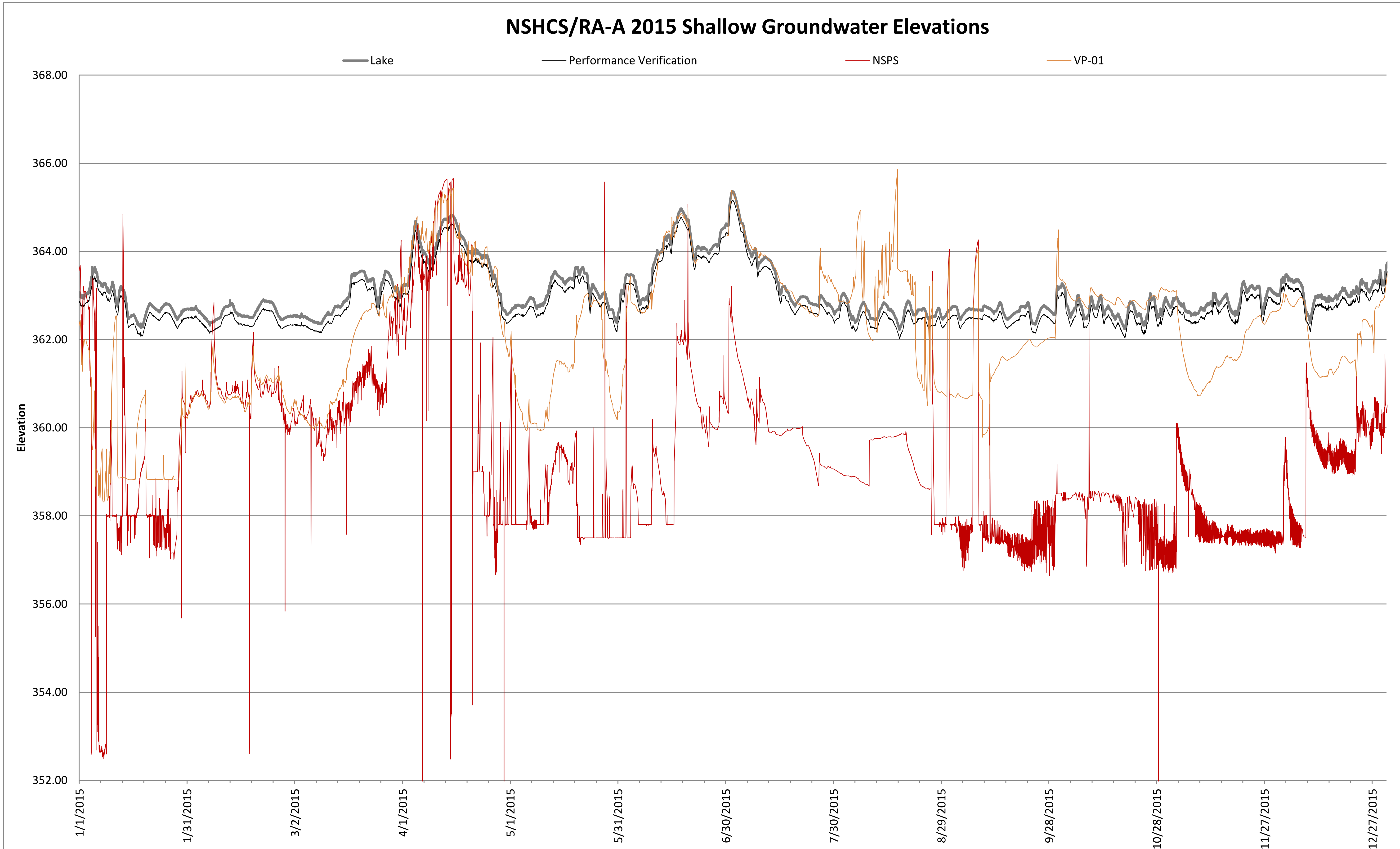
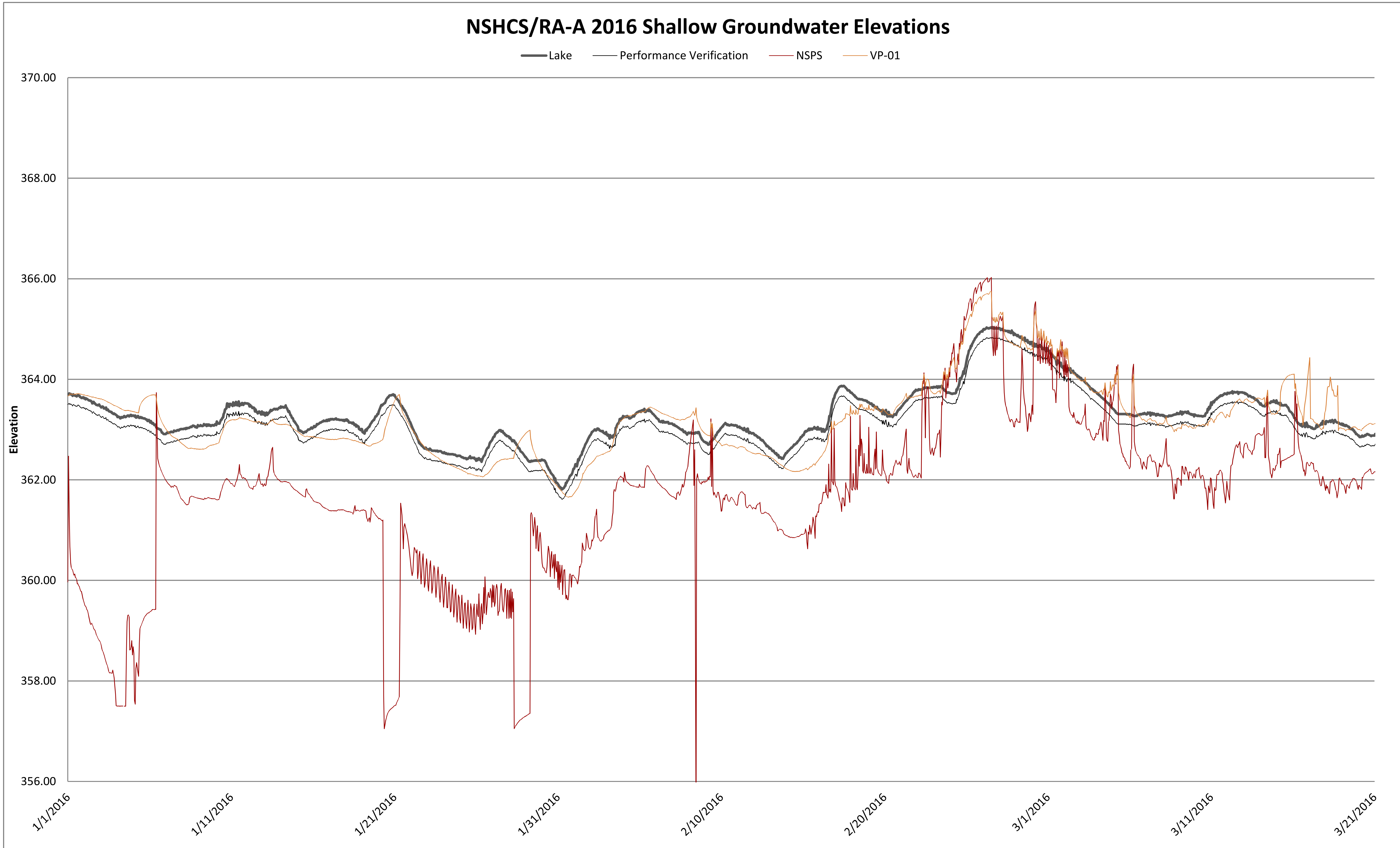

NSHCS/RA-A 2015 Shallow Groundwater Elevations
Lake
Performance Verification
NSPS
VP-01
Elevation
368.00
366.00
364.00
362.00
360.00
358.00
356.00
354.00
352.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015

Figure D-24



NSHCS/RA-A 2016 Shallow Groundwater Elevations
Lake
Performance Verification
NSPS
VP-01
Elevation
370.00
368.00
366.00
364.00
362.00
360.00
358.00
356.00
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016

Figure D-25

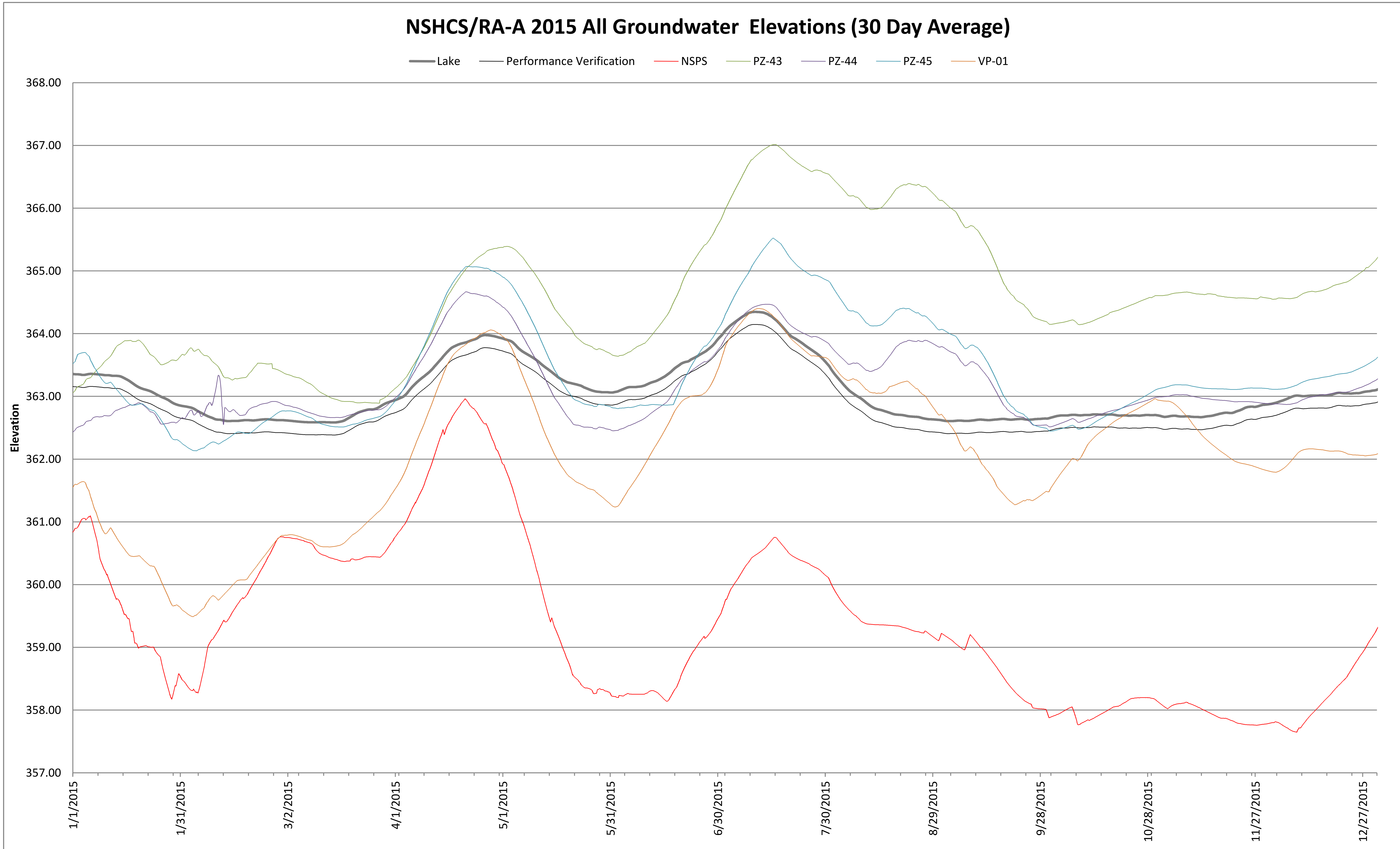

NSHCS/RA-A 2015 All Groundwater Elevations (30 Day Average)
Lake
Performance Verification
NSPS
PZ-43
PZ-44
PZ-45
VP-01
Elevation
368.00
367.00
366.00
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015

Figure D-26

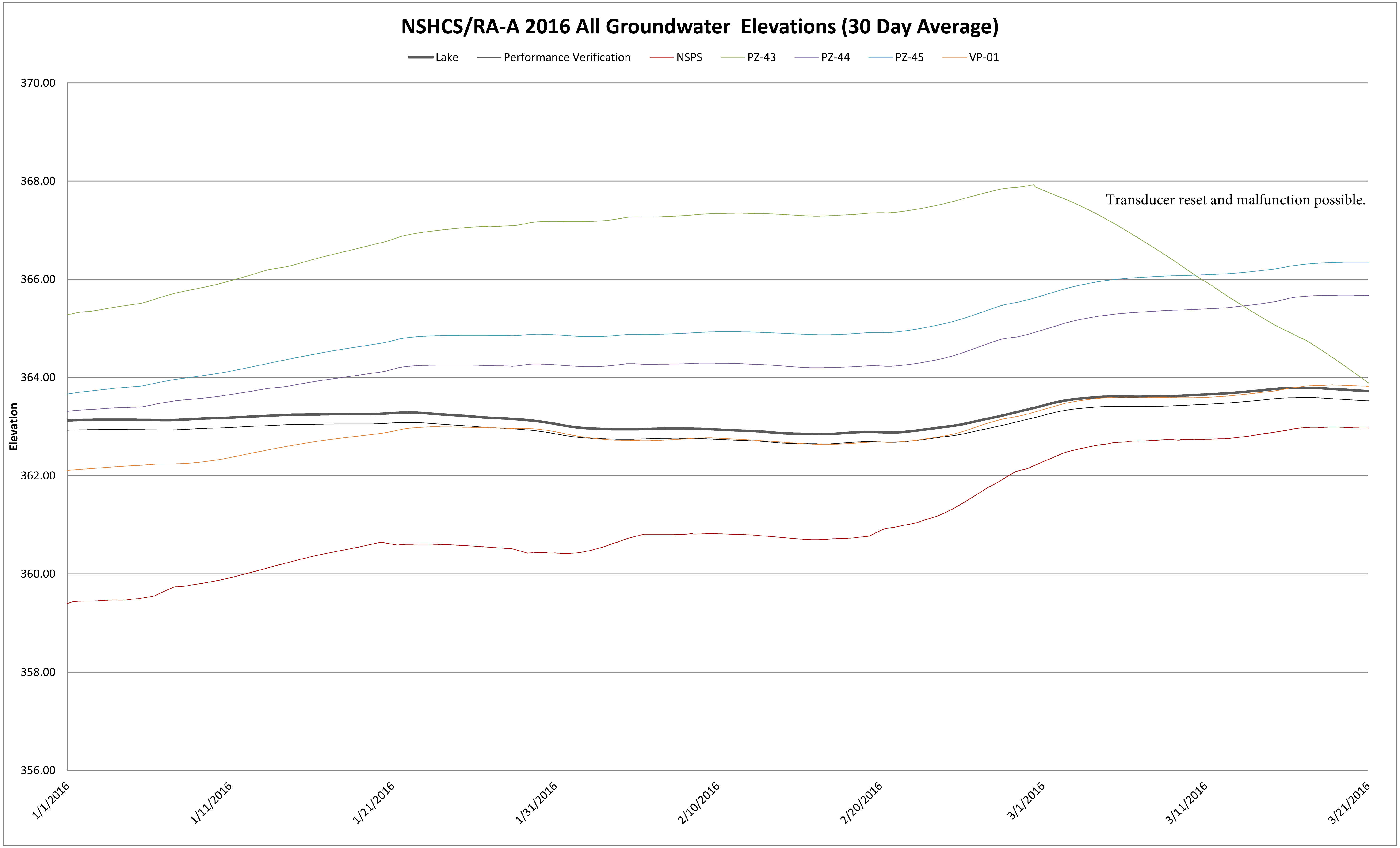

NSHCS/RA-A 2016 All Groundwater Elevations (30 Day Average)
Lake
Performance Verification
NSPS
PZ-43
PZ-44
PZ-45
VP-01
Elevation
370.00
368.00
366.00
364.00
362.00
360.00
358.00
356.00
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016
Transducer reset and malfunction possible.

Figure D-27

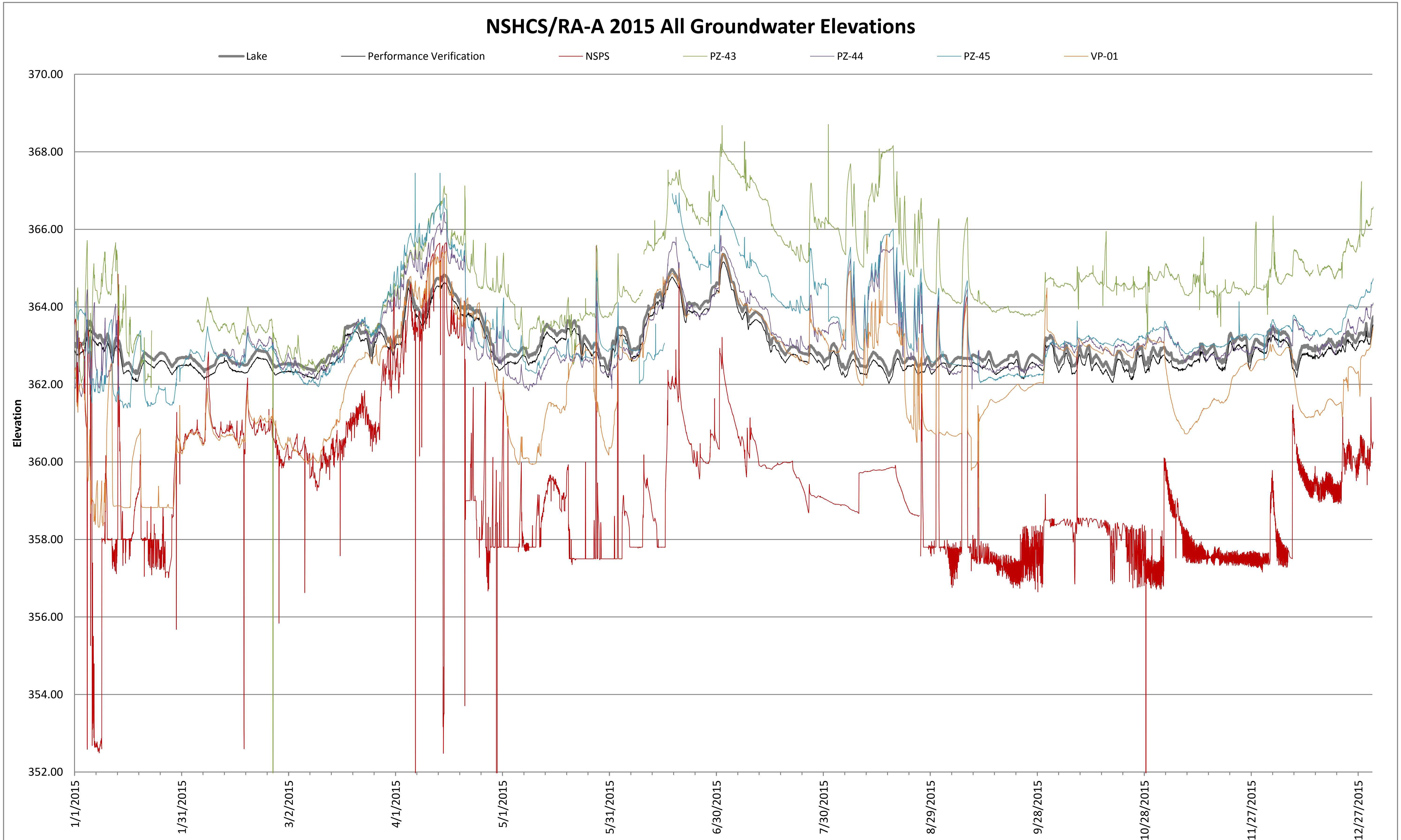
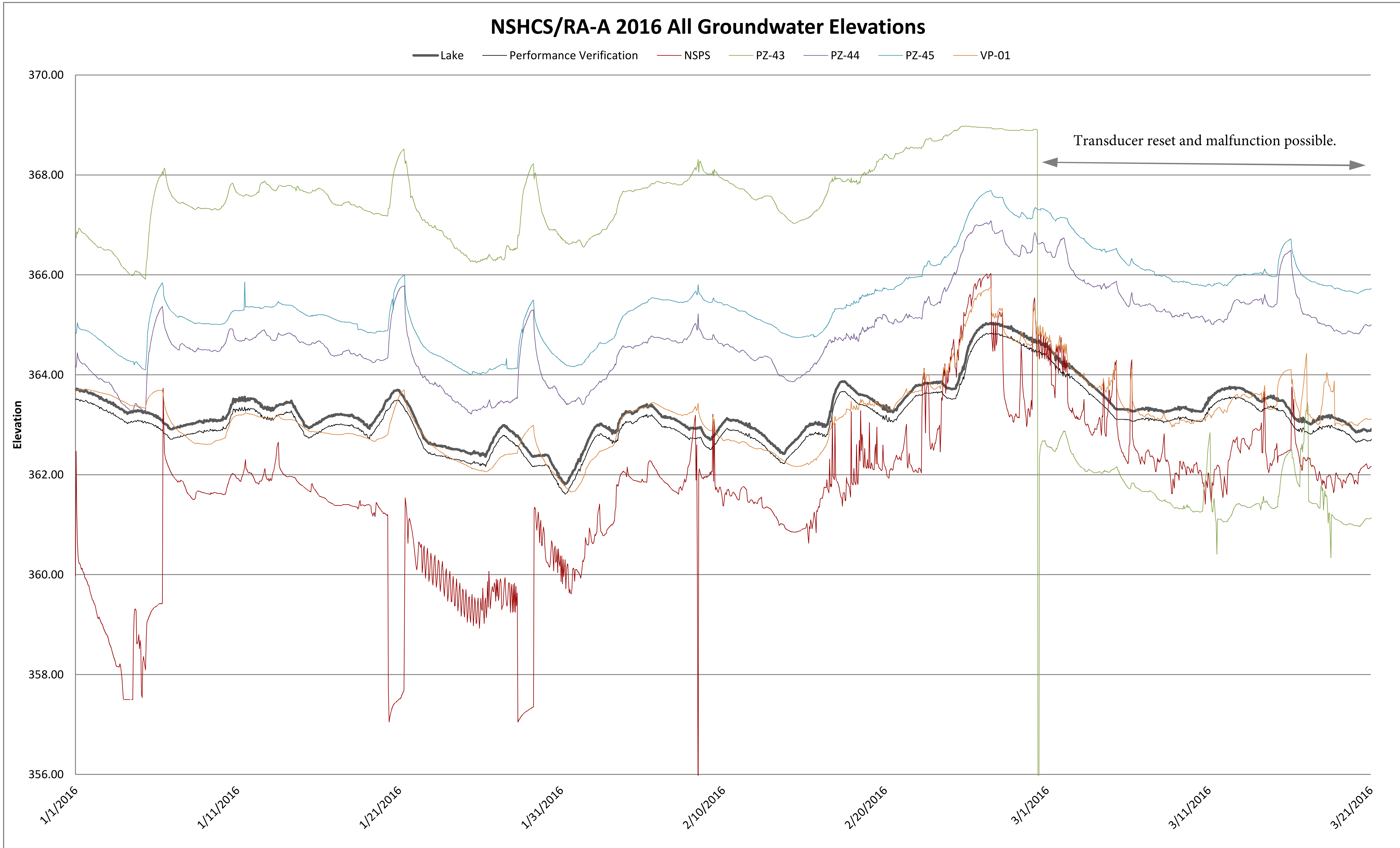
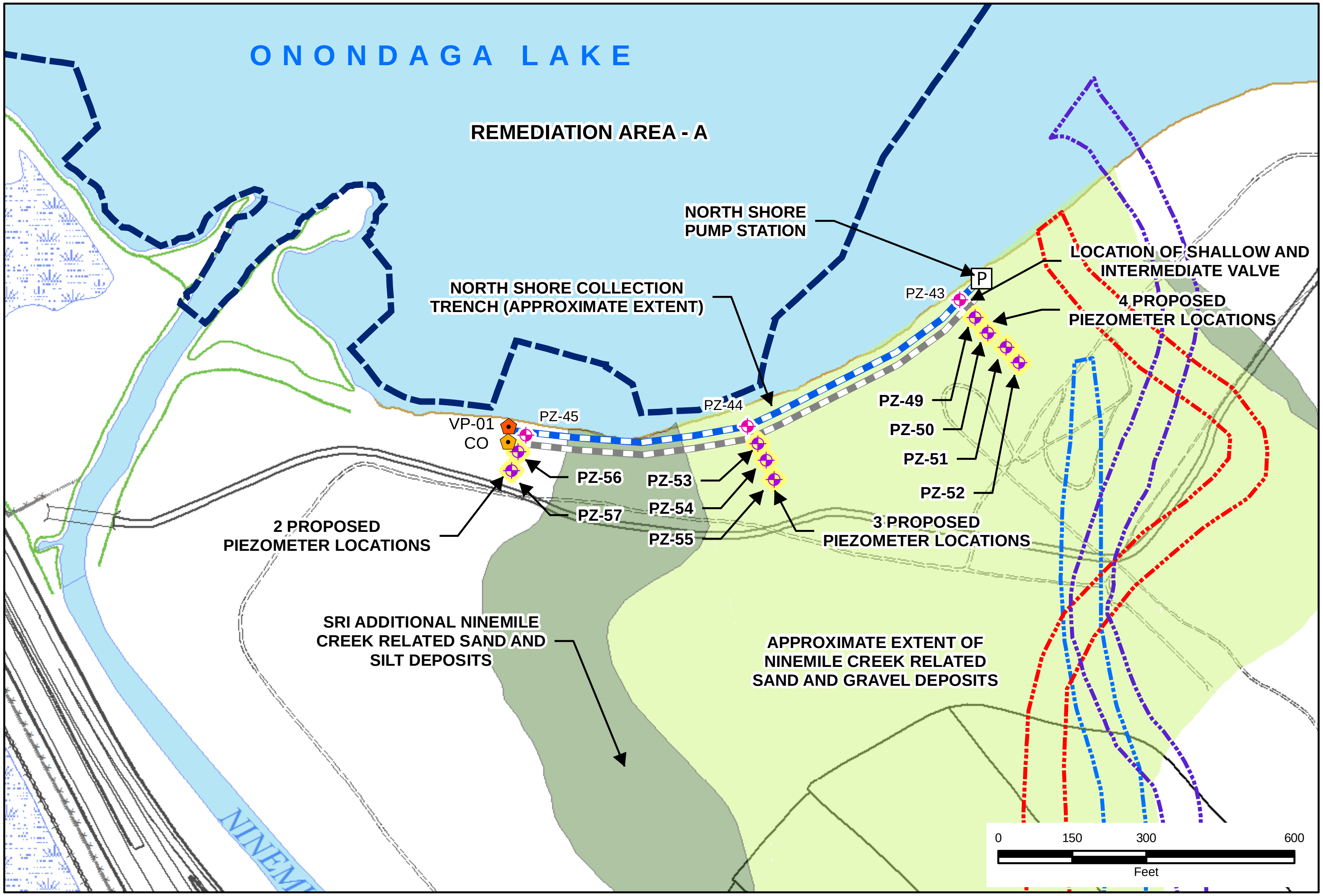

NSHCS/RA-A 2015 All Groundwater Elevations
Lake
Performance Verification
NSPS
PZ-43
PZ-44
PZ-45
VP-01
Elevation
370.00
368.00
366.00
364.00
362.00
360.00
358.00
356.00
354.00
352.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015

Figure D-28



NSHCS/RA-A 2016 All Groundwater Elevations
Lake
Performance Verification
NSPS
PZ-43
PZ-44
PZ-45
VP-01
Elevation
370.00
368.00
366.00
364.00
362.00
360.00
358.00
356.00
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016
Transducer reset and malfunction possible.



LEGEND

- VP-01
- HEADER CLEANOUT
- PROPOSED PIEZOMETER LOCATION
- PIEZOMETER

HISTORIC NINEMILE CREEK CHANNEL EXTENT

- USGS TOPO MAP 1898
- ALLIED DRAWING 1937
- THOMSEN ASSOCIATES. 1982

HONEYWELL INTERNATIONAL INC.
WASTEBEDS 1-8
GEDDES, NEW YORK

NORTHSHORE PIEZOMETER LOCATIONS

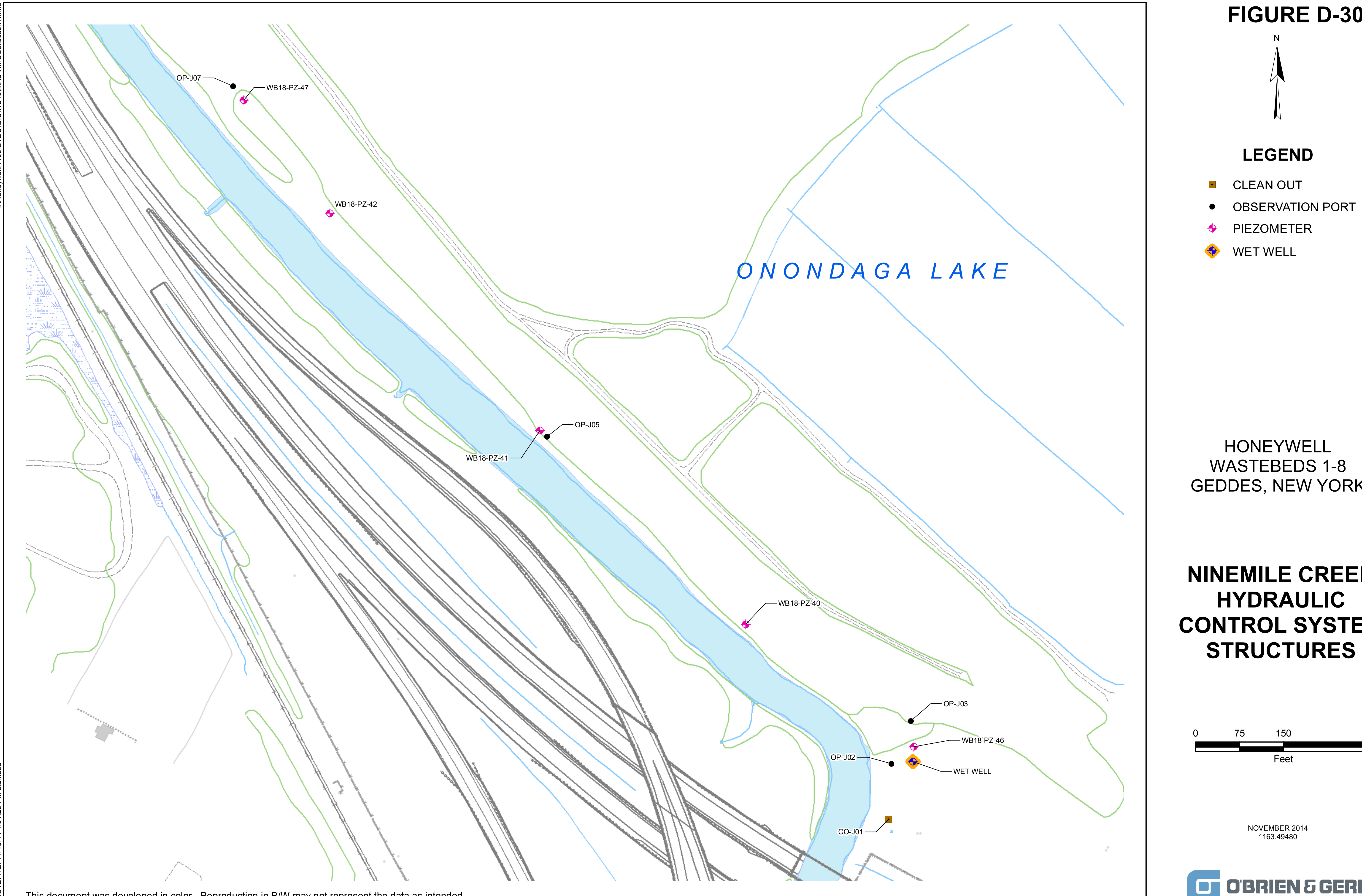
1163.52381
FEBRUARY 2016

O'BRIEN & GERE ENGINEERS, INC.

PLOTDATE: 12/22/15 3:22:29 PM nicholbm
I:\Honeywell.1163\52381.Wastebeds-1-8-I\Docs\DWG\MXD\Proposed_PZ.mxd

PLOTDATE: 11/13/14 4:51:25 PM stantosa

I:\Honeywell.1163\STDS\GIS\Wb18\MXD\NMCCollection1.mxd



This document was developed in color. Reproduction in B/W may not represent the data as intended.

FIGURE D-30

HONEYWELL
WASTEBEDS 1-8
GEDDES, NEW YORK

NINEMILE CREEK HYDRAULIC CONTROL SYSTEM STRUCTURES

NOVEMBER 2014
1163.49480

O'BRIEN & GERE

Figure D-31

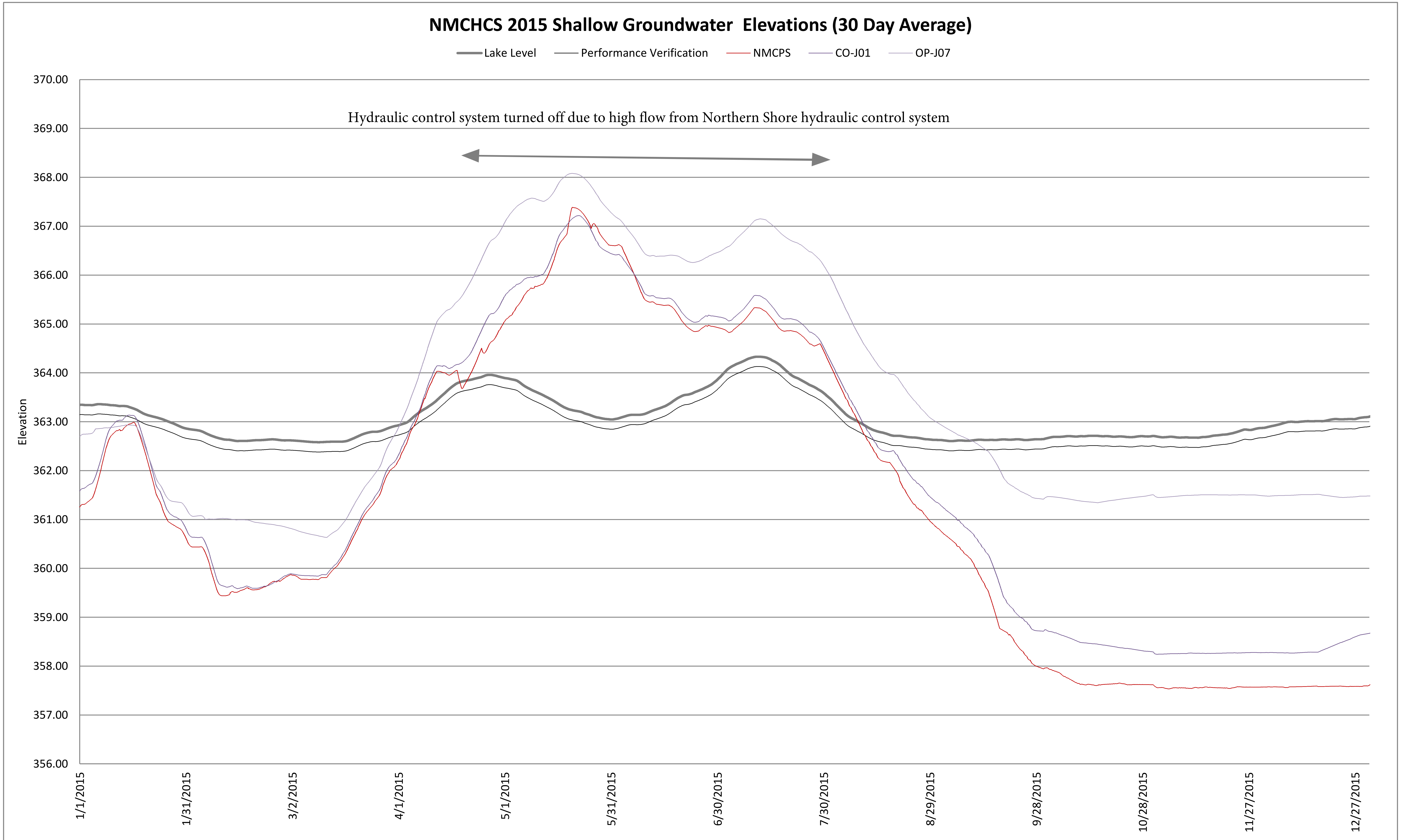

NMCHCS 2015 Shallow Groundwater Elevations (30 Day Average)
Lake Level
Performance Verification
NMCPS
CO-J01
OP-J07
Elevation
370.00
369.00
368.00
367.00
366.00
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
356.00
Hydraulic control system turned off due to high flow from Northern Shore hydraulic control system
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015

Figure D-32

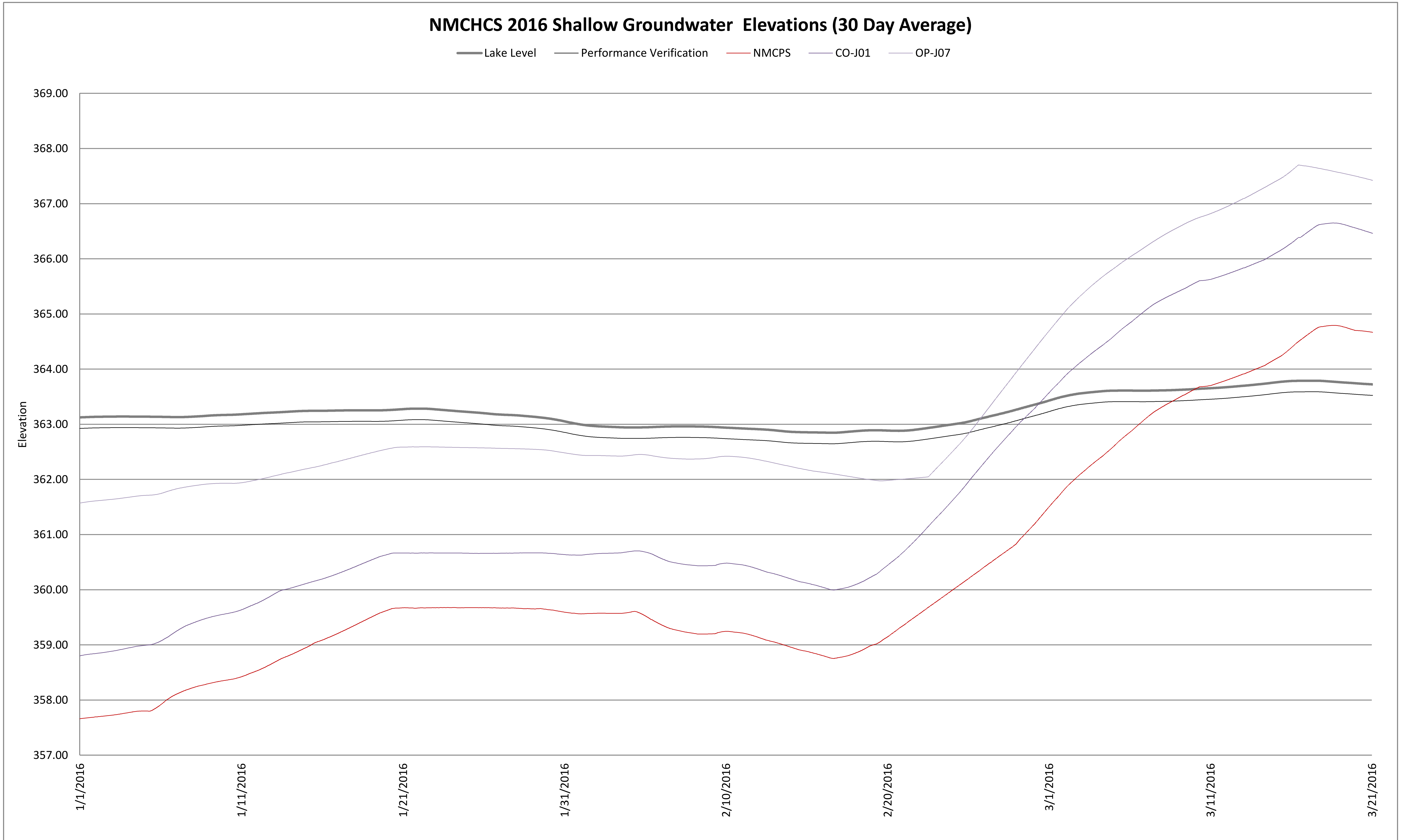

NMCHCS 2016 Shallow Groundwater Elevations (30 Day Average)
Lake Level
Performance Verification
NMCPS
CO-J01
OP-J07
Elevation
369.00
368.00
367.00
366.00
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016

Figure D-33

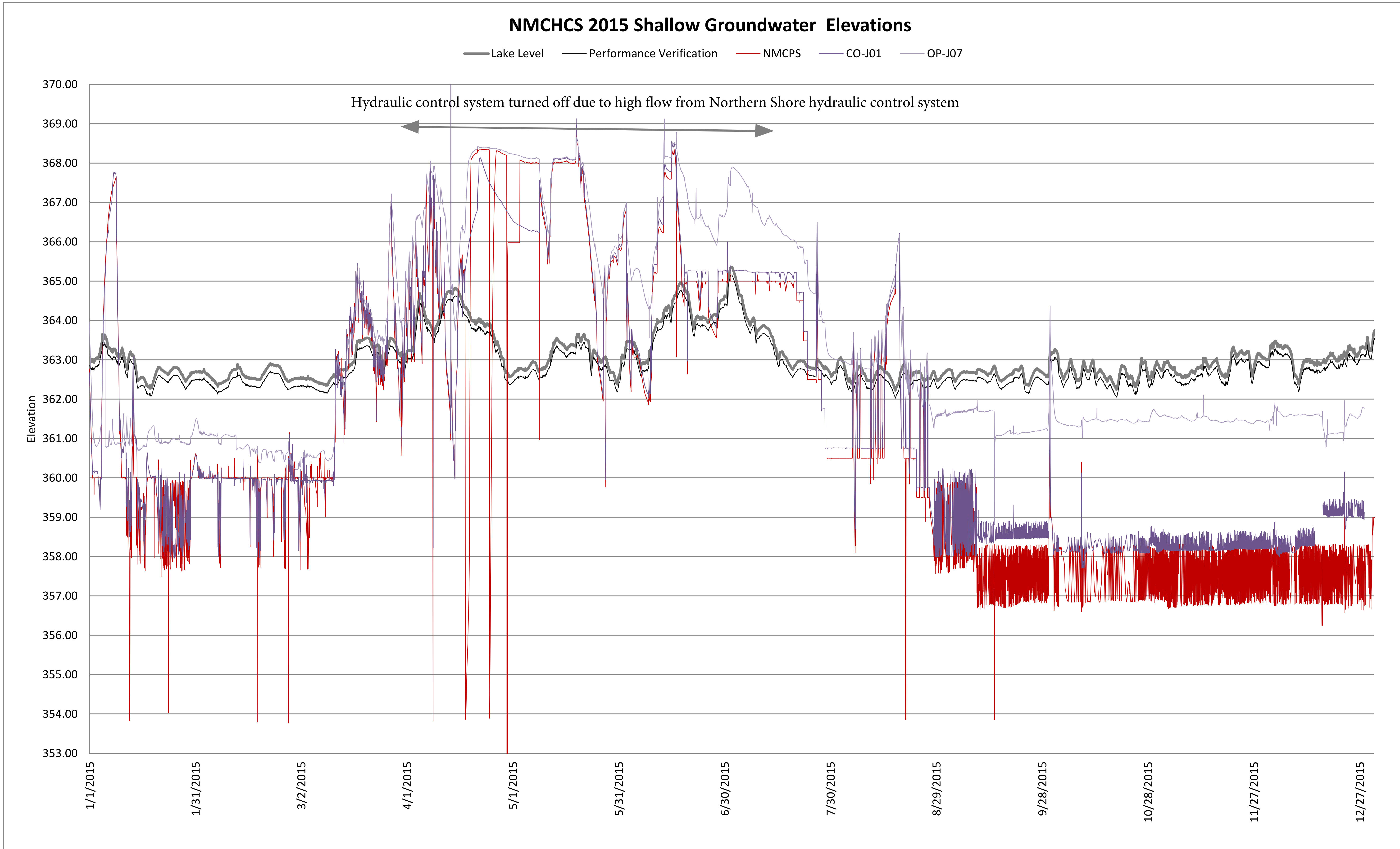
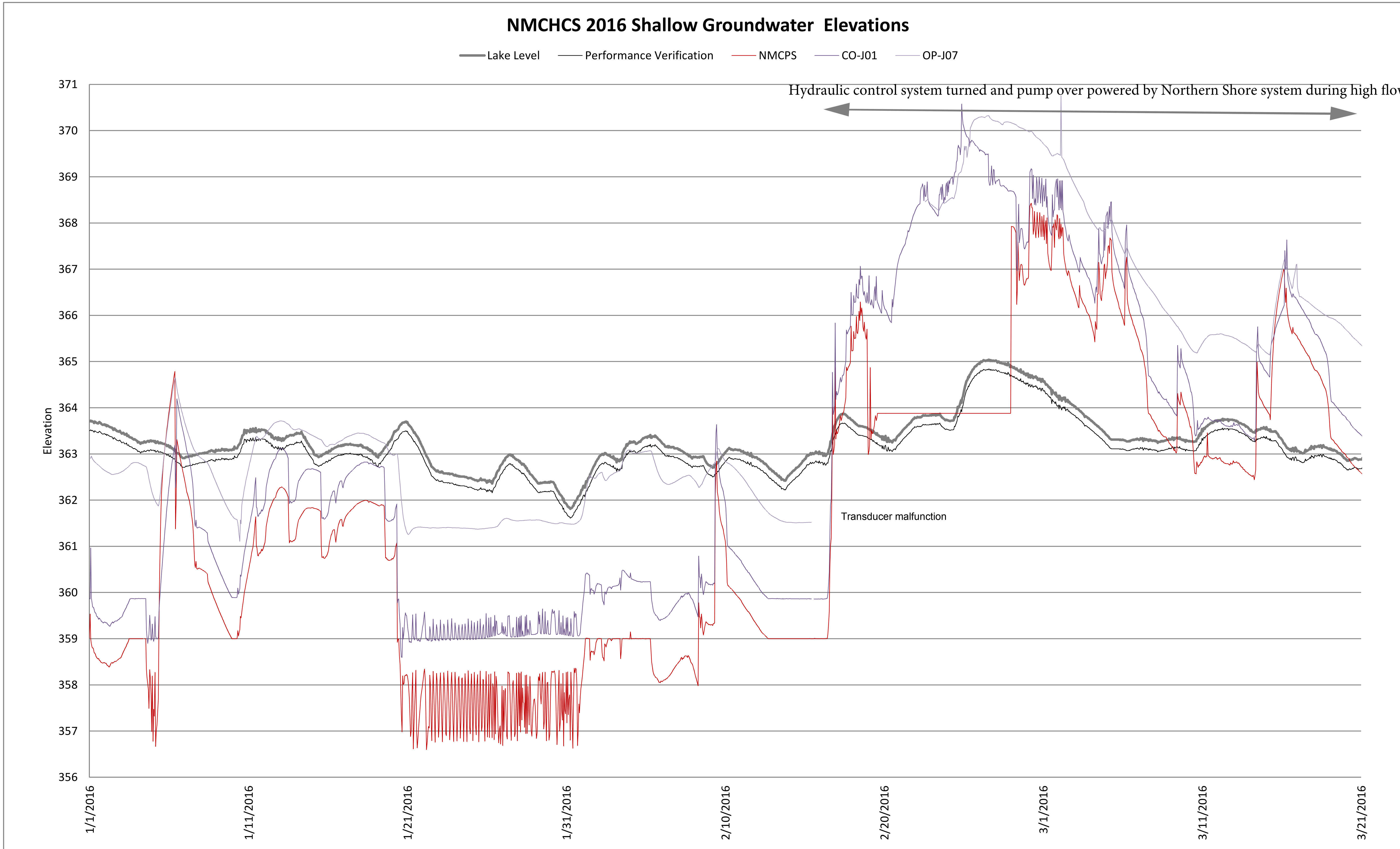

NMCHCS 2015 Shallow Groundwater Elevations
Lake Level
Performance Verification
NMCPS
CO-J01
OP-J07
Elevation
370.00
369.00
368.00
367.00
366.00
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
356.00
355.00
354.00
353.00
Hydraulic control system turned off due to high flow from Northern Shore hydraulic control system
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015

Figure D-34



NMCHCS 2016 Shallow Groundwater Elevations
Lake Level
Performance Verification
NMCPS
CO-J01
OP-J07
Elevation
371
370
369
368
367
366
365
364
363
362
361
360
359
358
357
356
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016
Hydraulic control system turned and pump over powered by Northern Shore system during high flow.
Transducer malfunction

Figure D-35

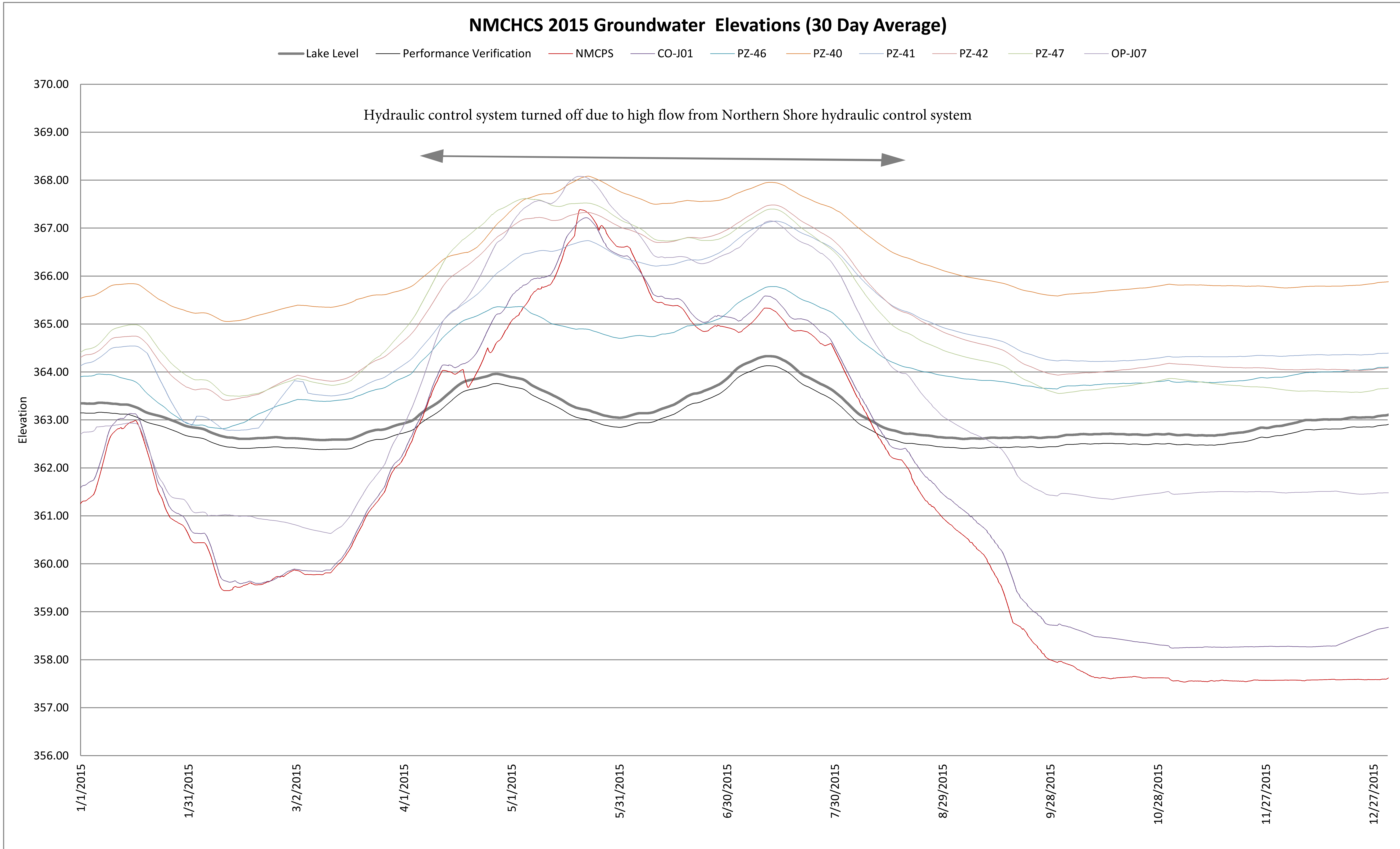

NMCHCS 2015 Groundwater Elevations (30 Day Average)
Lake Level
Performance Verification
NMCPS
CO-J01
PZ-46
PZ-40
PZ-41
PZ-42
PZ-47
OP-J07
Hydraulic control system turned off due to high flow from Northern Shore hydraulic control system
Elevation
370.00
369.00
368.00
367.00
366.00
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
356.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015

Figure D-36

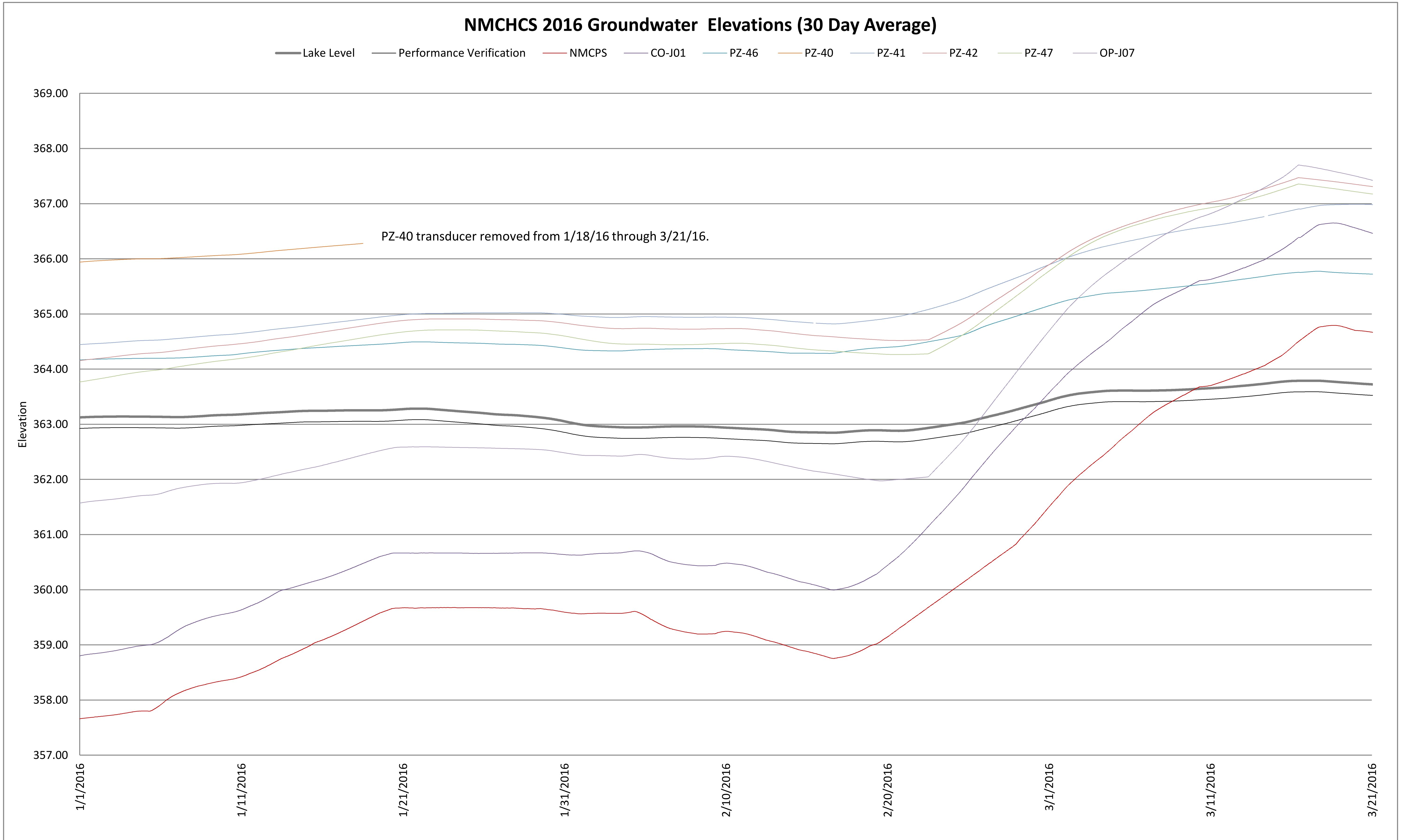
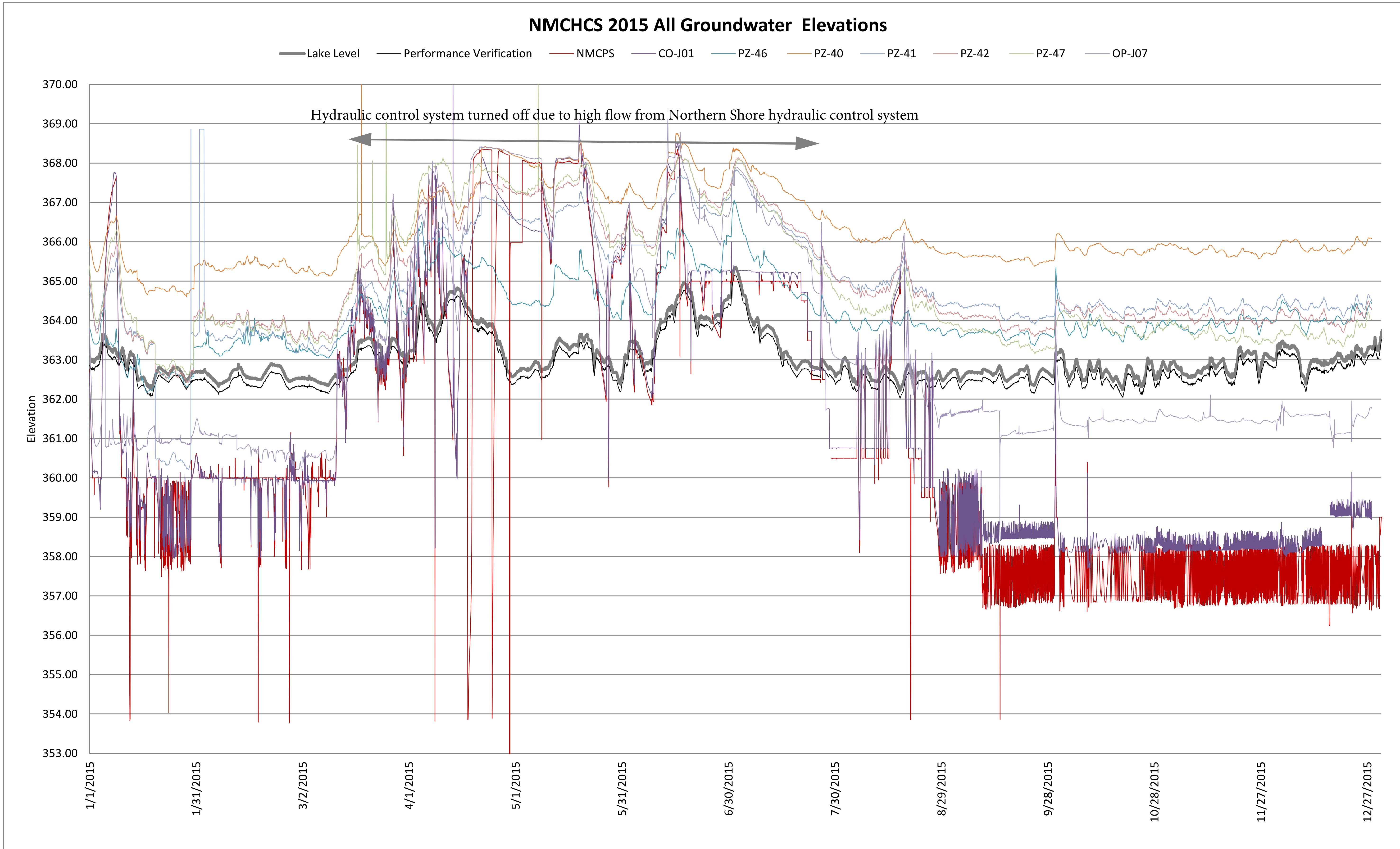
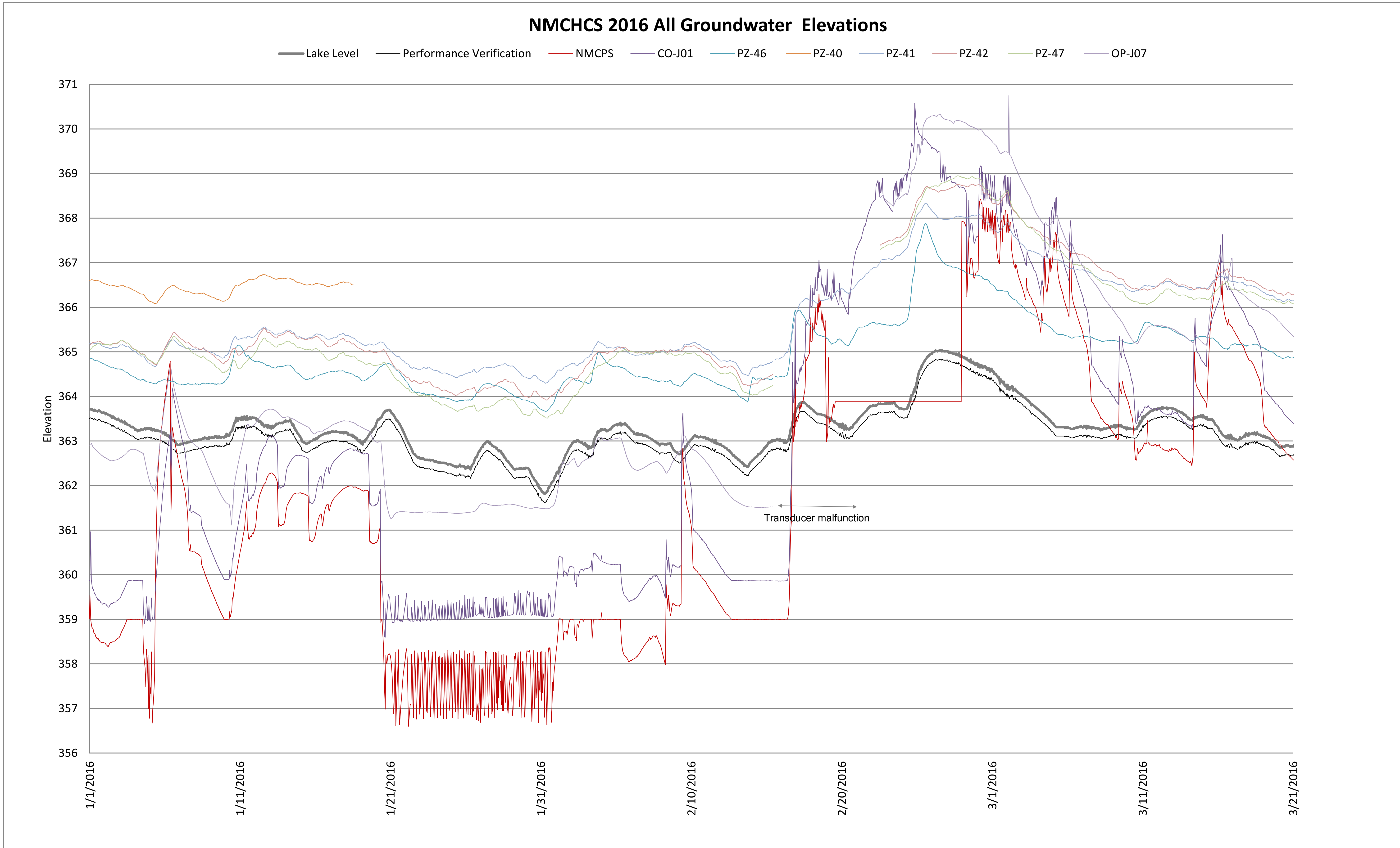

NMCHCS 2016 Groundwater Elevations (30 Day Average)
Lake Level
Performance Verification
NMCPS
CO-J01
PZ-46
PZ-40
PZ-41
PZ-42
PZ-47
OP-J07
PZ-40 transducer removed from 1/18/16 through 3/21/16.
Elevation
369.00
368.00
367.00
366.00
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016

Figure D-37



NMCHCS 2015 All Groundwater Elevations
Lake Level
Performance Verification
NMCPS
CO-J01
PZ-46
PZ-40
PZ-41
PZ-42
PZ-47
OP-J07
Hydraulic control system turned off due to high flow from Northern Shore hydraulic control system
Elevation
370.00
369.00
368.00
367.00
366.00
365.00
364.00
363.00
362.00
361.00
360.00
359.00
358.00
357.00
356.00
355.00
354.00
353.00
1/1/2015
1/31/2015
3/2/2015
4/1/2015
5/1/2015
5/31/2015
6/30/2015
7/30/2015
8/29/2015
9/28/2015
10/28/2015
11/27/2015
12/27/2015

Figure D-38


NMCHCS 2016 All Groundwater Elevations
Lake Level
Performance Verification
NMCPS
CO-J01
PZ-46
PZ-40
PZ-41
PZ-42
PZ-47
OP-J07
Elevation
371
370
369
368
367
366
365
364
363
362
361
360
359
358
357
356
1/1/2016
1/11/2016
1/21/2016
1/31/2016
2/10/2016
2/20/2016
3/1/2016
3/11/2016
3/21/2016
Transducer malfunction