FIGURES

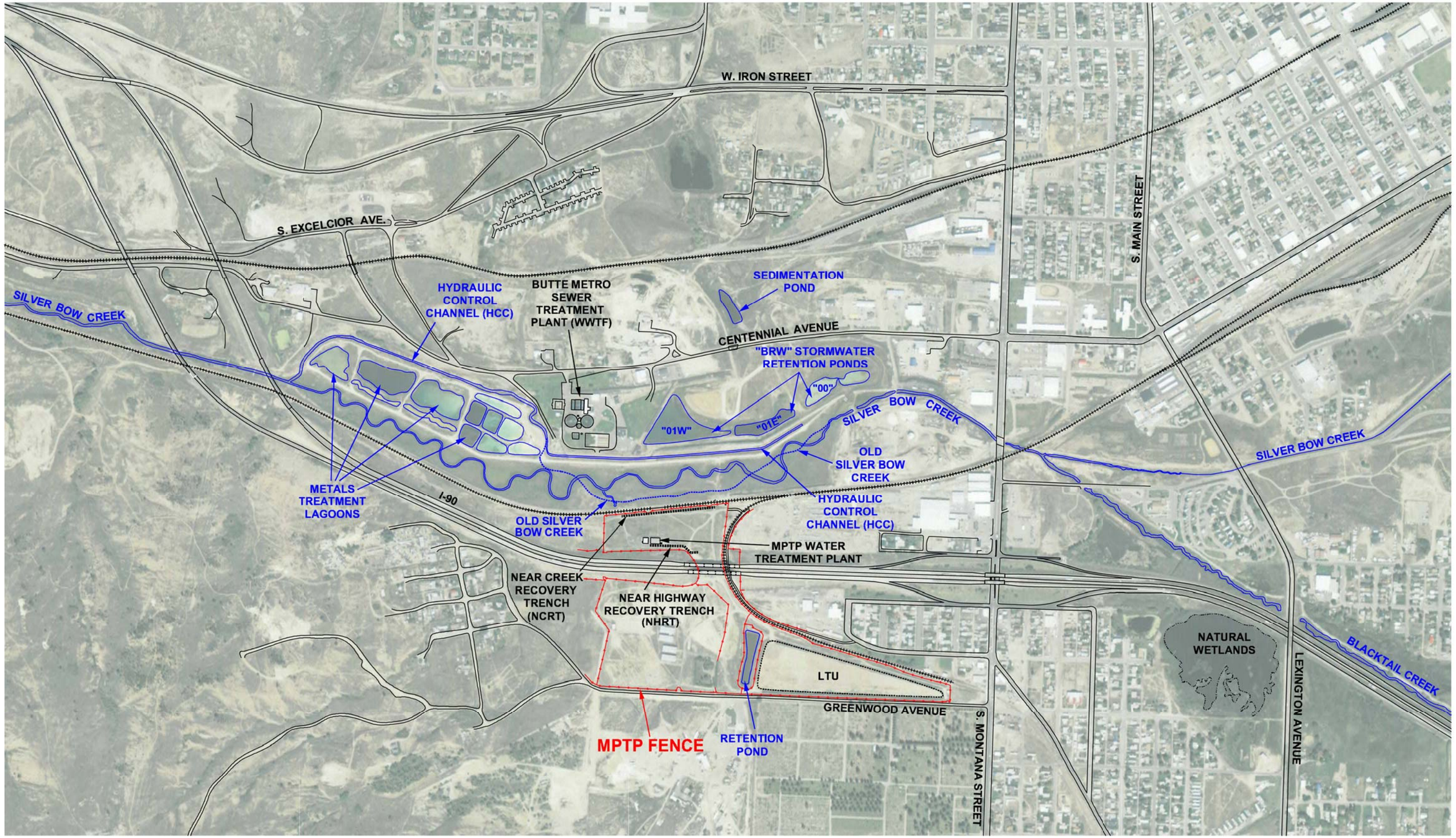

Figure 1-1. Key Features in Vicinity of MPTP Site

Tetra Tech

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HYDRAULIC CONTROL CHANNEL (HCC)

(THIS PORTION OLD SILVER BOW CREEK)

CENTENNIAL AVENUE

SILVER BOW CREEK

OLD SILVER BOW CREEK

I-90

MPTP FENCE

NOTE:

NAMES OF SOME WELLS TAKEN FROM CAD FILE PROVIDED BY STATE OF MONTANA MAY REFER TO "ALIAS" WELL NAMES IN WELL LIST PROVIDED IN APPENDIX B.

POWER POLE

0 350 700

SCALE IN FEET

Figure 2-1a. Monitoring Locations and Constructed Bottom Elevations of Silver Bow Creek and HCC

Tetra Tech

0509141004A.DWG

HYDRAULIC CONTROL CHANNEL (HCC)

HYDRAULIC CONTROL CHANNEL (HCC)

CENTENNIAL AVENUE

SILVER BOW CREEK

SILVER BOW CREEK

OLD SILVER BOW CREEK

I-90

MPTP FENCE

NOTE:

NAMES OF SOME WELLS TAKEN FROM CAD FILE PROVIDED BY STATE OF MONTANA MAY REFER TO "ALIAS" WELL NAMES IN WELL LIST PROVIDED IN APPENDIX B.

POWER POLE

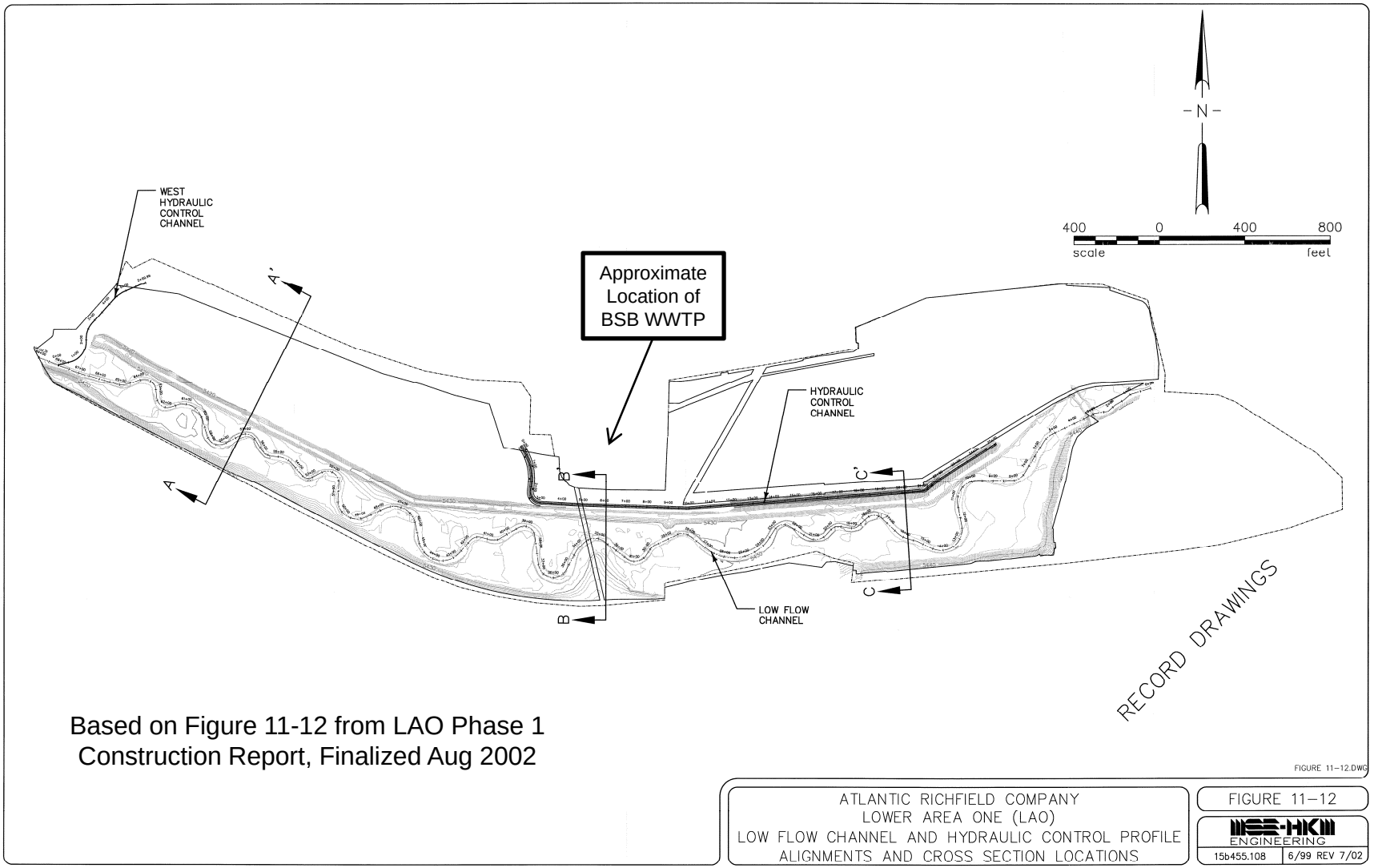
0 350 700

SCALE IN FEET

0509141007A.DWG

Figure 2-1b. Monitoring Locations and Constructed Bottom Elevations of Silver Bow Creek and HCC (Shows Southern Part of MPTP Site)

Tetra Tech



Based on Figure 11-12 from LAO Phase 1 Construction Report, Finalized Aug 2002

ATLANTIC RICHFIELD COMPANY
LOWER AREA ONE (LAO)
LOW FLOW CHANNEL AND HYDRAULIC CONTROL PROFILE
ALIGNMENTS AND CROSS SECTION LOCATIONS

FIGURE 11-12

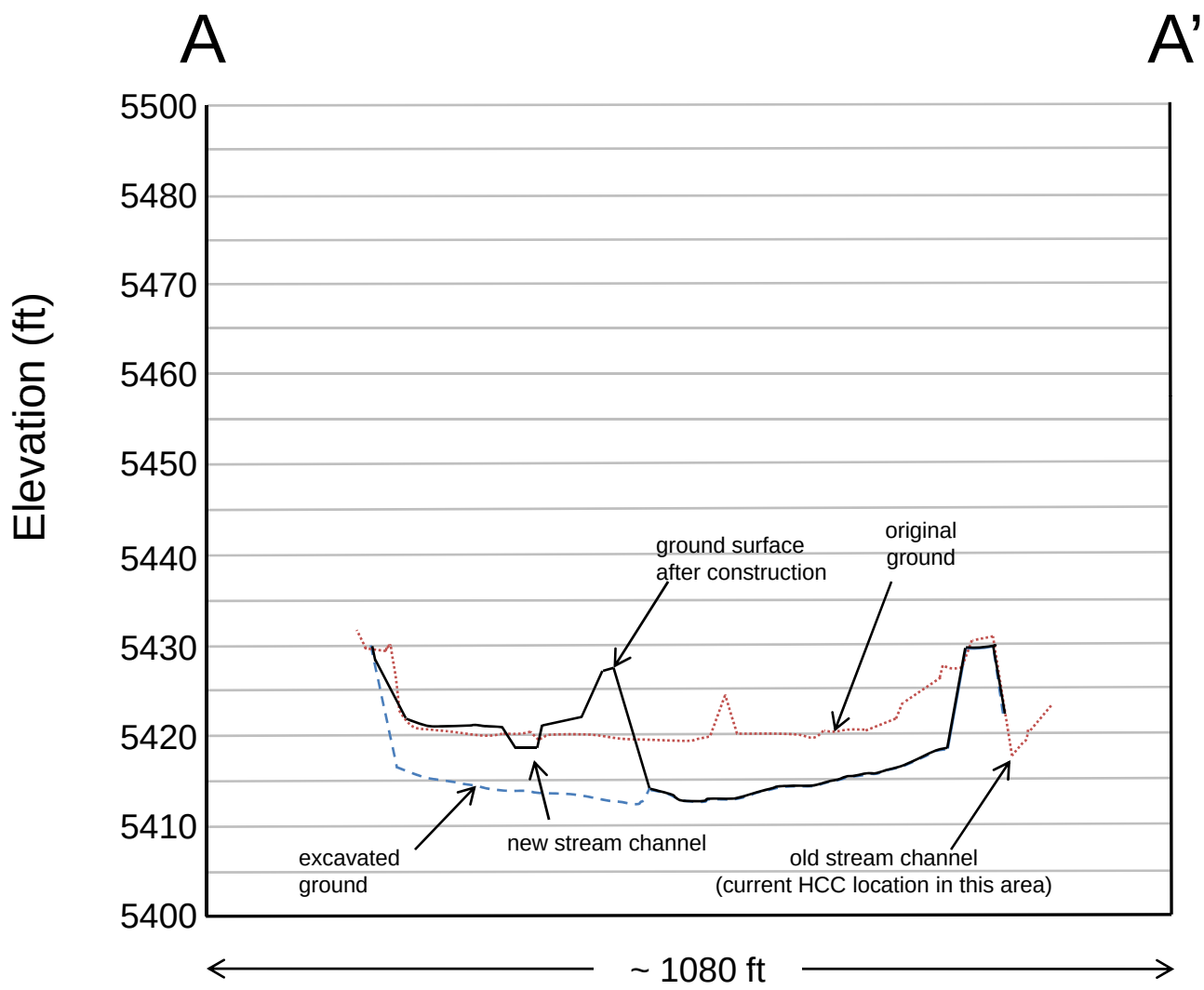
MSE-HKM ENGINEERING

15b455.108 | 6/99 REV 7/02

Figure 2-2. Locations of profiles for Silver Bow Creek (Old and Reconstructed) and Hydraulic Control Channel, from LAO Construction Report

TETRA TECH

SECTION A—A’



Based on Figure 13-3 from LAO Phase 1 Construction Report, Finalized Aug 2002

Section location is identified on Figure 11-12 from LAO Phase 1 Construction Report, Finalized Aug 2002

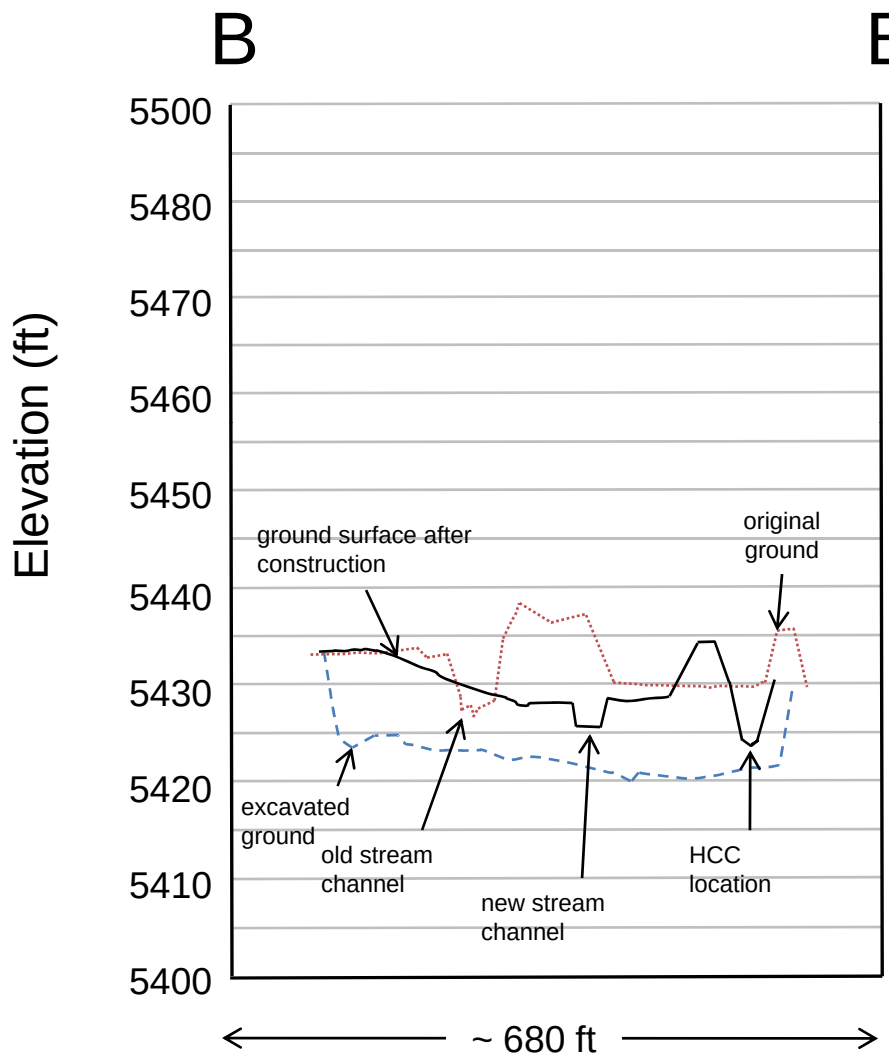
Annotations provided by Tetra Tech, June 2010

Elevation based on NGVD 29 (ft) datum

Figure 2-3. Profile A-A’ from LAO Construction Report (Annotated)

TETRA TECH

SECTION B—B’



Based on Figure 13-3 from LAO Phase 1 Construction Report, Finalized Aug 2002

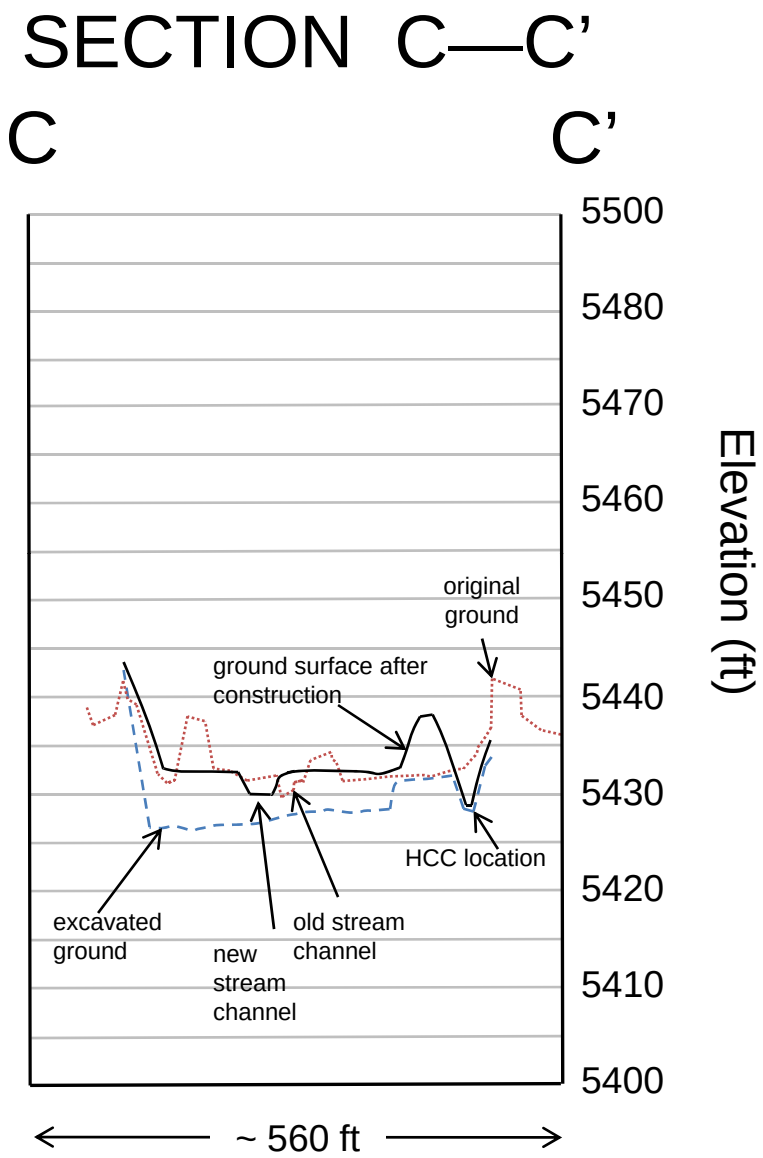
Section location is identified on Figure 11-12 from LAO Phase 1 Construction Report, Finalized Aug 2002

Annotations provided by Tetra Tech, June 2010

Elevation based on NGVD 29 (ft) datum

Figure 2-4. Profile B-B’ from LAO Construction Report (Annotated)

TETRA TECH



Based on Figure 13-3 from LAO Phase 1 Construction Report, Finalized Aug 2002

Section location is identified on Figure 11-12 from LAO Phase 1 Construction Report, Finalized Aug 2002

Annotations provided by Tetra Tech, June 2010

Elevation based on NGVD 29 (ft) datum

Figure 2-5. Profile C-C' from LAO Construction Report (Annotated)

TETRA TECH

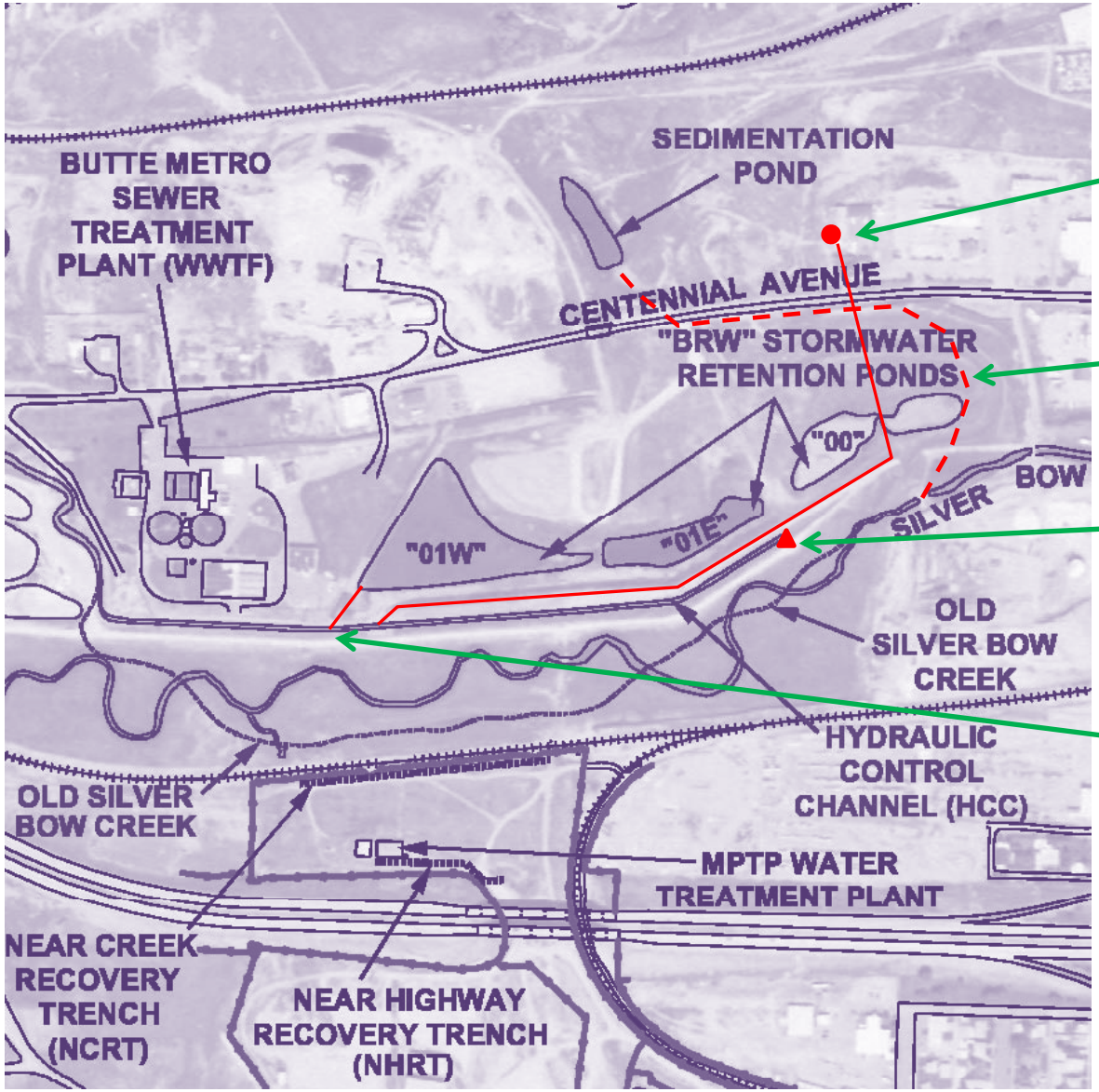


Figure 2-6. Illustration of Where Water Enters Eastern Portion of HCC, and Where Water Enters Silver Bow Creek from Sediment Pond Located North of BRW Ponds

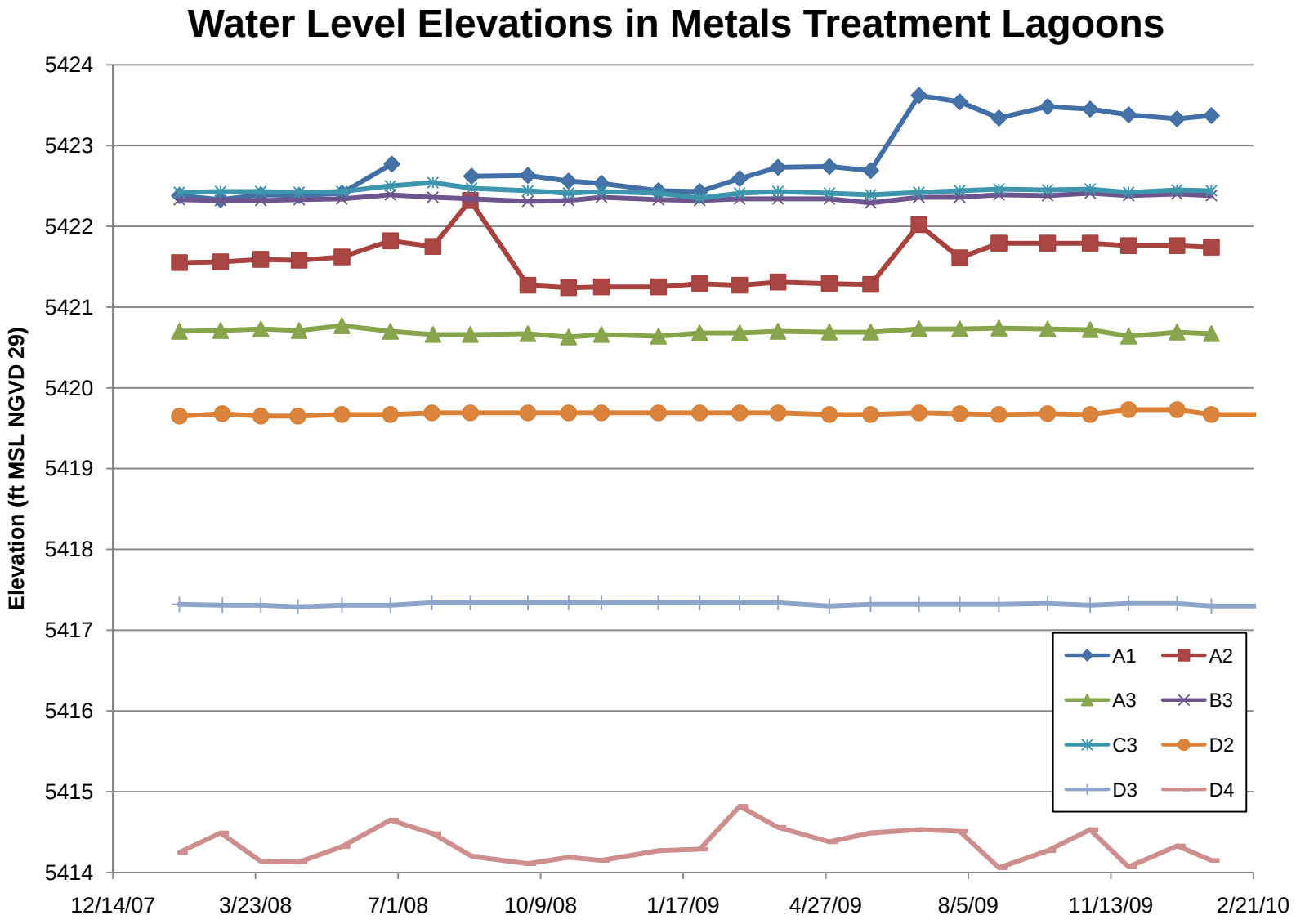


Figure 2-7. Water Level Elevations in Metals Treatment Lagoons

TETRA TECH

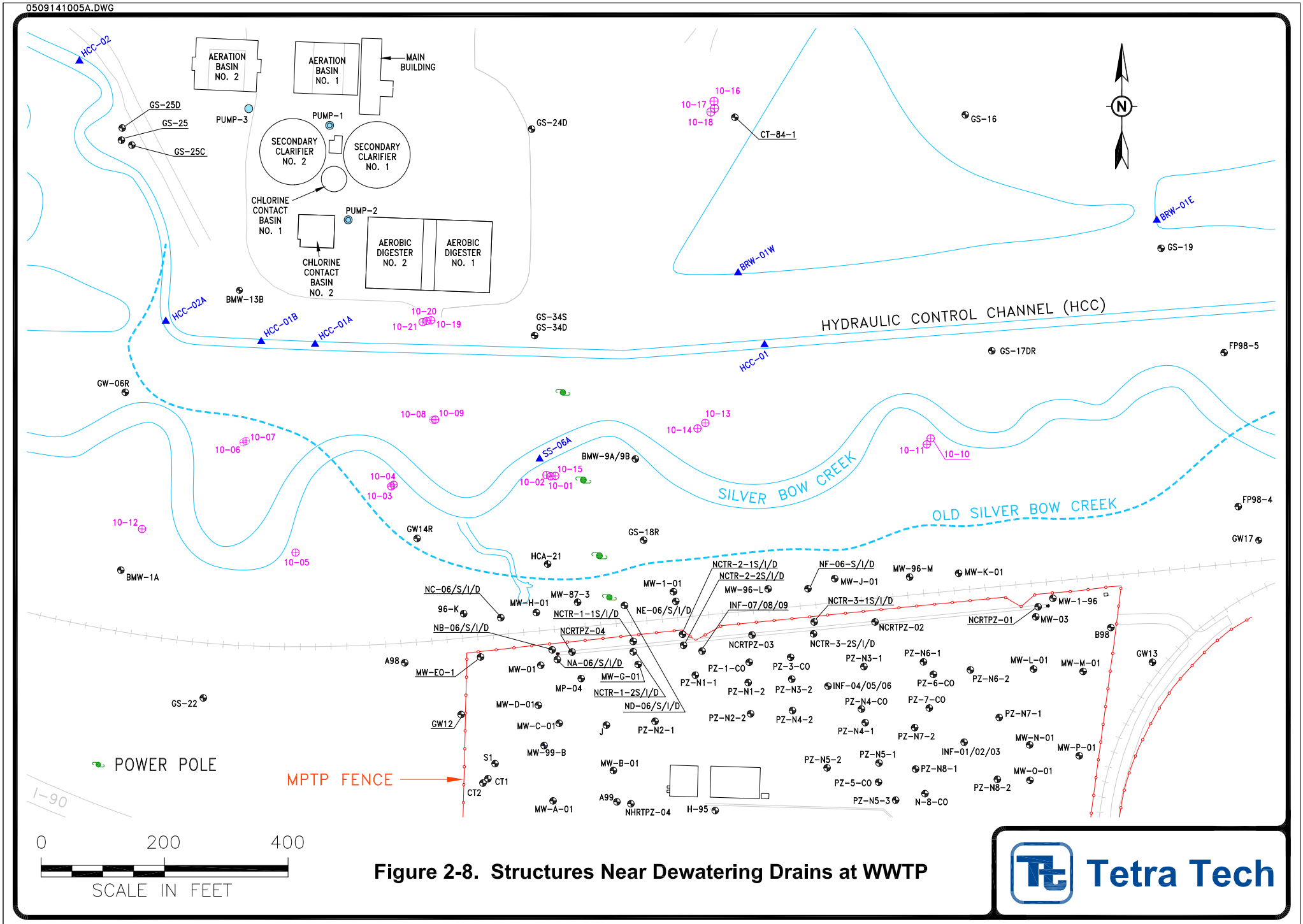


Figure 2-8. Structures Near Dewatering Drains at WWTP

Tetra Tech

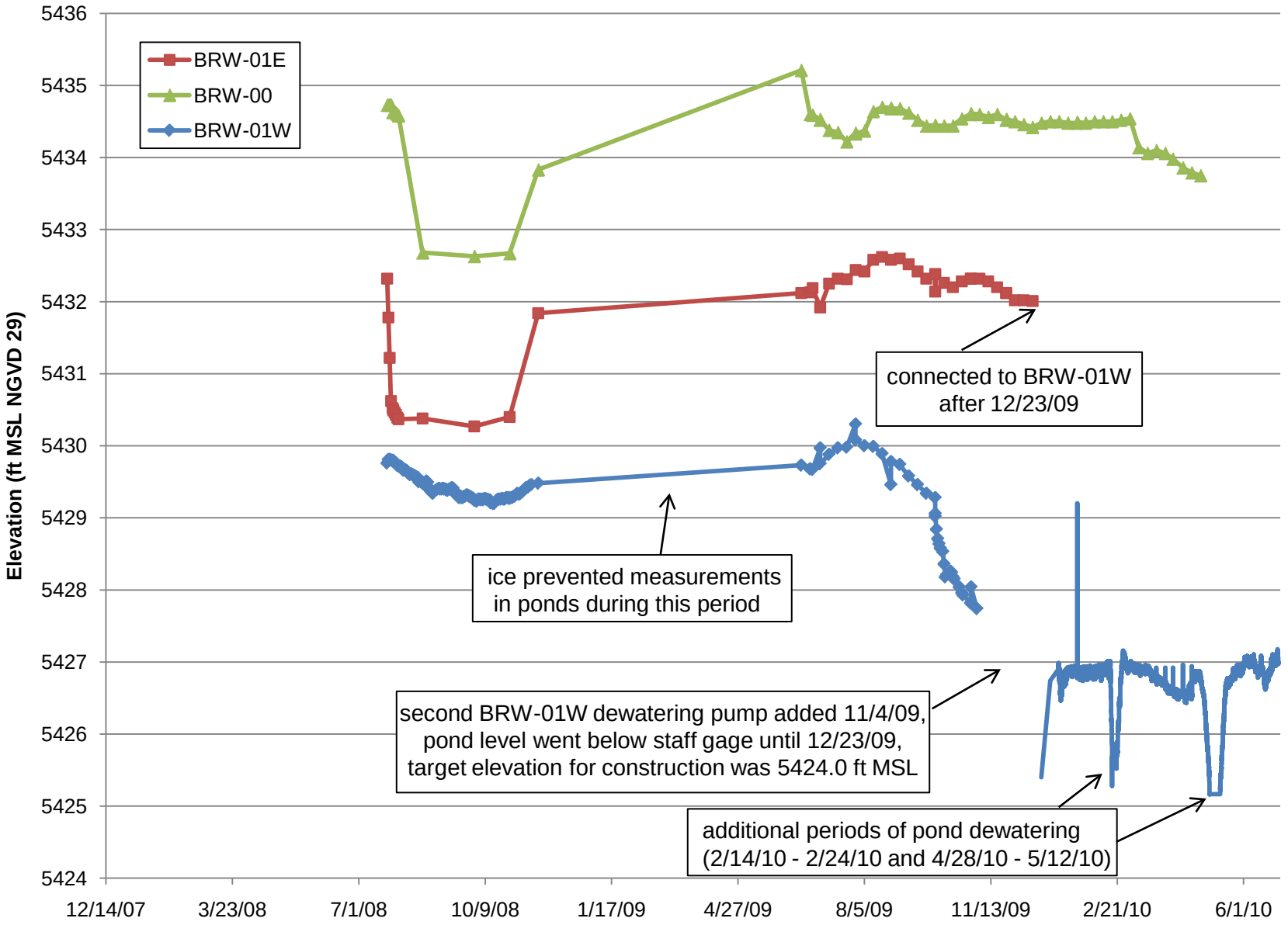


Figure 2-9. Water Level Elevations in BRW Ponds

TETRA TECH

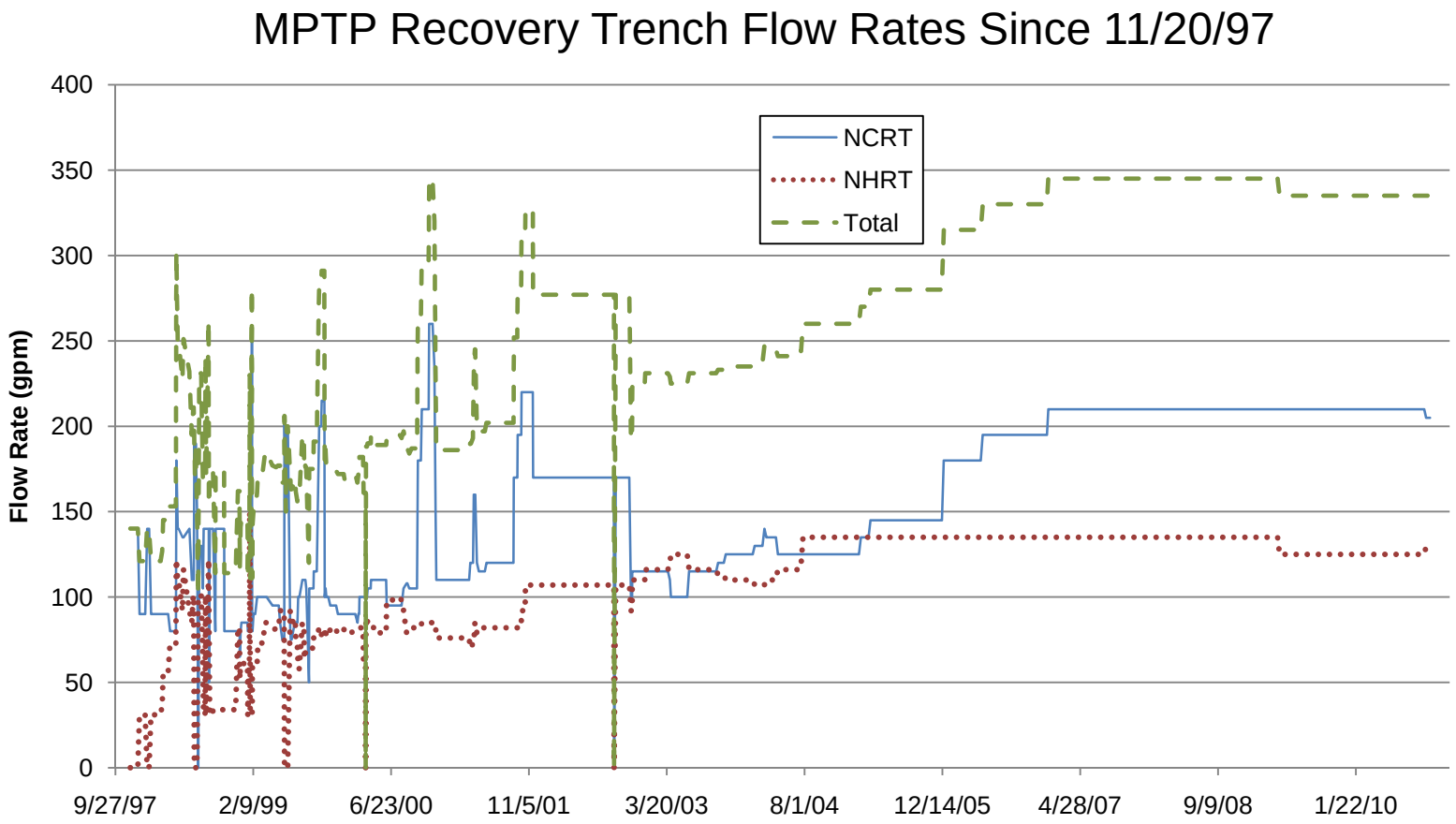


Figure 2-10. Flow Rates at MPTP Recovery Trenches Since 11/20/97

TETRA TECH

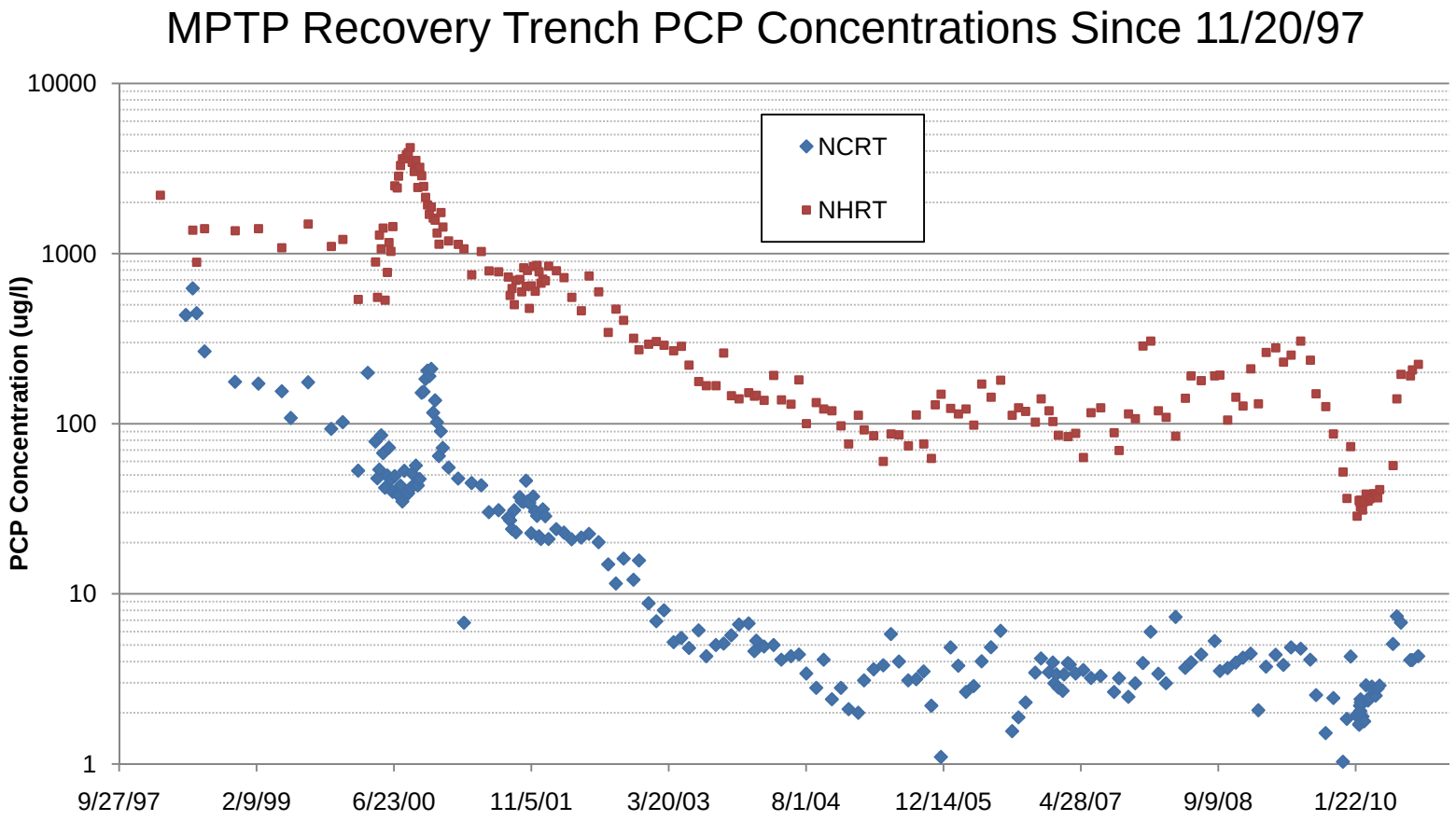


Figure 2-11. PCP Concentrations at MPTP Recovery Trenches Since 11/20/97

TETRA TECH

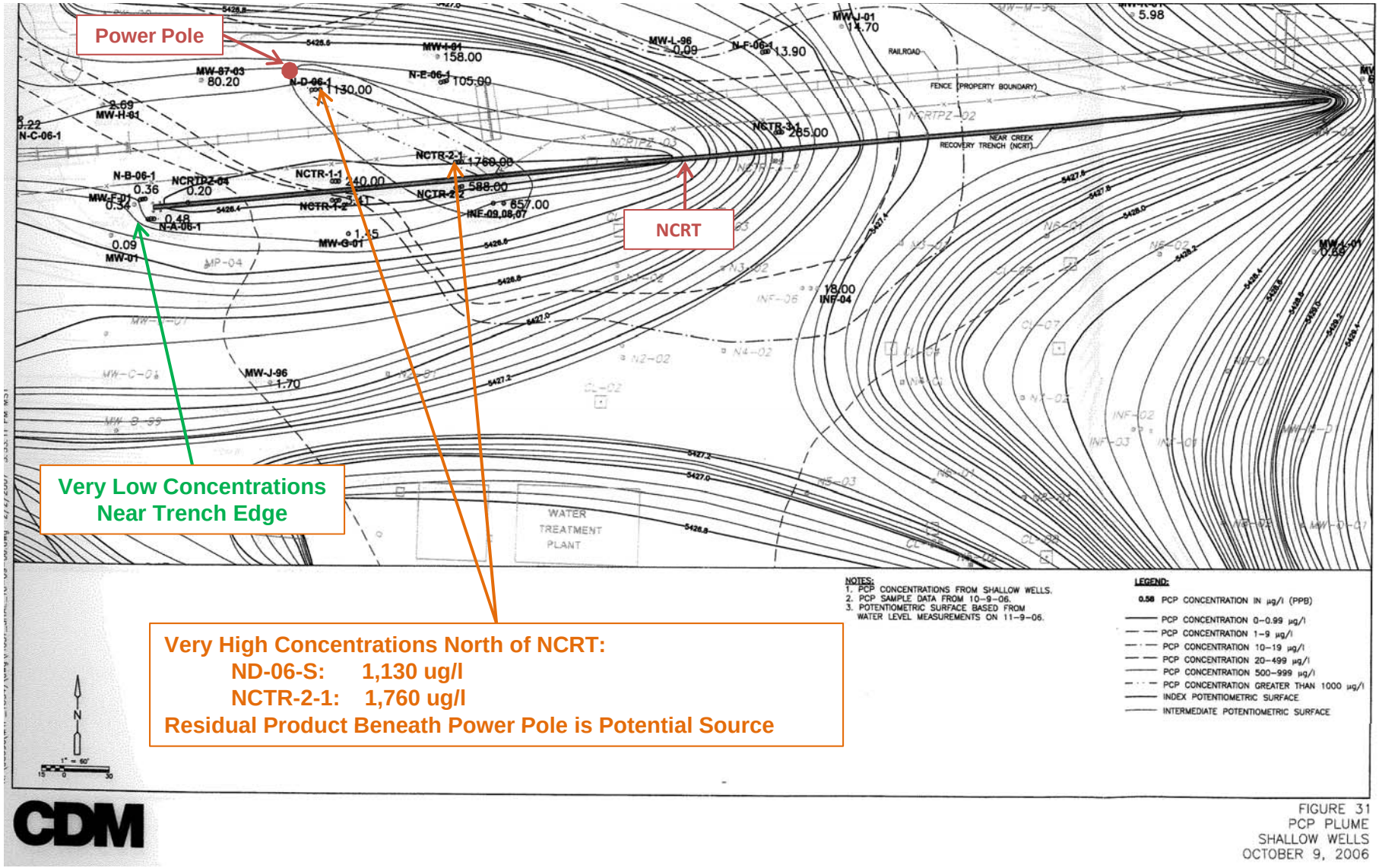
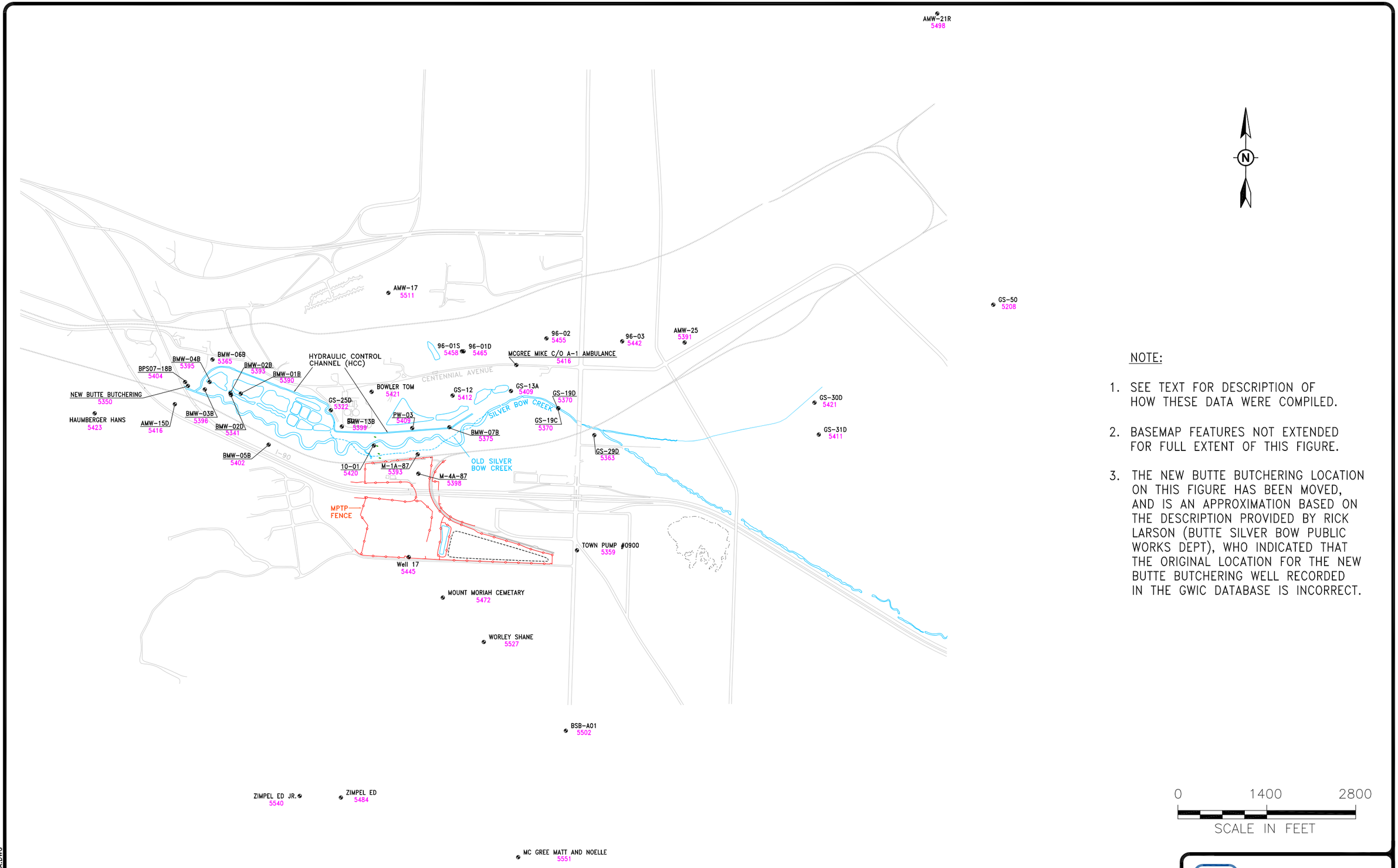


Figure 2-12. Example of Figure from CDM's 2007 "Near Creek Trench Investigation" Illustrating High Concentrations of PCP North of NCRT Potentially Caused by Residual Product beneath Power Pole (Annotations by Tetra Tech)

TETRA TECH



NOTE:

1. SEE TEXT FOR DESCRIPTION OF HOW THESE DATA WERE COMPILED.
2. BASEMAP FEATURES NOT EXTENDED FOR FULL EXTENT OF THIS FIGURE.
3. THE NEW BUTTE BUTCHERING LOCATION ON THIS FIGURE HAS BEEN MOVED, AND IS AN APPROXIMATION BASED ON THE DESCRIPTION PROVIDED BY RICK LARSON (BUTTE SILVER BOW PUBLIC WORKS DEPT), WHO INDICATED THAT THE ORIGINAL LOCATION FOR THE NEW BUTTE BUTCHERING WELL RECORDED IN THE GWIC DATABASE IS INCORRECT.

Figure 3-1. Approximate Elevation of Top of Competent Bedrock (FT MSL NGVD29)

Tetra Tech

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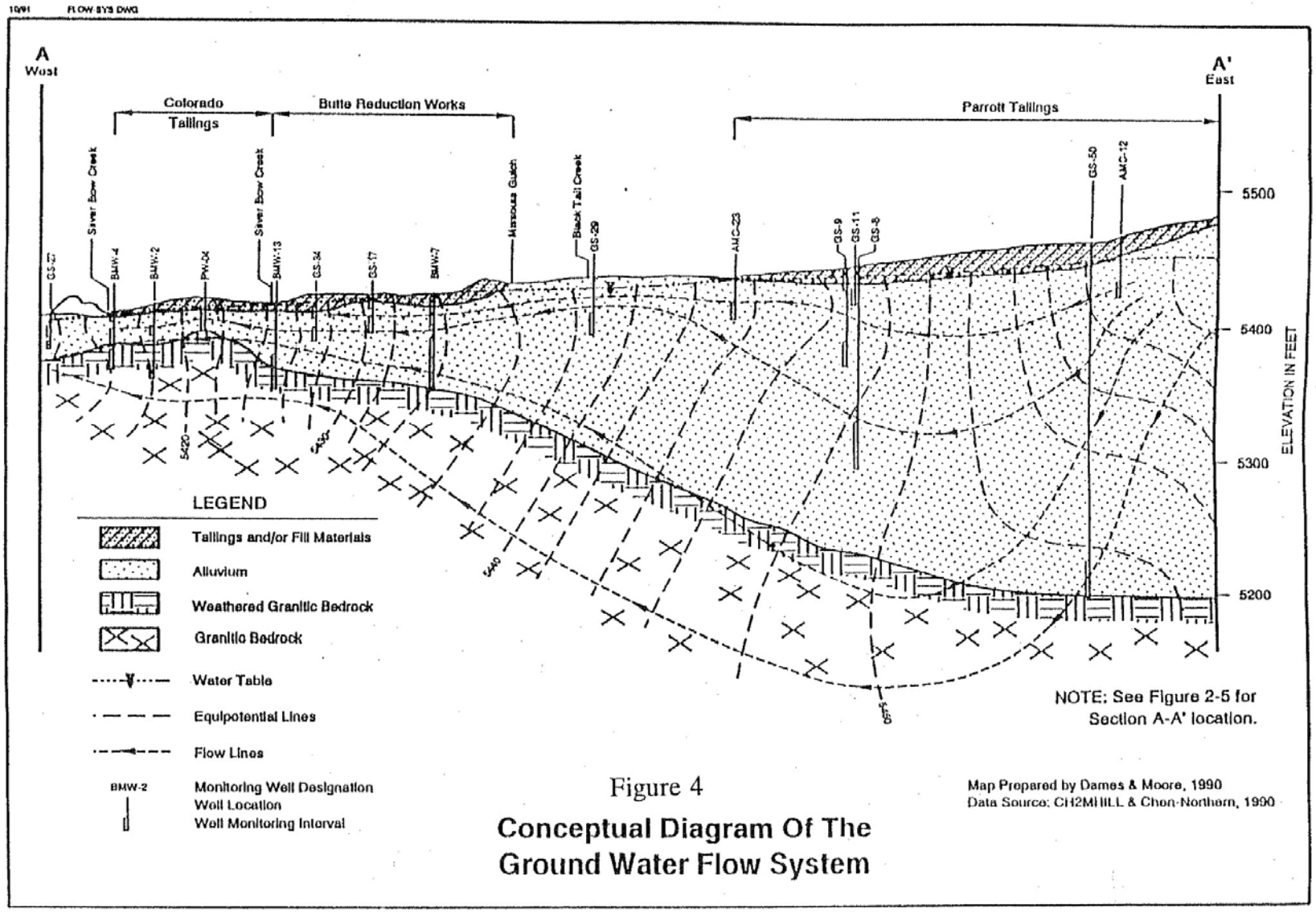


Figure 3-2. Generalized East-West Cross Section from WWTP Geotechnical Report

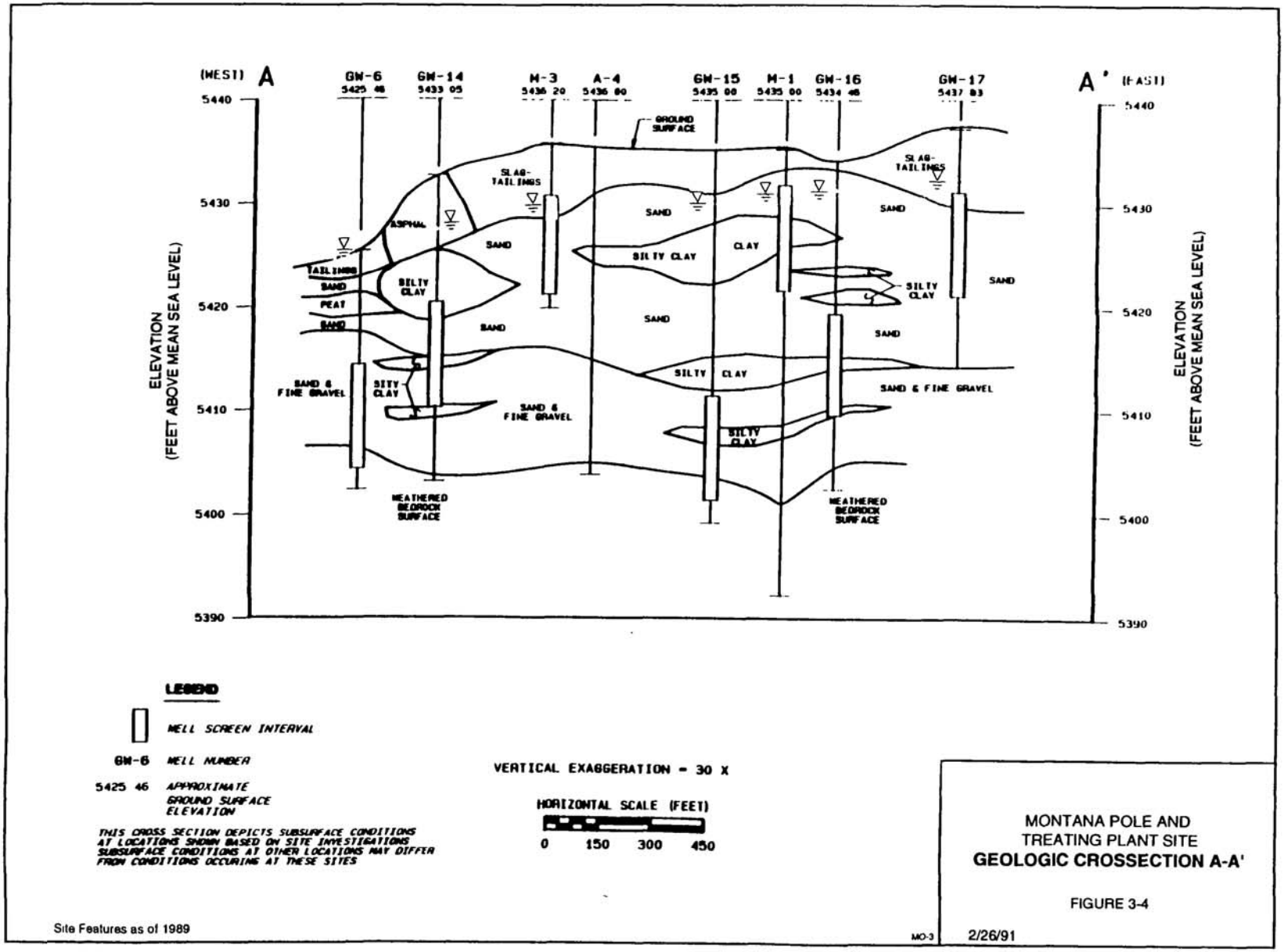


Figure 3-3. East-West Cross Section Near Silver Bow Creek from MPTP RI (Prior to Excavation Associated with MPTP and LAO Remedies)

TETRA TECH

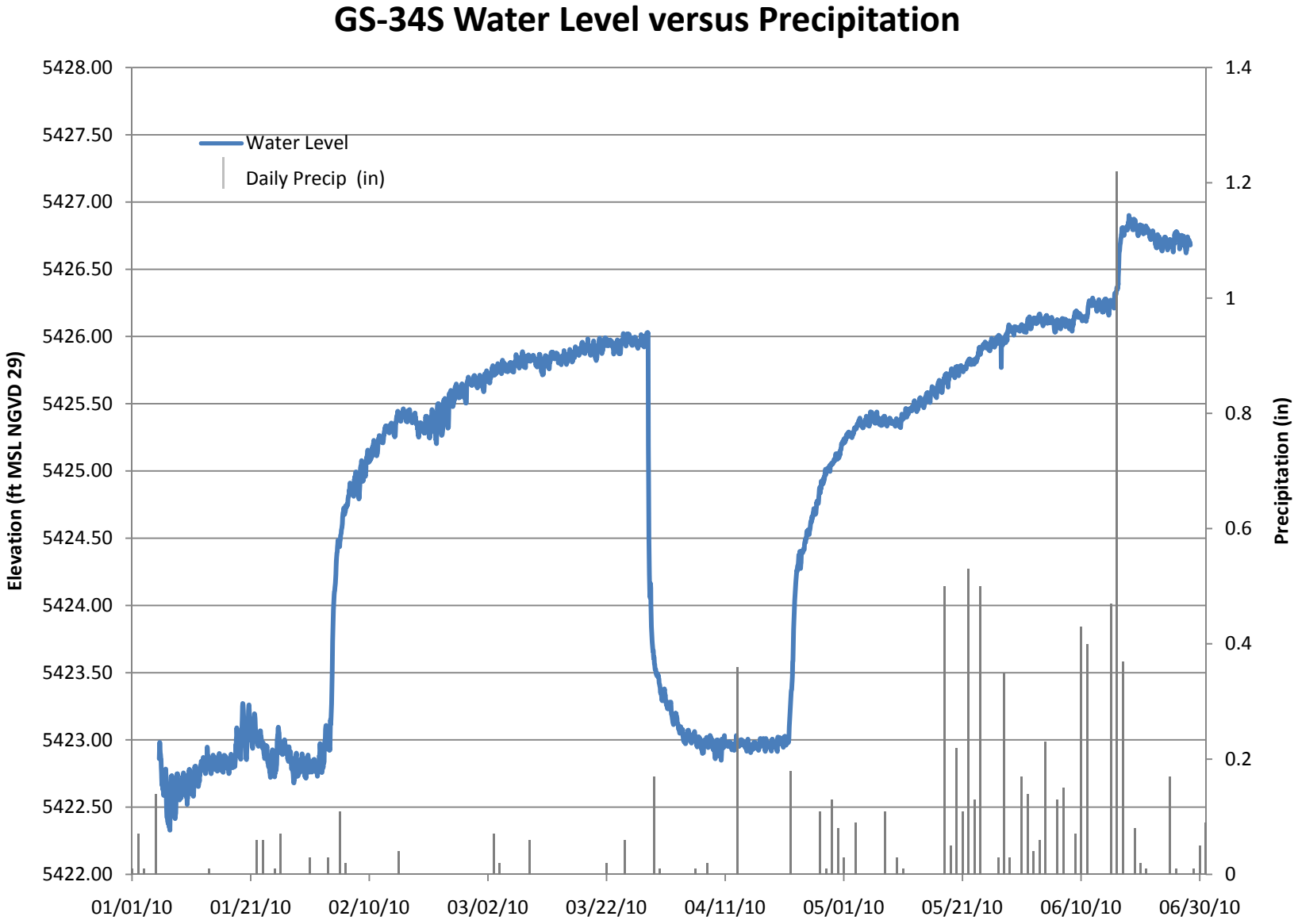


Figure 3-4. GS-34S Water Level versus Precipitation

TETRA TECH

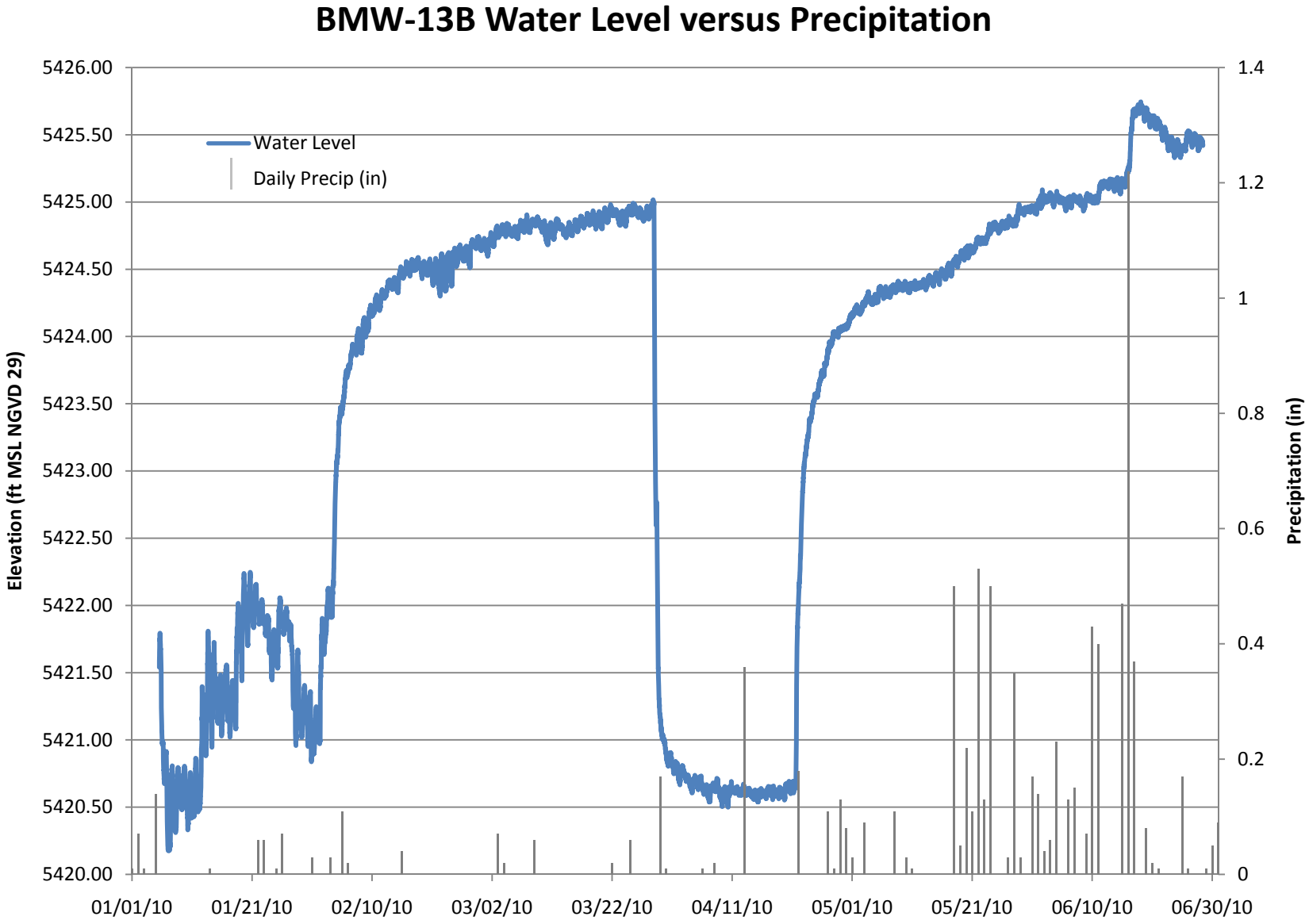
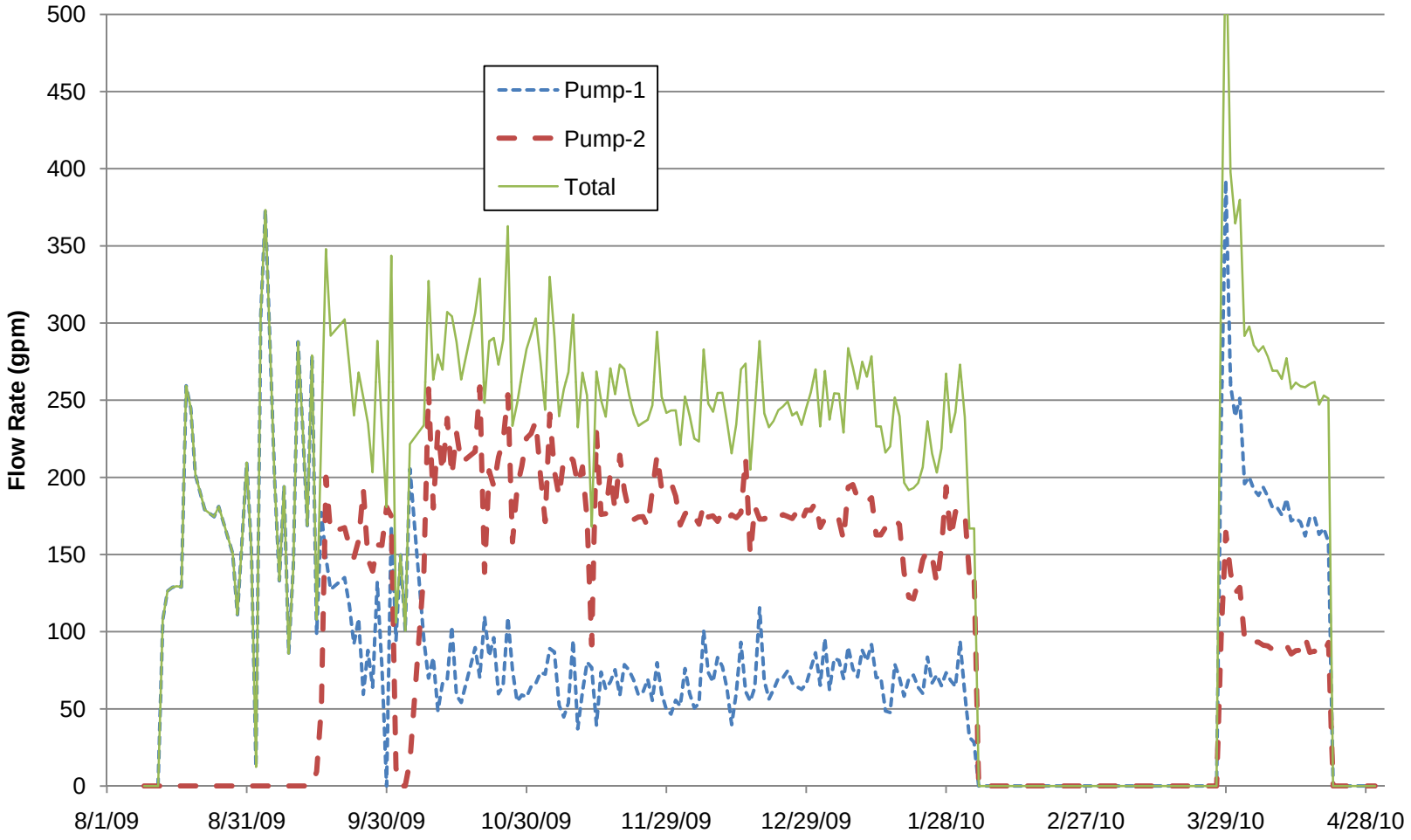


Figure 3-5. BMW-13B Water Level versus Precipitation

TETRA TECH



Dewatering occurred 8/13/09 to 2/3/10 and 3/28/10 to 4/21/10

Figure 4-1. Flow Rates at WWTP Dewatering Pumps, Late 2009 and Early 2010

TETRA TECH

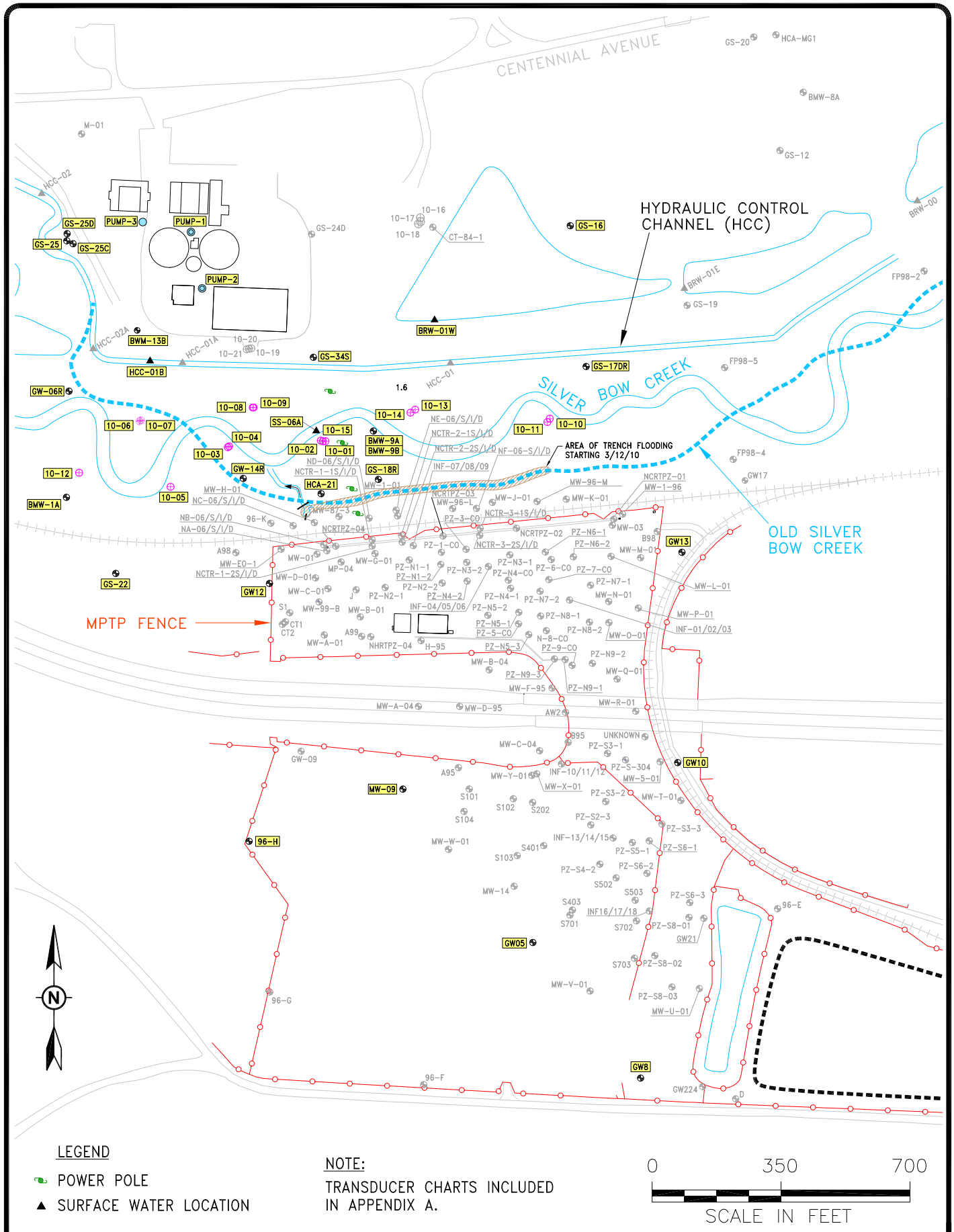


Figure 4-2. Locations of Transducers Installed After January 1, 2010

Tetra Tech

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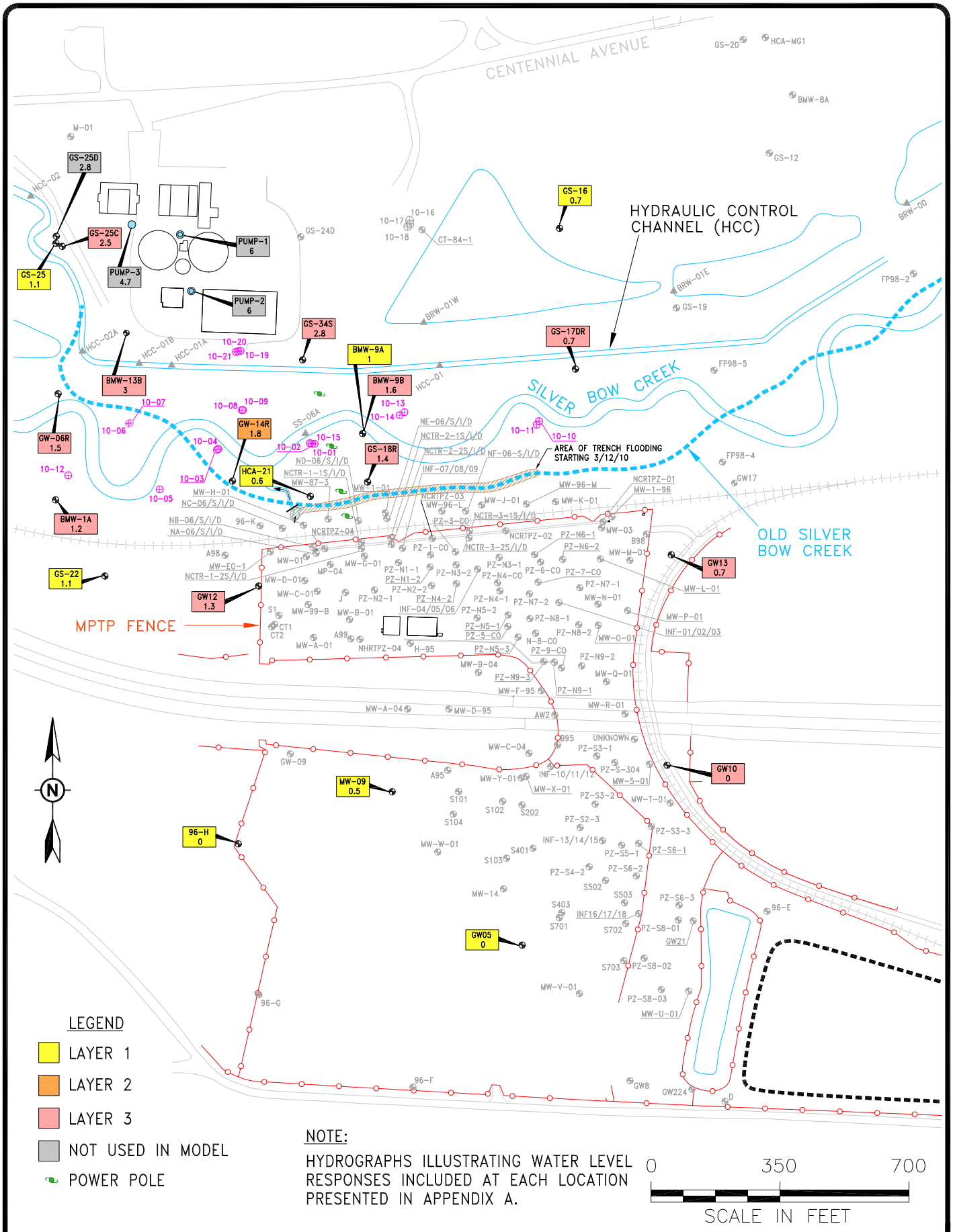


Figure 5-1. Summary of Increase in Water Level From End of Dewatering 2/3/10 to Beginning of Next Dewatering 3/28/10

Tetra Tech

0509141014A.DWG

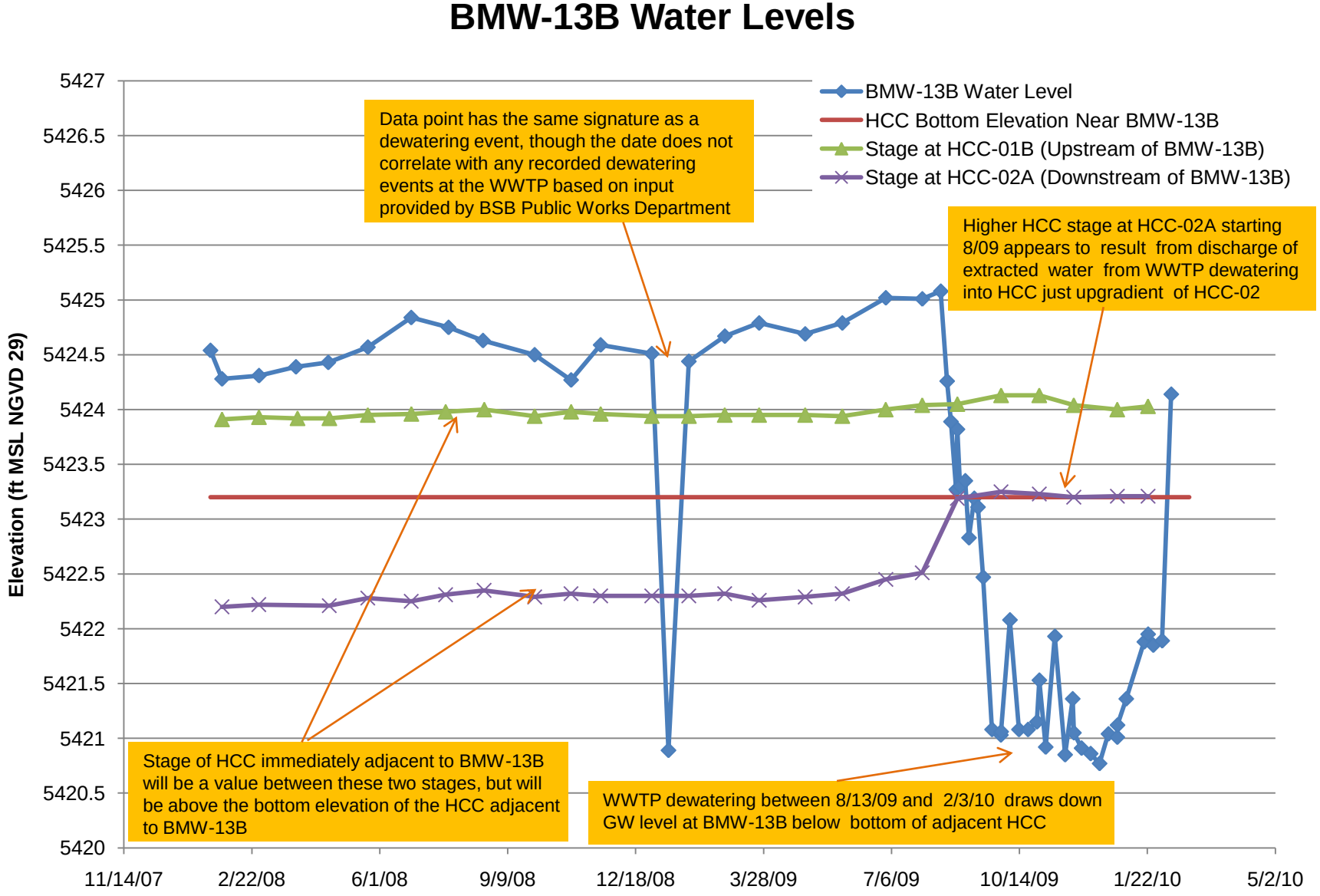


Figure 5-2. Water Levels at BMW-13B Compared to Stage and Bottom of the HCC

TETRA TECH

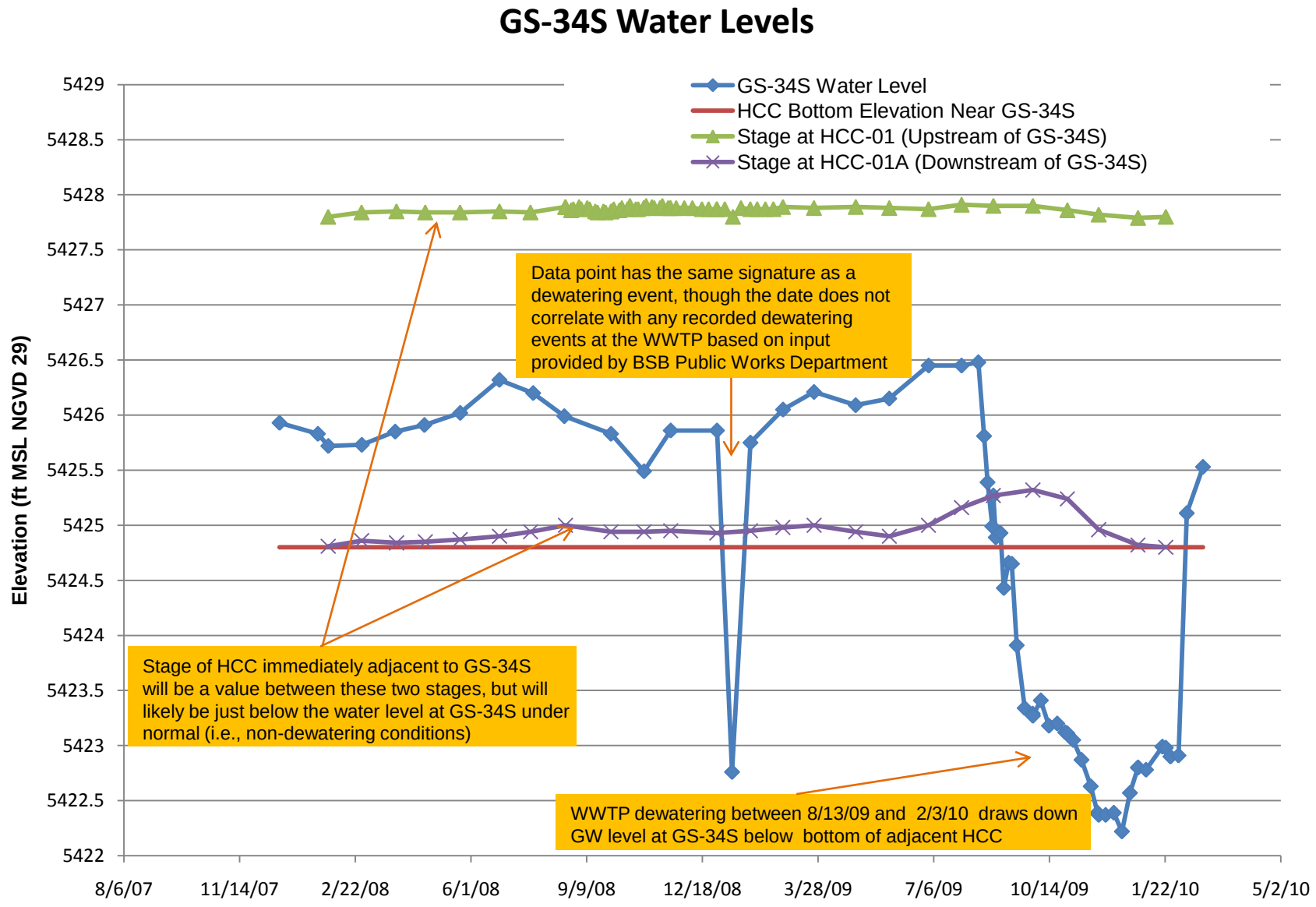


Figure 5-3. Water Levels at GS-34S Compared to Stage and Bottom of the HCC

TETRA TECH

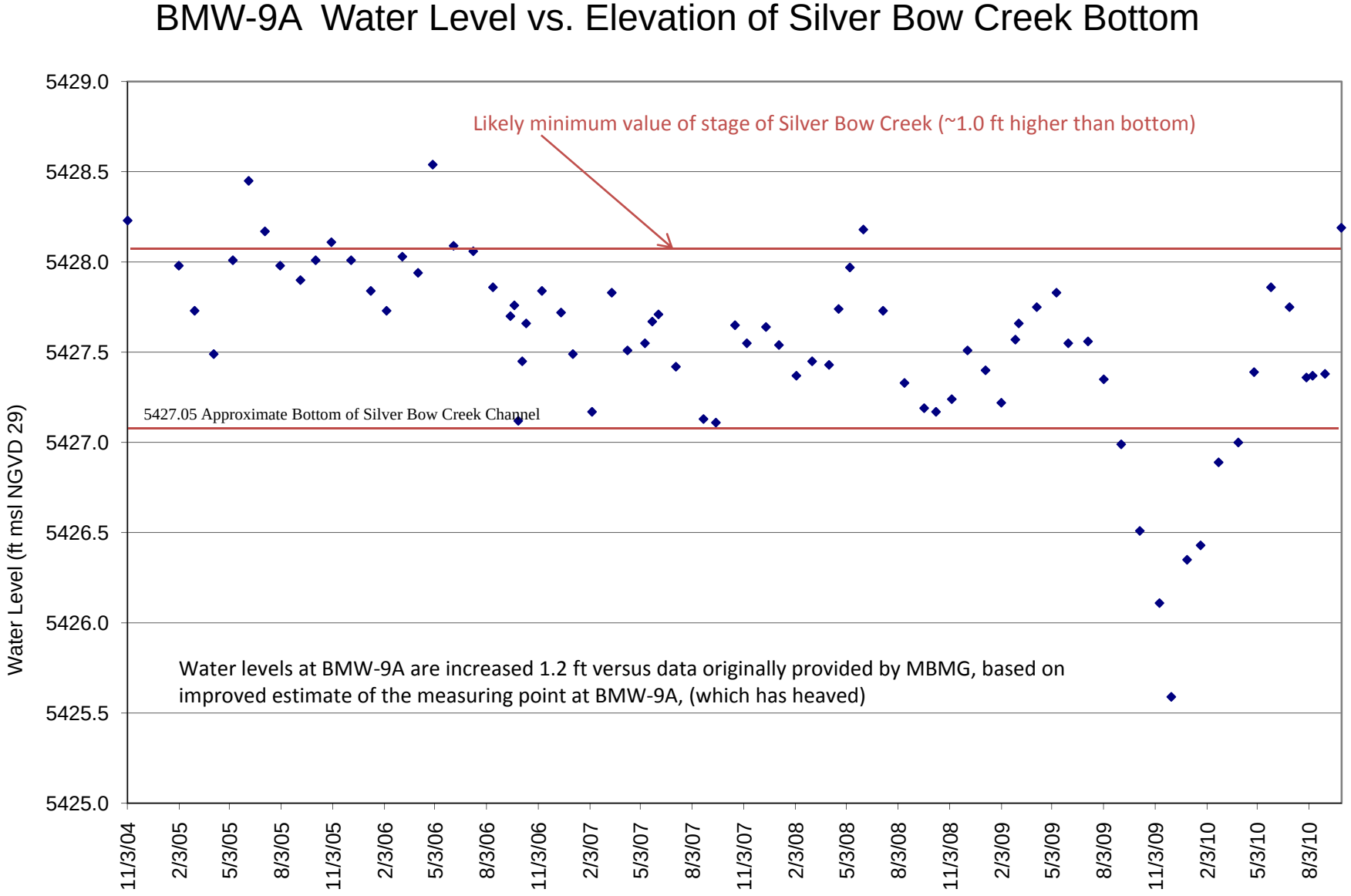


Figure 5-4. Water Level at BMW-9A versus Bottom Elevation and Estimated Stage of Silver Bow Creek

TETRA TECH

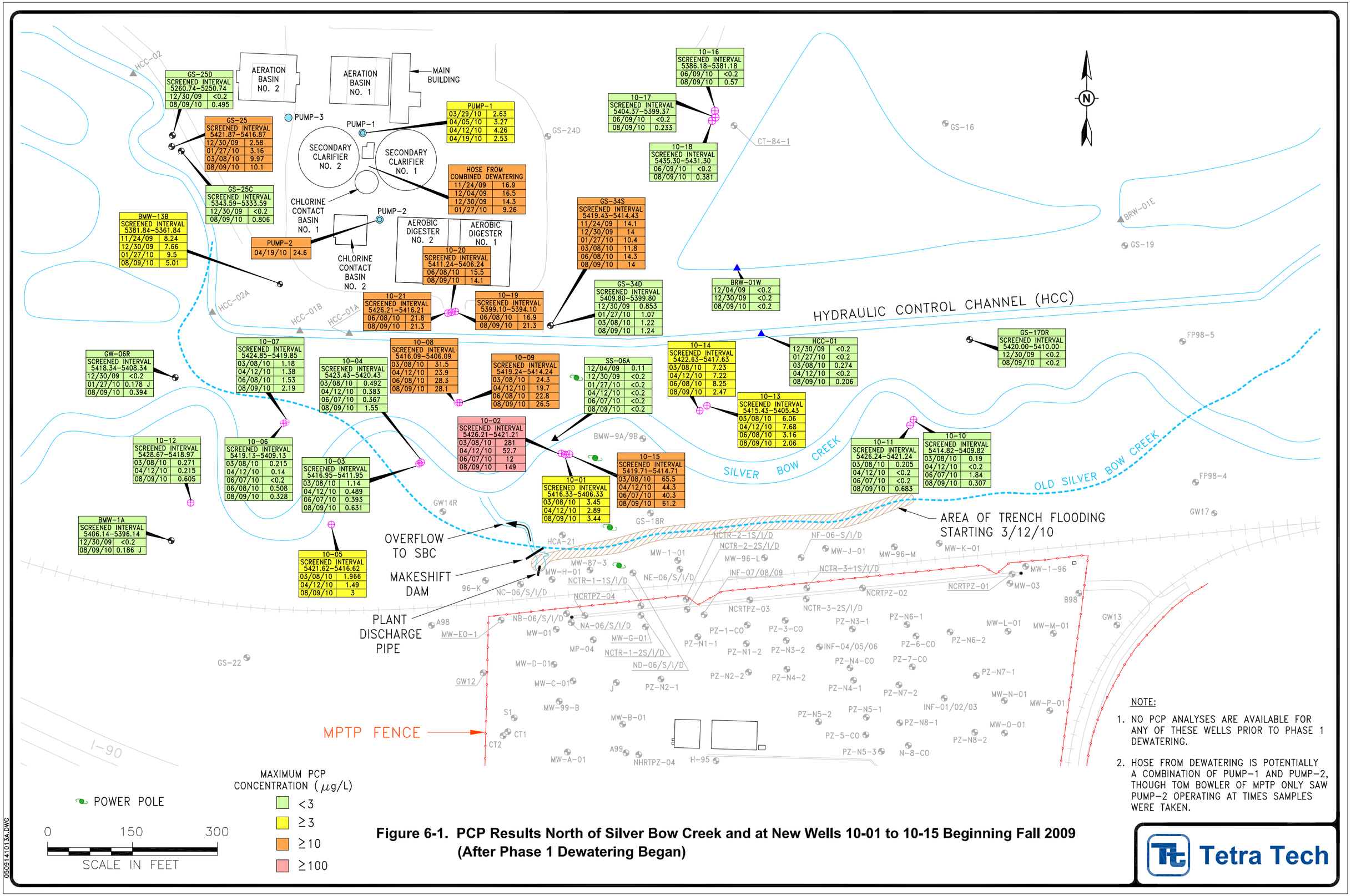


Figure 6-1. PCP Results North of Silver Bow Creek and at New Wells 10-01 to 10-15 Beginning Fall 2009 (After Phase 1 Dewatering Began)

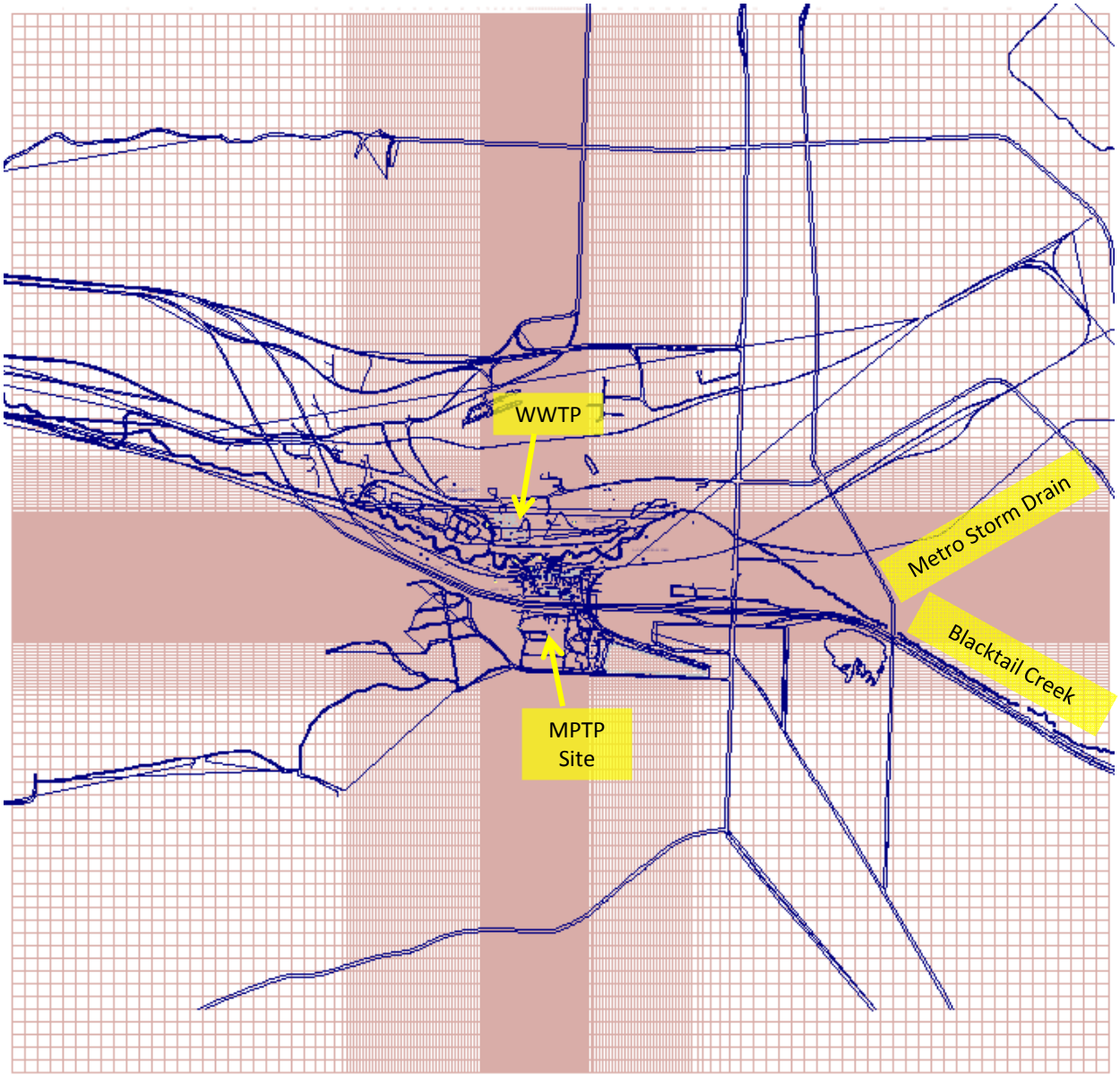


Figure 8-1. Model Grid Extent and Variable Grid Spacing

TETRA TECH

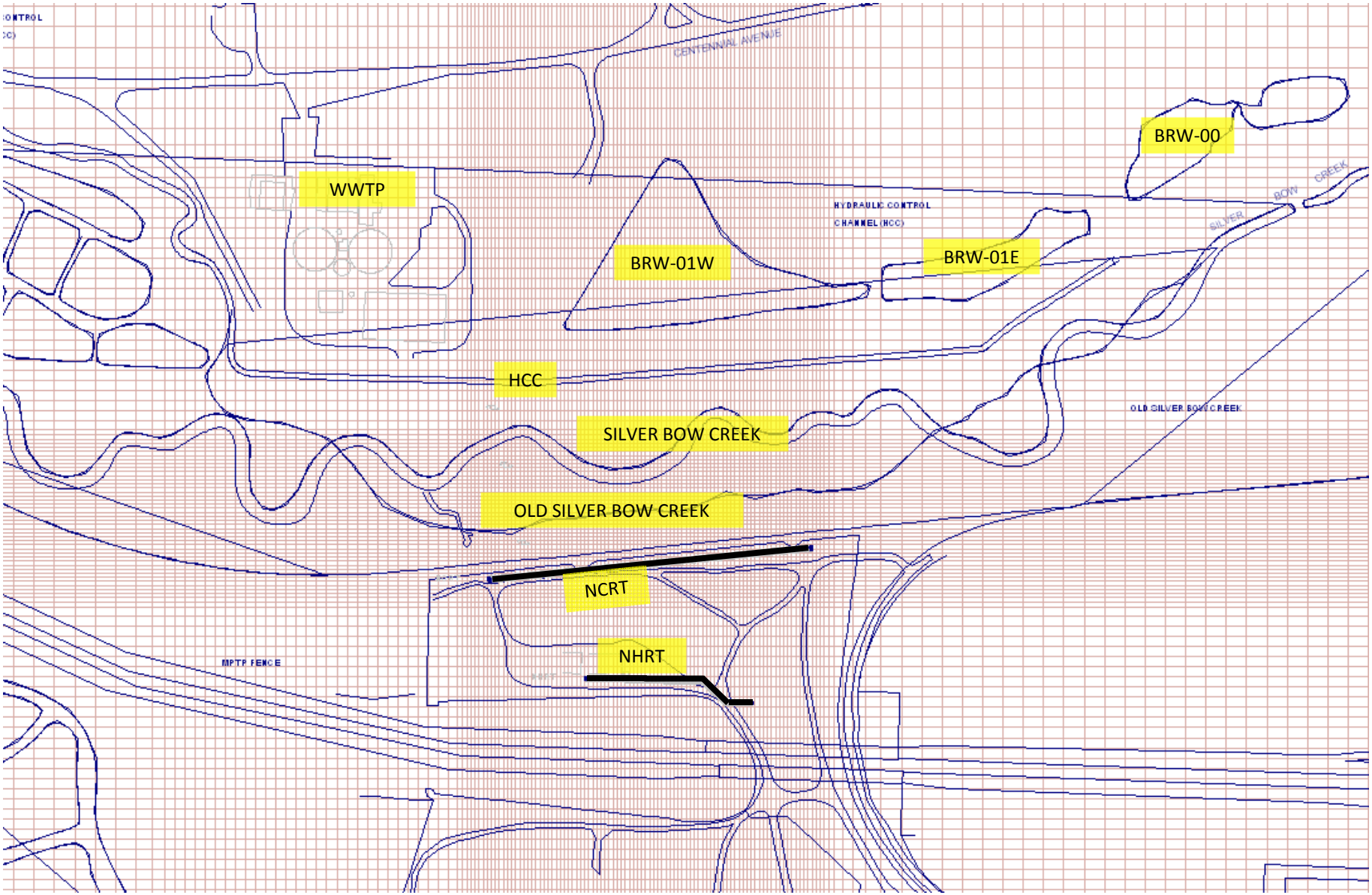
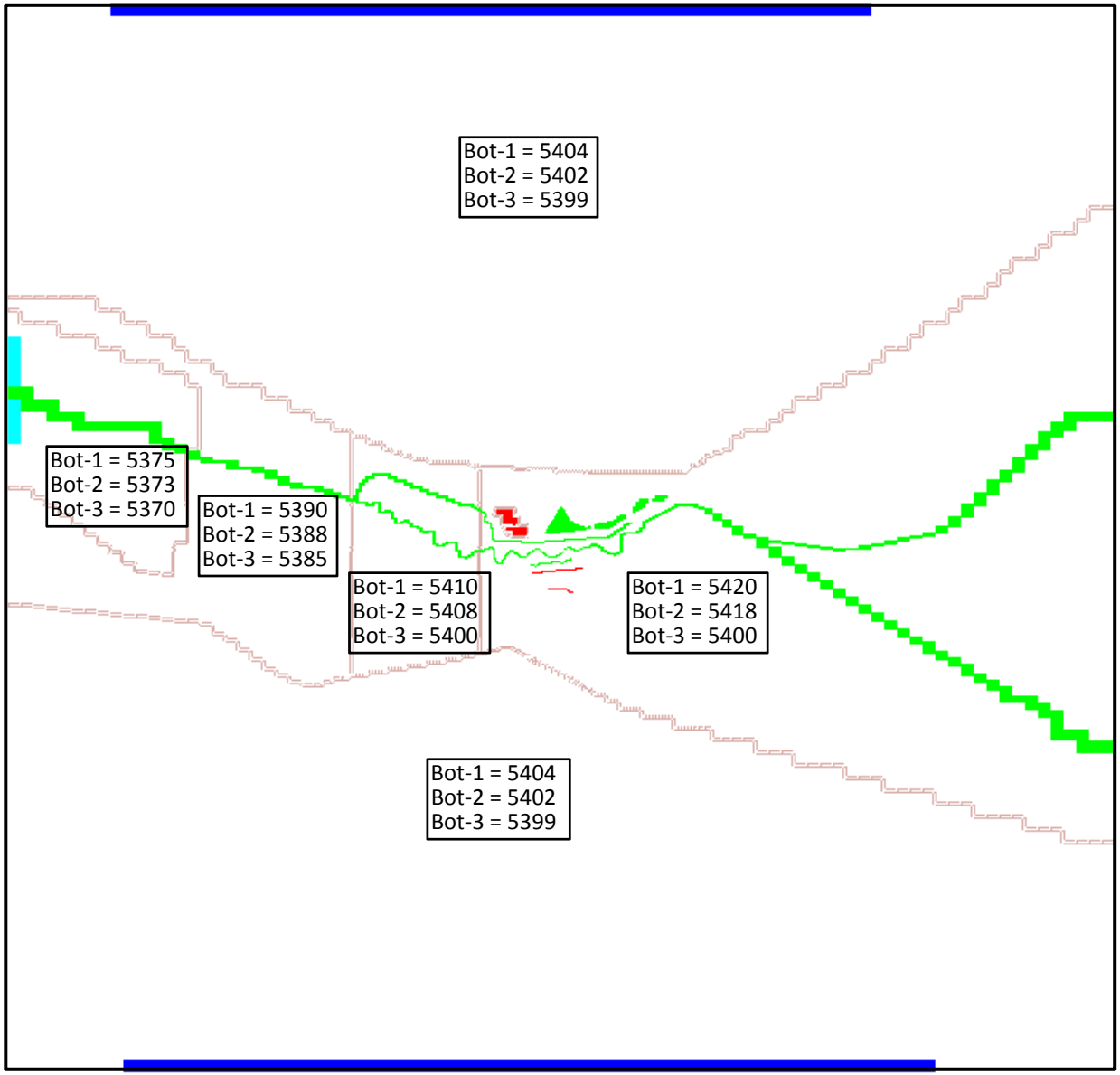


Figure 8-2. Grid Spacing in Vicinity of NCRT and WWTP

TETRA TECH



These bottom elevations are simplified values assigned only for the purpose of modeling, and are not intended to be a rigorous interpretation of the geology. See text for a complete explanation.

Boundary condition locations for all model layers provided for reference (see Figure 8-4 for identification of boundary conditions).

Figure 8-3. Zones for Bottom Elevations (ft MSL NGVD 29)

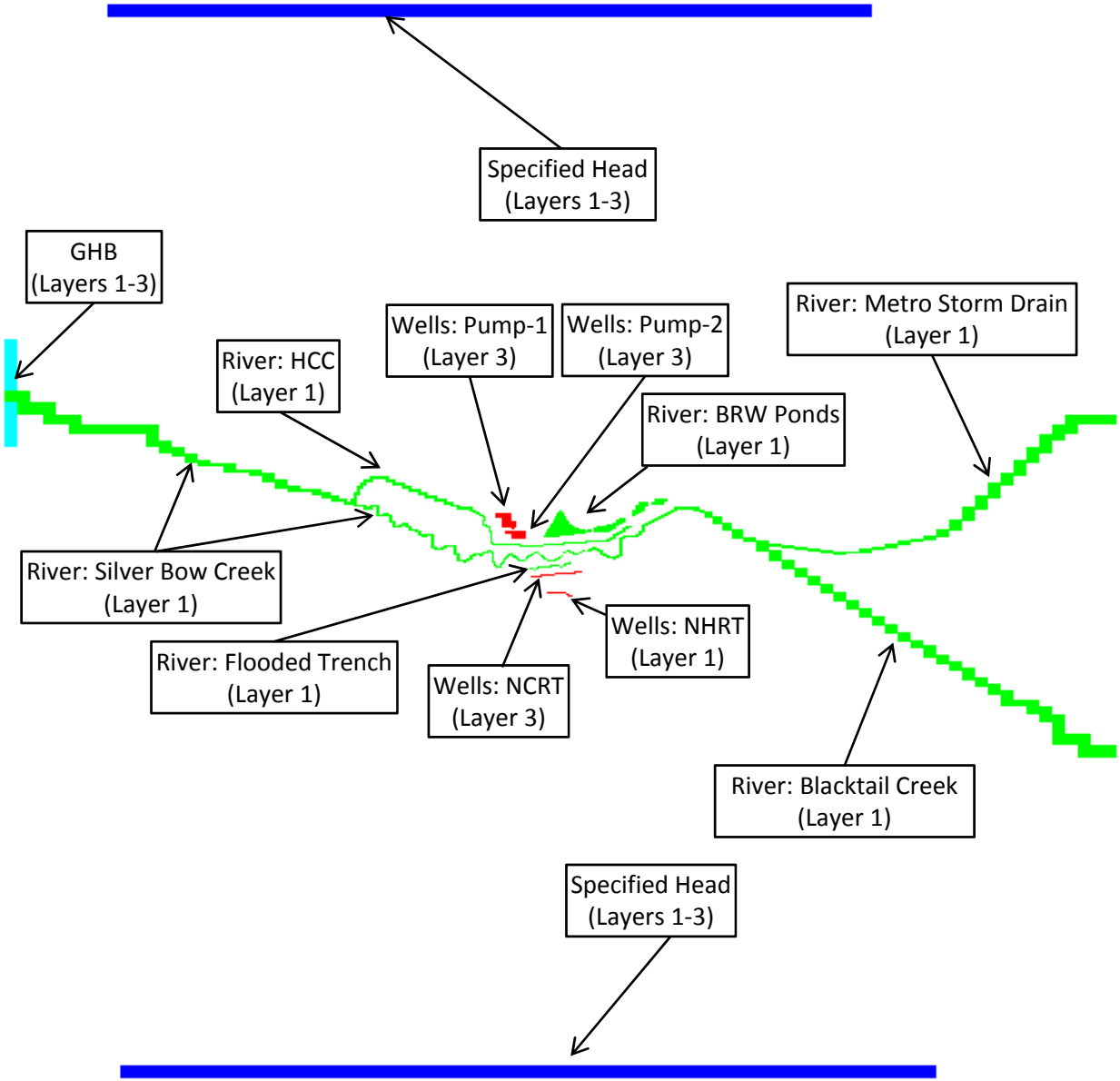


Figure 8-4. Locations of Boundary Conditions

TETRA TECH

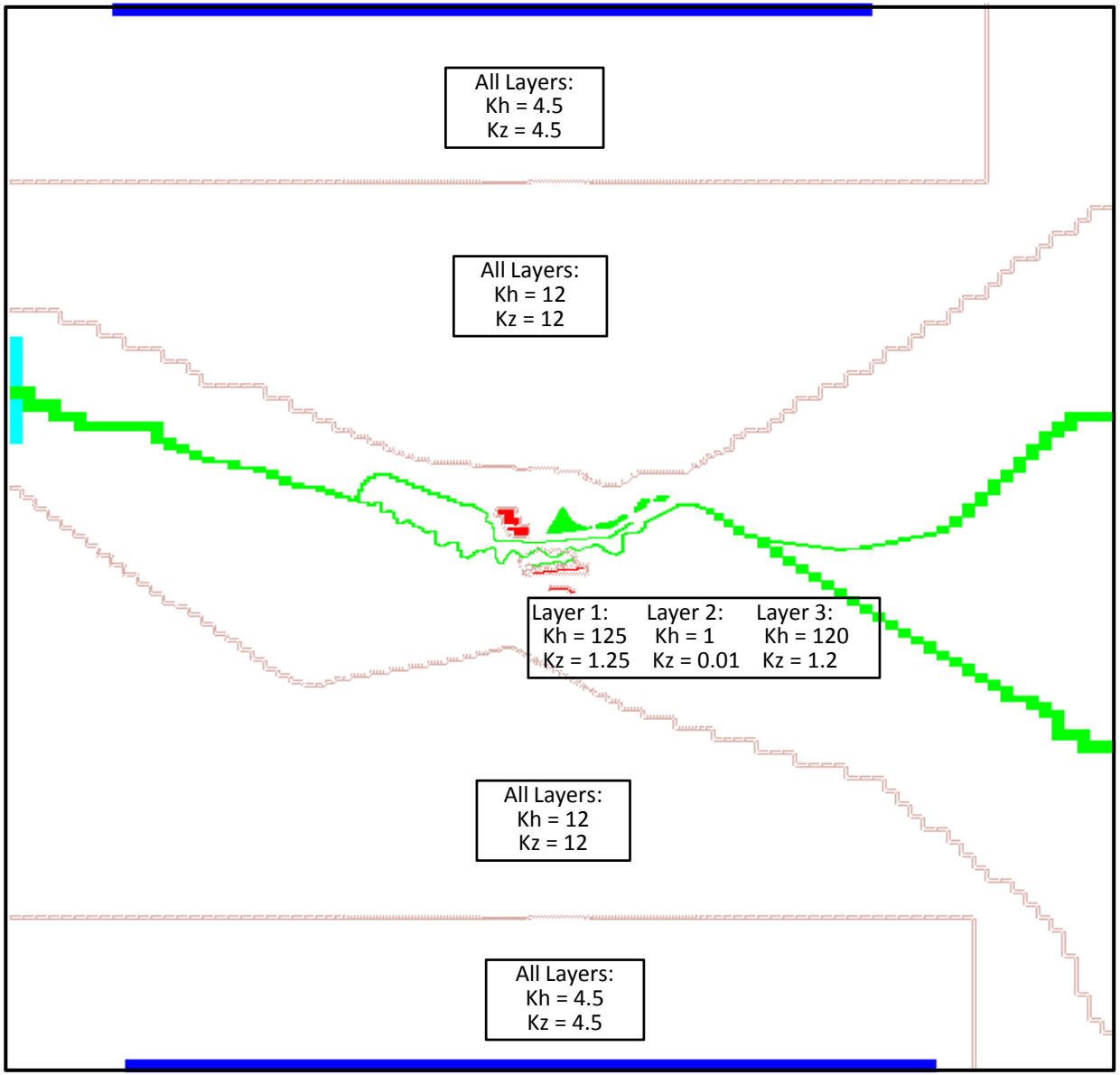
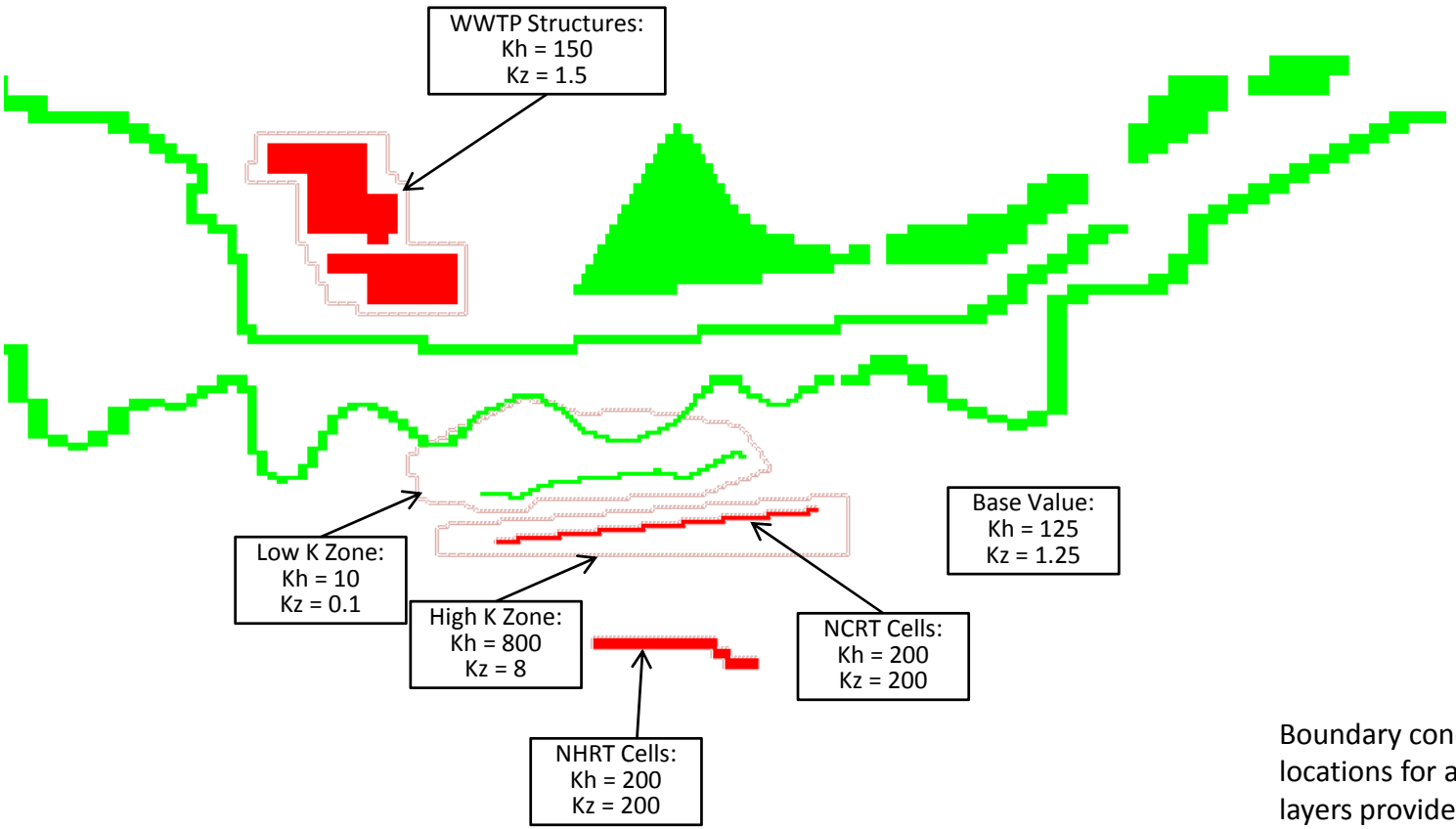


Figure 8-5. Zones for Hydraulic Conductivity (ft/d) For Simulating Regional Flow

The values except those in the alluvial valley are assigned only for the purpose of establishing a reasonable representation of regional groundwater flow in conjunction with assigned boundary conditions and bottom elevations, and are not intended to be a rigorous interpretation. See Section 8.3 of text for a complete explanation.

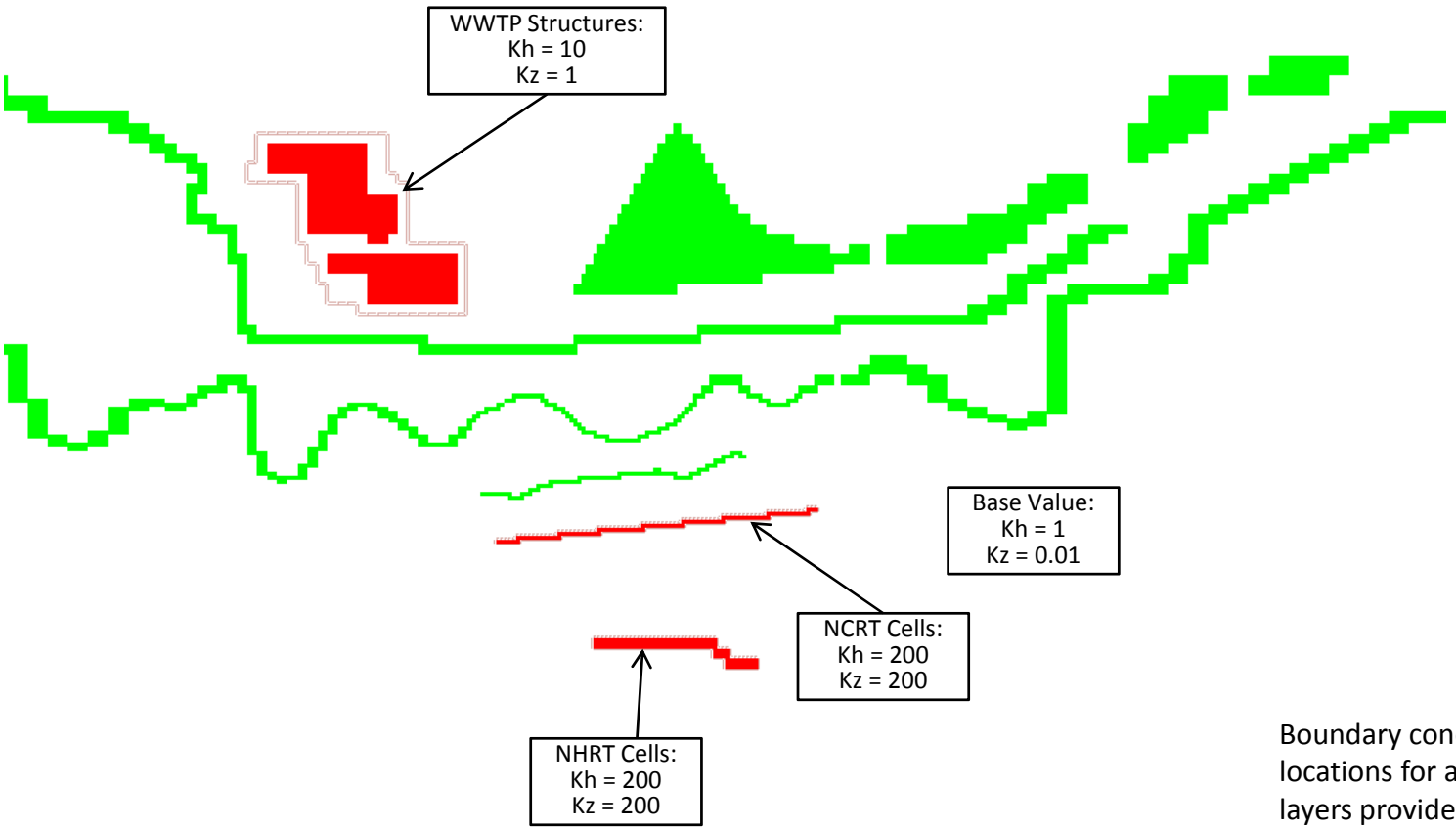
Boundary condition locations for all model layers provided for reference (see Figure 8-4 for identification of boundary conditions).



Boundary condition locations for all model layers provided for reference (see Figure 8-4 for identification of boundary conditions).

Figure 8-6. Zones for Hydraulic Conductivity (ft/d) Near MPTP site, Layer 1

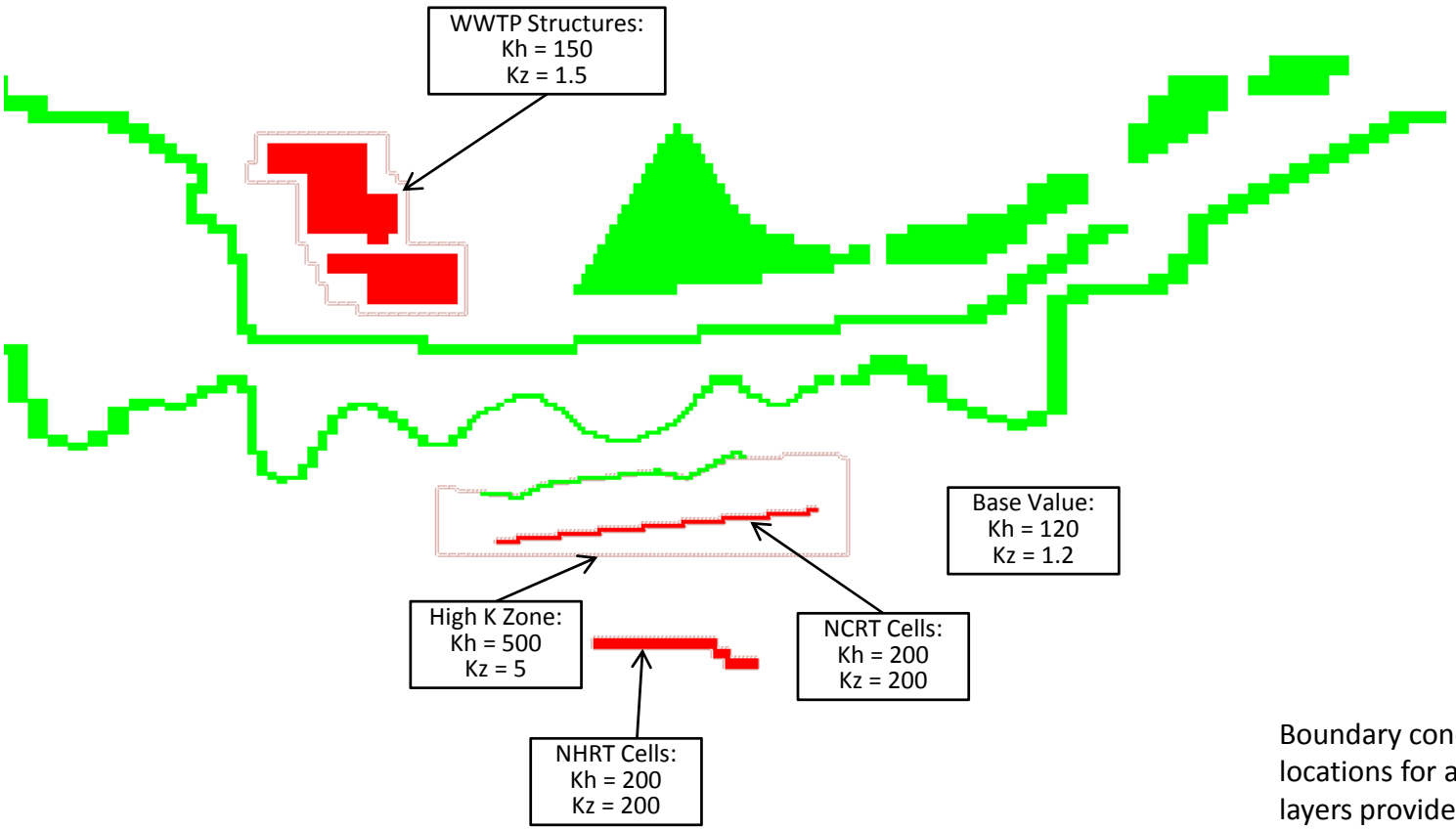
TETRA TECH



Boundary condition locations for all model layers provided for reference (see Figure 8-4 for identification of boundary conditions).

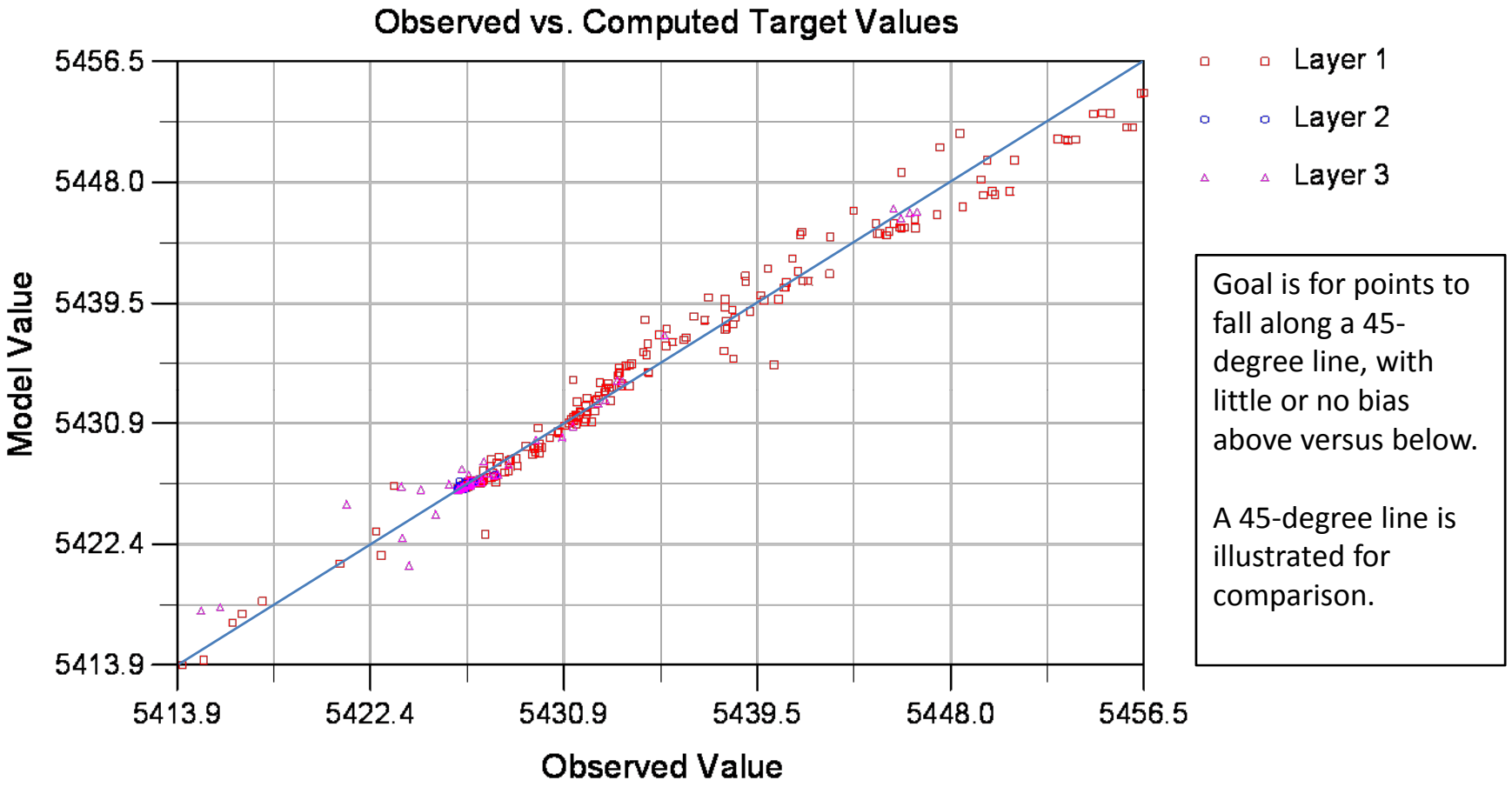
Figure 8-7. Zones for Hydraulic Conductivity (ft/d) Near MPTP site, Layer 2

TETRA TECH



Boundary condition locations for all model layers provided for reference (see Figure 8-4 for identification of boundary conditions).

Figure 8-8. Zones for Hydraulic Conductivity (ft/d) Near MPTP site, Layer 3



Goal is for points to fall along a 45-degree line, with little or no bias above versus below.

A 45-degree line is illustrated for comparison.

Figure 8-9. Simulated Versus Observed Water Levels, Steady-State Calibration

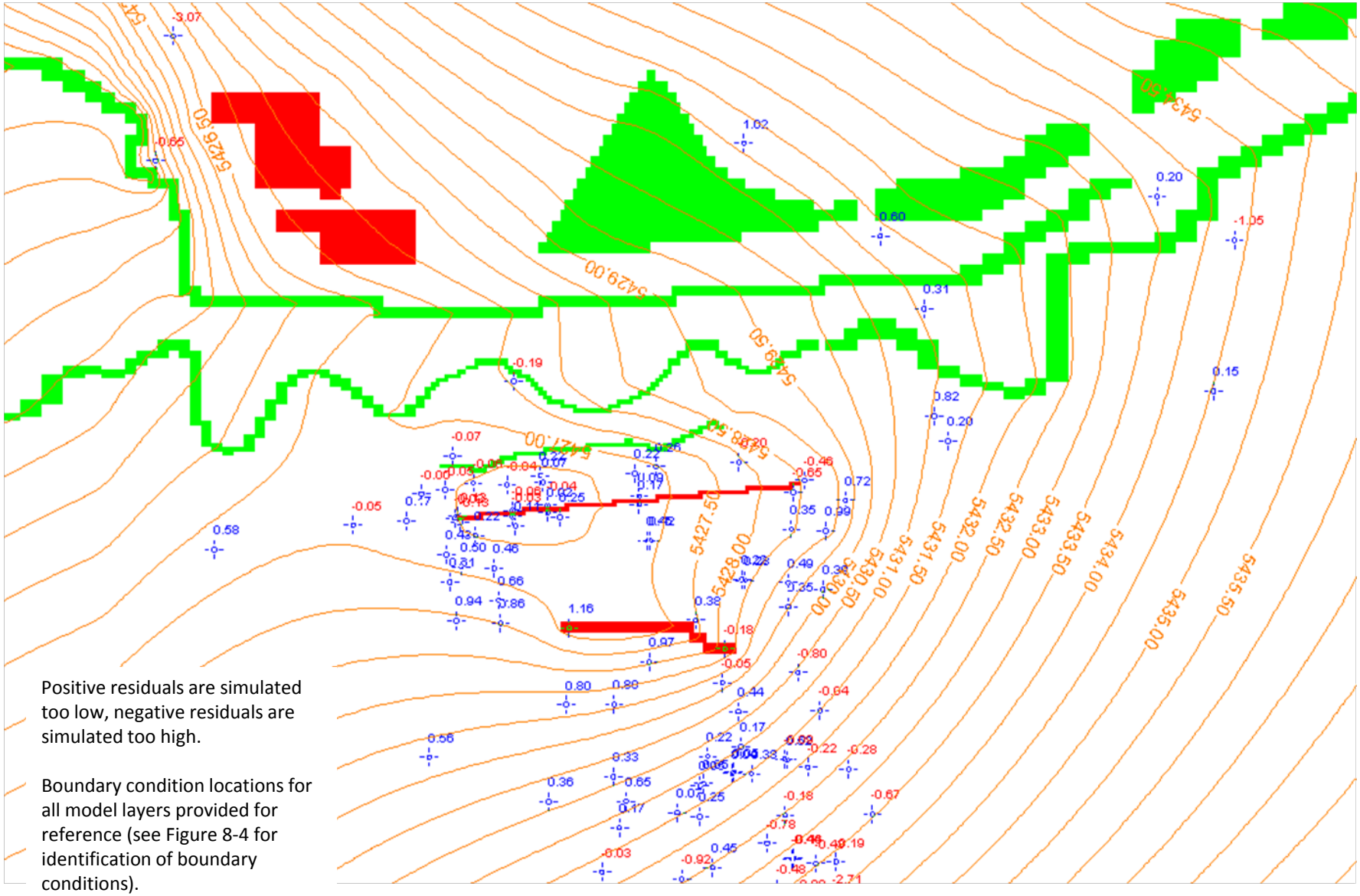


Figure 8-10. Simulated Steady-State Water Levels and Residuals (Observed Minus Simulated) Near NCRT and WWTP, Model Layer 1, Prior to Phase-1 Dewatering

TETRA TECH

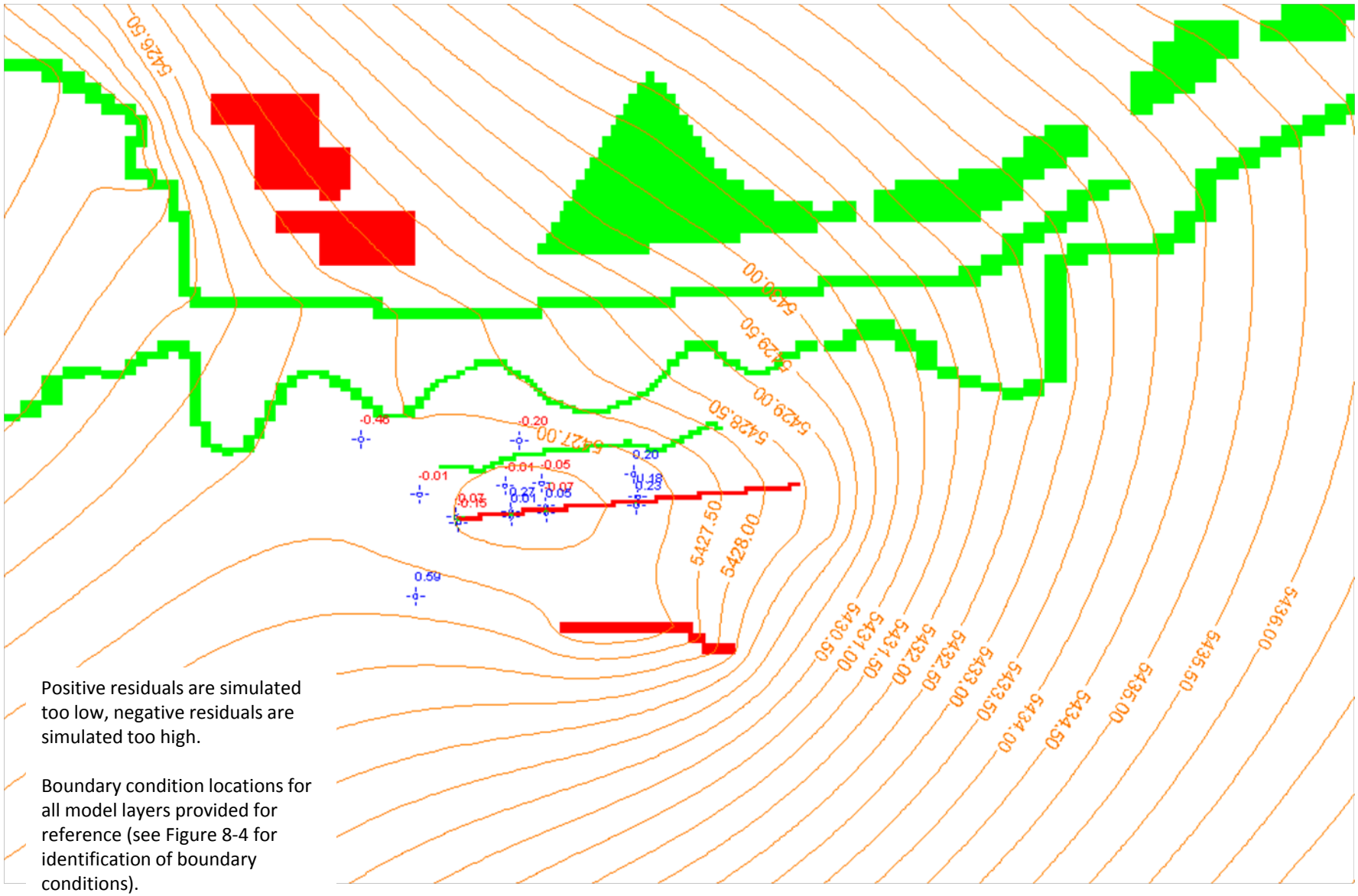
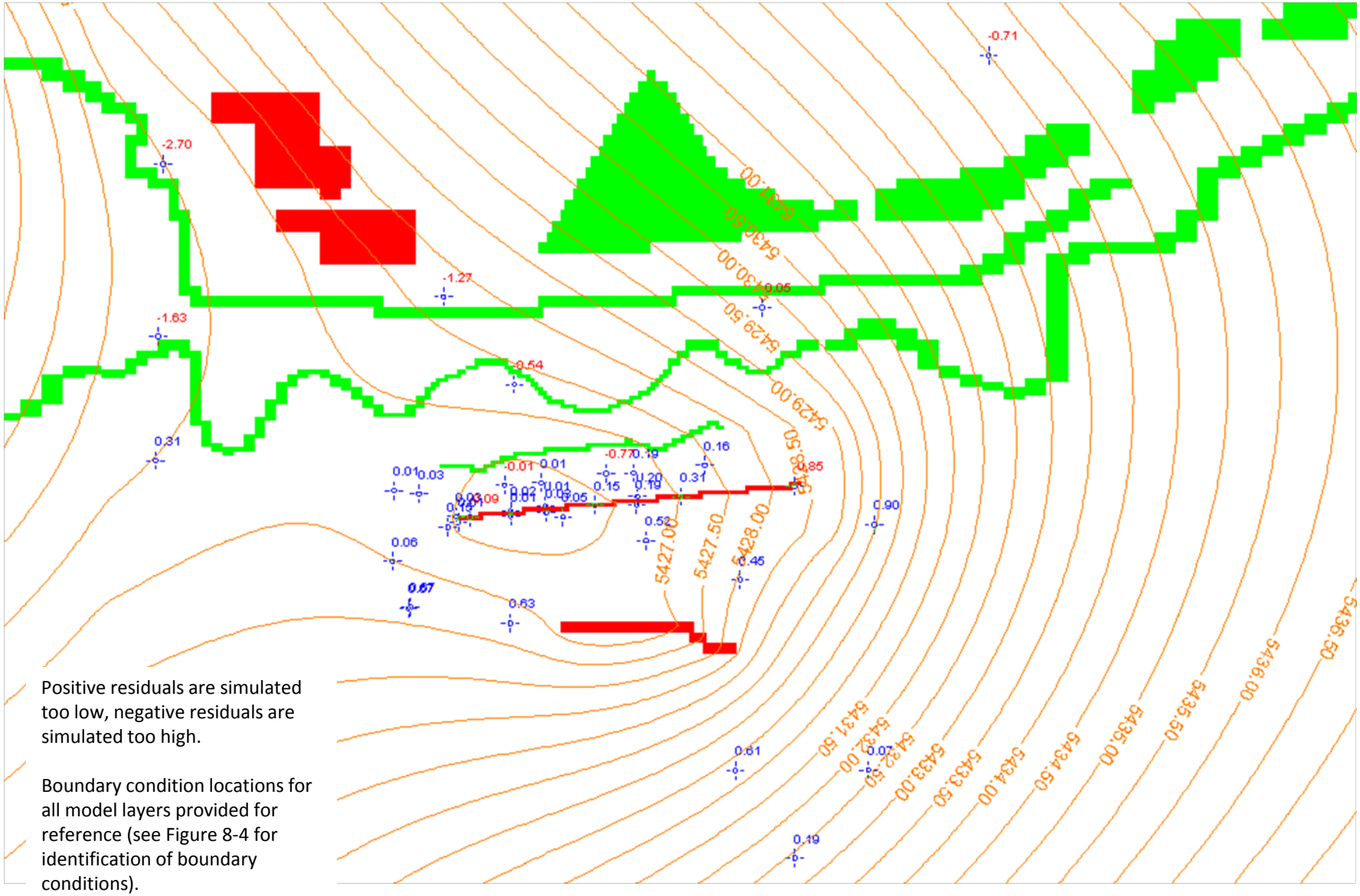


Figure 8-11. Simulated Steady-State Water Levels and Residuals (Observed Minus Simulated) Near NCRT and WWTP, Model Layer 2, Prior to Phase-1 Dewatering

TETRA TECH



Positive residuals are simulated too low, negative residuals are simulated too high.

Boundary condition locations for all model layers provided for reference (see Figure 8-4 for identification of boundary conditions).

Figure 8-12. Simulated Steady-State Water Levels and Residuals (Observed Minus Simulated) Near NCRT and WWTP, Model Layer 3, Prior to Phase-1 Dewatering

TETRA TECH

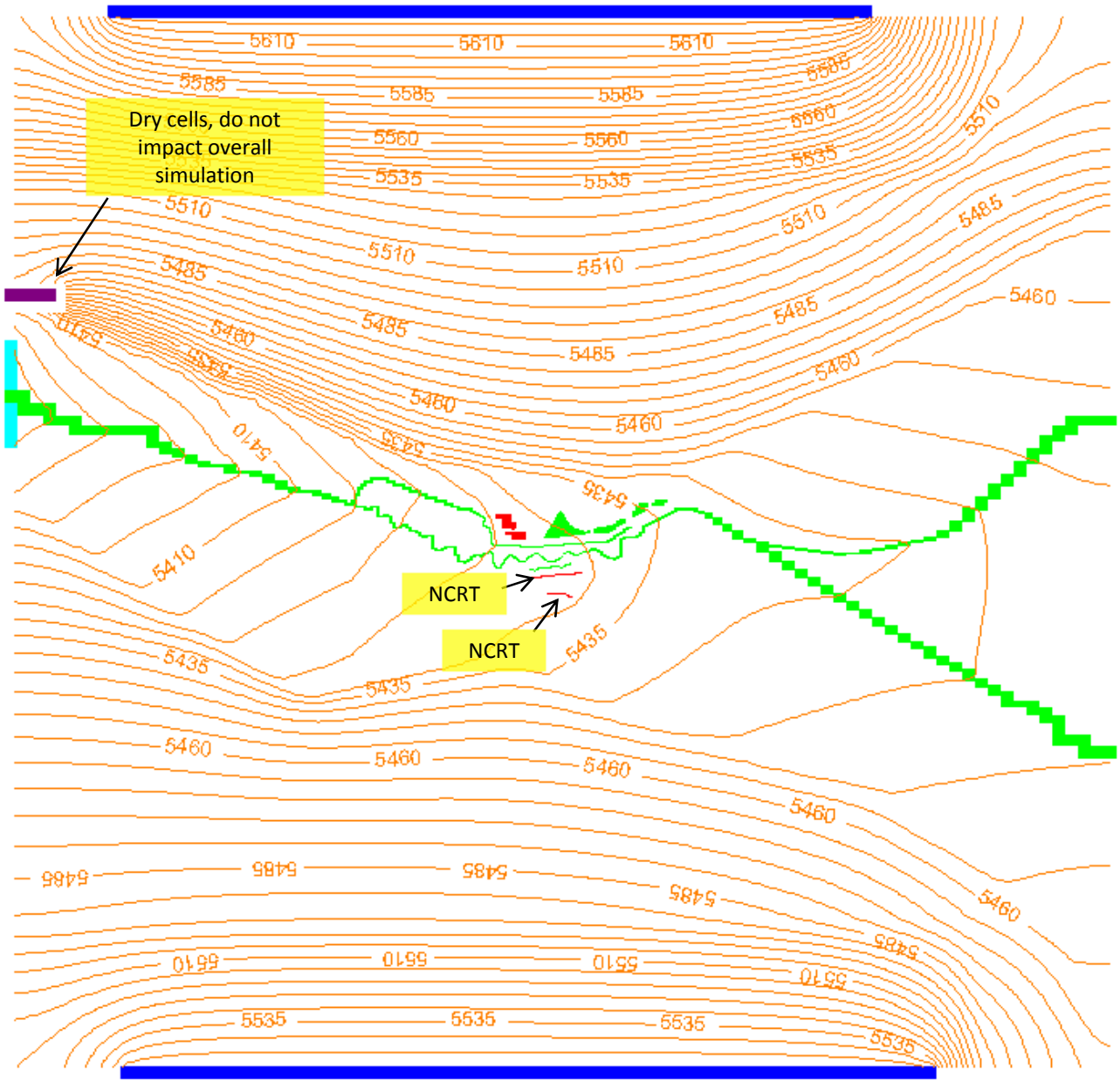


Figure 8-13. Simulated Steady-State Water Levels, Regional Flow (Model Layer 1)

Boundary condition locations for all model layers provided for reference (see Figure 8-4 for identification of boundary conditions).

TETRA TECH

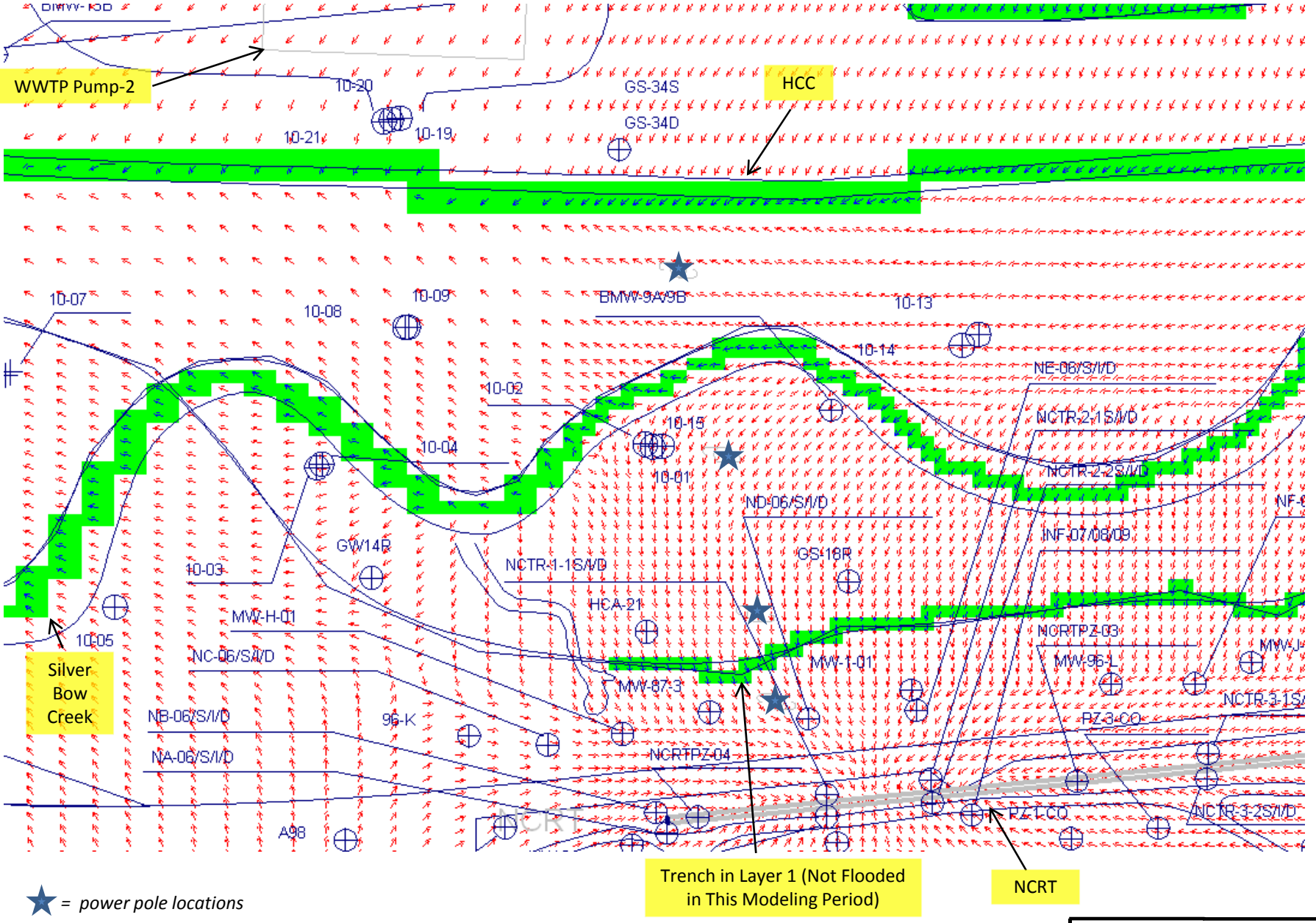


Figure 8-14. Simulated Flow Vectors (Model Layer 1) Between NCRT and WWTP, Steady-State Model Prior to Phase 1 Dewatering

TETRA TECH

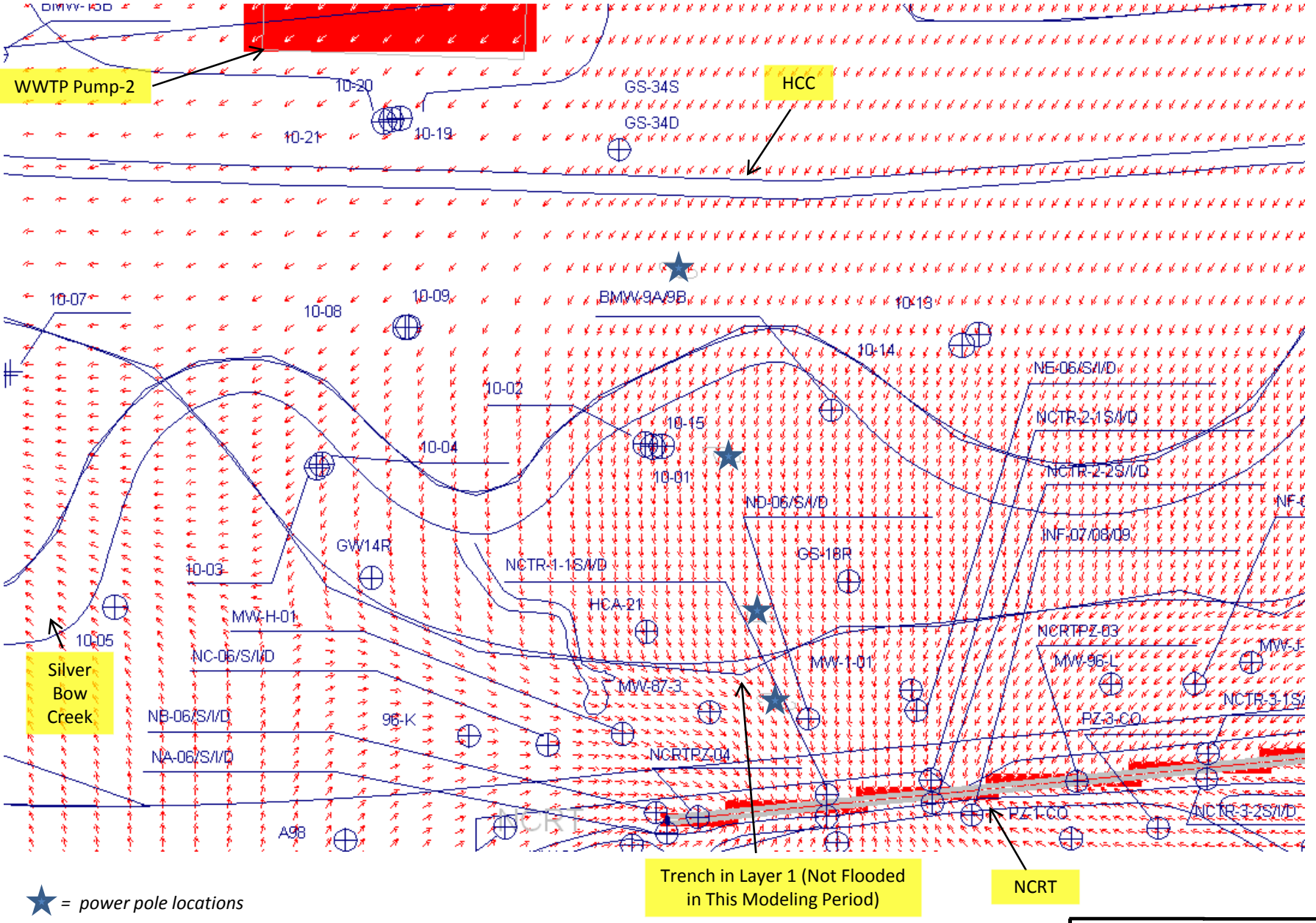


Figure 8-15. Simulated Flow Vectors (Model Layer 3) Between NCRT and WWTP, Steady-State Model Prior to Phase 1 Dewatering

TETRA TECH

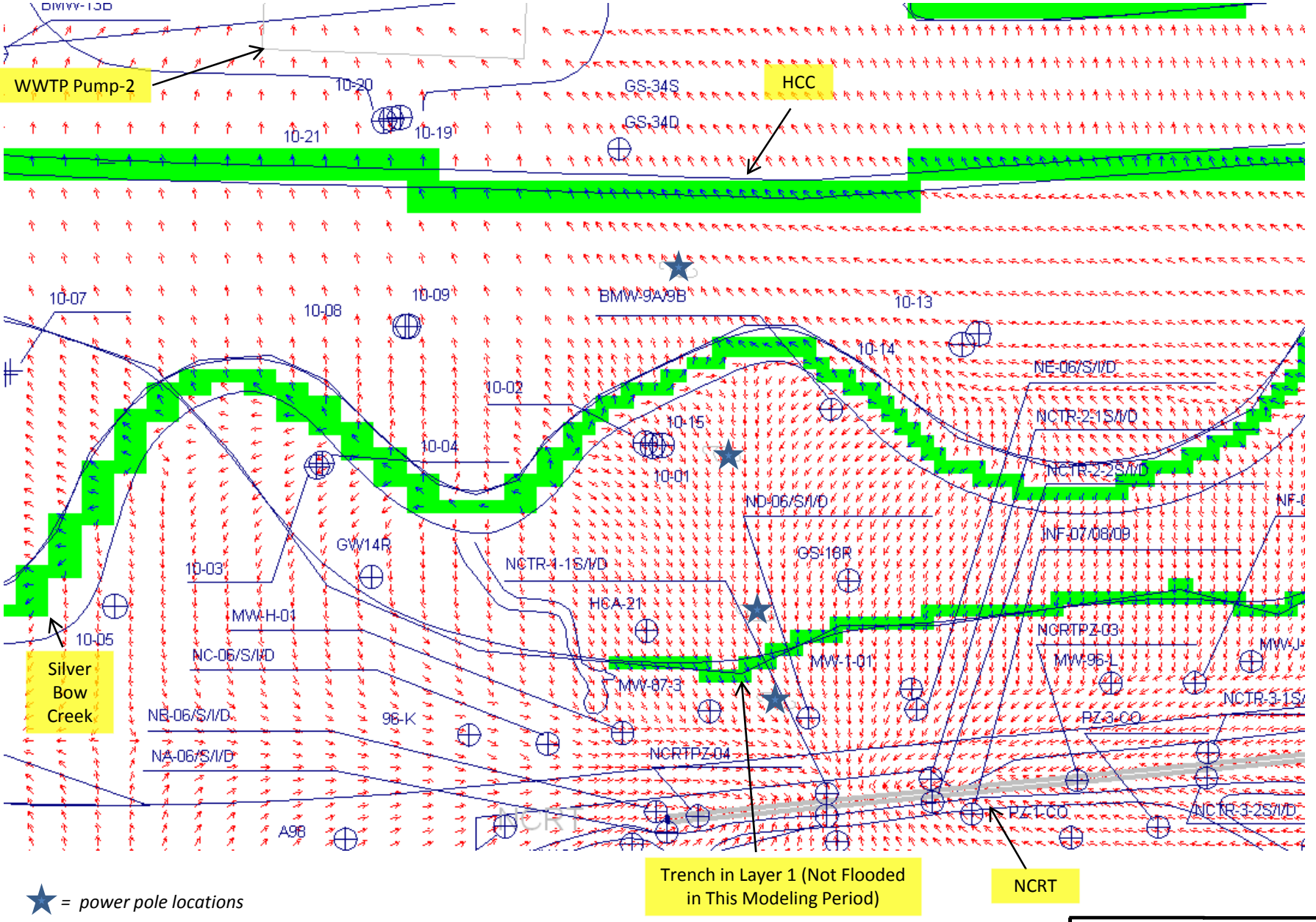


Figure 8-16. Simulated Flow Vectors (Model Layer 1) Between NCRT and WWTP, Stress Period 5 (WWTP Dewatering Plus BRW Pond Dewatering)

TETRA TECH

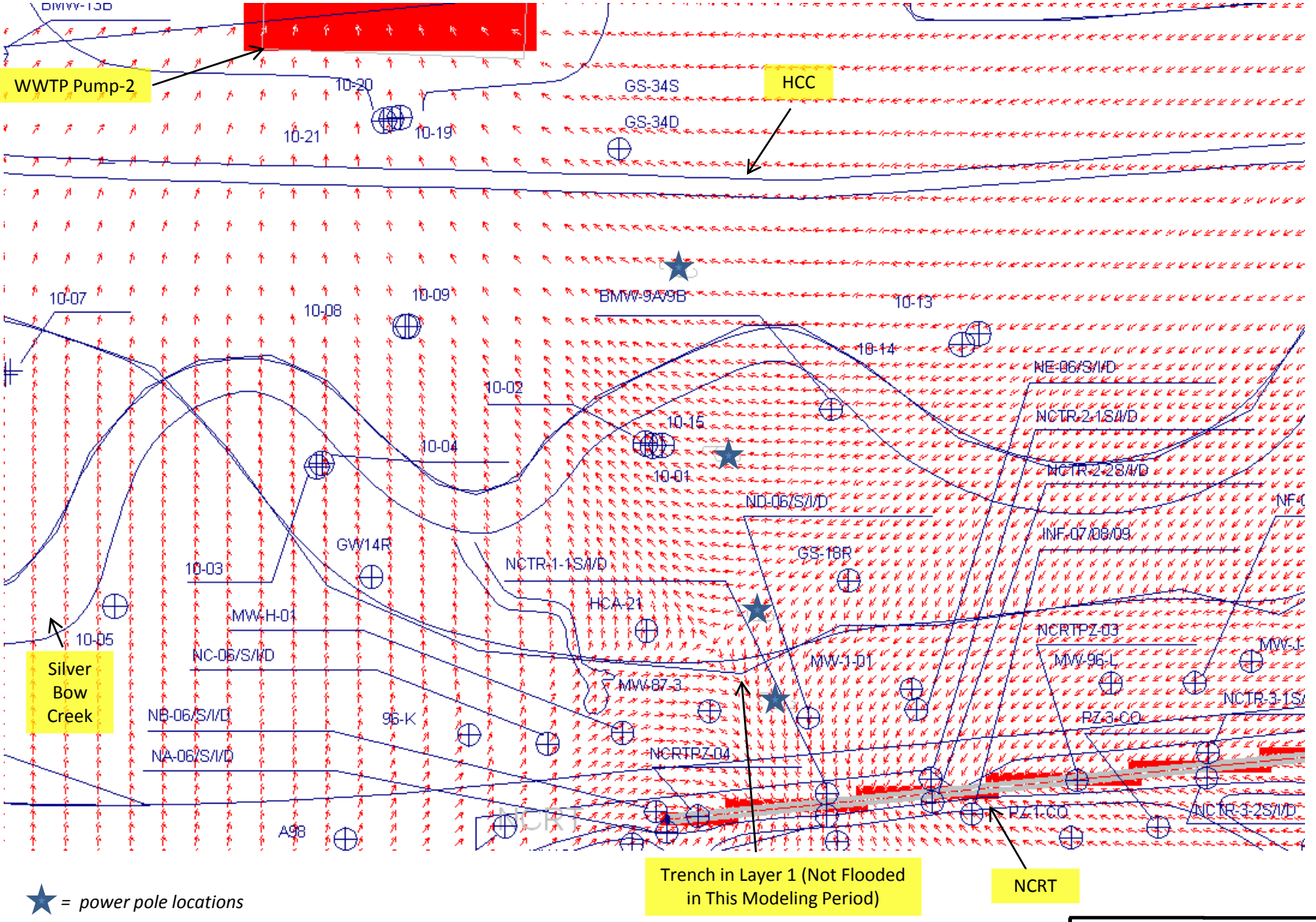


Figure 8-17. Simulated Flow Vectors (Model Layer 3) Between NCRT and WWTP, Stress Period 5 (WWTP Dewatering Plus BRW Pond Dewatering)

TETRA TECH

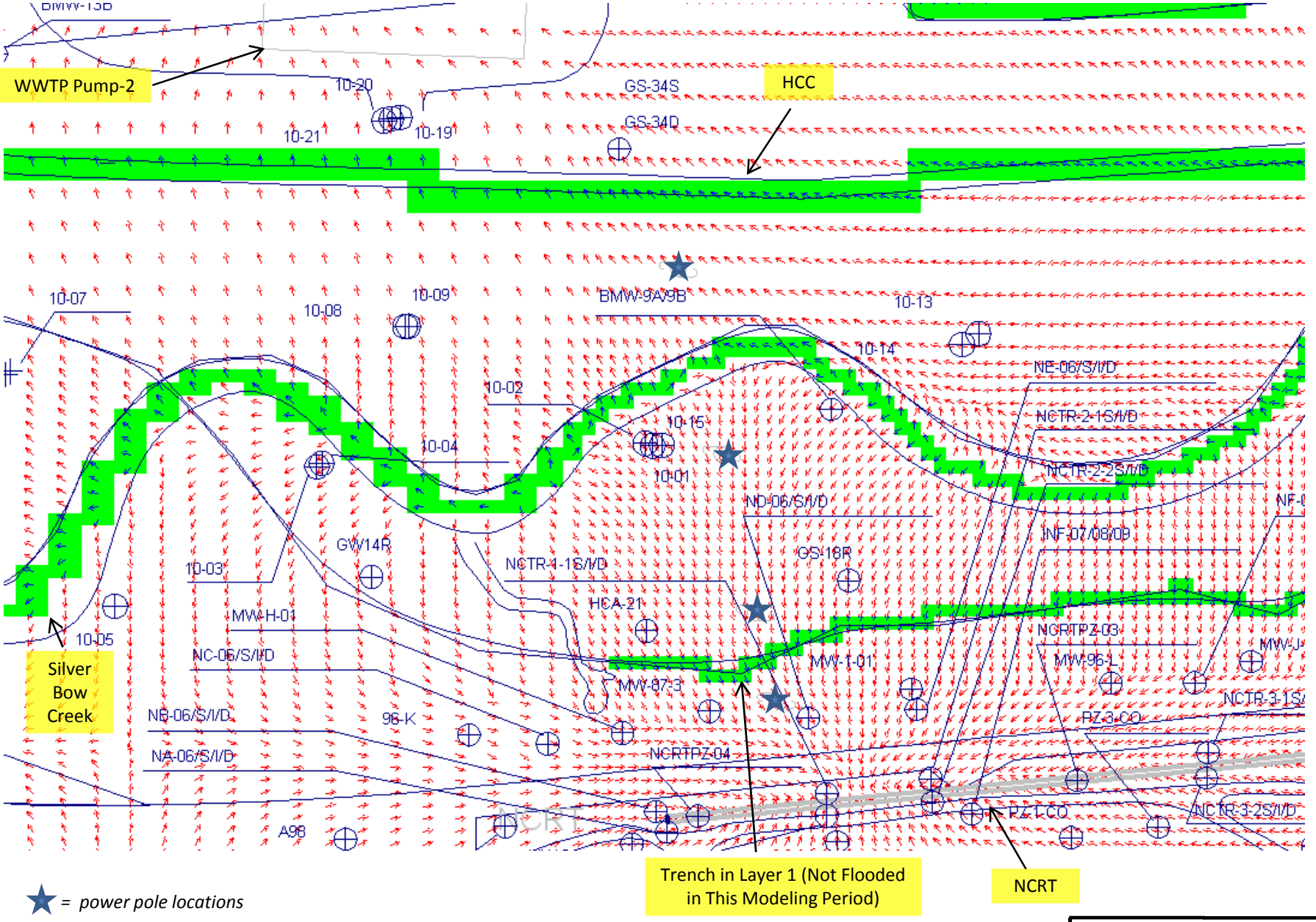


Figure 8-18. Simulated Flow Vectors (Model Layer 1) Between NCRT and WWTP, Stress Period 9 (WWTP Dewatering With No BRW Pond Dewatering)

TETRA TECH

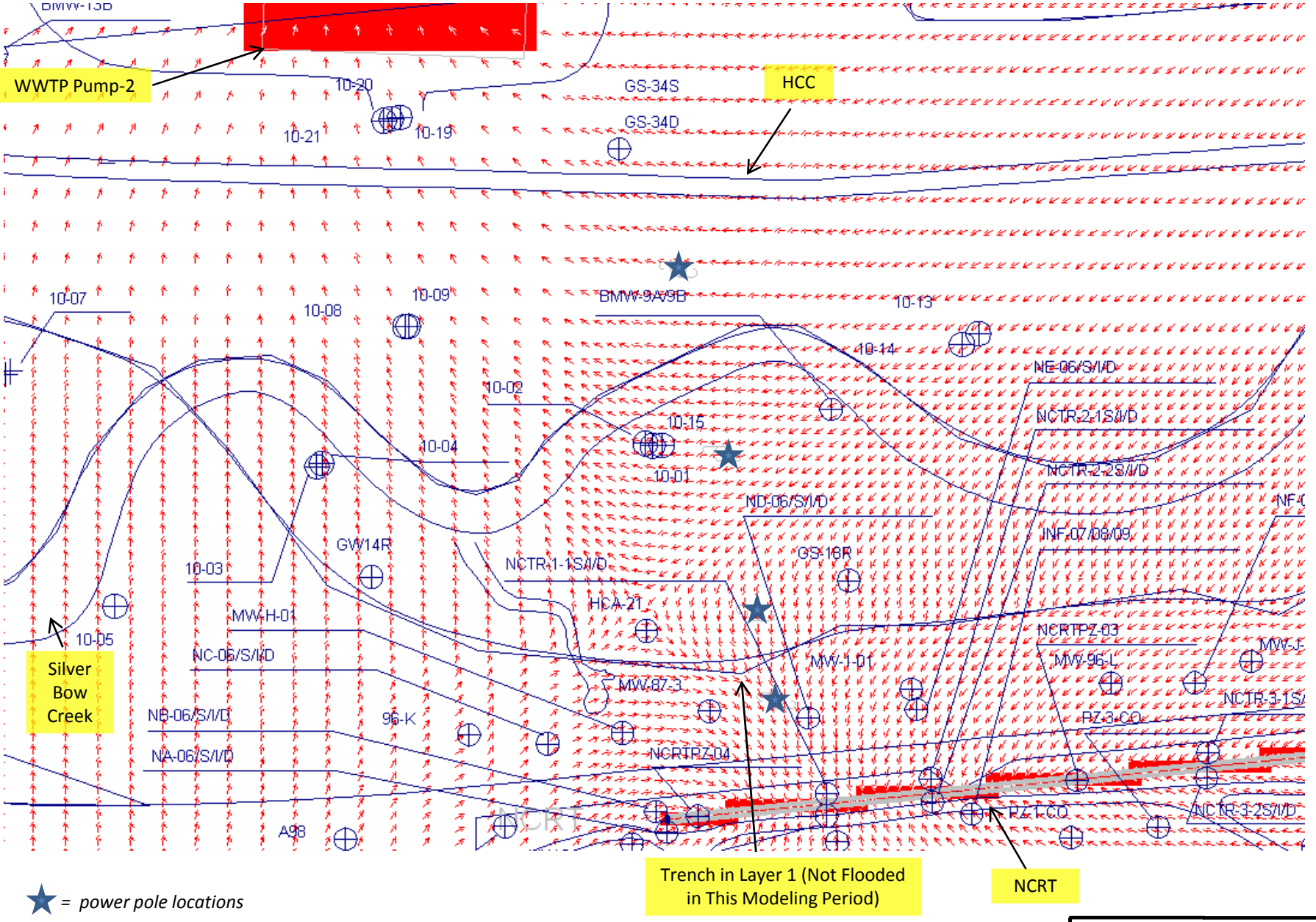


Figure 8-19. Simulated Flow Vectors (Model Layer 3) Between NCRT and WWTP, Stress Period 9 (WWTP Dewatering With No BRW Pond Dewatering)

TETRA TECH

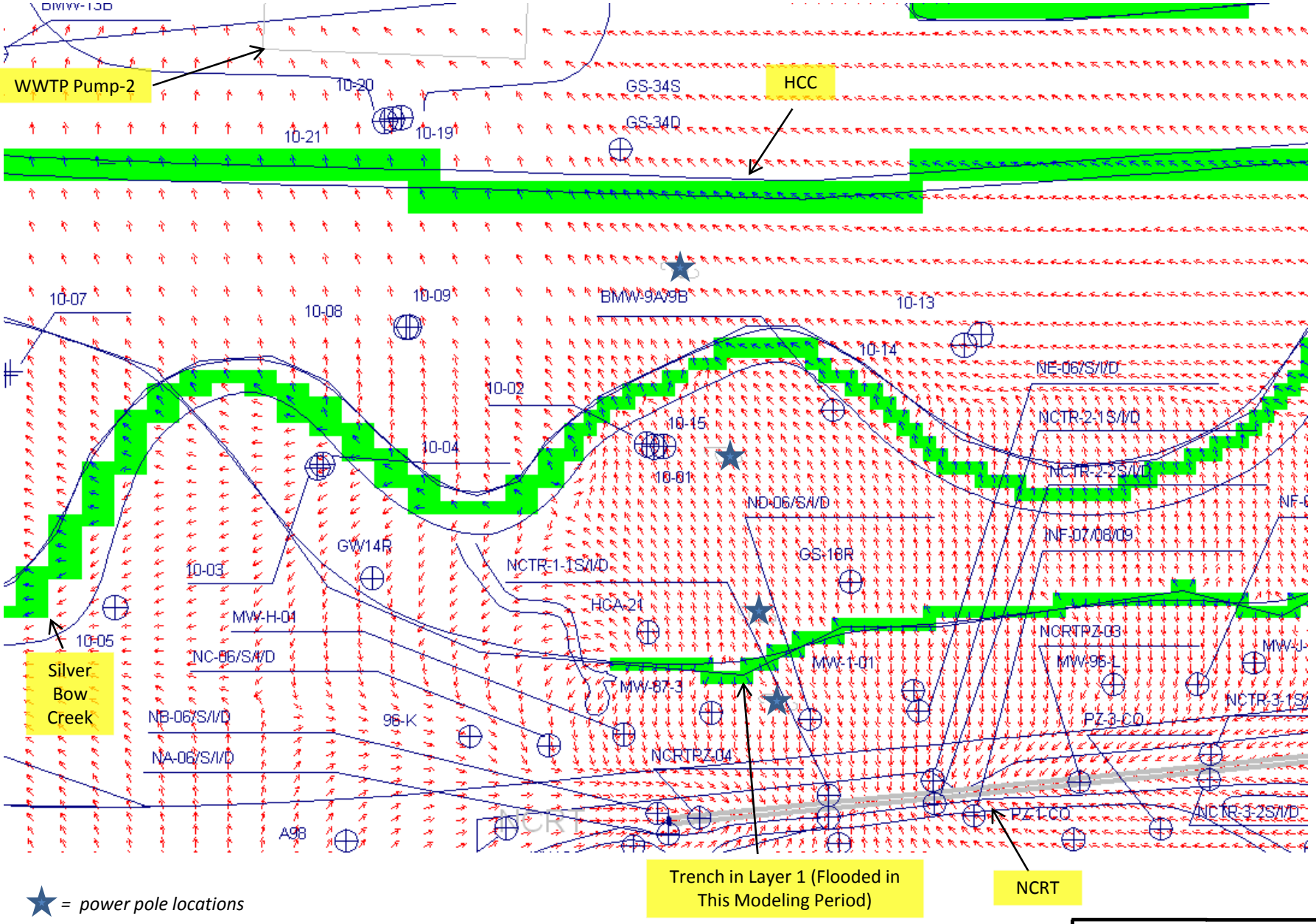


Figure 8-20. Simulated Flow Vectors (Model Layer 1) Between NCRT and WWTP, Stress Period 19 (WWTP Dewatering Plus Trench Flooding)

TETRA TECH

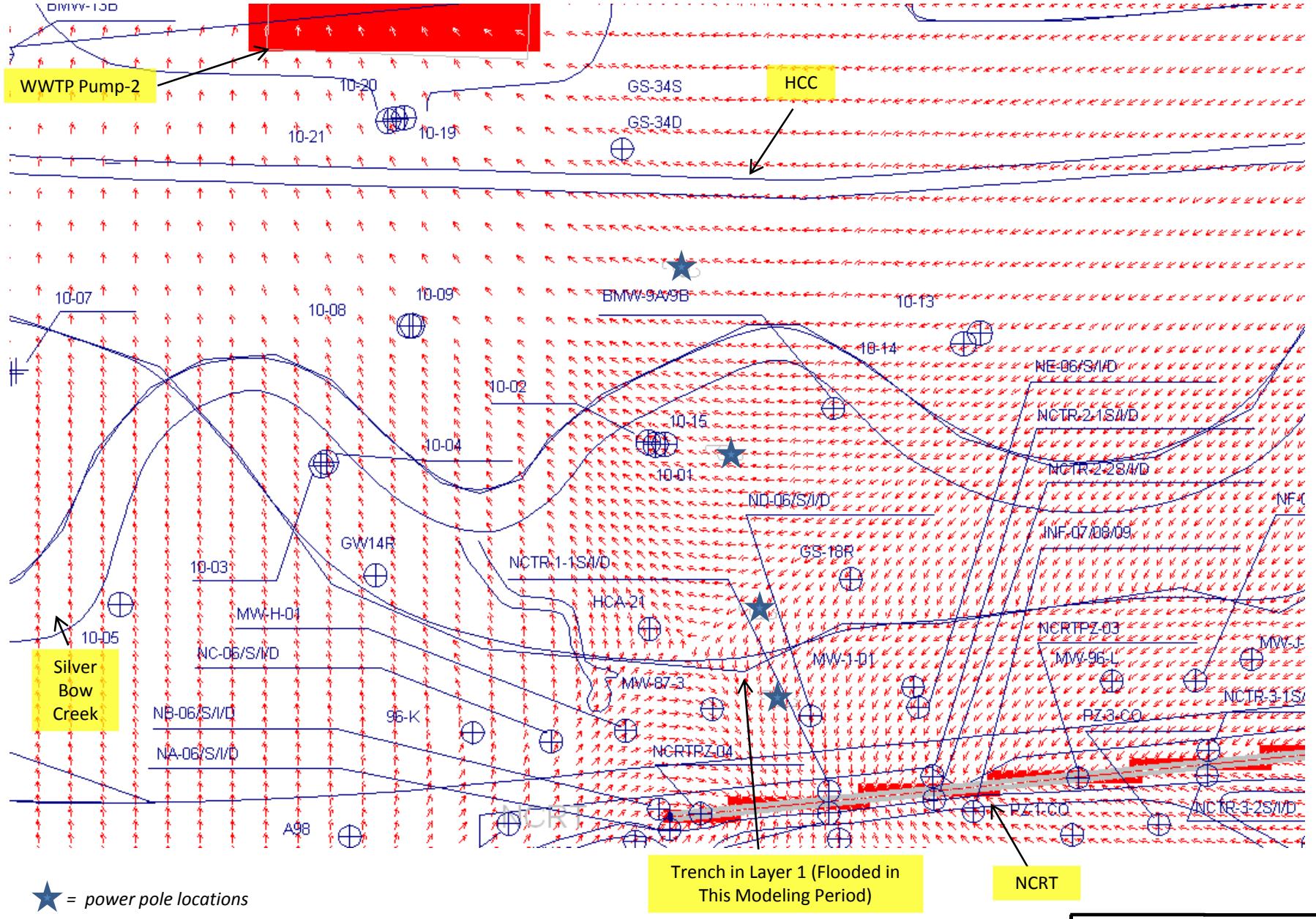


Figure 8-21. Simulated Flow Vectors (Model Layer 3) Between NCRT and WWTP, Stress Period 19 (WWTP Dewatering Plus Trench Flooding)

TETRA TECH

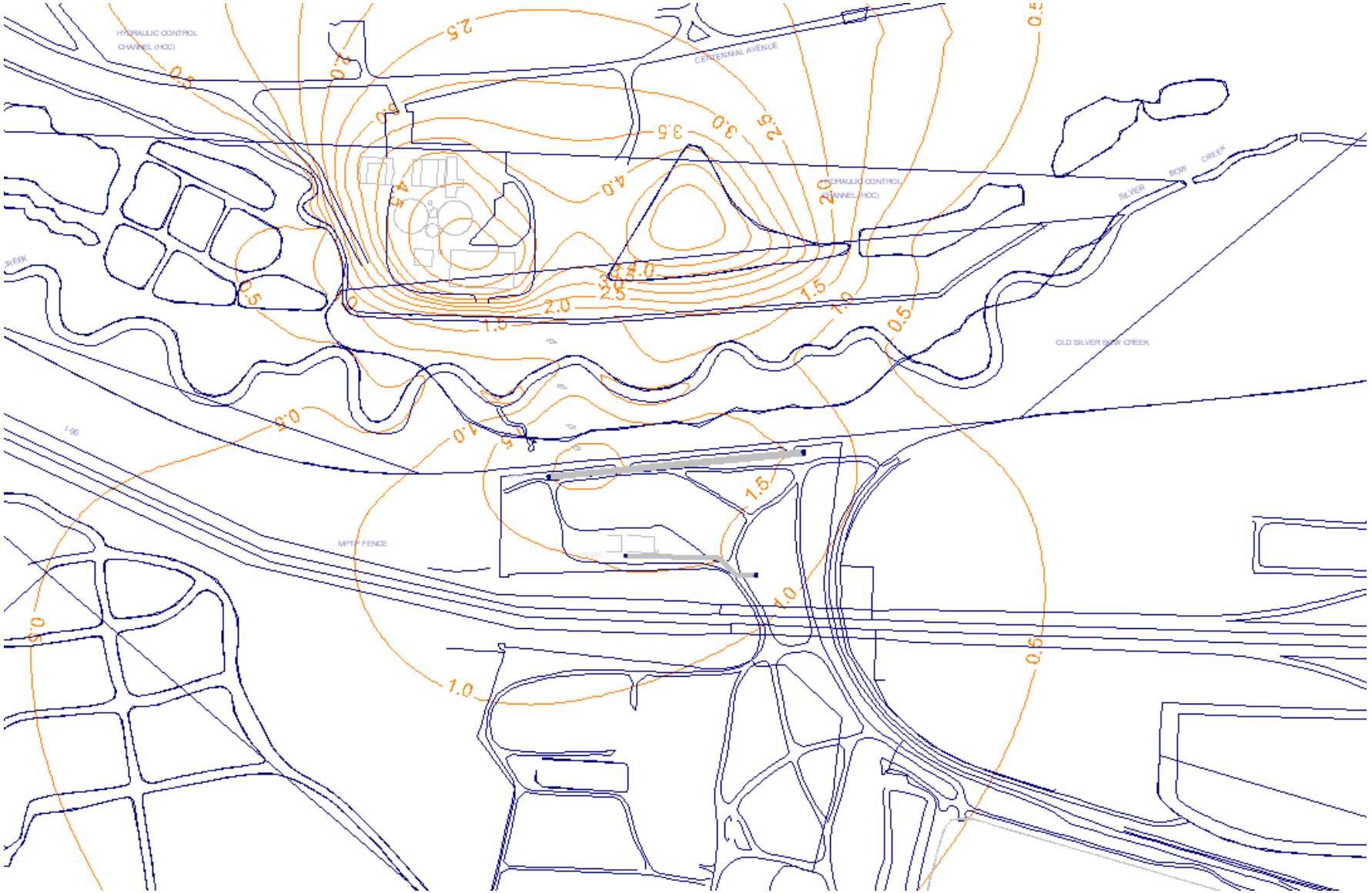


Figure 8-22. Simulated Drawdown (ft), Model Layer 1, Stress Period 5 (WWTP Dewatering Plus BRW Dewatering)

TETRA TECH

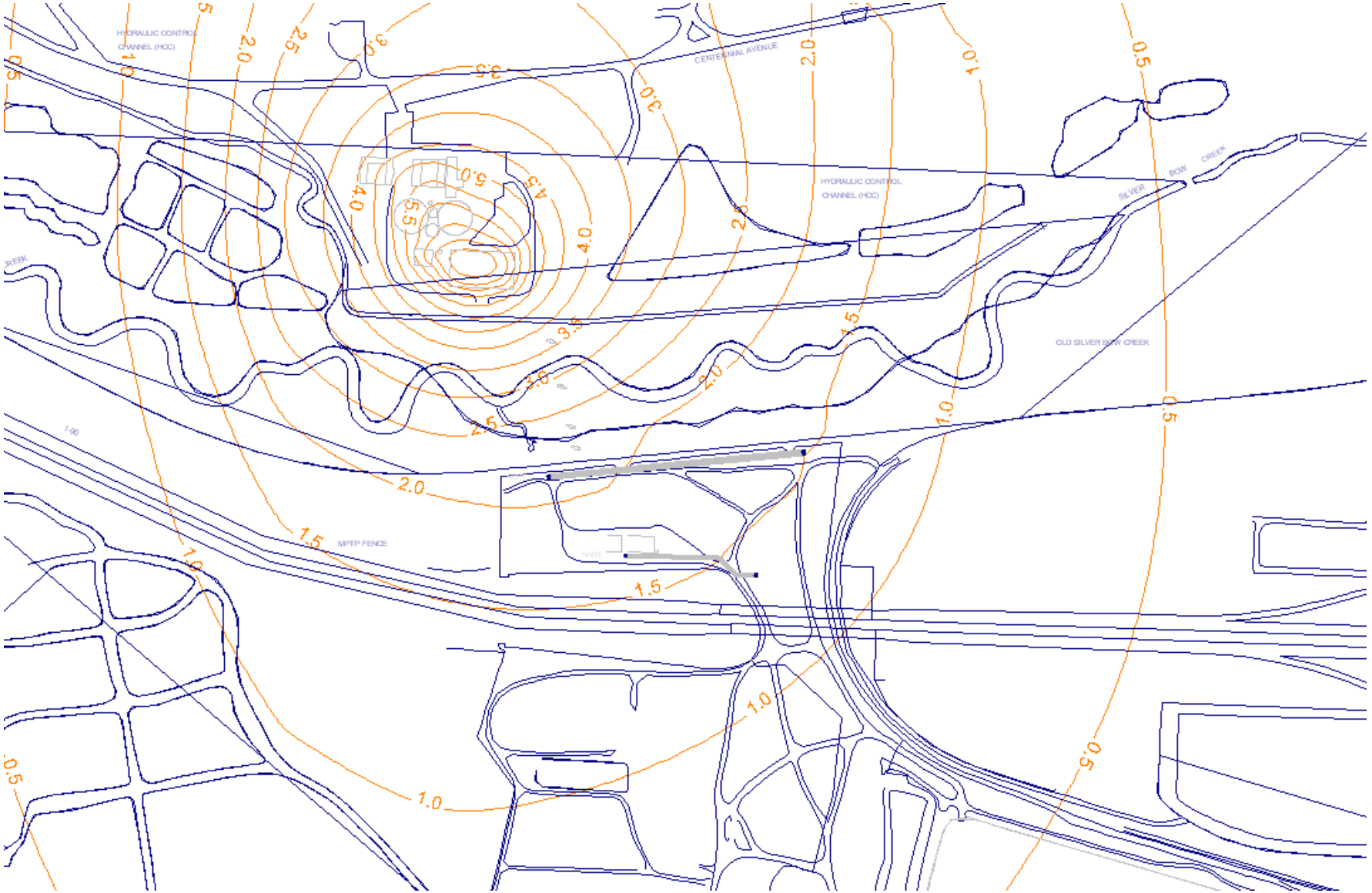


Figure 8-23. Simulated Drawdown (ft), Model Layer 3, Stress Period 5 (WWTP Dewatering Plus BRW Dewatering)

TETRA TECH

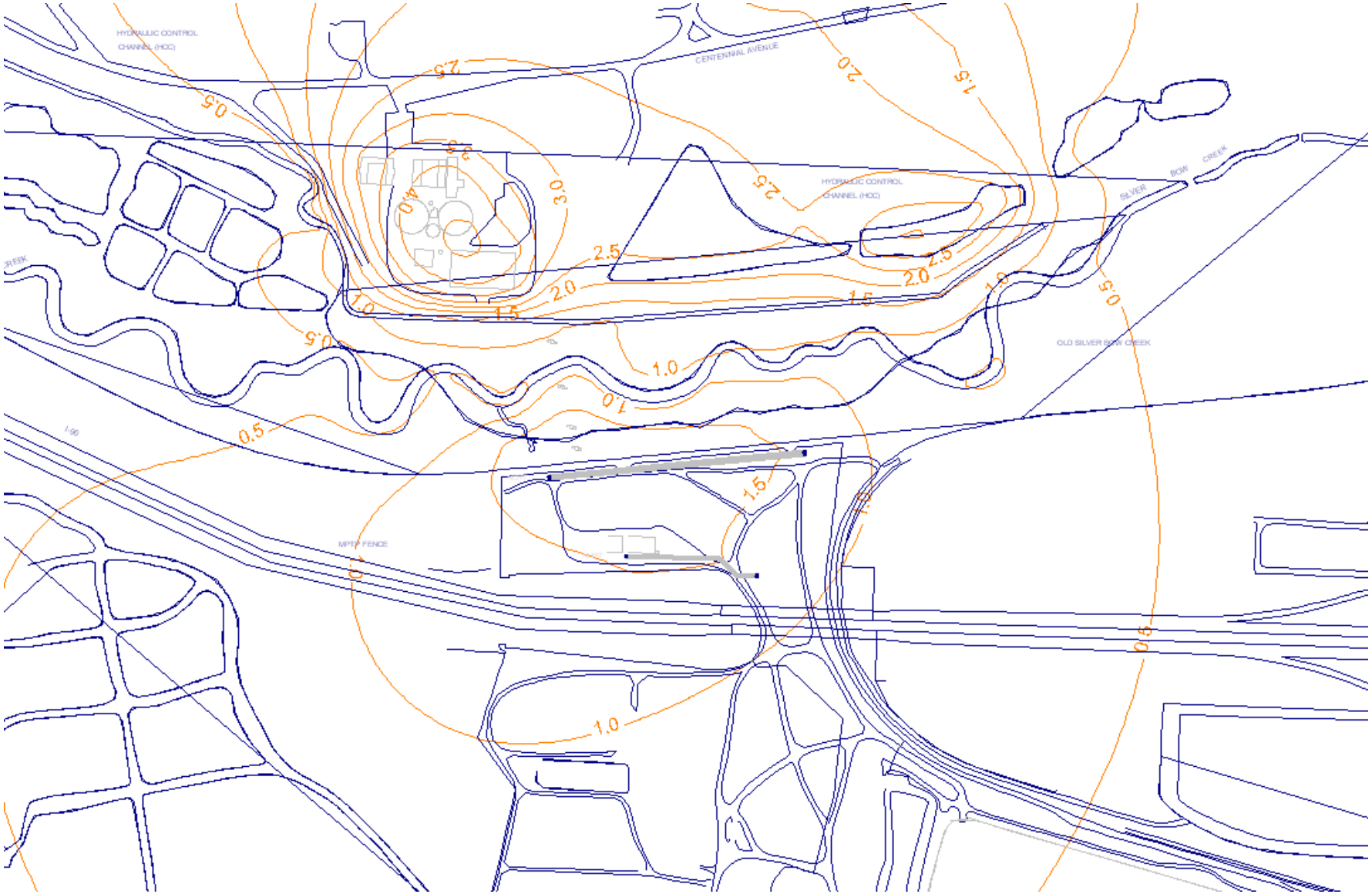


Figure 8-24. Simulated Drawdown (ft), Model Layer 1, Stress Period 9
(WWTP Dewatering With No BRW Dewatering)

TETRA TECH

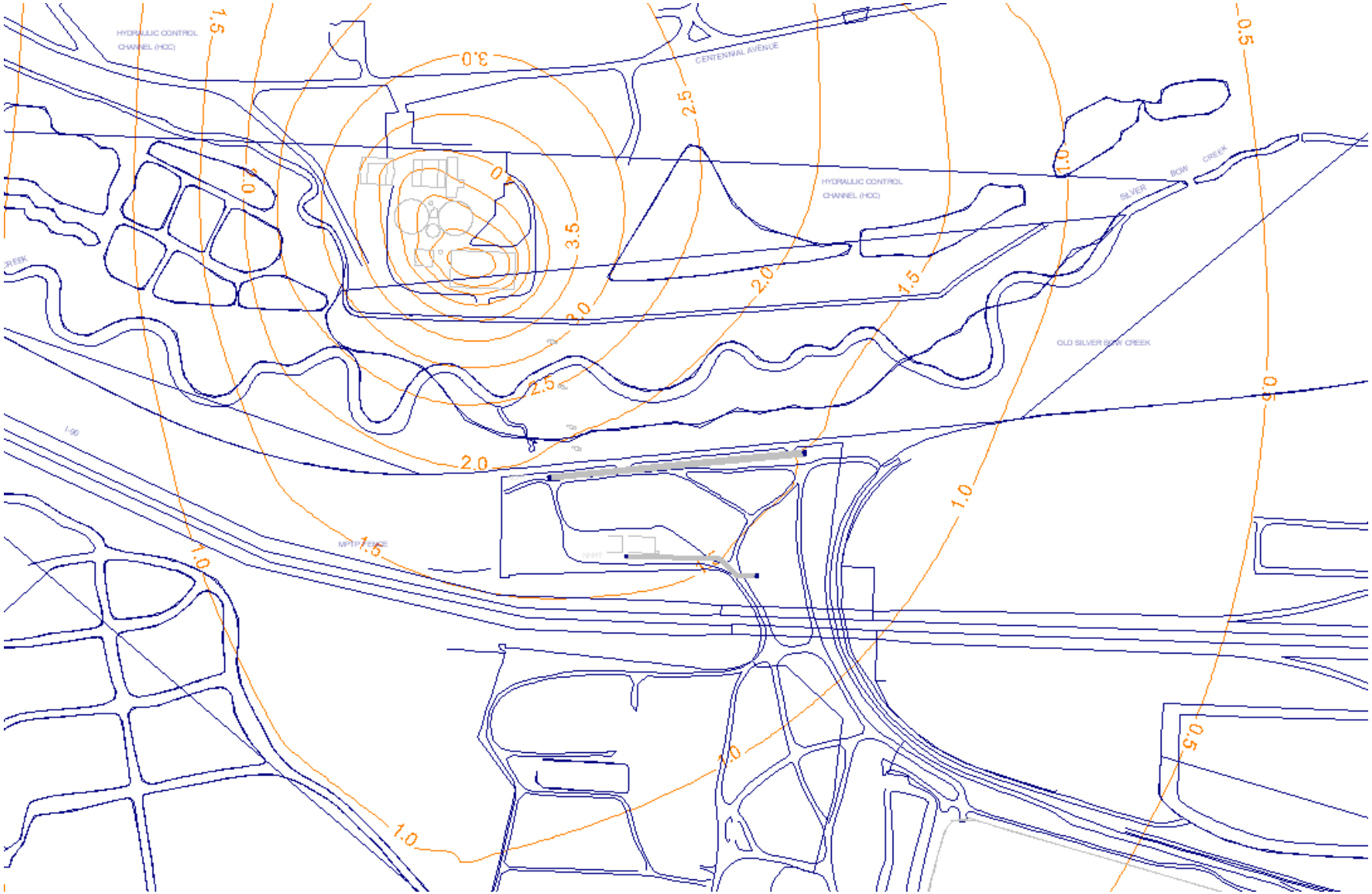


Figure 8-25. Simulated Drawdown (ft), Model Layer 3, Stress Period 9
(WWTP Dewatering With No BRW Dewatering)

TETRA TECH

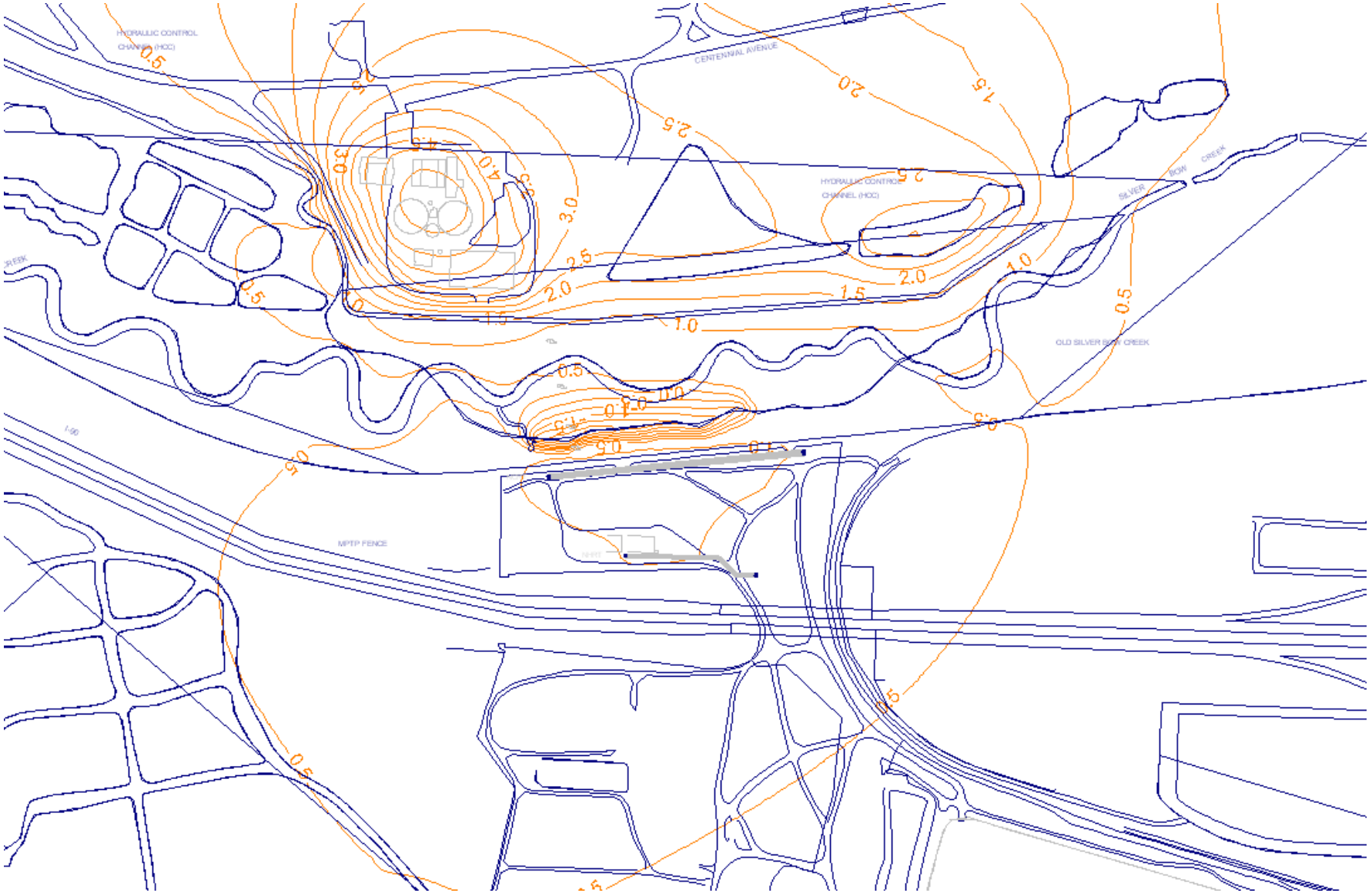


Figure 8-26. Simulated Drawdown (ft), Model Layer 1, Stress Period 19 (WWTP Dewatering Plus Trench Flooding)

TETRA TECH

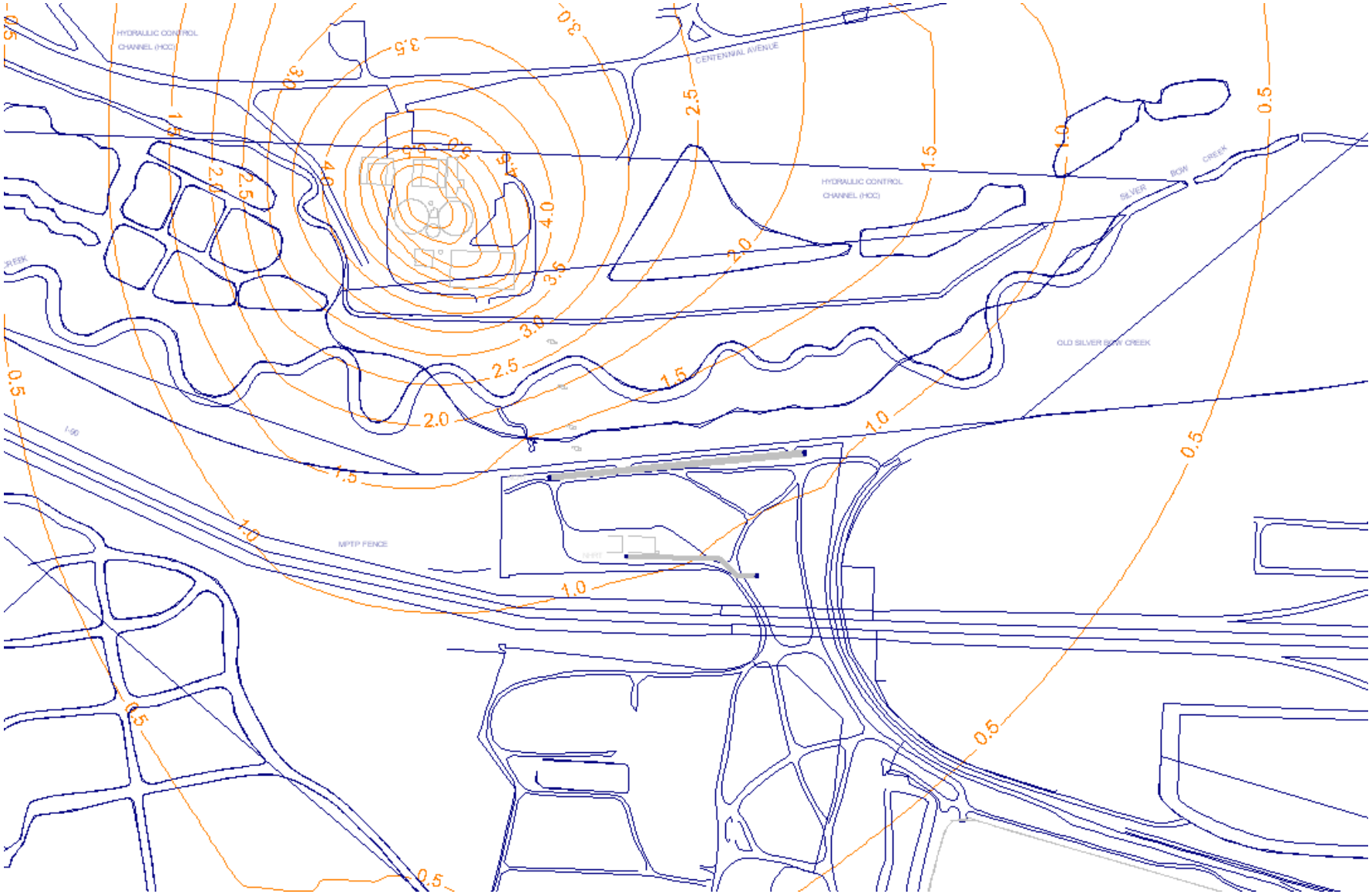
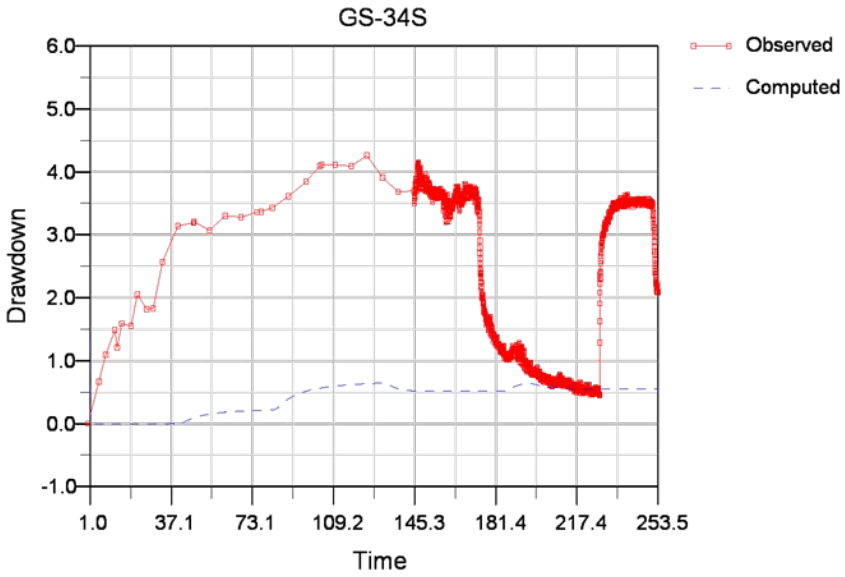
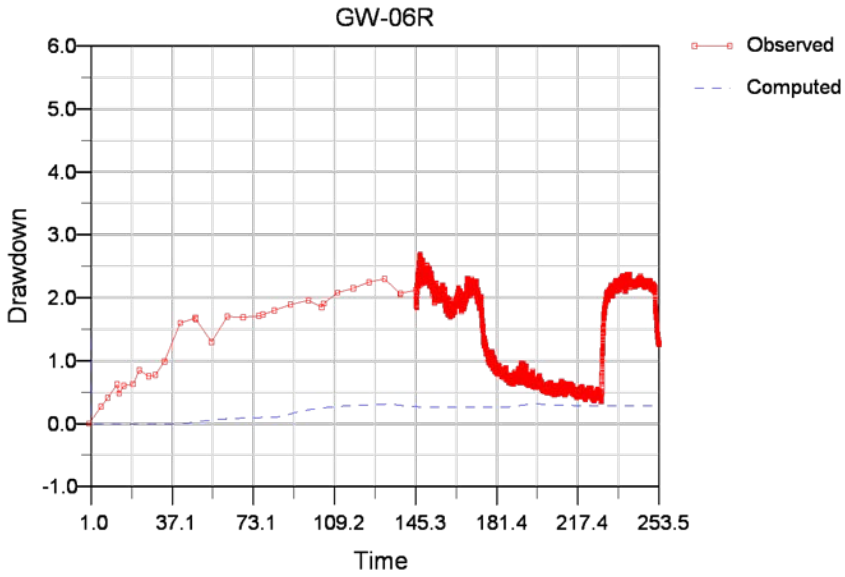
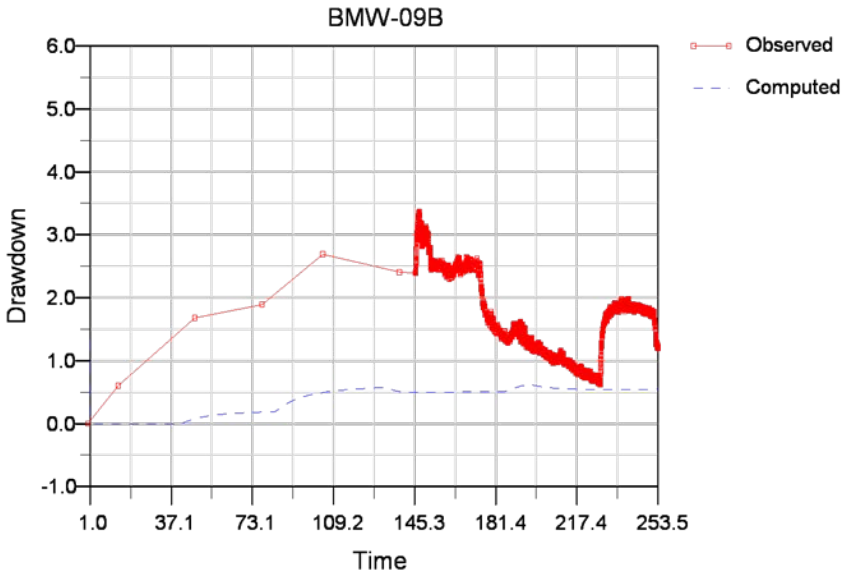


Figure 8-27. Simulated Drawdown (ft), Model Layer 3, Stress Period 19 (WWTP Dewatering Plus Trench Flooding)

TETRA TECH







These figures illustrate simulated drawdown response to changes in BRW pond elevations (versus observed drawdown due to all stress changes). For these wells, the BRW pond elevation changes cause only a small portion of the overall observed drawdown.

Note that observed water levels did not fully recover to pre-extraction water levels after the first period of dewatering (there was still ~0.5 ft of drawdown), and these results suggest the likely reason is that BRW pond elevations were lower after the construction on those ponds was completed in December 2009 than when this modeling period began (August 2009).

Drawdown is in feet. Time represents days after Phase 1 dewatering began.

Figure 8-28. Simulated Drawdown (ft) at Selected Wells Due Only to BRW Pond Elevation Changes

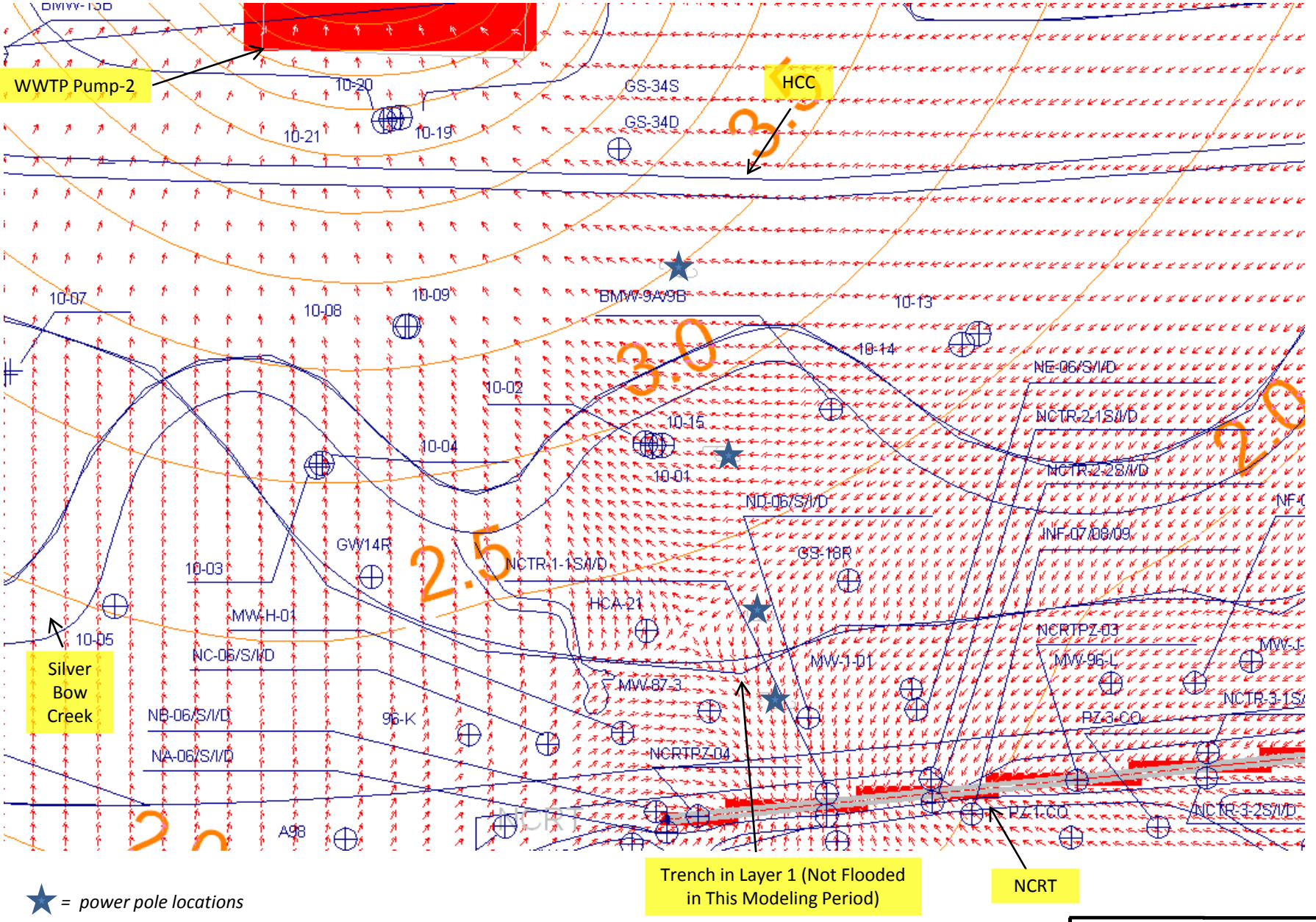


Figure 8-29. Simulated Flow Vectors (Model Layer 3) Between NCRT and WWTP, Stress Period 9 plus 25% additional extraction at WWTP for 9 days

TETRA TECH

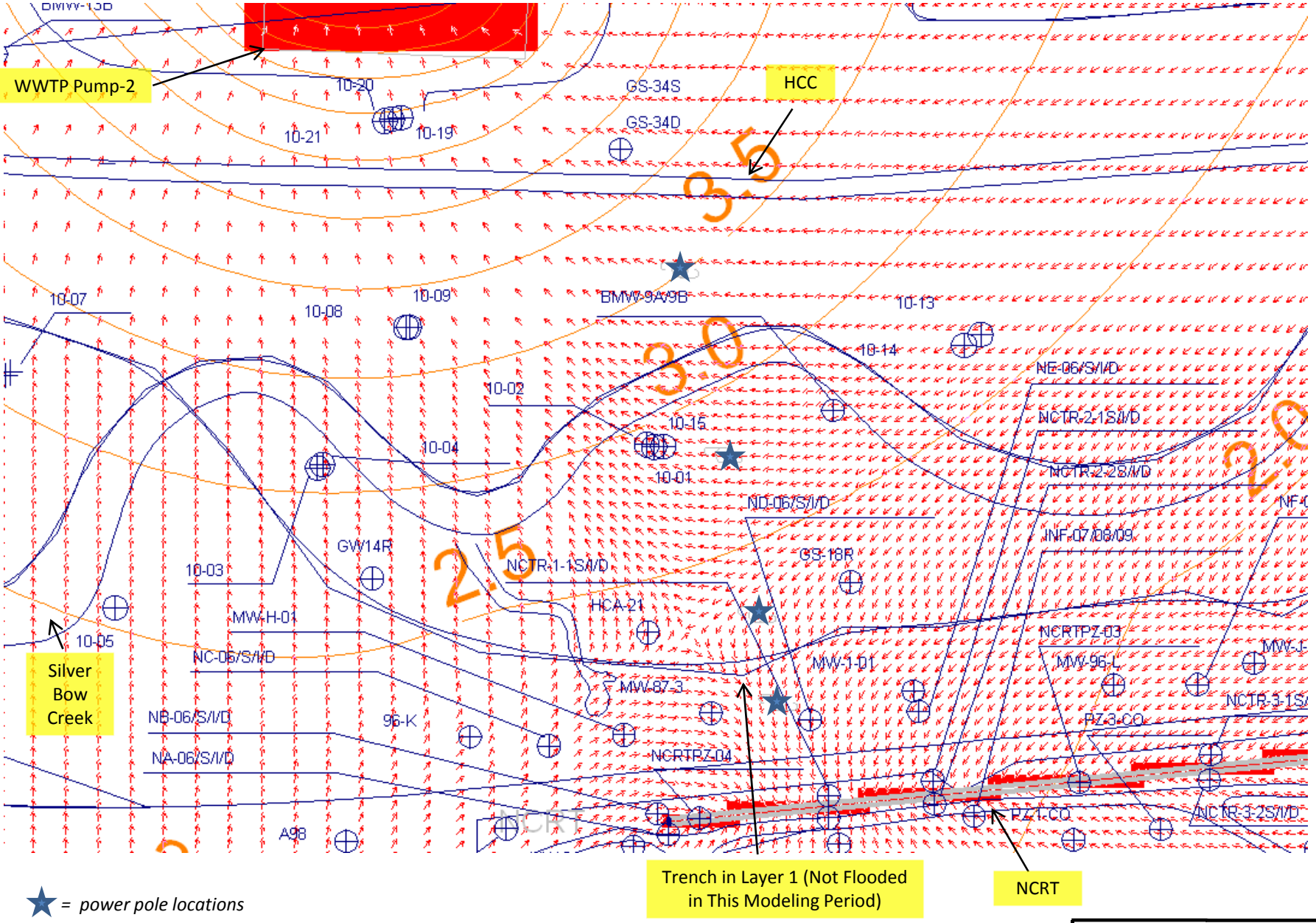


Figure 8-30. Simulated Flow Vectors (Model Layer 3) Between NCRT and WWTP, Stress Period 9 plus 25% additional extraction at WWTP for 30 days

TETRA TECH

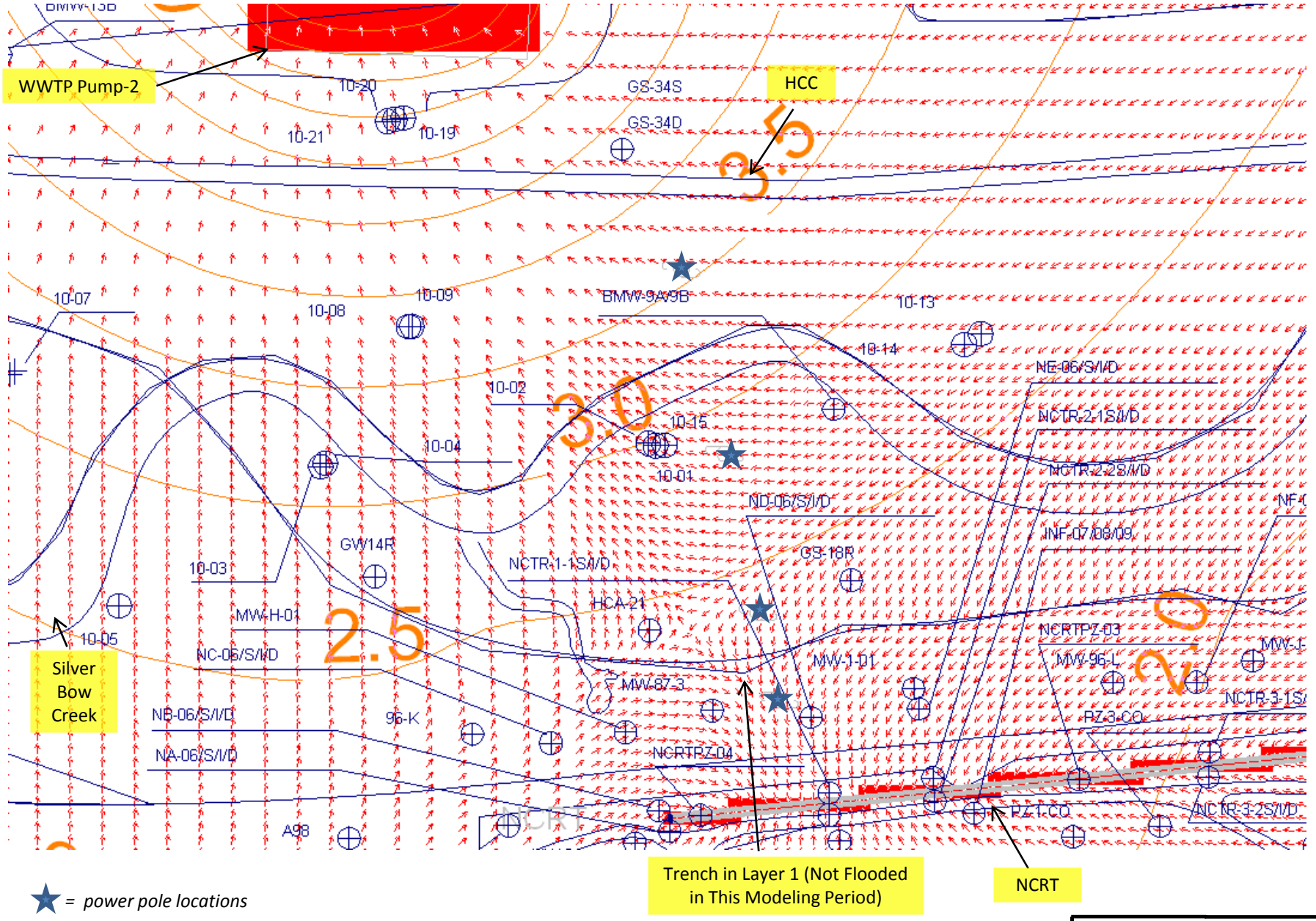
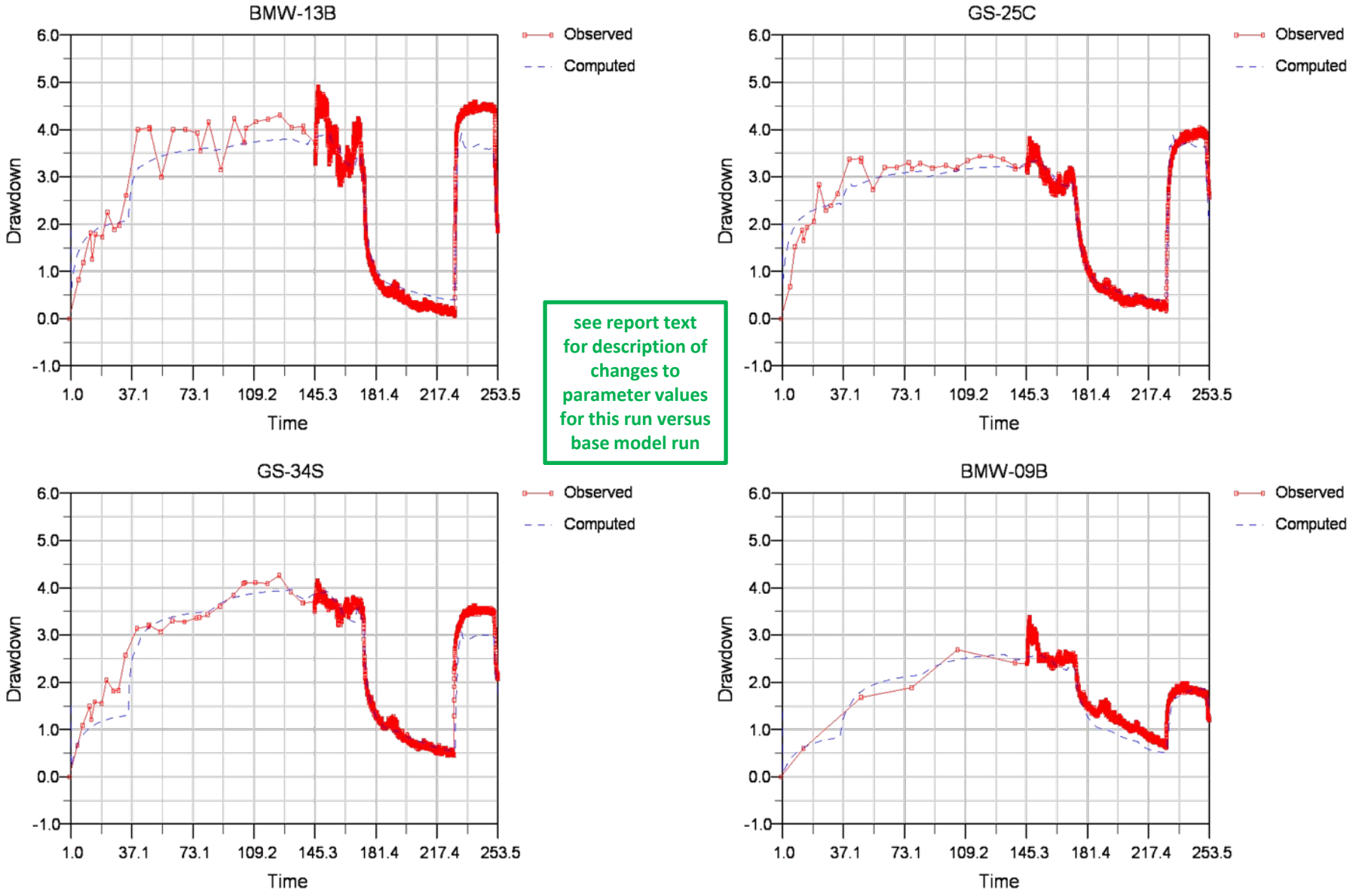


Figure 8-31. Simulated Flow Vectors (Model Layer 3) Between NCRT and WWTP, Stress Period 9 plus 25% additional extraction at WWTP for 365 days

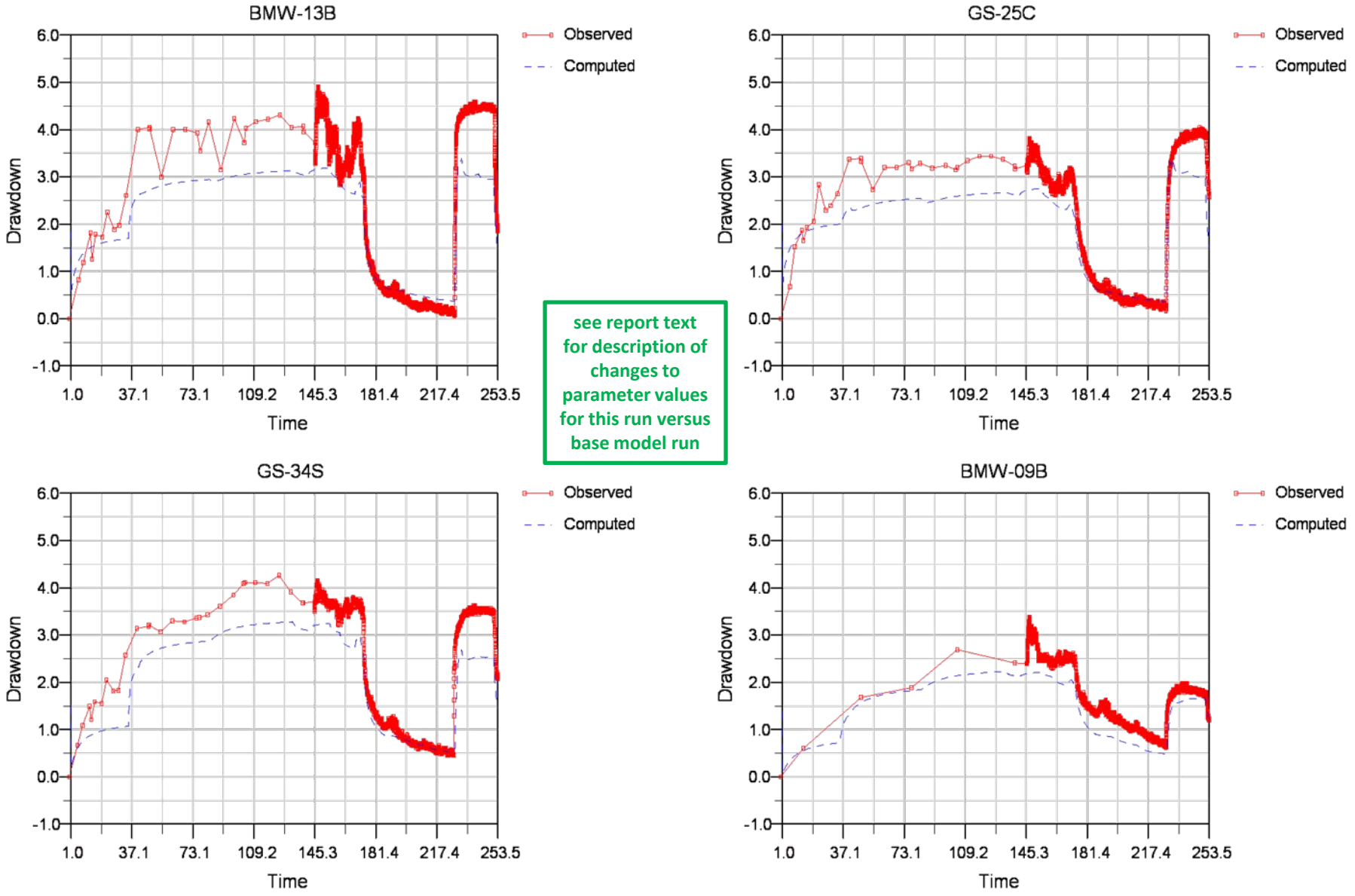
TETRA TECH



Drawdown is in feet. Time represents days after Phase 1 dewatering began.

Figure 8-32. Sensitivity Run 6a – Simulated versus Observed Change in Water Level (ft) (Less Water Added at Constant Head Boundaries in Hills)

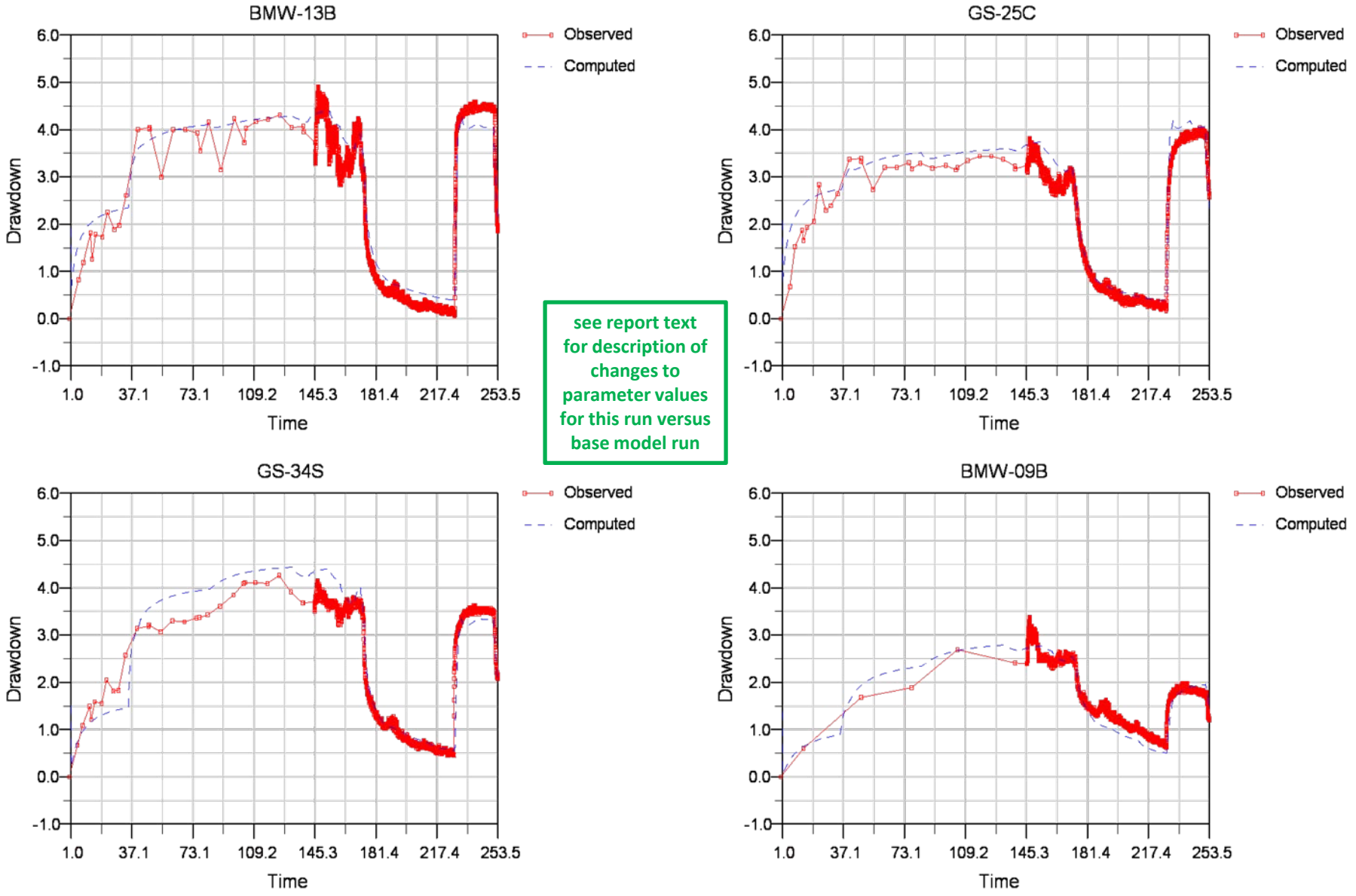
TETRA TECH



Drawdown is in feet. Time represents days after Phase 1 dewatering began.

Figure 8-33. Sensitivity Run 6b – Simulated versus Observed Change in Water Level (ft) (Even Less Water Added at Constant Head Boundaries in Hills)

TETRA TECH



Drawdown is in feet. Time represents days after Phase 1 dewatering began.

Figure 8-34. Sensitivity Run 6c – Simulated versus Observed Change in Water Level (ft) (More Water Added at Constant Head Boundaries in Hills)

TETRA TECH

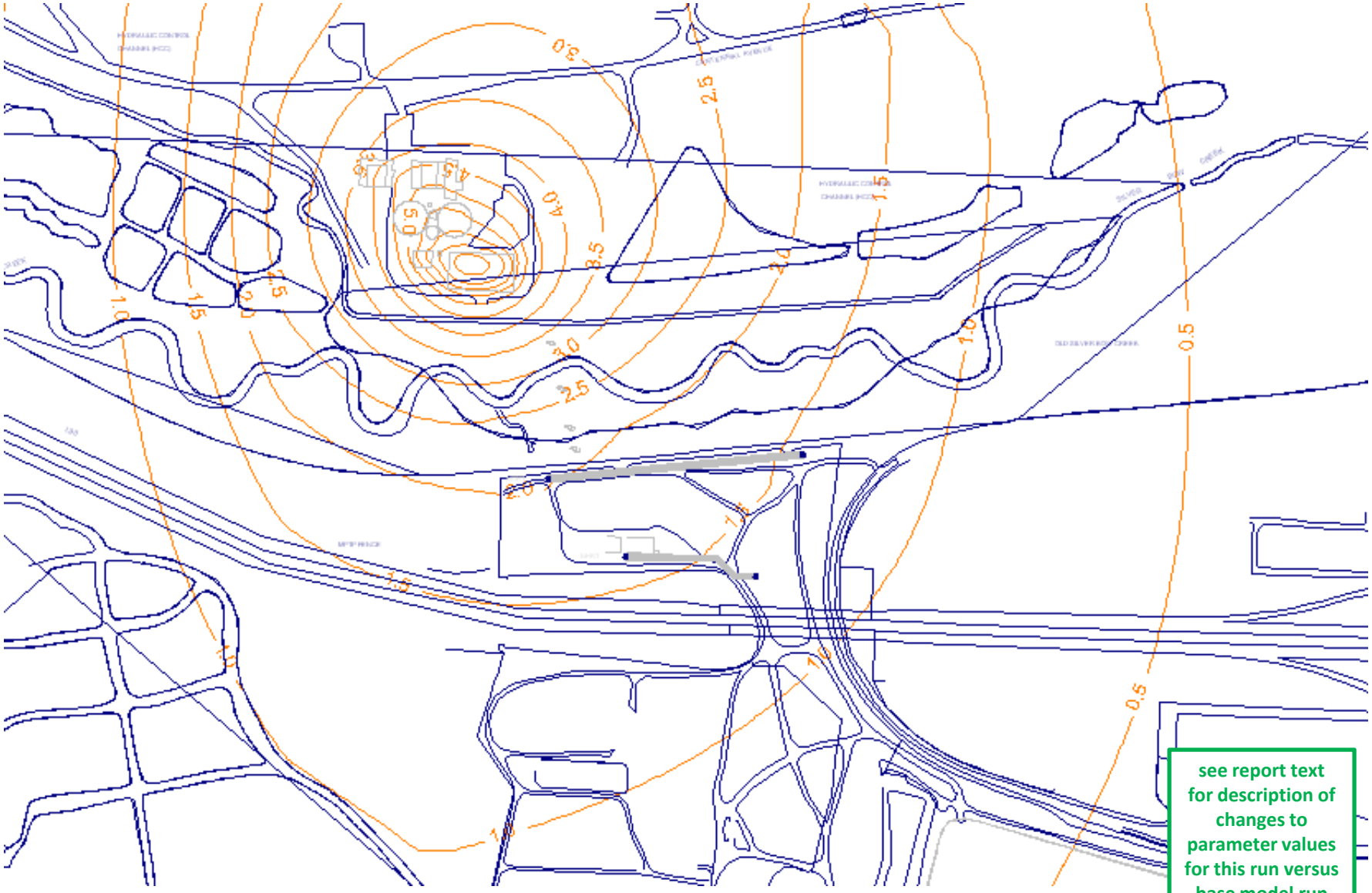


Figure 8-35. Sensitivity Run 6a – Simulated Drawdown (ft), Model Layer 3, Stress Period 5 (Less Water Added at Constant Head Boundaries in Hills)

TETRA TECH

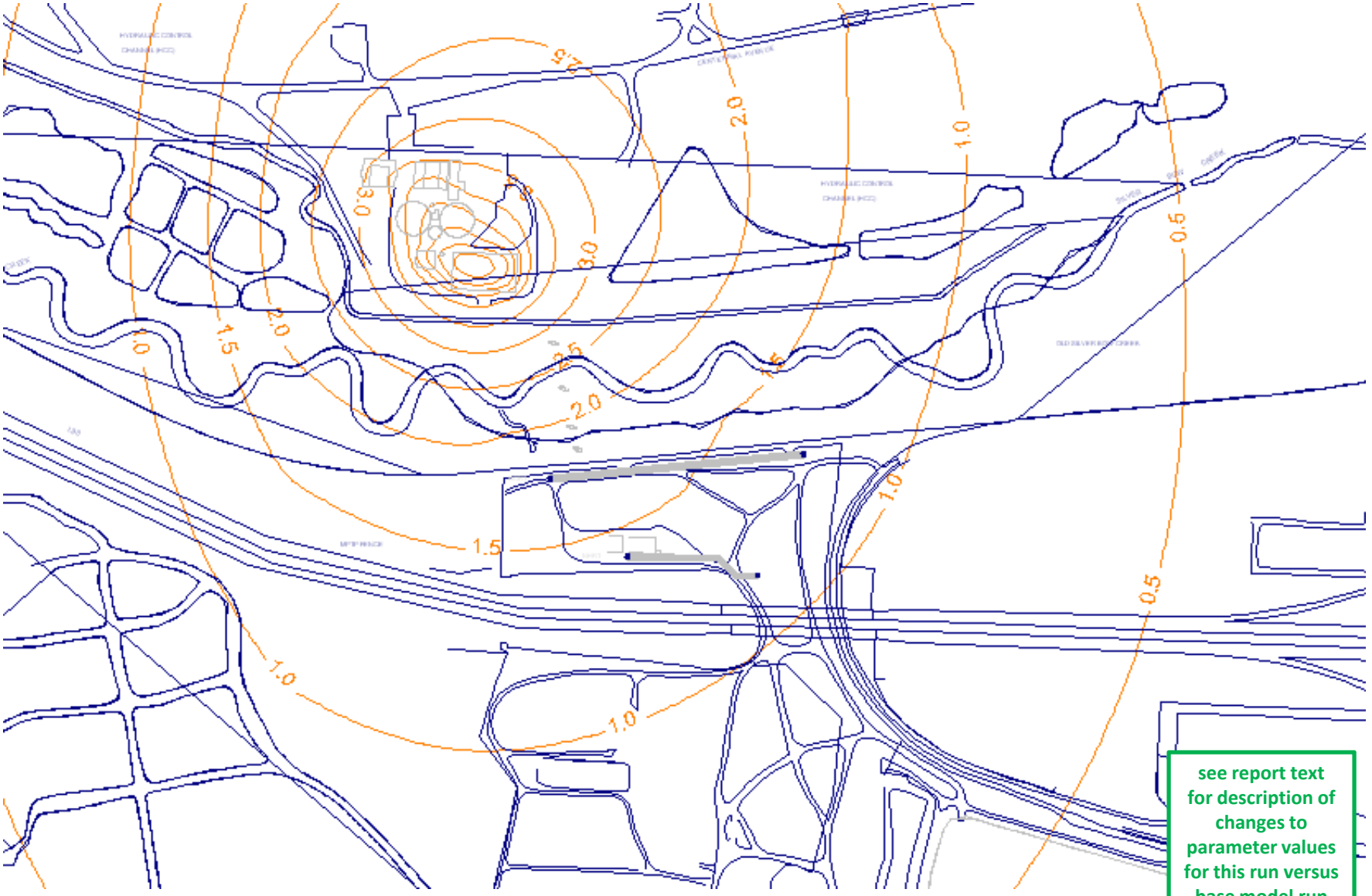


Figure 8-36. Sensitivity Run 6b – Simulated Drawdown (ft), Model Layer 3, Stress Period 5 (Even Less Water Added at Constant Head Boundaries in Hills)

TETRA TECH

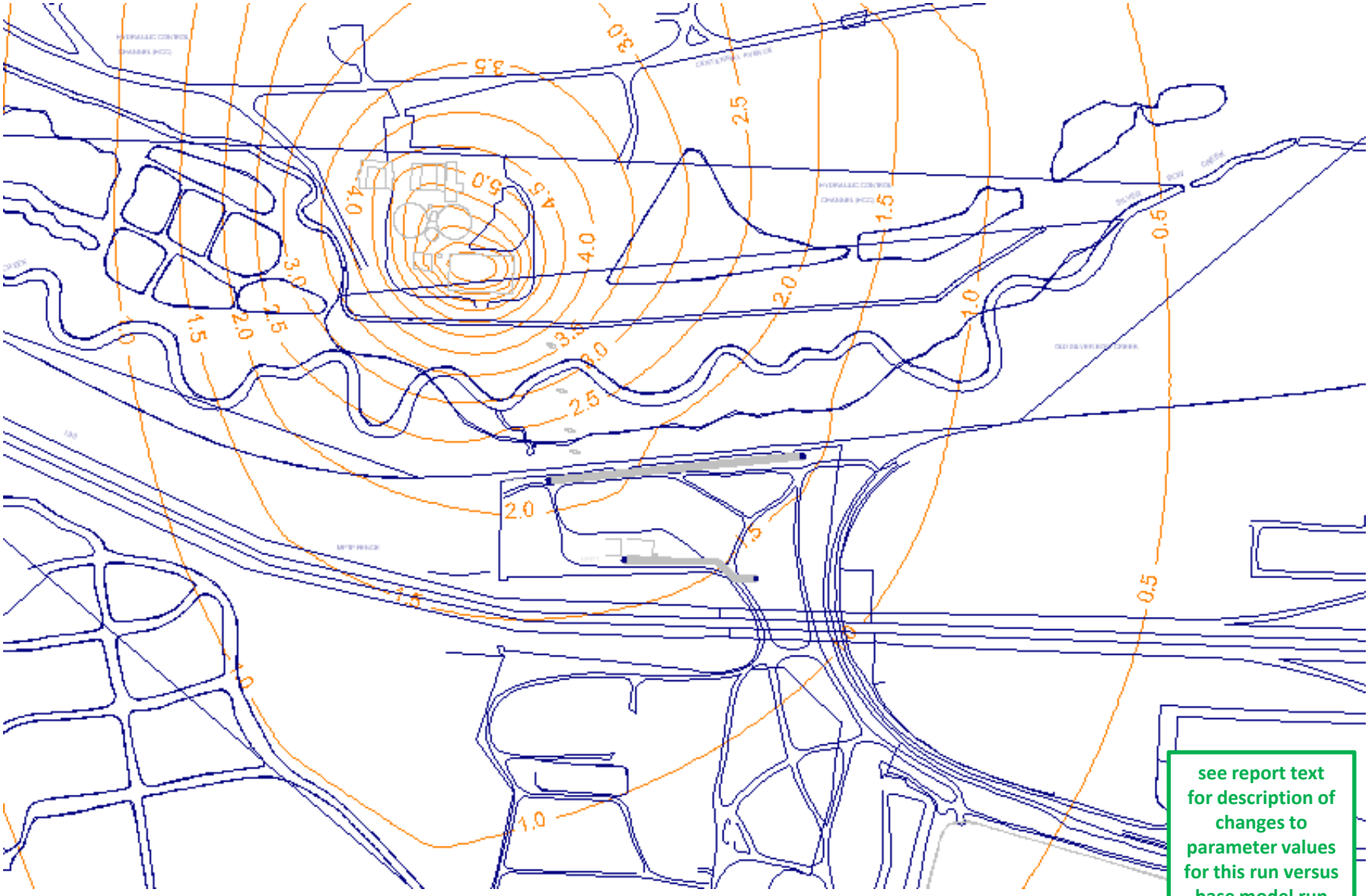


Figure 8-37. Sensitivity Run 6c – Simulated Drawdown (ft), Model Layer 3, Stress Period 5 (More Water Added at Constant Head Boundaries in Hills)

TETRA TECH

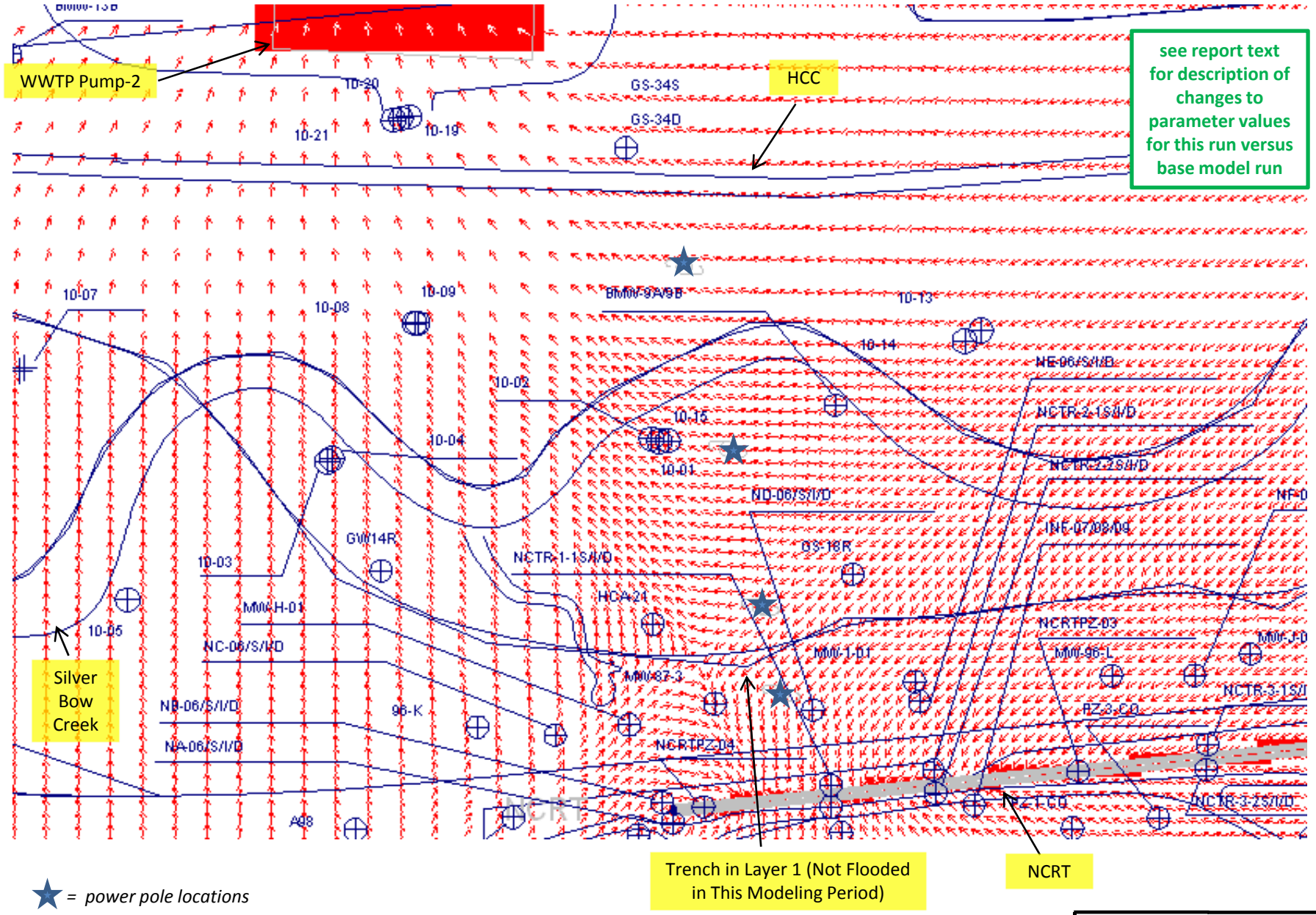


Figure 8-38. Sensitivity Run 6a – Simulated Flow Vectors (Model Layer 3) Between NCRT and WWTP, Stress Period 5 (Less Water Added at Constant Head Boundaries in Hills)

TETRA TECH

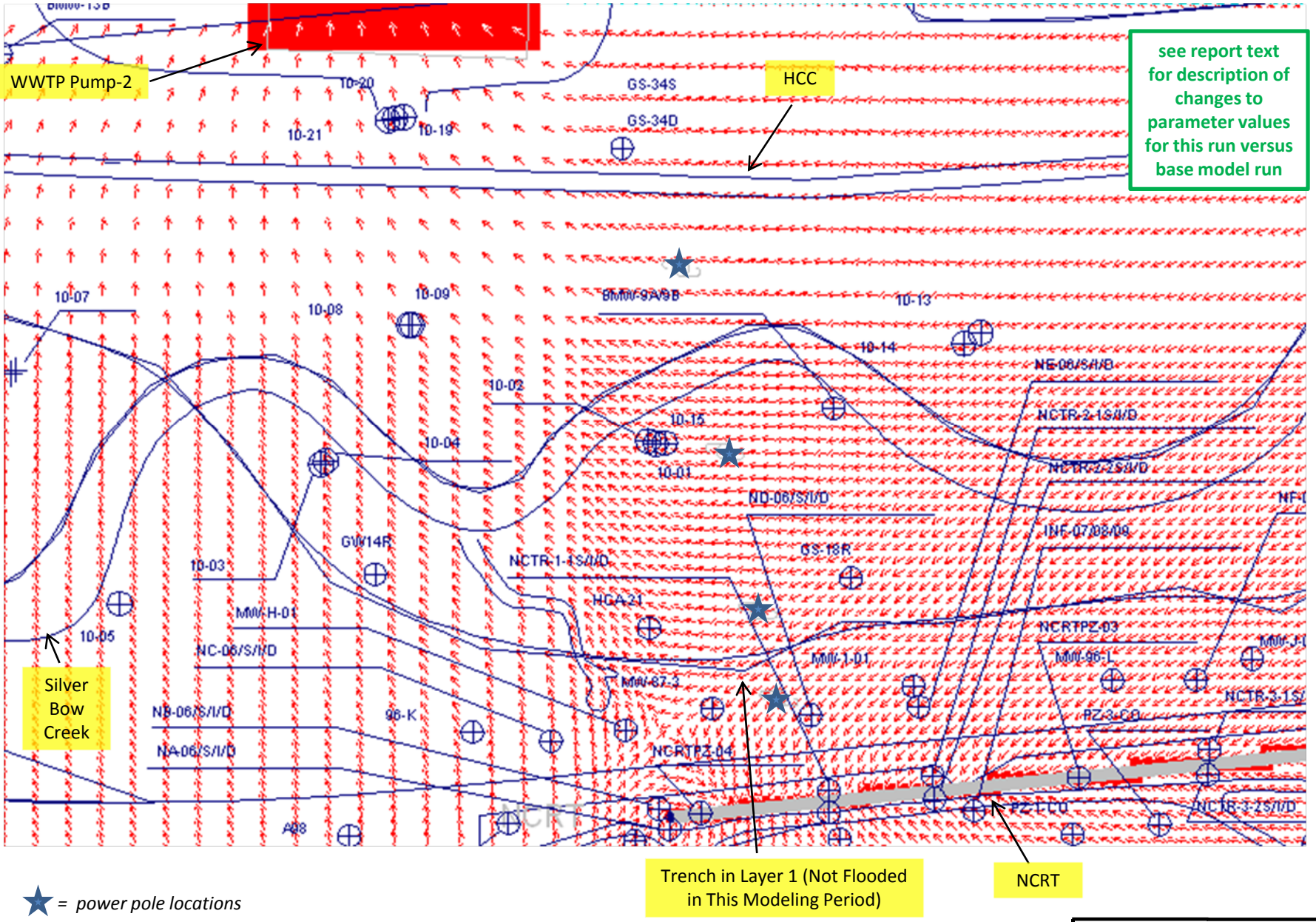


Figure 8-39. Sensitivity Run 6b – Simulated Flow Vectors (Model Layer 3) Between NCRT and WWTP, Stress Period 5 (Even Less Water Added at Constant Head Boundaries in Hills)

TETRA TECH

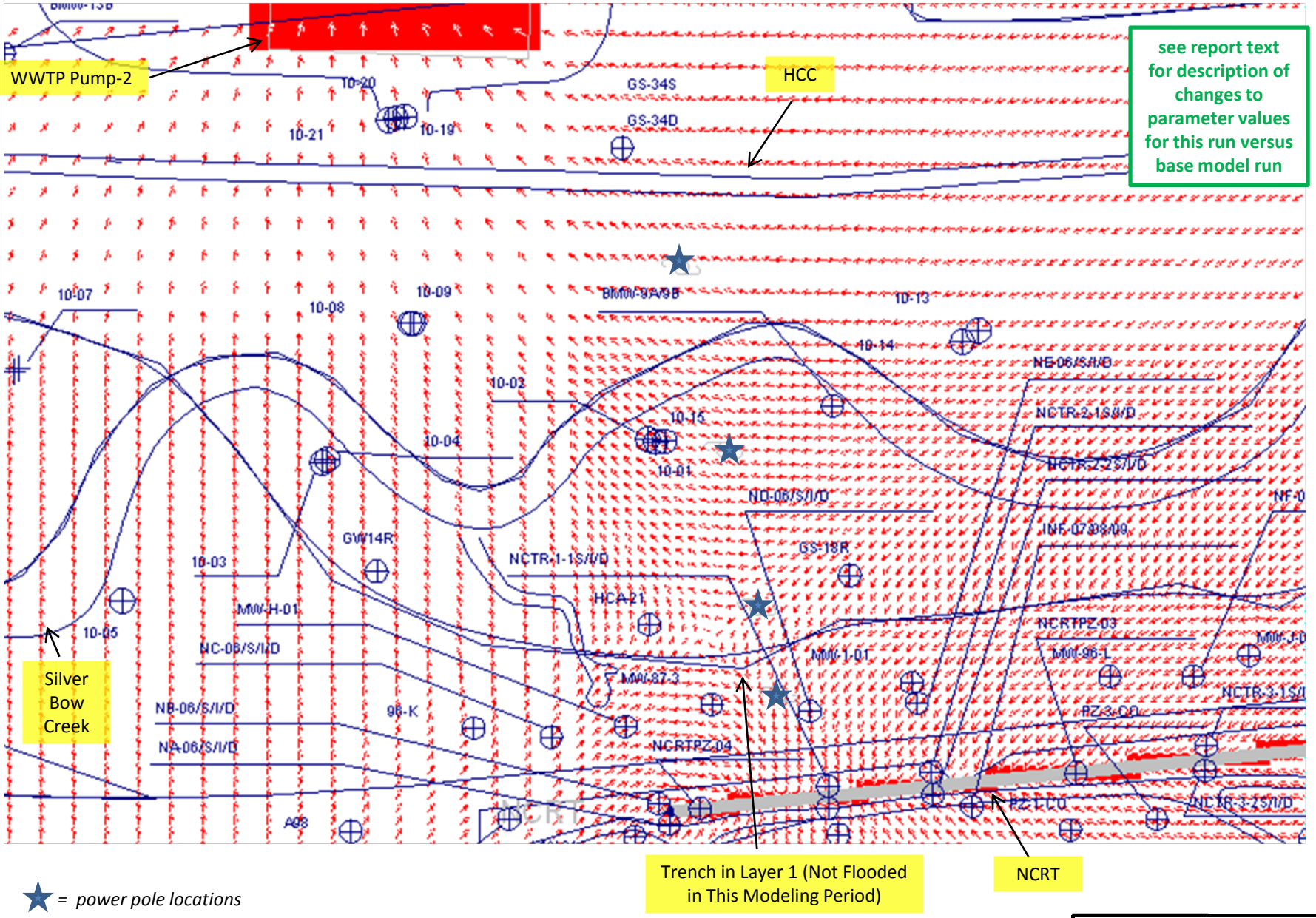


Figure 8-40. Sensitivity Run 6c – Simulated Flow Vectors (Model Layer 3) Between NCRT and WWTP, Stress Period 5 (More Water Added at Constant Head Boundaries in Hills)

TETRA TECH

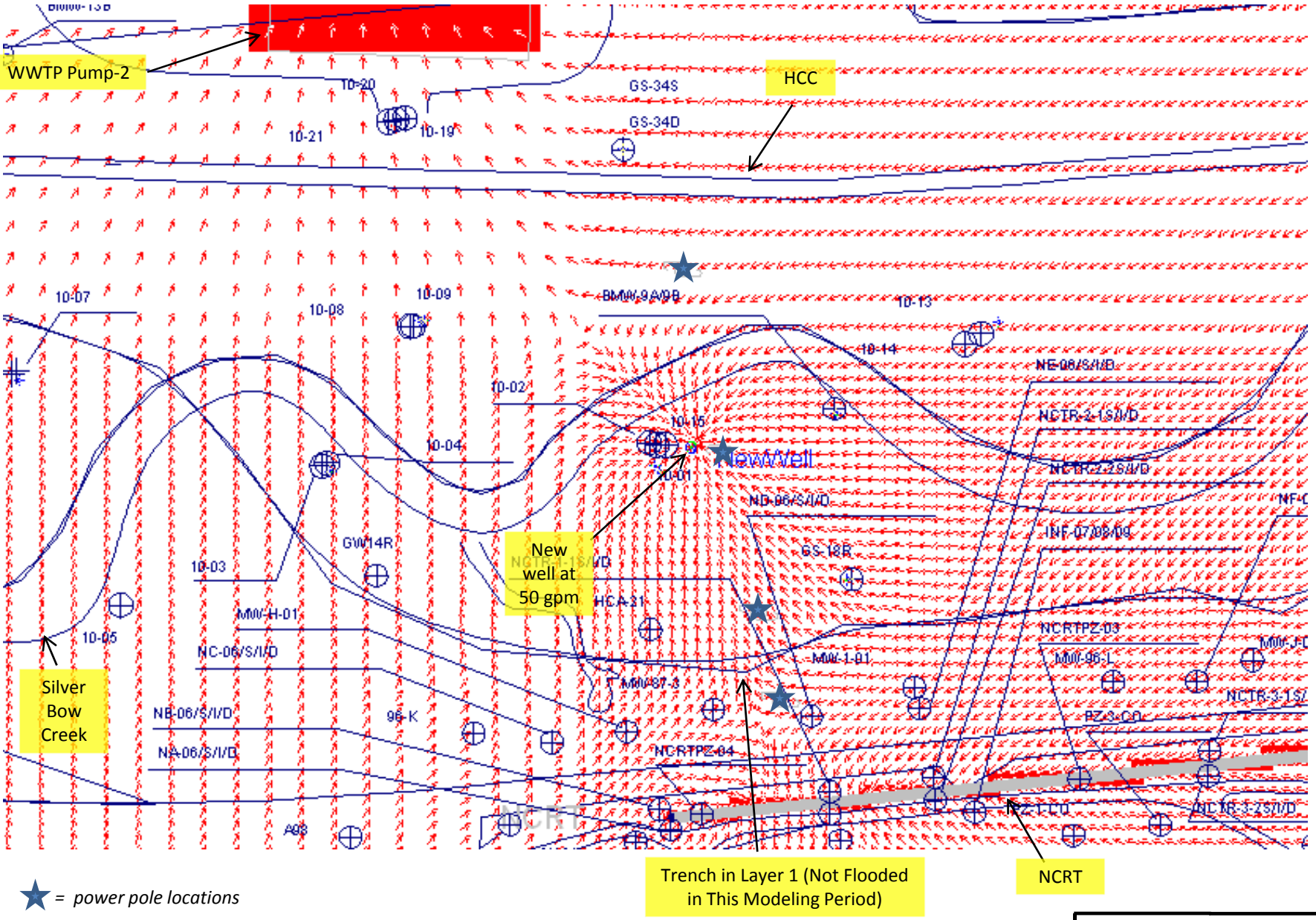


Figure 8-41. One New Well north of NCRT at 50 gpm, Flow Vectors for Model Layer 3 Stress Period 5 (WWTP Dewatering Plus BRW Pond Dewatering)

TETRA TECH

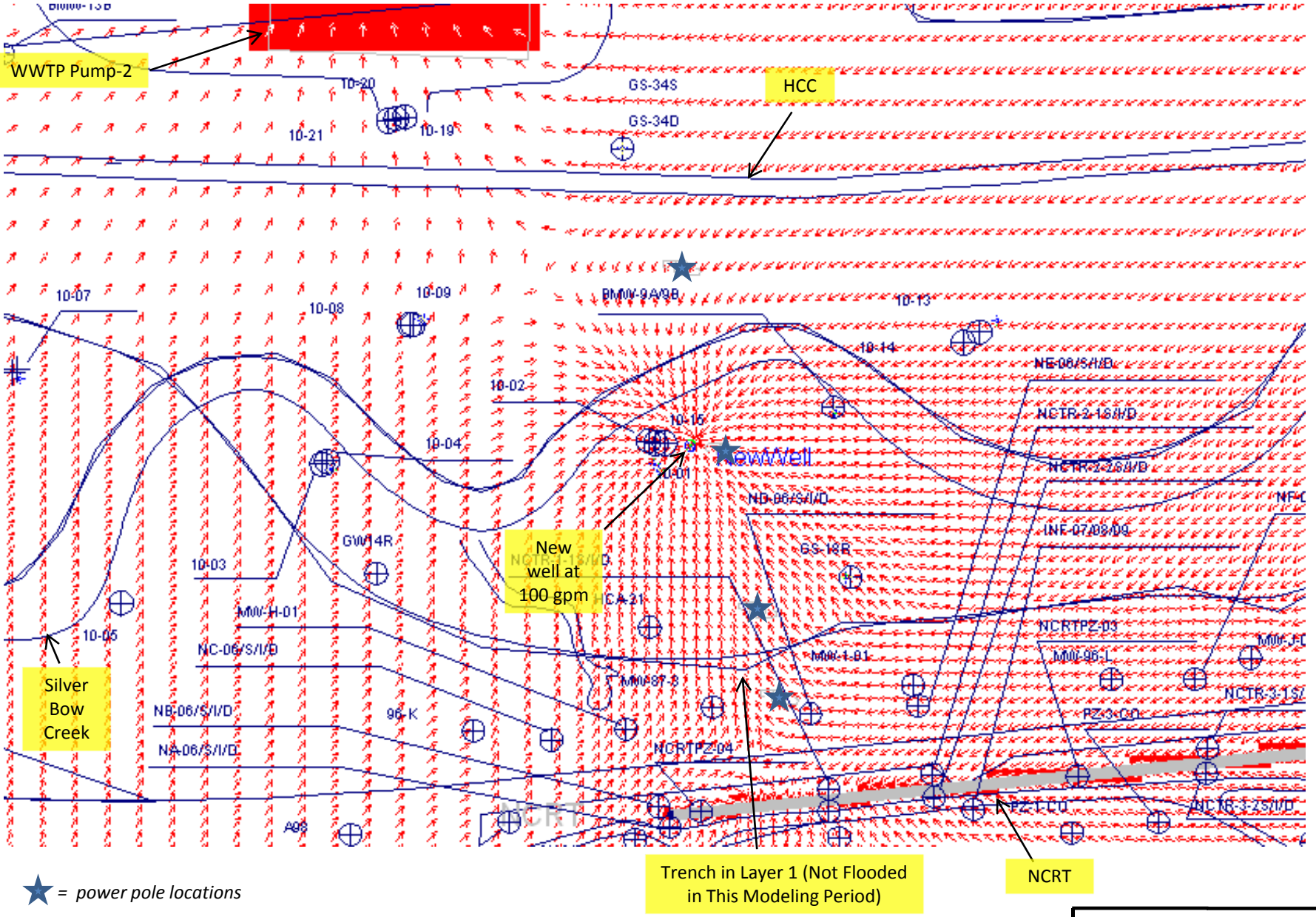


Figure 8-42. One New Well north of NCRT at 100 gpm, Flow Vectors for Model Layer 3 Stress Period 5 (WWTP Dewatering Plus BRW Pond Dewatering)

TETRA TECH

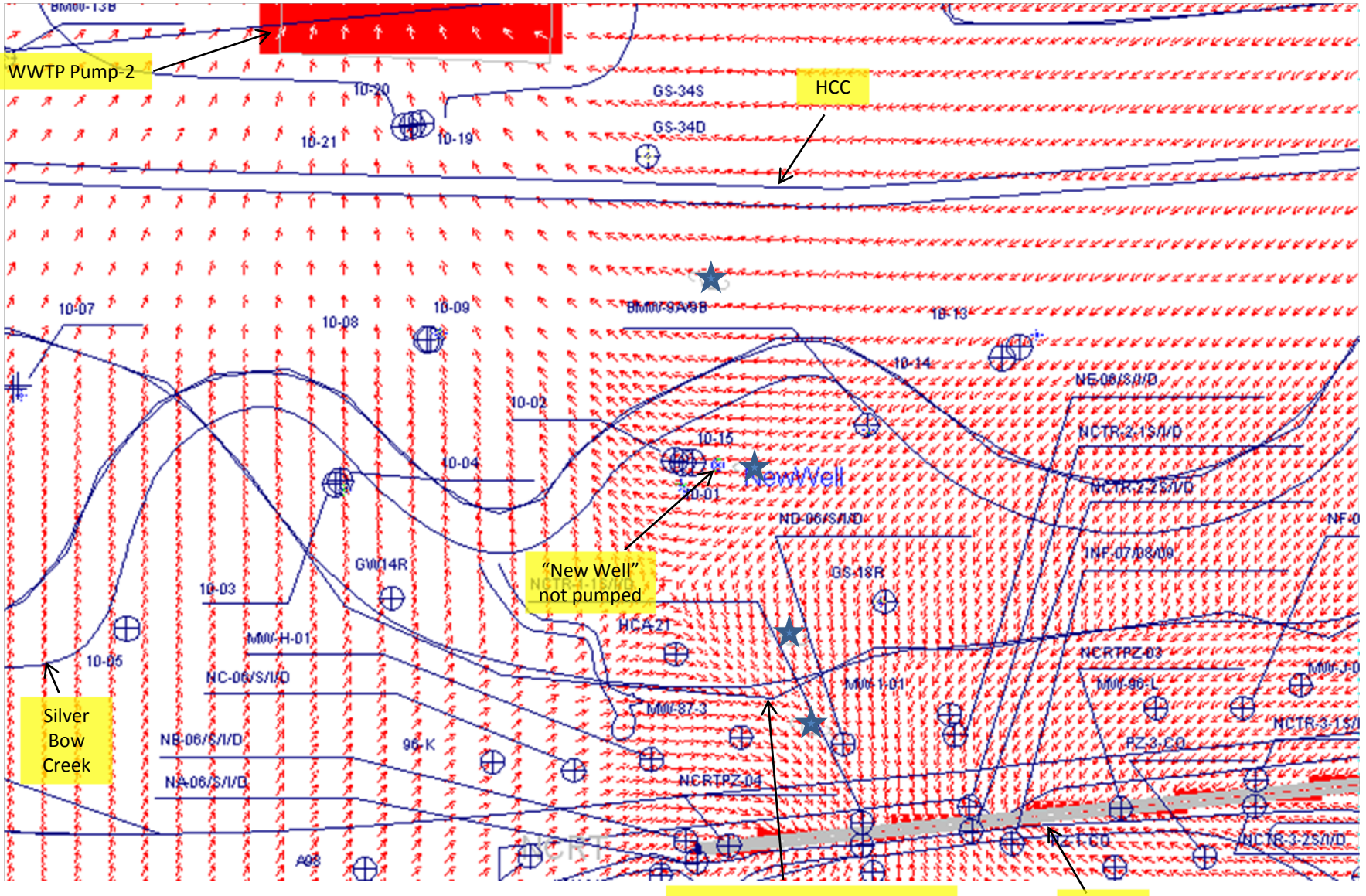


Figure 8-43. 50 gpm added at NCRT, Flow Vectors for Model Layer 3
Stress Period 5 (WWTP Dewatering Plus BRW Pond Dewatering)

TETRA TECH

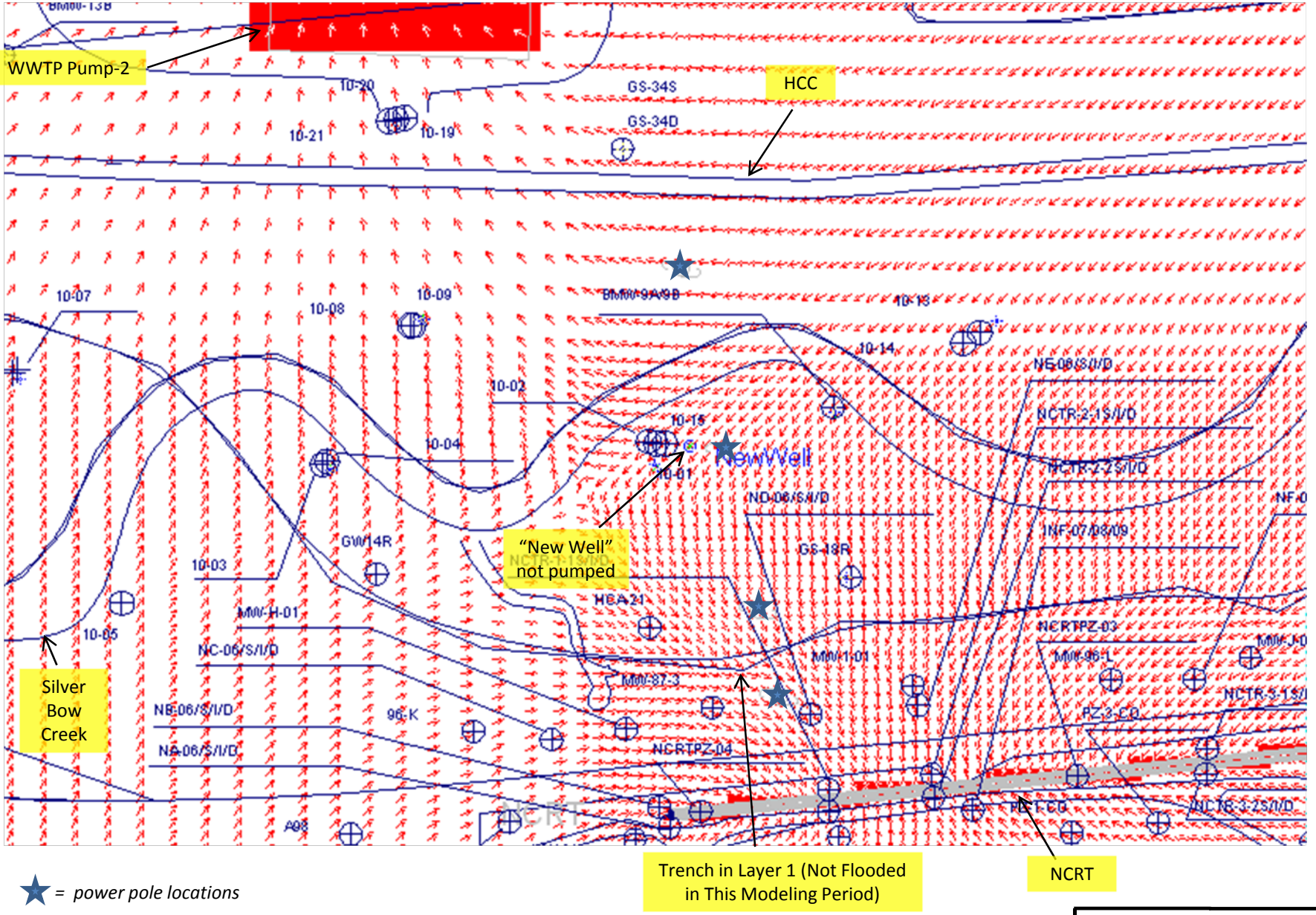


Figure 8-44. 100 gpm added at NCRT, Flow Vectors for Model Layer 3 Stress Period 5 (WWTP Dewatering Plus BRW Pond Dewatering)

TETRA TECH