

# Prather Spring Site Investigation Phase 1 - Progress Report

COGCC and Joint Companies

November 24, 2008

Prepared for:



**Nonsuch Natural Gas, Inc.**

Prepared by:





# Introductions and Agenda

- Sign in sheet
- Overview of Progress Report for 2008 activities
- Discussion of key points
- Questions

# Overview of Phase I Investigation Activities

- Objectives - find source(s) of impacts to Prather Spring and Spring 2
  - Release to groundwater implied from well pad operations or reserve pits
  - Companies response included alternative water supply, fencing, surface water monitoring
- 1st Round of Drilling (July, in Prather drainage)
  - 5 shallow colluvial wells, 1 deep (50') bedrock well
  - Wells completed in colluvium only are dry
  - Only BTEX detect was in 11D
  - Spring 2 became impacted following first investigation
  - Interim investigation report submitted to COGCC in August



# Overview of Phase I Investigation Activities

- Phase I Investigation activities (continued)
  - 2nd Round of Drilling (Aug and Sept)
    - Focused on bedrock zone
    - Prather drainage
      - 6 deep bedrock wells
      - 6 shallow bedrock wells (completed across colluvium)
  - Spring 2
    - 4 shallow wells, penetrated upper bedrock
    - 3 deep wells, completed in deeper bedrock
  - Groundwater sample analyses included VOCs, major ions, and trace metals

# Overview of Phase I Investigation Activities

- Phase I Investigation activities (continued)
  - 3rd Round of Drilling (October)
    - EM-34 Survey
    - Soil Gas Survey (valleys and ridgeline)
    - Well Installation - Prather drainage
      - 17 monitoring wells
      - Screened in shallow flow zone (lower colluvium/bedrock)
    - Well Installation - Spring 2
      - 5 monitoring wells
      - Screened in shallow flow zone (lower colluvium/bedrock)
    - Groundwater sample analyses limited to VOCs by mobile lab; two water level measurements
    - One round of surveying for new wells

# Overview of Phase I Investigation Activities

- Laboratories used include:
  - Evergreen, majority of samples collected
  - Chem Solutions, Field lab for 2<sup>nd</sup>/3<sup>rd</sup> round of drilling
  - Paragon (Ned Prather cistern samples)
- Surveying (multiple rounds by WHS and URS)
- Compilation of data from all parties into Access database
  - Reconciliation of sample location IDs
  - Electronic submittal of validated data to COGCC
- Vegetation Survey – August
- Cistern Sampling – October

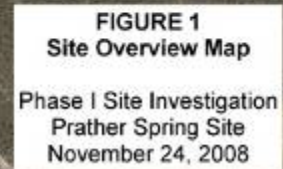
# Table 1 – Phase I Field Activities Overview

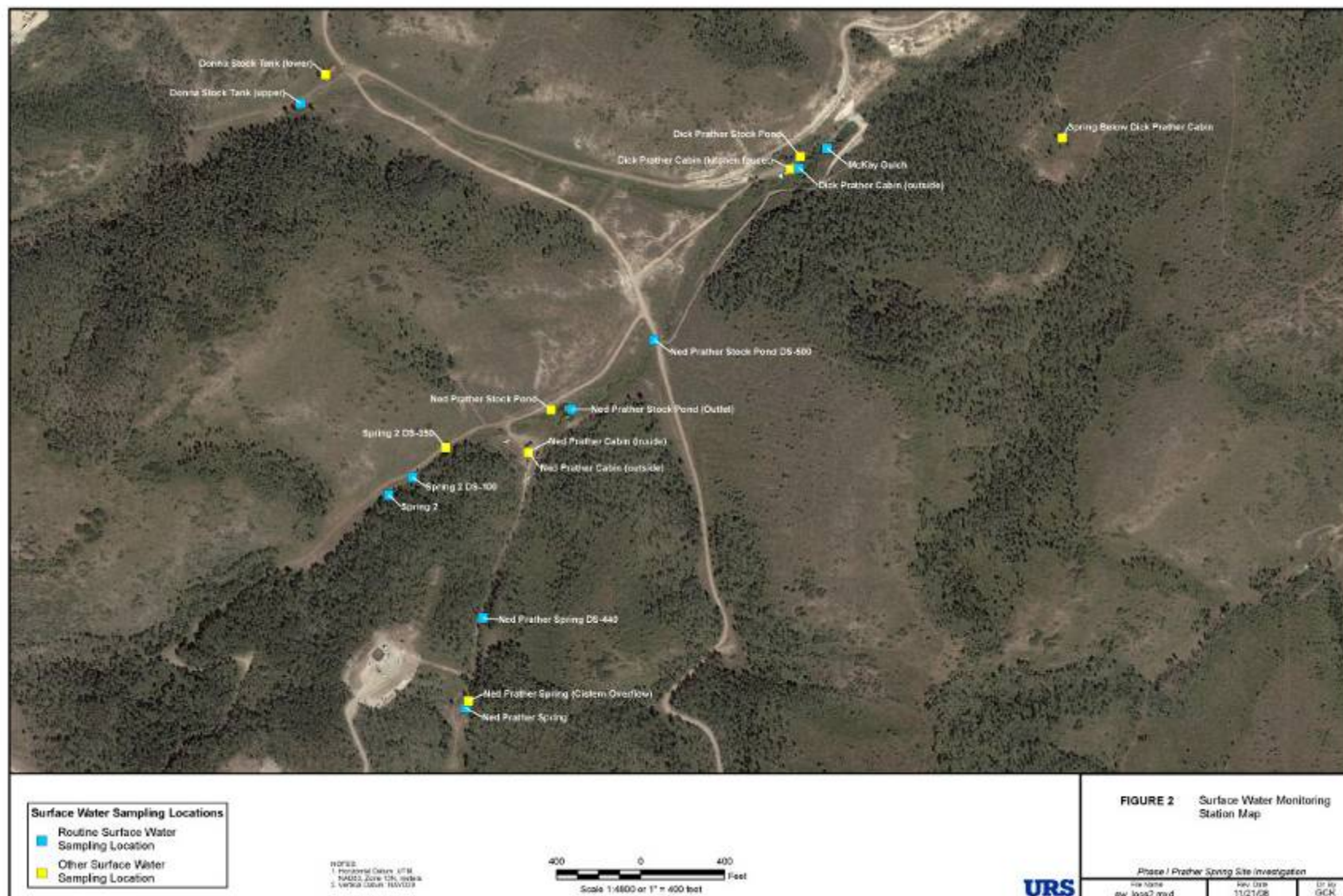
Table 1 – Phase I Field Activities Overview

| Work Plan                                 | Document Date                    | Field Activity  | Purpose   | Start Date | End Date | Data Reporting   |
|---|----------------------------------|---|---|------------|----------|--|
| Joint Work Plan (URS 2008a)               | Draft 07-07-08<br>Final 07-30-08 | First Round of Drilling   | Collect soil samples from borings; install six shallow monitoring wells   | 07/15/08   | 07/17/08 | Interim Prather Spring Phase I Site Investigation Drilling Report (URS 2008XX) |
| Joint Work Plan Addendum #1 (Golder 2008) | 07-10-08                         | Routine Surface Water Sampling  | Twice-weekly sampling at 10 SFW stations, analysis for VOCs, to evaluate SFW quality trends; later addition of chloride, nitrate, and nitrite | 07/15/08   | 10/31/08 | 9/29/08 Data Presentation Meeting to COGCC and this report                     |
| NA  | NA                               | Vegetation Survey   | Response to COGCC request to evaluate potential for stressed vegetation   | 07/30/08   | 07/30/08 | URS Memorandum to Chris Canfield dated 10/3/08                                 |
| Joint Work Plan Addendum #2 (URS 2008b)   | 08-28-08                         | Revised Surface Water Monitoring and Groundwater Monitoring                             | Reduce monitoring frequency for VOCs and methane; addition of major cations, anions, trace metals and other inorganic parameters              | 08/25/08   | 10/31/08 | 9/29/08 Data Presentation Meeting to COGCC and this report                     |
| Joint Work Plan Addendum #3 (URS 2008c)   | 08-21-08                         | Bedrock Monitoring Well Installation (second round of drilling and well installation)   | Installation of 15 deep bedrock monitoring wells in both drainages with collection of continuous core   | 08/28/08   | 09/10/08 | 9/29/08 Data Presentation Meeting to COGCC and this report                     |
| Joint Work Plan Addendum #4 (URS 2008d)   | 09-11-08 with 10-02-08 revision  | Cistern Evaluation  | Collection of water samples from cistern and observation of cistern contents; response to COGCC directive for additional work                 | 10/3/08    | 10/3/08  | This report  |
| Joint Work Plan Addendum #5 (URS 2008e)   | 10-07-08                         | Supplemental Field Activities (including third round of drilling and well installation) | EM-34 survey, soil gas survey in valley and ridgeline, installation of intermediate zone wells in the drainage valleys                        | 10/13/08   | 10/24/08 | This report  |

1 of 1





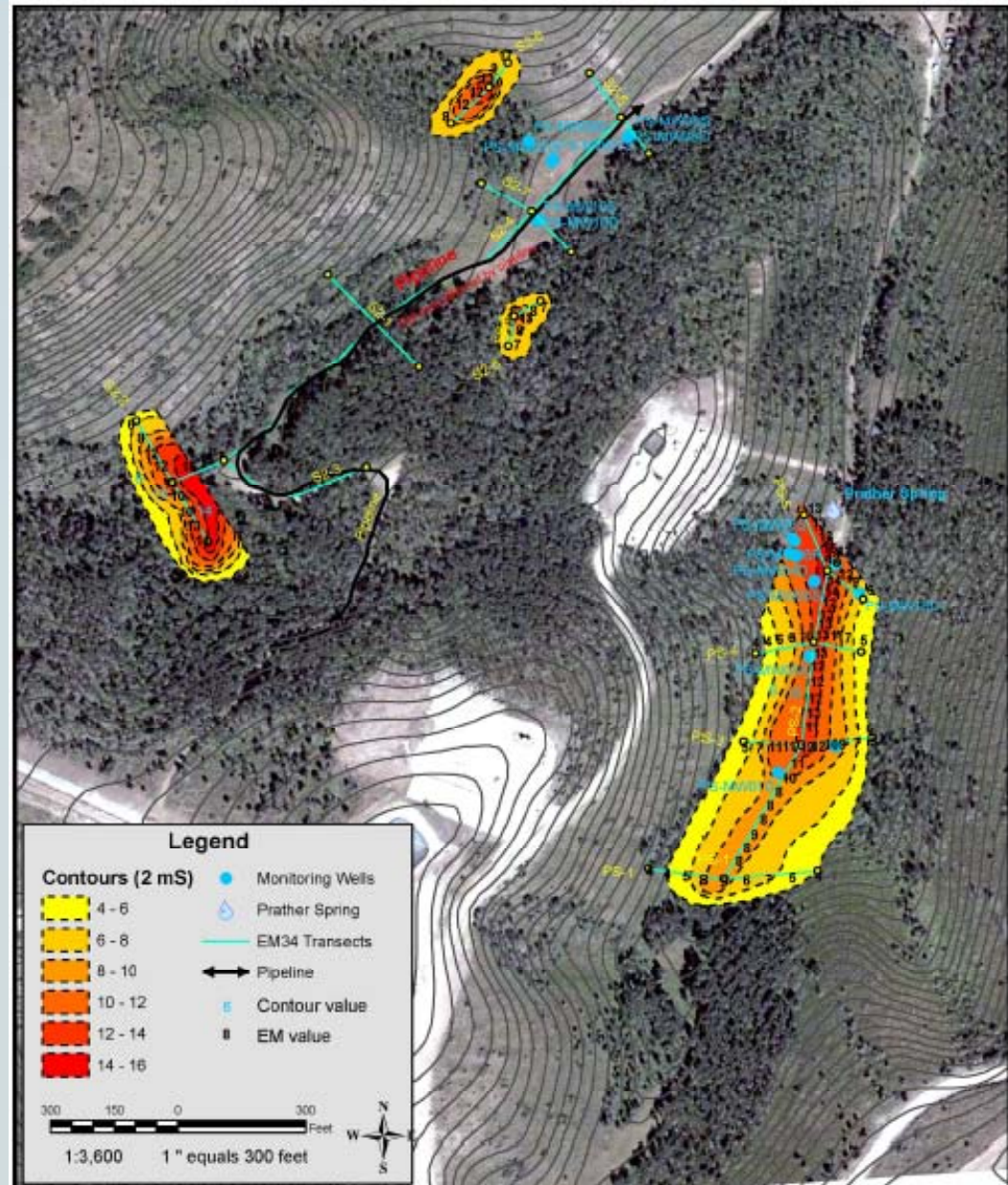




# Report Section 3

- EM-34 Survey
  - Natural gas pipeline
- Soil Gas Survey
  - All results non-detect
- Monitoring Well Installations
  - 21 wells installed in shallow flow zone
  - Auger methods (no core)

# EM-34 Map



# Soil Gas Probes

## ■ PID Results

Table 6 – Soil Gas Probe Completion and PID Values

| <b>Prather Spring</b>   |                                |                |                  |                                   |                        |
|-------------------------|--------------------------------|----------------|------------------|-----------------------------------|------------------------|
| <b>Location</b>         | <b>Coordinates<sup>1</sup></b> |                | <b>Elevation</b> | <b>Total Depth<br/>(feet bgs)</b> | <b>PID<br/>Reading</b> |
|                         | <b>Northing</b>                | <b>Easting</b> |                  |                                   |                        |
| PS-SGNS01               | 1624268.27                     | 2240618.64     | 8257.88          | 20                                | 6.1                    |
| PS-SGNS02               | 1624235.84                     | 2240625.55     | 8256.62          | 15                                | 4.5                    |
| PS-SGNS03               | 1624197.09                     | 2240710.10     | 8251.78          | 19                                | 14.6                   |
| PS-SGNS04               | 1624192.36                     | 2240684.36     | 8252.65          | 17                                | 4.2                    |
| PS-SGNS05               | 1624251.78                     | 2240650.44     | 8255.14          | 15                                | 4.2                    |
| PS-SGNS06               | 1624206.33                     | 2240682.04     | 8253.72          | 16                                | 6.7                    |
| PS-SGNS07               | 1624190.56                     | 2240674.73     | 8258.26          | 17                                | 7.2                    |
| PS-SGNS08               | 1624181.64                     | 2240652.57     | 8256.64          | 16                                | 2.7                    |
| PS-SGNS09               | 1624203.91                     | 2240644.88     | 8255.88          | 18                                | 3.6                    |
| PS-SGNS10               | 1624189.69                     | 2240614.98     | 8259.13          | 18                                | 3.0                    |
| PS-SGNS11               | 1624207.99                     | 2240622.21     | 8257.87          | 18                                | 3.2                    |
| PS-SGNS12               | 1624169.49                     | 2240628.06     | 8259.03          | 18                                | 2.6                    |
| <b>Spring Two</b>       |                                |                |                  |                                   |                        |
| <b>Location</b>         | <b>Coordinates<sup>1</sup></b> |                | <b>Elevation</b> | <b>Total Depth<br/>(feet bgs)</b> | <b>PID<br/>Reading</b> |
|                         | <b>Northing</b>                | <b>Easting</b> |                  |                                   |                        |
| PS-SGST01               | 1625257.00                     | 2240297.64     | 8219.12          | 8.5                               | 0.0                    |
| PS-SGST02               | 1625210.26                     | 2240232.09     | 8230.75          | 11.3                              | 0.0                    |
| PS-SGST03               | 1625194.30                     | 2240243.60     | 8232.68          | 11.3                              | 0.0                    |
| PS-SGST04               | 1625181.63                     | 2240255.13     | 8237.50          | 12.2                              | 0.0                    |
| PS-SGST05               | 1625113.40                     | 2240144.42     | 8235.98          | 12.8                              | 0.0                    |
| PS-SGST06               | 1625153.58                     | 2240122.17     | 8230.97          | 13.6                              | 0.0                    |
| PS-SGST07               | 1625047.42                     | 2240023.61     | 8238.15          | 13.0                              | 0.0                    |
| PS-SGST08               | 1625014.49                     | 2240077.81     | 8239.77          | 13.5                              | 0.0                    |
| PS-SGST09               | 1625018.91                     | 2240104.97     | 8241.53          | 9.2                               | 0.0                    |
| PS-SGST10               | 1625091.96                     | 2240163.59     | 8240.55          | 9.5                               | 0.0                    |
| PS-SGST11               | 1625121.33                     | 2240180.67     | 8237.07          | 4.7                               | 0.0                    |
| PS-SGST12               | 1625151.52                     | 2240224.23     | 8237.83          | 10.0                              | 0.0                    |
| PS-SGST13               | 1625236.51                     | 2240308.85     | 8220.82          | 7.9                               | 0.0                    |
| PS-SGST14               | 1625220.23                     | 2240317.06     | 8225.1           | 9.3                               | 0.0                    |
| PS-SGST15               | 1625250.92                     | 2240169.14     | 8233.57          | 9.4                               | 0.0                    |
| <b>Condensate Tanks</b> |                                |                |                  |                                   |                        |
| <b>Location</b>         | <b>Coordinates<sup>2</sup></b> |                | <b>Elevation</b> | <b>Total Depth<br/>(feet bgs)</b> | <b>PID<br/>Reading</b> |
|                         | <b>UTM X</b>                   | <b>UTM Y</b>   |                  |                                   |                        |
| PS-SGCT01               | 225309                         | 4378379        | NA               | 9                                 | 2.4                    |
| PS-SGCT02               | 225313                         | 4378362        | NA               | 9                                 | 7.5                    |
| PS-SGCT03               | 225318                         | 4378346        | NA               | 8                                 | 4.1                    |
| PS-SGCT04               | 225325                         | 4378331        | NA               | 9                                 | 4.8                    |
| PS-SGCT05               | 225329                         | 4378320        | NA               | 8                                 | 3.6                    |
| PS-SGCT06               | 225245                         | 4378692        | NA               | 9                                 | 0.7                    |
| PS-SGCT07               | 225256                         | 4378687        | NA               | 9                                 | 0.0                    |
| PS-SGCT08               | 225231                         | 4378676        | NA               | 8                                 | 0.1                    |
| PS-SGCT09               | 225245                         | 4378673        | NA               | 9                                 | 0.8                    |
| PS-SGCT10               | 225256                         | 4378677        | NA               | 8                                 | 0.6                    |

<sup>1</sup> Based on field GPS measurements (State Plane, NAVD83) bgs = below ground surface

<sup>2</sup> Based on field sketch map, digitized into GIS (UTM, WGS NA = not available

PID readings are initial purge values from each soil probe. PID = photoionization detector

PID used was a MiniRae with a 10.6 eV bulb.



# Sampling Locations

- Prather Spring drainage



# Sampling Locations

- Spring 2 drainage









# Report Section 4

- Geological and Hydrogeological Conceptual Model
- Geology
- Hydrogeology





# Preliminary Findings - Geology

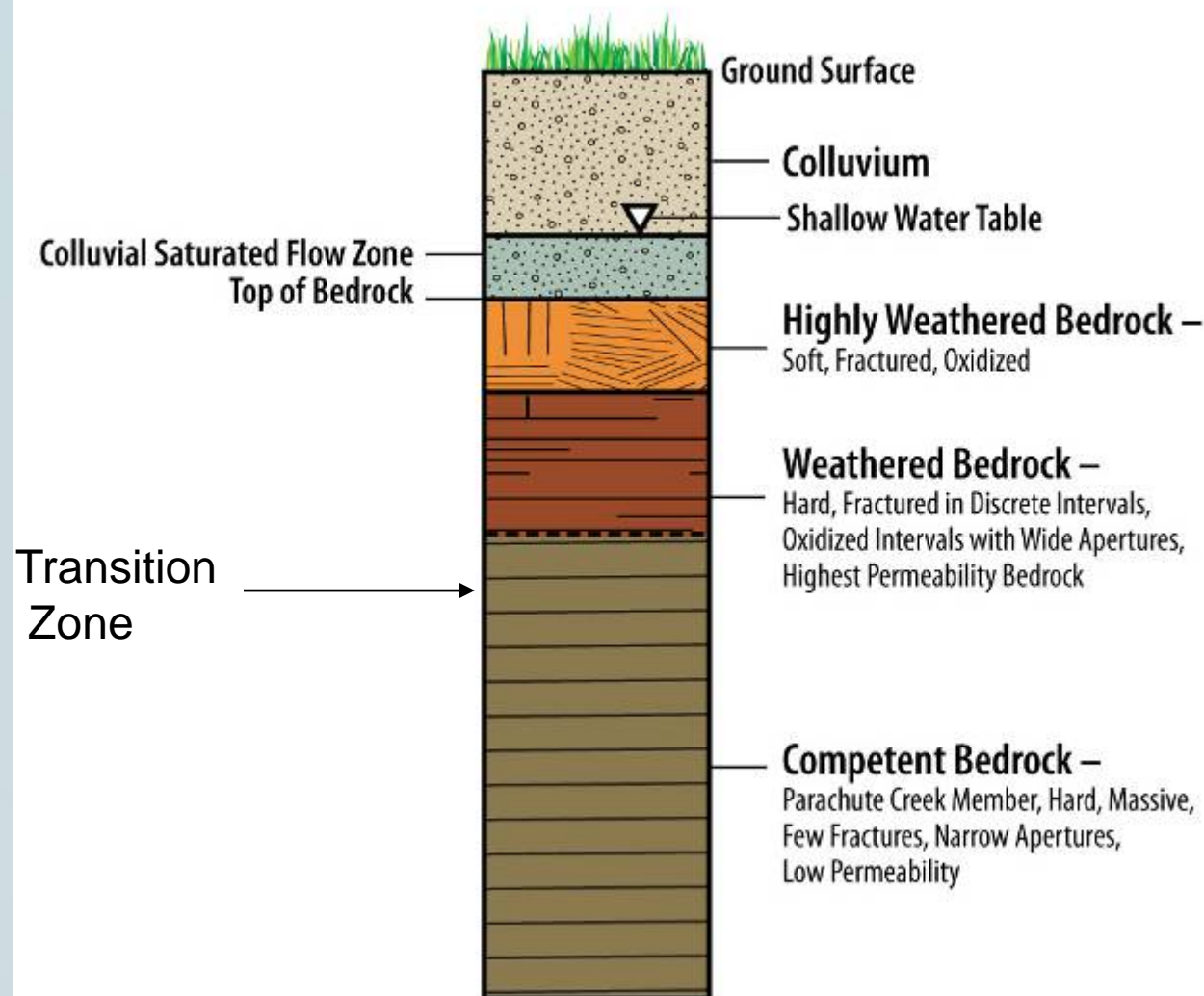
- Geologic Conditions
  - Uinta Formation (Unit D)
    - Siltstone and sandstone
    - Present at top of watershed (well pads)
  - Green River Formation (Parachute Creek Member)
    - Shale, marlstone, oil shale, carbonate rich zones
    - Encountered at all wells in valleys
  - Colluvium in valley and on slopes
    - Sandy clay matrix with shale and siltstone clasts
    - Encountered at all wells



# Preliminary Findings - Geology

- Geologic Conditions
  - Well total depth
    - Prather Drainage – 15 to 61 feet
    - Spring 2 – 18 to 49 feet
  - Well screen length – 5 to 20 feet
  - Depth to bedrock (colluvium thickness)
    - Prather Drainage – 6 to 22 feet
    - Spring 2 – 12 to 18 feet

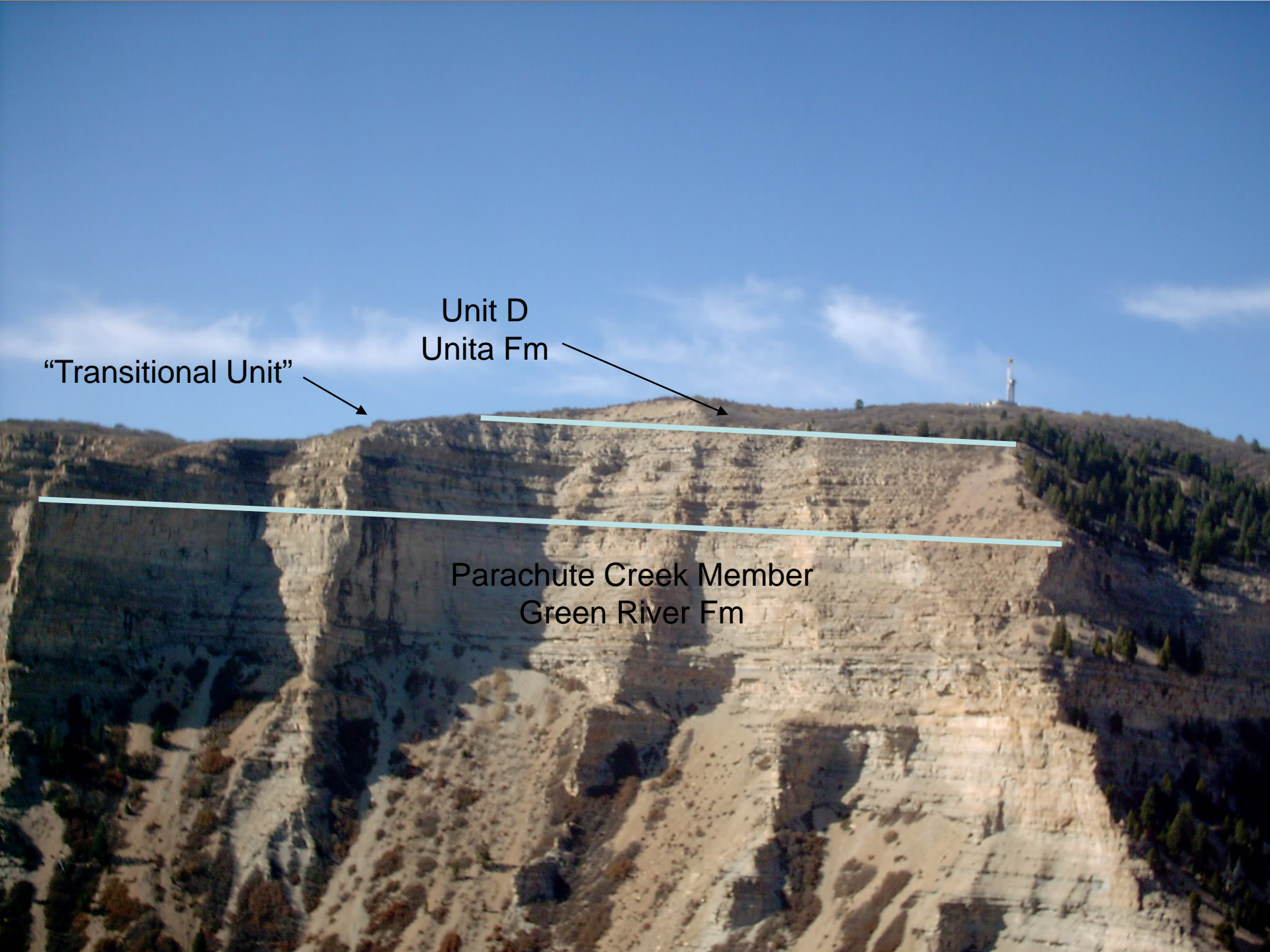
- One explanation for observed fracture pattern variations with depth



“Transitional Unit”

Unit D  
Unita Fm

Parachute Creek Member  
Green River Fm





Seeps



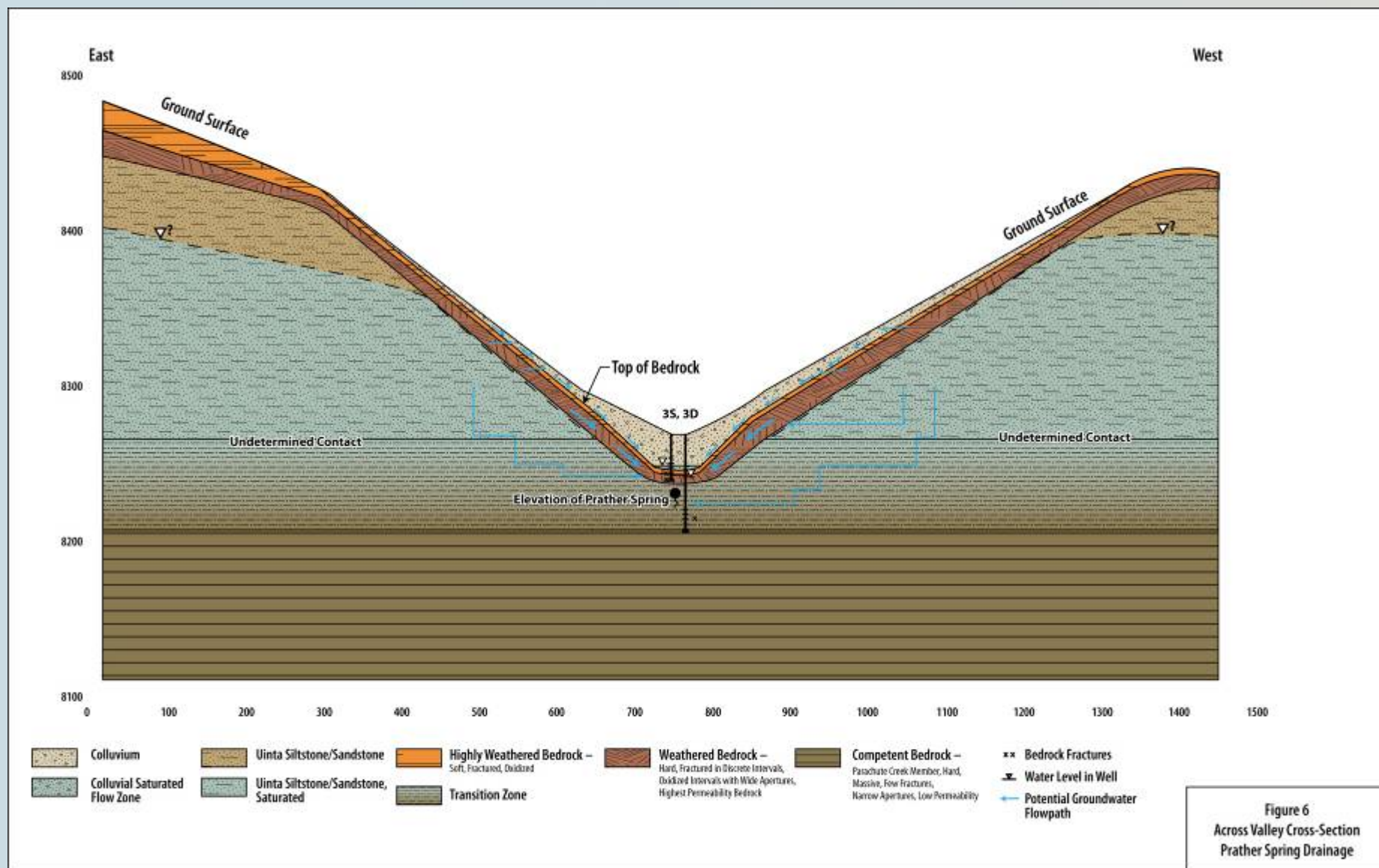




Garden Gulch

Prather Spring

From Williams Puckett 22-23 Pad, Looking N-NE

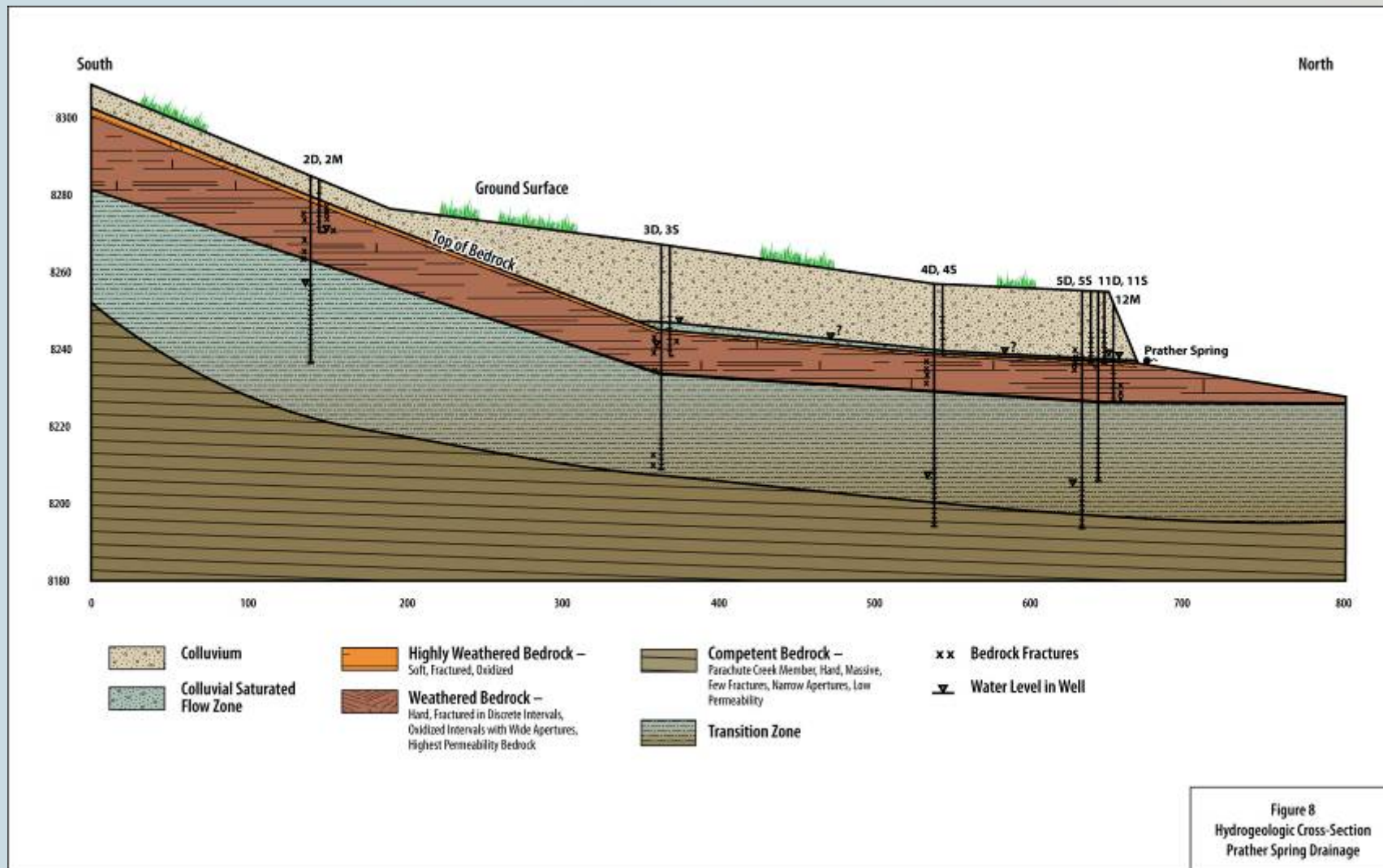














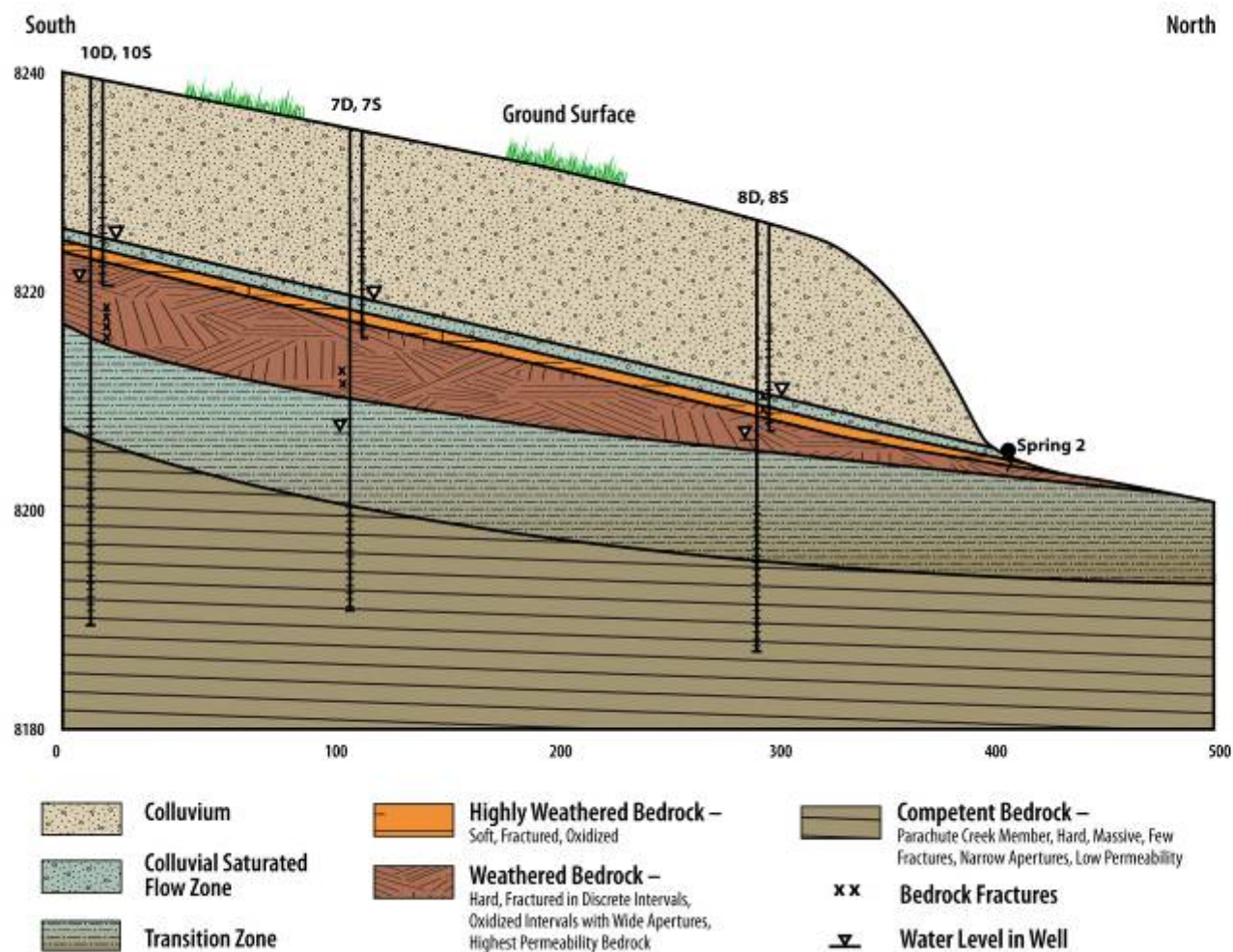


Figure 9  
Hydrogeologic Cross-Section  
Spring 2 Drainage

















# Well Construction Summary

Table 7 - Well Construction Summary

| Prather Spring     |                |             |            |                 |        |             |        |           |        |       |        |
|--------------------|----------------|-------------|------------|-----------------|--------|-------------|--------|-----------|--------|-------|--------|
| Monitoring Well    | Date Completed | Coordinates |            | Screen Interval |        | Filter Pack |        | Bentonite |        | Grout |        |
|                    |                | Northing    | Easting    | Top             | Bottom | Top         | Bottom | Top       | Bottom | Top   | Bottom |
| PS-MW02D           | 9/10/2008      | 1623759.00  | 2240673.00 | 34.0            | 54.0   | 32.0        | 54.0   | 21.0      | 32.0   | 1.0   | 21.0   |
| PS-MW02M           | 9/10/2008      | 1623752.61  | 2240670.19 | 10.0            | 20.0   | 9.6         | 34.6   | 6.0       | 9.6    | 0.0   | 6.0    |
| PS-MW03D           | 8/28/2008      | 1623971.27  | 2240623.66 | 51.0            | 61.0   | 49.2        | 61.0   | 24.0      | 49.2   | 2.0   | 24.0   |
| PS-MW03S           | 7/16/2008      | 1623963.76  | 2240621.29 | 8.6             | 28.6   | 7.0         | 29.0   | 0         | 7      | NA    | NA     |
| PS-MW04D           | 9/5/2008       | 1624145.32  | 2240645.47 | 41.1            | 61.1   | 39.1        | 61.5   | 22.0      | 39.1   | 1.0   | 22.0   |
| PS-MW04S           | 7/16/2008      | 1624139.81  | 2240644.82 | 8.0             | 18.0   | 7.0         | 18.0   | 0.0       | 7.0    | NA    | NA     |
| PS-MW06R           | 9/3/2008       | 1624205.31  | 2240603.90 | 6.0             | 21.0   | 4.0         | 21.0   | 0.0       | 4.0    | NA    | NA     |
| PS-MW06S           | 7/16/2008      | 1624209.74  | 2240591.06 | 7.0             | 17.0   | 6.0         | 17.0   | 0.0       | 6.0    | NA    | NA     |
| PS-MW05D           | 9/5/2008       | 1624240.50  | 2240603.97 | 51.0            | 61.0   | 49.0        | 61.2   | 20.0      | 49.0   | 2.0   | 20.0   |
| PS-MW05S           | 7/15/2008      | 1624243.00  | 2240599.58 | 8.6             | 13.6   | 8.0         | 15.0   | 0.0       | 8.0    | NA    | NA     |
| PS-MW11D           | 7/17/2008      | 1624177.78  | 2240696.31 | 39.0            | 49.0   | 28.6        | 49.0   | 0.0       | 29.0   | NA    | NA     |
| PS-MW11S           | 7/17/2008      | 1624175.90  | 2240701.56 | 9.0             | 19.0   | 7.0         | 19.0   | 0.0       | 7.0    | NA    | NA     |
| PS-MW12M           | 9/8/2008       | 1624177.78  | 2240696.31 | 24.0            | 29.0   | 24.0        | 29.0   | 19.0      | 24.0   | 1.0   | 19.0   |
| PS-MW13D           | 9/8/2008       | 1624109.81  | 2240750.13 | 34.0            | 54.0   | 32.0        | 54.0   | 19.0      | 32.0   | 1.0   | 19.0   |
| PS-MW14            | 10/14/2008     | 1624191.78  | 2240668.29 | 10.0            | 20.0   | 20.0        | 8.0    | 2.0       | 8.0    | NA    | NA     |
| PS-MW15            | 10/14/2008     | 1624132.74  | 2240665.78 | 10.0            | 20.0   | 20.0        | 8.0    | 2.0       | 8.0    | NA    | NA     |
| PS-MW16            | 10/15/2008     | 1624018.81  | 2240662.17 | 15.0            | 25.0   | 25.0        | 13.0   | 2.0       | 13.0   | NA    | NA     |
| PS-MW17            | 10/15/2008     | 1623952.74  | 2240673.88 | 22.0            | 32.0   | 32.0        | 20.0   | 2.0       | 20.0   | NA    | NA     |
| PS-MW18            | 10/16/2008     | 1623956.13  | 2240631.44 | 19.0            | 29.0   | 29.0        | 17.0   | 2.0       | 17.0   | NA    | NA     |
| PS-MW19            | 10/16/2008     | 1624021.60  | 2240635.56 | 14.0            | 24.0   | 24.0        | 12.0   | 2.0       | 12.0   | NA    | NA     |
| PS-MW20            | 10/16/2008     | 1624075.38  | 2240642.05 | 16.0            | 26.0   | 26.0        | 14.0   | 2.0       | 14.0   | NA    | NA     |
| PS-MW21            | 10/16/2008     | 1624086.99  | 2240671.31 | 14.0            | 24.0   | 24.0        | 12.0   | 2.0       | 12.0   | NA    | NA     |
| PS-MW22            | 10/16/2008     | 1624282.96  | 2240630.71 | 16.0            | 26.0   | 26.0        | 14.0   | 2.0       | 14.0   | NA    | NA     |
| PS-MW28            | 10/21/2008     | 1624209.14  | 2240736.88 | 15.0            | 25.0   | 25.0        | 13.0   | 2.0       | 13.0   | NA    | NA     |
| PS-MW29            | 10/22/2008     | 1624200.28  | 2240719.29 | 12.0            | 22.0   | 22.0        | 10.0   | 2.0       | 10.0   | NA    | NA     |
| PS-MW30            | 10/22/2008     | 1624187.82  | 2240800.36 | 27.0            | 47.0   | 47.0        | 24.5   | 2.0       | 24.5   | NA    | NA     |
| PS-MW31            | 10/22/2008     | 1624154.91  | 2240778.30 | 25.0            | 45.0   | 45.0        | 22.5   | 2.0       | 22.5   | NA    | NA     |
| PS-MW32            | 10/22/2008     | 1624196.97  | 2240688.17 | 13.0            | 23.0   | 23.0        | 11.0   | 2.0       | 11.0   | NA    | NA     |
| PS-MW33            | 10/22/2008     | 1624192.13  | 2240652.35 | 13.0            | 23.0   | 23.0        | 11.0   | 2.0       | 11.0   | NA    | NA     |
| PS-MW34            | 10/22/2008     | 1624220.50  | 2240644.35 | 12.5            | 22.5   | 22.5        | 10.5   | 2.0       | 10.5   | NA    | NA     |
| Spring 2           |                |             |            |                 |        |             |        |           |        |       |        |
| Monitoring Well    | Date Completed | Coordinates |            | Screen Interval |        | Filter Pack |        | Bentonite |        | Grout |        |
|                    |                | Northing    | Easting    | Top             | Bottom | Top         | Bottom | Top       | Bottom | Top   | Bottom |
| PS-MW07D           | 9/4/2008       | 1625166.49  | 2240094.52 | 34.0            | 44.0   | 32.0        | 44.0   | 7.0       | 32.0   | 0.0   | 7.0    |
| PS-MW07S           | 9/4/2008       | 1625170.93  | 2240097.57 | 9.0             | 19.0   | 7           | 19.0   | 2.0       | 7.0    | NA    | NA     |
| PS-MW08D           | 9/5/08         | 1625213.66  | 2240275.35 | 24.0            | 39.0   | 23.0        | 39.0   | 14.0      | 23.0   | 0.0   | 14.0   |
| PS-MW08S           | 9/3/2008       | 1625217.44  | 2240279.21 | 8.0             | 18.0   | 6           | 18.0   | 0.0       | 6.0    | NA    | NA     |
| PS-MW09S           | 9/7/2008       | 1625218.23  | 2240041.46 | 11.0            | 21.0   | 9.0         | 21.0   | 5.0       | 9.0    | 1.0   | 5.0    |
| PS-MW10D           | 9/7/2008       | 1625030.64  | 2240053.28 | 29.0            | 49.0   | 27.0        | 49.0   | 23.0      | 27.0   | 1.0   | 23.0   |
| PS-MW10S           | 9/7/2008       | 1625027.53  | 2240050.05 | 8.4             | 18.4   | 6.5         | 18.4   | 4.5       | 6.5    | 0.5   | 4.5    |
| PS-MW23            | 10/20/2008     | 1625132.98  | 2240152.70 | 12              | 22     | 22.0        | 10.0   | 2         | 10     | NA    | NA     |
| PS-MW24            | 10/20/2008     | 1625235.58  | 2240065.43 | 13              | 23     | 23.0        | 11.0   | 2         | 11     | NA    | NA     |
| PS-MW25            | 10/21/2008     | 1624917.65  | 2239924.31 | 12.5            | 22.5   | 22.5        | 10.5   | 2         | 10.5   | NA    | NA     |
| PS-MW26            | 10/21/2008     | 1624957.71  | 2240061.83 | 4               | 14     | 14.0        | 2.0    | 2         | 2      | NA    | NA     |
| PS-MW27            | 10/21/2008     | 1625214.66  | 2240314.30 | 7.5             | 17.5   | 17.5        | 5.5    | 2         | 5.5    | NA    | NA     |
| NA = not available |                |             |            |                 |        |             |        |           |        |       |        |



# Preliminary Findings - Geology

- Geologic Conditions
  - Fractures prevalent in upper 10 feet of bedrock
  - Bedrock becomes more competent with depth
    - Review of core



# PSMW3D

- 24' to 34.5'
- Highly fractured core interval



# PSMW4D

- 19.5' to 29.5'
- Fracture dip approx 30-40 degrees
- Close-up of mud and clast-filled fracture apertures



# PSMW3D

- 55.5' to 60'
- Bedding plane fractures
- Carbonaceous seam





# PSMW10D

- 20' to 30'
- Highly fractured from 20' to 23'
- Carbon seam at 28'



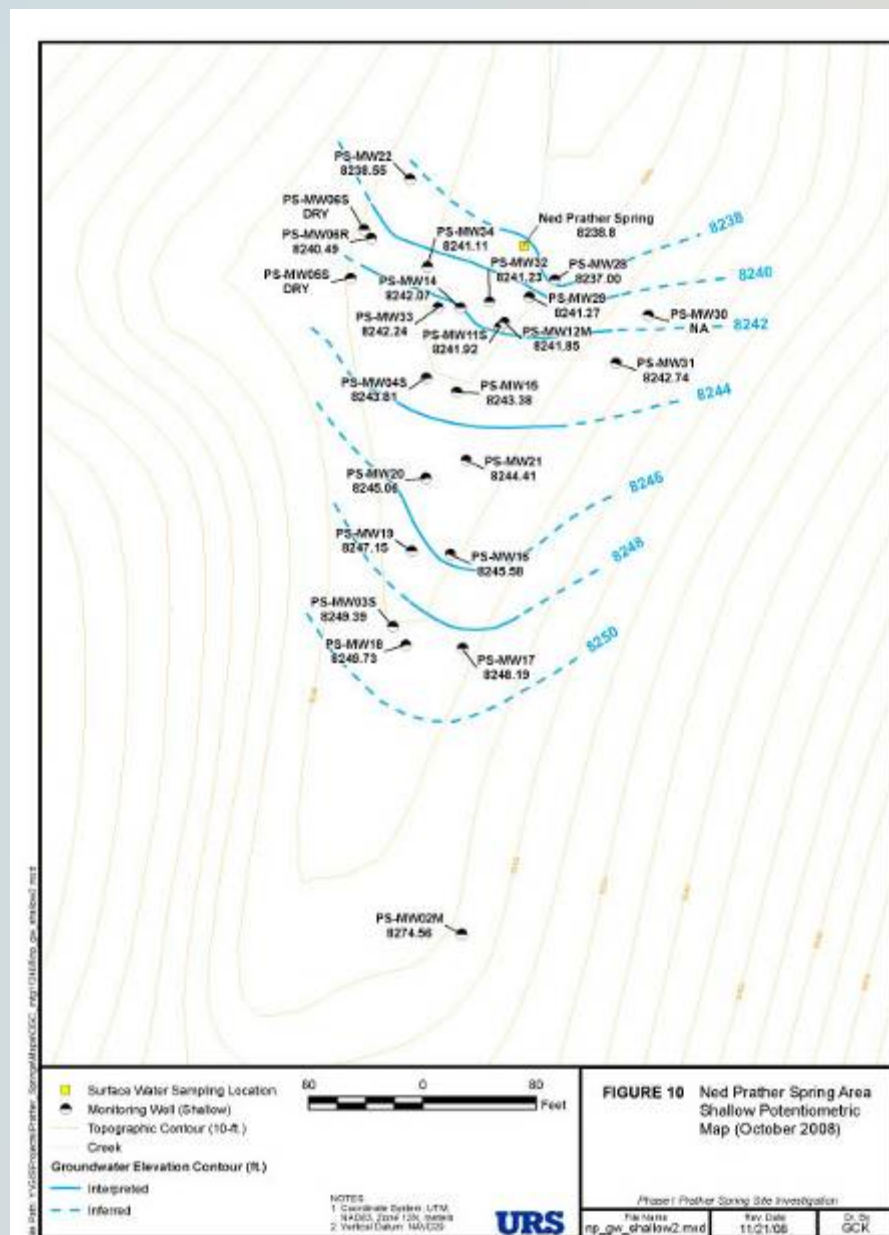


# Hydrogeologic Conditions

- Depth to water
  - Prather drainage – 19 to 51 feet deep
  - Spring 2 drainage – 16 to 32 feet deep
- Colluvium saturated thickness
  - Dry to 2 feet maximum thickness
- Shallow wells screen upper bedrock
  - Shallow and “middle” versus deep flow zones
- Water levels are lower in the deeper zone
- Despite fracture flow conditions, appears to be relatively low permeability

# Potentiometric Surface Map

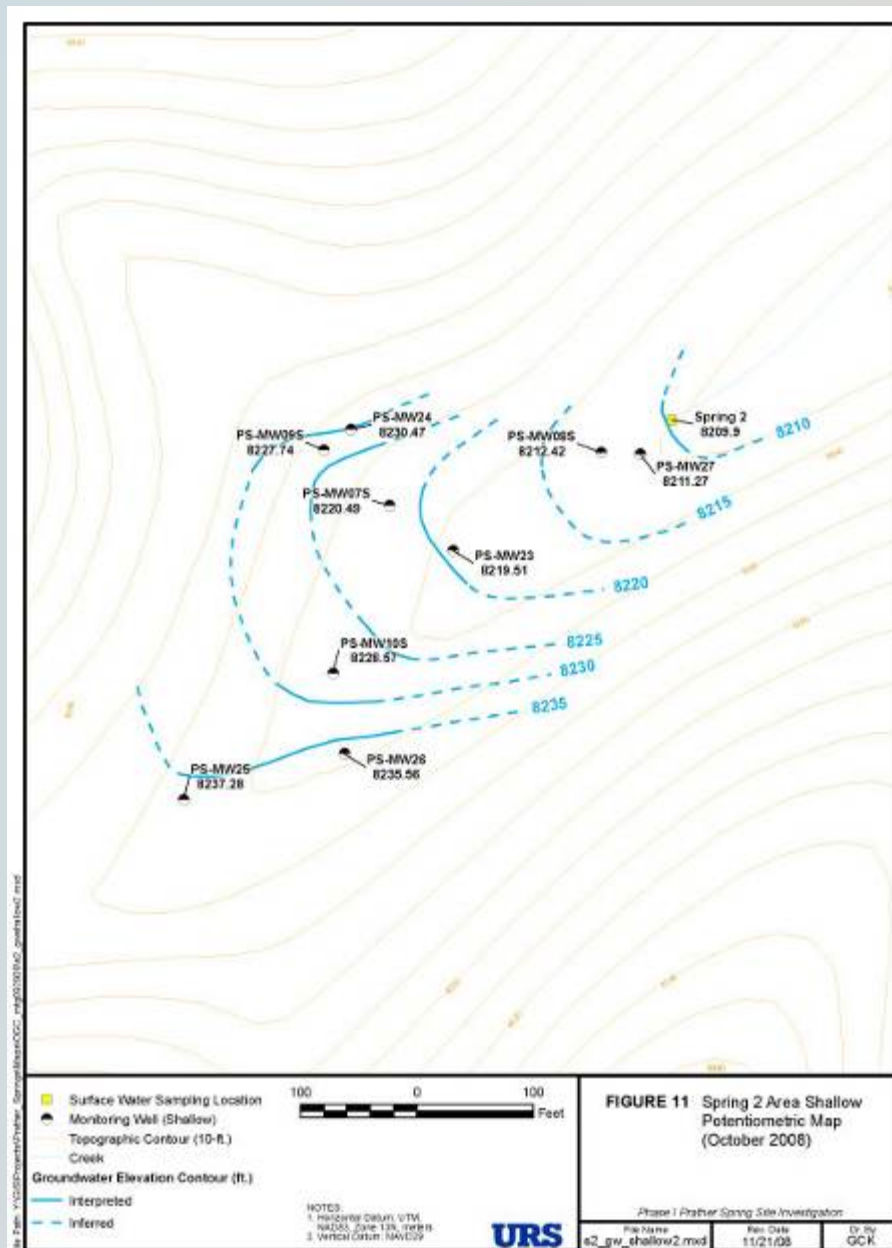
- Shallow wells - Prather Spring area
- Inferred curve to contours





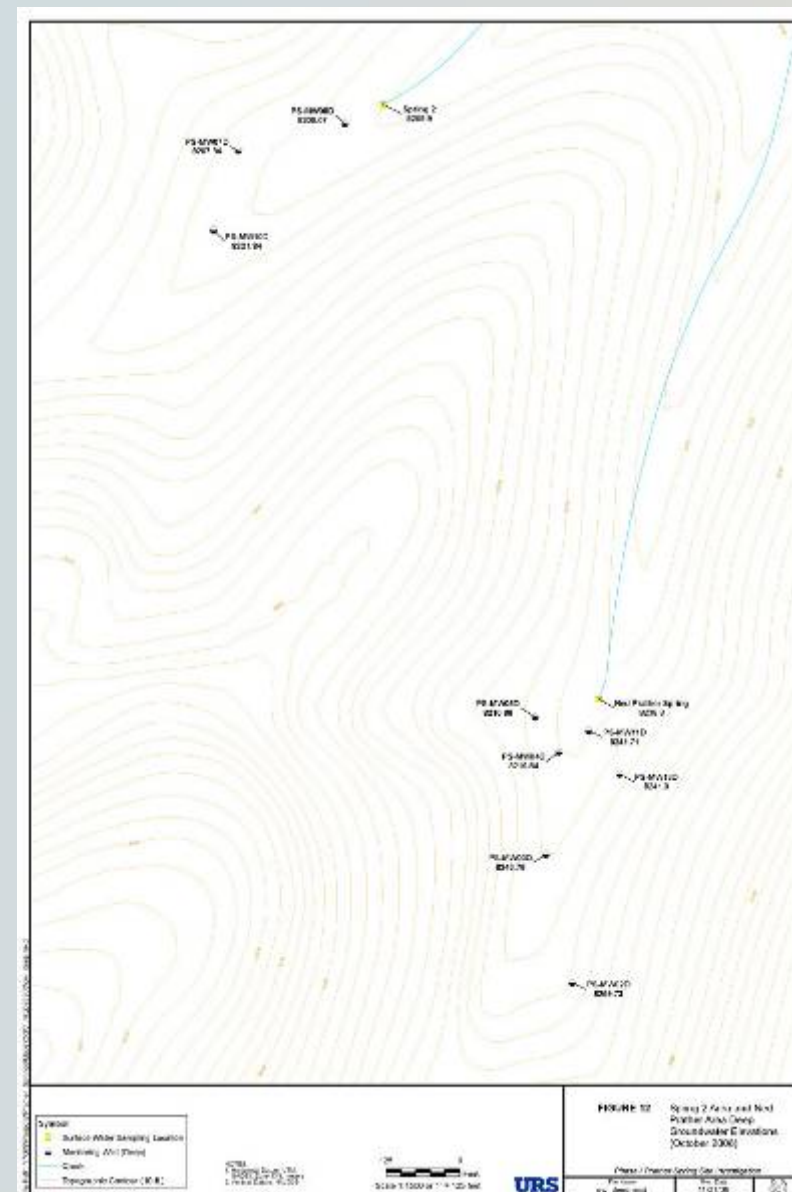
# Potentiometric Surface Map

- Shallow wells - Spring 2 area
- Inferred curve to contours



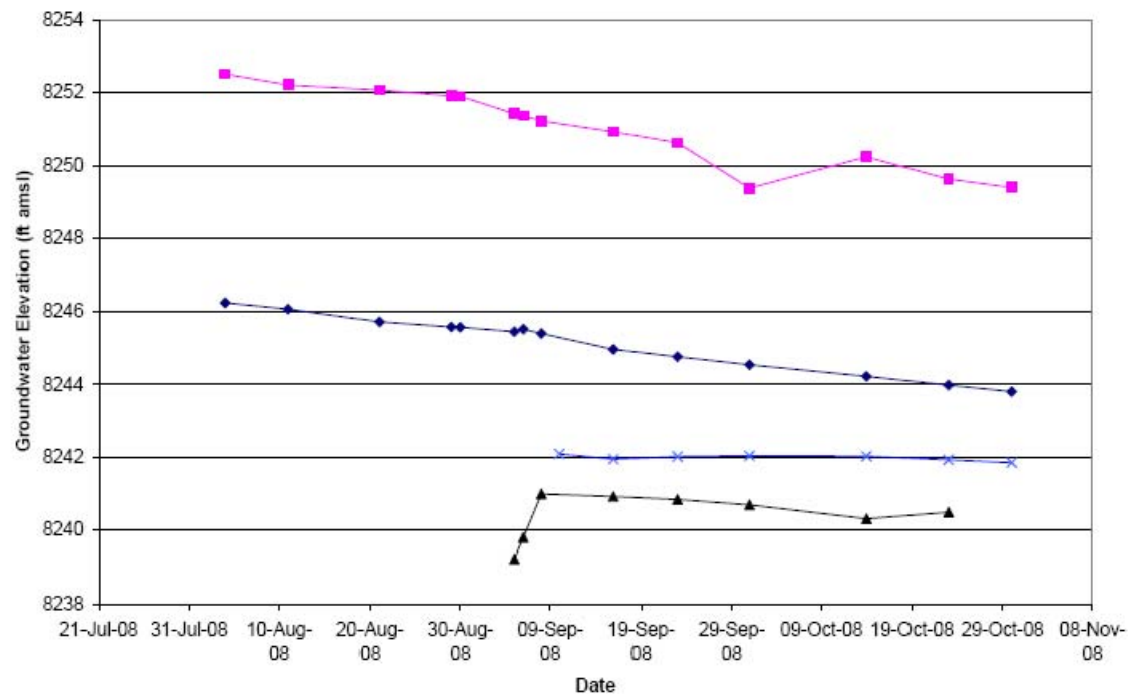
# Deep Wells

- Prather and Spring 2 drainages



# Well Hydrographs

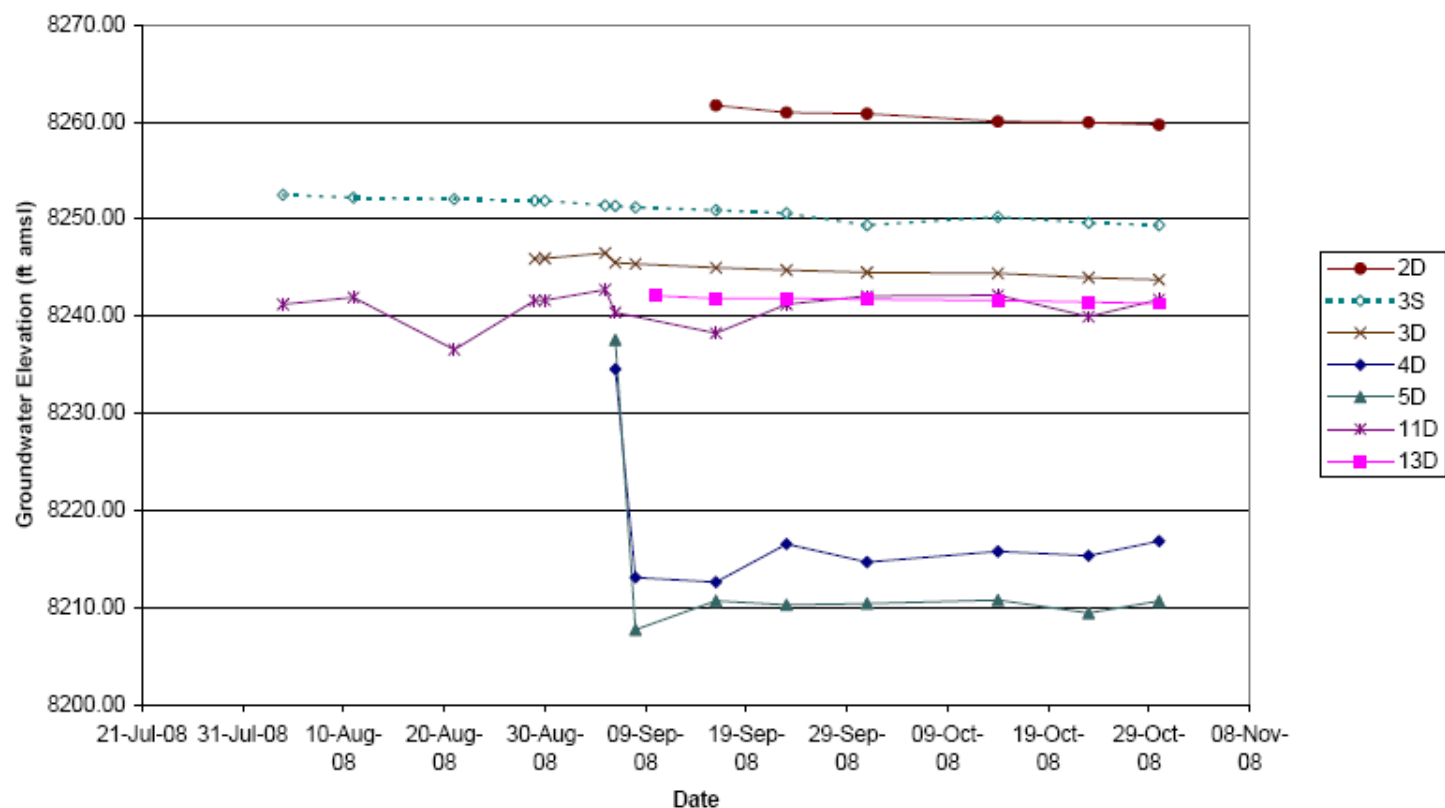
Figure 13  
Shallow Well Hydrographs  
Prather Spring Wells





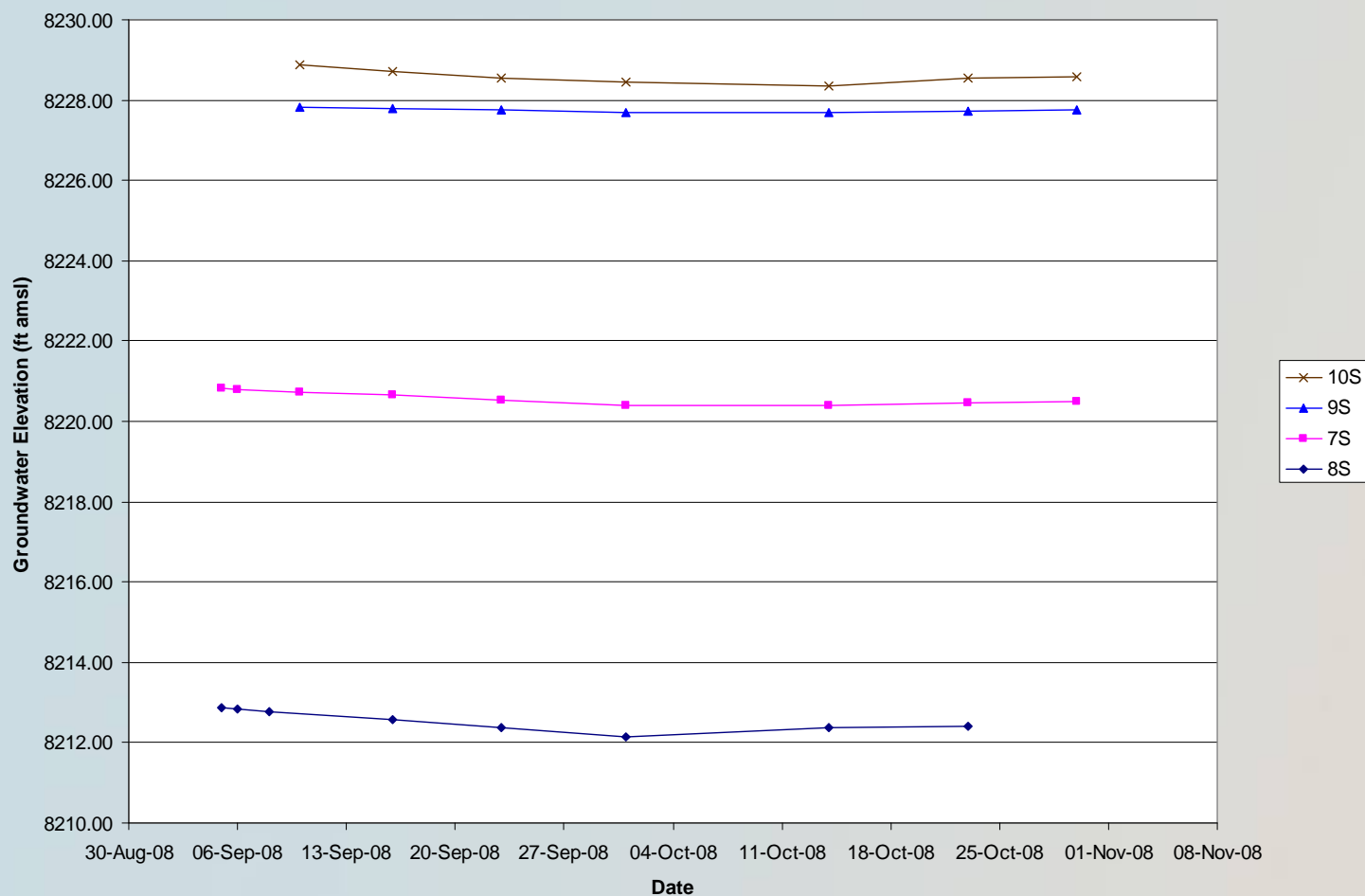
# Well Hydrographs

Figure 14  
Deep Well Hydrographs  
Prather Spring Wells



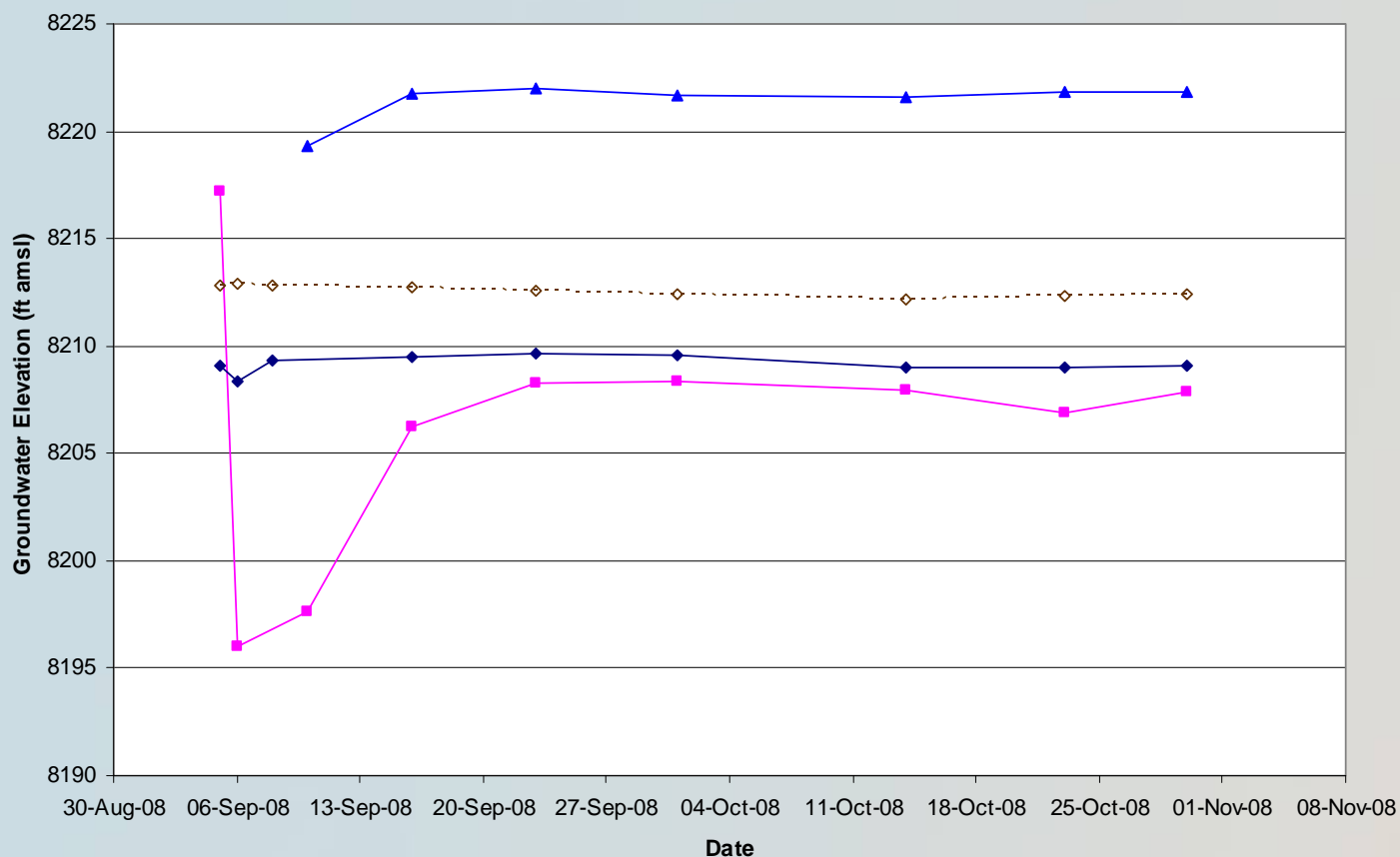
# Well Hydrographs

Figure 15  
Shallow Well Hydrographs  
Spring 2 Wells



# Well Hydrographs

Figure 16  
Deep Well Hydrographs  
Spring 2 Wells





# Section 5

- Summary of Analytical Data
  - Data Quality
  - Data Validation
  - Database (Attachment 3)
  - Data Quantity
- Attachment 5 Contents
  - Data Packages
  - Data Validation Report Summaries
  - Qualified Data Reporting Forms

# Summary of Number of Samples by Sample Matrix and Analyses

Summary of Number of Samples by Sample Matrix and Analyses  
Phase 1 Site Investigation - Prather Spring Area

| Sample Matrix  | <u>BTEX:</u><br>SW8021B | <u>Inorganics:</u><br>A2320 (alkalinity),<br>A2510B or E150.1 (SC),<br>A2540C (TDS),<br>A4500B (anions),<br>A4500F (anions),<br>A4500H (anions),<br>E120.1 (SC) | <u>Dissolved Metals:</u><br>SW6010B (cations),<br>SW6020 (trace metals),<br>SW7470 (mercury) | <u>PHCD:</u><br>SW8015B,<br>SW8260B | <u>PHCG:</u><br>SW8015B,<br>SW8260B | <u>SVOCs:</u><br>SW8270C | <u>VOCs-Short List</u><br>(13-19 compounds):<br>SW8260B | <u>VOCs-Long List 1</u><br>(39-49 compounds):<br>R SK175 (methane),<br>SW8260B | <u>VOCs-Long List 2</u><br>(51-70 compounds):<br>E1664 (oil & grease),<br>R SK175 (methane),<br>SW8260B | Total      |
|----------------|-------------------------|---|--|-------------------------------------|-------------------------------------|--------------------------|---|--|---|------------|
| Soil           | 2                       | 0   | 0  | 11                                  | 11                                  | 1                        | 0   | 8  | 4   | 37         |
| Surface Water  | 30                      | 224   | 43   | 6                                   | 14                                  | 1                        | 1   | 193  | 34  | 546        |
| Drinking Water | 0                       | 24  | 2  | 0                                   | 0                                   | 0                        | 0   | 24   | 1   | 51         |
| Groundwater    | 0                       | 32  | 32   | 8                                   | 46                                  | 0                        | 36  | 26   | 32  | 212        |
| <b>Total</b>   | <b>32</b>               | <b>280</b>  | <b>77</b>  | <b>25</b>                           | <b>71</b>                           | <b>2</b>                 | <b>37</b>   | <b>251</b>   | <b>71</b>   | <b>846</b> |

Total Number of Data Packages = 69

## Table 10 – Summary of Data Packages Containing Phase I Site Investigation Data for Prather Spring

Table 9 – Summary of Data Packages Containing Phase I Site Investigation Data for Prather Spring

| Collected By | Laboratory | Data Package Number | Contents  | Collection Period  | Analyses   | Sampling Program            |
|--------------|------------|---------------------|---|--|--|-----------------------------|
| COCCC        | TA         | DGP030387           | 7 aquifers, incl. 1 PZ<br>1 solid sample (sediment)         | 6/4/08   | sol: CRO, DRO<br>aq: NO <sub>3</sub> , CH <sub>4</sub> , major cations,<br>trace metals, major anions, SC, pH,<br>DO/CI      | COCCC initial response      |
| LTE          | BAL        | 08-4070             | 2 soil soils (Mendota, Nourack)<br>Prather Spring           | 6/12/08  | sol: CRO, DRO, MRO<br>aq: GR <sub>2</sub> , CH <sub>4</sub> , major cations,<br>trace metals, major anions, SC, pH,<br>DO/CI | Individual company response |
| Monrovia     | Key        | 06008-1382          | 4 aquifers (NP direct, NP stream,<br>Nourack Sgg, DP flood) | 6/8/08   | VOCs   | Individual company response |
| Monrovia     | Key        | 06008-1382          | 2 aquifers (stock pond, NPS Sgg)                            | 6/20/08  | VOCs   |                             |
| Monrovia     | Key        | 062308-1668         | 1 aquifer (creek below pond)                                | 6/23/08  | VOCs   |                             |
| UPS          | BAL        | 08-5065             | Soil and GRW from 1st round of drilling                     | Soils:<br>7/15/08, 7/17/08<br>Water:<br>7/17/08, 7/18/08 | GPO, DRO, VOCs; methane for<br>ORW<br>1 soil for SVOCs also  | Joint Work Plan             |
|              |            | 08-5101             |   |  |  |                             |
|              |            | 08-5151             |   |  |  |                             |
|              |            | 08-5175             |   |  |  |                             |
|              |            | 08-5116             |   |  |  |                             |
| LTE          | TA         | NRO-1655            | Split of Soil and GRW from 1st round<br>of drilling         | same as above  | GPO, DRO, VOCs; methane for<br>ORWs  | Joint Work Plan             |
|              |            | NRO-1800            |   |  |  |                             |
|              |            | NRO-1903            |   |  |  |                             |
| HRL          | BAL        | 08-3744             | Cabin Top and Spring  | 5/31/08<br>6/1/08<br>6/2/08                              | GPO, BTEX, Anions, TDS, CH <sub>4</sub>  | Individual company response |
| HRL          | BAL        | 08-3842             | Cabin Top and Spring  | 6/3/08   | GPO, BTEX, Anions, TDS, CH <sub>4</sub>  |                             |
| HRL          | BAL        | 08-4235             | 3 locations   | 6/18/08  | BTEX   |                             |
| HRL          | BAL        | 08-4239             | 5 SPWs  | 6/23/08  | BTEX, NO <sub>2</sub> , NO <sub>3</sub> , Cl   | Addendum #1                 |
| HRL          | BAL        | 08-4611             | 5 SPWs  | 7/1/08   | BTEX, NO <sub>2</sub> , NO <sub>3</sub> , Cl   | Addendum #1                 |
| HRL          | BAL        | 08-4776             | 5 SPWs  | 7/8/08   | BTEX, NO <sub>2</sub> , NO <sub>3</sub> , Cl   | Addendum #1                 |
| HRL          | BAL        | 08-5011             | 9 SPWs Sgg, incl. SPW3                                      | 7/15/08  | VOCs - Short, some anions  | Addendum #1                 |

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## Table 10 – Summary of Data Packages Containing Phase I Site Investigation Data for Prather Spring cont.

Table 9 – Summary of Data Packages Containing Phase I Site Investigation Data for Prather Spring

| Collected By | Laboratory | Data Package Number | Contents                            | Collection Period | Analyses   | Sampling Program |
|--------------|------------|---------------------|-------------------------------------|-------------------|--|------------------|
| EDL          | EAL        | 08-5117             | 9 SPW/Ssg, incl. SPO#2              | 7/17/08           | VOCs-Short, some anions                            | Addendum #1      |
| EDL          | EAL        | 08-5218             | 9 SPW/Ssg, incl. SPO#2              | 7/23/08           | VOCs-Short, some anions<br>DM4 for Pesticide Ssg   | Addendum #1      |
| EDL          | EAL        | 08-5309             | 9 SPW/Ssg, incl. SPO#2              | 7/24/08           | VOCs-Short, some anions                            | Addendum #1      |
| EDL          | EAL        | 08-5418             | 9 SPW/Ssg, incl. SPO#2              | 7/29/08           | VOCs-Short, some anions                            | Addendum #1      |
| EDL          | EAL        | 08-5544             | 10 SPW/Ssg, incl. SPO#2 and 2A      | 8/1/08            | VOCs-Short, some anions                            | Addendum #1      |
| EDL          | EAL        | 08-5576             | 10 SPW/Ssg, incl. SPO#2 and 2A      | 8/4/08            | VOCs-Short, some anions                            | Addendum #1      |
| EDL          | EAL        | 08-5777             | 11 SPW/Ssg, incl. SPO#2 and 2A      | 8/7/08            | VOCs-Short, some anions                            | Addendum #1      |
| LTR          | TA         | NRH-0888            | 3 SPWs                              | 8/7/08            | VOCs-Long, some metals, some anions and veterinary | Addendum #1      |
| EDL          | EAL        | 08-5833             | 10 aqueous, incl. SPO#2 and 2A      | 8/11/08           | VOCs, some anions                                  | Addendum #1      |
| EDL          | EAL        | 08-6048             | 10 aqueous, incl. SPO#2 and 2A      | 8/14/08           | VOCs-Long, some anions                             | Addendum #1      |
| EDL          | EAL        | 08-6082             | 4 GRW, 1 FD                         | 8/14/08           | VOCs-Long, methane                                 | Addendum #1      |
| EDL          | EAL        | 08-6168             | 10 aqueous, incl. SPO#2 and 2A      | 8/18/08           | VOCs-Long, some anions                             | Addendum #1      |
| EDL          | EAL        | 08-6291             | 11 aqueous, incl. SPO#2 and 2A      | 8/21/08           | VOCs-Long, some anions                             | Addendum #1      |
| EDL          | EAL        | 08-6339             | 11 aqueous, incl. SPO#2 and 2A      | 8/25/08           | VOCs-Long, some anions                             | Addendum #1      |
| EDL          | EAL        | 08-6596             | 11 SPW                              | 8/29/08           | Addendum #2 List                                   | Addendum #2      |
| URS          | ChemSol    | URS037              | 3 GRW                               | 8/29/08           | VOCs and GRC                                       | Addendum #3      |
| URS          | ChemSol    | URS038              | 2 Sed, 5 GRW, R2                    | 9/3/08            | VOCs, GRC, DPO                                     | Addendum #3      |
| URS          | ChemSol    | URS039              | 1 Sed, 5 GRW, R2                    | 9/4/08            | VOCs, GRC, DPO                                     | Addendum #3      |
| URS          | ChemSol    | URS040              | 7 GRW                               | 9/5/08            | VOCs   | Addendum #3      |
| EDL          | EAL        | 08-6745             | 11 SPW                              | 9/4/08            | Addendum #2 List                                   | Addendum #2      |
| EDL          | EAL        | 08-6746             | Portable Water Tank                 | 9/4/08            | Addendum #2 List                                   | Addendum #2      |
| EDL          | EAL        | 08-6780             | 1 AC (Portable Water Tank),<br>1 TD | 9/5/08            | Addendum #2 List                                   | Addendum #2      |
| EDL          | EAL        | 08-6806             | MW089 (Pre-development), 2 acids    | 9/7/08            | VOCs, GRC, DPO                                     | Addendum #3      |

2 of 4

## Table 10 – Summary of Data Packages Containing Phase I Site Investigation Data for Prather Spring cont.

Table 9 – Summary of Data Packages Containing Phase I Site Investigation Data for Prather Spring

| Collected By | Laboratory | Data Package Number | Contents   | Collection Period | Analyses   | Sampling Program |
|--------------|------------|---------------------|--|-------------------|--|------------------|
| ERL          | Daegon     | 0009060             | 7 GRW (MV3D, MW3S, MW3D, MW4S, MW4D, MW3S, MW3D)   | 9/8/08            | Addendum #2 List   | Addendum #2      |
| ERL          | Daegon     | 0009076             | 11 SFW   | 9/10/08           | Addendum #2 List   | Addendum #2      |
| HRL          | Daegon     | 0009093             | 2 GRW (3S, 2D)                                     | 9/10/08           | Addendum #3 List   | Addendum #3      |
| HRL          | Daegon     | 0009141             | 2 GRW (2S, 2D)                                     | 9/17/08           | Addendum #2 List   | Addendum #2      |
| LTE          | TA         | NRJ0466             | 3 soil (6R 17-21, SS 10-12, TS 14-16) + 1 TB       | 9/10/08, 9/14/08  | VOCs-Long, DRO   | Addendum #3      |
| LTE          | TA         | NRJ0739             | 3 GRW (3D, SS, 8D), 1 TB                           | 9/10/08, 9/14/08  | VOCs-Long, DRO, DRO, Methane, Cations, Anions, Alkalinity, TDS, Sulfide  | Addendum #3      |
| LTE          | TA         | NRJ0779             | 3 GRW (10S, 3D, 4D, 6R), 1 soil (10S 10-12) + 1 TB | 9/2/08            | VOCs-Long, DRO, DRO, Methane, Cations, Anions, Alkalinity, TDS, Sulfide  | Addendum #3      |
| LTE          | TA         | NRJ1054             | 2 GRW (10S, 10D) + TB                              | 9/9/08            | VOCs-Long, Alkalinity, Anions, Dissolved Metals, Methane   | Addendum #3      |
| LTE          | TA         | NRJ1060             | 2 GRW (2S, 9S) + TB                                | 9/9/08            | VOCs-Long, Alkalinity, Anions, Dissolved Metals, Methane   | Addendum #3      |
| LTE          | TA         | NRJ1052             | 3 GRW (12D, 13D, 2D) + 1 TB                        | 9/9/08            | VOCs-Long, Alkalinity, Anions, Dissolved Metals, Methane VOCs-Long + Methane for FS (MV13D and FS (MV13D and FS (MV13D | Addendum #3      |
| LTE          | TA         | NRJ1695             | 1 GRW (02D) + 1 TB                                 | 9/17/08           | VOCs-Long, Alkalinity, Anions, Dissolved Metals, Methane   | Addendum #3      |
| HRL          | EAL        | 08-7173             | 10 GRW + 1 PD + 1 TB                               | 9/17/08           | VOCs, Total Alkalinity, Metals, Cations, Anions, Sulfide, TDS, Conductivity  | Addendum #3      |
| ERL          | EAL        | 08-7264             | 10 GRW + 1 PD + 1 TB                               | 9/24/08           | VOCs (Metals and Inorganics on Hold)   | Addendum #3      |
| ERL          | EAL        | 08-7373             | 1 GRW (FS (MW-3S)                                  | 9/24/08           | VOCs   | Addendum #3      |
| HRL          | EAL        | 08-7609             | 10 GRW + 1 PD + 1 TB                               | 10/1/08           | VOCs, Calcite  | Addendum #5      |

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## Table 10 – Summary of Data Packages Containing Phase I Site Investigation Data for Prather Spring cont.

Table 9 – Summary of Data Packages Containing Phase I Site Investigation Data for Prather Spring

| Collected By | Laboratory | Data Package Number | Contents                                  | Collection Period | Analyses  | Sampling Program |
|--------------|------------|---------------------|---|-------------------|---|------------------|
| LTE          | EAL        | 08-7657             | 1 Drinking Water (NP Chlorine)            | 10/0/08           | VOCs, Lead, Alkalinity, Ammonia, Dissolved Metals, Methane    | Addendum #4      |
| HRL          | Ruegen     | 08-10431            | NP Chlorine (water + soil), 1 FD, 2 TBs   | 10/3/08           | VOCs, SVOCs, GRG, DRD, Organics, Metals, Inorganics           | Addendum #4      |
| URS          | ChemSol    | URS041              | 38 soil vapor samples                     | 10/15, 16, 17/08  | VOCs, GRG   | Addendum #4      |
| URS          | ChemSol    | URS042              | 3 GRW                                     | 10/28/08          | VOCs, GRG   |                  |
| URS          | ChemSol    | URS043              | 3 GRW                                     | 10/28/08          | VOCs, GRG   |                  |
| HRL          | EAL        | 08-7885             | 10 GRW + 1 FD + 1 TB                      | 10/8/08           | VOCs, Chloride  | Addendum #2      |
| HRL          | EAL        | 08-8072             | 16 GRW + 1 FD + 1 TB                      | 10/06/08          | VOCs, Alkalinity, Metals, Ammonia, Sulfide, TDS, Conductivity | Addendum #2      |
| HRL          | EAL        | 08-8074             | 10 GRW + 1 FD + 1 TB                      | 10/06/08          | VOCs, Chloride  | Addendum #2      |
| HRL          | EAL        | 08-8263             | 10 SPW + 1 TB                             | 10/28/08          | VOCs, Chloride  | Addendum #2      |
| HRL          | EAL        | 08-8406             | 10 SPW + 1 FD + 1 TB                      | 10/28/08          | VOCs, Chloride  | Addendum #2      |
| HRL          | EAL        | 08-8584             | 1 SPW (Old Prather Spring clean response) | 11/4/08           | BTEX, TPH, TPH  | NA               |

69 = Total number of data packages

BTEX = benzene, toluene, ethylbenzene, xylene  
 CH4 = methane  
 ChemSol = Chem Solutions (onsite laboratory)  
 CL = chloride  
 DRD = dissolved organic residue  
 EAL = Evergreen Analytical  
 FD = field duplicate  
 GRG = gasoline range organics  
 GRW = groundwater  
 HRL = HRL Compliance Solutions  
 LTE = LT Environmental  
 NO2 = nitrite  
 NO3 = nitrate

NP = Ned Prather  
 PW = pond water  
 RD = road blank  
 SPW = surface water  
 STD = spring  
 SVOC = semi-volatile organic compound  
 TB = Test Ammonia  
 TD = trip blank  
 TDS = total dissolved solids  
 TPH = total extractable petroleum hydrocarbon  
 TPHR = total extractable petroleum hydrocarbon  
 URS = URS Corporation  
 VOC = volatile organic compound

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# Summary of Analytical Results

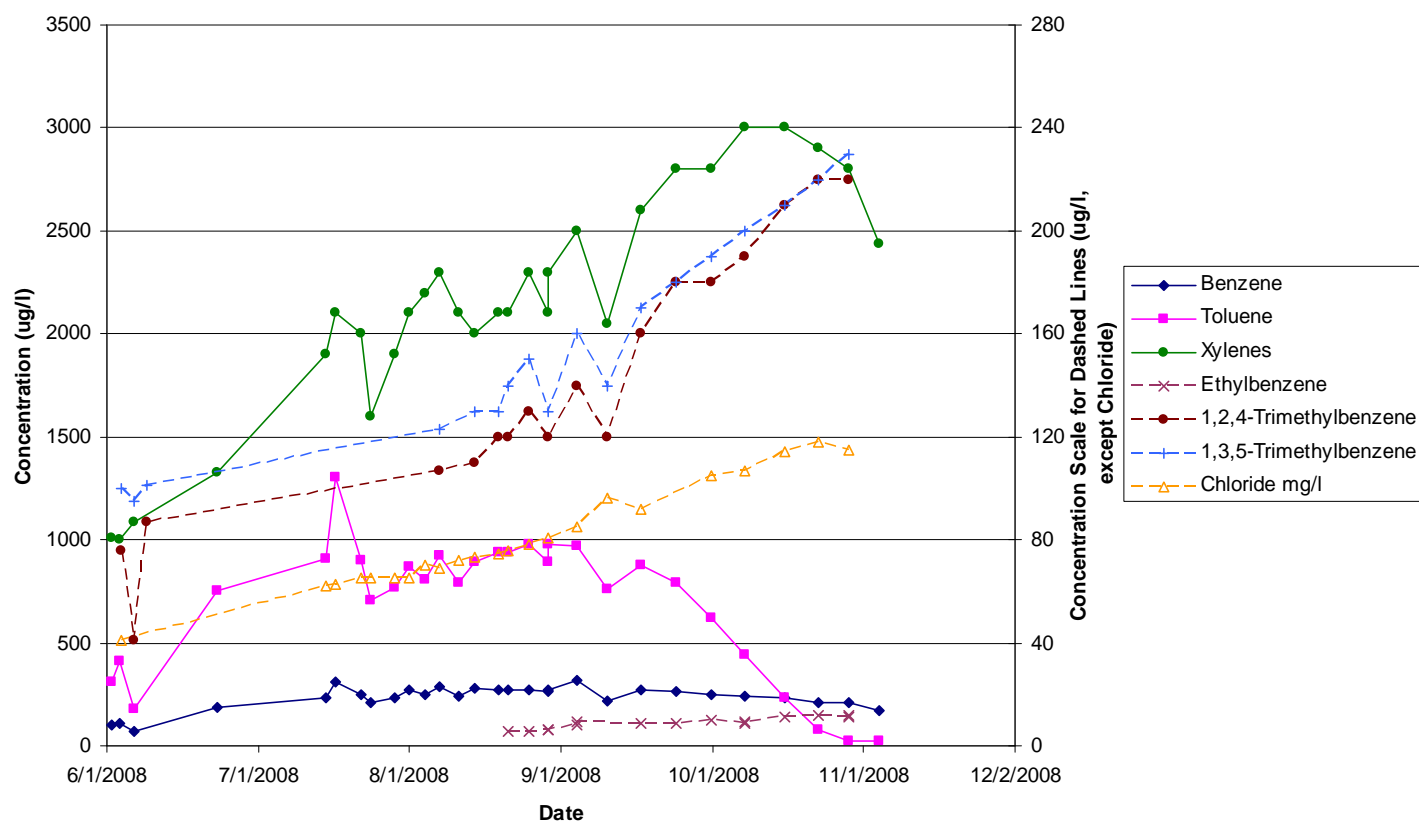
- Surface Water
- Groundwater
- Drinking Water
- Soil
- Soil Gas

# Water Quality

- Collection and analysis of surface water and groundwater samples
  - Joint Workplan Addenda #1 - 5
  - Sampling events between May 31 and November 4, 2008
    - URS
    - HRL Compliance
    - LT Environmental
    - Marathon
    - COGCC

# Prather Spring

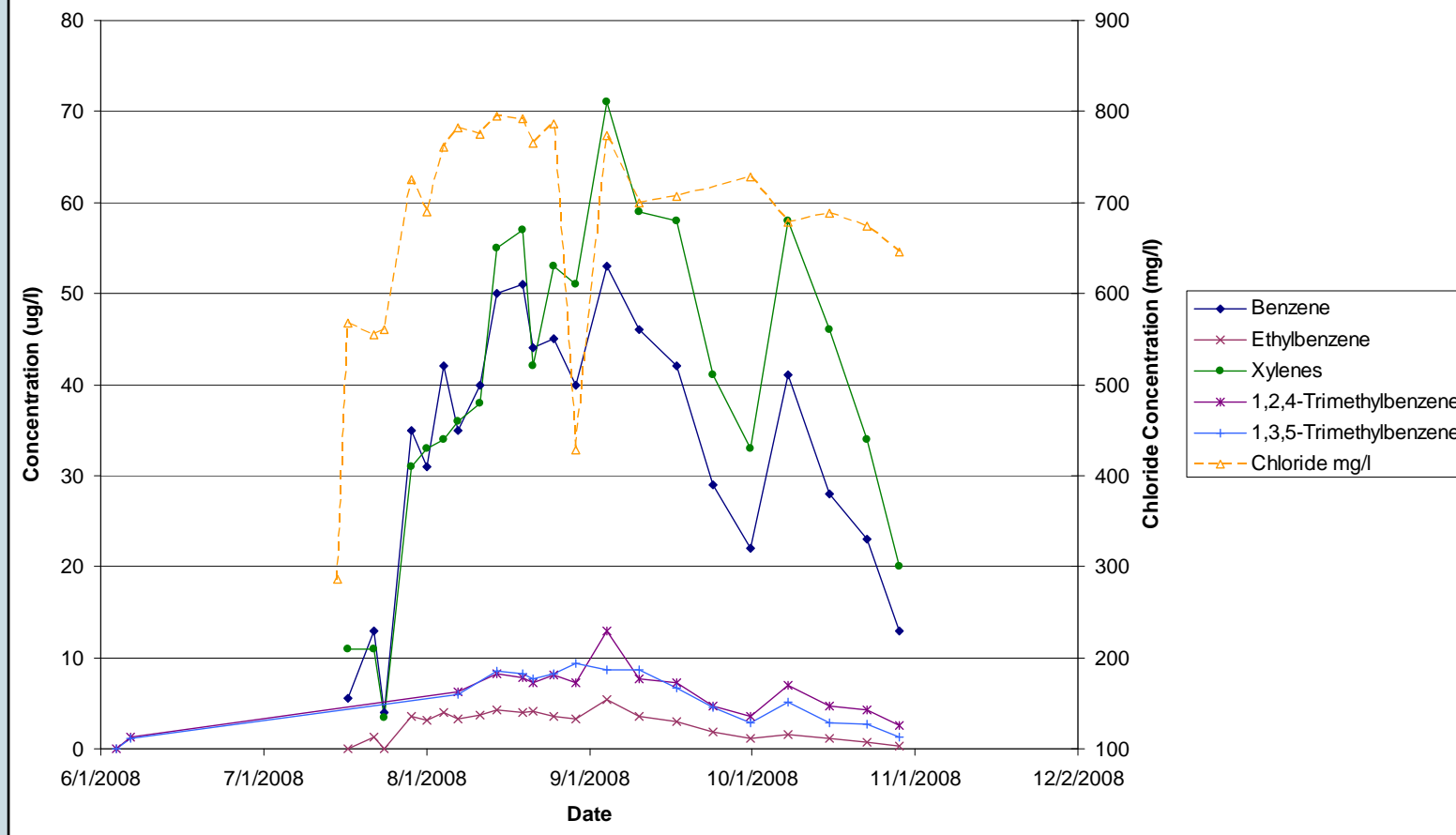
**Figure 17**  
**BTEX, TMB, and Chloride Concentrations at Prather Spring**

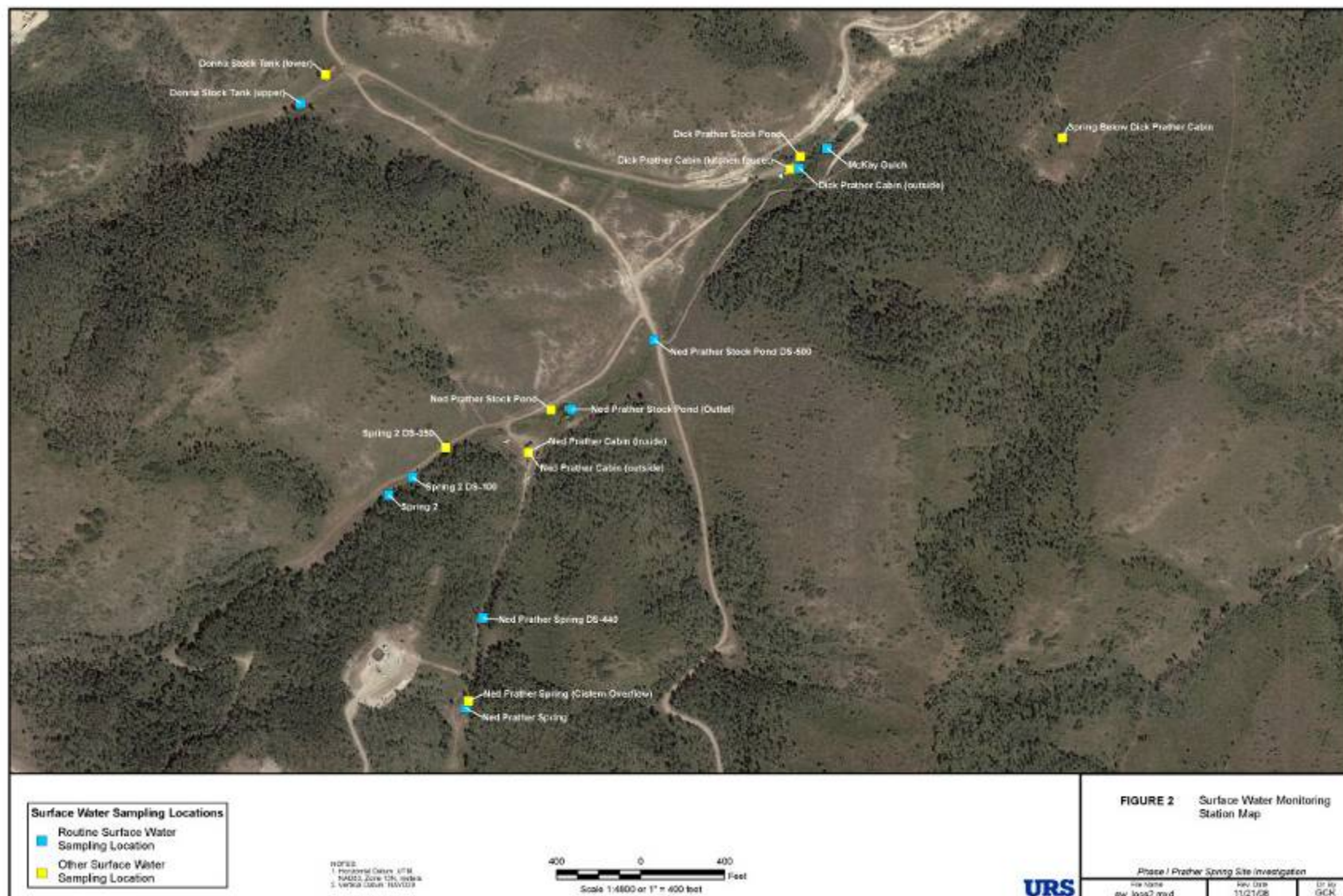




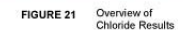
# Spring 2

**Figure 18**  
**BTEX, TMB, and Chloride Concentrations at Spring 2**

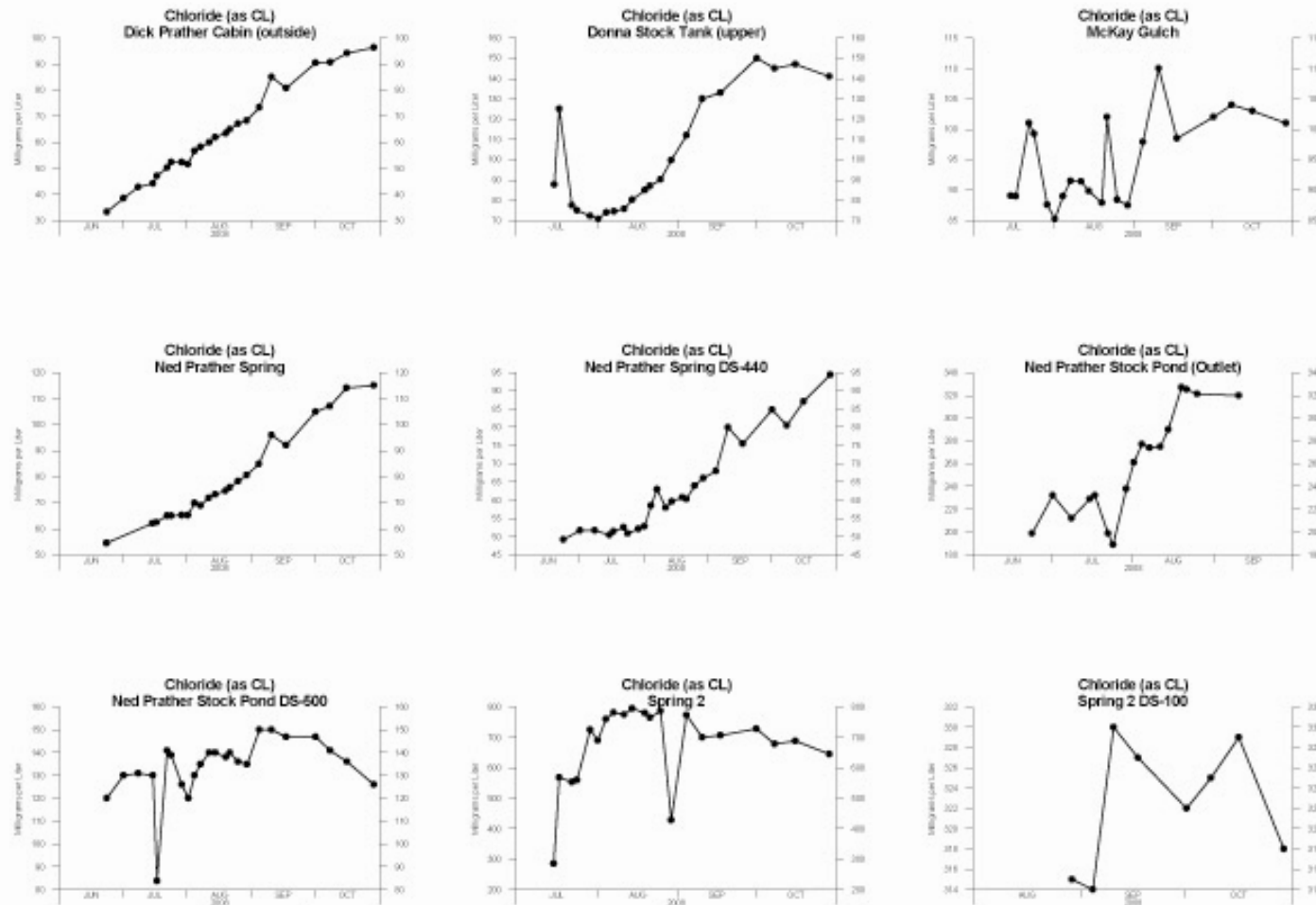




- Surface water and groundwater







## EXPLANATION

- - Measured Value
- - Undetected (Displayed at RL)

# URS

Project Name: Prather Spring

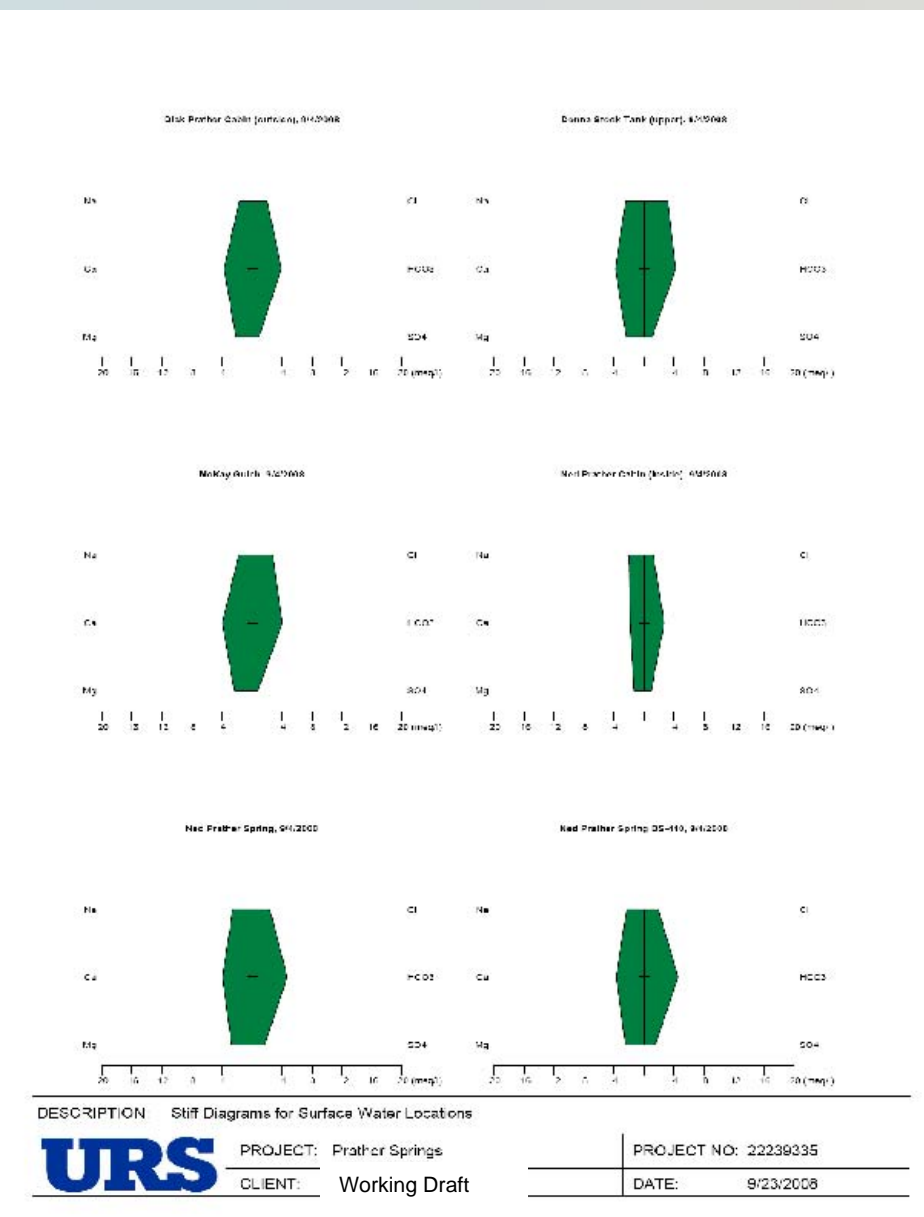
Job No: 22239335

Date: November 2008

**Figure 22. Time-Series Graphs  
Chloride (as CL)  
Phase I Site Investigation  
Parachute, Colorado**

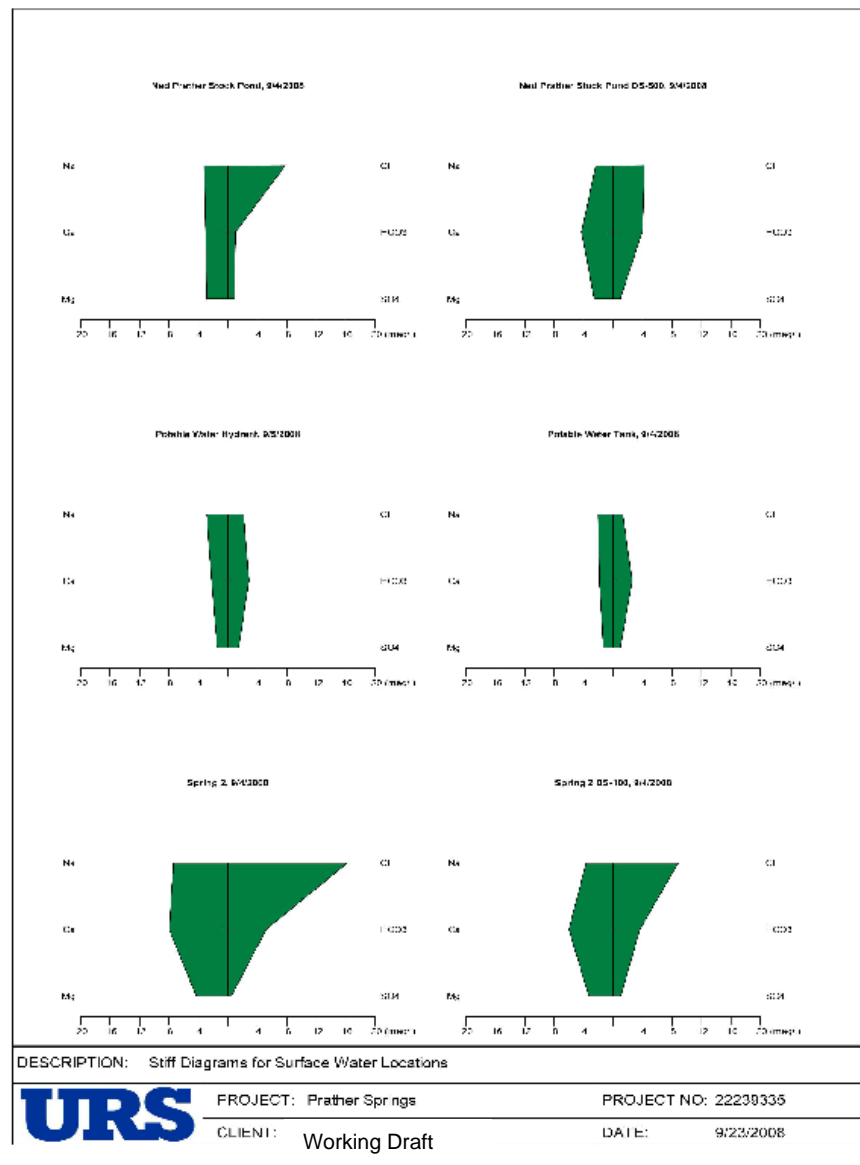
# Major Ions

- Surface water samples
- Similar to background groundwater samples with increase in chloride



# Major Ions

- Surface water samples
- Increase in chloride ion percentage begins at Spring 2



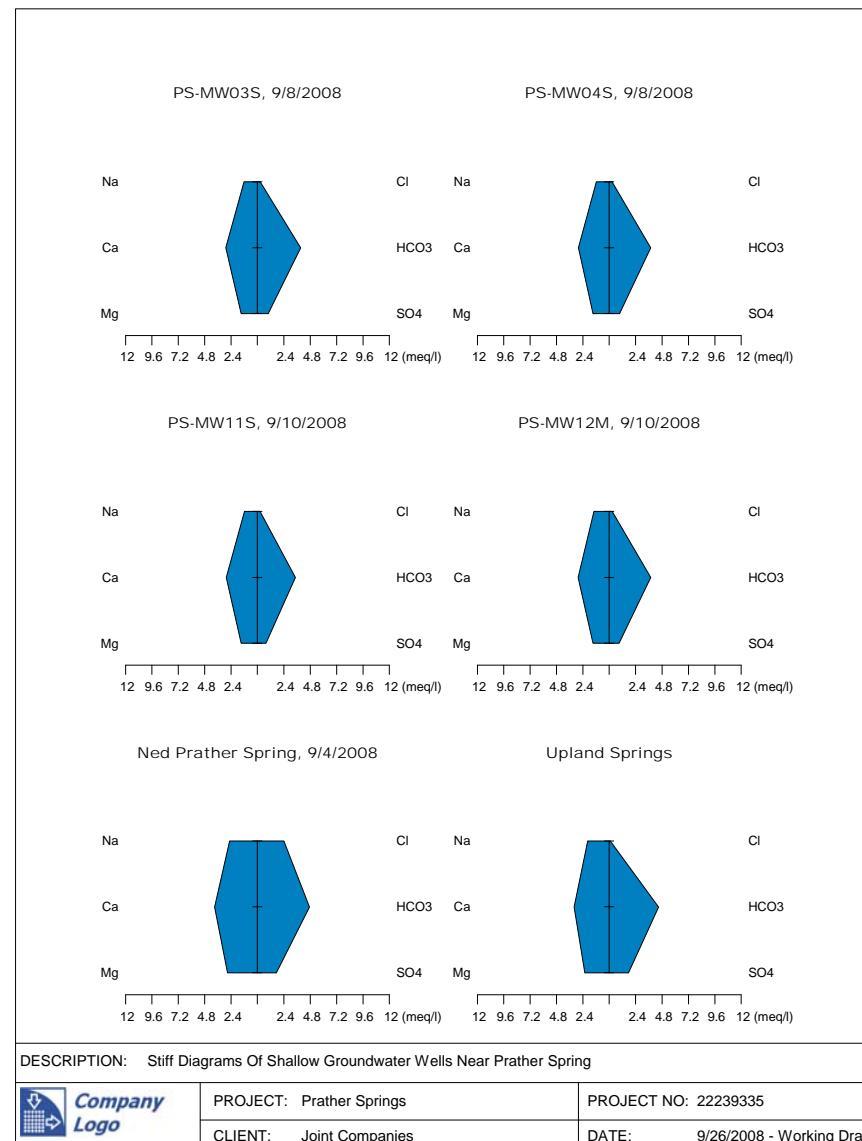


# Background or Baseline Water Quality

- Major ion chemistry
  - Utilized to distinguish between and evaluate characteristics of groundwater flow zones
  - Interaction between groundwater and surface water
  - Evaluate source of impacts to surface water and groundwater
- Hydrocarbon constituent detections
  - Evaluate source of impacts to surface water and groundwater

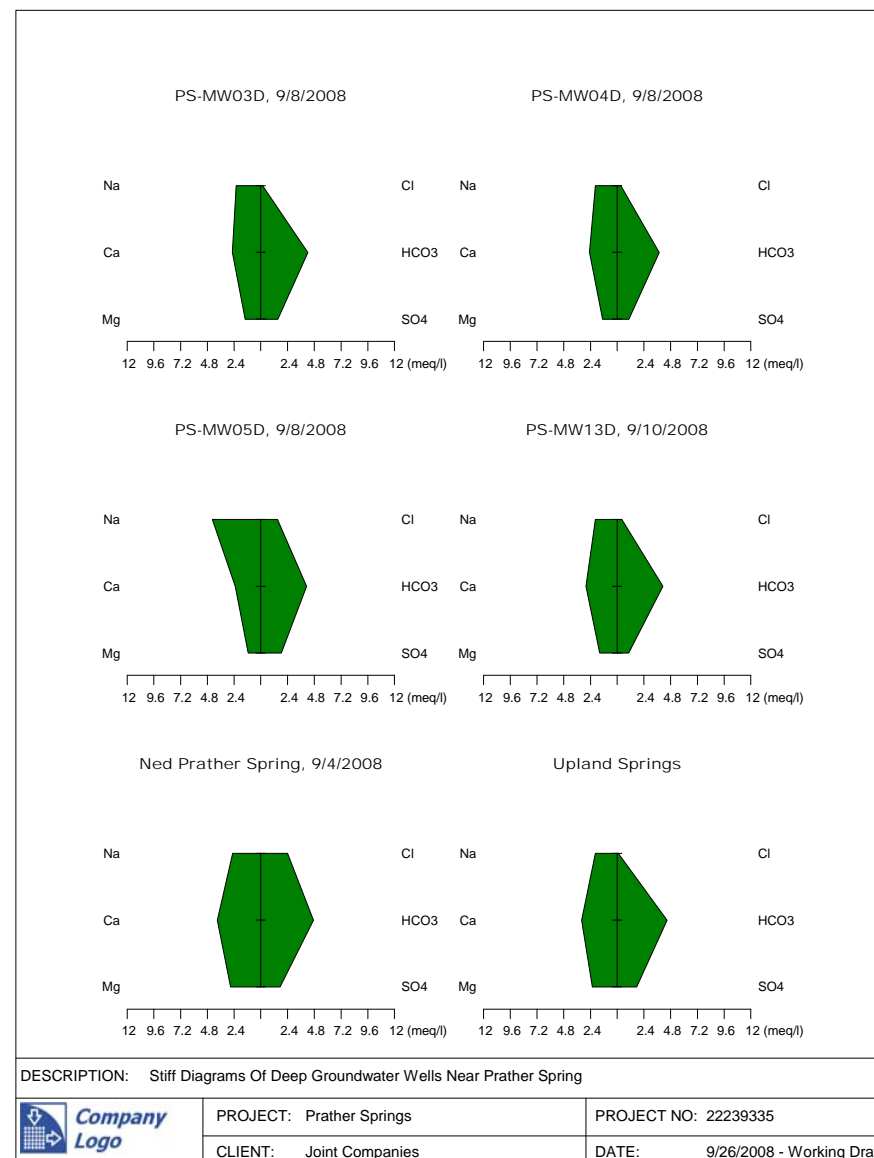
# Major Ions

- Shallow wells in Prather Drainage
- Ca-HCO<sub>3</sub> water type
- Similar to USGS “Upland Springs” in the area
- Groundwater has low dissolved ion content and appears to be relatively young



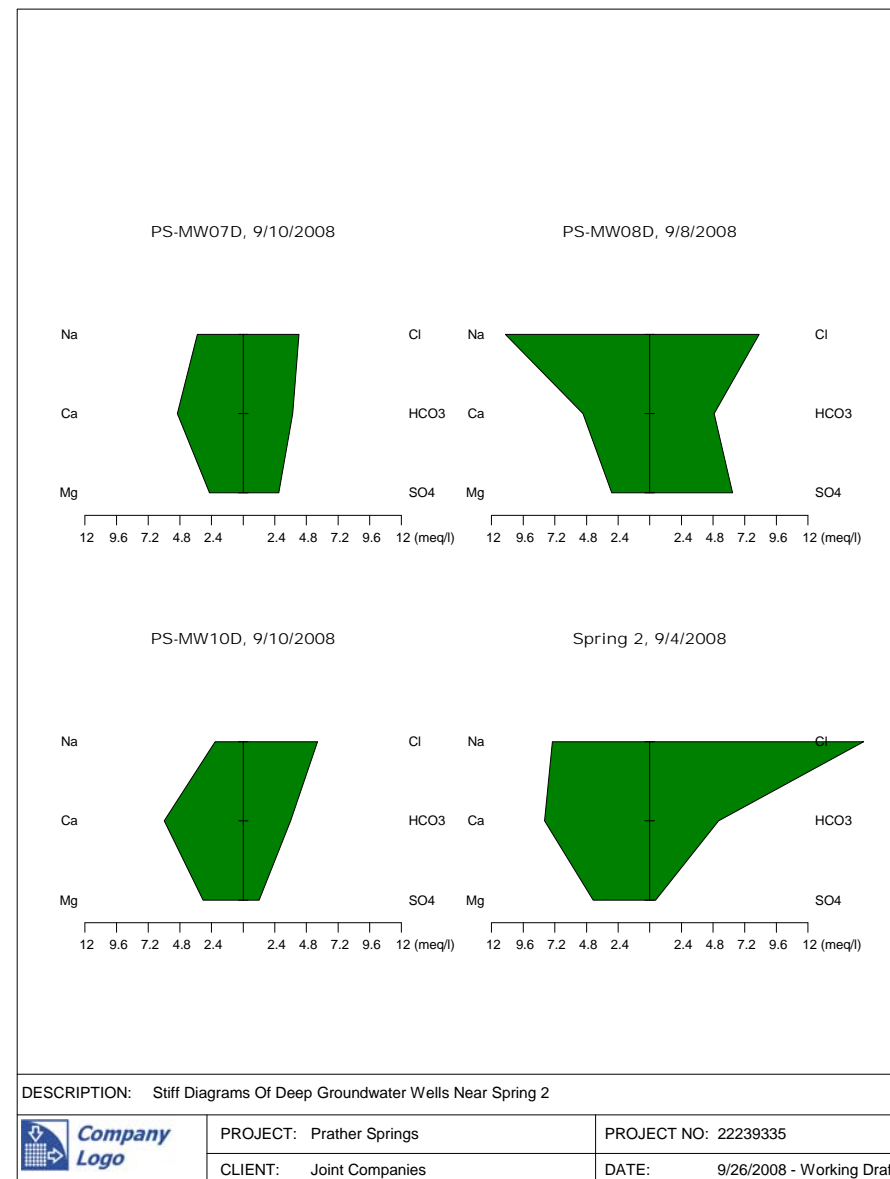
# Major Ions

- Deep wells in Prather Drainage
- Ca-Na-HCO<sub>3</sub> water type
- Very similar to shallow well water type
- Deep wells may show relative increase in sodium, potassium, sulfate, arsenic, boron, and selenium concentrations compared to shallow wells
- Well 5D is different



# Major Ions

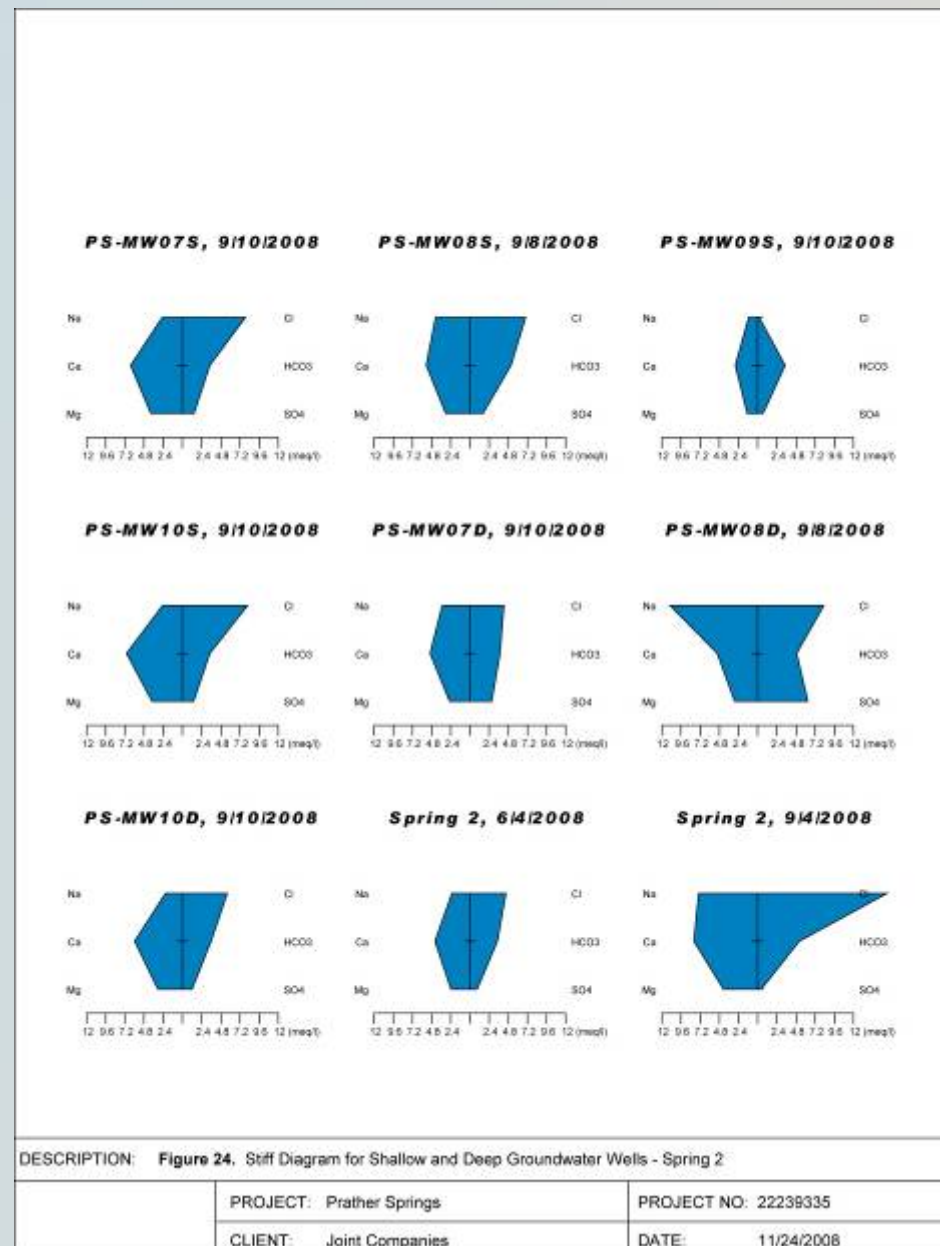
- Deep wells in Spring 2 Drainage
- Ca-Cl and Na-Cl water types
- All locations appear to be impacted from saline source





# Major Ions

- Shallow wells in Spring 2 Drainage
- Ca-HCO<sub>3</sub> water type at MW-09S
  - Similar to USGS “Upland Springs” in the area
- Higher chloride content in other three well locations (Ca-Cl type)
- Samples from MW-07S and MW-10S are similar, ditto for BTEX

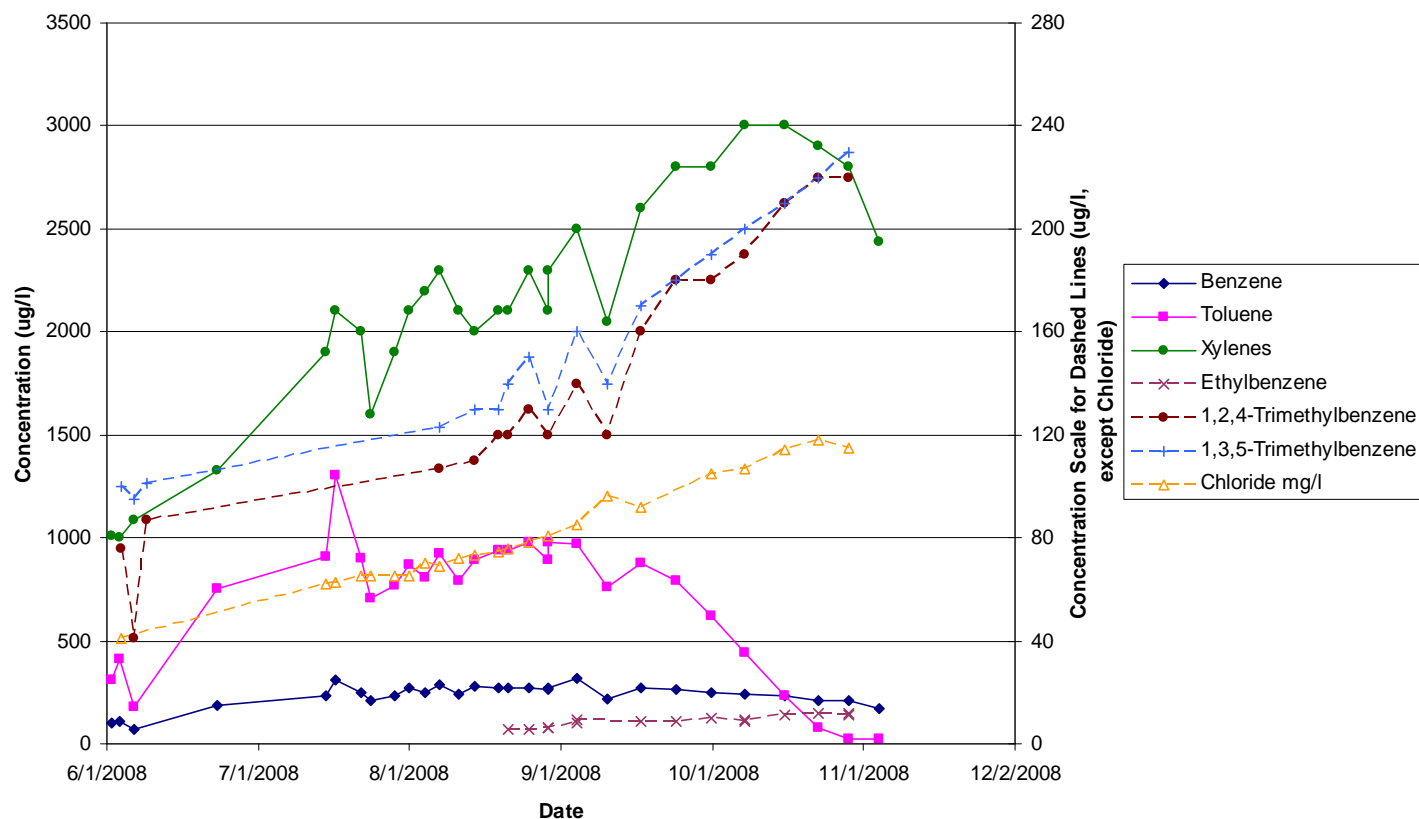


# Potential Indicator Analytes

- Potential Indicator Analytes
  - BTEX
  - 1,3,5-TMB and 1,2,4-TMB
  - Naphthalene
  - PHC as gasoline
  - Chloride
- Results posted to maps

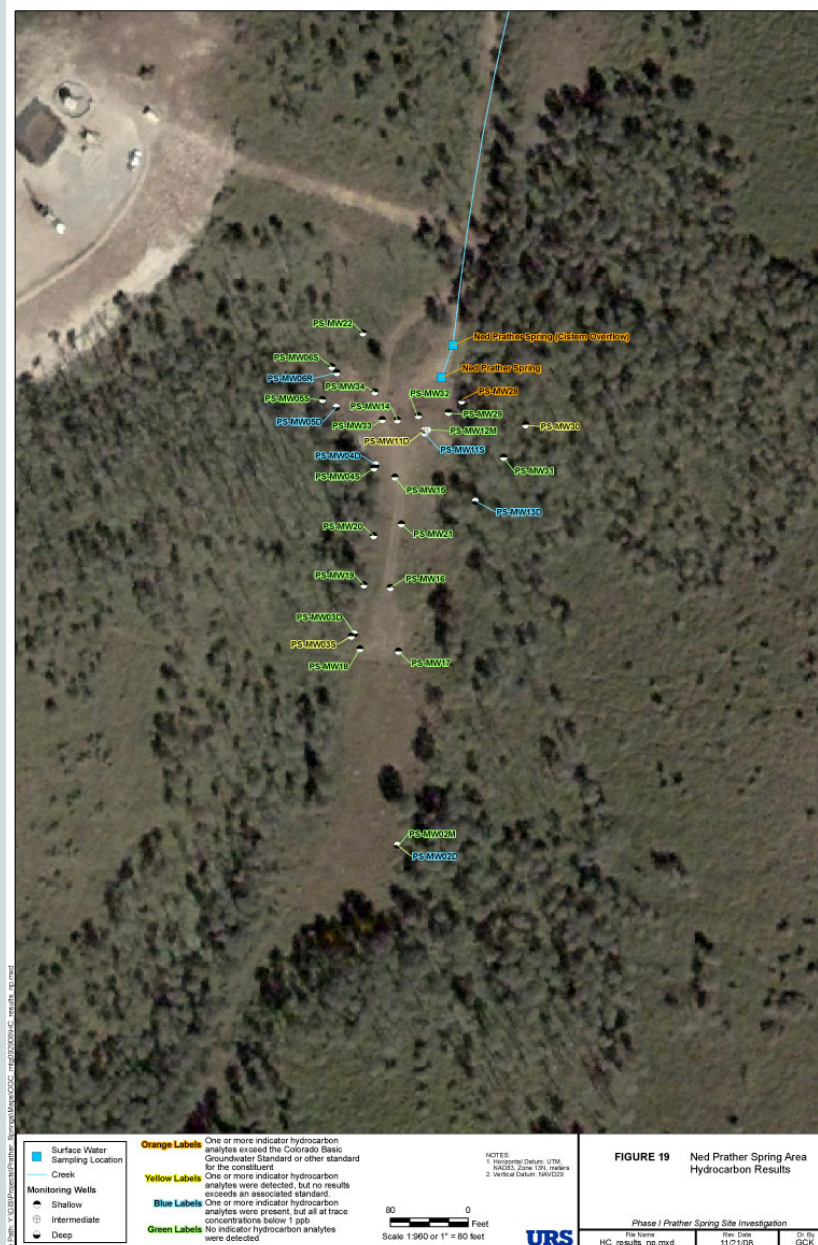
# Prather Spring

**Figure 17**  
**BTEX, TMB, and Chloride Concentrations at Prather Spring**



# Location of Potential Hydrocarbon Indicator Analytes

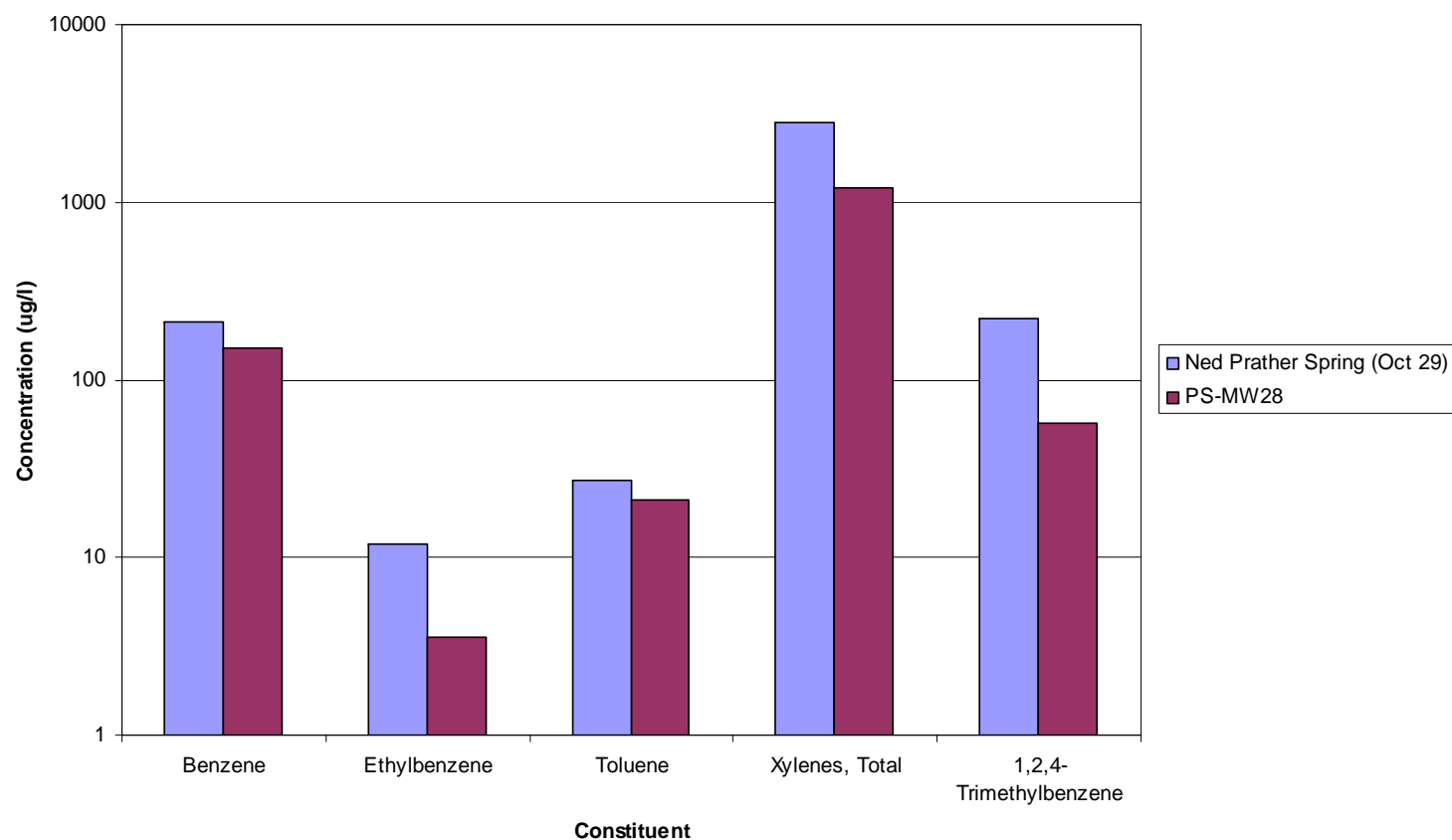
## ■ Prather Spring





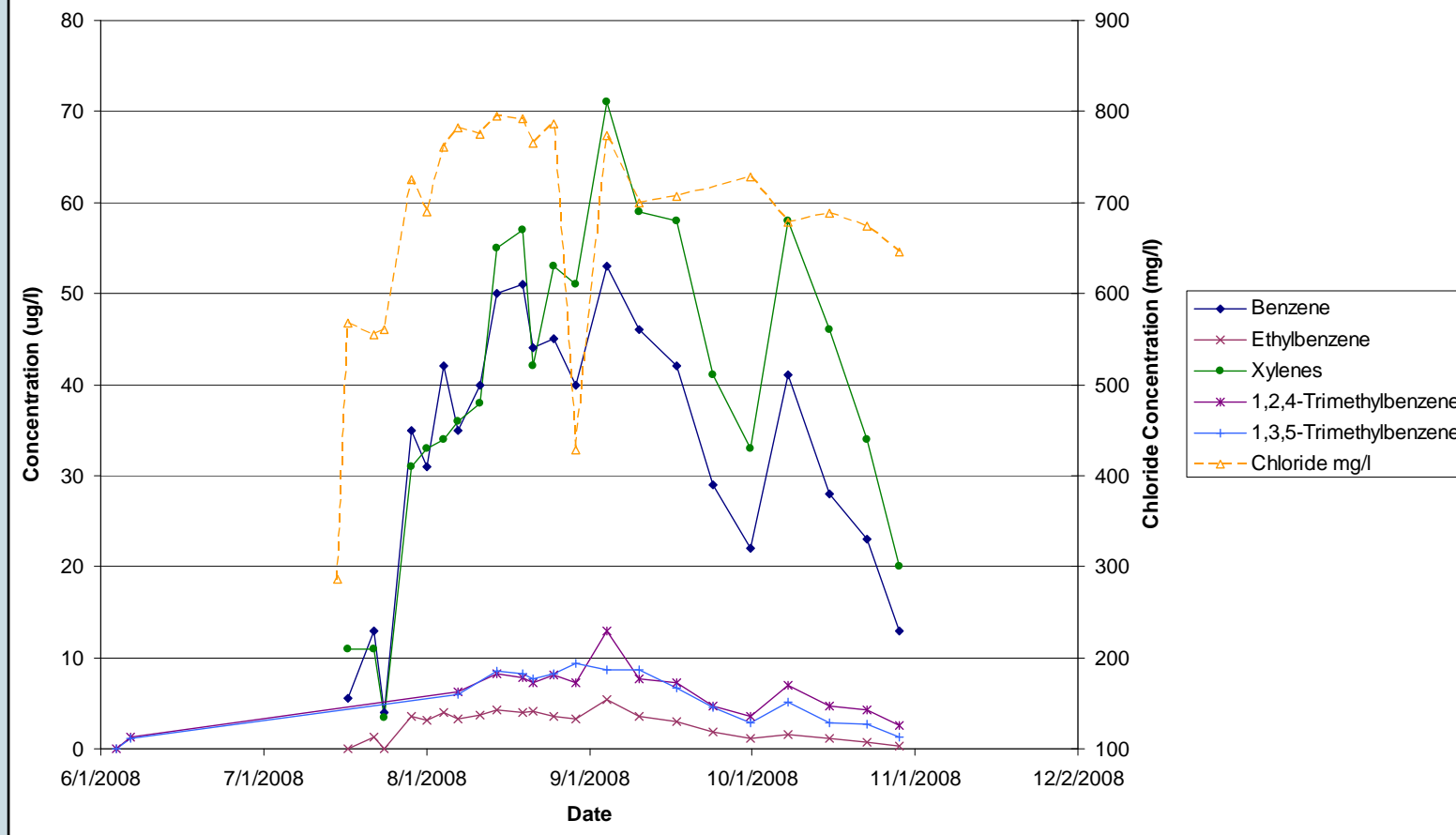
# MW-28 vs Prather Spring

Figure 20  
Concentration Comparison - Ned Prather Spring and PSMW-28



# Spring 2

**Figure 18**  
**BTEX, TMB, and Chloride Concentrations at Spring 2**



# Location of Potential Hydrocarbon Indicator Analytes

## ■ Spring 2



# Other Matrices

- Drinking Water (Tables 17-19)
  - Potable water tank
  - Supply hydrant
- Soil (Table 20)
- Soil Gas (PID in Table 6)
  - No detections



# Cistern Sampling















# Questions and Discussion