Analysis of Claremont Extraction System

1) Efficacy of extraction system in capturing all contamination originating on-site
2) Estimation of off-site TCE contribution to Claremont groundwater extraction system

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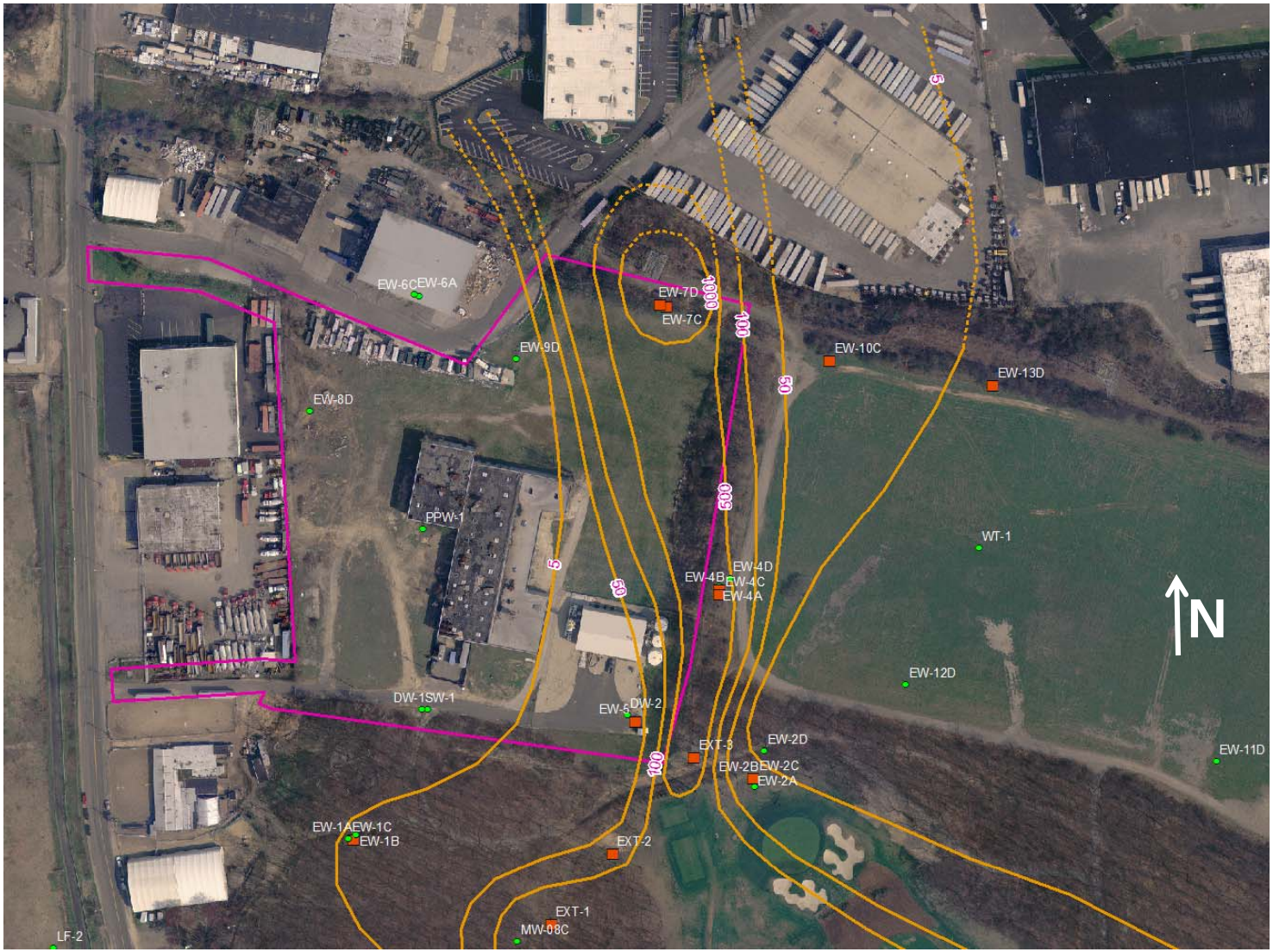
Claremont Site Map



Interpreted TCE plume based on 2006 groundwater quality data

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Efficacy of extraction system in capturing all contamination originating on-site

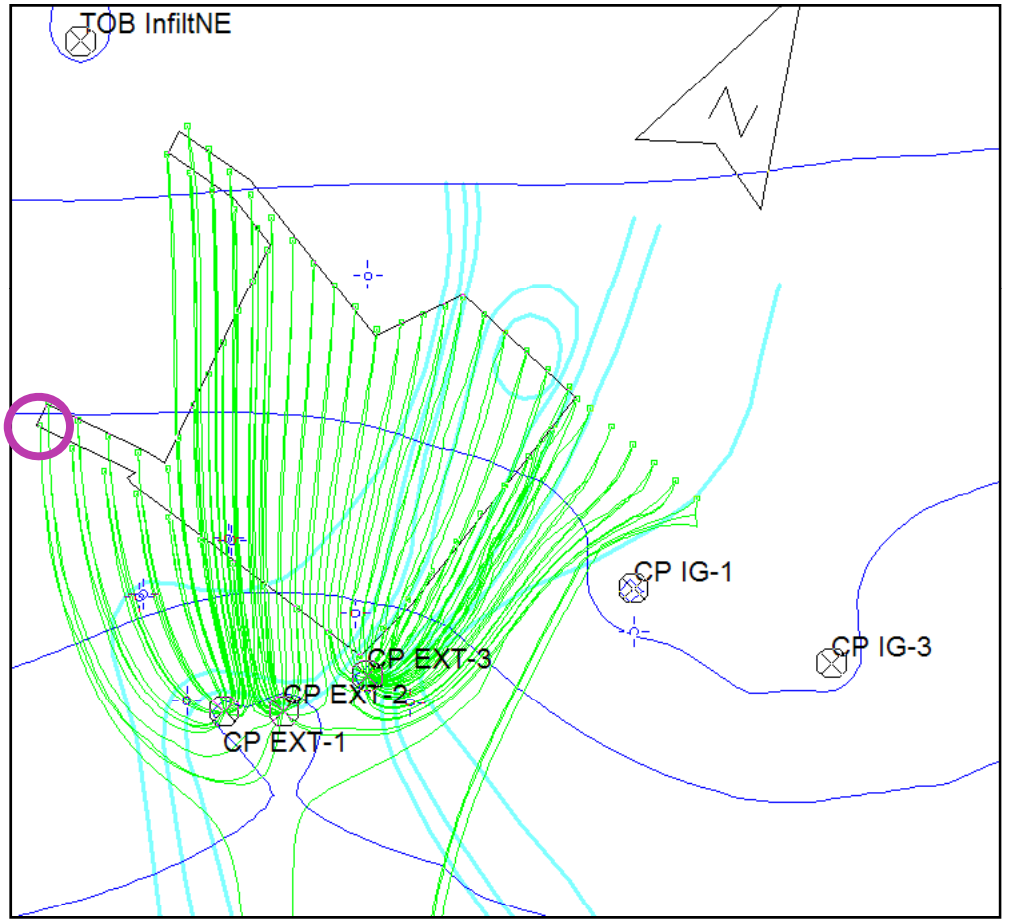
Capture of Claremont Contamination by Claremont Extraction System

- Objective
  - Use model to predict whether all contamination originating from Claremont site is captured by Claremont extraction system

- Methods
  - Perform particle tracking with groundwater model to assess flow paths and capture zone
    - Place starting particles around perimeter of site and determine if particles are captured by extraction system
    - Use April 2010 extraction rate data
      - EXT-1: 110 gpm
      - EXT-2: 113 gpm
      - EXT-3: 118.5 gpm
      - Total: ~340 gpm

Capture of Claremont Contamination: Particle Tracks Originating in Layer 1

- In Claremont area, Layer 1 extends from water table to between 30 and 60 ft AMSL
- Only a particle originating on the extreme **SW corner** of Claremont site is predicted not to be captured by Claremont extraction wells



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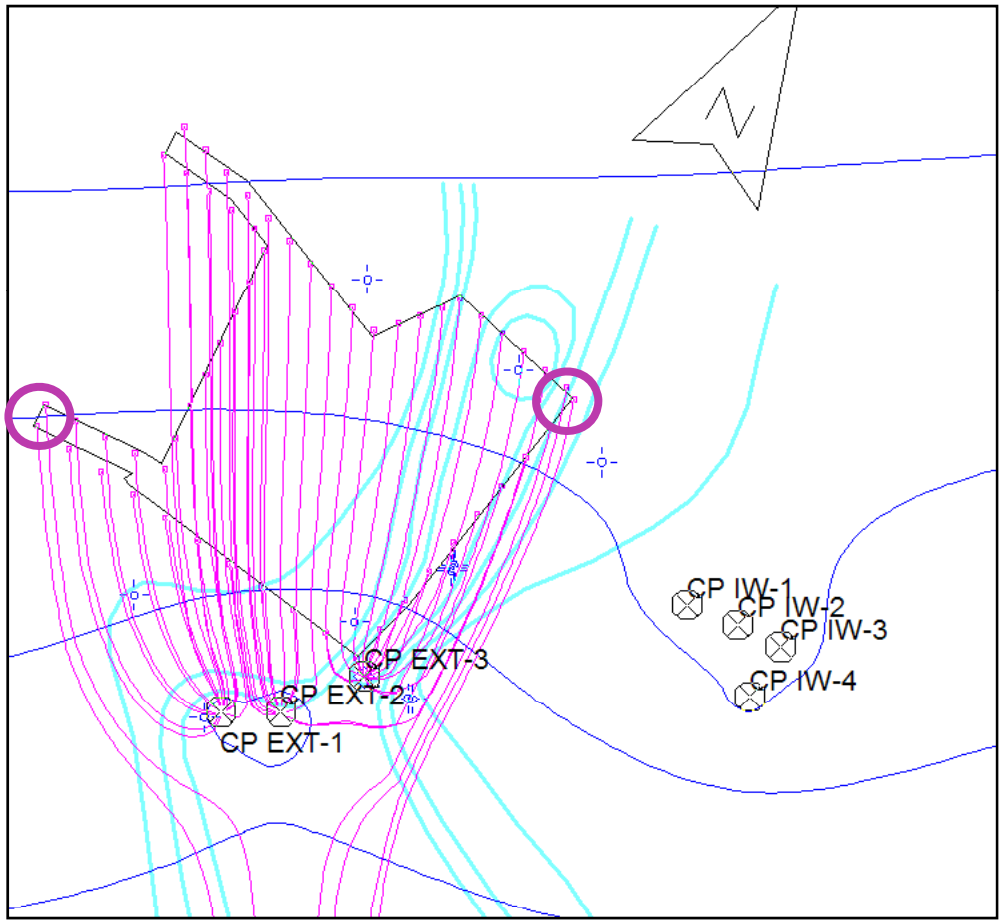
Capture of Claremont Contamination: Particle Tracks Originating at Bottom of Layer 2

- In Claremont area, bottom of Layer 2 ranges between -11 and -45 ft AMSL
- A number of particles on the extreme southwest and northeast corners of Claremont site are predicted not to be captured
  - Includes part of the high concentration area from off-site to the north
  - Particle tracks that are not captured continue to the south/southeast until they are captured by the Town of Oyster Bay extraction well R-5.



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Capture of Claremont Contamination by Claremont Extraction System

- Particle tracking on previous two slides demonstrates that groundwater within nearly the entire Claremont site footprint in layers 1 and 2 (the top ~100ft of saturated thickness) is captured by the Claremont extraction system
  - Using April 2010 extraction rates totaling ~340 gpm
- Exceptions: extreme southwest and northeast corners of site not captured
  - No known Claremont sources in these areas
- Capture zone will narrow moving below layer 2
  - Bottom of layer 2 corresponds to bottom of extraction well screens
  - However, assuming deep migration of DNAPL did not occur at Claremont, contamination should start relatively shallow (layer 1)
  - So, critical issue from standpoint of capturing Claremont contamination is that extraction wells capture shallow groundwater on-site, which is demonstrated by particle tracking results

Estimation of off-site TCE contribution to Claremont groundwater extraction system

Estimation of Off-Site TCE Contribution to Claremont Groundwater Extraction System

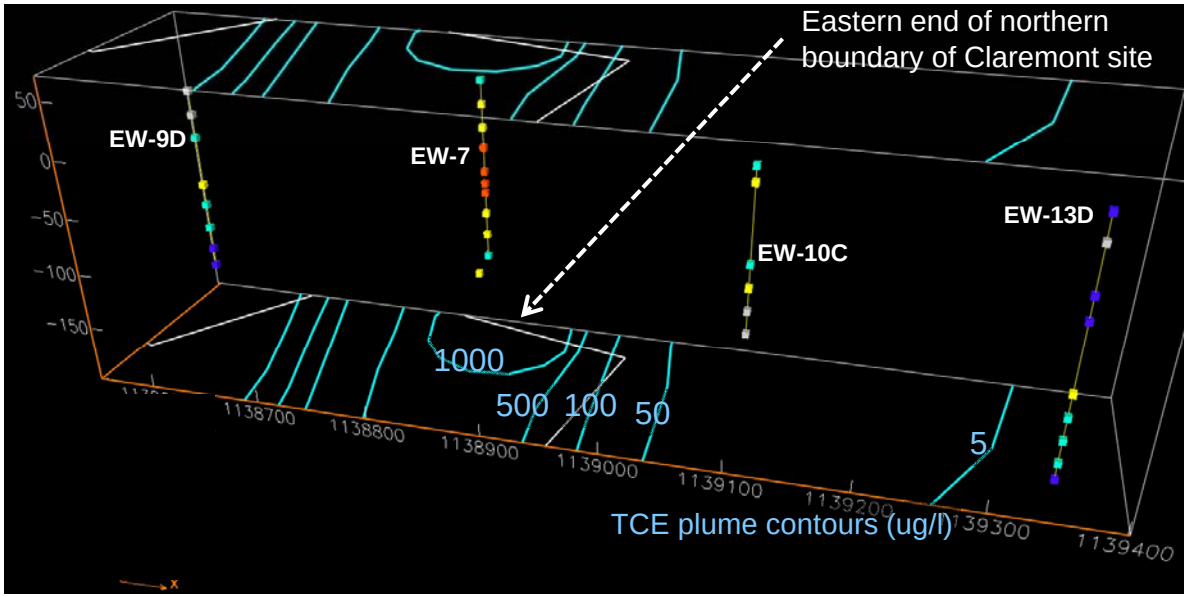
- Objective: Estimate TCE mass contribution to Claremont extraction system from upgradient (to north) off-site contamination

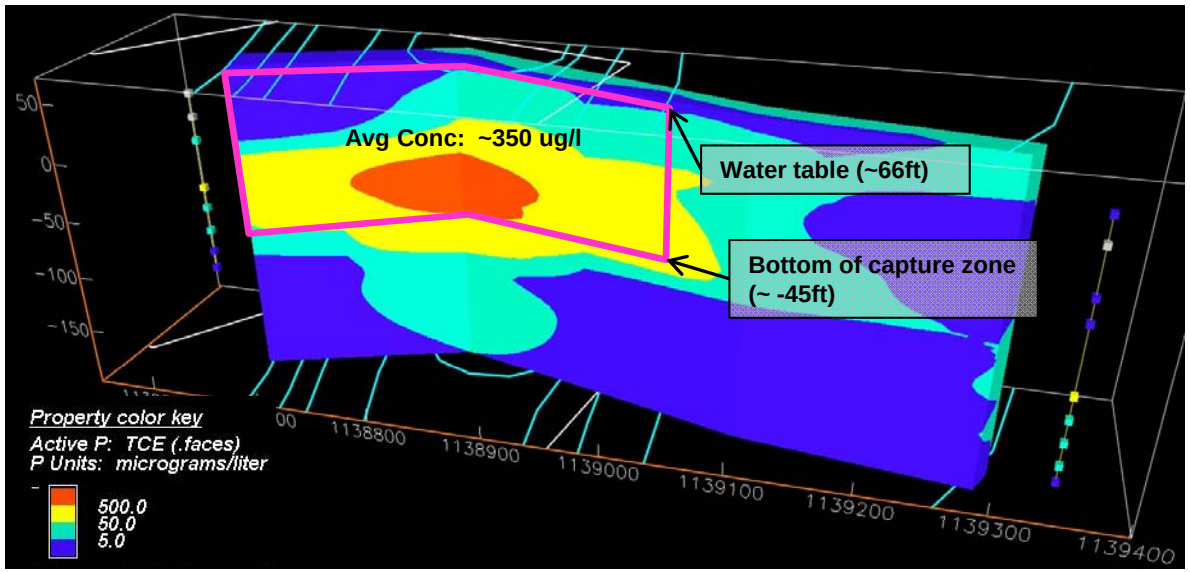
- Methods
  - Use April 2010 extraction system monitoring data (TCE concentrations and extraction rates) to calculate actual mass removal rate
  - Use model to estimate TCE mass contribution from off-site to north
    - Develop cross-sectional understanding of TCE concentrations at upgradient boundary of site
      - » Develop from April 2010 TCE groundwater quality data together with TCE data from discrete interval sampling during well installation
      - » Cross-section then used to specify concentrations in model at upgradient site boundary
      - » Do *not* include any *on-site* concentrations/sources in this model simulation (want off-site contribution only)
    - Simulate April 2010 extraction rates in model
    - Predicted mass removal rates for EXT-1, EXT-2, & EXT-3 combined for this simulation will then provide an estimate of off-site TCE contribution
  - Compare estimated off-site contribution to total removal rate

Estimation of Off-Site TCE Contribution to Claremont Groundwater Extraction System

Cross-Section of TCE Plume at Northern Boundary of Claremont Site

- Cross-section on this slide used to develop average concentration of plume crossing onto Claremont site at northern boundary
  - Top image shows April 2010 TCE groundwater quality data together with TCE data from discrete interval sampling during well installation
  - Bottom image shows cross-section thru a grid developed from this data, and average TCE concentration within window captured by Claremont extraction system
    - Average concentration estimated from grid
  - Average concentration then simulated in the model with current pumping rates to estimate mass contribution from off-site to the gw extraction system (see results on previous slide)





Estimation of Off-Site TCE Contribution to Claremont Groundwater Extraction System

TCE mass calculations/estimates via methods outlined on slide 9

- Calculated total mass removal: ~0.12 kg/d (details in 1st table below)
- Estimated off-site (upgradient) contribution: ~0.05 kg/d (details in 2nd table below)
- Estimated off-site (upgradient) percentage contribution: 0.05/0.12 = ~40%
  - Greatest uncertainty in estimate is the 350 ug/l estimated avg concentration described in previous slide and in note at bottom

Claremont Groundwater Extraction System:
Calculated Total TCE Mass Removal based upon April 2010 Extraction System Monitoring Data

	EXT-1	EXT-2	EXT-3	*total*	comment
Q (gpm)	110	113	118.5	*341.5*	average for April 2010
TCE (ug/l)	5.8	21	160	*NA*	4/12/2010 sampling results
TCE removal rate (kg/d)	3.48E-03	1.29E-02	1.03E-01	*0.12*	per-well product of flow rate and concentration

Claremont Groundwater Extraction System:
Estimated TCE Mass Contribution from Off-site Upgradient Sources[1]

	EXT-1	EXT-2	EXT-3	*total*	comment
Q (gpm)	110	113	118.5	*341.5*	average for April 2010
estimated TCE concentration contribution (ug/l)	0.07	12.46	61.6	*NA*	simulated contribution due only to upgradient sources[1]
estimated TCE rate contribution (kg/d)	4.20E-05	7.67E-03	3.98E-02	*0.05*	simulated contribution due only to upgradient sources[1]

[1]Using April 2010 TCE groundwater quality data together with TCE data from discrete interval sampling during well installation, a cross-section of the TCE plume at the north end of the Claremont site was constructed. From this cross-section, an average TCE concentration of 350 ug/l was estimated across the width of the TCE plume at the north end of the Claremont site, within the vertical capture interval of the 3 Claremont extraction wells (water table to about -45ft). This 350 ug/l average concentration was specified in the flow and transport model as a constant concentration condition across the width of the TCE plume at the north end of the Claremont site. A steady-state flow and transport simulation was then conducted to estimate the concentrations contributions at the three Claremont extraction wells due only to the upgradient contamination.

Summary

- Groundwater within nearly the entire Claremont site footprint in layers 1 and 2 (the top ~100ft of saturated thickness) is captured by the Claremont extraction system using April 2010 rates
  - Small exceptions fall in areas with no known Claremont sources

- Off-site (upgradient) TCE contribution to Claremont groundwater extraction system estimated to be ~0.05 kg/d, or ~40% of total TCE extraction rate