

AREA B GROUNDWATER INVESTIGATION

Progress Report to the RAB
April 18 2012



Overview of Topics

- ❑ Background/objectives of the current phase of work
- ❑ Status of rights-of-entry for off-site work
- ❑ Status of field work
 - ❑ Monitoring well installation on-site
 - ❑ Direct push sampling on and off-site
 - ❑ Stream survey (seep and spring identification)
 - ❑ Groundwater/surface water sampling
- ❑ Anticipated path forward

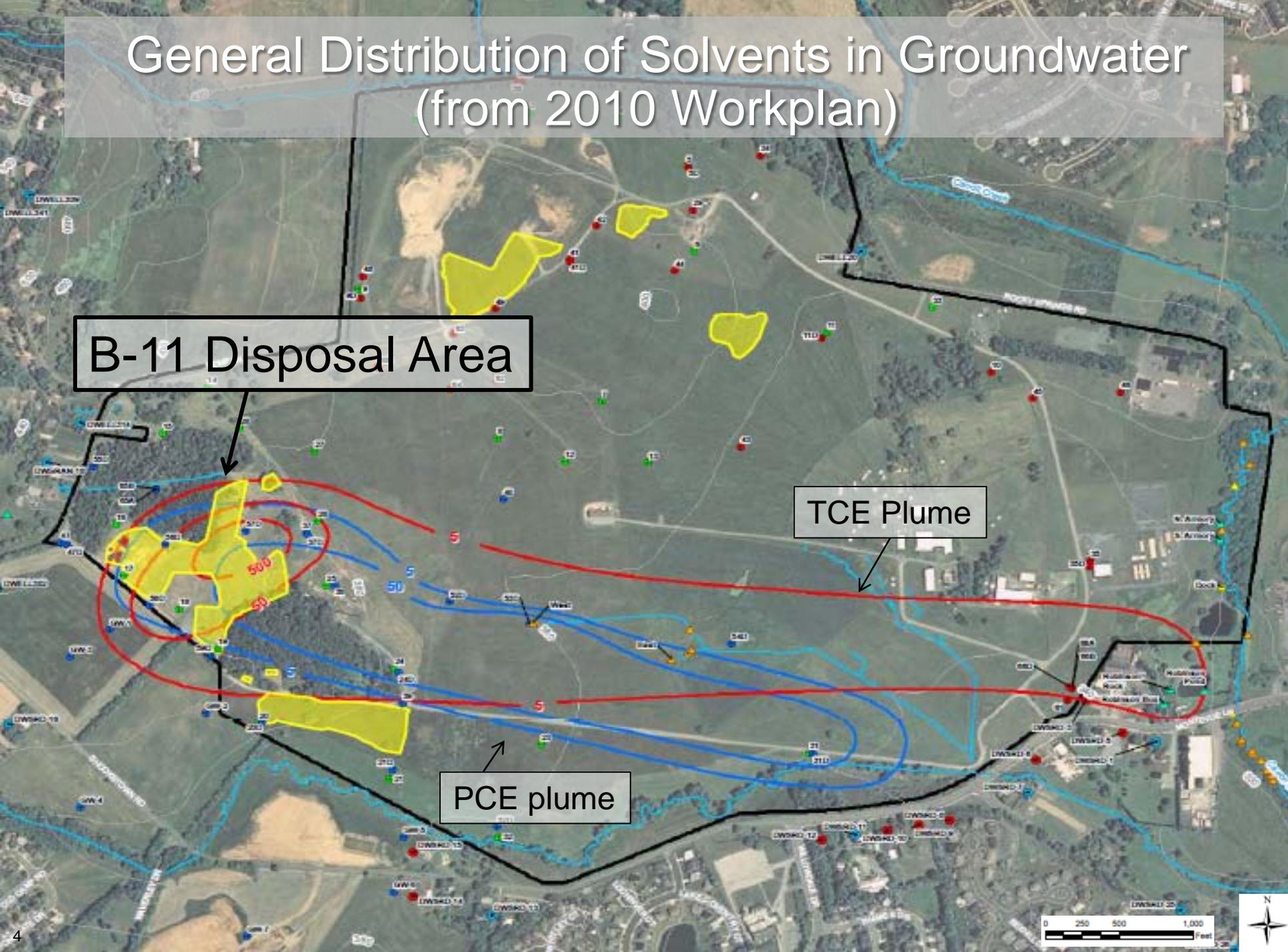
Background/ Study Objectives

General Distribution of Solvents in Groundwater (from 2010 Workplan)

B-11 Disposal Area

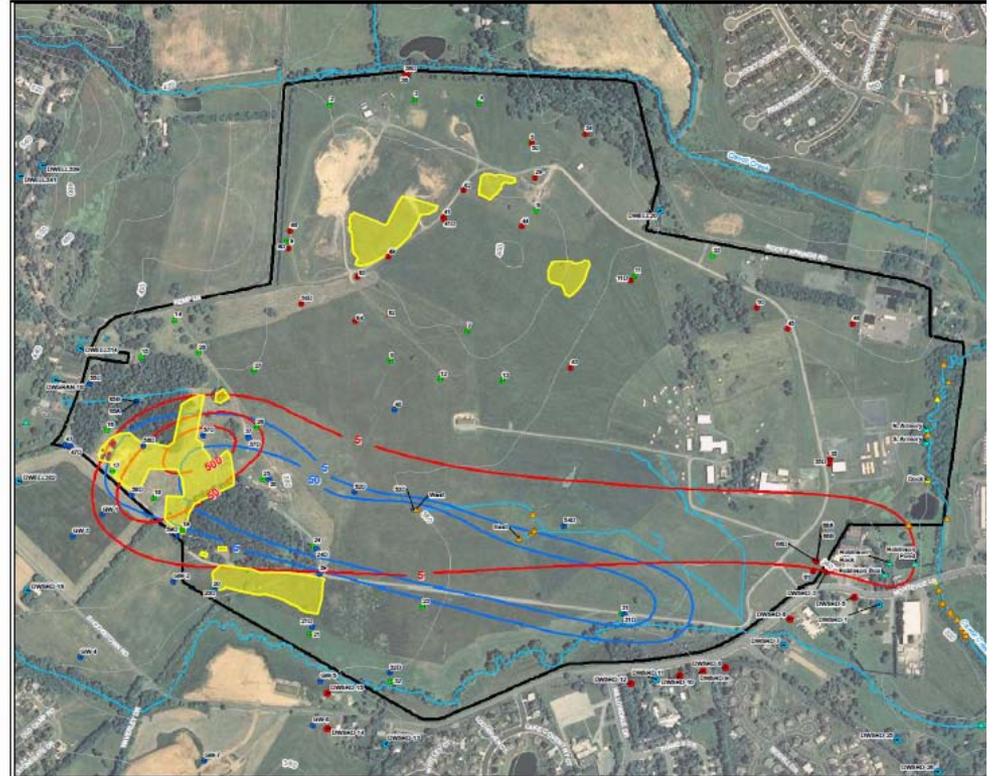
TCE Plume

PCE plume



Objectives of the Current Study

- Further assess the depth and extent of contamination
- Further assess possible groundwater flow directions including deep groundwater under Carroll Creek
- Further assess the potential for vapor intrusion into on and off site buildings
- Further assess the full range of possible chemical compounds



Planned/On-Going Work

- ▶ Existing well assessment and repair Feb 2011 to Apr 2011
- ▶ New well installation April 2011 to Mar 2012
- ▶ Direct Push Investigation March 2012
- ▶ Spring and Seep Surveys March 2012
- ▶ Groundwater/Surface Water Sampling April 2012/Sept 2012
- ▶ Vapor Intrusion Sampling Summer 2012
- ▶ Dye trace study Summer 2012

OFF-SITE RIGHTS OF ENTRY

ROE Status – APRIL 2012

Remedial Investigation Fort Detrick Frederick, MD



Right-of-Entry Status April 2012

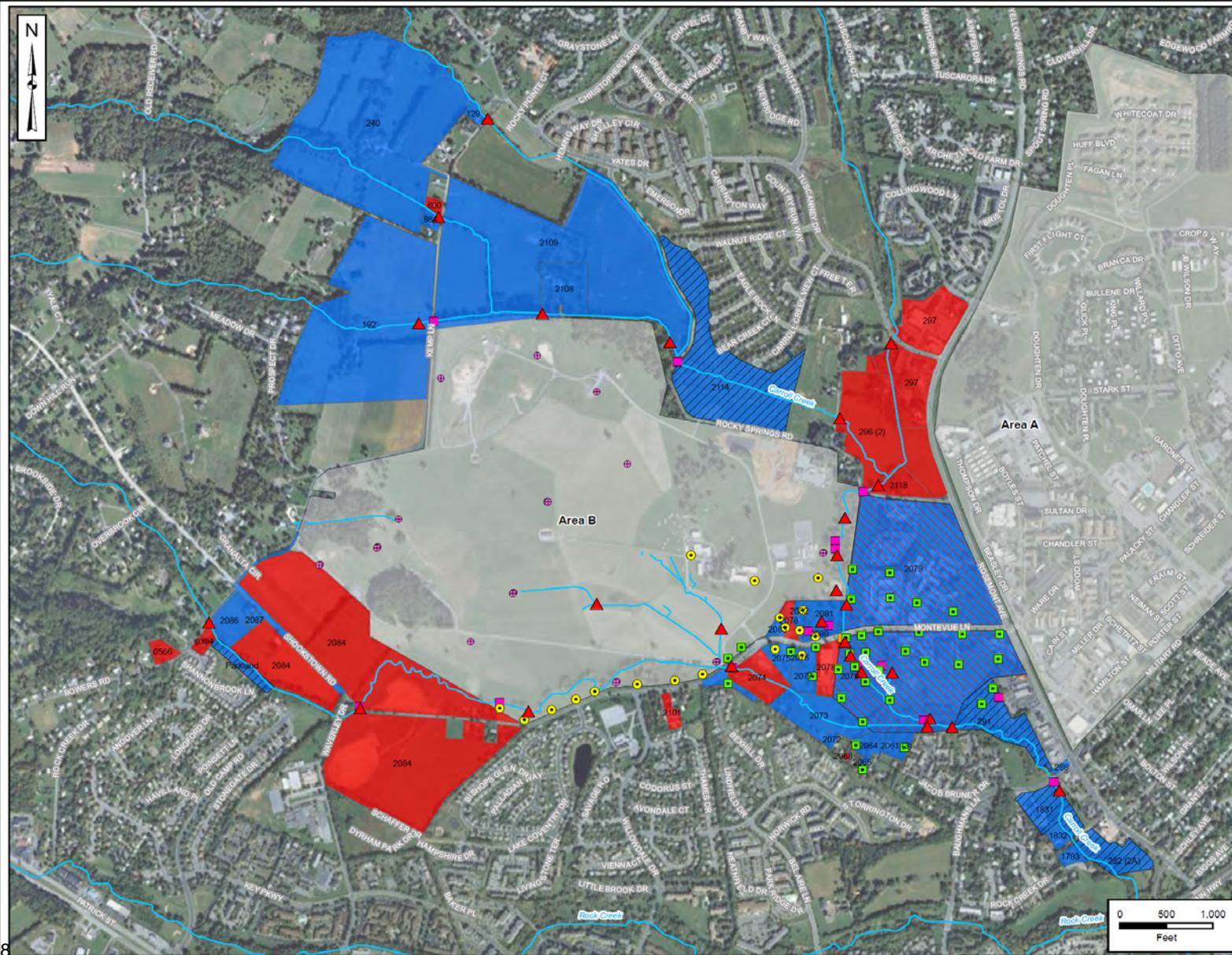
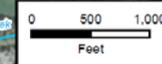
Legend

- Proposed Surface Water/Sediment Sample Location
- Continuous Stage Gauge Location
- Manual Stage Gauge Location
- Proposed DPT Location
- Proposed PZ Location
- Proposed Monitoring Well
- Stream
- Fort Detrick Boundary
- City Property
- County Property
- Right-of-Entry Status**
- Access Granted or Expected
- Access Denied or Unresponsive

Data Source: ESRI, ArcGISOnline, Aerial Photo, 2008

Coordinate System: Maryland State Plane
Datum: NAD 1983
Units: Feet

Date: April 2012

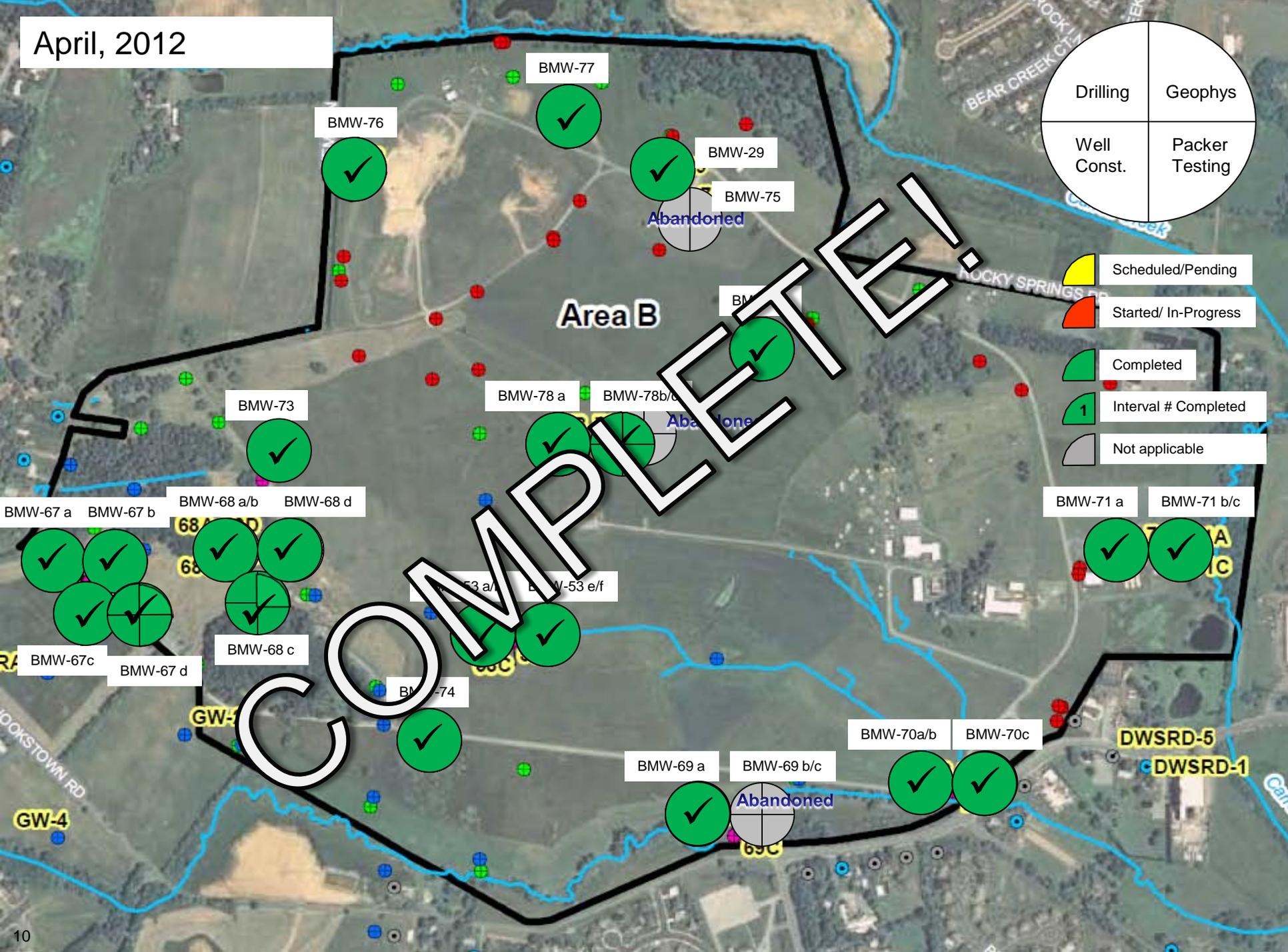
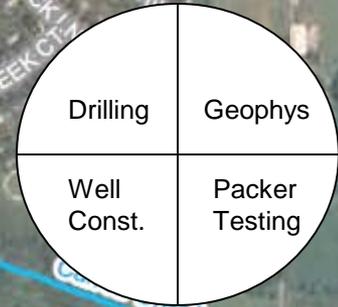


ONSITE WELL DRILLING



5/20/2011 1:02pm

April, 2012



COMPLETED!

Area B

BMW-77

BMW-76

BMW-29

BMW-75

BMW-73

BMW-78 a

BMW-78 b/c

BMW-68 a/b

BMW-68 d

BMW-67 a

BMW-67 b

68 a/b

68 c

53 a/b

BMW-53 e/f

BMW-67c

BMW-67 d

BMW-68 c

BMW-74

BMW-70 a/b

BMW-70 c

BMW-69 a

BMW-69 b/c

DWSRD-5

DWSRD-1

GW-4

GW-5

69 c

Status of Drilling Program

- ▶ 29 new monitoring wells installed (~100 wells total)
- ▶ Wells are up to 325 feet deep
- ▶ 3,966 linear feet of drilling completed
- ▶ 3,028 linear feet of geophysical logging completed
- ▶ Subsurface conditions consistent with expectations
 - ▶ Groundwater flows in fractures and solution features
 - ▶ Highest concentrations TCE/PCE in vicinity of B-11

DIRECT PUSH SAMPLING



DPT METHODOLOGY

Hydraulic pressure used to advance 3-inch steel tube to top of rock

Temporary well screen exposed or small diameter well installed

Groundwater samples are then collected via surface pump for analyses



DPT Update

- DPT work completed 3/22/12
- 52 locations
- Refusal at 13 locations. Multiple attempts in each area, but no groundwater samples could be collected at these locations
- 39 groundwater samples collected and submitted for laboratory analysis
- Validated data due mid May
- Data to be presented at future RAB





2/28/2012 15:05

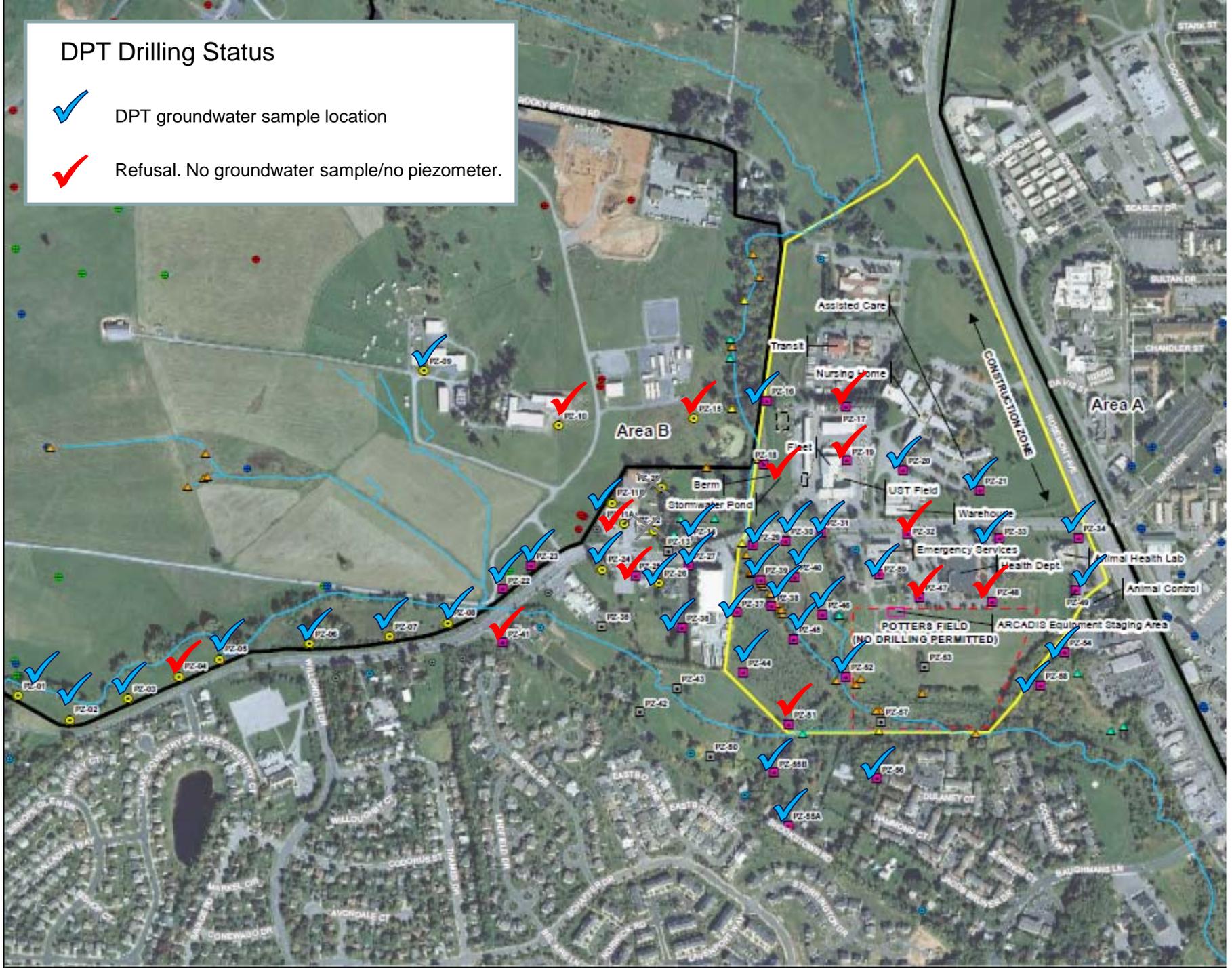
DPT Drilling Status



DPT groundwater sample location



Refusal. No groundwater sample/no piezometer.



SEEP AND SPRING SURVEY



Seep and Spring Survey

13,000 feet of stream bed surveyed

Visual inspection for seeps and springs

Water quality parameters collected in vicinity of possible springs (pH, temp, oxygen etc)



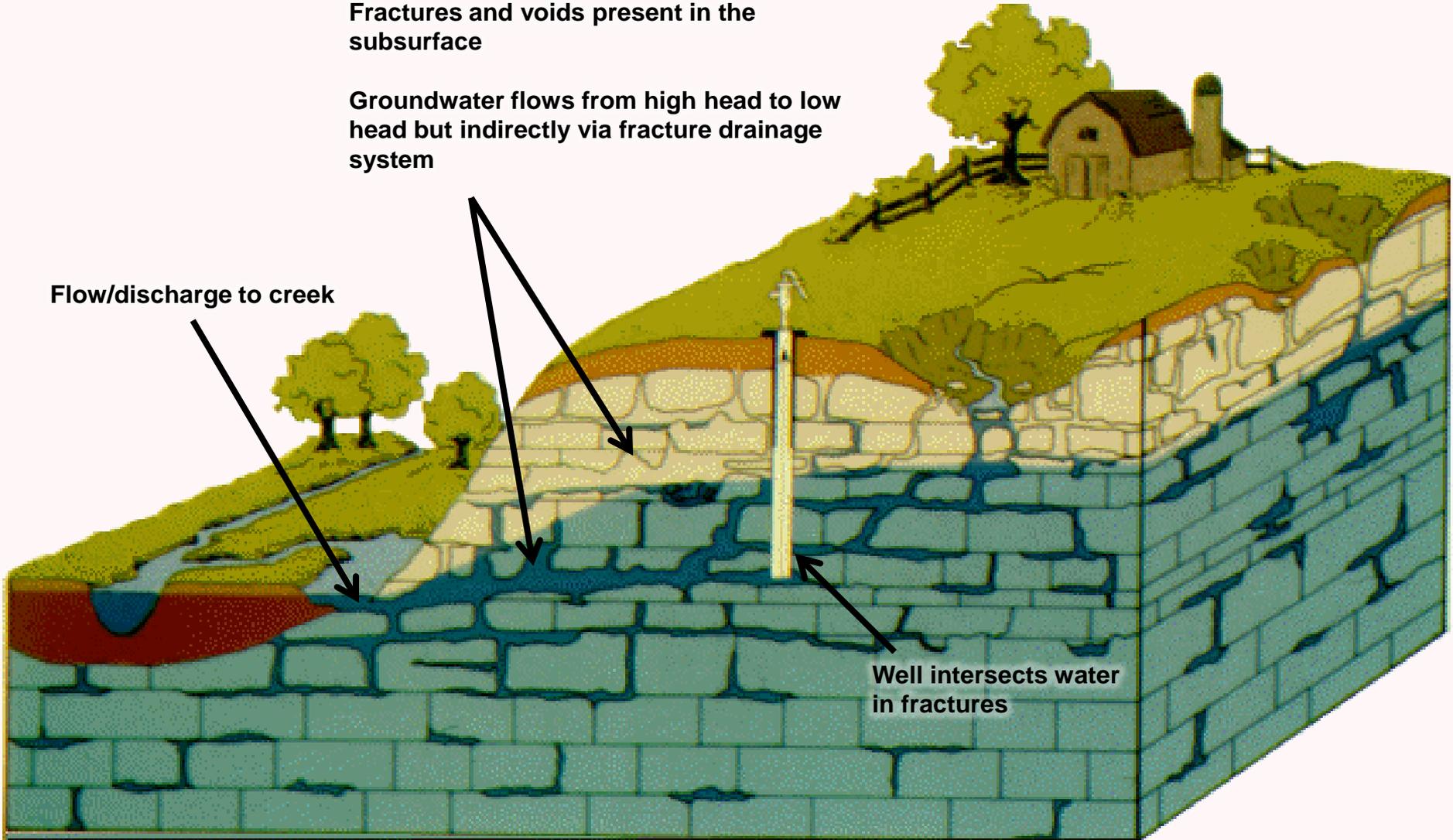
General Groundwater Flow in Limestone/Karst

Fractures and voids present in the subsurface

Groundwater flows from high head to low head but indirectly via fracture drainage system

Flow/discharge to creek

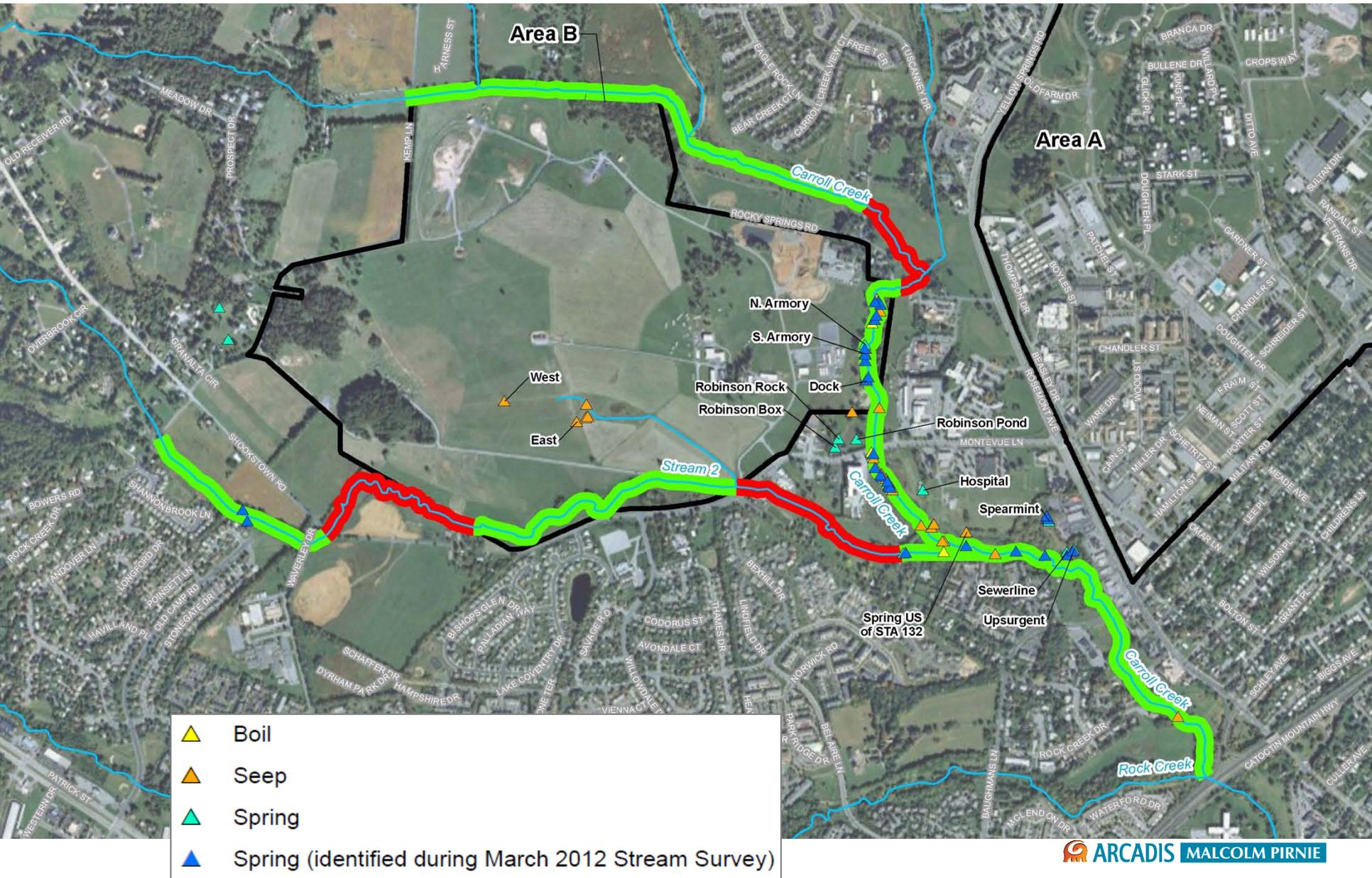
Well intersects water in fractures



Spring/Seep Surveys

Green = Access granted or expected

Red = Access denied or unresponsive



Seep and Spring Survey

~ 40 seeps and springs identified

18 new stream elevation gauges installed

Surface water and sediment sampling is currently being conducted



Robinson Box Spring



Robinson Pond

POSSIBLE SEEP



STREAM GAUGE



APRIL 2012 SAMPLING



Sampling Locations: April 2012

GROUNDWATER

Elevation data at 157 monitoring wells

Samples at 79 monitoring wells and 5 private wells

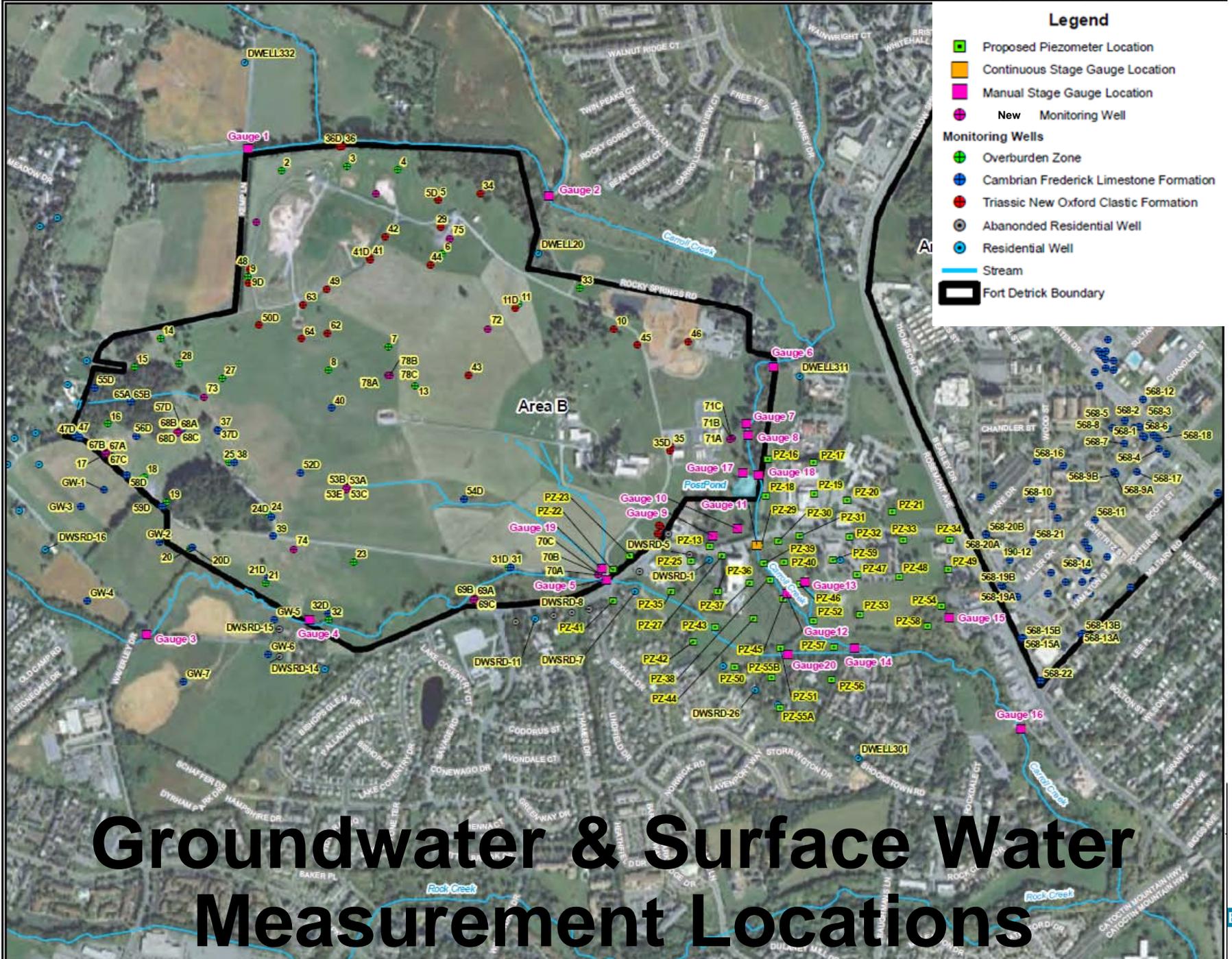
SURFACE WATER

Elevation data at 20 locations

27 stream samples

SEDIMENT

32 sediment samples from stream bed and springs



Legend

- Proposed Piezometer Location
- Continuous Stage Gauge Location
- Manual Stage Gauge Location
- + New Monitoring Well

Monitoring Wells

- + Overburden Zone
- + Cambrian Frederick Limestone Formation
- + Triassic New Oxford Clastic Formation
- Abandoned Residential Well
- Residential Well

- Stream
- Fort Detrick Boundary

Groundwater & Surface Water Measurement Locations

Analytical Parameters

- TCL volatile organic compounds with library search for unknowns
- TCL semi-volatile organic compounds with library search for unknowns
- TCL Pesticide/PCBs
- Chlorinated herbicides and picloram
- TAL Metals
- Dioxin/Furans
- Gross alpha/Gross beta
- 1,4-Dioxane



Analytical Parameters (cont)

Freons

1,2,4-trimethylbenzene

1,2,3-trichlorobenzene

1,2,4-trichlorobenzene

1,2,3-trichloropropane

Bis (2-chloroisopropyl)
ether

DBCP

EDB

BCEE

Dalapon

Diquat (water only)

Simazine

Monuron

Diuron

Fenuron

Endothall

Cyanide

Boron

Anions

Cations

TDS

Alkalinity





Anticipated Path Forward

Development of
Conceptual Site Model

CONCEPTUAL SITE MODEL

CSM integrates all the information gathered into a succinct format allowing clear understanding of groundwater flow and potential contaminant nature and extent

CSM is used to identify possible data-gaps (if any) and guides future work including assessment of possible remedies at the Feasibility Study stage

ELEMENTS OF THE CSM

Geologic Framework

Geologic structure is the basic foundation of a CSM

- Drilling program provides this information

Groundwater and surface water flow patterns

Flow patterns drive migration of contaminants

- Water elevation data used to determine horizontal and vertical flow patterns

ELEMENTS OF THE CSM (cont.)

Groundwater discharge areas

Indicates where contaminated groundwater may discharge to the surface

- Stream survey provides this information

Nature and extent of contamination

Actual extent of groundwater contamination and documents contaminated groundwater discharge locations

- Groundwater/surface water sampling provides this information

PATH FORWARD

Conduct dye trace study to assess deep groundwater flow (Summer)

Conduct vapor intrusion sampling (Summer)

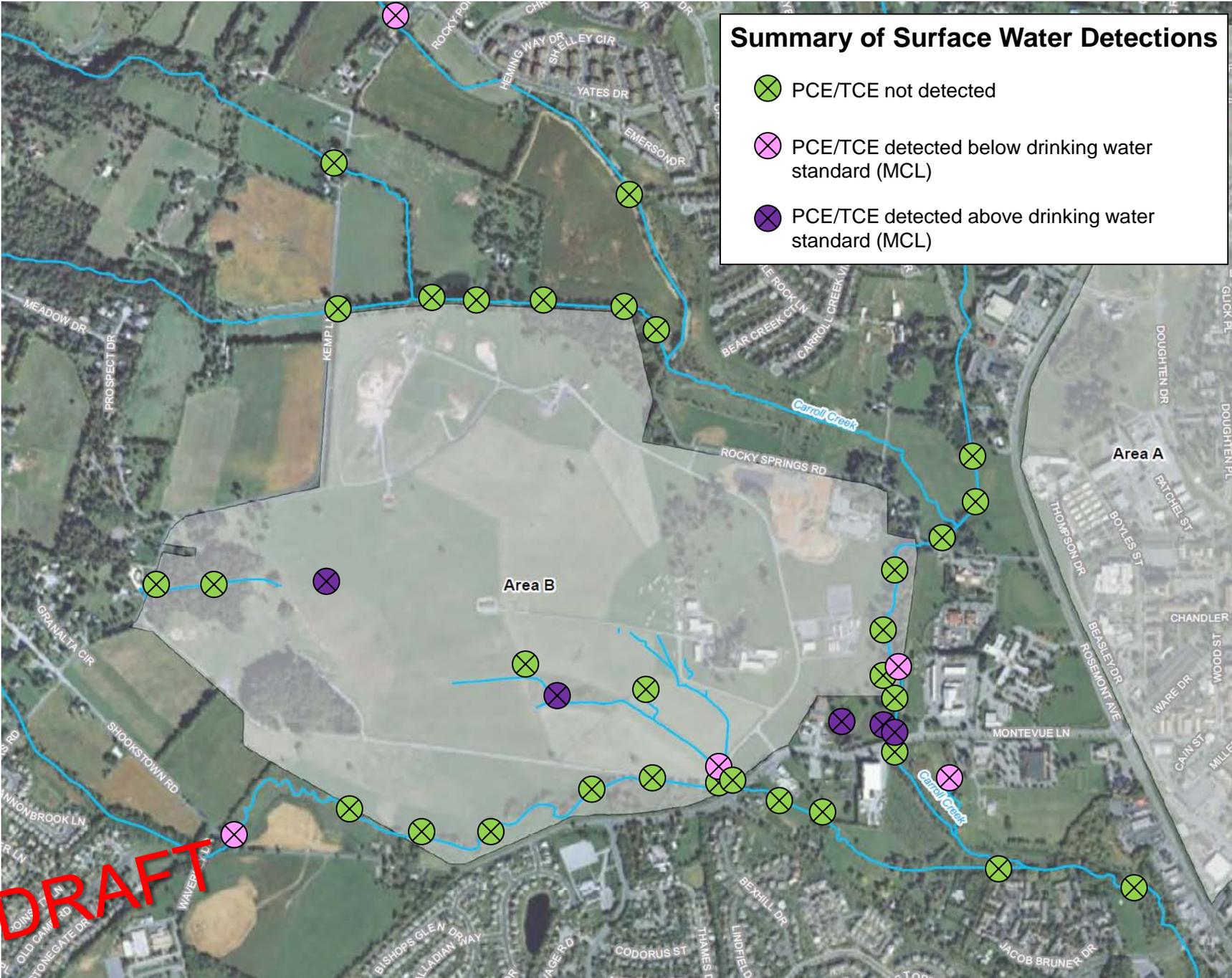
Conduct groundwater/surface water sampling in Fall 2012

Develop draft CSM (Summer)

QUESTIONS AND DISCUSSION

Summary of Surface Water Detections

-  PCE/TCE not detected
-  PCE/TCE detected below drinking water standard (MCL)
-  PCE/TCE detected above drinking water standard (MCL)



VOCs Dilute/Volatilize Rapidly In Surface Water



Aerial Source: Pictometry Birdseye (c) 2010 Pictometry International Corp (c) and (c) 2010 NAVTEQ (c) 2010 Microsoft Corp.

- Low or non-detect concentrations found downstream of detections.