Informational Meeting: Onsite and Offsite Response Action Plans

Kop-Flex Voluntary Cleanup Program Site #31

June 24, 2015

BACKGROUND – ONSITE AREA

SUMMARY OF SITE HISTORY

- **Koppers Company purchased the property, which included 92 acres north of State Route 100, and began manufacturing flexible couplings for the power transmission industry in 1969.**

- **In 1986, members of the management team acquired the company from Koppers and the eventually became Kop-Flex, Inc. By 1987, large portions of the property had been sold, leaving the current 25-acre property.**

- **In 1996, Emerson Electric Co acquired Kop-Flex and continued manufacturing couplings and drives at the site through 2011.**

SUMMARY OF SITE HISTORY (continued)

- **From 2012 to 2014, the manufacturing operations were decommissioned.**
- **In late 2014, Emerson transferred the property to EMERSUB 16 LLC and entered into an agreement to sell the property to Trammel Crow who plans to redevelop the property for commercial use.**
- **EMERSUB 16 LLC is the applicant for the site under the Voluntary Cleanup Program (VCP).**


HARMANS ROAD
STONY RUN
PARKING AREA
VERIZON
PARKING AREA
WILLIAMS SCOTSMAN, INC.
OFFICE
FORMER MANUFACTURING BUILDING
FORMER FORGE SHOP
PENN CENTRAL RAILROAD TRACKS
ROUTE 100
N

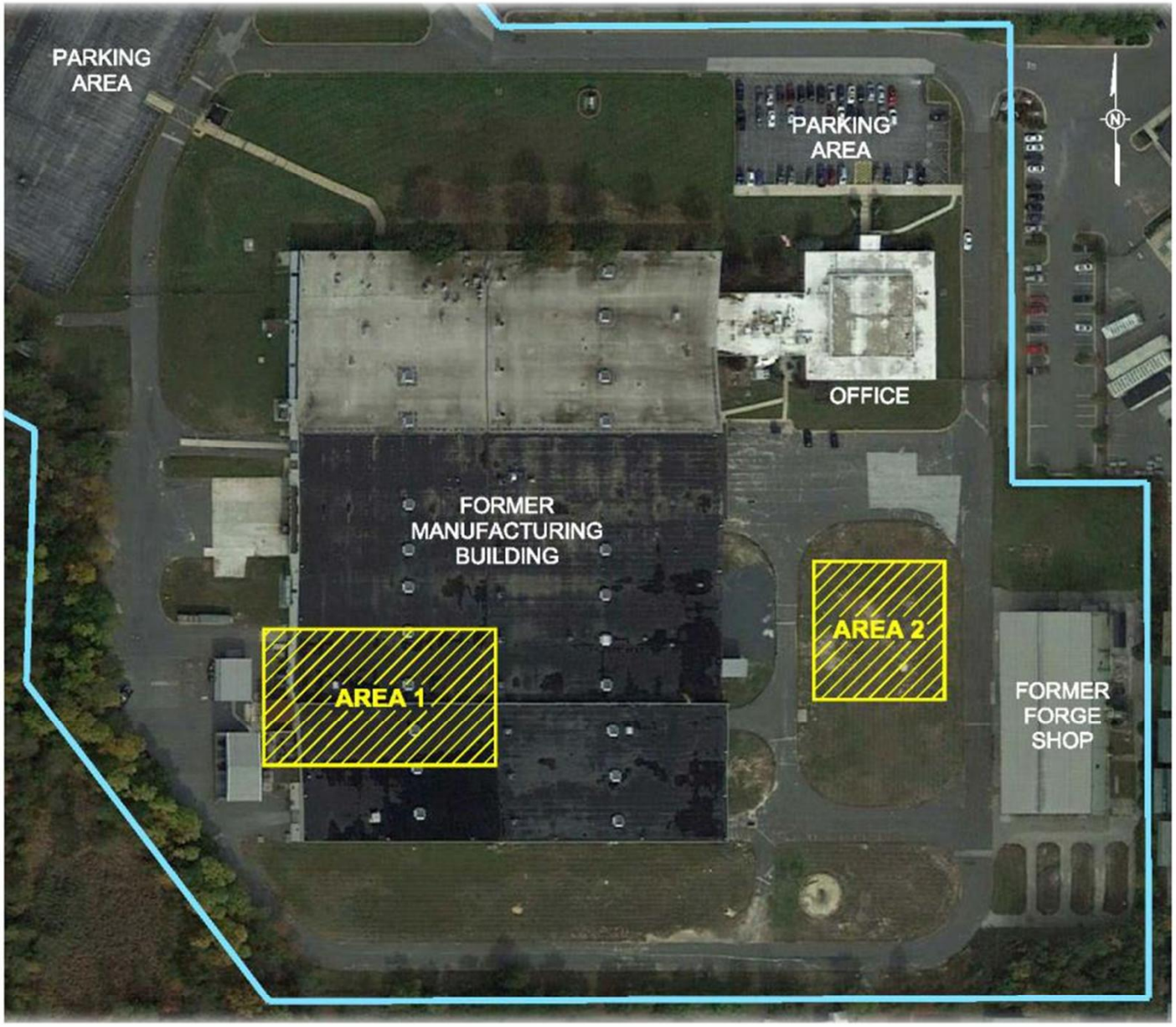
ENVIRONMENTAL INVESTIGATIONS

- **After acquisition of the property by Emerson, investigations conducted in 1996 and 1997 identified volatile organic compounds (VOCs) in soil and groundwater in two primary areas of concern**
  - Area 1 – machining area in southwest portion of manufacturing building
  - Area 2 – wastewater leach field east of manufacturing building

- **The VOC impacts in soil and groundwater are attributable to the historic use of degreasing solvents – primarily 1,1,1-trichloroethane (TCA) - during manufacturing operations. Use of this solvent ceased in 1993, before Emerson acquired the property.**

- **In July 1998, Emerson applied for inclusion of the Site into the MDE VCP; application was approved by in April 1999**

- **In 2000, Emerson prepared Response Action Plans (RAPs) to address the VOCs in the impacted areas on the property**


PARKING AREA
PARKING AREA
N
OFFICE
FORMER MANUFACTURING BUILDING
AREA 1
AREA 2
FORMER FORGE SHOP

VCP RESPONSE ACTIONS (2002 TO 2013)

- **Area 1 - soil vapor extraction (SVE) and dual phase extraction (DPE)**
  - SVE recovered soil vapor containing VOCs
  - DPE extracted both VOC-containing soil vapor and shallow groundwater

- **Area 2 - *in-situ* air stripping well technology**
  - Series of wells installed in the surficial aquifer within the affected area
  - Wells extracted, treated, and returned groundwater to the aquifer

MDE/EPA RESPONSE ACTION ACTIVITIES

- **In January 2010, Emerson was notified by USEPA that the property was subject to oversight by the Resource Conservation and Recovery Act (RCRA) Corrective Action Program.**
- **In cooperation with EPA and MDE, additional investigations were conducted between 2010 and early 2013 to evaluate soil and groundwater at the site.**

MDE/EPA RESPONSE ACTION ACTIVITIES (continued)

- **Soil sampling results identified a source area immediately east of the building.**
- **Groundwater investigations identified two distinct hydrogeologic units**
  - Shallow (or surficial) water table aquifer to a depth of approximately 60 feet below ground surface (bgs); groundwater flow direction to the west towards Stony Run
  - Deeper semi-confined aquifer below 60 feet bgs; groundwater flow direction to the south-southeast
- **Groundwater sampling detected the presence of VOCs in deeper groundwater; VOCs were migrating offsite to the south in the deep aquifer.**
- **Based on these findings, Emerson agreed to implement supplemental response actions.**

SOIL SOURCE REMOVAL (2013 – 2014)

- **RAP Addendum for source area soils approved by MDE in July 2013**
- **Objective of supplemental response action to reduce contaminant mass and risk to human health and the environment**
- **Soil remedial activities included the following:**
  - Excavation and offsite disposal of source areas soils in areas 1 and 2
    - Area 1 – soils removed to a depth of 15 feet
    - Area 2 – soils removed to depths ranging from 18 feet to 23 feet
  - In eastern portion of Area 2, emulsified zero-valent iron was injected to promote the degradation of VOCs in groundwater.
- **The soil removal activities were conducted between October 2013 and March 2014**


PARKING AREA
PARKING AREA
OFFICE
FORMER MANUFACTURING BUILDING
AREA 2 EXCAVATION
AREA 2 INJECTION
FORMER FORGE SHOP
AREA 1 EXCAVATION

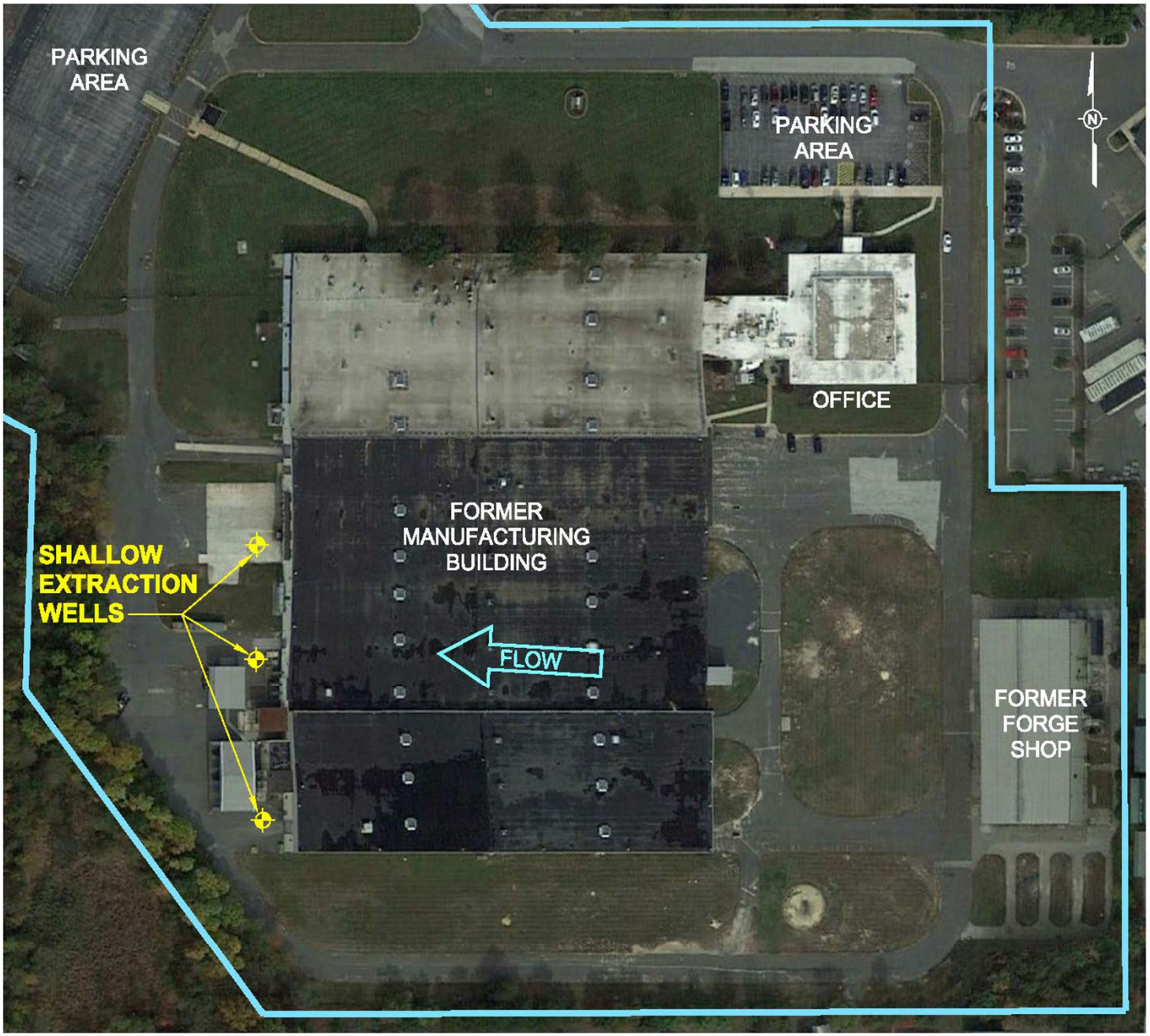
PROPOSED ONSITE RESPONSE ACTIONS

PROPOSED RESPONSE ACTION FOR SOIL

- **Current soil conditions pose no unacceptable risk to human health and the environment.**
- **Soil response actions will involve the implementation of institutional and engineering controls to prevent any potential future exposure to residual VOCs by workers**
  - Institutional controls
    - Restriction on property use to non-residential (commercial)
    - Plan for safely conducting digging (trenching and excavation) activities
  - Engineering controls
    - Passive sub-slab venting systems underneath buildings
    - Installation and maintenance of surface pavement in AOCs

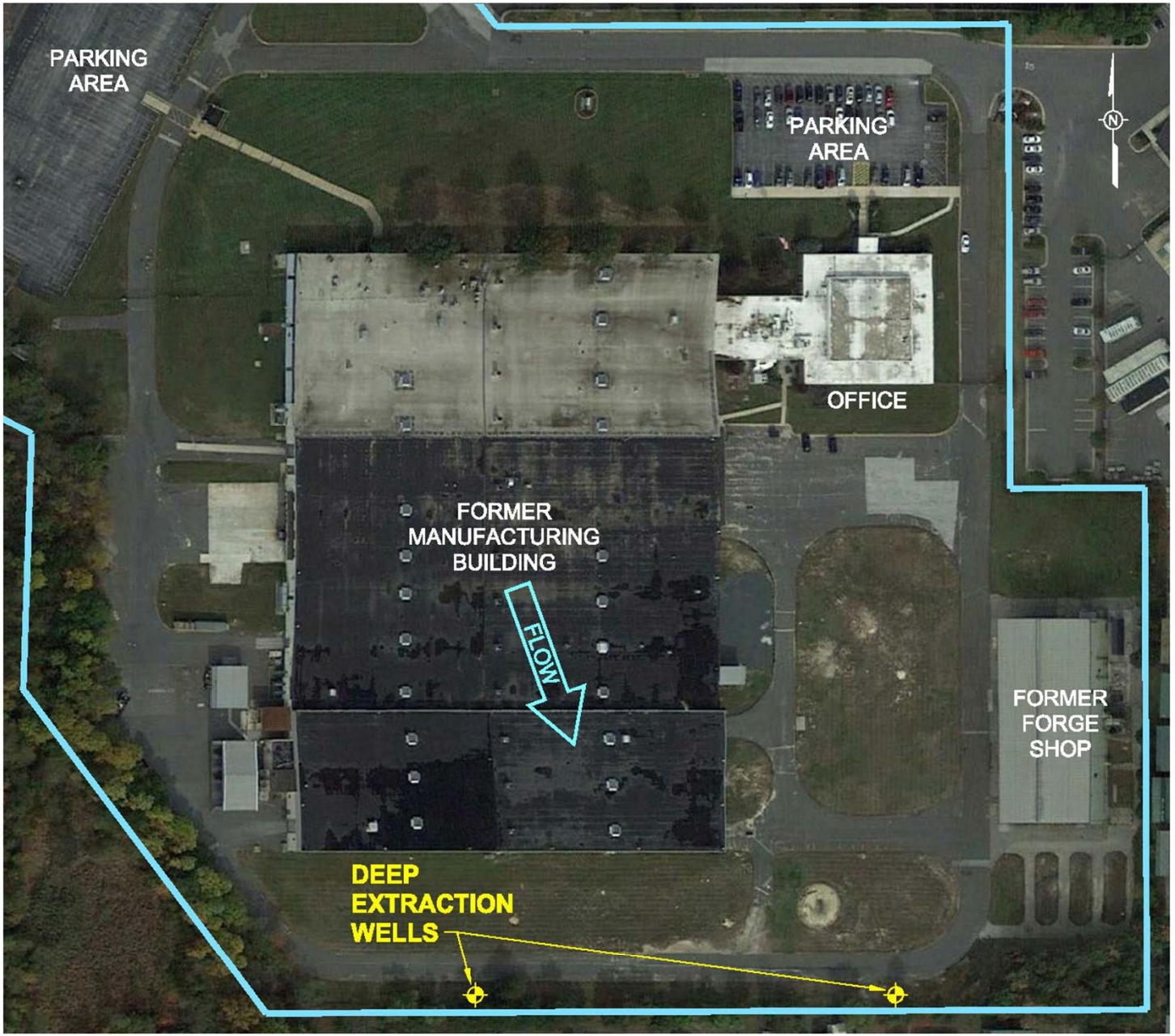
PROPOSED RESPONSE ACTION FOR GROUNDWATER

- **Remedial approach involves the installation of two groundwater extraction systems to hydraulically contain contaminated groundwater**
  - Shallow Aquifer Containment System
    - Groundwater flow in the shallow aquifer is to the west
    - Three pumping wells located west of former manufacturing building to extract VOC-impacted groundwater
    - Total groundwater withdrawal from the three extraction wells will be approximately 10 gallons per minute (gpm)


PARKING AREA
PARKING AREA
N
OFFICE
FORMER MANUFACTURING BUILDING
SHALLOW EXTRACTION WELLS
FLOW
FORMER FORGE SHOP

PROPOSED RESPONSE ACTION FOR GROUNDWATER (continued)

- Deeper Aquifer Containment system
  - Groundwater flow toward the south-southeast
  - Two pumping wells located along southern property boundary to control contaminated groundwater flow
  - Total groundwater withdrawal from the two deep extraction wells is approximately 70 gpm
- Implementation of a groundwater monitoring program to ensure control of contaminant migration


PARKING AREA
PARKING AREA
N
OFFICE
FORMER MANUFACTURING BUILDING
FLOW
FORMER FORGE SHOP
DEEP EXTRACTION WELLS

PROPOSED RESPONSE ACTIONS FOR GROUNDWATER (continued)

- Extracted groundwater will be treated to remove VOCs using a specialty proprietary resin
- Treated water will be discharged to Stony Run under a renewed NPDES permit
  - Permit will establish limits for treated water discharge
  - Sampling will be conducted monthly of the discharge to demonstrate compliance with limitations in NPDES permit
  - Results will be reported to MDE
- Preparation of a completion report in accordance with MDE guidance documenting the implementation of the response actions.

BACKGROUND – OFFSITE AREA

PREVIOUS OFFSITE INVESTIGATIONS

- **Groundwater samples from well on adjacent Williams-Scotsman property indicated the presence of site-related VOCs at levels of concern in the deep aquifer south of the Kop-Flex property.**
- **Based on these results, MDE and EPA requested that Emerson conduct the following activities:**
  - Sample potable water supply wells located south of the Kop-Flex property and MD Route 100.
  - Install additional monitoring wells in the offsite area to evaluate groundwater quality and flow.


HARMANS ROAD
STONY RUN
PARKING AREA
VERIZON
PARKING AREA
WILLIAMS SCOTSMAN, INC.
OFFICE
FORMER MANUFACTURING BUILDING
FORMER FORGE SHOP
PENN CENTRAL RAILROAD TRACKS
ROUTE 100
N

SAMPLING OF POTABLE WATER SUPPLY WELLS

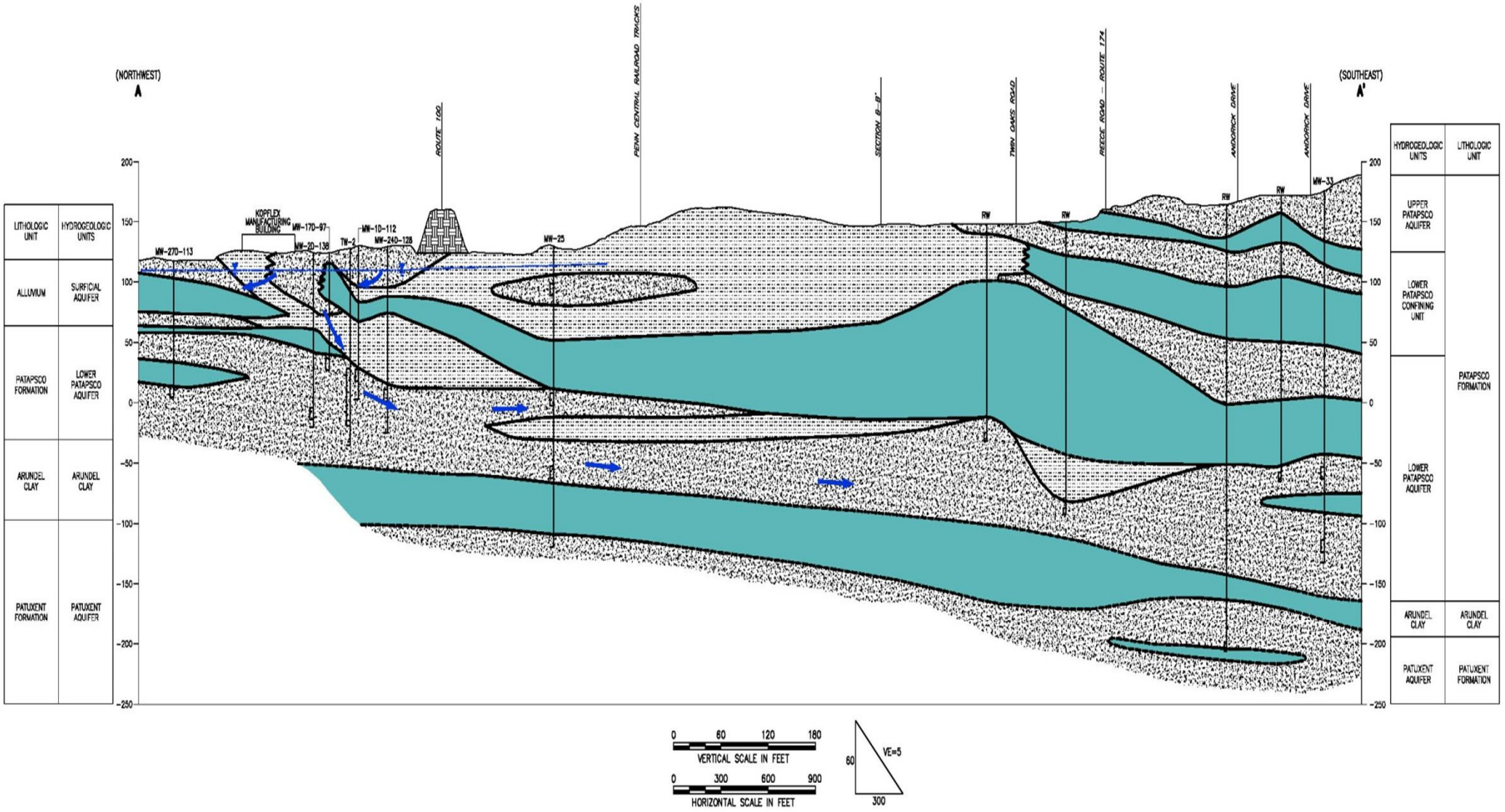
- **Total of approximately 175 wells sampled during three phases from late 2012 through early 2015.**
- **Eight potable water supply wells contained site-related VOCs above federal and/or state drinking water standards or risk based criteria.**
  - These eight potable water supply wells were decommissioned and the homes connected to the municipal water system.

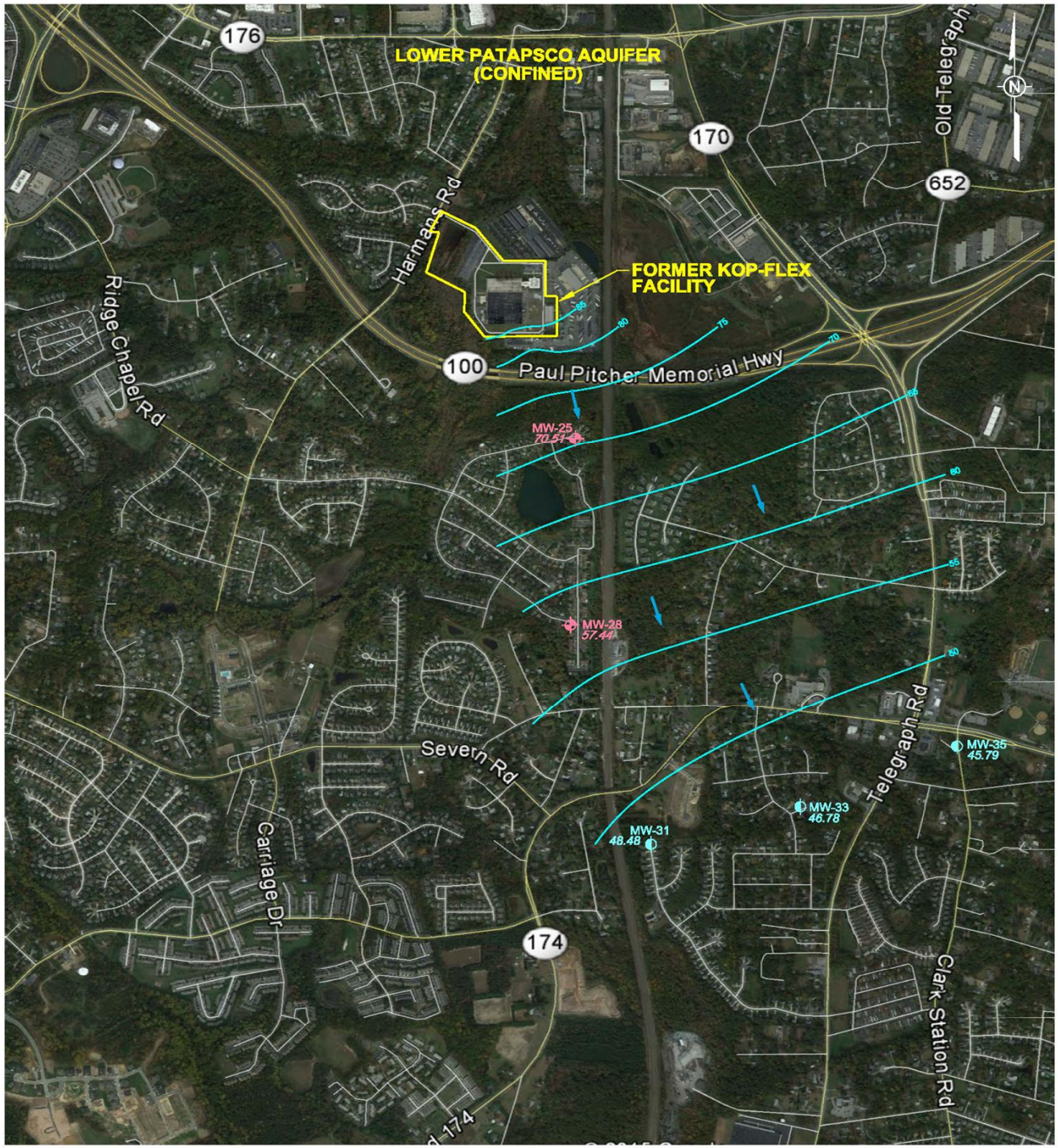
OFFSITE GROUNDWATER INVESTIGATION

- **Installation of additional monitoring wells began following issuance of county Right-of-Way work permits. Well locations approved by MDE and EPA.**
- **Monitoring wells installed at five locations in the residential areas south of MD 100 between June and August 2014.**
  - Shallow wells (<50 feet below ground surface) completed at two locations
  - Deep wells completed at all locations with depths ranging from 130 feet to approximately 300 feet
- **Quarterly sampling of all offsite monitoring wells, with three sampling events conducted to date.**

OFFSITE GROUNDWATER INVESTIGATION RESULTS

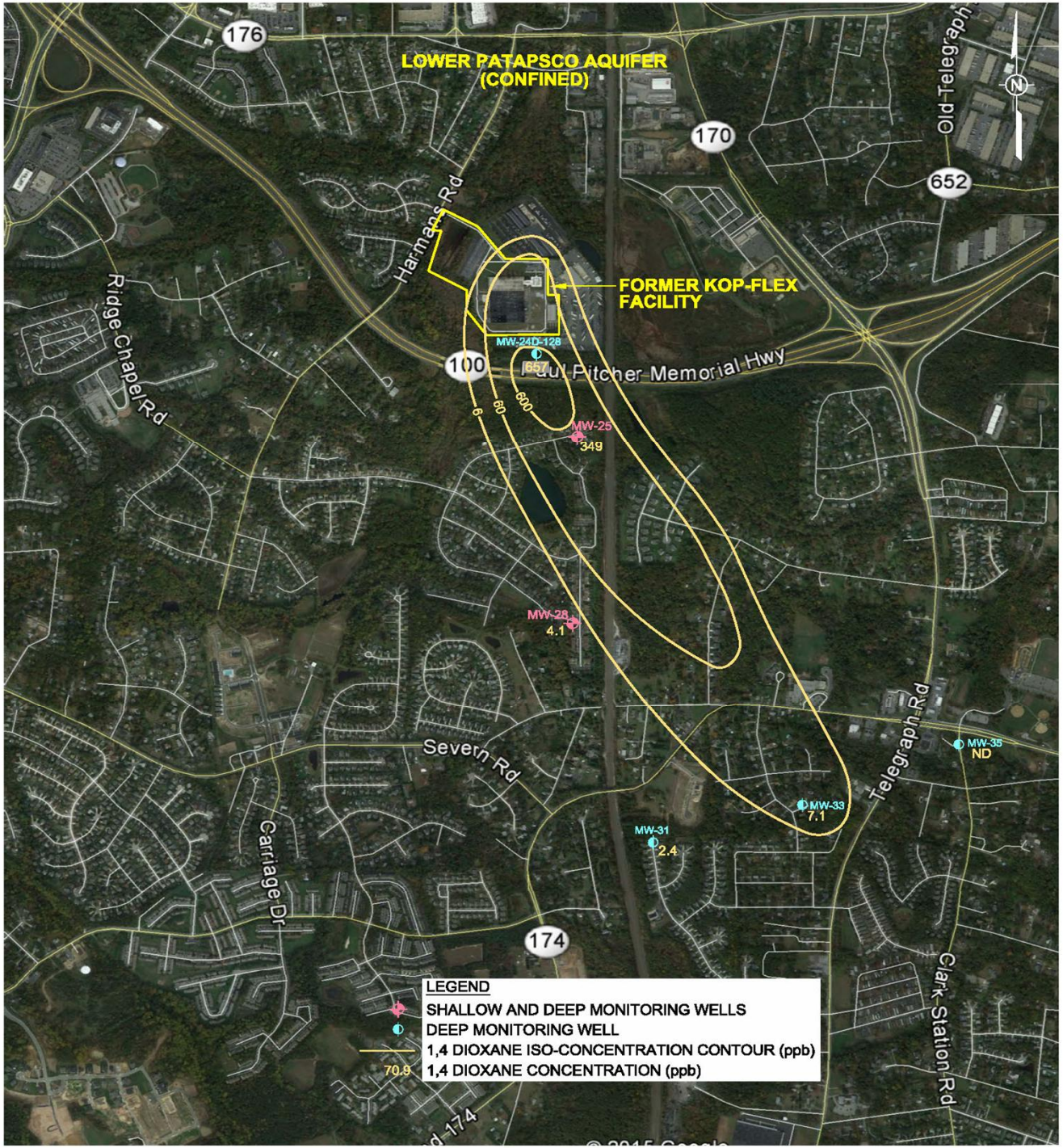
- **Site and surrounding area situated within the Atlantic Coastal Plain.**
- **On regional scale, subsurface deposits form alternating layers of predominately clayey to sandy deposits that dip, or are tilted, to the south and east.**
  - Sandy layers → aquifers
  - Clayey layers → aquitards or confining units
- **Primary unit of interest in offsite area is Lower Patapsco Aquifer.**
- **Groundwater flow in the deep portion of the Lower Patapsco aquifer is to the south-southeast; direction is consistent with data from deep wells at Kop-Flex site.**


(NORTHWEST)
A
(SOUTHEAST)
A'
ROUTE 100
PENN CENTRAL RAILROAD TRACKS
SECTION B-B'
TWIN OAKS ROAD
REECE ROAD – ROUTE 174
ANDORICK DRIVE
ANDORICK DRIVE
KOPPLEX MANUFACTURING BUILDING
MW-27D-113
MW-17D-97
MW-2D-136
TW-2
MW-1D-112
MW-24D-128
MW-25
MW-33
RW
200
150
100
50
0
-50
-100
-150
-200
-250
LITHOLOGIC UNIT
HYDROGEOLOGIC UNITS
ALLUVIUM
SURFICIAL AQUIFER
PATAPSCO FORMATION
LOWER PATAPSCO AQUIFER
ARUNDEL CLAY
ARUNDEL CLAY
PATUXENT FORMATION
PATUXENT AQUIFER
HYDROGEOLOGIC UNITS
LITHOLOGIC UNIT
UPPER PATAPSCO AQUIFER
LOWER PATAPSCO CONFINING UNIT
LOWER PATAPSCO AQUIFER
PATAPSCO FORMATION
ARUNDEL CLAY
ARUNDEL CLAY
PATUXENT AQUIFER
PATUXENT FORMATION
0 60 120 180
VERTICAL SCALE IN FEET
0 300 600 900
HORIZONTAL SCALE IN FEET
60
300
VE=5


LOWER PATAPSCO AQUIFER
(CONFINED)
FORMER KOP-FLEX
FACILITY
176
170
652
100
174
Harmans Rd
Ridge Chapel Rd
Paul Pitcher Memorial Hwy
Severn Rd
Carriage Dr
Telegraph Rd
Clark Station Rd
Old Telegraph
N
MW-25
70.51
MW-28
57.44
MW-31
48.48
MW-33
46.78
MW-35
45.79
85
80
75
70
65
60
55
50

OFFSITE GROUNDWATER INVESTIGATION RESULTS (continued)

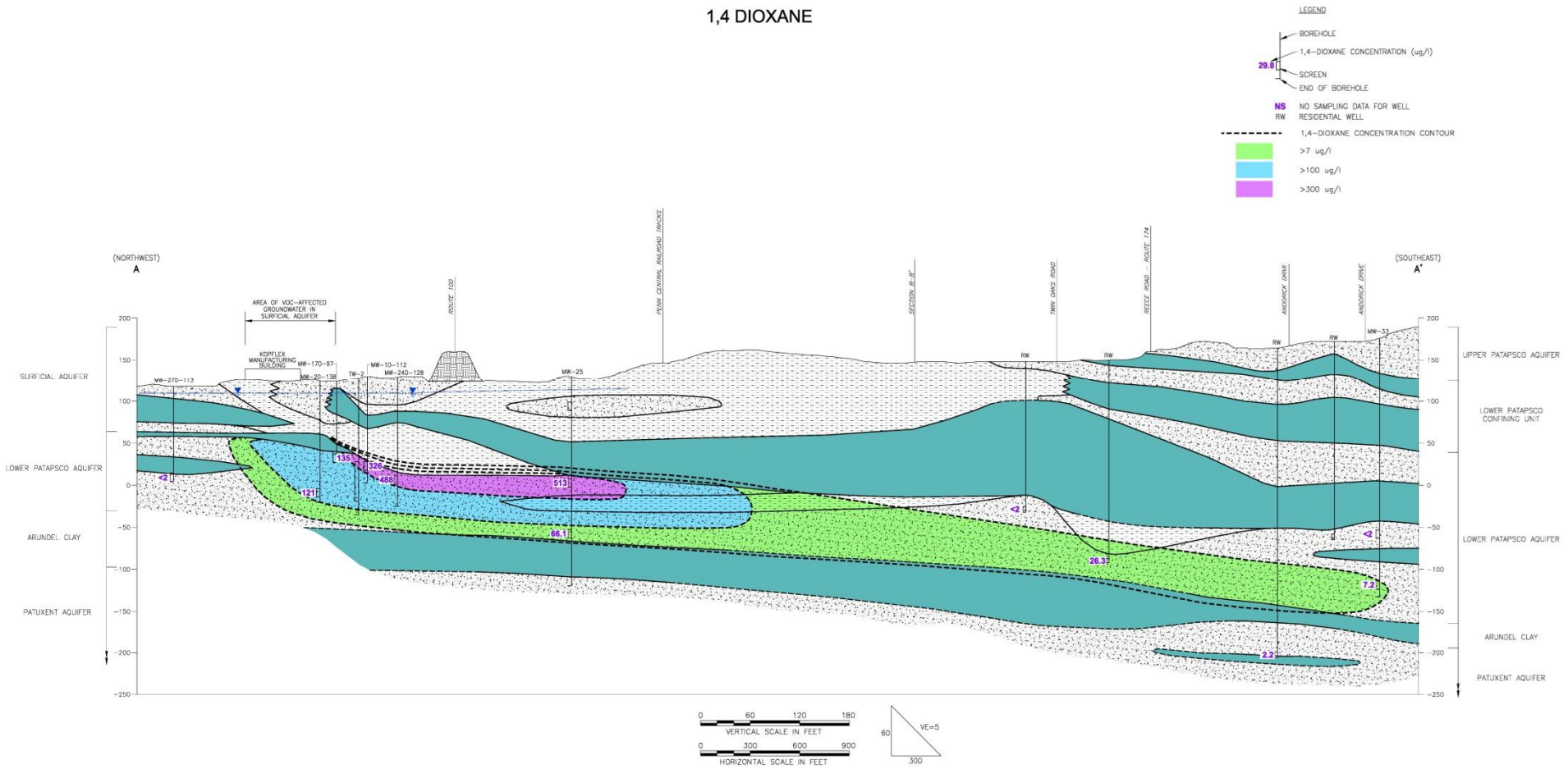
- **Results for shallow monitoring wells showed no impacts by site-related VOCs.**
- **Results for the deeper portion of the Lower Patapsco aquifer show an elongated area – termed "plume" – containing VOCs that extends from the former Kop-Flex facility in the direction of groundwater flow.**
  - The distribution of the VOC plume is best illustrated by detections of 1,4-dioxane, which are shown in the next slide.
  - The concentrations of 1,4-dioxane detected in offsite monitoring well samples are as follows: 349 parts per billion (ppb) in MW-25, 4.1 ppb in MW-28, 2.4 ppb in MW-31, 7.1 ppb in MW-33, and not detected above 2 ppb in MW-35.
  - The MDE risk-based criterion for 1,4-dioxane in groundwater is 6.7 ppb.


LOWER PATAPSCO AQUIFER
(CONFINED)
FORMER KOP-FLEX
FACILITY
MW-24D-128
857
MW-25
349
MW-28
4.1
MW-33
7.1
MW-31
2.4
MW-35
ND
600
60
6
176
170
652
100
174
Harmans Rd
Ridge Chapel Rd
Paul Pitcher Memorial Hwy
Old Telegraph
Severn Rd
Carriage Dr
Telegraph Rd
Clark Station Rd
N
LEGEND
SHALLOW AND DEEP MONITORING WELLS
DEEP MONITORING WELL
1,4 DIOXANE ISO-CONCENTRATION CONTOUR (ppb)
70.9
1,4 DIOXANE CONCENTRATION (ppb)

OFFSITE GROUNDWATER INVESTIGATION RESULTS (continued)

- **Deep sand deposits in the Lower Patapsco aquifer represent the primary zone for the migration of the VOCs in the aquifer system.**
- **Southeastward dip, or tilt, of the layers results in a corresponding increase in the depth of the VOC plume in southward (hydraulically downgradient) direction.**
- **Highest VOC concentrations in groundwater occur in the upper portion of the deep sand deposits at the MW-25 well location and the lower portion of the deep sand deposits further south at MW-33.**

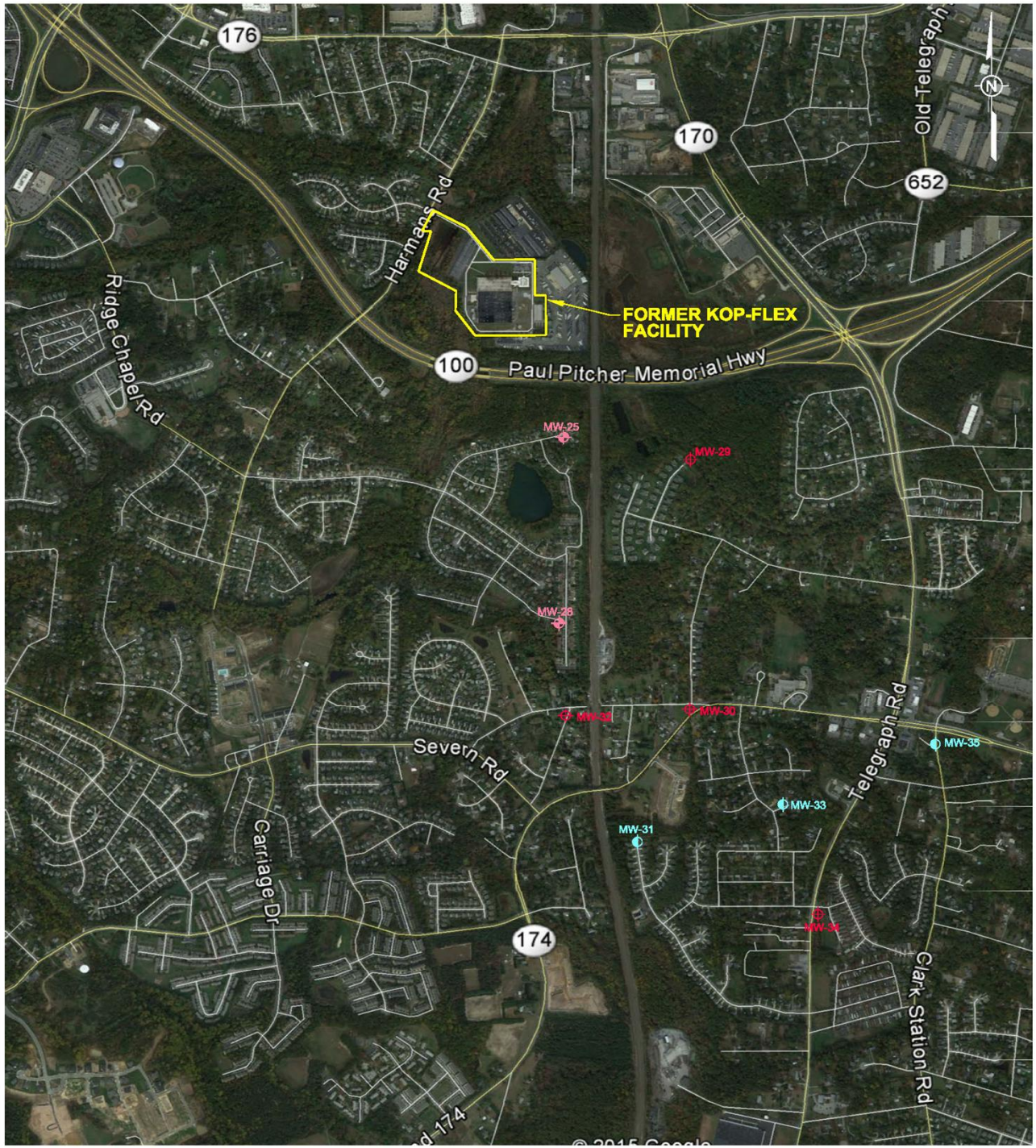
1,4 DIOXANE


LEGEND
BOREHOLE
1,4-DIOXANE CONCENTRATION (ug/l)
29.8
SCREEN
END OF BOREHOLE
NS NO SAMPLING DATA FOR WELL
RW RESIDENTIAL WELL
1,4-DIOXANE CONCENTRATION CONTOUR
>7 ug/l
>100 ug/l
>300 ug/l
(NORTHWEST)
A
(SOUTHEAST)
A'
AREA OF VOC-AFFECTED GROUNDWATER IN SURFICIAL AQUIFER
KOPFLEX MANUFACTURING BUILDING
ROUTE 100
PENN CENTRAL RAILROAD TRACKS
SECTION B-B'
TWIN OAKS ROAD
REECE ROAD - ROUTE 174
ANDORICK DRIVE
ANDORICK DRIVE
MW-270-113
MW-170-97
MW-20-138
TW-2
MW-10-112
MW-240-128
MW-25
MW-33
RW
SURFICIAL AQUIFER
LOWER PATAPSCO AQUIFER
ARUNDEL CLAY
PATUXENT AQUIFER
UPPER PATAPSCO AQUIFER
LOWER PATAPSCO CONFINING UNIT
LOWER PATAPSCO AQUIFER
ARUNDEL CLAY
PATUXENT AQUIFER
<2
135
326
488
513
121
66.1
<2
26.3
<2
7.2
2.2
200
150
100
50
0
-50
-100
-150
-200
-250
0 60 120 180
VERTICAL SCALE IN FEET
0 300 600 900
HORIZONTAL SCALE IN FEET
60
300
VE=5

PROPOSED OFFSITE RESPONSE ACTIONS

PROPOSED OFFSITE GROUNDWATER MONITORING

- **Proposed plan for offsite area involves further evaluation of the hydrogeology and groundwater quality through implementation of a monitoring program.**
- **Proposed program includes the following**
  - Installation of additional monitoring wells at four locations.
    - Locations selected to better characterize and monitor the groundwater quality in the area south of the site
    - Wells to be screened in deep portion of the Lower Patapsco aquifer
  - Implementation of groundwater monitoring program for new and existing monitoring wells.
    - Collection of water level data to assess direction of groundwater flow
    - Collection and analysis of well samples to monitor VOC concentrations in the aquifer


176
170
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Harmans Rd
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FORMER KOP-FLEX FACILITY
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Paul Pitcher Memorial Hwy
MW-25
MW-29
MW-28
MW-32
MW-30
MW-35
Severn Rd
Telegraph Rd
MW-33
MW-31
MW-34
Carriage Dr
174
Clark Station Rd
N

GROUNDWATER MONITORING PROGRAM (continued)

- Evaluation of well sampling data
  - Determine whether concentrations of site-related VOCs are above or below federal and/or state drinking water standards.
  - Assess trends in VOC concentrations at well locations
- Groundwater monitoring results to be regularly reported to MDE and EPA.

➢ **Proposed groundwater monitoring program to be reviewed by MDE and EPA.**

QUESTIONS?