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Infrastructure, environment, facilities

NORTHROP GRUMMAN
Integrated Systems

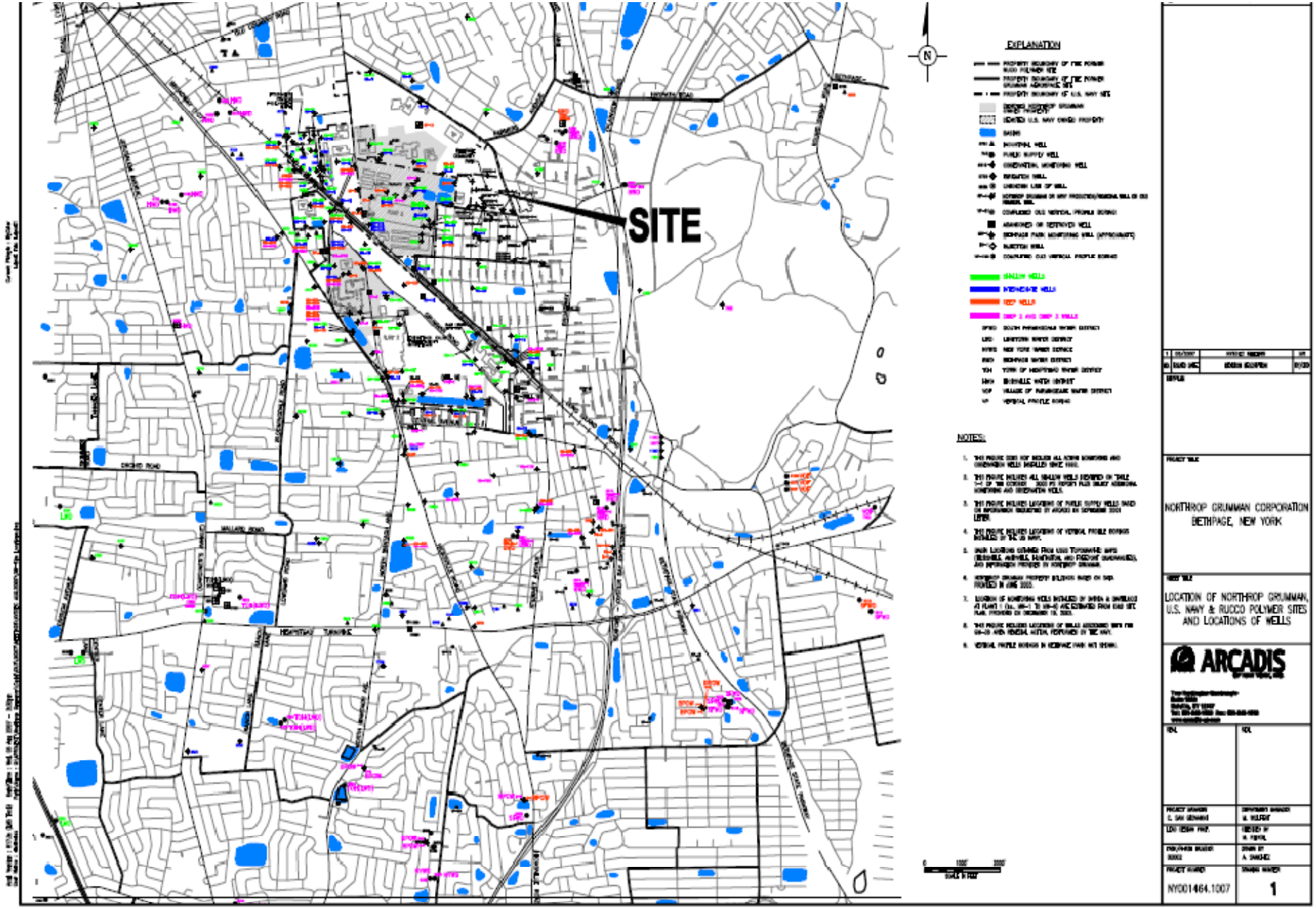
Dvirka and Bartilucci
CONSULTING ENGINEERS

Remedial Investigation/Feasibility Study/ Interim Remedial Measures Progress Update, Operable Unit 3, Bethpage, New York.

August 16, 2007

Summary of Presentation Topics

- Summary of RI:
  - Scope
  - Updated Preliminary RI Findings
    - Soil
    - Soil Gas
    - Perched Water
    - Groundwater
- Current Conceptual Site Model
- Known Status of Town IRM
- Status of IRMs
- Project Schedule


SITE
EXPLANATION
NOTES:
NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK
LOCATION OF NORTHROP GRUMMAN, U.S. NAVY & RUCCO POLYMER SITES AND LOCATIONS OF WELLS
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NY001464.1007
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Project Area – December 2004

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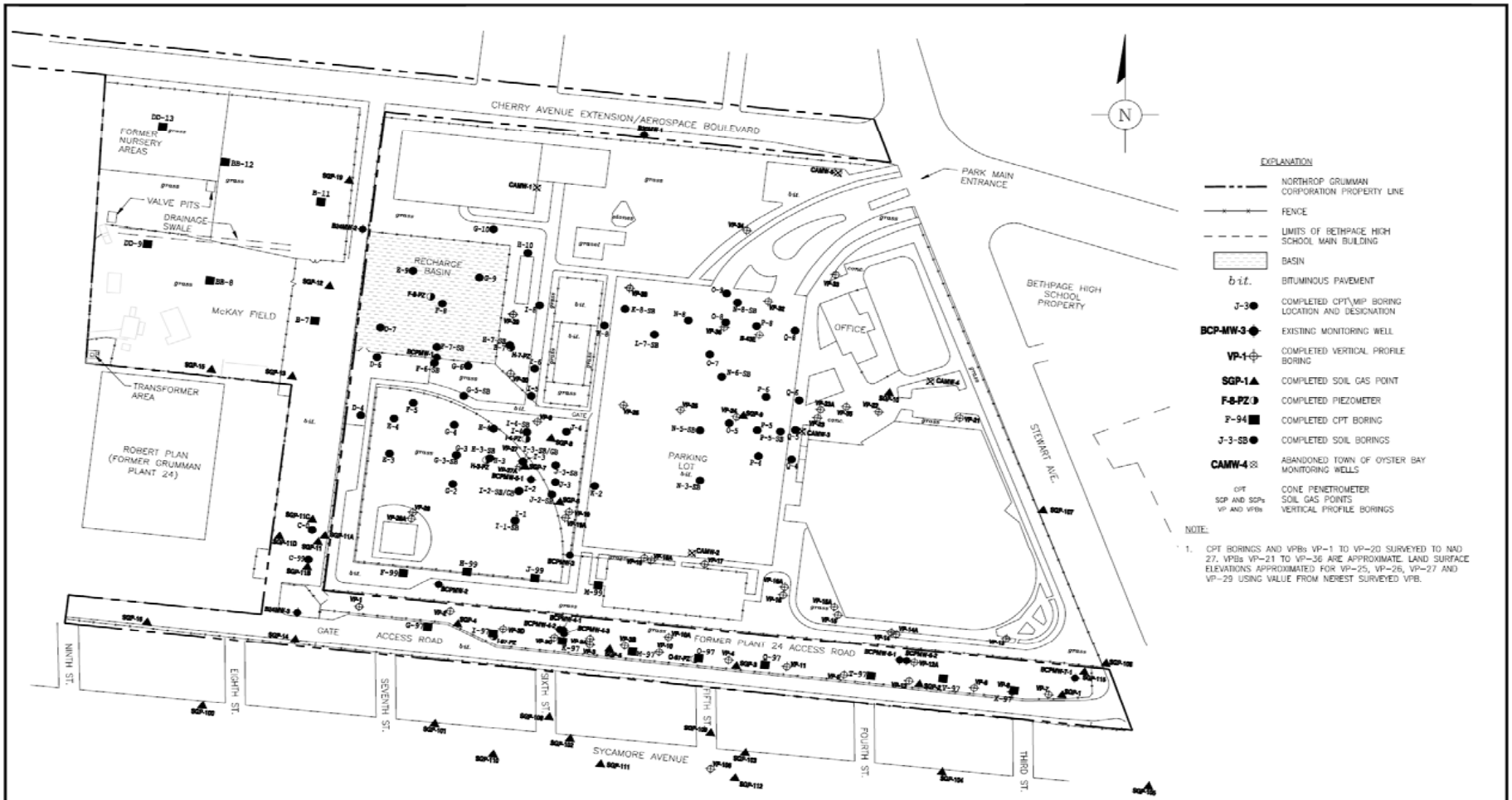
Summary of RI Scope

Type of Work	Media Investigated	Dec-06 Number of Locations	Aug-07 Number of Locations	Analyte Tested
Soil Borings	Soil	314	354	VOC, SVOC, Metals, PCB
Surface Geophysics	Buried Features	Continuous Grid	No Additional Work	NA
Test Pits	Soil	21	21	VOC, SVOC, Metals, PCB
Cone Penetrometer/ Membrane Interface Borings	Soil, Perched Water	49	49	VOC
Piezometers	Perched Water	4	6	VOC, Metals
Vertical Profile Borings, Shallow	Groundwater, Limited Soil	58	63	VOC, SVOC, perchlorate
Vertical Profile Borings, Deep	Groundwater	3	7	VOC, perchlorate
Ambient Air Samples	Ambient Air	4	4	VOC
Soil Gas Points	Soil Gas, Groundwater	25	41	VOC
Monitoring Wells	Groundwater	9	19	TBD

Summary of RI Findings: On-Site Soil



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NO.	ISSUED DATE	REVISION DESCRIPTION	BY/CKD

SEAL

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Melville, NY 11747
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PROJECT TITLE
OPERABLE UNIT 3
FORMER GRUMMAN
SETTLING PONDS
BETHPAGE, NEW YORK

PROJECT MANAGER	DEPARTMENT MANAGER	LEAD DESIGN PROF.	CHECKED BY
C. SAN GIOVANNI	M. WOLFERT		D. STERN
SHEET TITLE		TASK/PHASE NUMBER	DRAWN BY
SITE PLAN SHOWING COMPLETED SAMPLE LOCATIONS		00004	A. SANCHEZ
		PROJECT NUMBER	DRAWING NUMBER
		NY001464.0807	1

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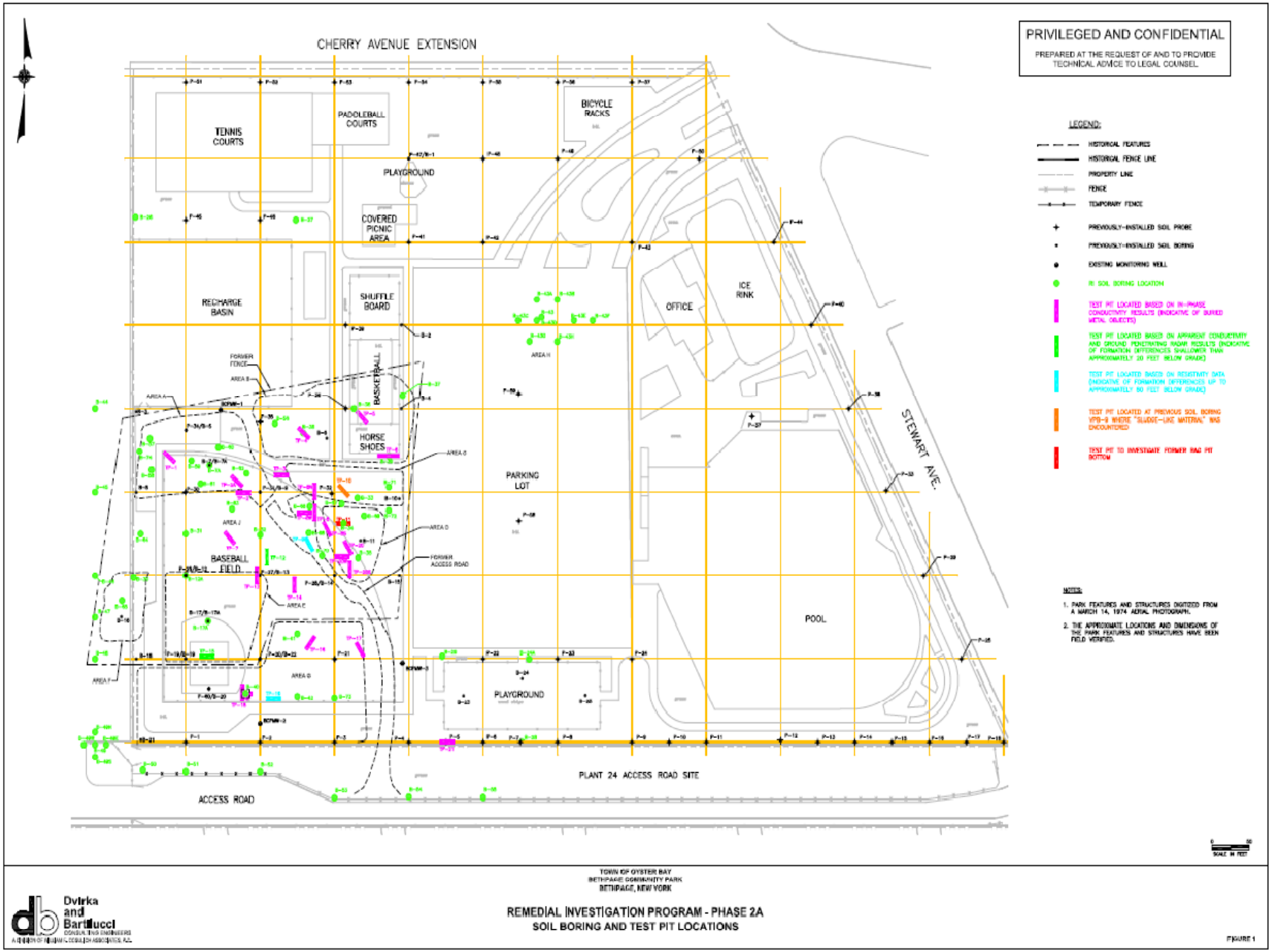
PRIVILEGED AND CONFIDENTIAL
PREPARED AT THE REQUEST OF AND TO PROVIDE TECHNICAL ADVICE TO LEGAL COUNSEL
CHERRY AVENUE EXTENSION
TENNIS COURTS
PADDLEBALL COURTS
BICYCLE RACKS
PLAYGROUND
COVERED PICNIC AREA
RECHARGE BASIN
SHUFFLE BOARD
BASKETBALL
HORSE SHOES
OFFICE
ICE RINK
STEWART AVE.
PARKING LOT
BASEBALL FIELD
POOL
PLAYGROUND
PLANT 24 ACCESS ROAD SITE
ACCESS ROAD
FORMER FENCE
FORMER ACCESS ROAD
AREA A
AREA B
AREA C
AREA D
AREA E
AREA F
AREA G
AREA H
AREA I
AREA J
LEGEND:
HISTORICAL FEATURES
HISTORICAL FENCE LINE
PROPERTY LINE
FENCE
TEMPORARY FENCE
PREVIOUSLY-INSTALLED SOIL PROBE
PREVIOUSLY-INSTALLED SOIL BORING
EXISTING MONITORING WELL
RI SOIL BORING LOCATION
TEST PIT LOCATED BASED ON IN-PHASE CONDUCTIVITY RESULTS (INDICATIVE OF BURIED METAL OBJECTS)
TEST PIT LOCATED BASED ON APPARENT CONDUCTIVITY AND GROUND PENETRATING RADAR RESULTS (INDICATIVE OF FORMATION DIFFERENCES SHALLOWER THAN APPROXIMATELY 10 FEET BELOW GRADE)
TEST PIT LOCATED BASED ON RESISTIVITY DATA (INDICATIVE OF FORMATION DIFFERENCES UP TO APPROXIMATELY 50 FEET BELOW GRADE)
TEST PIT LOCATED AT PREVIOUS SOIL BORING VPB-9 WHERE "SLUDGE-LIKE MATERIAL" WAS ENCOUNTERED
TEST PIT TO INVESTIGATE FORMER RAG PIT BOTTOM
NOTES:
1. PARK FEATURES AND STRUCTURES DIGITIZED FROM A MARCH 14, 1974 AERIAL PHOTOGRAPH.
2. THE APPROXIMATE LOCATIONS AND DIMENSIONS OF THE PARK FEATURES AND STRUCTURES HAVE BEEN FIELD VERIFIED.
SCALE IN FEET
TOWN OF OYSTER BAY
BETHPAGE COMMUNITY PARK
BETHPAGE, NEW YORK
REMEDIAL INVESTIGATION PROGRAM - PHASE 2A
SOIL BORING AND TEST PIT LOCATIONS
Dvirka and Bartilucci CONSULTING ENGINEERS
FIGURE 1

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Summary of Soil RI

- March 2002 – June 2005: NG Phase 1 Soil RI
  - Objective: Initial environmental survey of property with delineation as work progressed
  - Primary analytes: Metals and PCBs, with fewer SVOC & VOC analyses
  - 582 Soil Samples Collected
  - Soil boring depths varied throughout vadose zone

- 2005: TOB IRM Soil Program
  - 773 Samples for RCRA Metals and PCBs
  - 153 Samples for VOC, SVOC, TAL Metals

Summary of Soil RI

- 2006: NG Phase 2 RI
  - CPT/MIP:
    - •Continuous profile of soil behavior type
    - •PID/FID/ECD continuous profiles
  - Soil Borings to fill data gaps:
    - •397 samples analyzed for VOCs, SVOCs, PCBs, and/or Cd/Cr
    - •Soil borings to correlate MIP to soil VOC concentrations
  - Geophysical survey to investigate/characterize anomalies
  - Test Pits with soil sampling for VOCs, Metals, SVOCs, and PCBs to assess anomalies
  - 28 Geoprobe borings to qualitatively investigate limits of impacts based on test pit results

Summary of Soil RI

- January to June 2007: Phase 3 RI
  - 15 Geoprobe borings –
    - •select quantitative analyses – limits of impacts
    - •qualitative analyses – selection of boring locations
  - 40 Soil Borings – Characterization/Delineation of site impacts
    - •370 Samples – VOCs
    - •165 Samples – PAHs, PCBs, and/or Cd/Cr
  - 3 Geo-technical Borings – Soil Properties

Preliminary Findings of Soil RI

- CPT/MIP Primary Areas of Impact:
  - Areas “B” and “D” – PID, ECD & FID at depths generally >20 ft bls
  - Area “A” – FID at depths <20 ft bls
  - Area “H” – ECD & PID Response to 14 ft bls
  - Area “I” – ECD Response
  - Field GC results: cis-1,2-DCE, TCE & Toluene
  - Lab results confirmed VOCs detected

Preliminary Findings of Soil RI

- Materials encountered in soil borings and test pits
  - Fill/reworked materials ranged from surface to depths of 2 to 25 ft bls
    - •Thickest under Areas “A” and “K”
    - •Upper fill unit: brown sand and gravel to ~3 ft bls
    - •Underlying fill unit : black/dark gray silt/sand/gravel from ~3 ft bls to bottom of fill:
      - –Hydrocarbon-like odor; anthropogenic materials including metal, rags, plastic, rubber, bricks, concrete, re-bar, cinder/slag, lumber
      - – Unit present throughout southwestern Park area, absent along western edge of Parking Lot

Preliminary Findings of Soil RI

- Materials encountered in soil borings and test pits (cont'd)
  - Scattered, discontinuous LPZs
  - Blue/gray sludge-like material (max. thickness 4 ft) in and around Area "B"
  - Black/Blue wet, soft, clayey material in western portion of Area "A"
  - Occasional lenses/nodules of green and yellow silt/fine sand or residue (max. thickness <1 ft)
  - Oily (non-free phase) fluid observed localized in Area "D" soil throughout vadose zone (fill to 17 ft bls)
- Test Pit Program objectives were generally achieved:
  - Identified anomalies (observations under review/analyses pending)
    - •Objects included pipes, rebar, slag
    - •Rusted, crumpled drum and drum fragments found at TP-11, TP-13, and TP-14
    - •Identified formation-related anomalies, i.e., surface silt layer

Preliminary Findings of Soil RI

COCs: Metals (primarily Cd, Cr), PCBs, CaPAHs, TEX, CVOCs (primarily TCE)

Present above RSCOs

- Eastern Park Perimeter (along Stewart Ave):
  - PCBs and Cr locally present in upper 8 feet
- Areas “H” and “I”:
  - Investigated to delineate PCBs and VOCs
  - Cr, PCBs, CaPAHs, toluene and some CVOCs primarily to 14 ft bls at former boring B-43.
  - Cr, PCBs and PAHs may extend west of Area “H”. TOB soil excavation included area west of Area “H”, assessment of extent pending issuance of TOB report.
  - Deeper LPZ (42 ft bls) contains VOC impacts south of Area “H”; max TVOC 5.2 mg/kg

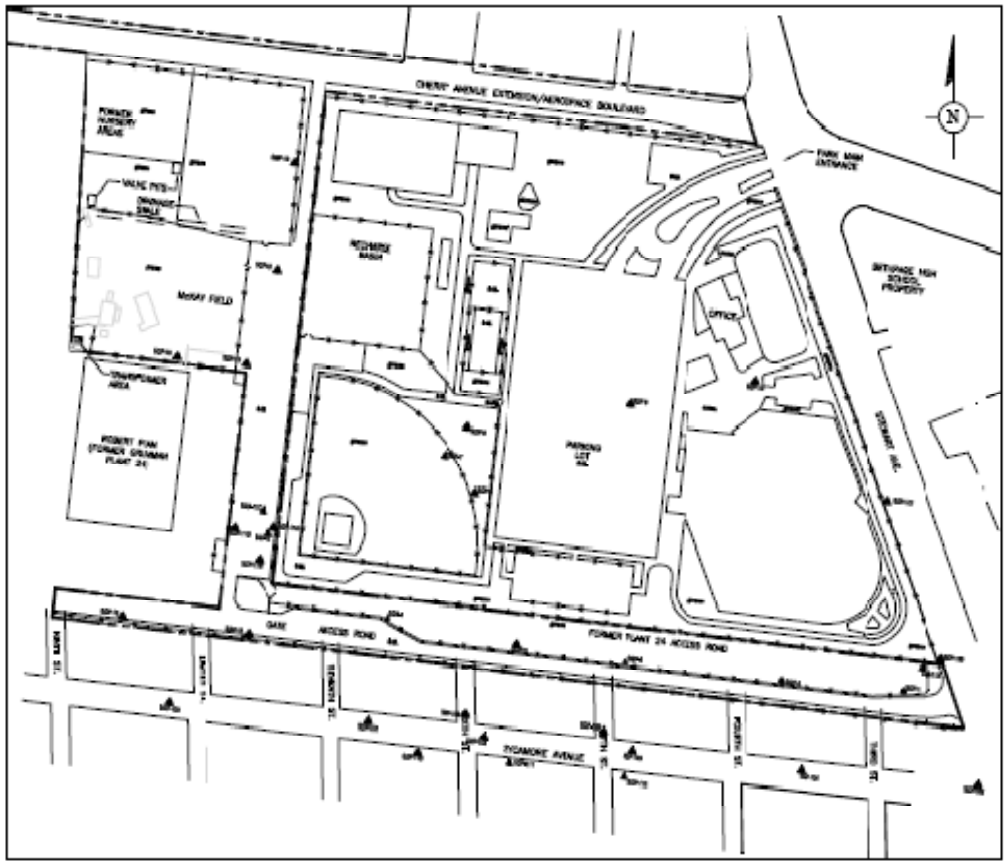
Preliminary Findings of Soil RI

- Southwestern Park Area:
  - Cd, Cr and PCBs:
    - •Exceedances limited to fill
    - •Max. Cr in Areas “A” (49,000 mg/kg), “C” (13,400 mg/kg), & south Park fence (124,000 mg/kg).
    - •Max. PCBs in Areas “A” (121 mg/kg), “B” (190 mg/kg), “C” (1,400 mg/kg), “D” (2,800 mg/kg), south Park fence (180 mg/kg), between “D” and “E” (910 mg/kg) & “K” (230 mg/kg)
  - CaPAHs:
    - •Present in underlying black/dark gray fill unit
    - •Primarily in Area “B”, between “D” and “E”, and south of Parking Lot
    - •Primarily benzo(a)pyrene; others include benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene

Preliminary Findings of Soil RI

- Southwestern Park Area (continued):
  - VOCs localized at four areas:
    - Area “A” Max. VOCs
      - Toluene (200 mg/kg) and xylene (6.4 mg/kg) localized in fill (at 15 ft bls)
      - TCE (3.7 mg/kg) in LPZ
    - Area “D”
      - Primarily toluene (to 1,000 mg/kg) and TCE (to 380 mg/kg) throughout vadose zone
      - Other VOCs include xylene, ethylbenzene, 1,1-DCA, PCE, TCA, and VCM
    - Area “F”
      - Xylene (to 21 mg/kg) in fill (between 2 and 6 ft bls)
    - North of Area “G”
      - Toluene (to 1.9 mg/kg) , xylene (to 3 mg/kg) and 1,1-DCA (0.49 mg/kg) in fill (to 25 ft bls)

Summary of RI Findings: On-Site Soil Gas



LEGEND:

- NORTHROP GRUMMAN PROPERTY LINE
- FENCE
- LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
- BITUMINOUS PAVEMENT
- SGP4 SOIL GAS POINT (SGP) (ARCADIS)

NOTES:

1. ALL COMPLETED SGP LOCATIONS HAVE BEEN FIELD VERIFIED AS OF JUNE 22, 2007.

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© 2007 ARCADIS OF NEW YORK, INC.	1	05/2007	MINOR MODIFICATIONS	MR	ARCADIS OF NEW YORK, INC.	NORTHROP GRUMMAN OPERABLE UNIT 3 REMEDIAL INVESTIGATION BETHPAGE, NEW YORK	LOCATION OF COMPLETED SOIL GAS SAMPLING LOCATIONS	NY001464.1007	1

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Summary of On-Site Soil Gas RI

- NG Phase 1 RI (October 2004):
  - 12 soil vapor samples at depths of 5, 15, and 40 ft bls
  - Ambient air sample collected
- TOB Investigation (June 2005):
  - 21 samples collected at 10, 52, or 58 ft bls
- NG Phase 2 RI (June 2006):
  - 19 samples at 8, 35, and 50 ft bls
  - Three ambient air samples collected
- NG Phase 3 RI (March to June 2007):
  - 11 locations west of Park on Plant 24 Access Road/McKay Field
  - 23 samples at 8, 20 and 50 ft bls
  - Groundwater samples collected at 2 locations to assess possible correlation between soil gas and shallow groundwater

Preliminary Findings of On-Site Soil Gas RI

- Variability by location
  - Compounds
  - Concentrations
- Maximum VOC concentration at deep depth, except in areas between shallow/deep LPZs
- COCs: TCE; VCM; BTEX; cis-1,2-DCE; 1,1,1-TCA; 1,1-DCA; and 1,3-butadiene
- Freon 12 & 22 at the former ice rink
- Max. shallow TCE concentration at SGP-13 – 36,000 µg/m3
- Soil gas VOC concentrations decrease significantly south, east and west of Park

Summary of RI Findings: Off-Site Soil Gas

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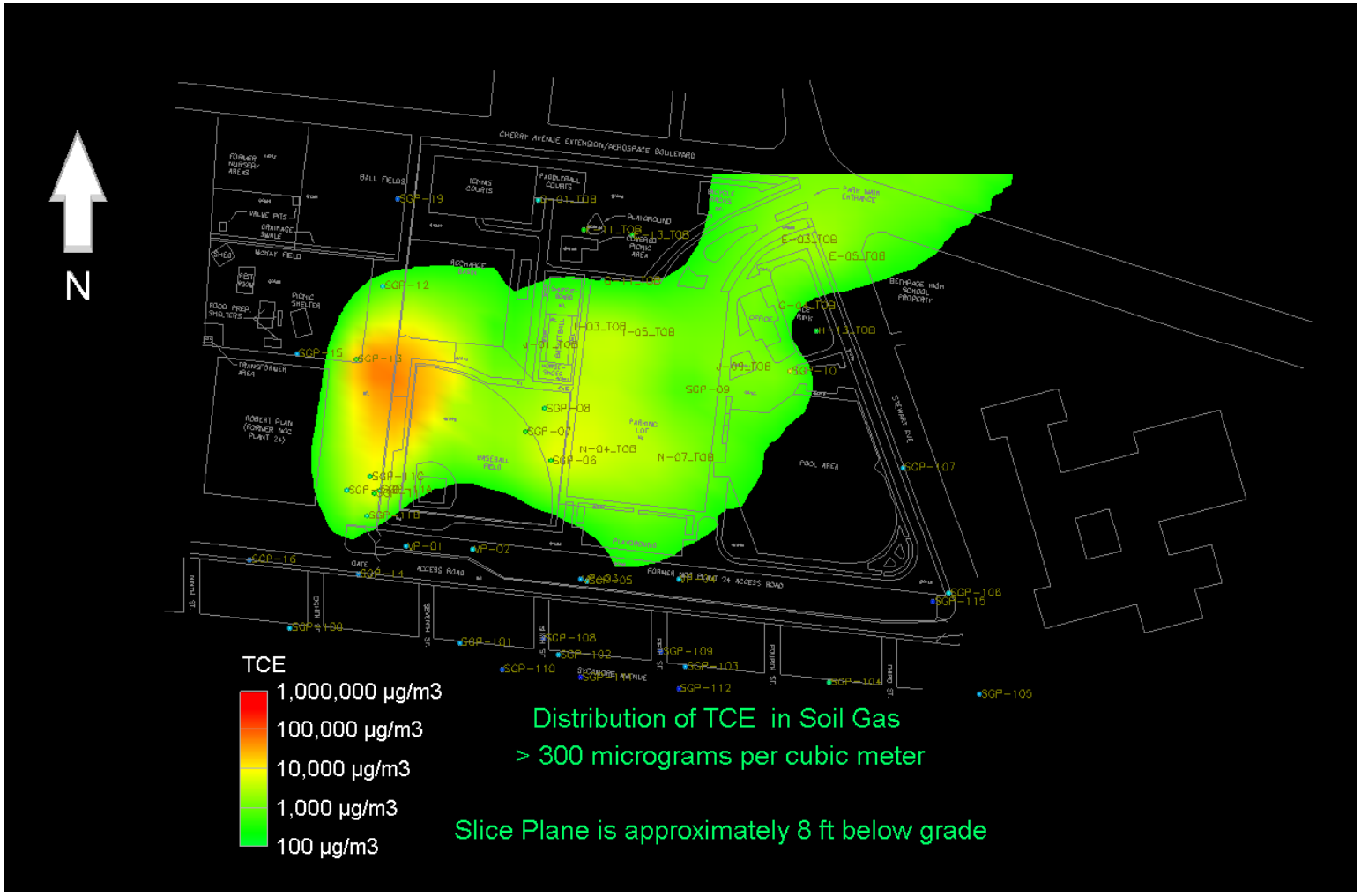
Summary of Off-Site Soil Gas RI

- NG Phase 2 RI (July 2006)
  - TOB Rights of Way south and east of Park
  - 8 Locations; samples analyzed for VOCs
  - 14 samples at 8, 35, and 50 ft bls
- NG Phase 3 RI (March and April 2007):
  - Soil Gas Sampling on TOB Rights of Way at 5 locations; samples analyzed for VOCs
  - 15 samples at depths of 8, 35 and 50 ft bls
  - Groundwater samples collected at 4 locations to assess possible correlation between soil gas and shallow groundwater

EVS Stills – On- and Off-Site Soil Gas

- Plan views of VOCs in soil gas:
  - TCE
  - cis-1,2-DCE
  - Freon

Note: Illustration coloring east of Stewart Avenue based on computer extrapolation and not actual data.



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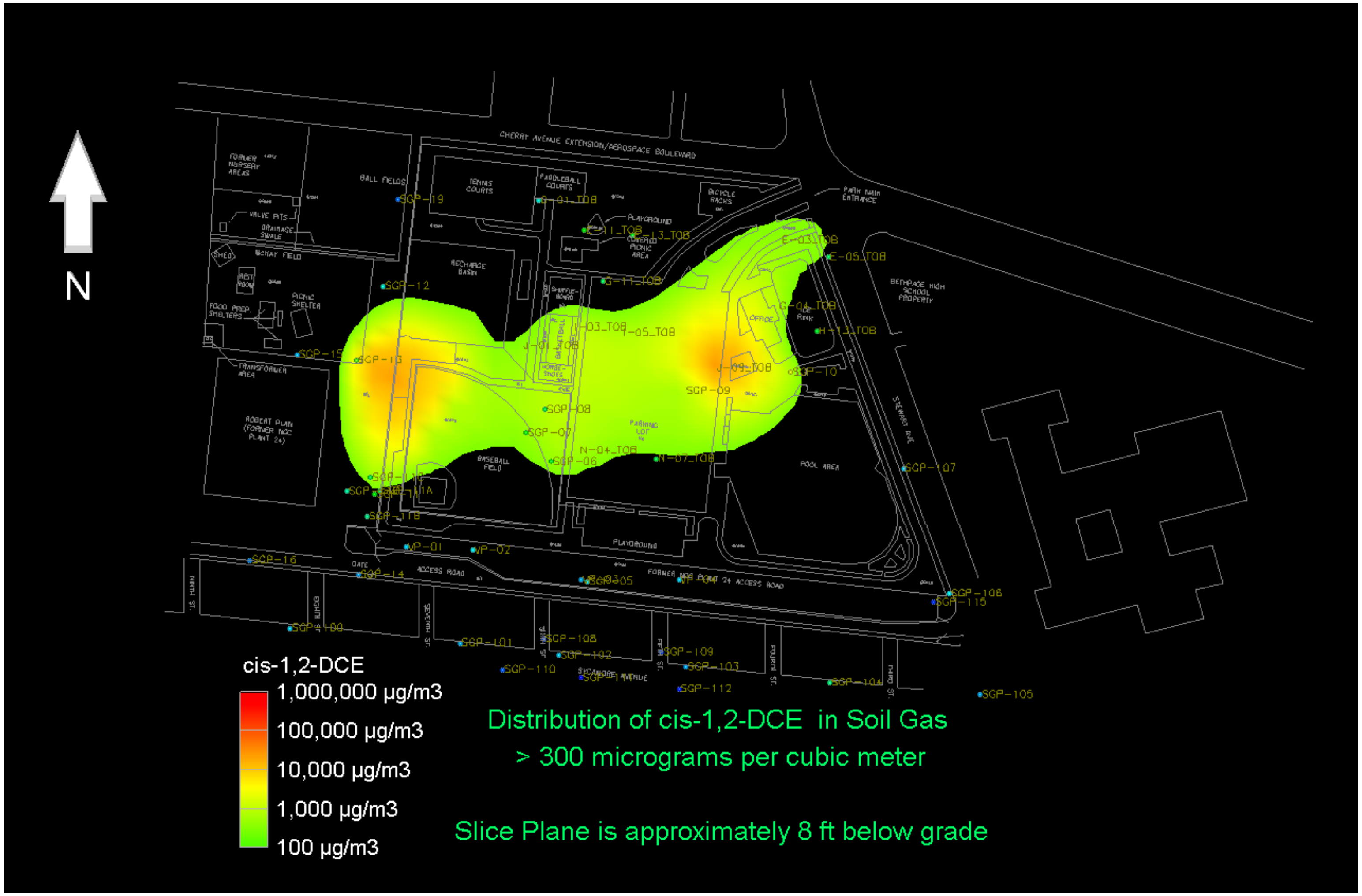
N
cis-1,2-DCE
1,000,000 µg/m3
100,000 µg/m3
10,000 µg/m3
1,000 µg/m3
100 µg/m3
Distribution of cis-1,2-DCE in Soil Gas
> 300 micrograms per cubic meter
Slice Plane is approximately 8 ft below grade

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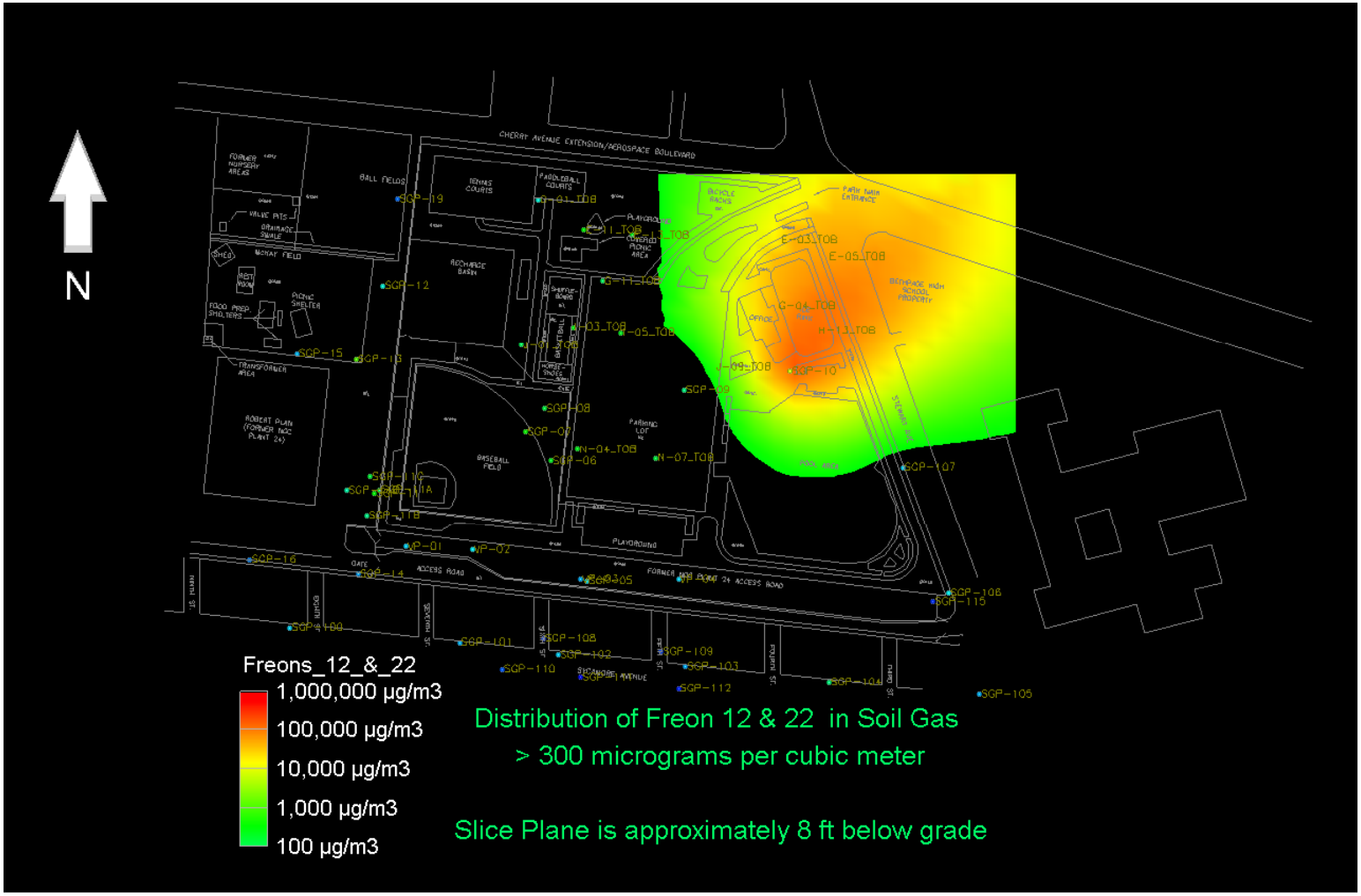
Note: Illustration coloring east of Stewart Avenue based on computer extrapolation and not actual data.



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Summary of RI Findings: On-Site Perched Water

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Summary of On-Site Perched Water RI

- April to December 2006 (Phase 2):
  - 4 perched-water piezometers installed
  - Periodic water-level monitoring
  - 3 piezometers sampled

- January to July 2007 (Phase 3):
  - 2 perched water piezometers installed; dry since installation
  - Periodic water-level monitoring – all piezometers
  - 4 of 6 piezometers sampled for VOCs, SVOCs, Metals, perchlorate, and PCBs.

Preliminary Findings of On-Site Perched Water RI

- Water Levels:
  - Elevation between 80-85 ft msl (Groundwater ~70 ft msl)
  - Trend shows stable levels of perched water since 2006.

  Water Quality:
  - July 2007 perched water results are pending.
  - Approximately 3 inches of LNAPL detected in H-3; analysis of LNAPL is pending.

ID	December 2006	Max. Indiv. VOC	February 2007	Max. Indiv. VOC
F-8PZ	24	TCE (23)	NA	NA
H-3PZ	7,693	Xylene (7,300)	28,399	Toluene (23,000)
H-7PZ	1,515	TCE (1,300)	571	VC (330)
I-4PZ	147,427	DCE (62,000)	118,659	DCE (47,000)

Summary of RI Findings: On-Site Groundwater

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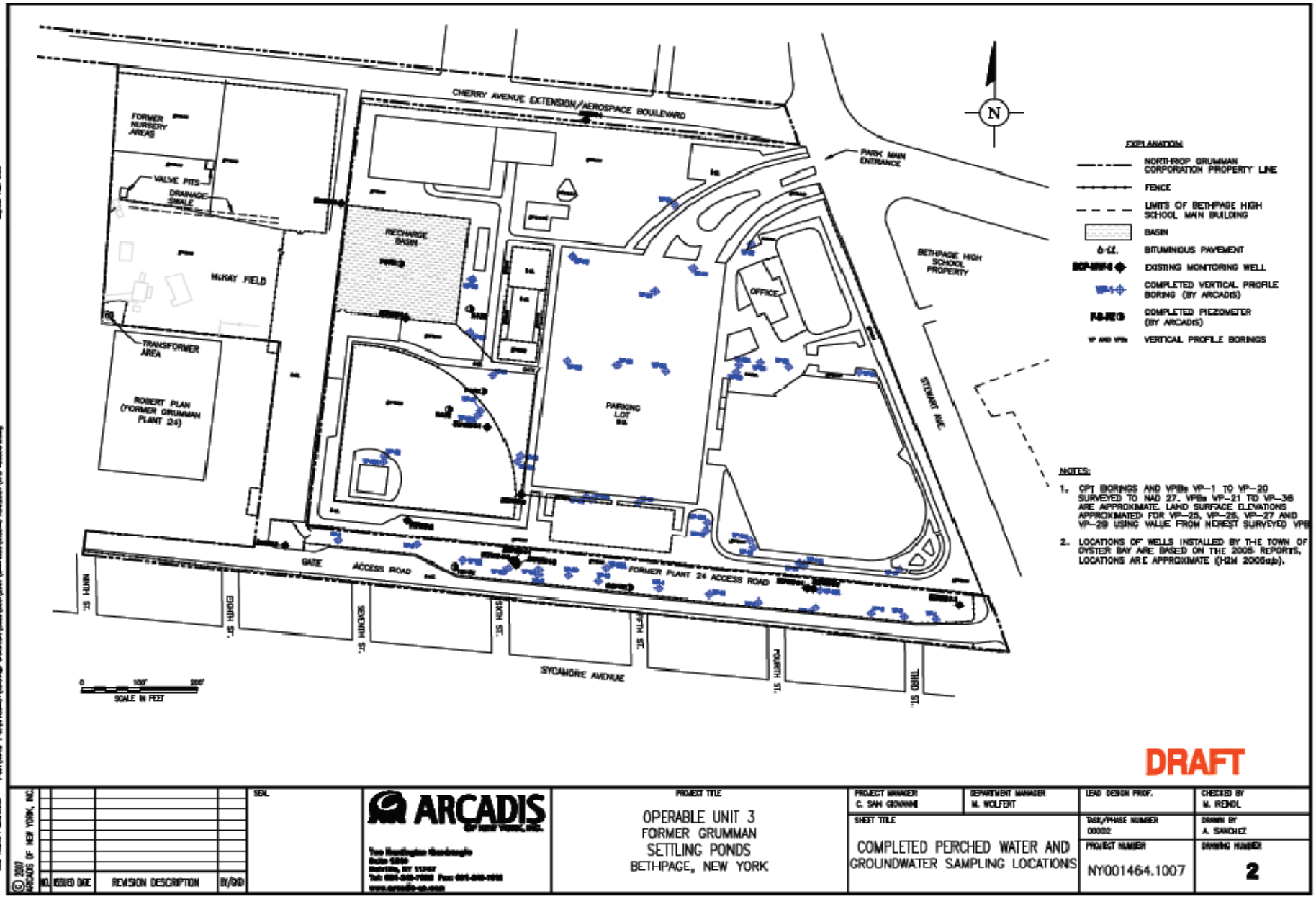
CHERRY AVENUE EXTENSION/AEROSPACE BOULEVARD
FORMER NURSERY AREAS
VALVE PITS
DRAINAGE SWALE
RECHARGE BASIN
McGAY FIELD
TRANSFORMER AREA
ROBERT PLAN (FORMER GRUMMAN PLANT 24)
PARKING LOT
PARK MAIN ENTRANCE
BETHPAGE HIGH SCHOOL PROPERTY
OFFICE
STEWART AVE.
GATE
ACCESS ROAD
FORMER PLANT 24 ACCESS ROAD
NINTH ST.
EIGHTH ST.
SEVENTH ST.
SIXTH ST.
FIFTH ST.
FOURTH ST.
THIRD ST.
SYCAMORE AVENUE
SCALE IN FEET
EXPLANATION
NORTHROP GRUMMAN CORPORATION PROPERTY LINE
FENCE
LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
BASIN
BITUMINOUS PAVEMENT
EXISTING MONITORING WELL
COMPLETED VERTICAL PROFILE BORING (BY ARCADIS)
COMPLETED PIEZOMETER (BY ARCADIS)
VERTICAL PROFILE BORINGS
NOTES:
1. CPT BORINGS AND VPBs VP-1 TO VP-20 SURVEYED TO NAD 27. VPBs VP-21 TO VP-36 ARE APPROXIMATE. LAND SURFACE ELEVATIONS APPROXIMATED FOR VP-25, VP-26, VP-27 AND VP-29 USING VALUE FROM NEAREST SURVEYED VPB.
2. LOCATIONS OF WELLS INSTALLED BY THE TOWN OF OYSTER BAY ARE BASED ON THE 2005 REPORTS. LOCATIONS ARE APPROXIMATE ((H2M 2005a,b).
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SEAL
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PROJECT TITLE
OPERABLE UNIT 3
FORMER GRUMMAN
SETTLING PONDS
BETHPAGE, NEW YORK
PROJECT MANAGER C. SAN GIOVANNI
DEPARTMENT MANAGER M. WOLFERT
LEAD DESIGN PROF.
CHECKED BY M. RENDL
SHEET TITLE
COMPLETED PERCHED WATER AND GROUNDWATER SAMPLING LOCATIONS
TASK/PHASE NUMBER 00002
DRAWN BY A. SANCHEZ
PROJECT NUMBER NY001464.1007
DRAWING NUMBER 2

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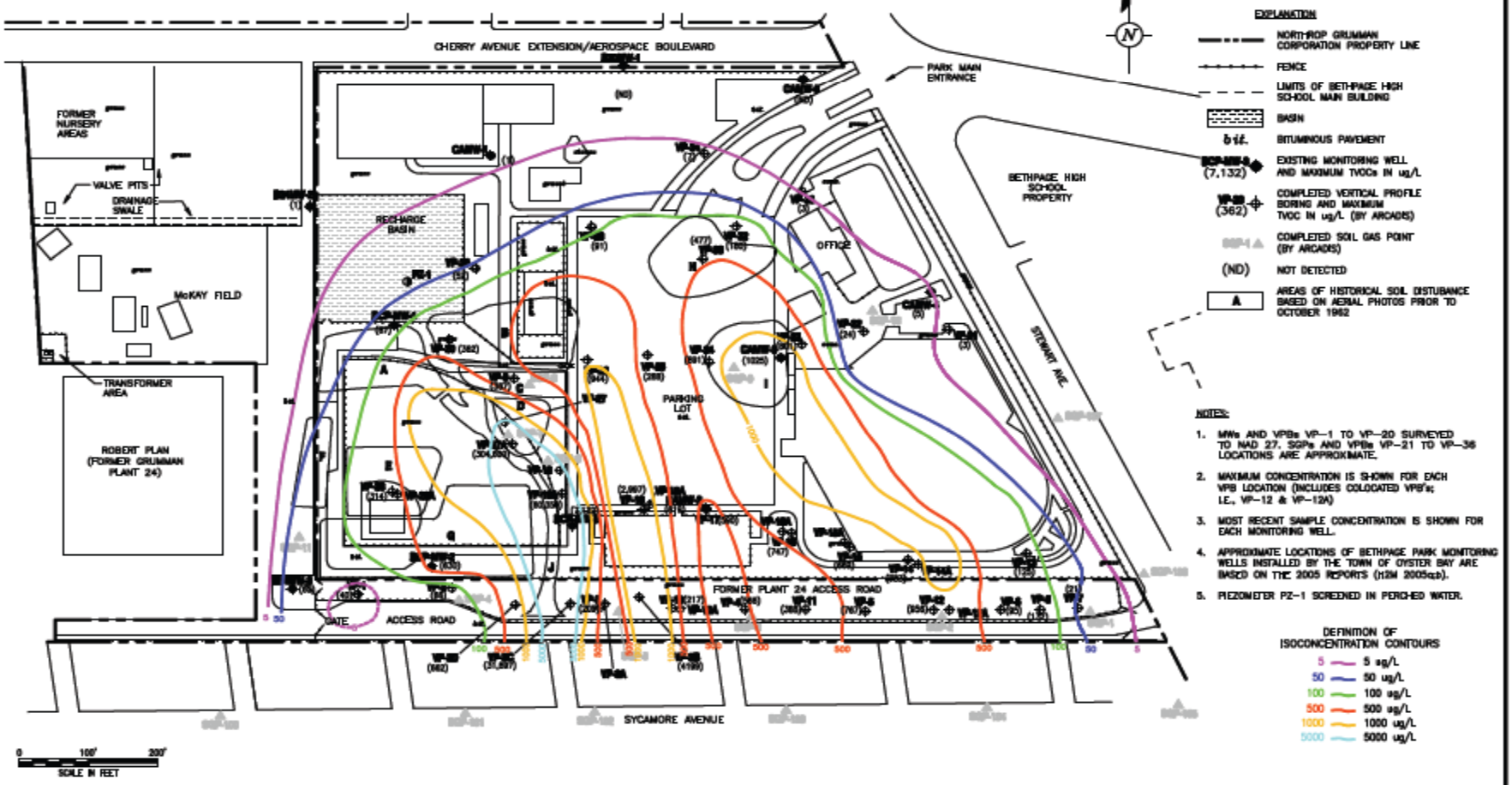
CHERRY AVENUE EXTENSION/AEROSPACE BOULEVARD
PARK MAIN ENTRANCE
FORMER NURSERY AREAS
VALVE PITS
DRAINAGE SWALE
RECHARGE BASIN
McKAY FIELD
TRANSFORMER AREA
ROBERT PLAN (FORMER GRUMMAN PLANT 24)
BETHPAGE HIGH SCHOOL PROPERTY
OFFICE
PARKING LOT
STEWART AVE.
FORMER PLANT 24 ACCESS ROAD
GATE
ACCESS ROAD
SYCAMORE AVENUE
0 100' 200'
SCALE IN FEET
EXPLANATION
NORTHROP GRUMMAN CORPORATION PROPERTY LINE
FENCE
LIMITS OF BETHPAGE HIGH SCHOOL MAIN BUILDING
BASIN
BITUMINOUS PAVEMENT
EXISTING MONITORING WELL AND MAXIMUM TVOCs IN ug/L
COMPLETED VERTICAL PROFILE BORING AND MAXIMUM TVOC IN ug/L (BY ARCADIS)
COMPLETED SOIL GAS POINT (BY ARCADIS)
(ND) NOT DETECTED
AREAS OF HISTORICAL SOIL DISTURBANCE BASED ON AERIAL PHOTOS PRIOR TO OCTOBER 1962
NOTES:
1. MWs AND VPBs VP-1 TO VP-20 SURVEYED TO NAD 27. SGPs AND VPBs VP-21 TO VP-36 LOCATIONS ARE APPROXIMATE.
2. MAXIMUM CONCENTRATION IS SHOWN FOR EACH VPB LOCATION (INCLUDES COLOCATED VPB's; I.E., VP-12 & VP-12A)
3. MOST RECENT SAMPLE CONCENTRATION IS SHOWN FOR EACH MONITORING WELL.
4. APPROXIMATE LOCATIONS OF BETHPAGE PARK MONITORING WELLS INSTALLED BY THE TOWN OF OYSTER BAY ARE BASED ON THE 2005 REPORTS (H2M 2005a,b).
5. PIEZOMETER PZ-1 SCREENED IN PERCHED WATER.
DEFINITION OF ISOCONCENTRATION CONTOURS
5 5 ug/L
50 50 ug/L
100 100 ug/L
500 500 ug/L
1000 1000 ug/L
5000 5000 ug/L
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OPERABLE UNIT 3
FORMER GRUMMAN
SETTLING PONDS
BETHPAGE, NEW YROK
SITE PLAN SHOWING
TOTAL VOLATILE ORGANIC
COMPOUND CONCENTRATIONS
IN GROUNDWATER
C. SAN GIOVANNI
M. WOLFERT
M. RENDL
A. SANCHEZ
NY001464.1007
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0 08/2007 NYSDEC MEETING MR

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Summary of On-Site Groundwater RI

- July 2004 to June 2005 (Phase 1):
  - 32 VPBs drilled along NG Plant 24 access road and in Park
  - 163 groundwater samples collected for VOC/ SVOC analysis.
  - 26 soil samples collected for VOC/SVOC/TOC analysis.
  - 30 gamma logs ran in addition to soil samples collected for lithologic characterization.
  - VPB depths varied from 110 to 300 ft bls.
- TOB Investigation: 5 Monitoring Wells (all have been abandoned)
- April to December 2006 (Phase 2):
  - 17 VPBs drilled in Park:
    - 65 samples analyzed for VOCs, with selective analysis for SVOCs, TAL Metals, biogeochemical, and perchlorate.
    - Depths varied from 70 to 130 ft bls.
  - 3 monitoring wells.
- January to July 2007 (Phase 3):
  - 4 monitoring wells installed
  - Periodic monitoring of select wells for VOCs
  - All 13 wells sampled for VOCs, SVOCs, metals, PCBs, and perchlorate

Preliminary Findings of On-Site Groundwater RI

- COCs: TEX, CVOCs, and Metals
  - Four potential source areas:
    - Area “D” (304,000 ug/L)
    - Area “B” (~1,000 ug/L)
    - Areas “H” and “I” (~1,000 ug/L)
    - Former Ice Rink: Freons 12 & 22
- Dimensions of VOCs >100 ug/L at site southern boundary
  - ~800 ft in width
  - to a depth 60 ft below water table (~110 ft bls).
- Primary VOCs: TCE, c-1,2-DCE, VCM, 1,1,1-TCA, & toluene
- End products of bio-transformation present (ethene/ethane)
- PCB/Metal impacts still being investigated
- Average perchlorate levels detected <2 ug/L; no source identified

Summary of RI Findings: Off-Site Groundwater

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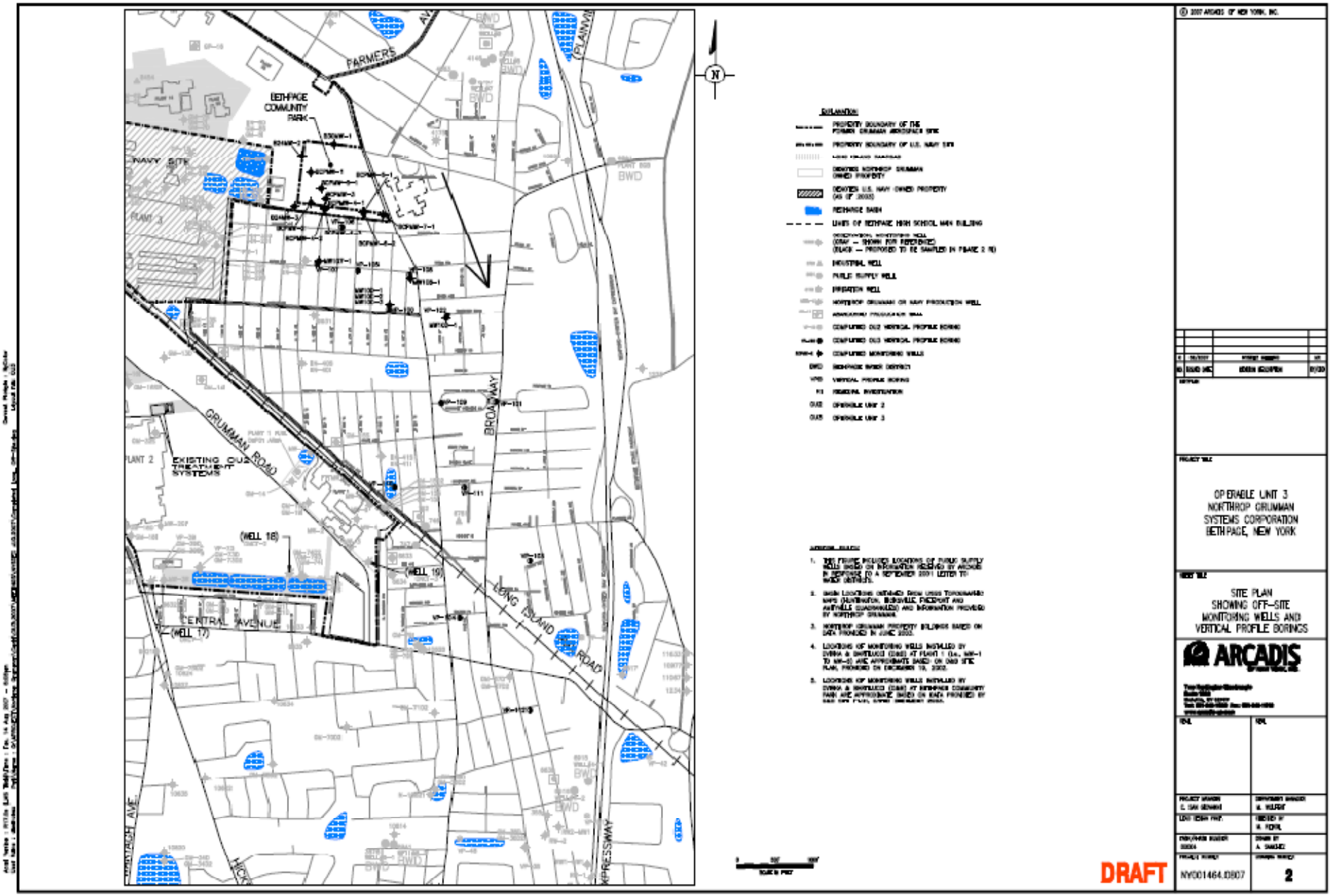
BETHPAGE COMMUNITY PARK
NAVY SITE
PLANT 3
PLANT 2
EXISTING OU2 TREATMENT SYSTEMS
GRUMMAN ROAD
BROADWAY
LONG ISLAND EXPRESSWAY
CENTRAL AVENUE
(WELL 18)
(WELL 19)
(WELL 17)
FARMERS
BWD
DRAFT
OPERABLE UNIT 3
NORTHROP GRUMMAN SYSTEMS CORPORATION
BETHPAGE, NEW YORK
SITE PLAN
SHOWING OFF-SITE
MONITORING WELLS AND
VERTICAL PROFILE BORINGS
ARCADIS
NY001464.0807
2

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Summary of Off-Site Groundwater RI

- April to October 2006 (Phase 2 RI)
  - VPBs VP-100 to 108 completed south/southeast of Park:
    - 174 samples analyzed for VOCs,
    - 168 samples analyzed for perchlorate
  - Completed depths bls:
    - VP-100 (400) VP-101 (507)
    - VP-102 (385) VP-103 (660)
    - VP-104 (885) VP-105 (165)
    - VP-106 (120) VP-107 (165)
    - VP-108 (165)
- 2007:
  - 4 new, deep VPBs
  - 123 samples analyzed for VOCs and perchlorate
  - Completed depths bls:
    - VP-109 (295) VP-110 (387)
    - VP-111 (631) VP-112 (700)

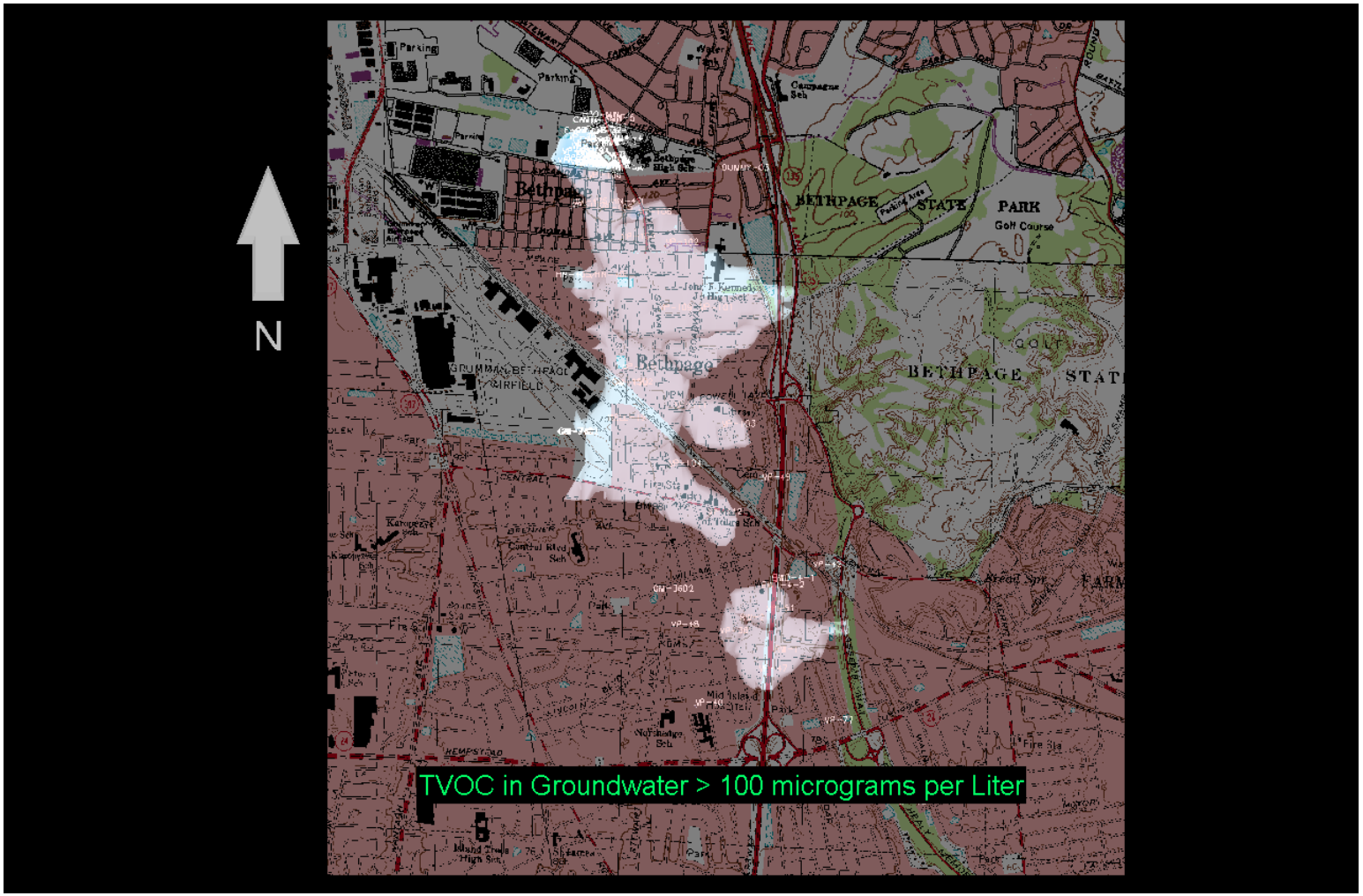
Preliminary Findings of Off-Site Groundwater RI

- Current estimate of known off-site VOC impacts:
  - Tracks along regional groundwater flow direction
  - 7,000 ft in length (to VP-112), distal end not currently known
  - 1,000 ft or greater in width
- Closer to the Park: principally cis-1,2 DCE, further from site, principally TCE
- Max. known off-site VOC concentration = 10,500 ug/L (VP-111)
- PCBs and Metals not assessed yet
- Average detected perchlorate levels <5 ug/L; no source identified
- Additional delineation of VOC plume extent needed.

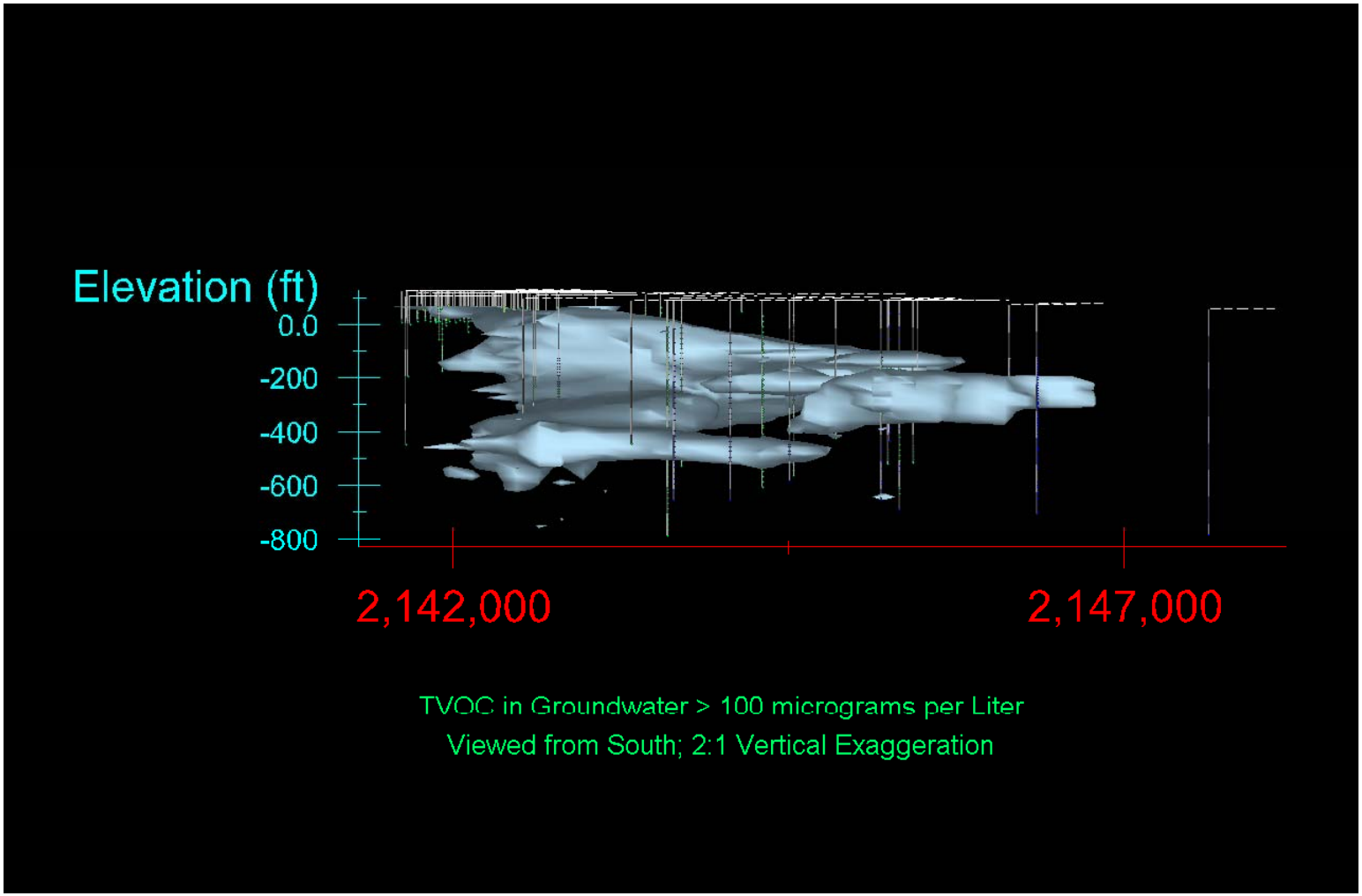
EVS Stills – Off-Site Groundwater

- Site Plan
- Plan and cross-sectional views of VOCs in off-site groundwater:
  - TVOC
  - Cis-1,2-DCE
  - TCE

N
Bethpage
BETHPAGE STATE PARK
Golf Course
BETHPAGE STATE
GRUMMAN BETHPAGE AIRFIELD
Bethpage High Sch
John F. Kennedy Jr High Sch
Campagne Sch
Central Blvd Sch
Northedge Sch
Mid Island Hospital
Island Trees Mem Sch
Island Trees High Sch
Parking
Park
Fire Sta
HEMPSTEAD



ARCADIS


Elevation (ft)
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-400
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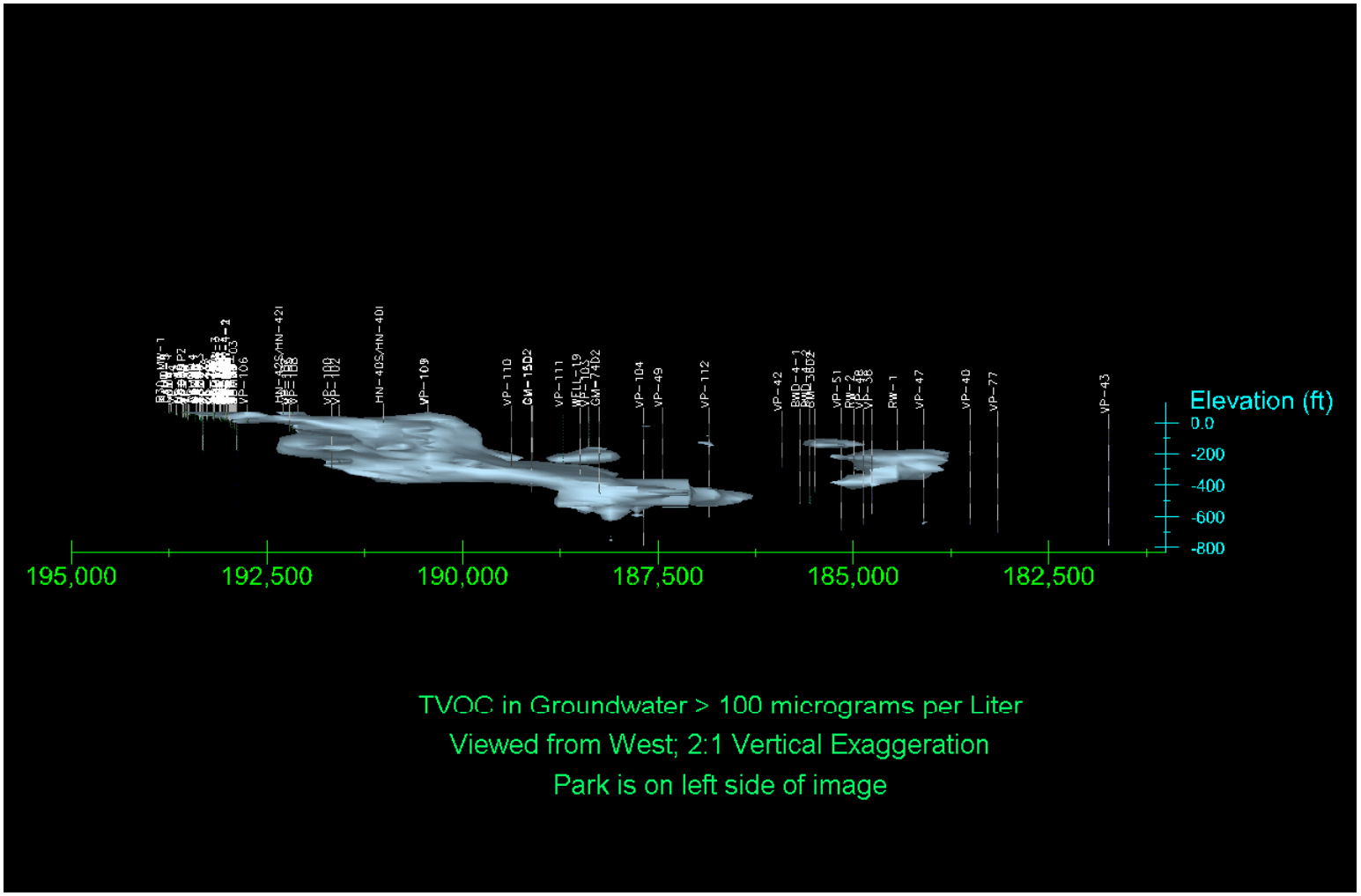
2,142,000
2,147,000
TVOC in Groundwater > 100 micrograms per Liter
Viewed from South; 2:1 Vertical Exaggeration

ARCADIS


Elevation (ft)
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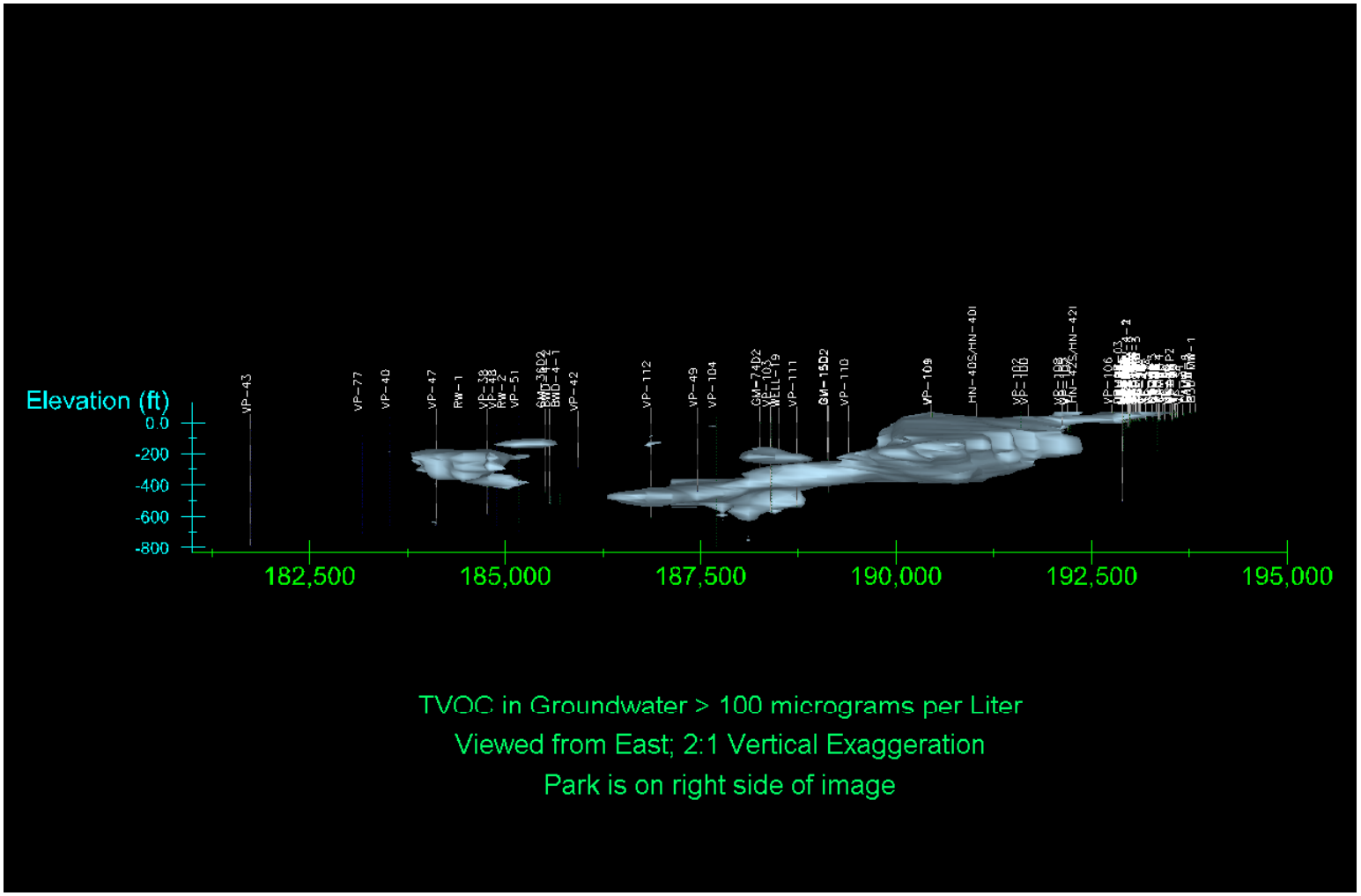
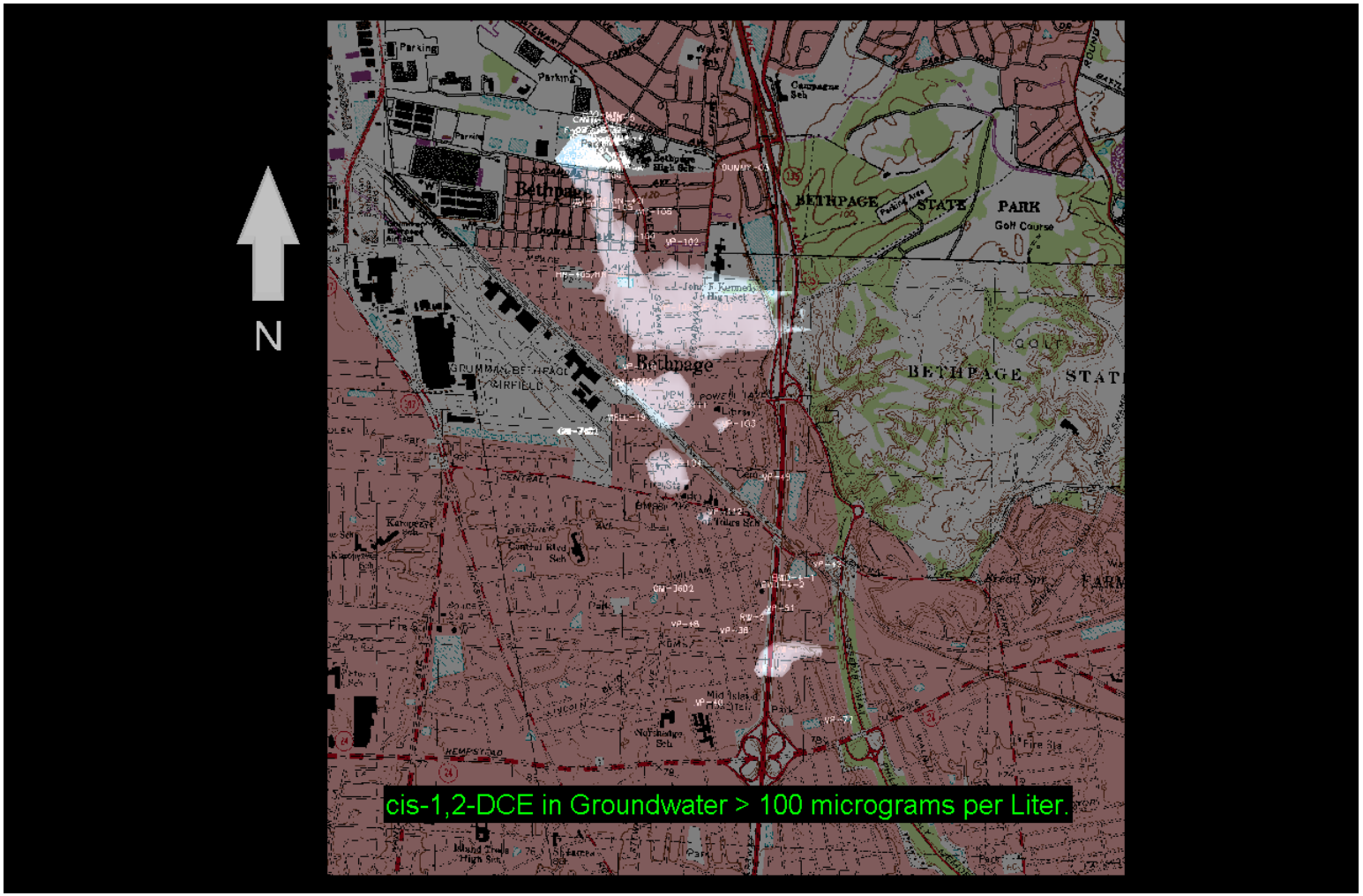
195,000
192,500
190,000
187,500
185,000
182,500
TVOC in Groundwater > 100 micrograms per Liter
Viewed from West; 2:1 Vertical Exaggeration
Park is on left side of image

ARCADIS

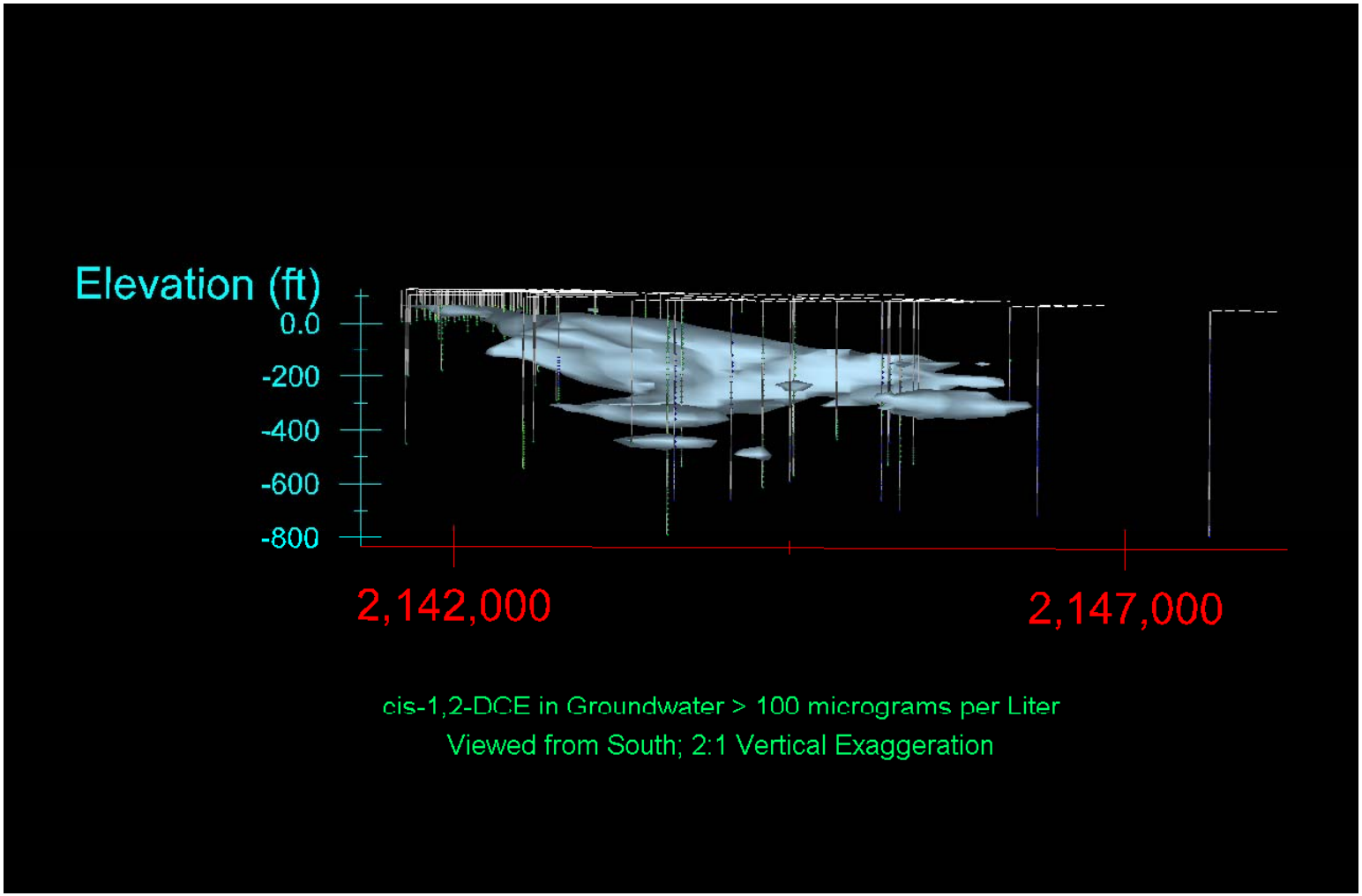


TVOC in Groundwater > 100 micrograms per Liter
Viewed from East; 2:1 Vertical Exaggeration
Park is on right side of image

ARCADIS


N
Bethpage
BETHPAGE STATE PARK
Golf Course
cis-1,2-DCE in Groundwater > 100 micrograms per Liter.

ARCADIS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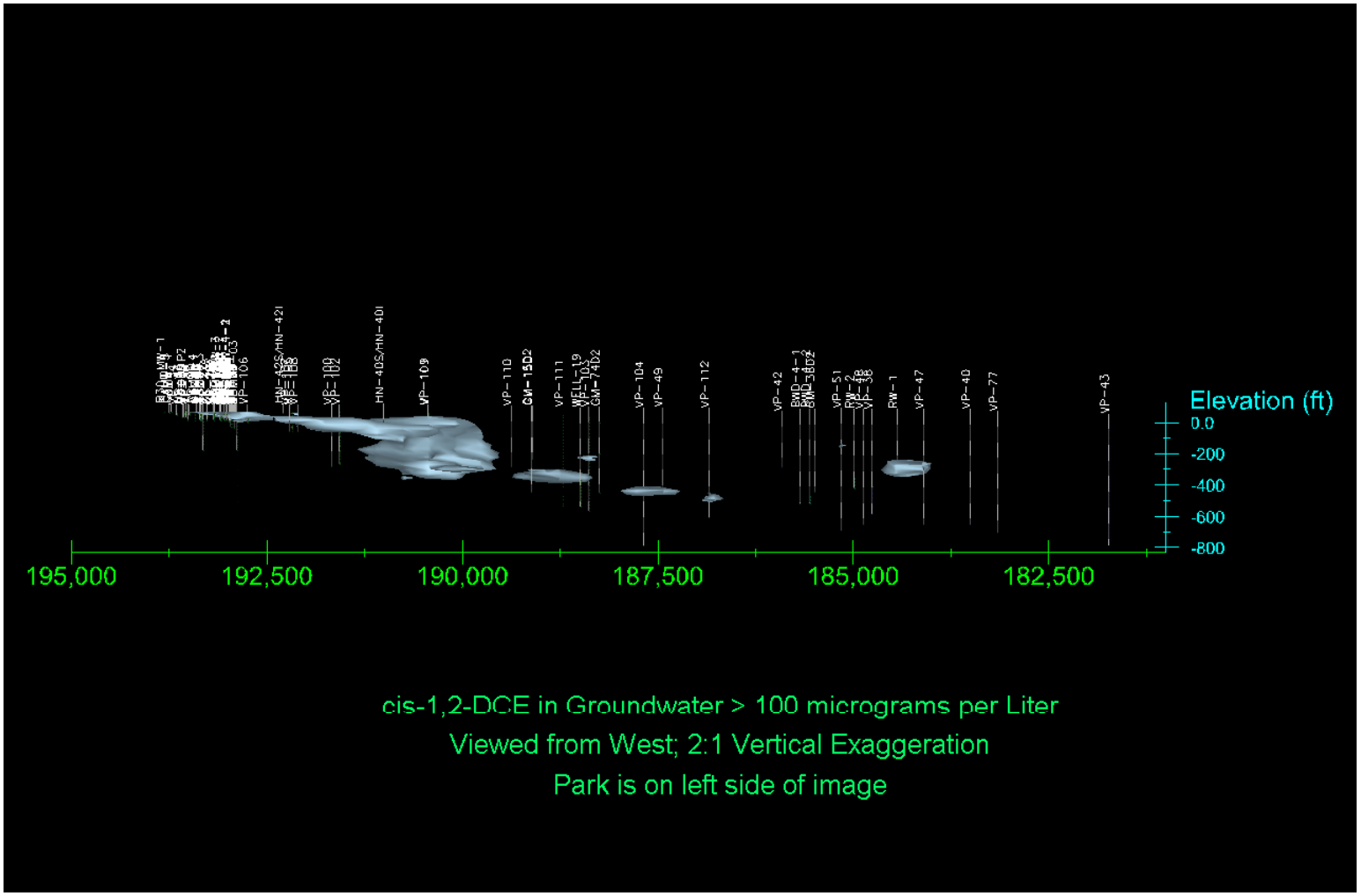
2,147,000
cis-1,2-DCE in Groundwater > 100 micrograms per Liter
Viewed from South; 2:1 Vertical Exaggeration

ARCADIS


Elevation (ft)
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-200
-400
-600
-800
195,000
192,500
190,000
187,500
185,000
182,500
cis-1,2-DCE in Groundwater > 100 micrograms per Liter
Viewed from West; 2:1 Vertical Exaggeration
Park is on left side of image

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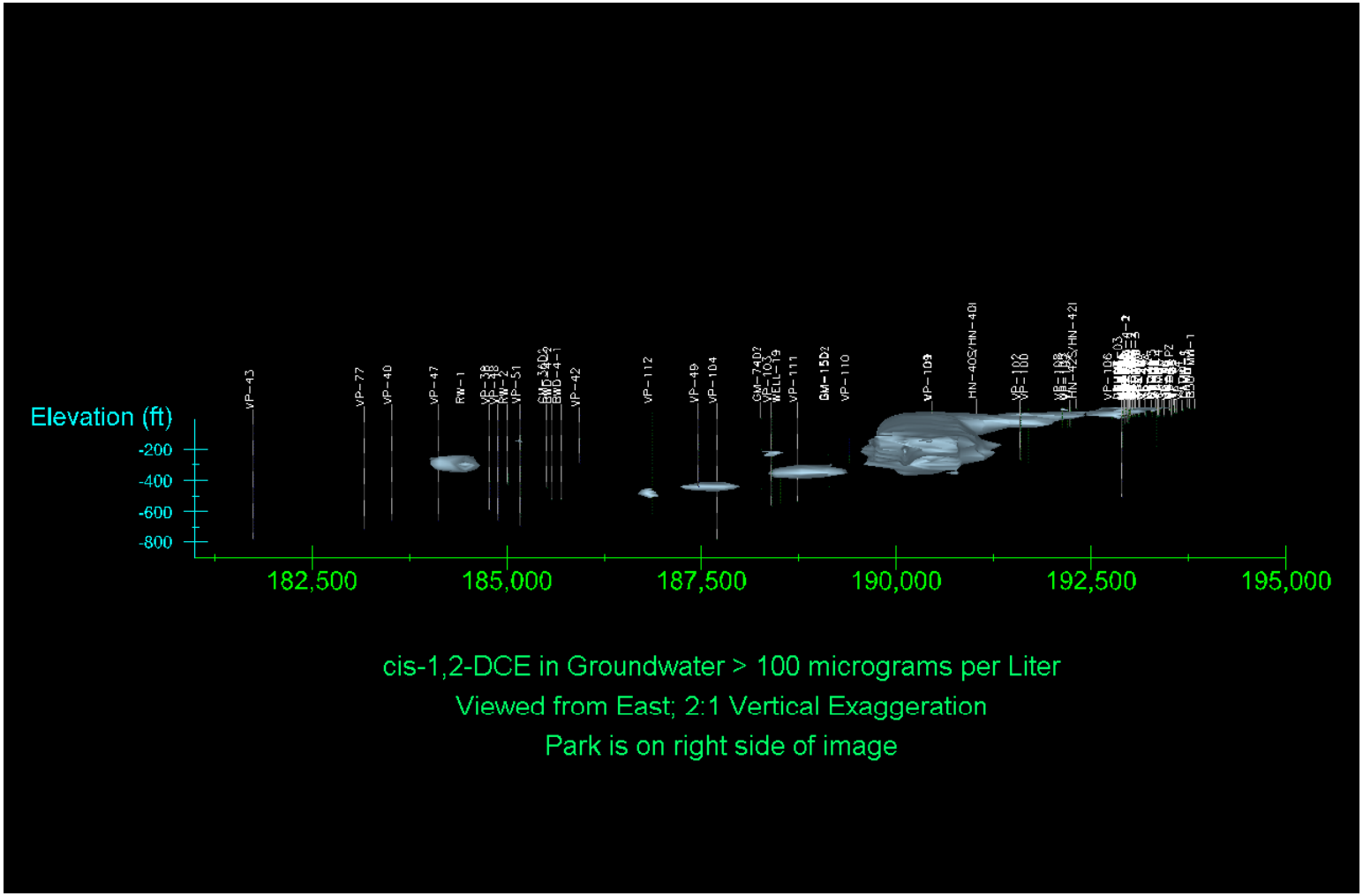
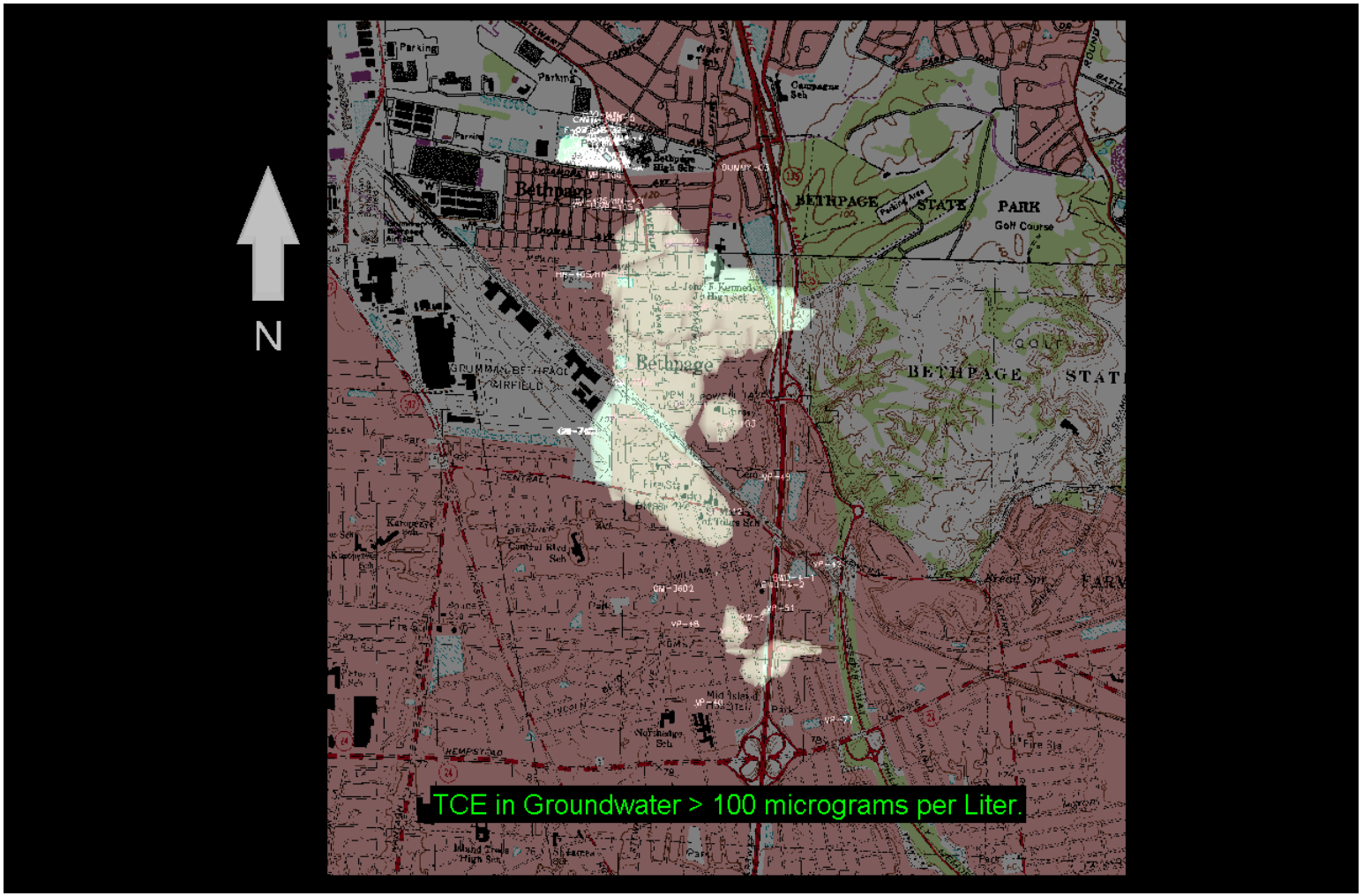
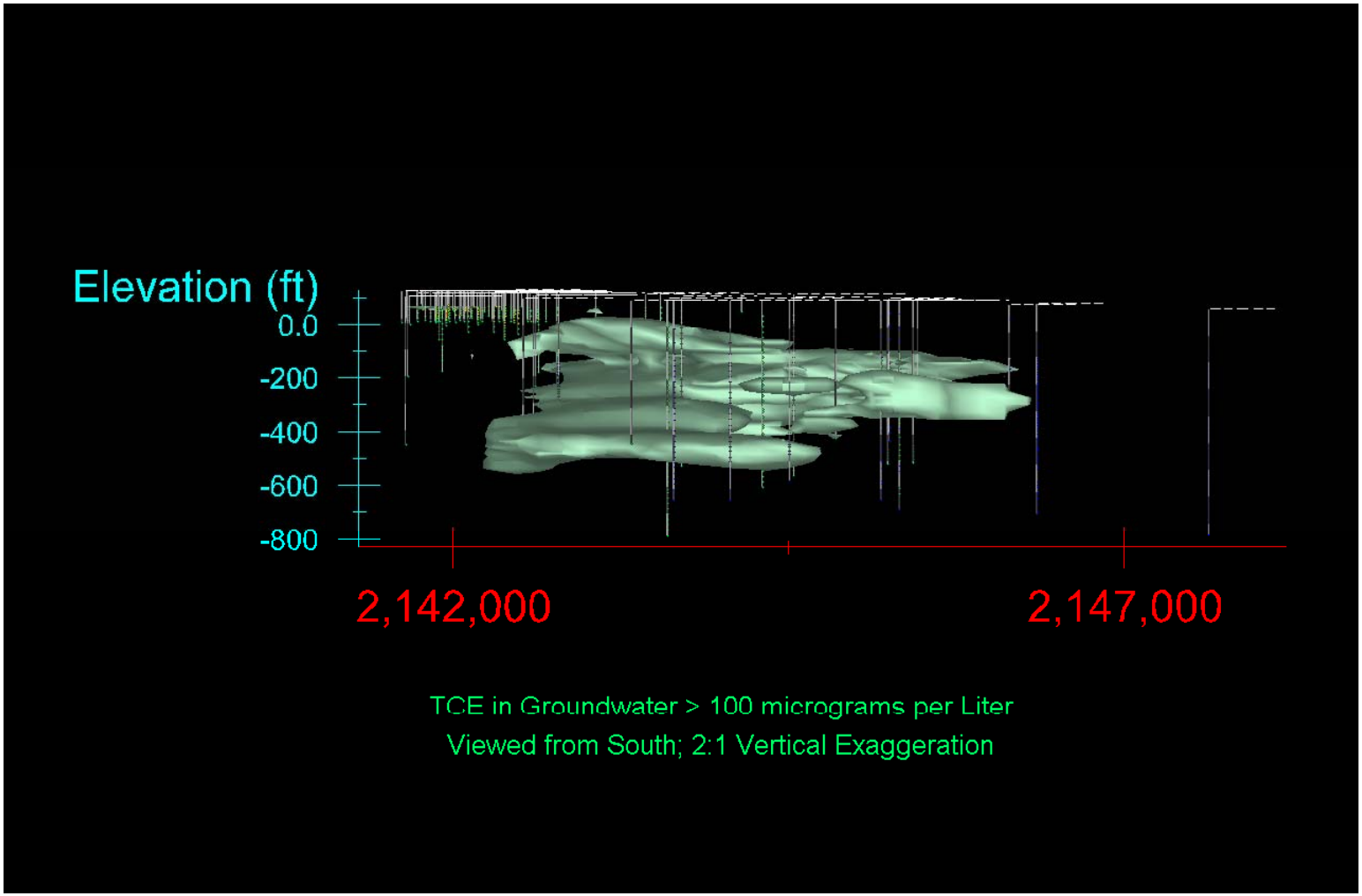
Infrastructure, environment, facilities

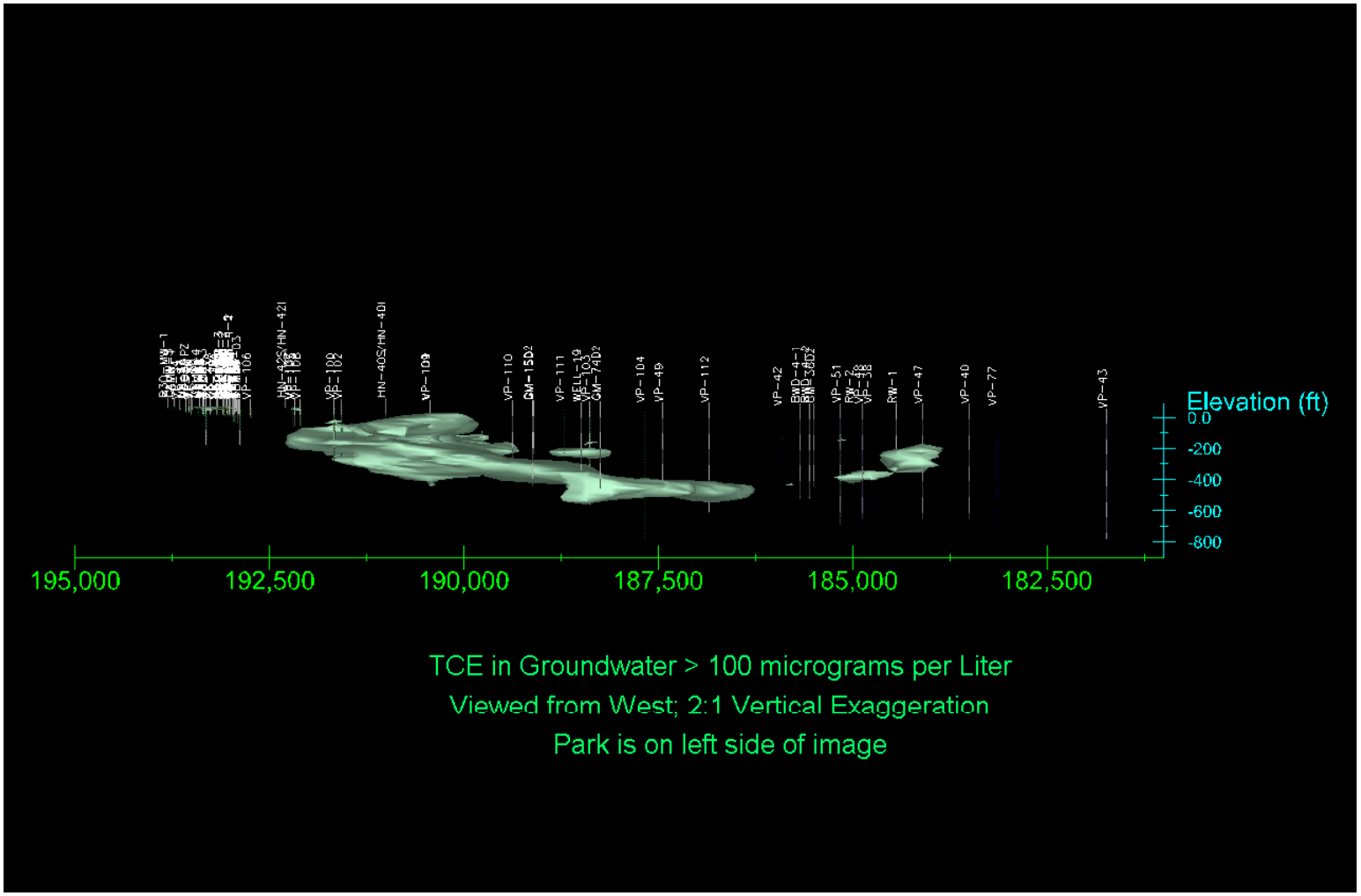



N
Bethpage
BETHPAGE STATE PARK
Golf Course
Bethpage
BETHPAGE
TCE in Groundwater > 100 micrograms per Liter.

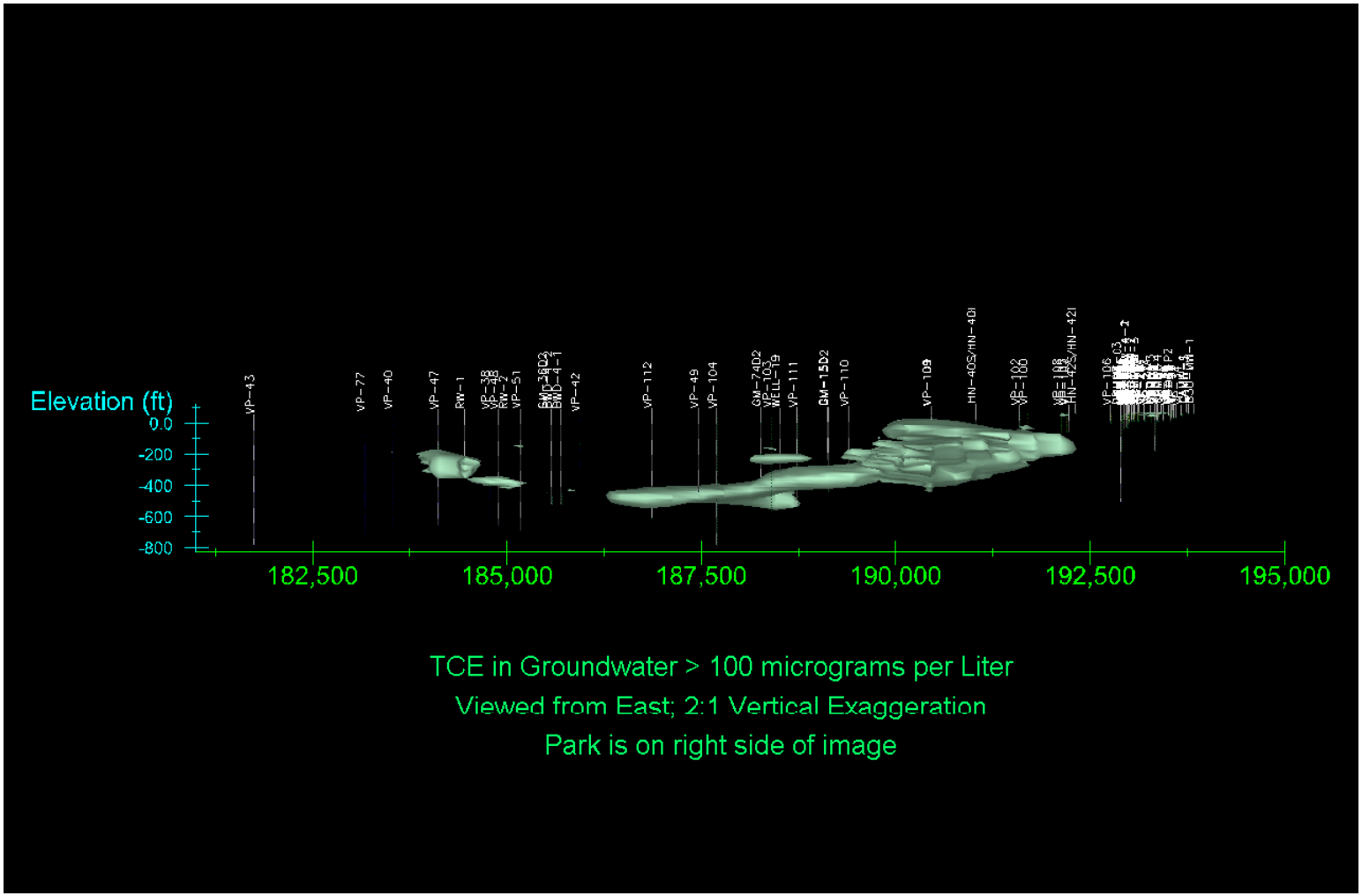
ARCADIS


Elevation (ft)
0.0
-200
-400
-600
-800
2,142,000
2,147,000
TCE in Groundwater > 100 micrograms per Liter
Viewed from South; 2:1 Vertical Exaggeration

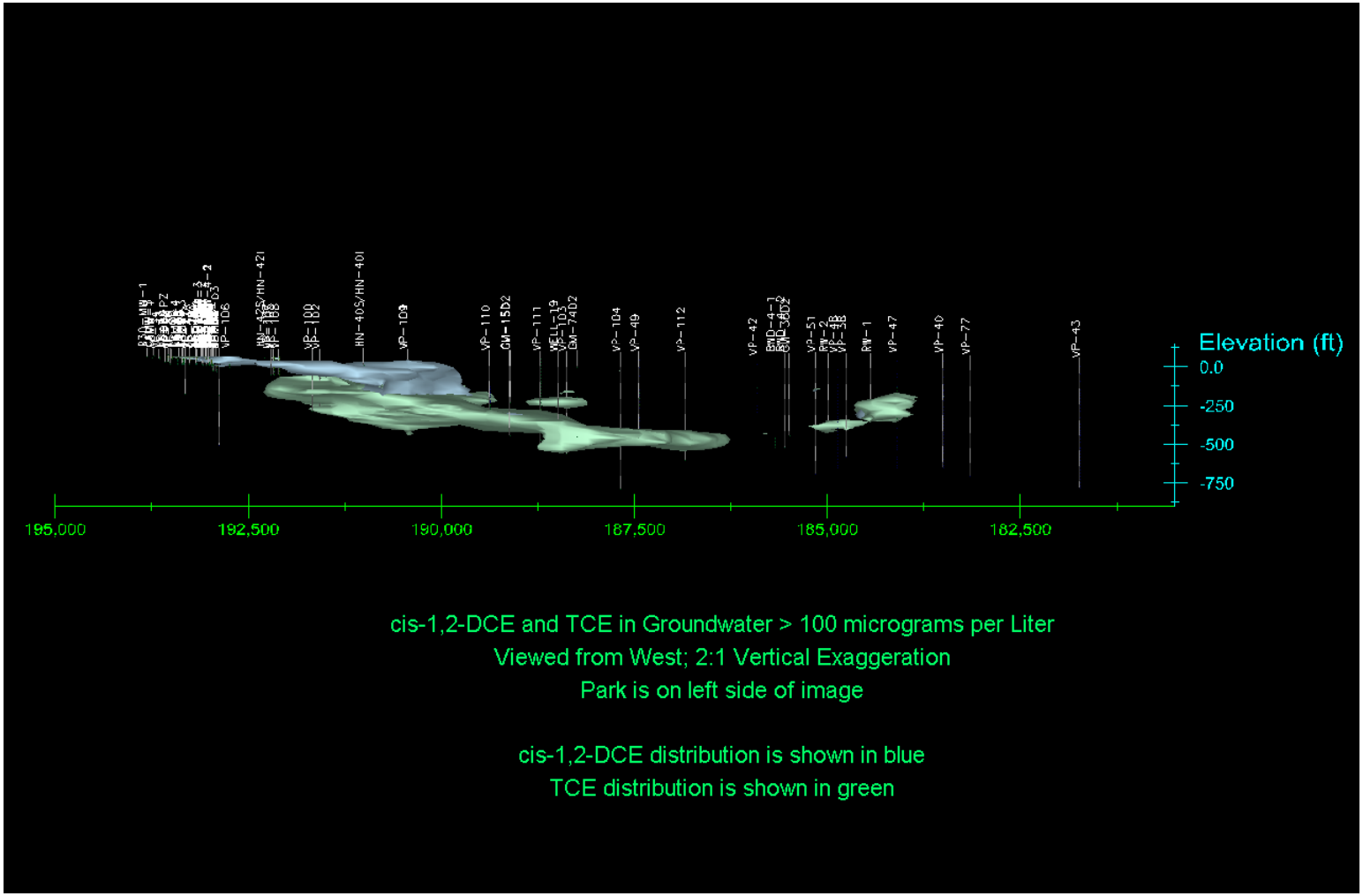
ARCADIS


Elevation (ft)
0.0
-200
-400
-600
-800
195,000
192,500
190,000
187,500
185,000
182,500
TCE in Groundwater > 100 micrograms per Liter
Viewed from West; 2:1 Vertical Exaggeration
Park is on left side of image

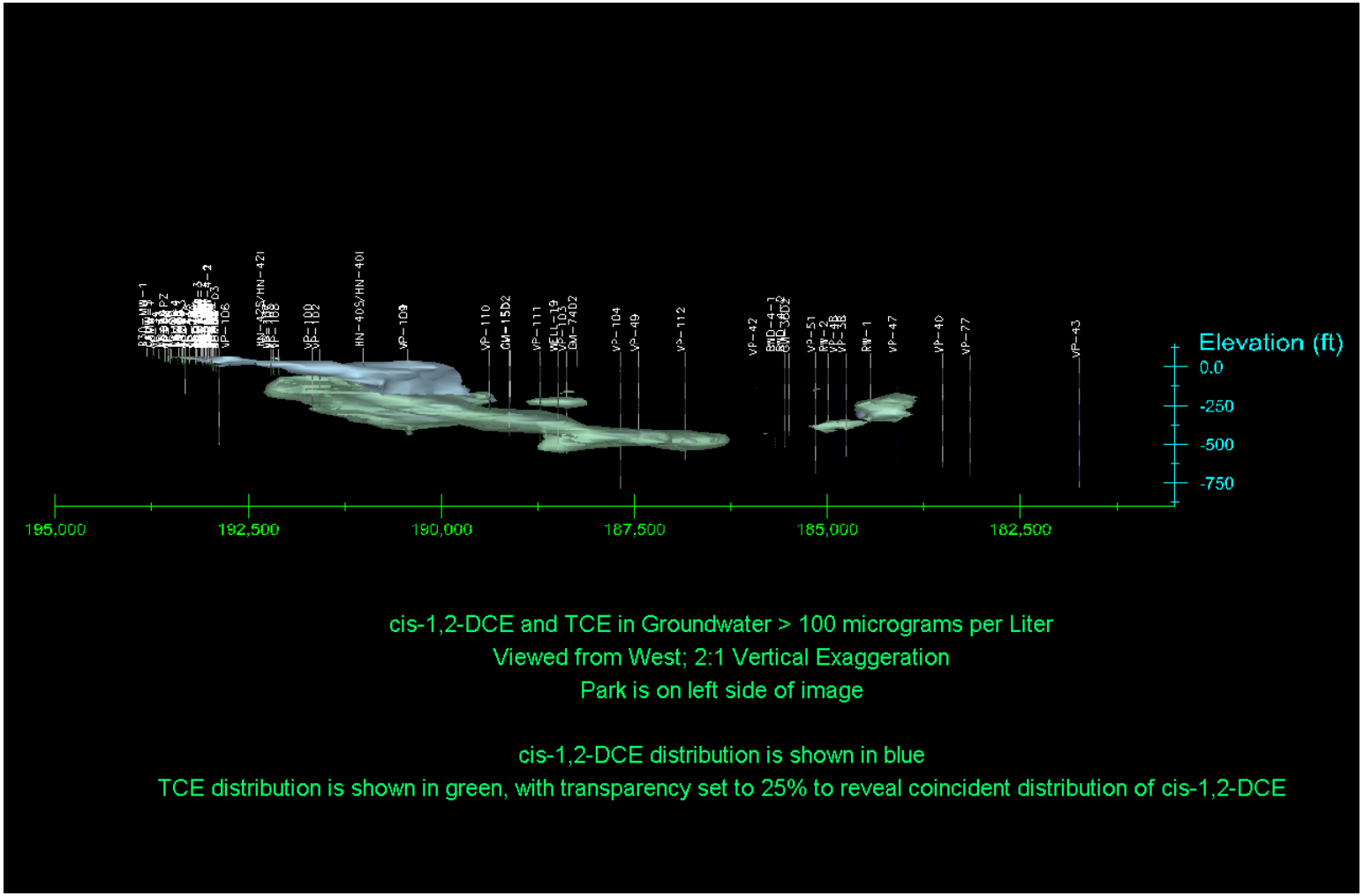
ARCADIS


Elevation (ft)
0.0
-200
-400
-600
-800
182,500
185,000
187,500
190,000
192,500
195,000
TCE in Groundwater > 100 micrograms per Liter
Viewed from East; 2:1 Vertical Exaggeration
Park is on right side of image

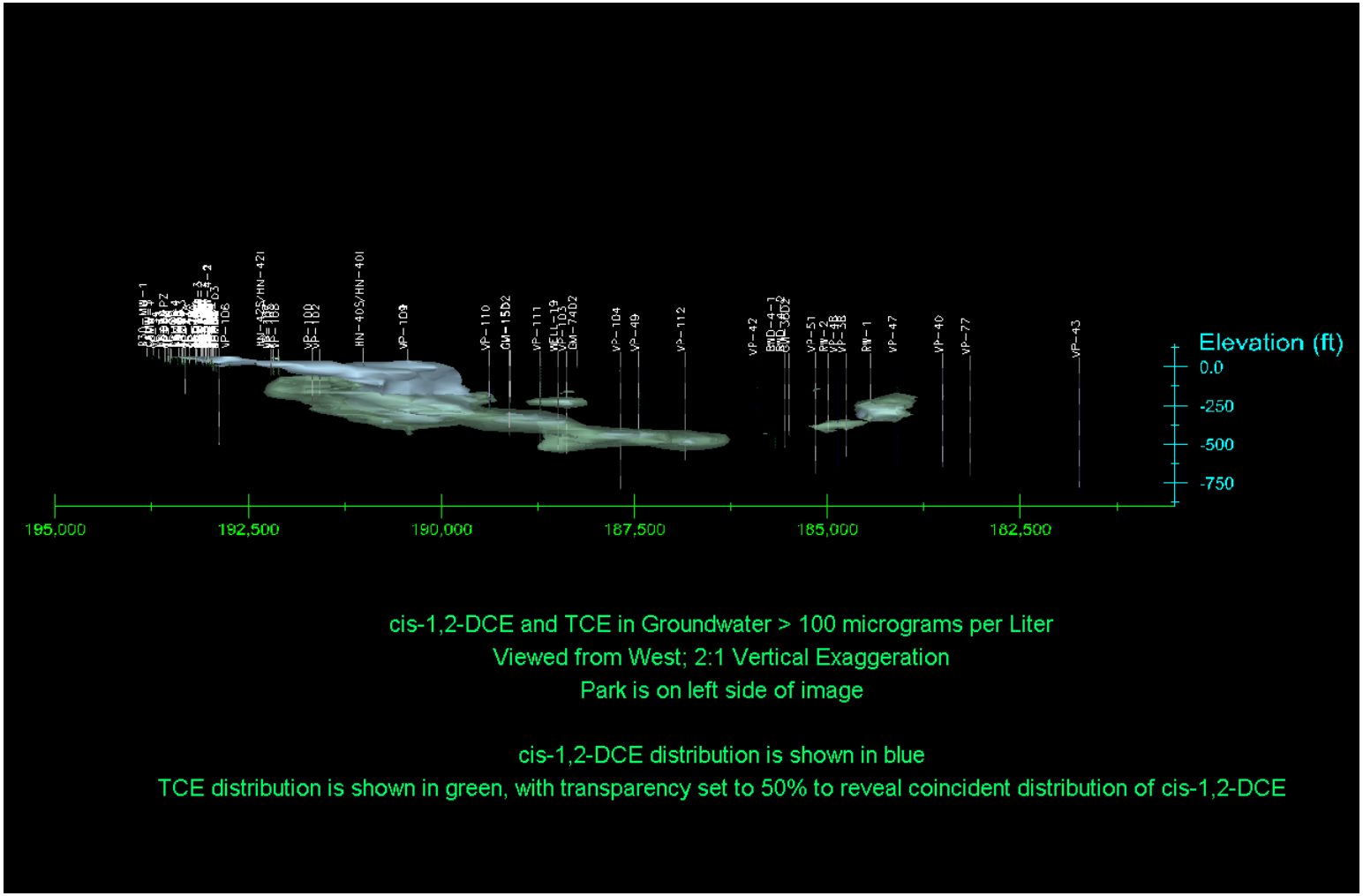
ARCADIS


Elevation (ft)
0.0
-250
-500
-750
195,000
192,500
190,000
187,500
185,000
182,500
cis-1,2-DCE and TCE in Groundwater > 100 micrograms per Liter
Viewed from West; 2:1 Vertical Exaggeration
Park is on left side of image
cis-1,2-DCE distribution is shown in blue
TCE distribution is shown in green

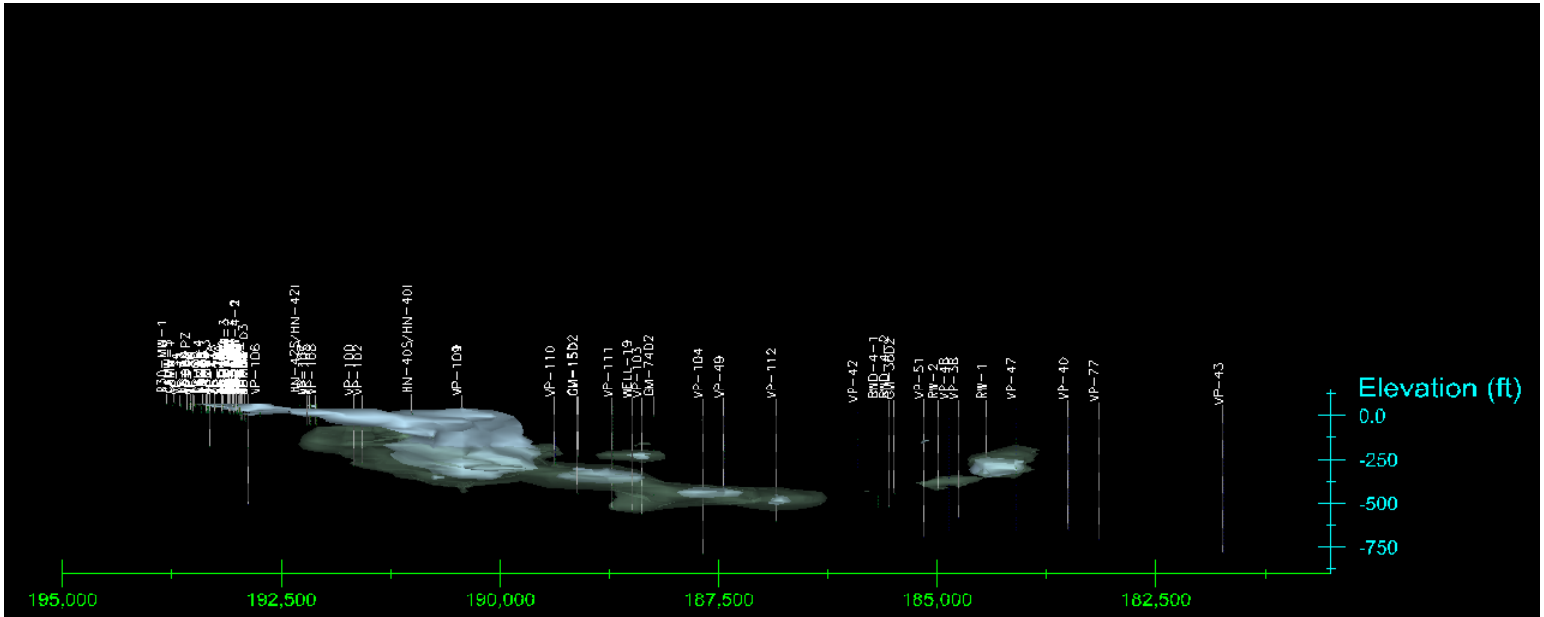
ARCADIS


Elevation (ft)
0.0
-250
-500
-750
195,000
192,500
190,000
187,500
185,000
182,500
cis-1,2-DCE and TCE in Groundwater > 100 micrograms per Liter
Viewed from West; 2:1 Vertical Exaggeration
Park is on left side of image
cis-1,2-DCE distribution is shown in blue
TCE distribution is shown in green, with transparency set to 25% to reveal coincident distribution of cis-1,2-DCE

ARCADIS


Elevation (ft)
0.0
-250
-500
-750
195,000
192,500
190,000
187,500
185,000
182,500
cis-1,2-DCE and TCE in Groundwater > 100 micrograms per Liter
Viewed from West; 2:1 Vertical Exaggeration
Park is on left side of image
cis-1,2-DCE distribution is shown in blue
TCE distribution is shown in green, with transparency set to 50% to reveal coincident distribution of cis-1,2-DCE

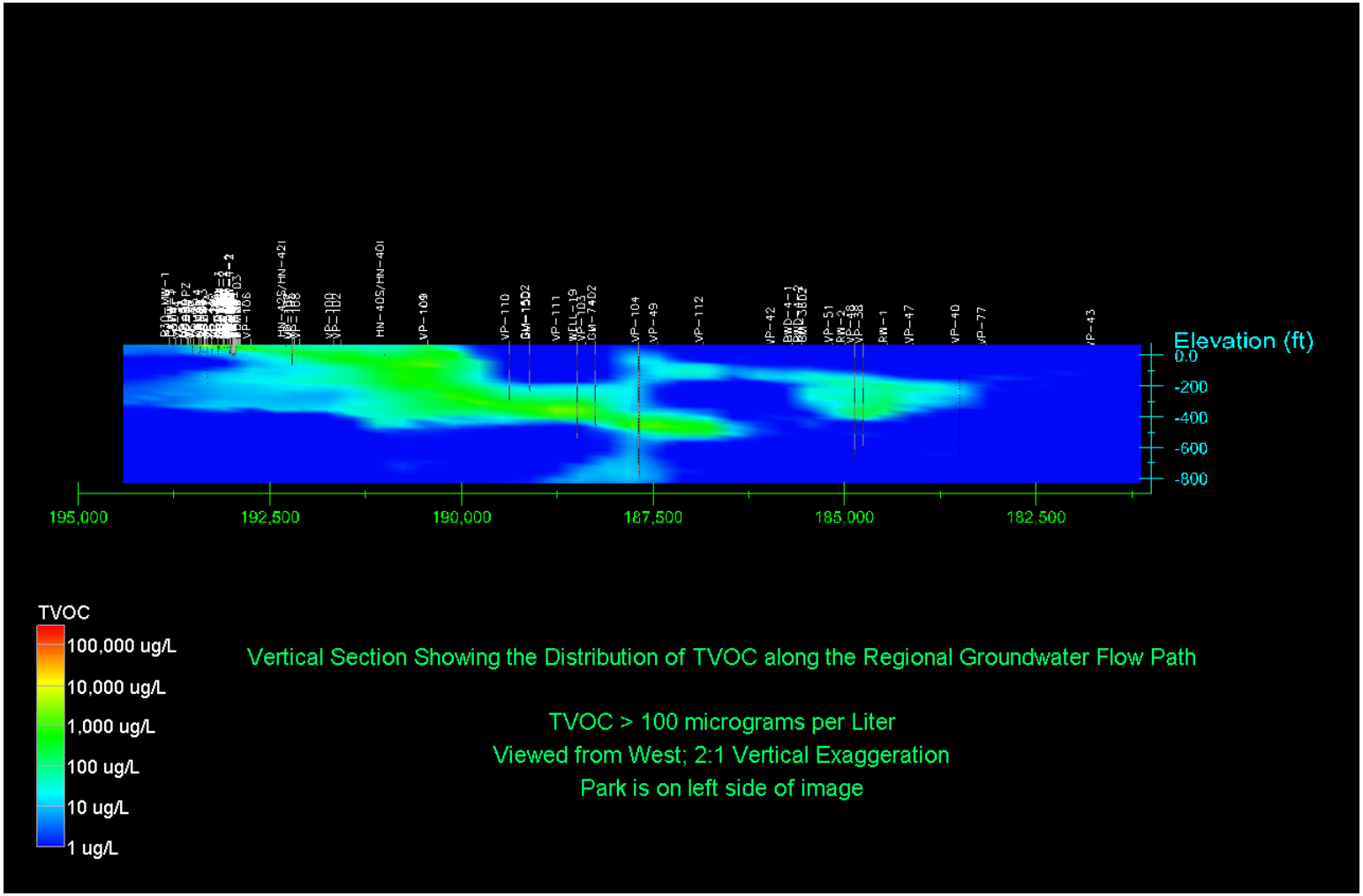
ARCADIS



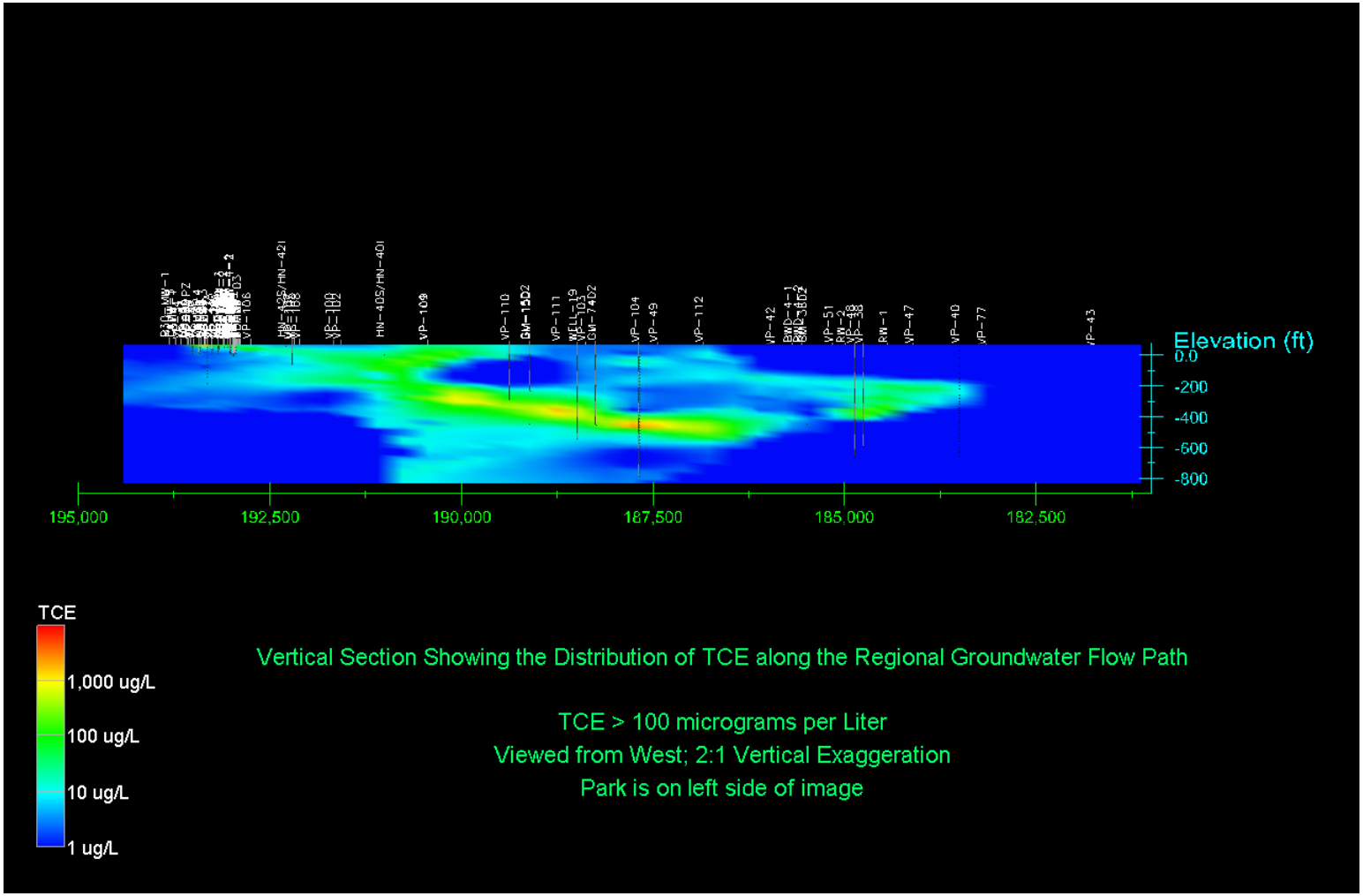
cis-1,2-DCE and TCE in Groundwater > 100 micrograms per Liter
Viewed from West; 2:1 Vertical Exaggeration
Park is on left side of image

cis-1,2-DCE distribution is shown in blue
TCE distribution is shown in green, with transparency set to 75% to reveal coincident distribution of cis-1,2-DCE

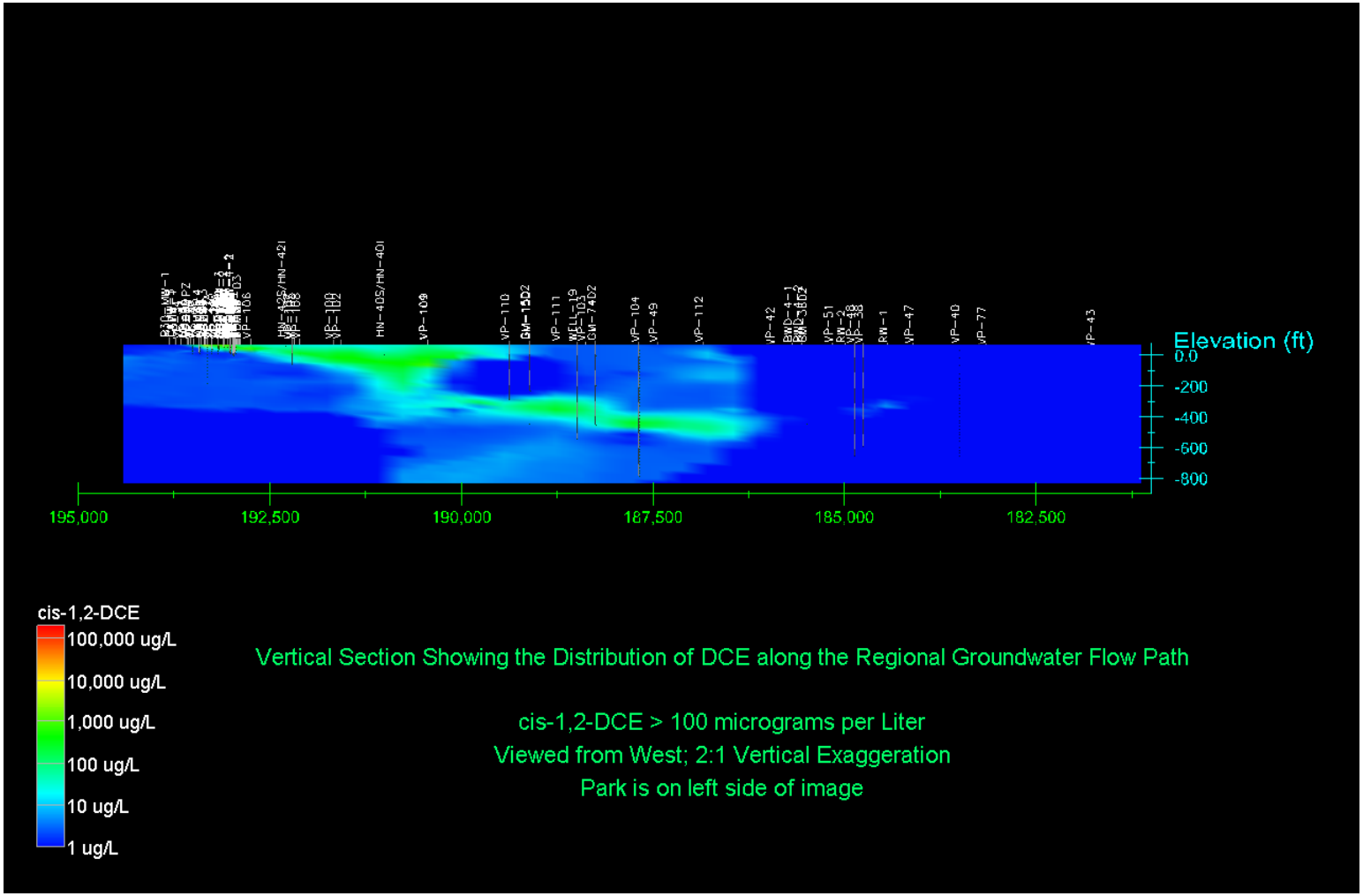
ARCADIS


Elevation (ft)
0.0
-200
-400
-600
-800
195,000
192,500
190,000
187,500
185,000
182,500
TVOC
100,000 ug/L
10,000 ug/L
1,000 ug/L
100 ug/L
10 ug/L
1 ug/L
Vertical Section Showing the Distribution of TVOC along the Regional Groundwater Flow Path
TVOC > 100 micrograms per Liter
Viewed from West; 2:1 Vertical Exaggeration
Park is on left side of image

ARCADIS


Elevation (ft)
0.0
-200
-400
-600
-800
195,000
192,500
190,000
187,500
185,000
182,500
TCE
1,000 ug/L
100 ug/L
10 ug/L
1 ug/L
Vertical Section Showing the Distribution of TCE along the Regional Groundwater Flow Path
TCE > 100 micrograms per Liter
Viewed from West; 2:1 Vertical Exaggeration
Park is on left side of image

ARCADIS


Elevation (ft)
0.0
-200
-400
-600
-800
195,000
192,500
190,000
187,500
185,000
182,500
cis-1,2-DCE
100,000 ug/L
10,000 ug/L
1,000 ug/L
100 ug/L
10 ug/L
1 ug/L
Vertical Section Showing the Distribution of DCE along the Regional Groundwater Flow Path
cis-1,2-DCE > 100 micrograms per Liter
Viewed from West; 2:1 Vertical Exaggeration
Park is on left side of image

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Current Conceptual Site Model (CSM)

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Current Conceptual Site Model

- Potential Areas of Soil Impacts:
  - VOCs: Areas “A”, “B”, “D”, “F”, “H”, and “I”
  - PCBs and Cd/Cr :
    - Fill/re-worked material
    - At least one type of sludge-like material contained Cr.
  - PAHs:
    - Mostly limited to fill material
    - Sporadic in south of Parking Lot and southwest Park areas

Current Conceptual Site Model

- Potential Sources of Groundwater Impacts:
  - Area “B”, “D”, and “I”
  - Former Ice Rink
  - Perched water
- Potential Areas of Soil Gas Impacts:
  - Area “A” (Shallow Low Permeability Zone)
  - Area “D” (Deep Low Permeability Zone)
  - Area “I” (Deep Vadose Zone)
  - Former Ice Rink (Freons)
  - Perched Water & Groundwater

Current Conceptual Site Model

- Soil Pathways:
  - CaPAHs, PCBs and Metals in shallow soil possible exposure scenario – additional study/analysis required
  - Majority of VOC mass appears to be present in deep vadose zone with local hotspots in fill material, therefore exposure unlikely
- Fate of Soil COCs:
  - LPZ on site affects COC migration
  - Some COCs mobilized via recharge and seasonal contact of LPZ with water table
  - Some soils are likely continuing sources of groundwater VOC and metals impacts
  - Partial Bio-transformation of CVOCs occurring within LPZ

Current Conceptual Site Model

- Groundwater Pathways (VOCs):
  - LPZ has slowed the release of VOCs to groundwater resulting in continuing source
  - Seasonal groundwater level fluctuations may vary VOC release rates
  - On-Site VOCs continue to migrate off-site
  - Off-Site VOC Plume descending through the Magothy Aquifer to the southeast
  - Localized off-site LPZ's not significantly influencing plume movement.
  - No known private wells; Bethpage Water District (BWD) Plants 4, 5, and 6 public supply wells have VOC treatment.

Current Conceptual Site Model

- Groundwater Fate (VOCs):
  - Based on off-site plume chemical composition, discarded materials may have changed over time
  - On-site data indicate partial CVOCs bio-transformation is occurring
  - Portion of off-site VOC plume appears to be within capture zone of OU2 remedial well 19
  - Off-site data indicate VOC plume not showing evidence of further retardation or bio-transformation
  - Uncertainty exists as to possible 2nd source as well as the distal portion of VOC plume.
  - Freons 12 and 22 detected in groundwater downgradient of former ice rink, continue to migrate off site; off-site extent is not known.

Current Conceptual Site Model

- Soil Gas Pathways (VOCs):
  - lateral diffusion
  - off-gassing from groundwater
  - Significance of lateral diffusion and off-gassing from groundwater is still being assessed

- Soil Gas Fate (VOCs):
  - Orders of magnitude reduction in VOCs in off-site soil gas compared to on-site

Known Status of Town IRM

Status of Town IRM

- Excavation: Completed May 2007
  - Pre-Work Estimate: 100,000 tons
  - Post-Ex Estimate: 172,500 tons
  - Areas “H” and “I” impacts
    - excavated ranging between 10-20 ft
    - Approx. 15,600 tons of buried debris and drums, with some sludge-like material
  - Open pits that accumulated water and other poor work practices may have exacerbated groundwater impacts
- Backfill: Substantially Completed June 2007
- IRM Report: due in August 2007
- Re-Development currently underway

Status of IRMs

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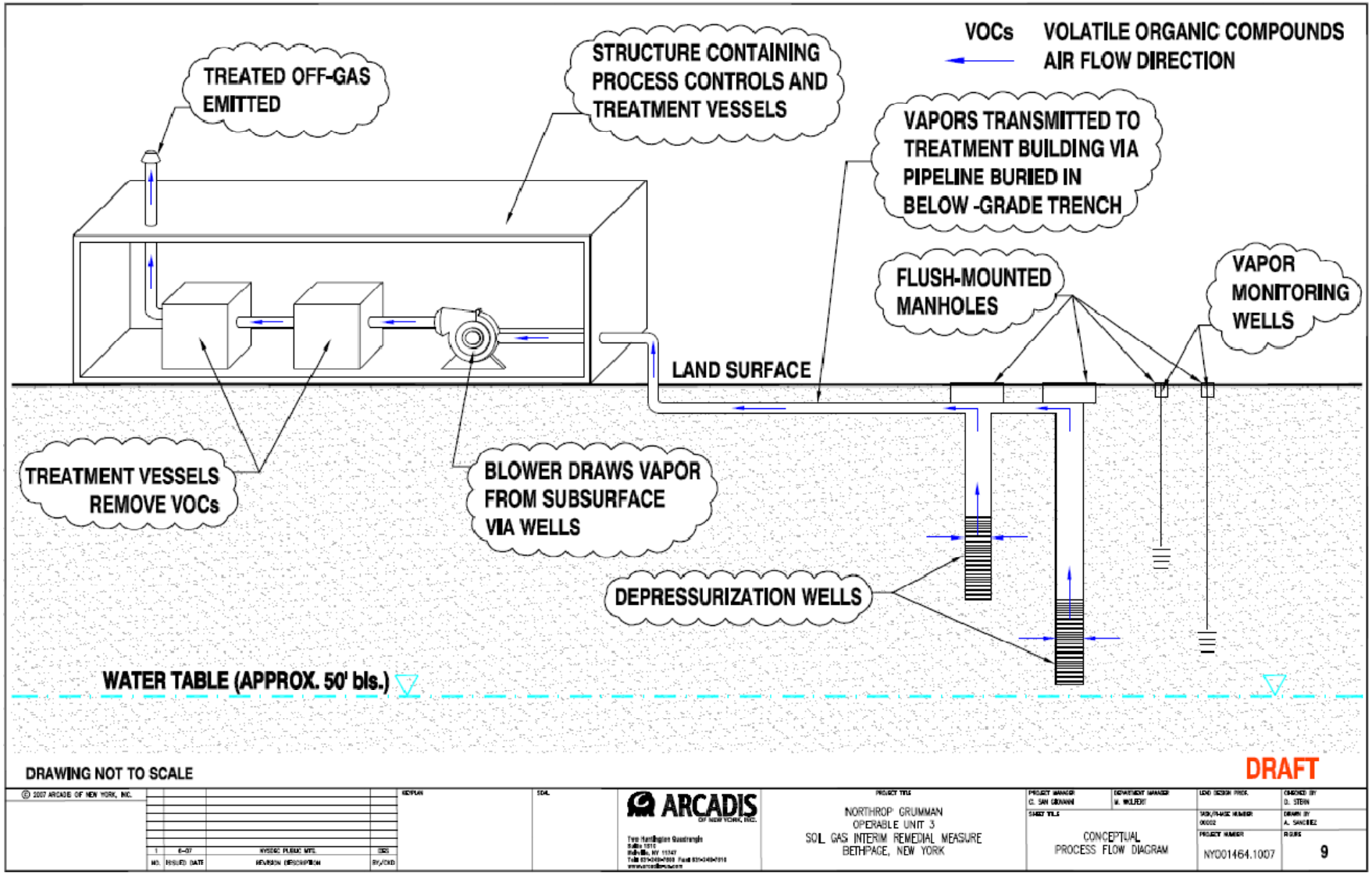
Soil Gas Interim Remedial Measure

- Objective:
  - Create zone of lower pressure between Park and adjoining properties to south and west.
- Status
  - ARCADIS teaming with ARCADIS-BBL
  - 50-75% Design Submitted to NYSDEC and approved
  - 95% Design nearing completion
  - Startup: 4th Quarter 2007

Soil Gas IRM



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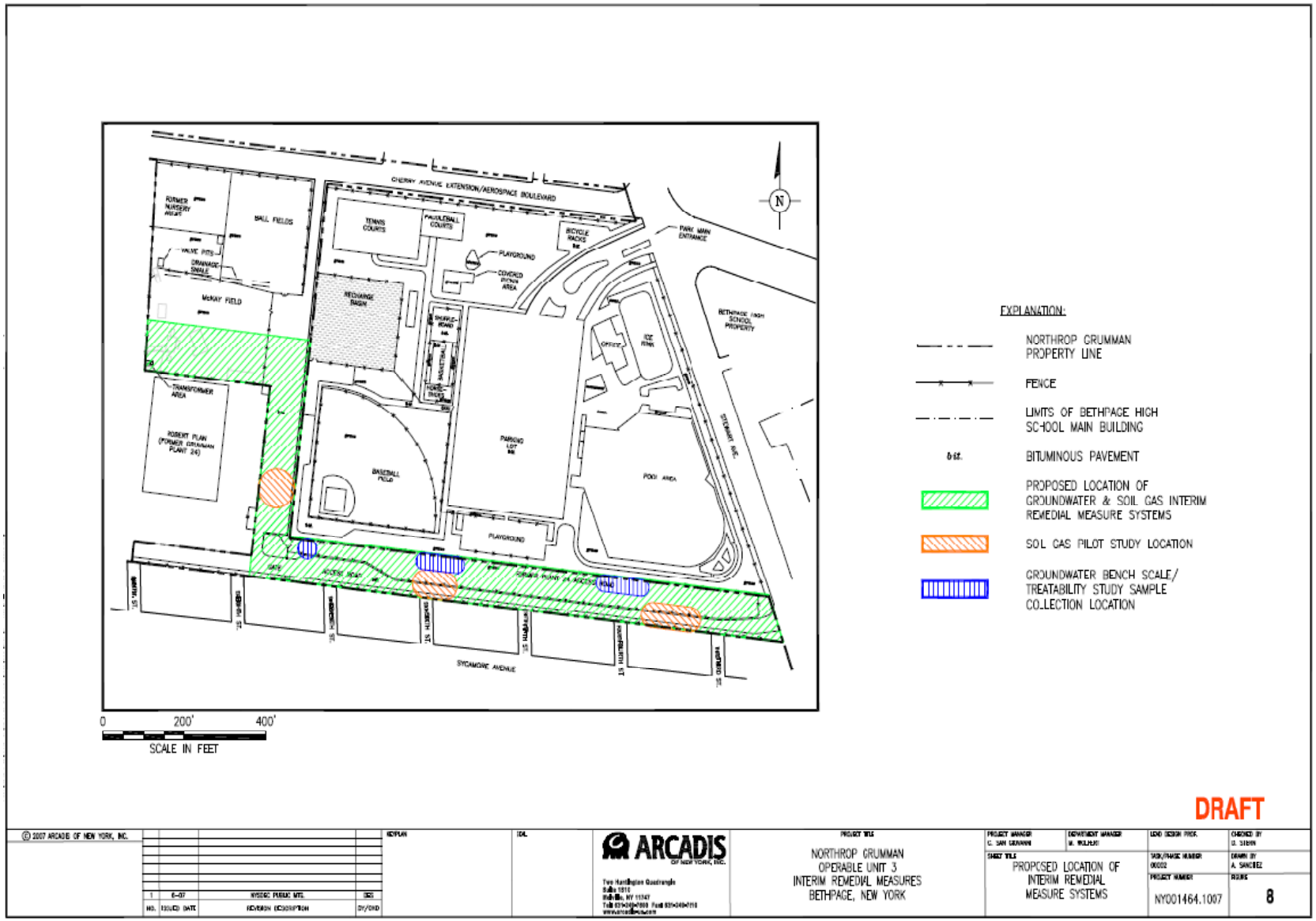
Groundwater/Soil Gas IRM Integration



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Groundwater Interim Remedial Measure

- Objectives:
  - Minimize off-site migration of VOCs in groundwater
  - Create/Enhance clean water-table lens south of Park
- Options considered for groundwater (site southern boundary) :
  - Groundwater Pump & Treat (multiple scenarios)
  - Enhanced Anaerobic Biodegradation (EAB)
  - In-Situ Chemical Oxidation (ISCO)
  - Permeable Reactive Barrier (PRB)

Project Schedule

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Project Schedule

- To expedite issuance of RI/FS Reports, the reports were bifurcated into on-site (2007) and off-site (2008) deliverables.
- Simultaneous development of Soil Gas and Groundwater IRMs underway
- Off-Site RI/FS schedule extended by 6 months for the following reason:
  - Off-site plume length and complexity

Project Schedule

- RI:
  - On-Site Phase 2 and 3 RI - Complete
  - On-Site RI Report (October 2007)
  - Off-Site Phase 3 RI (VPBs and Wells) (1st thru 4th Quarters 2008)
  - Off-Site RI Report (4th Quarter 2008)

- Soil Gas IRM:
  - Pilot Tests/Pre-Design Data – Complete
  - 50 – 75% Design – Complete and Approved
  - 95% Design – August 2007
  - Initiate Construction – August 2007
  - Startup – October 2007

Project Schedule

- Groundwater IRM:
  - PRB Bench Scale & ISCO Treatability Tests – Completed
  - Internal optimization/costing: August 2007
  - IRM Work Plan – 3rd Quarter 2007
  - Conceptual Design – 1st Quarter 2008
  - 95% Design – 2nd Quarter 2008
  - Construction – 3rd Quarter 2008

- Other Dates:
  - On-Site Preliminary Screening of Alts. (4th Quarter 2007)
  - On-Site FS (1st Quarter 2008)
  - Off-Site Preliminary Screening of Alts. (4th Quarter 2008)
  - Off-Site FS (1st Quarter 2009)