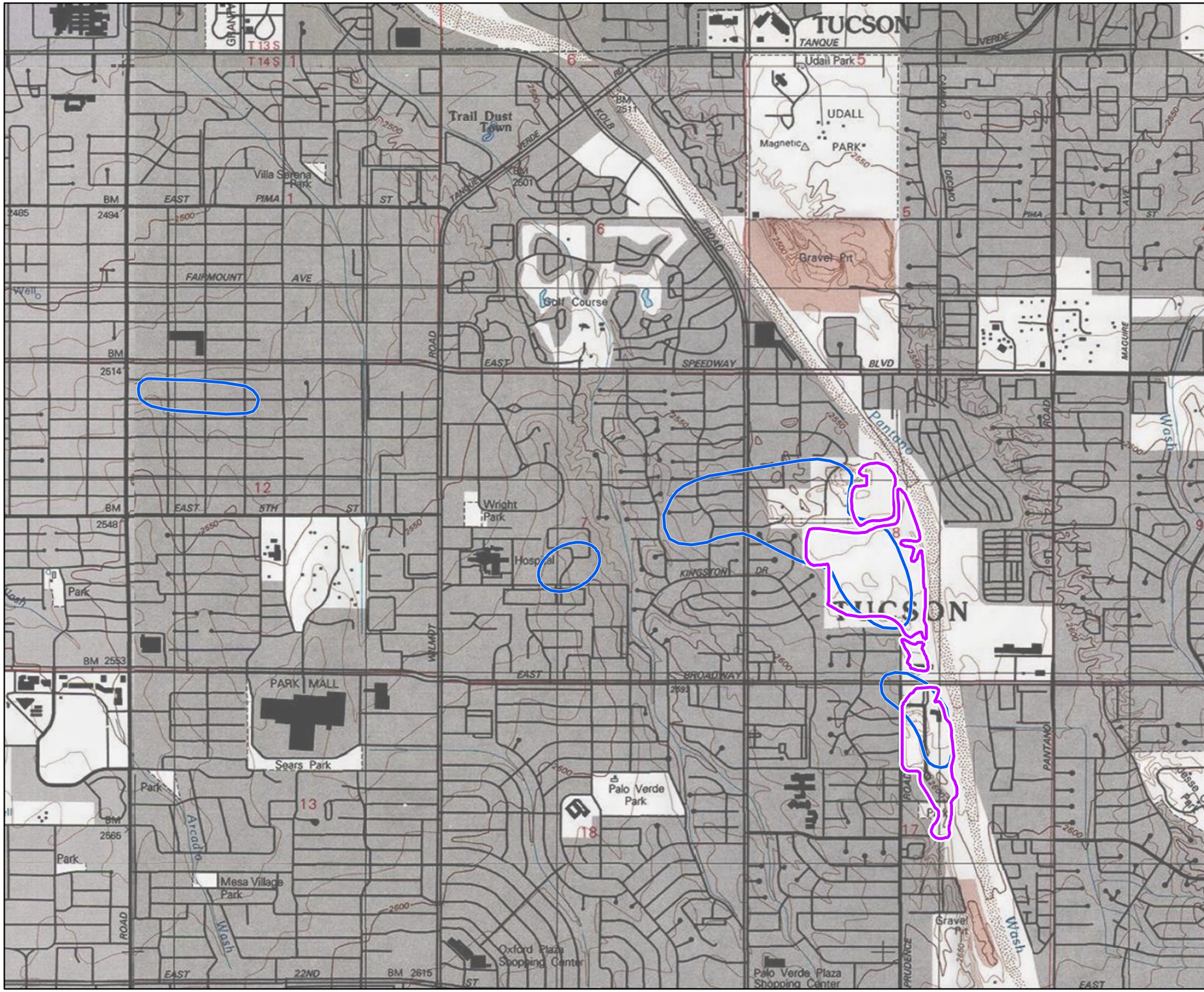
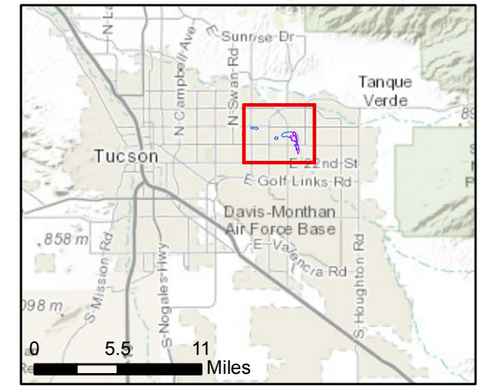


Legend

- Approximate Extent of Landfill Operable Unit*
- Approximate Extent of Groundwater Operable Unit

View Extent at Left (Red Frame)



0 2,000 4,000 Feet

1 inch:2,000 feet

Notes:
**LOU RI Extent for BNL from Stantec, 2012*

Map Projection: WGS 1984 Web Mercator Auxiliary Sphere

Service Layer Credits: Copyright: © 2013 National Geographic Society
Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), and the GIS User Community

Job No. 233005

Revision: A

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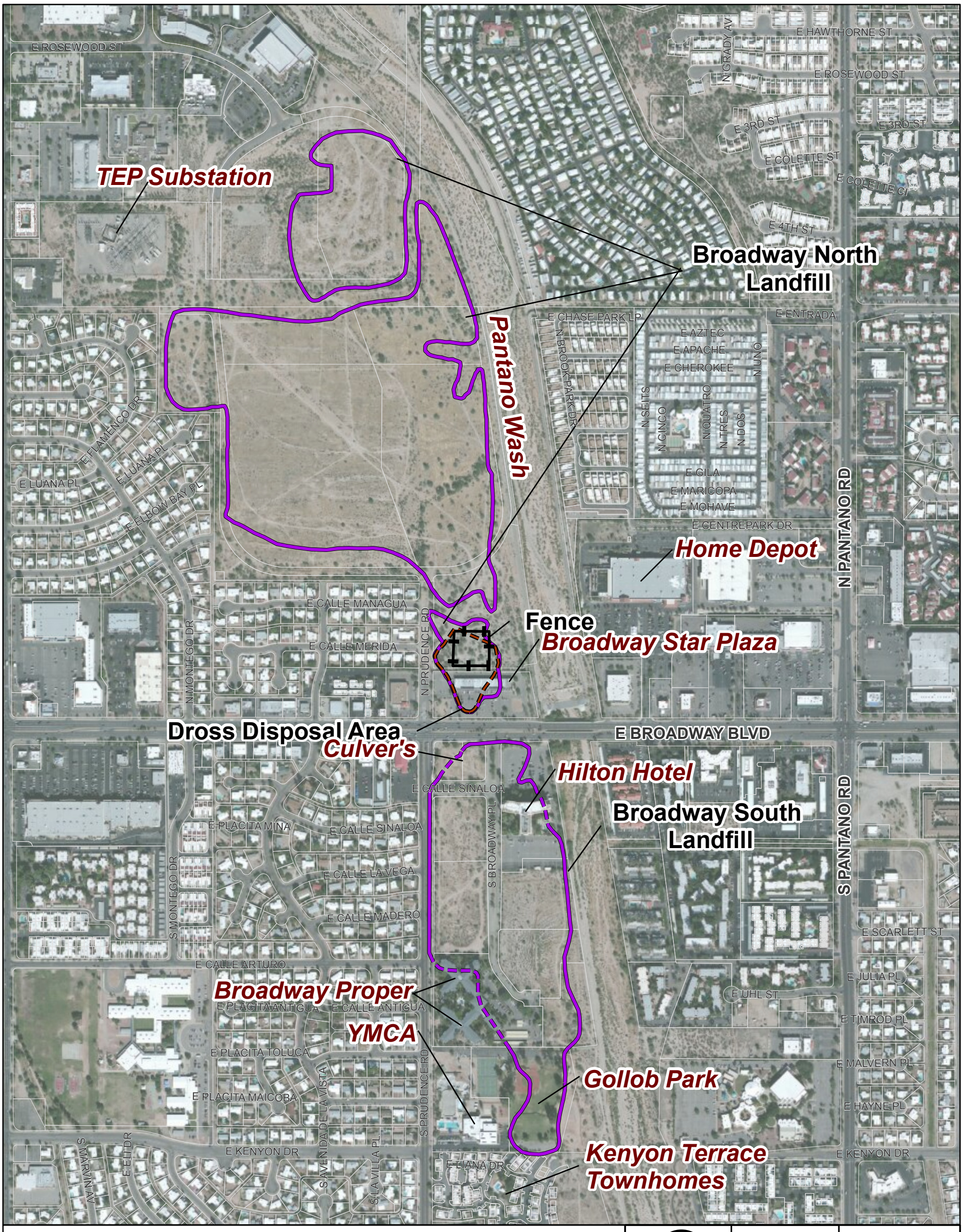
Figure 1
Site Location Map
Broadway-Pantano WQARF Site
Tucson, AZ

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig1 SiteLocation 11x17l.mxd



Legend

- Landfill Operable Unit (LOU) Boundary*
- Parcel Boundary
- Dross Disposal Area
- Fence

0 590 1,180 Feet

1 inch:600 feet

Job No. 233005

Revision: A

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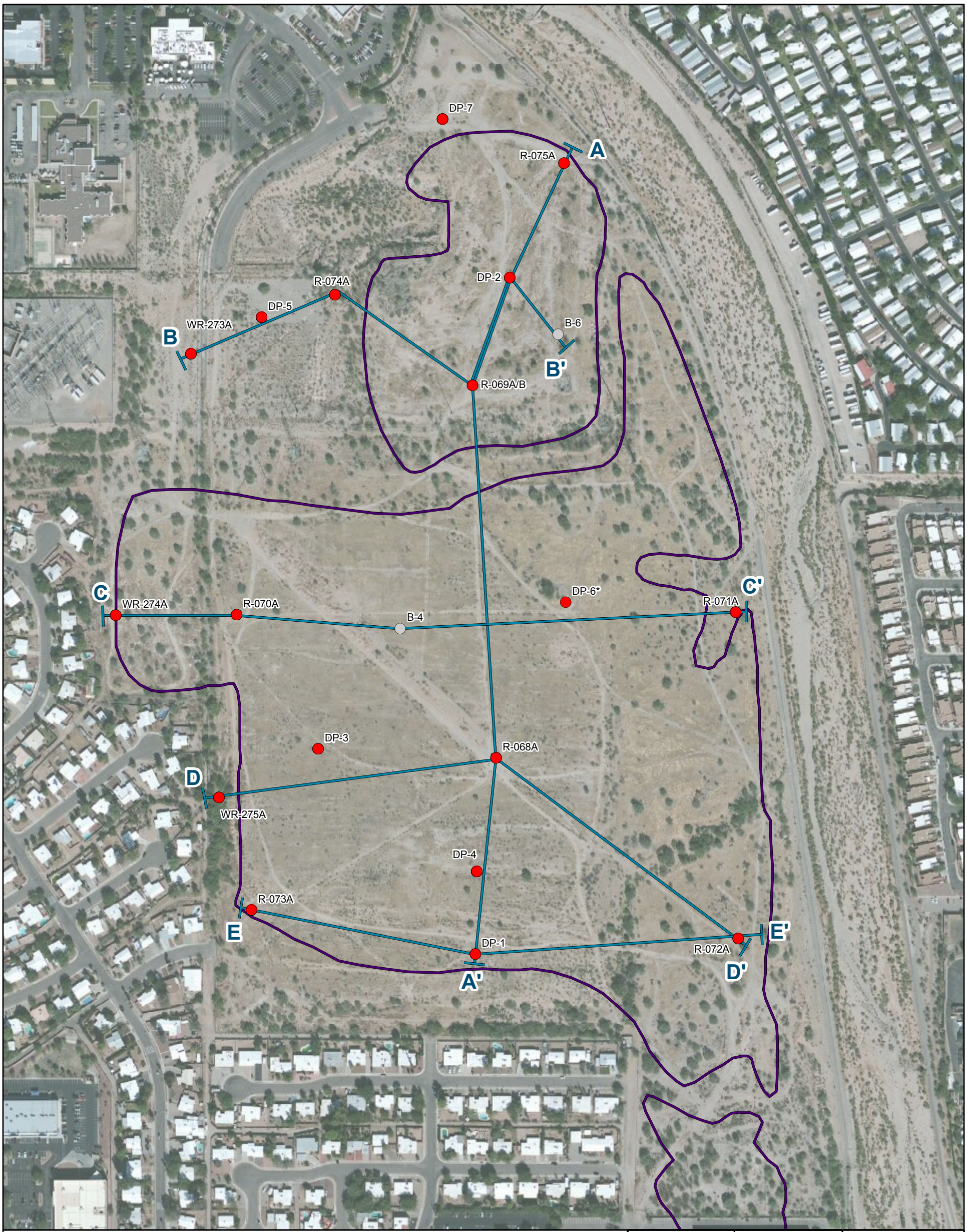
Notes:
**LOU RI Extent for BNL from Stantec, 2012. Refuse was reported to have been removed from within the BSL at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The BSL LOU boundary is dashed in areas where removal may have occurred.*

Map Projection: NAD 1983 UTM Zone 12N

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 2
LOU Location Map
Broadway-Pantano WQARF Site
Tucson, AZ

Document Path: N:\Projects\ADEQ\BP LOU RI\GIS Files\Fig2 LOU SiteLocation 11x17p.mxd



Legend

- Deep-Nested Soil Gas Probe
- Other Borehole, Well, or Probe
- Stratigraphic Cross Section Trace**
- Landfill Operable Unit Boundary***

0 300 600 Feet

1 inch:300 feet

Notes:
**Probe vandalized prior to sampling event- No sample collected*

***Stratigraphic cross sections adapted from Stantec, 2012*

****LOU RI extent for BNL from Stantec, 2012*

ft. bls - feet below land surface

Map Projection: NAD 1983 UTM Zone 12N

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Job No. 233005

Revision: A

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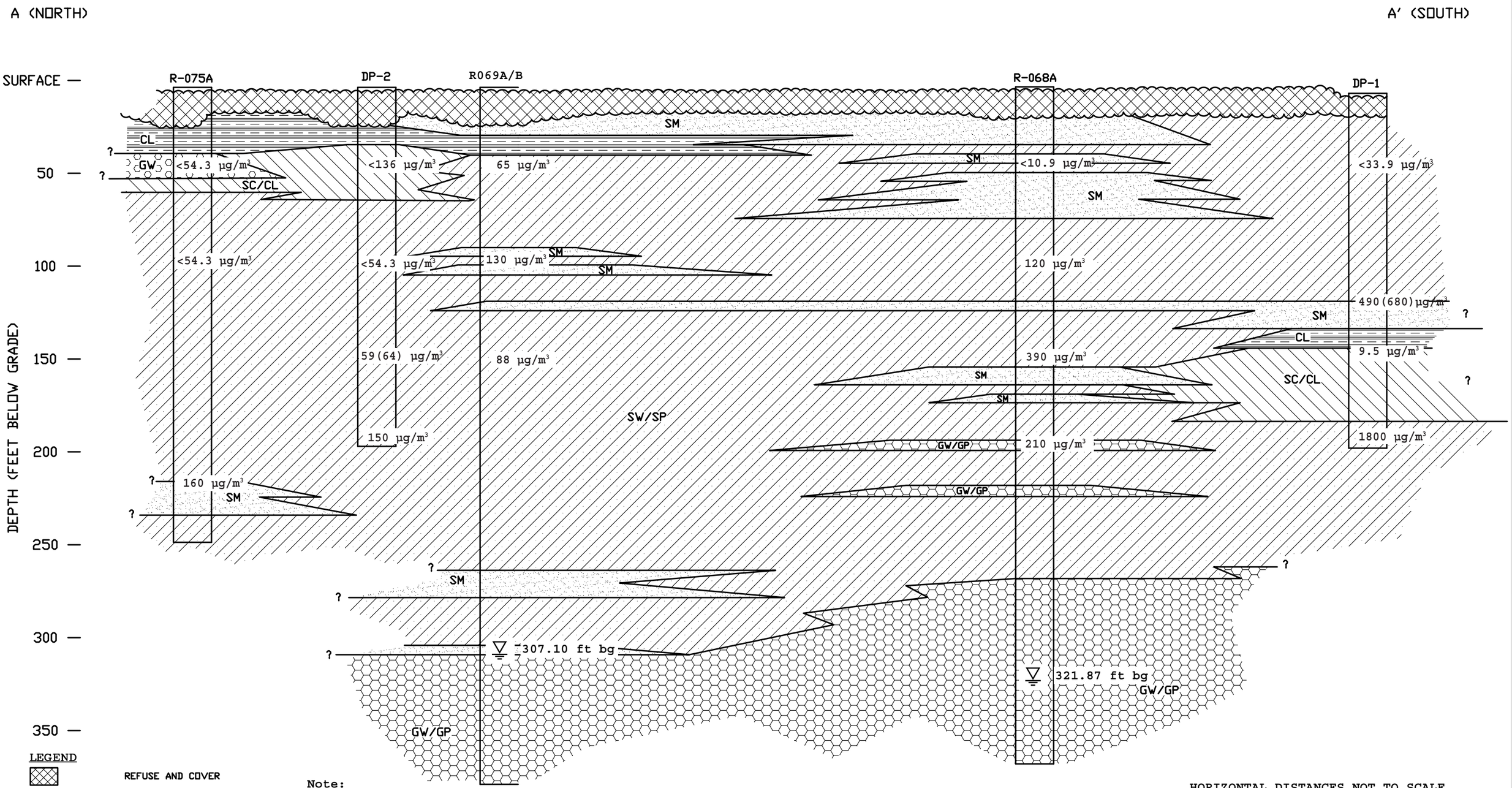
Figure 3 - Location of Stratigraphic Cross Sections Broadway North Landfill

Document Path: N:\Projects\ADEQ\BP LOU RI\GIS Files\rev-Fig3 BNL X-SecLocationMap 11x17p.mxd



LEGEND

		REFUSE AND COVER
	SW/SP	SAND WELL TO POORLY GRADED
	SC/CL	CLAYEY SAND/SANDY CLAY
	CL	CLAY
	GW/GP	GRAVEL WELL TO POORLY GRADED
	SM	SILTY SAND
	GW	GRAVEL

Note:

60 µg/m³ — PCE concentration from soil gas samples collected in February and March 2013, micrograms per cubic meter

490(680)µg/m³ — Sample(Duplicate)

▽ 320.87 ft bg — Water level measured Feb. 2013, feet below grade

Reference: Cross section from Stantec, 2012

*An April 2014 field check of soil gas probe depths revealed blockages in wells DP-2 and DP-3 at 6'bgs and 20'bgs, respectively (ADEQ, 2014). Because it is uncertain when this damage occurred, data from DP-2 and DP-3 were not used to draw conclusions for the Final LOU RI Report.

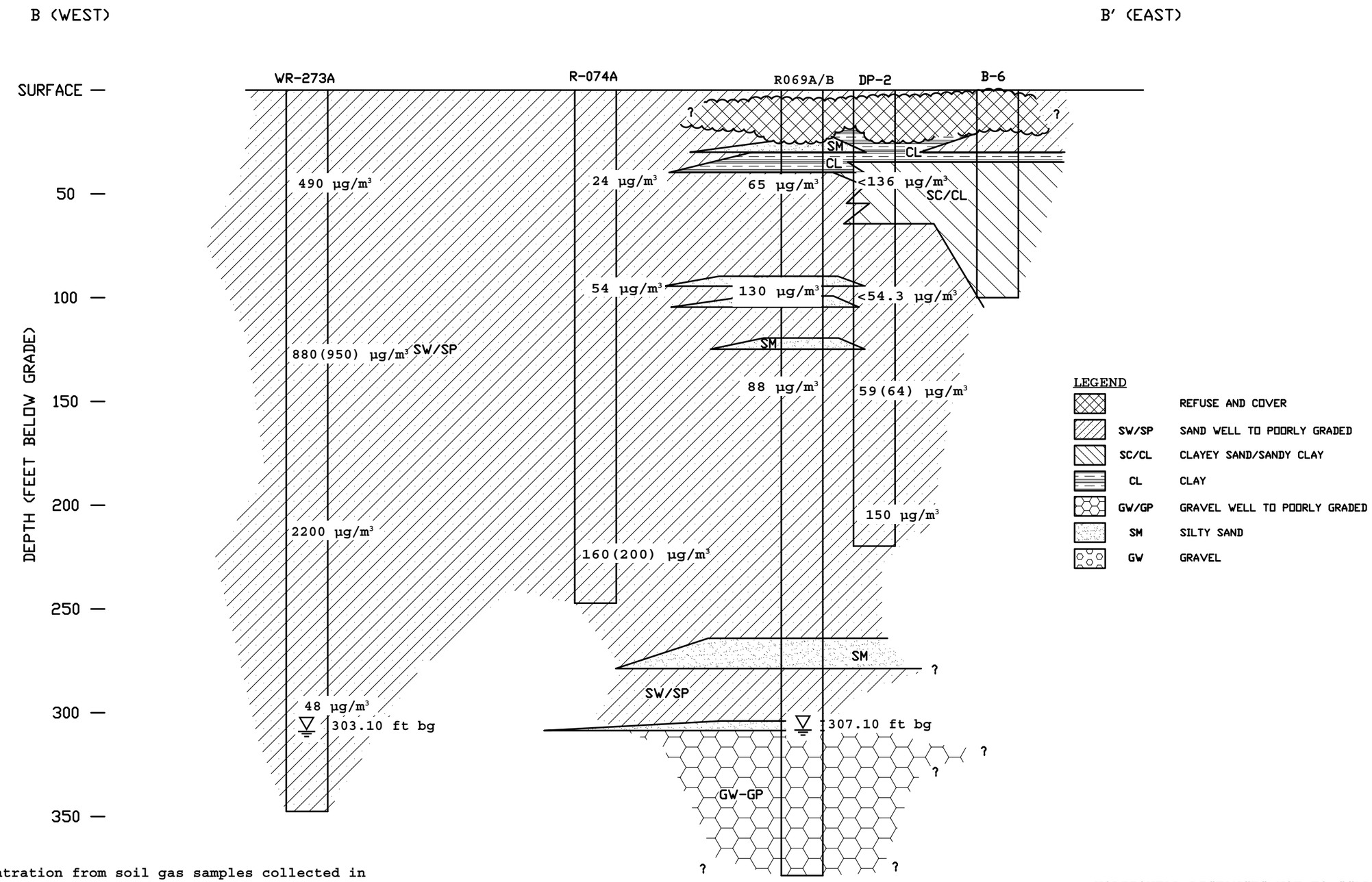
HORIZONTAL DISTANCES NOT TO SCALE
VERTICAL SCALE 1" = 50'

CLEAR CREEK ASSOCIATES

CROSS SECTION A-A'

BROADWAY NORTH LANDFILL

PROJECT NO.	PROJECT NAME	REFERENCE	FIGURE
233005	BP LOU RI	Pjcts/ADEQ/BP LOU/RI Report/Deep Nested Soil Gas	4



Note:

490 µg/m³	PCE concentration from soil gas samples collected in February and March 2013, micrograms per cubic meter
880(950)µg/m³	Sample(Duplicate)
▽ 320.87 ft bg	Water level measured Feb. 2013, feet below grade

Reference: Cross section from Stantec, 2012

*An April 2014 field check of soil gas probe depths revealed blockages in wells DP-2 and DP-3 at 6'bgs and 20'bgs, respectively (ADEQ, 2014). Because it is uncertain when this damage occurred, data from DP-2 and DP-3 were not used to draw conclusions for the Final LOU RI Report.

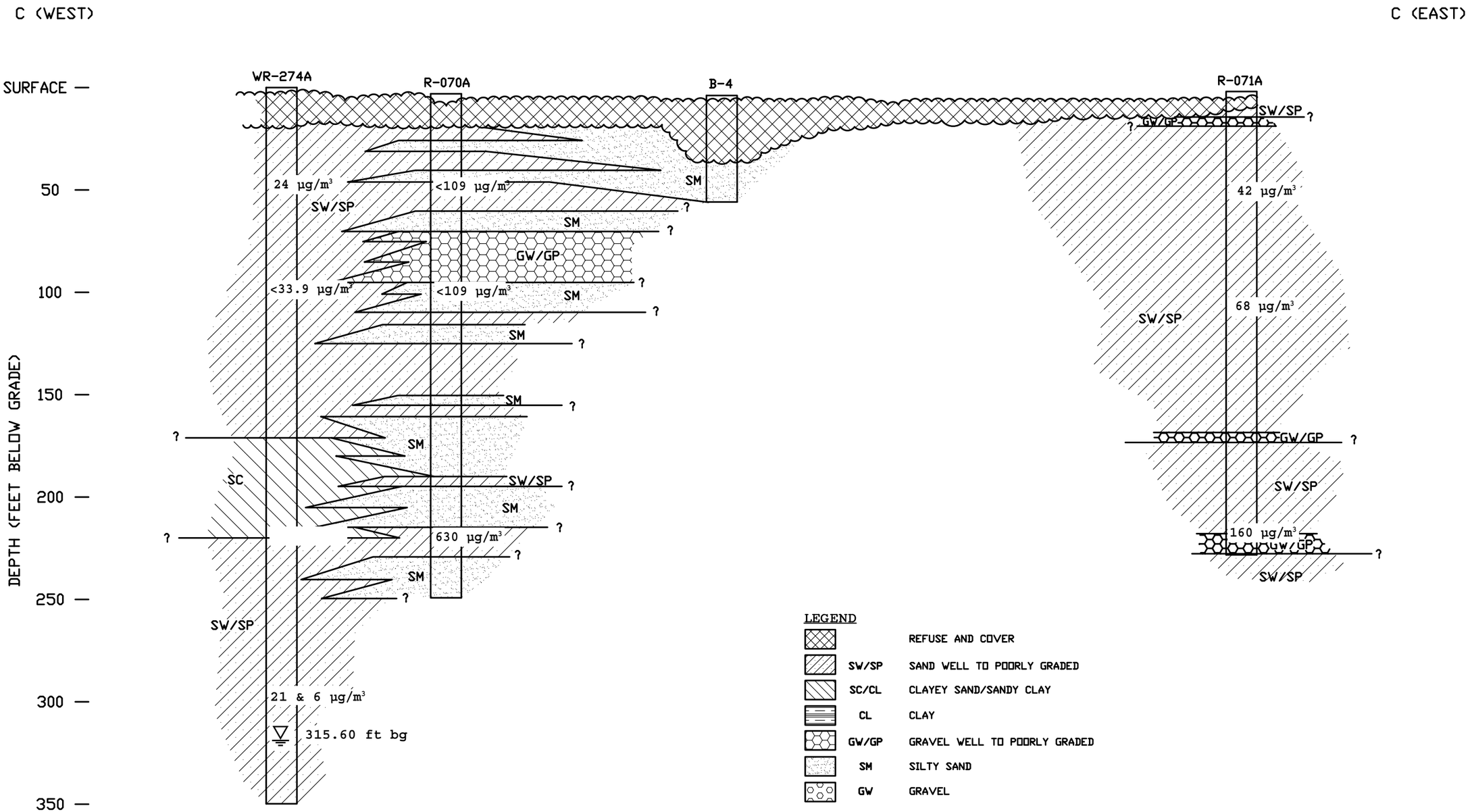
HORIZONTAL DISTANCES NOT TO SCALE
VERTICAL SCALE 1" = 50'

CLEAR CREEK ASSOCIATES

CROSS SECTION B-B'

BROADWAY NORTH LANDFILL

PROJECT NO.	PROJECT NAME	REFERENCE	FIGURE
233005	BP LOU RI	Pjcts/ADEQ/BP LOU/RI Report/Deep Nested Soil Gas	5



HORIZONTAL DISTANCES NOT TO SCALE
VERTICAL SCALE 1" = 50'

Note:

60 µg/m³	PCE concentration from soil gas samples collected in February and March 2013, micrograms per cubic meter
45(75)µg/m³	Sample(Duplicate)
▽ 320.87 ft bg	Water level measured Feb. 2013, feet below grade

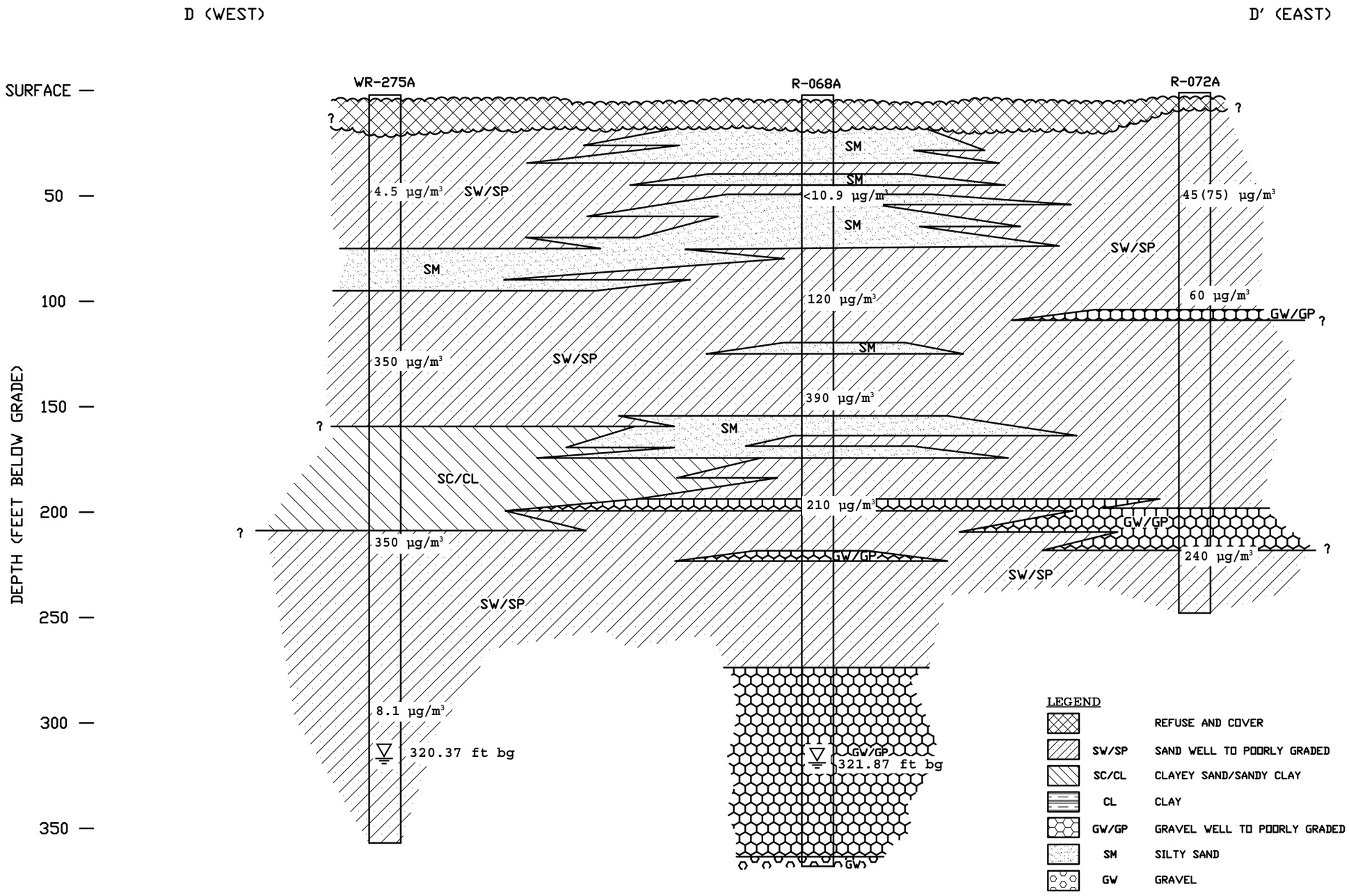
Reference: Cross section from Stantec, 2012

CLEAR CREEK ASSOCIATES

CROSS SECTION C-C'

BROADWAY NORTH LANDFILL

PROJECT NO.	PROJECT NAME	REFERENCE	FIGURE
233005	BP LOU RI	Pjcts/ADEQ/BP LOU/RI Report/Deep Nested Soil Gas	6



HORIZONTAL DISTANCES NOT TO SCALE
VERTICAL SCALE 1" = 50'

Note:

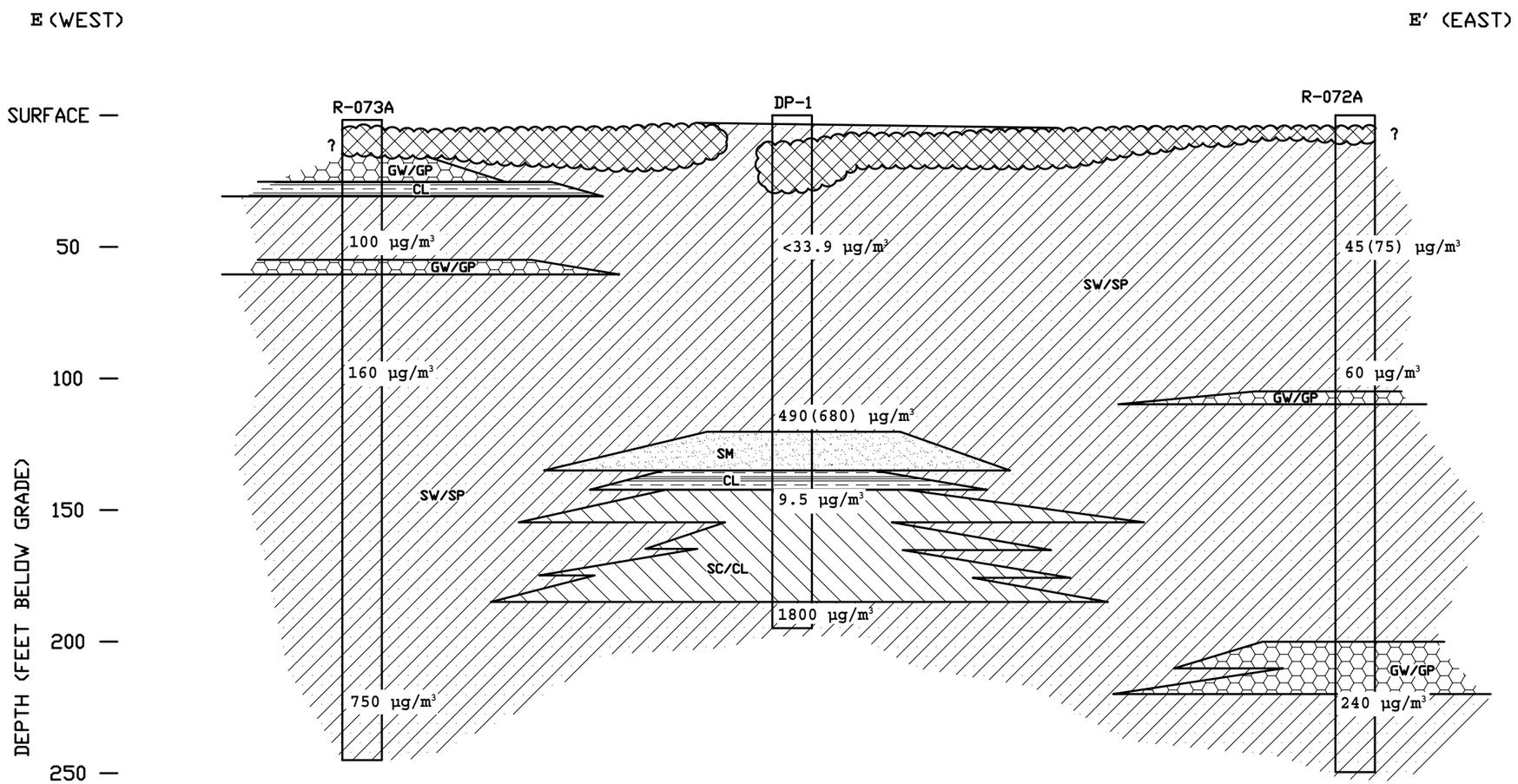
60 µg/m³	PCE concentration from soil gas samples collected in February and March 2013, micrograms per cubic meter
45(75)µg/m³	Sample(Duplicate)
▽ 320.87 ft bg	Water level measured Feb. 2013, feet below grade

CLEAR CREEK ASSOCIATES

CROSS SECTION D-D'

BROADWAY NORTH LANDFILL

PROJECT NO.	PROJECT NAME	REFERENCE	FIGURE
233005	BP LOU RI	Pjcts/ADEQ/BP LOU/RI Report/Deep Nested Soil Gas	7



LEGEND

		REFUSE AND COVER
	SW/SP	SAND WELL TO POORLY GRADED
	SC/CL	CLAYEY SAND/SANDY CLAY
	CL	CLAY
	GW/GP	GRAVEL WELL TO POORLY GRADED
	SM	SILTY SAND
	GW	GRAVEL

HORIZONTAL DISTANCES NOT TO SCALE
VERTICAL SCALE 1" = 50'

Note:

60 µg/m³	PCE concentration from soil gas samples collected in February and March 2013, micrograms per cubic meter
45(75) µg/m³	Sample(Duplicate)
▽ 320.87 ft bg	Water level measured Feb. 2013, feet below grade

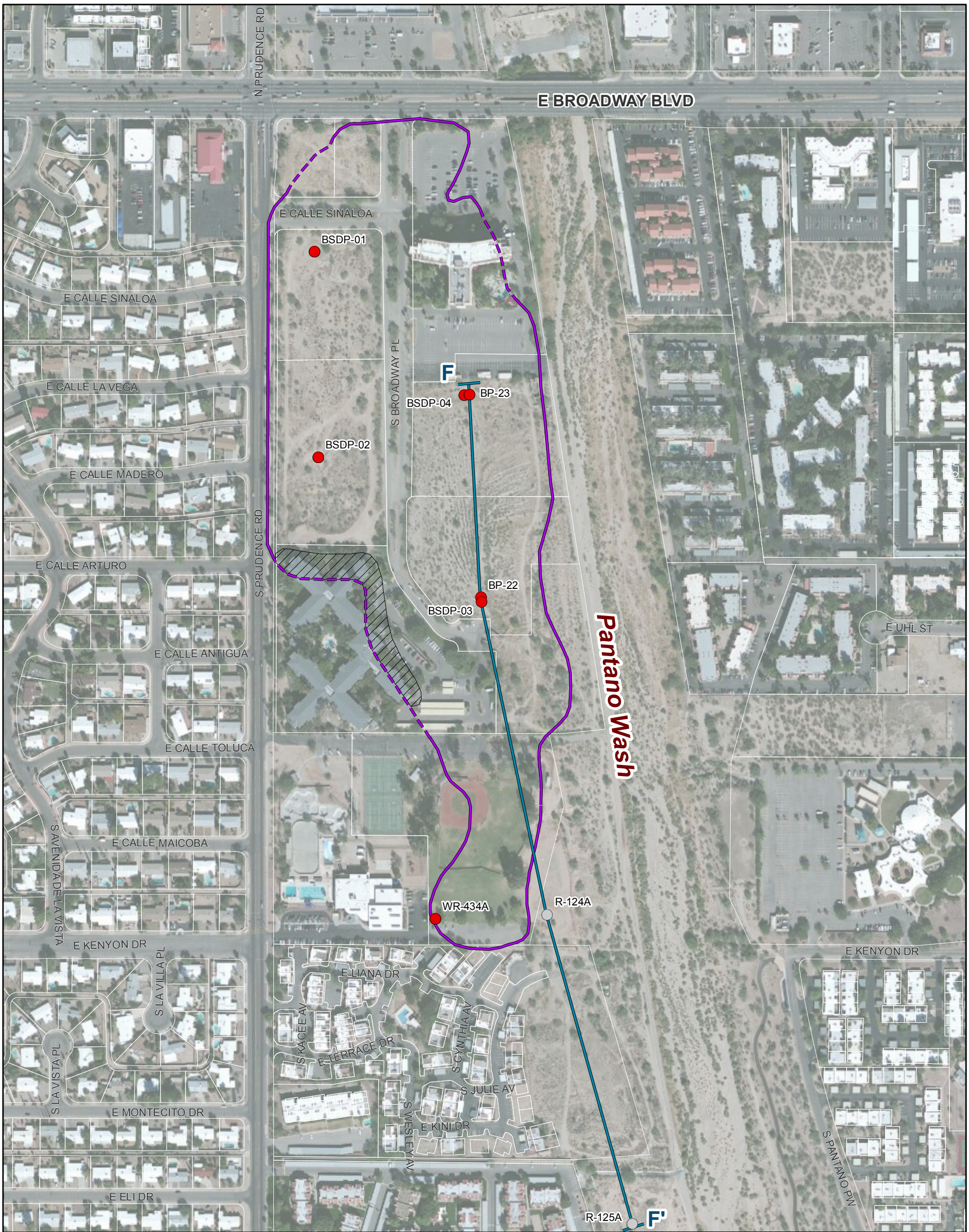
Reference: Cross section from Stantec, 2012

CLEAR CREEK ASSOCIATES

CROSS SECTION E-E'

BROADWAY NORTH LANDFILL

PROJECT NO.	PROJECT NAME	REFERENCE	FIGURE
233005	BP LOU RI	Pjcts/ADEQ/BP LOU/RI Report/Deep Nested Soil Gas	8



Legend

- Deep-Nested Soil Gas Probe
- Other Borehole, Well, or Probe
- Stratigraphic Cross Section Trace*
- Extent of Refuse**
- Estimated Extent of Refuse Removed***

0 300 600 Feet

1 inch:300 feet

Notes:
**Stratigraphic cross section adapted from Stantec, 2012.*
***Refuse was reported to have been removed at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The "Extent of Refuse" boundary is dashed in areas where removal may have occurred.*
****Estimated extent of refuse removed during construction operations at Broadway Proper (Brinsko, 1989).*

ft. bls - feet below land surface

Map Projection: NAD 1983 UTM Zone 12N

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

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Revision: A

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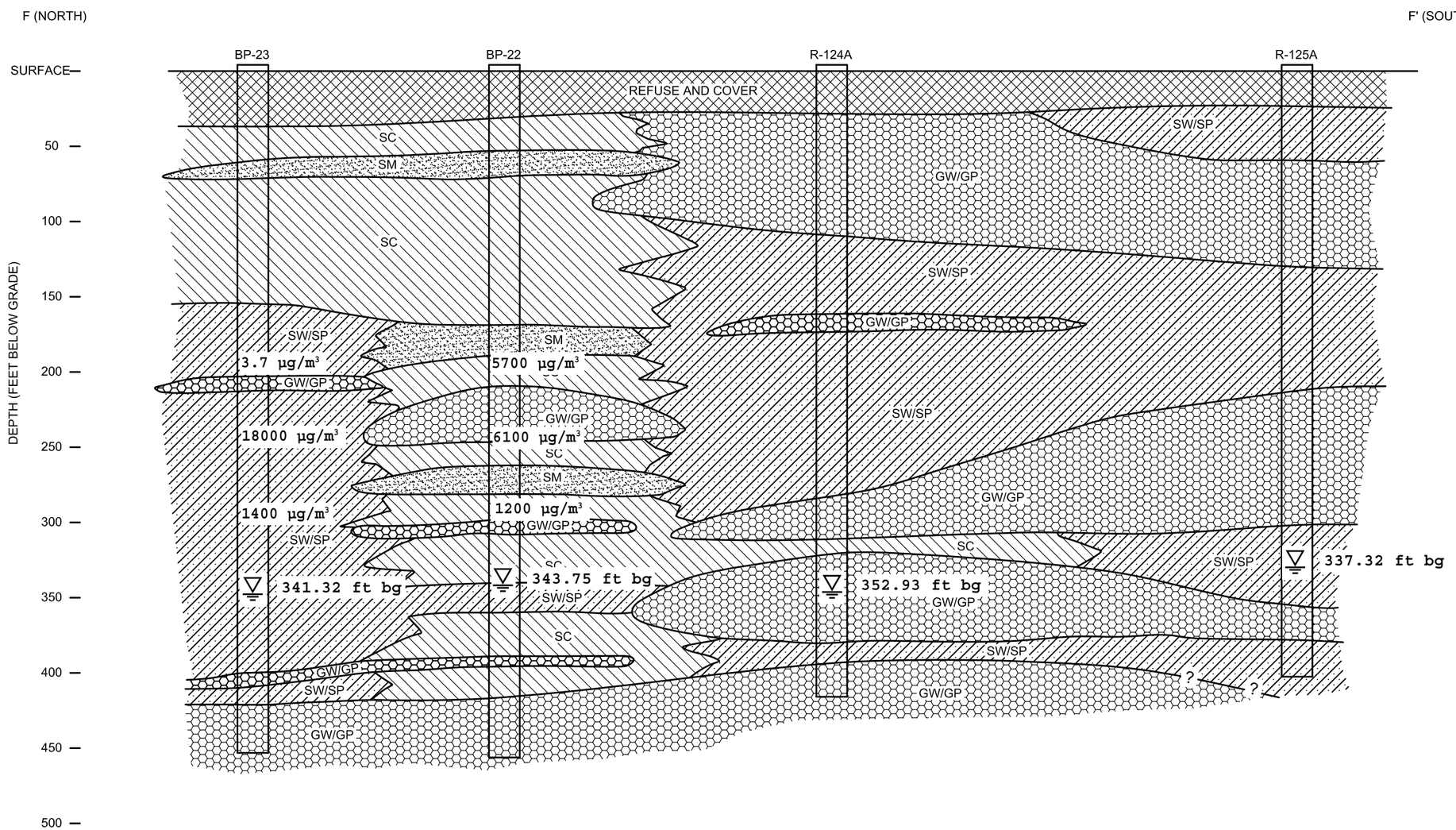
Figure 9 - Location of Stratigraphic Cross Section Broadway South Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig9 BSL X-SecLocationMap 11x17p.mxd



LEGEND

		REFUSE AND COVER
	SW/SP	SAND WELL TO POORLY GRADED
	SC	CLAYEY SAND
	CL	CLAY
	GW/GP	GRAVEL WELL TO POORLY GRADED
	SM	SILTY SAND
	GW	GRAVEL

HORIZONTAL DISTANCES NOT TO SCALE
VERTICAL SCALE 1" = 50'

Note:

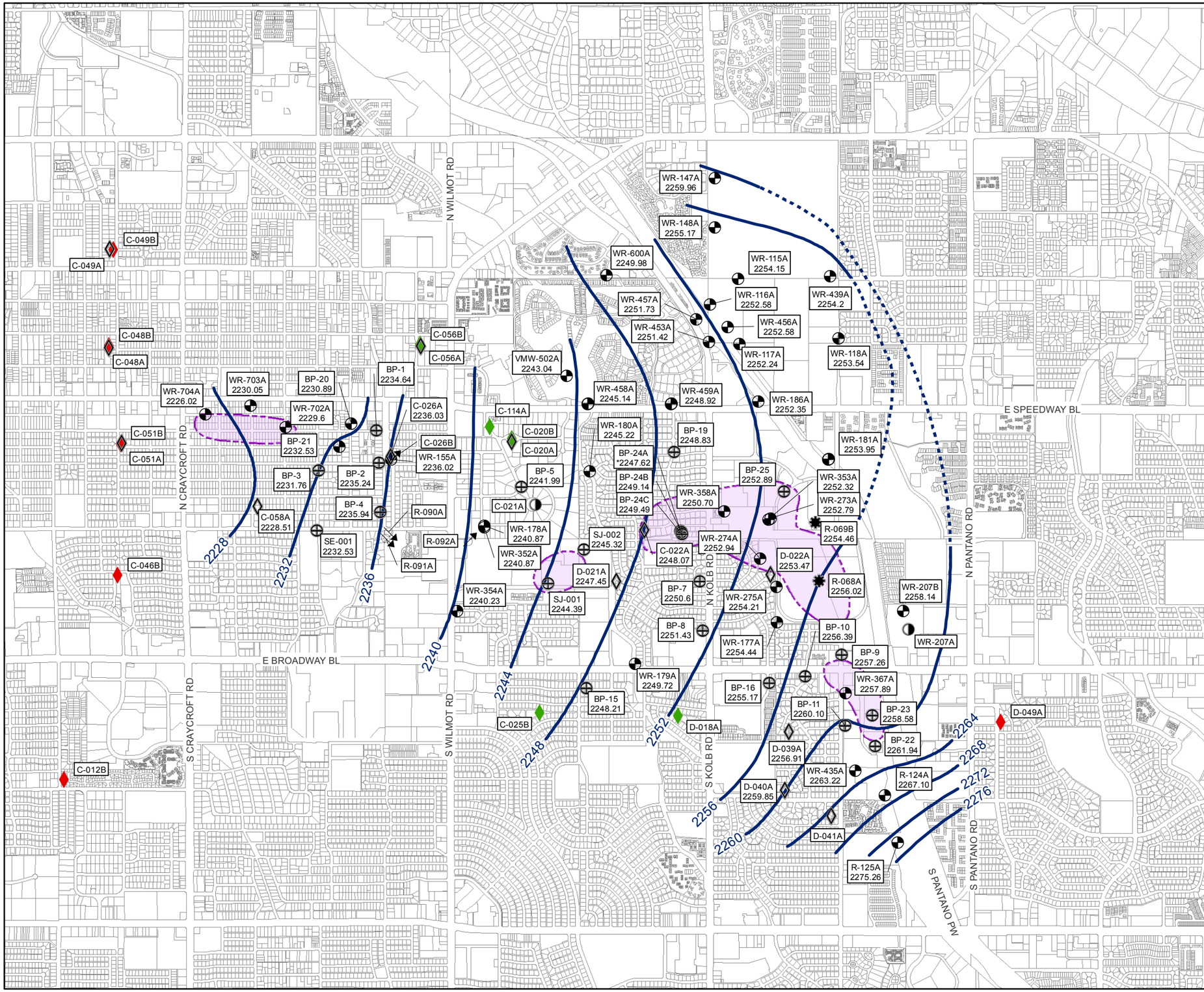
60 µg/m³	PCE concentration from soil gas samples collected in February and March 2013, micrograms per cubic meter
45(75)µg/m³	Sample(Duplicate)
∇ 320.87 ft bg	Water level measured Feb. 2013, feet below grade

Reference: Cross section from Stantec, 2012

CLEAR CREEK ASSOCIATES

CROSS SECTION F-F'
BROADWAY SOUTH LANDFILL

PROJECT NO.	PROJECT NAME	REFERENCE	FIGURE
233005	BP LOU RI	Pjcts/ADEQ/BP LOU/RI Report/Deep Nested Soil Gas	10



Legend

- COT Active Water Well in Production
- COT Last-On/First-Off Production Well
- COT Inactive Production Well
- COT Monitor Well
- COT Abandoned Well
- ADEQ Monitor Well
- Air Injection Well/Monitor Well
- Western Containment Sys. Extraction Well**
- Western Containment Sys. Injection Well**
- Groundwater Elevation Contour (ft. amsl) *Dashed Where Inferred. Contour Interval = 4 ft.*
- Approximate Extent of PCE Concentration of 5 ug/L or Greater***
- WR-115A 2254.15 — Well ID / Groundwater Level Elevation (ft. amsl)

Notes:

** Value was not used during groundwater level elevation contouring*

*** Western Containment System not operating*

****PCE extent based on Groundwater Operable Unit (GOU) bounds (Stantec, 2012)*

All water level measurements collected Feb. 2013

Map Projection: NAD 1983 UTM Zone 12N

0 2,000 4,000 Feet

1 inch:2,000 feet

Job No. 233005

Revision: A

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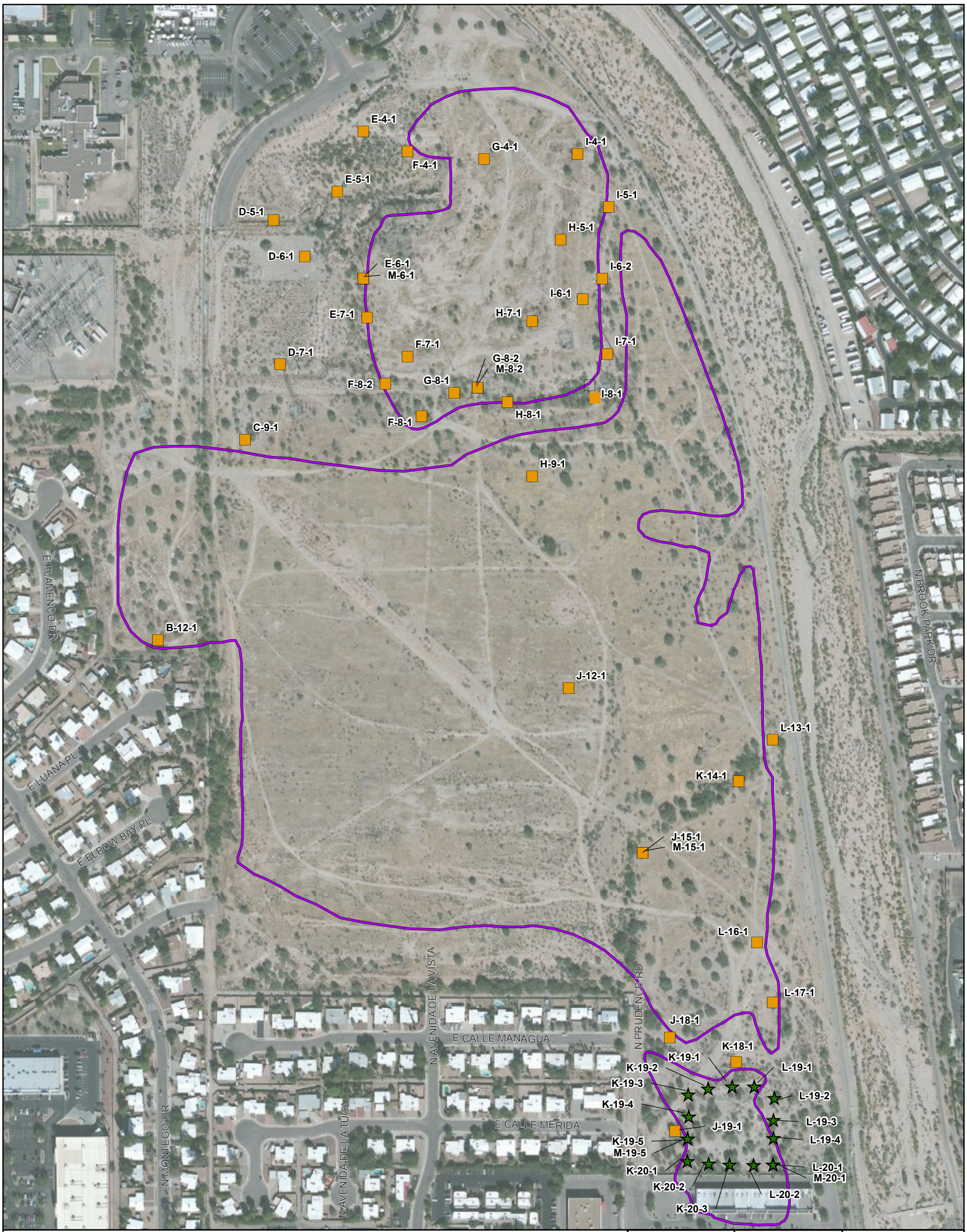
Figure 11
Groundwater Elevation Map
Broadway-Pantano WQARF Site

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig11 BNL WLE 11x17p.mxd



Legend

- Surface Soil Sample Location*
- Dross Area Perimeter Soil Sample Location*
- Landfill Operable Unit Boundary**

0 300 600 Feet

1 inch:300 feet

Job No. 233005

Revision: A

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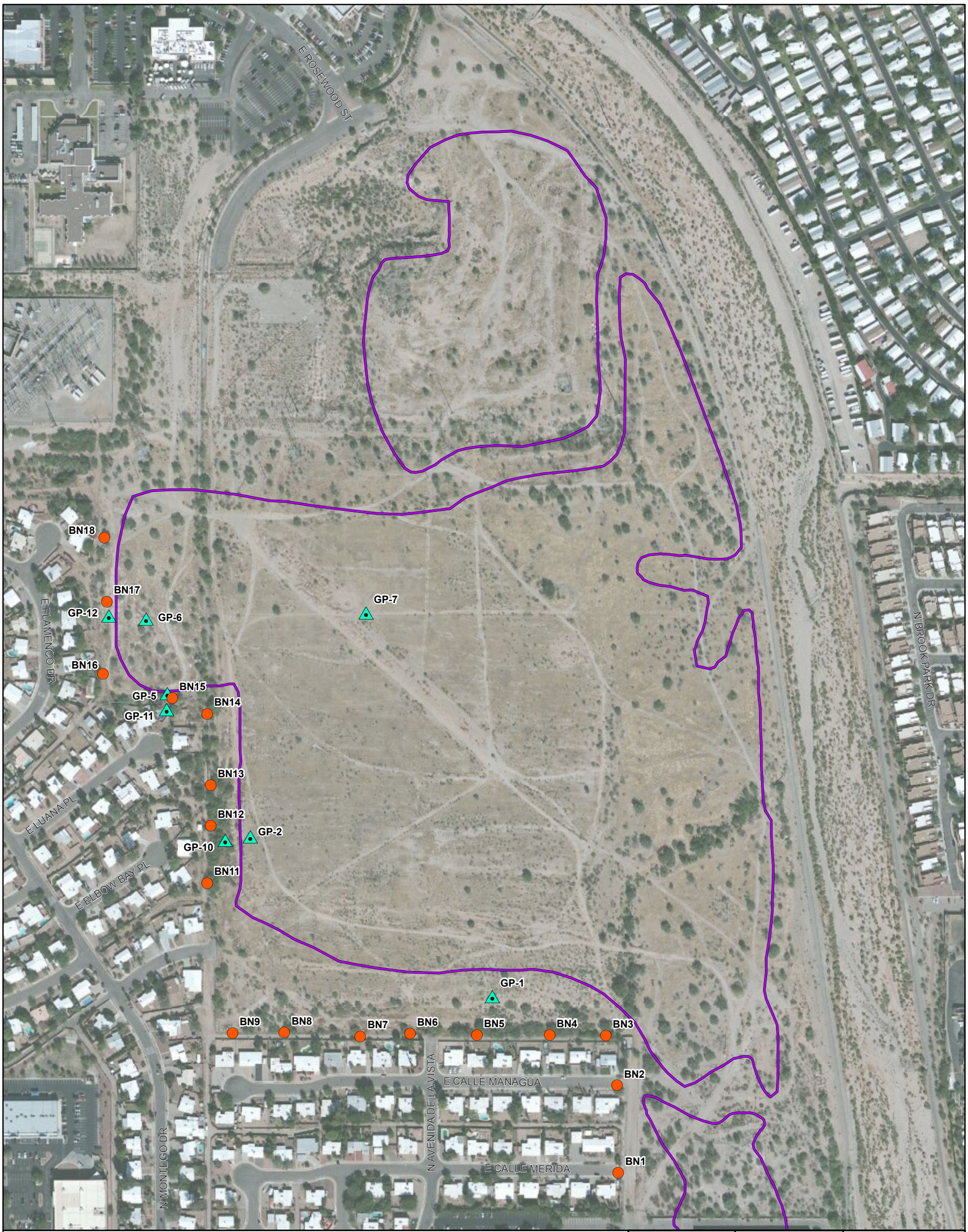
Figure 12
Surface Soil Sampling Locations
Broadway North Landfill

Notes:
**Soil Sample Locations from SECOR, 2004*
***LOU RI Extent for BNL from Stantec, 2012*

Map Projection: NAD 1983 UTM Zone 12N

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Document Path: N:\Projects\ADEQ\BP LOU RI\GIS Files\Fig13 BNL SoilSamplingLocations 11x17p.mxd



Legend

- City of Tucson Soil Gas Probe*
- Other Soil Gas Probe*
- Landfill Operable Unit Boundary**

0 300 600 Feet

1 inch:300 feet

Job No. 233005

Revision: A

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Figure 13 - Shallow Soil Gas Monitoring Probes Used for Health Risk Assesment Broadway North Landfill

Notes:
**Probe Locations from Stantec, 2010*
***LOU RI Extent for BNL from Stantec, 2012*

Map Projection: NAD 1983 UTM Zone 12N

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Document Path: N:\Projects\ADEQ\BP LOU RI\GIS Files\Fig12 BNL LocationMap, HRA ShallowProbes 11x17p.mxd

Legend

- Methane Probe
- Extent of Refuse*
- Estimated Extent of Refuse Removed**

0 300 600 Feet

1 inch:300 feet

Notes:
**Refuse was reported to have been removed at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The "Extent of Refuse" boundary is dashed in areas where removal may have occurred.*

***Estimated extent of refuse removed during construction operations at Broadway Proper (Brinsko, 1989).*

Map Projection: NAD 1983 UTM Zone 12N

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

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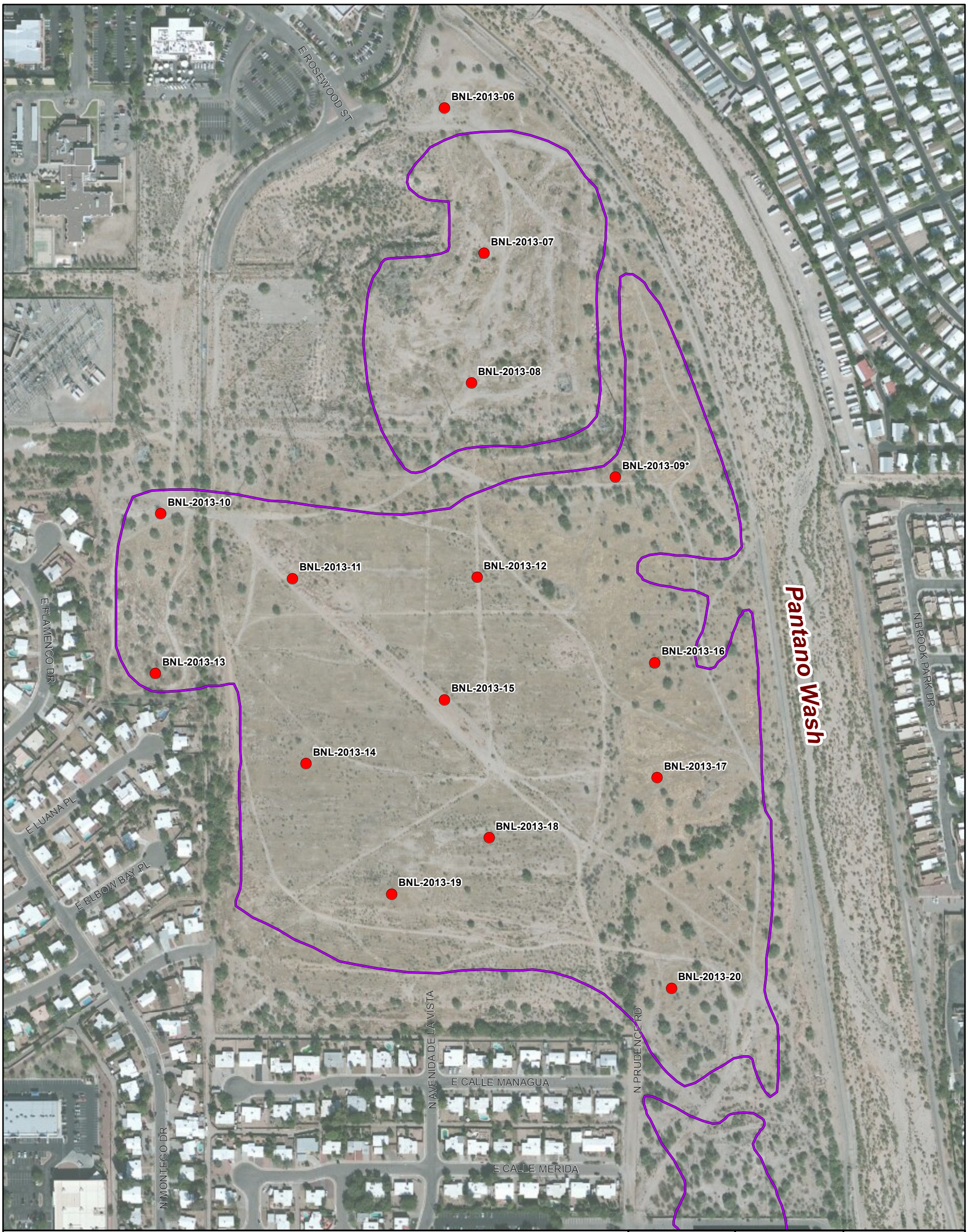
Figure 14
Methane Probe Locations
Broadway South Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig14 BSL LocationMap, MethaneProbes 11x17p.mxd



Legend

- Temporary Soil Gas Probe
- Landfill Operable Unit Boundary**

0 300 600 Feet

1 inch:300 feet

Job No. 233005

Revision: A

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Notes:
**Probe vandalized prior to sampling event. No sample collected*
***LOU RI Extent for BNL from Stantec, 2012*

Map Projection: NAD 1983 UTM Zone 12N

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Figure 15 - Shallow Temporary Soil Gas Probe Locations Broadway North Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig15 BNL LocationMap, ShallowTempProbes 11x17p.mxd

Legend

- Temporary Soil Gas Probe
- Extent of Refuse*
- Estimated Extent of Refuse Removed**

0 300 Feet
1 inch:300 feet

Map Projection:
NAD 1983 UTM Zone 12N

Notes:
**Refuse was reported to have been removed at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The "Extent of Refuse" boundary is dashed in areas where removal may have occurred.*
***Estimated extent of refuse removed during construction operations at Broadway Proper (Brinsko, 1989).*

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

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Revision: A

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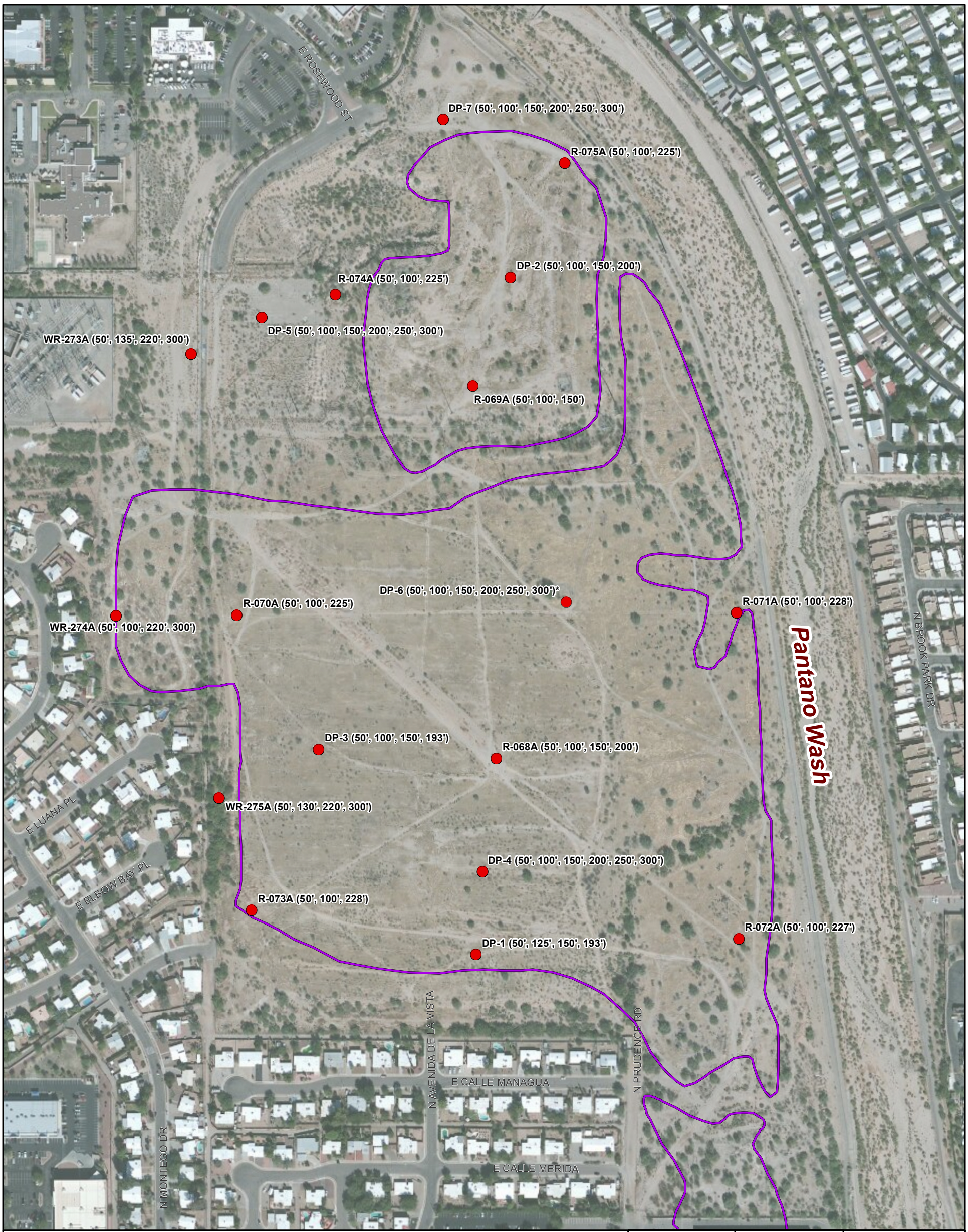
Figure 16 - Shallow Temporary Soil Gas Probe Locations Broadway South Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig16 BSL LocationMap, ShallowTempProbes 8.5x11p.mxd



Legend

- Deep-Nested Soil Gas Probe (Probe depth [ft. bls])
- Landfill Operable Unit Boundary**

0 300 600 Feet

1 inch:300 feet

Notes:
**Probe vandalized prior to sampling event- No samples collected.*
***LOU RI Extent for BNL from Stantec, 2012*

ft. bls - feet below land surface

Map Projection: NAD 1983 UTM Zone 12N

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

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Figure 17 - Deep-Nested Soil Gas Probe Locations Broadway North Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig17 BNL LocationMap, DeepProbes 11x17p.mxd

Legend

- Deep-Nested Soil Gas Probe (Probe depth [ft. bls])
- Extent of Refuse*
- Estimated Extent of Refuse Removed**

0 300 600 Feet

1 inch:300 feet

Notes:
**Refuse was reported to have been removed at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The "Extent of Refuse" boundary is dashed in areas where removal may have occurred.*
***Estimated extent of refuse removed during construction operations at Broadway Proper (Brinsko, 1989).*

ft. bls - feet below land surface

Map Projection: NAD 1983 UTM Zone 12N

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Job No. 233005

Revision: A

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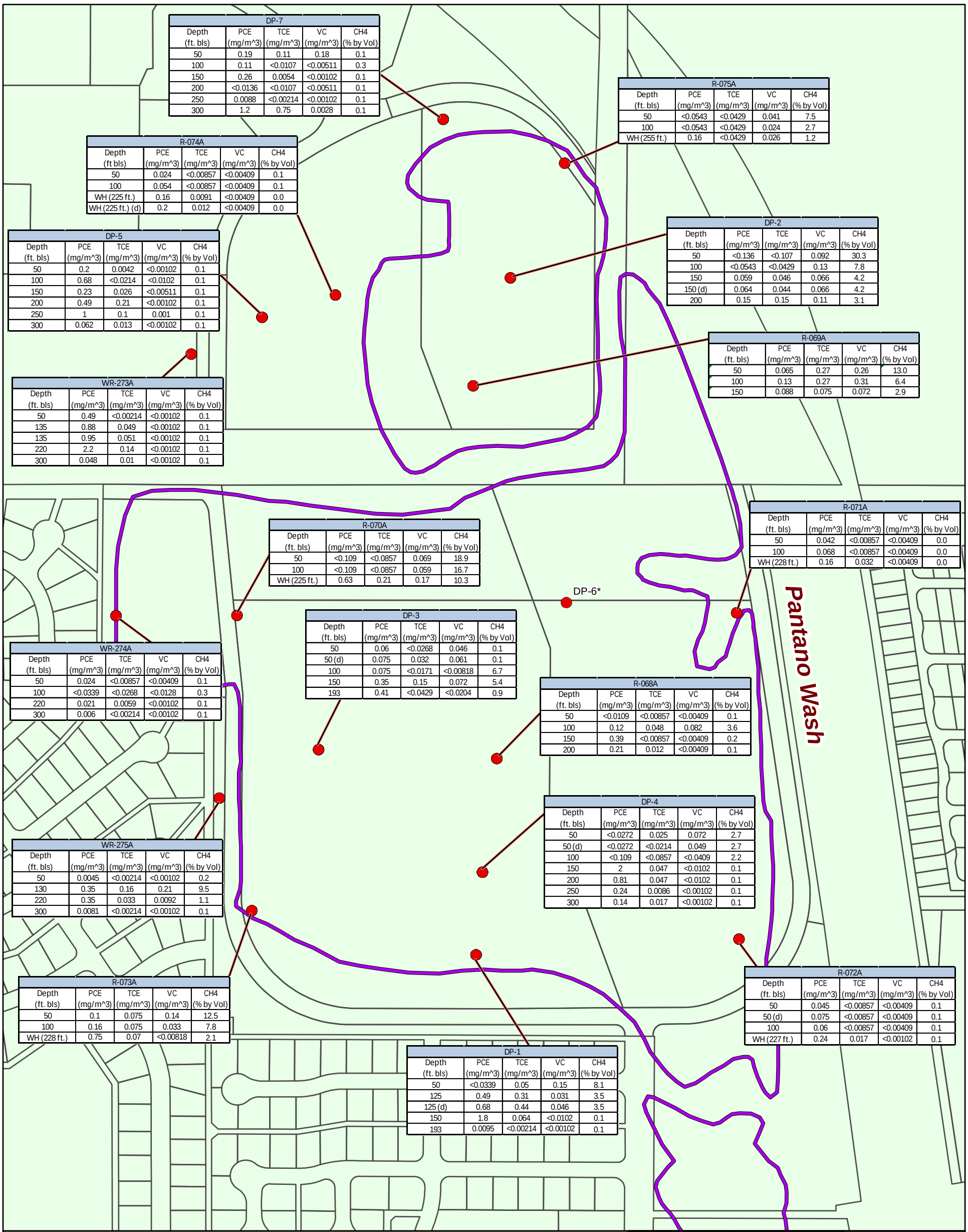
Figure 18 - Deep-Nested Soil Gas Probe Locations Broadway South Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig18 BSL LocationMap, DeepProbes 11x17p.mxd



DP-7				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.19	0.11	0.18	0.1
100	0.11	<0.0107	<0.00511	0.3
150	0.26	0.0054	<0.00102	0.1
200	<0.0136	<0.0107	<0.00511	0.1
250	0.0088	<0.00214	<0.00102	0.1
300	1.2	0.75	0.0028	0.1

R-075A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	<0.0543	<0.0429	0.041	7.5
100	<0.0543	<0.0429	0.024	2.7
WH (255 ft.)	0.16	<0.0429	0.026	1.2

R-074A				
Depth (ft bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.024	<0.00857	<0.00409	0.1
100	0.054	<0.00857	<0.00409	0.1
WH (225 ft.)	0.16	0.0091	<0.00409	0.0
WH (225 ft.) (d)	0.2	0.012	<0.00409	0.0

DP-5				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.2	0.0042	<0.00102	0.1
100	0.68	<0.0214	<0.0102	0.1
150	0.23	0.026	<0.00511	0.1
200	0.49	0.21	<0.00102	0.1
250	1	0.1	0.001	0.1
300	0.062	0.013	<0.00102	0.1

DP-2				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	<0.136	<0.107	0.092	30.3
100	<0.0543	<0.0429	0.13	7.8
150	0.059	0.046	0.066	4.2
150 (d)	0.064	0.044	0.066	4.2
200	0.15	0.15	0.11	3.1

R-069A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.065	0.27	0.26	13.0
100	0.13	0.27	0.31	6.4
150	0.088	0.075	0.072	2.9

WR-273A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.49	<0.00214	<0.00102	0.1
135	0.88	0.049	<0.00102	0.1
135	0.95	0.051	<0.00102	0.1
220	2.2	0.14	<0.00102	0.1
300	0.048	0.01	<0.00102	0.1

R-071A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.042	<0.00857	<0.00409	0.0
100	0.068	<0.00857	<0.00409	0.0
WH (228 ft.)	0.16	0.032	<0.00409	0.0

R-070A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	<0.109	<0.0857	0.069	18.9
100	<0.109	<0.0857	0.059	16.7
WH (225 ft.)	0.63	0.21	0.17	10.3

DP-3				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.06	<0.0268	0.046	0.1
50 (d)	0.075	0.032	0.061	0.1
100	0.075	<0.0171	<0.00818	6.7
150	0.35	0.15	0.072	5.4
193	0.41	<0.0429	<0.0204	0.9

WR-274A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.024	<0.00857	<0.00409	0.1
100	<0.0339	<0.0268	<0.0128	0.3
220	0.021	0.0059	<0.00102	0.1
300	0.006	<0.00214	<0.00102	0.1

R-068A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	<0.0109	<0.00857	<0.00409	0.1
100	0.12	0.048	0.082	3.6
150	0.39	<0.00857	<0.00409	0.2
200	0.21	0.012	<0.00409	0.1

DP-4				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	<0.0272	0.025	0.072	2.7
50 (d)	<0.0272	<0.0214	0.049	2.7
100	<0.109	<0.0857	<0.0409	2.2
150	2	0.047	<0.0102	0.1
200	0.81	0.047	<0.0102	0.1
250	0.24	0.0086	<0.00102	0.1
300	0.14	0.017	<0.00102	0.1

WR-275A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.0045	<0.00214	<0.00102	0.2
130	0.35	0.16	0.21	9.5
220	0.35	0.033	0.0092	1.1
300	0.0081	<0.00214	<0.00102	0.1

R-072A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.045	<0.00857	<0.00409	0.1
50 (d)	0.075	<0.00857	<0.00409	0.1
100	0.06	<0.00857	<0.00409	0.1
WH (227 ft.)	0.24	0.017	<0.00102	0.1

R-073A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.1	0.075	0.14	12.5
100	0.16	0.075	0.033	7.8
WH (228 ft.)	0.75	0.07	<0.00818	2.1

DP-1				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	<0.0339	0.05	0.15	8.1
125	0.49	0.31	0.031	3.5
125 (d)	0.68	0.44	0.046	3.5
150	1.8	0.064	<0.0102	0.1
193	0.0095	<0.00214	<0.00102	0.1

Legend

- Deep-Nested Soil Gas Probe (Probe Depths/Sampling Results**)
- Landfill Operable Unit Boundary***
- Parcel Boundary

Notes:
An April 2014 field check of soil gas probe depths revealed blockages in wells DP-2 and DP-3 at 6' bgs and 20' bgs, respectively (ADEQ, 2014). Because it is uncertain when this damage occurred, data from DP-2 and DP-3 were not used to draw conclusions for the Final LOU RI Report.

0 300 600 Feet

1 inch:300 feet

**Probe vandalized prior to sampling event- No sample collected*
***Soil gas samples collected in Feb. and March 2013*
****LOU RI boundary for BNL from Stantec, 2012*

(d) - duplicate sample
PCE - tetrachloroethylene
TCE - trichloroethylene
VC - vinyl chloride
CH4 - methane (field measurement)
mg/m^3 - milligrams per cubic meter
% - percentage by vol. measured during soil gas purge
ft. bls - feet below land surface

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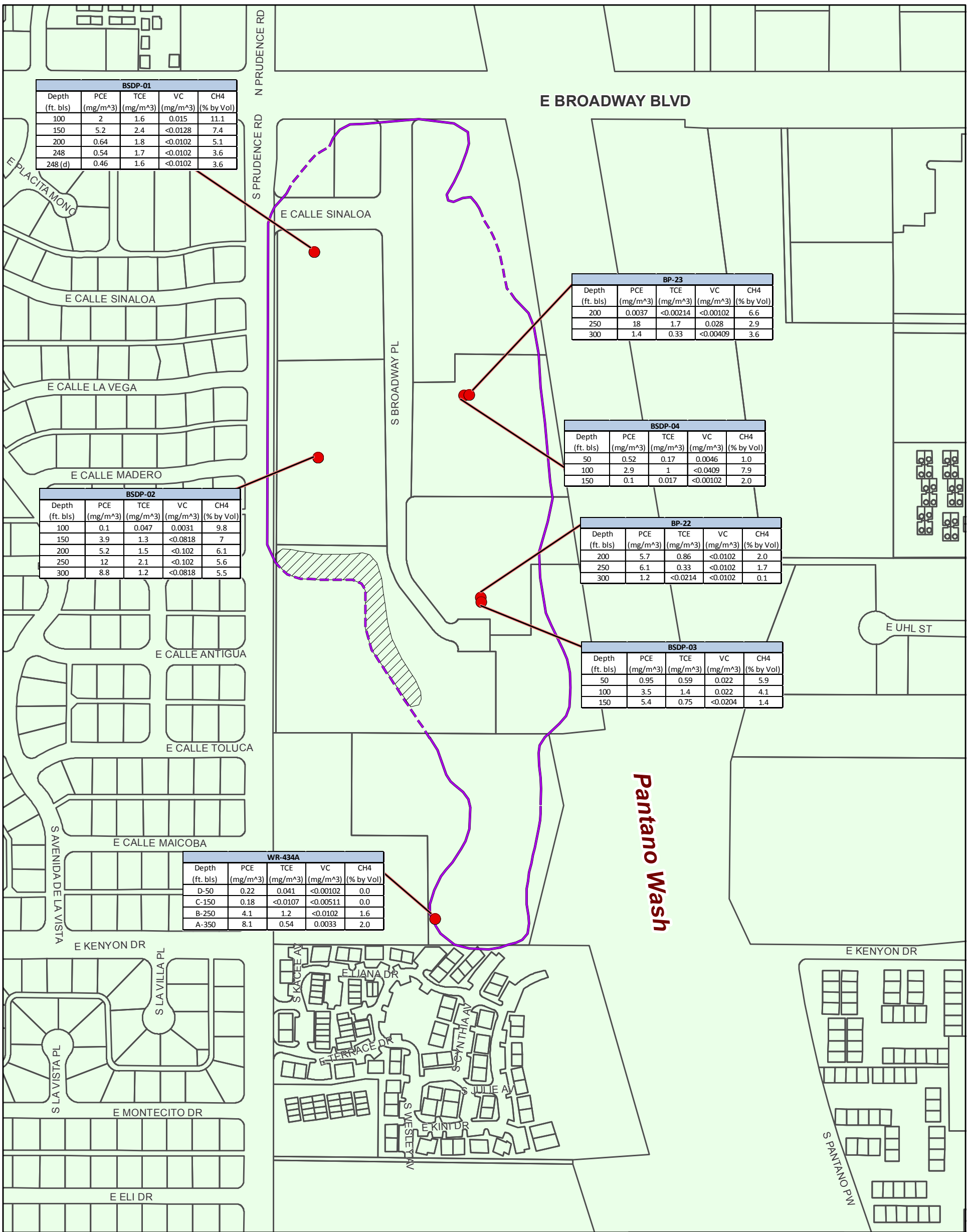
Figure 19 - Selected Soil Gas Monitoring Results Deep-Nested Soil Gas Probes Broadway North Landfill

Document Path: N:\Projects\ADEQ\BP LOU RI\GIS Files\Fig19 BNL SamplingResults, DeepProbes 11x17p.mxd



BSDP-01				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
100	2	1.6	0.015	11.1
150	5.2	2.4	<0.0128	7.4
200	0.64	1.8	<0.0102	5.1
248	0.54	1.7	<0.0102	3.6
248 (d)	0.46	1.6	<0.0102	3.6

BP-23				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
200	0.0037	<0.00214	<0.00102	6.6
250	18	1.7	0.028	2.9
300	1.4	0.33	<0.00409	3.6

BSDP-04				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.52	0.17	0.0046	1.0
100	2.9	1	<0.0409	7.9
150	0.1	0.017	<0.00102	2.0

BSDP-02				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
100	0.1	0.047	0.0031	9.8
150	3.9	1.3	<0.0818	7
200	5.2	1.5	<0.102	6.1
250	12	2.1	<0.102	5.6
300	8.8	1.2	<0.0818	5.5

BP-22				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
200	5.7	0.86	<0.0102	2.0
250	6.1	0.33	<0.0102	1.7
300	1.2	<0.0214	<0.0102	0.1

BSDP-03				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
50	0.95	0.59	0.022	5.9
100	3.5	1.4	0.022	4.1
150	5.4	0.75	<0.0204	1.4

WR-434A				
Depth (ft. bls)	PCE (mg/m^3)	TCE (mg/m^3)	VC (mg/m^3)	CH4 (% by Vol)
D-50	0.22	0.041	<0.00102	0.0
C-150	0.18	<0.0107	<0.00511	0.0
B-250	4.1	1.2	<0.0102	1.6
A-350	8.1	0.54	0.0033	2.0

Legend

- Deep-Nested Soil Gas Probe (Probe Depths/Sampling Results*)
- Extent of Refuse**
- Estimated Extent of Refuse Removed***
- Parcel Boundary

Abbreviations:
PCE - tetrachloroethylene TCE - trichloroethylene
VC - vinyl chloride CH4 - methane (field measurement)
mg/m^3 - milligrams per cubic meter
% - percentage by vol. measured during soil gas purge
ft. bls - feet below land surface

0 300 600 Feet
1 inch:300 feet

Notes:
**Soil gas samples collected in Feb. and March 2013.*

***Refuse was reported to have been removed at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The "Extent of Refuse" boundary is dashed in areas where removal may have occurred.*

****Estimated extent of refuse removed during construction operations at Broadway Proper (Brinsko, 1989).*

Map Projection: NAD 1983 UTM Zone 12N

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Figure 20 - Selected Soil Gas Monitoring Results Deep-Nested Soil Gas Probes Broadway South Landfill

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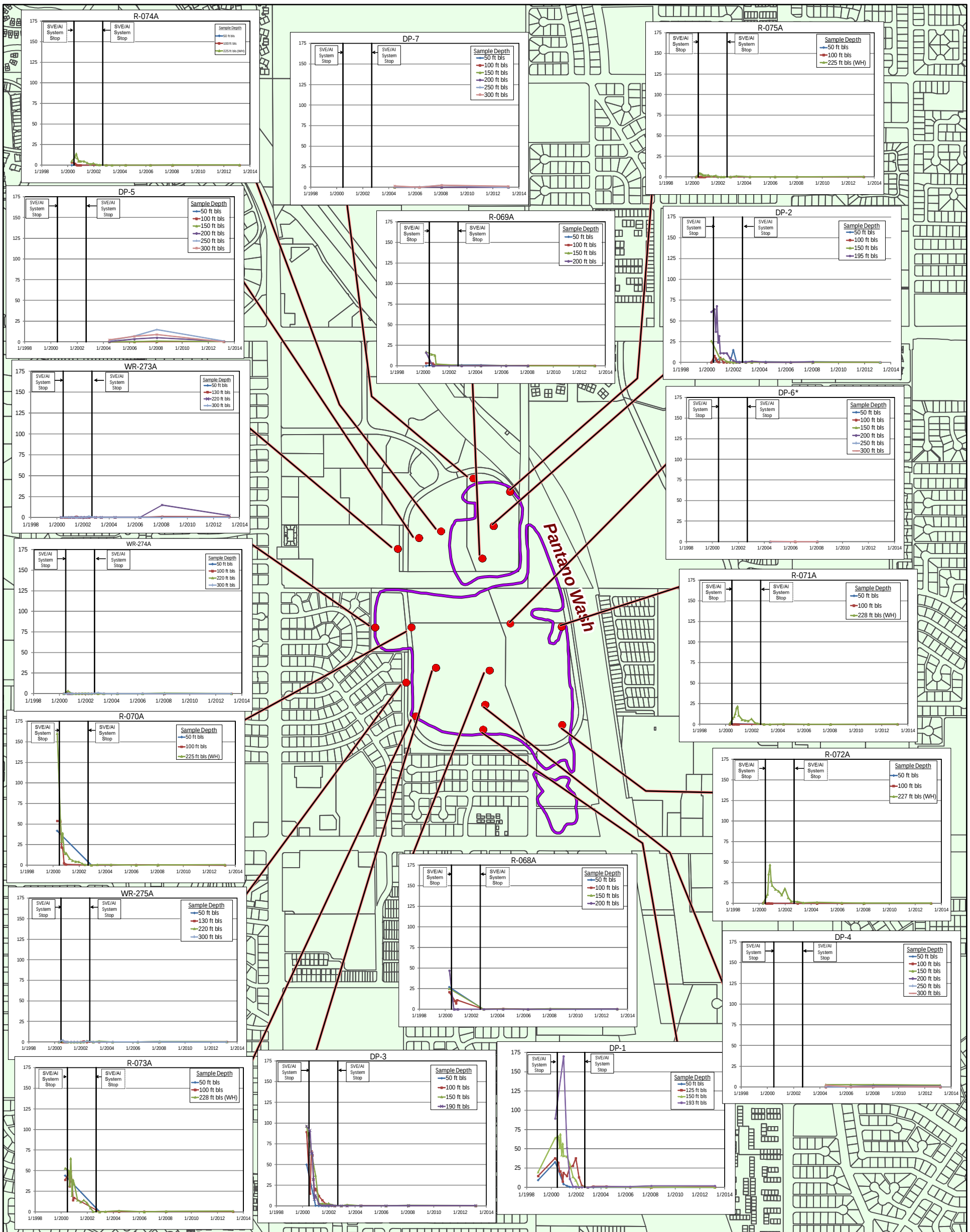

Legend

- Deep-Nested Soil Gas Probe (PCE Sampling Results, mg/m^3)
- Landfill Operable Unit Boundary**
- Parcel Boundary

Notes:

An April 2014 field check of soil gas probe depths revealed blockages in wells DP-2 and DP-3 at 6' bgs and 20' bgs, respectively (ADEQ, 2014). Because it is uncertain when this damage occurred, data from DP-2 and DP-3 were not used to draw conclusions for the Final LOU RI Report.

0 1,000 2,000 Feet

1 inch:1,000 feet

**Probe vandalized prior to 2013 sampling event- No samples collected*
***LOU RI boundary for BNL from Stantec, 2012*

SVE/AI - Soil Vapor Extraction/Air Injection
WH - Wellhead
PCE - tetrachloroethylene
mg/m^3 - milligrams per cubic meter
ft. bls - feet below land surface

Map Projection: NAD 1983 UTM Zone 12N

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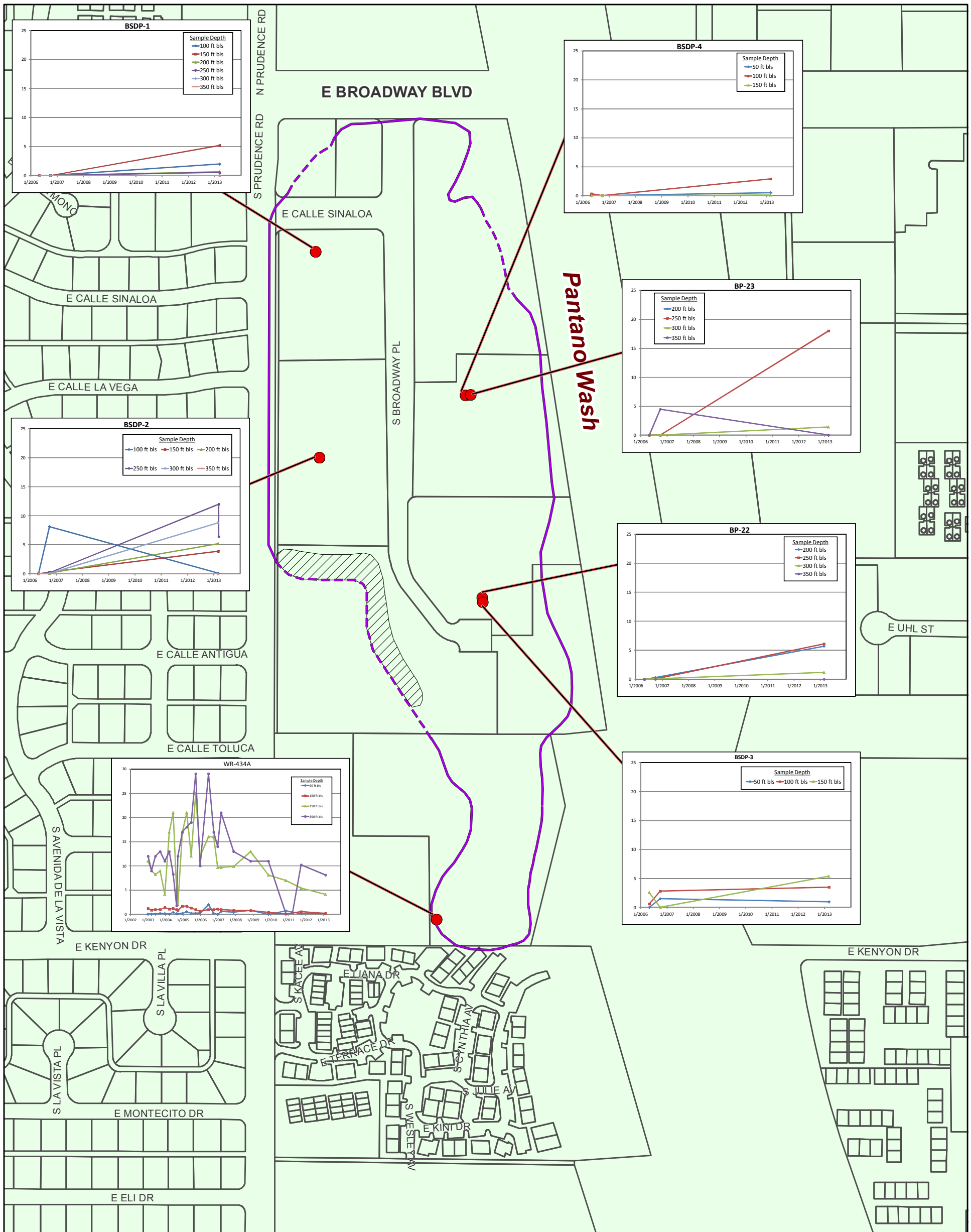
Figure 21 - Historical PCE Distribution in Soil Gas Deep-Nested Soil Gas Probes Broadway North Landfill



Legend

- Deep-Nested Soil Gas Probe (PCE Sampling Results, mg/m^3)
- Extent of Refuse*
- Estimated Extent of Refuse Removed**
- Parcel Boundary

0 300 600 Feet

1 inch:300 feet

Notes:
**Refuse was reported to have been removed at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The "Extent of Refuse" boundary is dashed in areas where removal may have occurred.*
***Estimated extent of refuse removed during construction operations at Broadway Proper (Brinsko, 1989).*

PCE - tetrachloroethylene
mg/m^3 - milligrams per cubic meter
ft. bls - feet below land surface

Map Projection: NAD 1983 UTM Zone 12N

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Figure 22 - Historical PCE Distribution in Soil Gas Deep-Nested Soil Gas Probes Broadway South Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig22 BSL HistoricalPCE, DeepProbes 11x17p.mxd

Legend

- Temporary Soil Gas Probe
- Extent of Refuse*
- Estimated Extent of Refuse Removed**

0 300 Feet
1 inch:300 feet

Map Projection:
NAD 1983 UTM Zone 12N

Notes:
**Refuse was reported to have been removed at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The "Extent of Refuse" boundary is dashed in areas where removal may have occurred.*
***Estimated extent of refuse removed during construction operations at Broadway Proper (Brinsko, 1989).*

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

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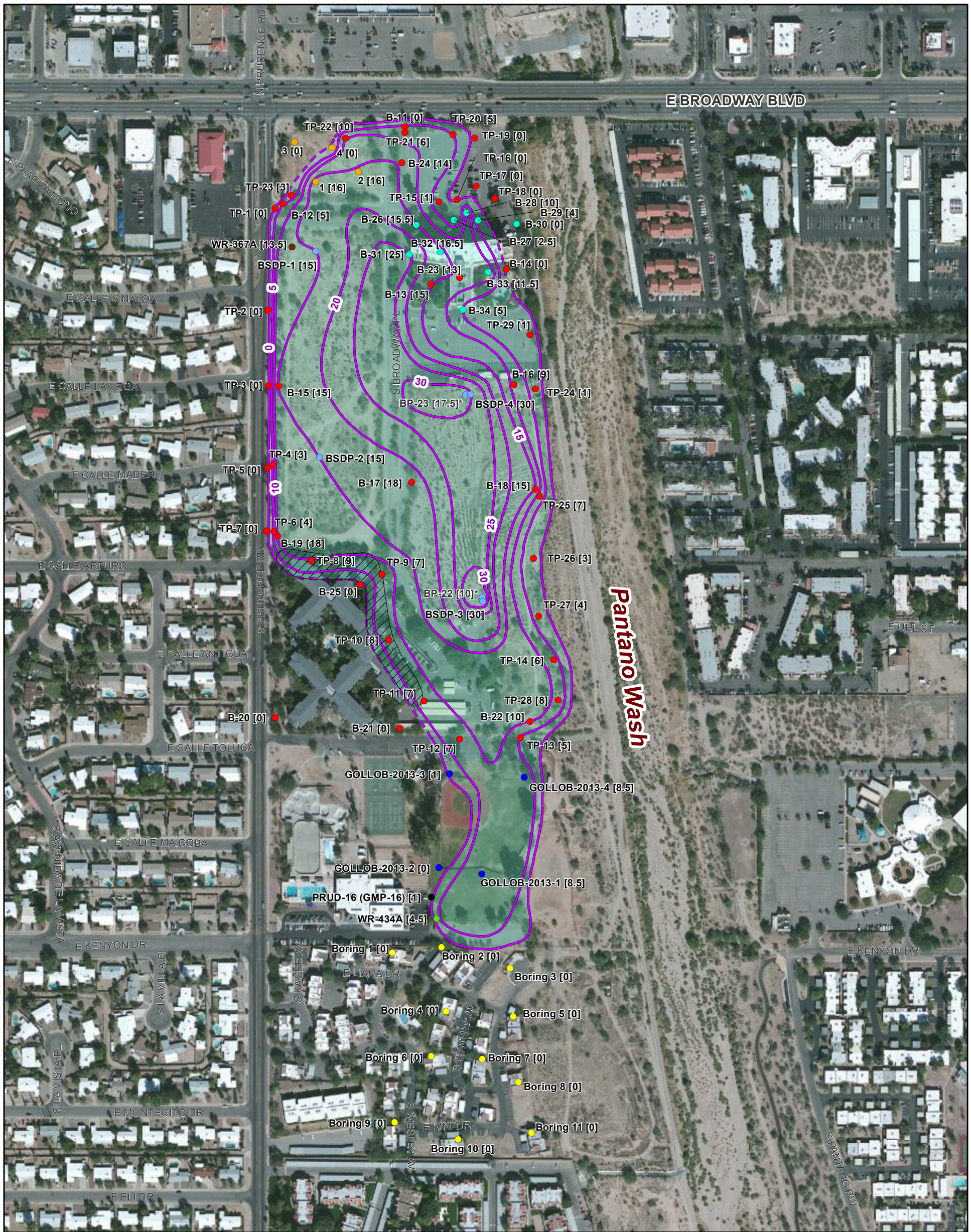
Figure 23 - Shallow Temporary Soil Gas Probe Locations Gollob Park Broadway South Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig23 BSL-GP LocationMap, ShallowTempProbes 8.5x11p.mxd



0 300 600 Feet

1 inch:300 feet

Legend

- GRC, 1984 [Refuse Thickness in ft.]
- WCC, 1985 [Refuse Thickness in ft.]
- GRC, 1987 [Refuse Thickness in ft.]
- COT, 2000 [Refuse Thickness in ft.]
- COT, 2001 [Refuse Thickness in ft.]
- Env. Eng., 2002 [Refuse Thick. in ft.]
- SECOR, 2006b [Refuse Thickness in ft.]*
- EEC, 2007 [Refuse Thickness in ft.]
- CCA, Appendix H [Refuse Thickness in ft.]

- Refuse Thickness Isopach (C.I. = 5 ft.)
- Extent of Refuse**
- Estimated Extent of Refuse Removed***

Notes:
**Values in gray were NOT used in contouring.*
***Refuse was reported to have been removed at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The "Extent of Refuse" boundary is dashed in areas where removal may have occurred.*
****Estimated extent of refuse removed during construction operations at Broadway Proper (Brinsko, 1989).*
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

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Figure 24
Refuse Isopach Map
Broadway South Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig24 BSL RefuseIsopach 11x17p.mxd

0 300 600 Feet

1 inch:300 feet

Legend

- GRC, 1984 [Cover Thickness in ft.]
- WCC, 1985 [Cover Thickness in ft.]
- GRC, 1987 [Cover Thickness in ft.]
- COT, 2000 [Cover Thickness in ft.]
- COT, 2001 [Cover Thickness in ft.]
- Env. Eng., 2002 [Cover Thick. in ft.]
- SECOR, 2006b [Cover Thickness in ft.]
- EEC, 2007 [Cover Thickness in ft.]
- CCA, Appendix H [Cover Thickness in ft.]

- Cover Thickness Isopach (C.I. = 5 ft.)
- Extent of Refuse*
- Estimated Extent of Refuse Removed**

Notes:
**Refuse was reported to have been removed at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The "Extent of Refuse" boundary is dashed in areas where removal may have occurred.*
***Estimated extent of refuse removed during construction operations at Broadway Proper (Brinsko, 1989).*
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

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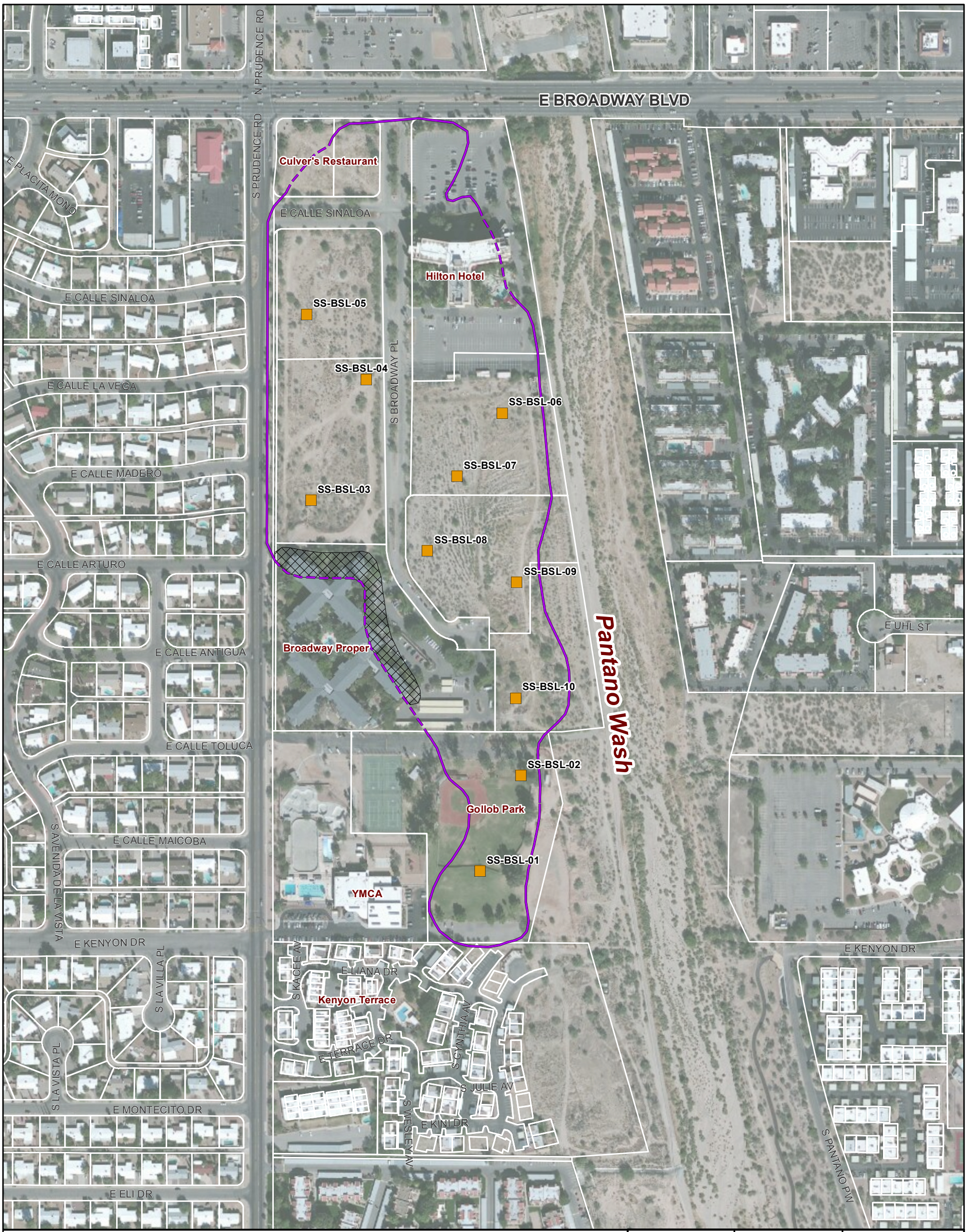
Figure 25
Landfill Cover Isopach Map
Broadway South Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig25 BSL CoverIsopach 11x17p.mxd



Legend

- Shallow Soil Sample Location*
- Extent of Refuse**
- Estimated Extent of Refuse Removed***
- Parcel Boundary

0 300 600 Feet

1 inch:300 feet

Notes:
**Shallow soil samples collected in March 2013.*

***Refuse was reported to have been removed at Hilton, Culver's, and Broadway Proper prior to construction of the buildings. The areas of removal were not documented. The "Extent of Refuse" boundary is dashed in areas where removal may have occurred.*

****Estimated extent of refuse removed during construction operations at Broadway Proper (Brinsko, 1989).*

Map Projection: NAD 1983 UTM Zone 12N

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

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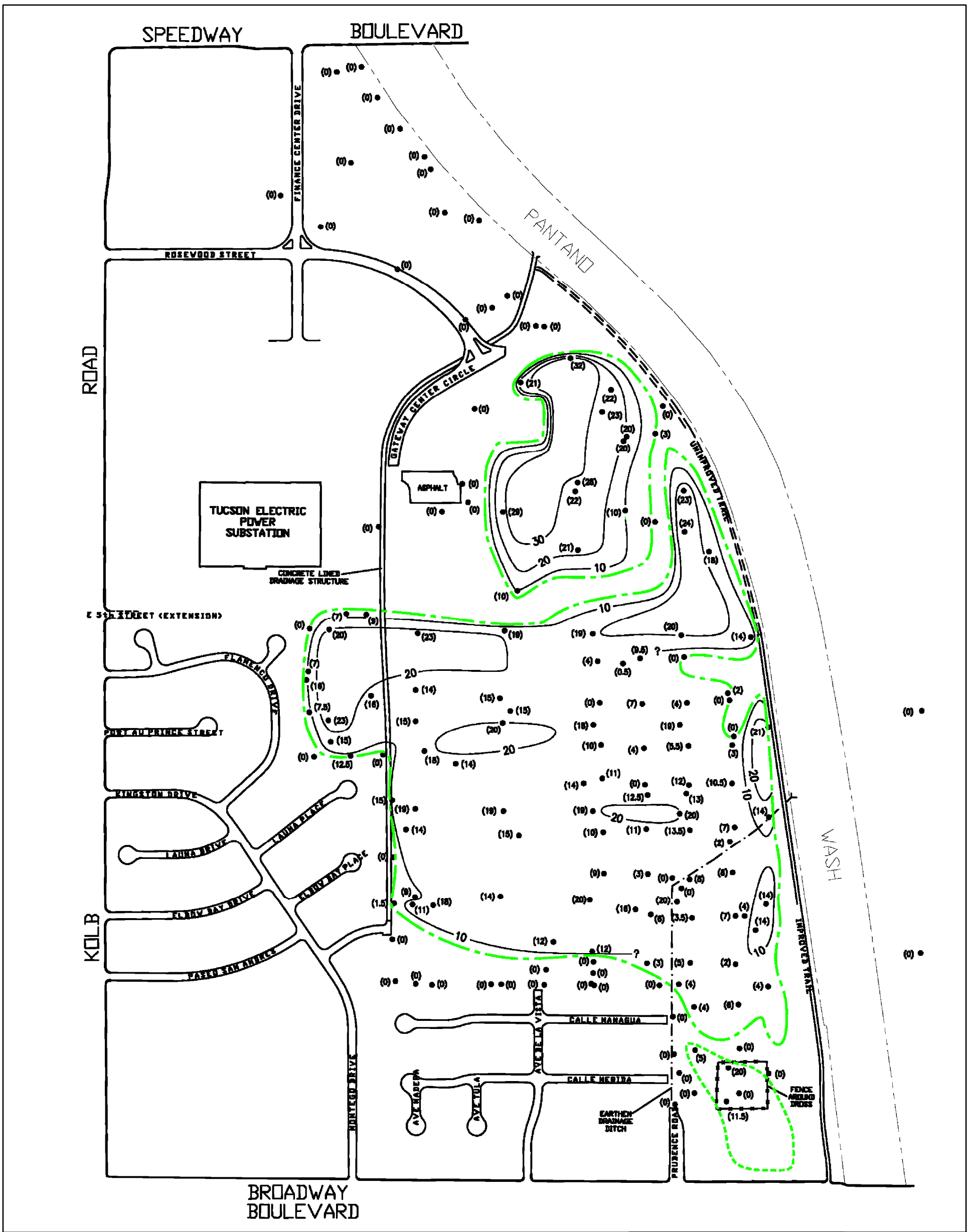
Figure 26
Shallow Soil Sampling Locations
Broadway South Landfill

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig26 BSL SoilSamplingLocations 11x17p.mxd



Legend

- Approximate Historical Data Location
- (12) Refuse Thickness (ft.)
- Refuse Thickness Contour (ft.)
- Approximate Extent of Municipal Waste
- Approximate Extent of Construction Debris

0 440 880 Feet

1 inch:440 feet

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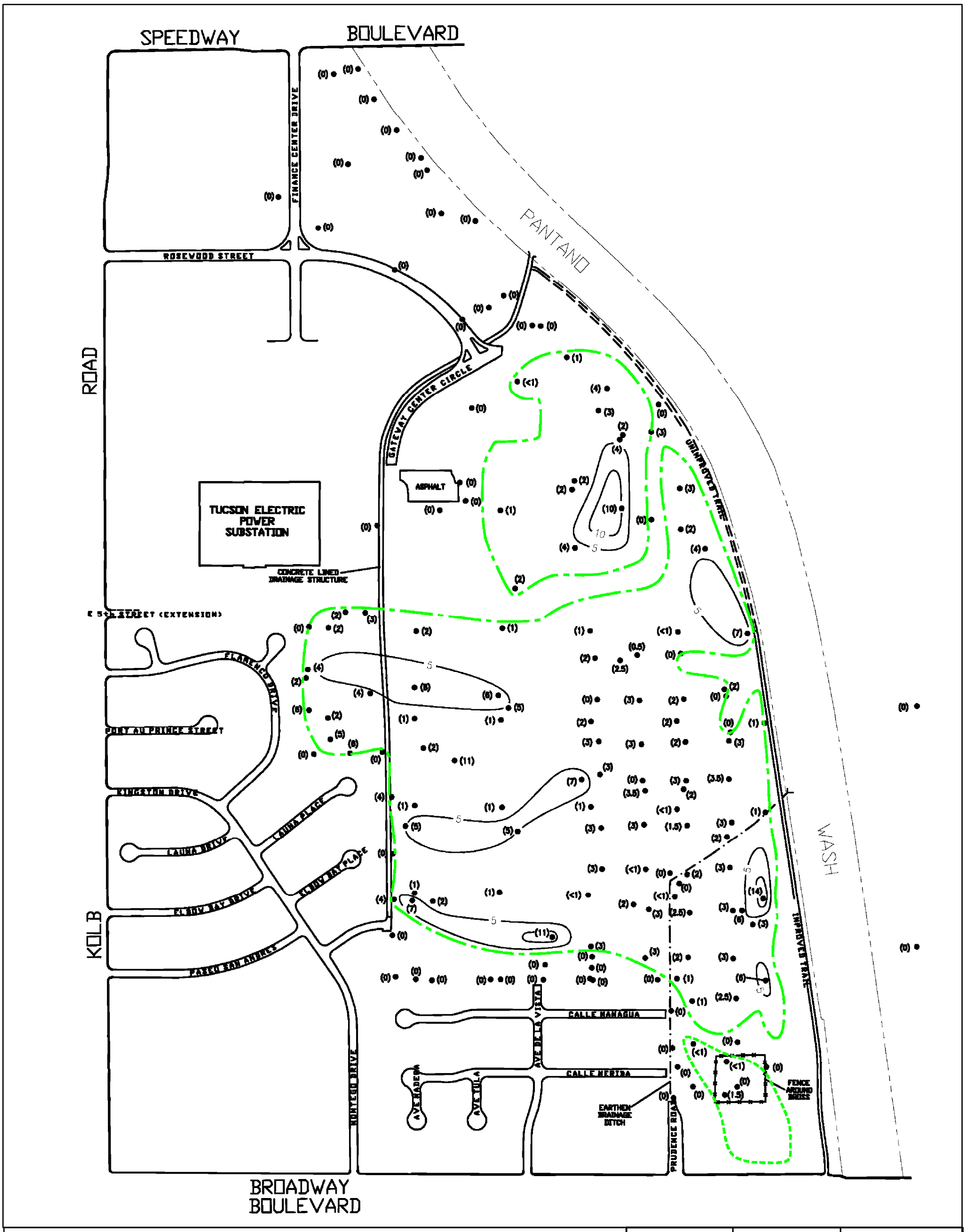
Figure 27*
Refuse Isopach Map
Broadway North Landfill

Notes:
**Figure from Stantec, 2012*

Map Projection: NAD 1983 UTM Zone 12N

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig27 BNL RefuseIsopach 11x17l.mxd



Legend

- Approximate Historical Data Location
- (12) Landfill Cover Thickness (ft.)
- Landfill Cover Thickness Contour (ft.)
- Approximate Extent of Municipal Waste
- Approximate Extent of Construction Debris

0 440 880 Feet

1 inch:440 feet

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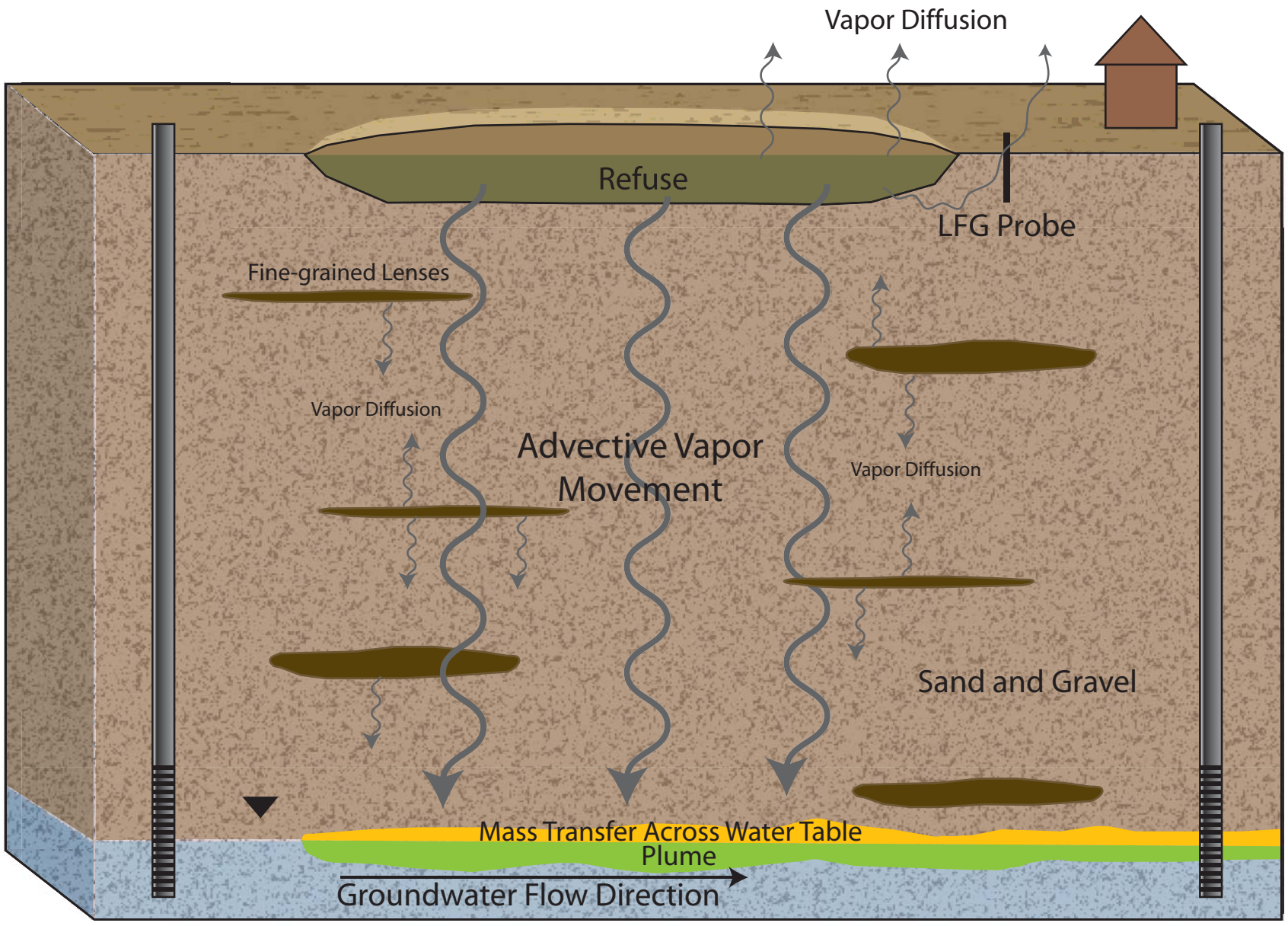
Figure 28*
Landfill Cover Isopach Map
Broadway North Landfill

Notes:
**Figure from Stantec, 2012*

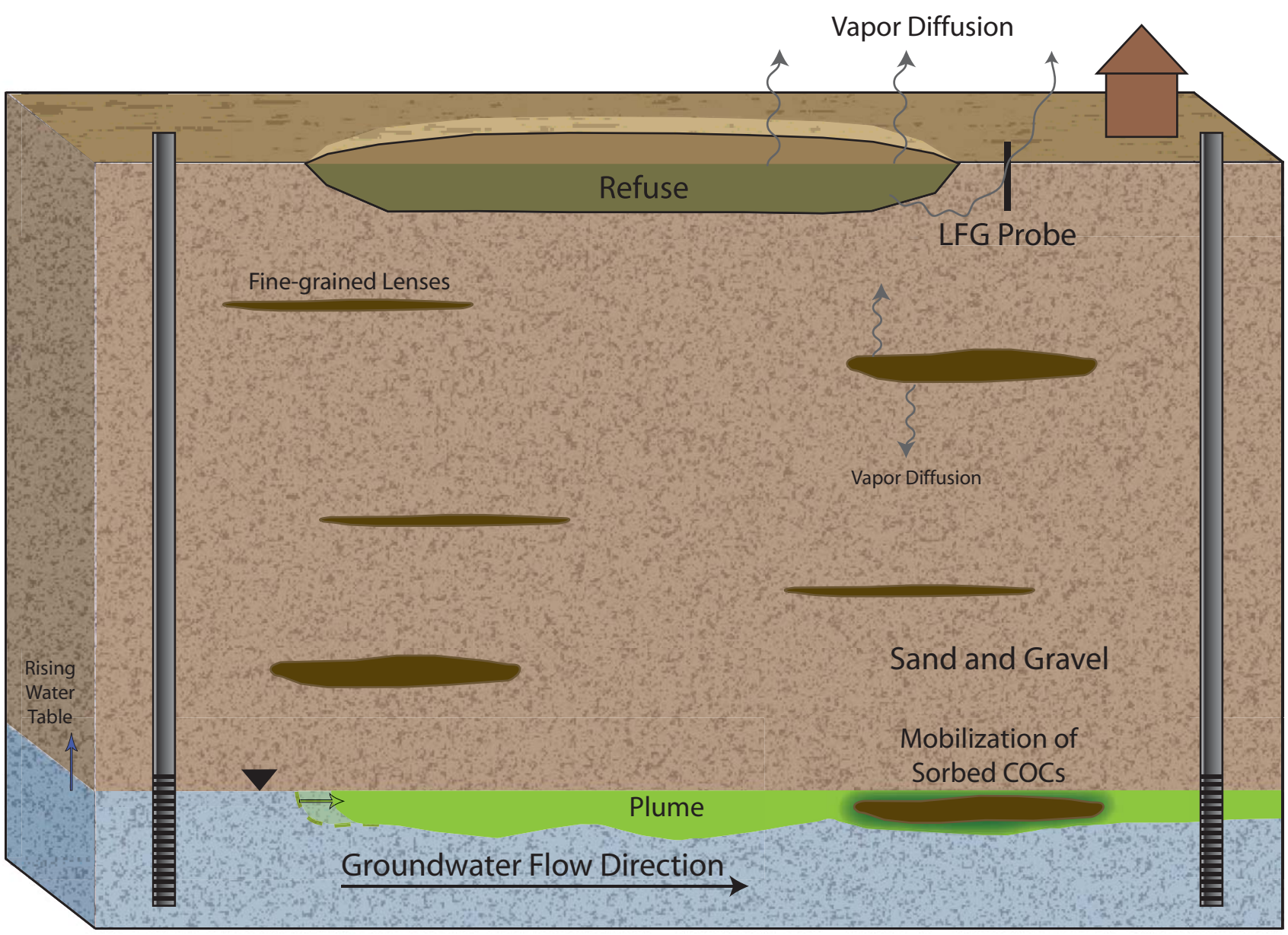
Map Projection: NAD 1983 UTM Zone 12N

Document Path: \\PHX-FILE1\Tucson\Data\Projects\ADEQ\BP LOU RI\GIS Files\Fig28 BNL LandfillCoverIsopach 11x17l.mxd

ACTIVE RELEASE PHASE



POST SVE/AI PHASE



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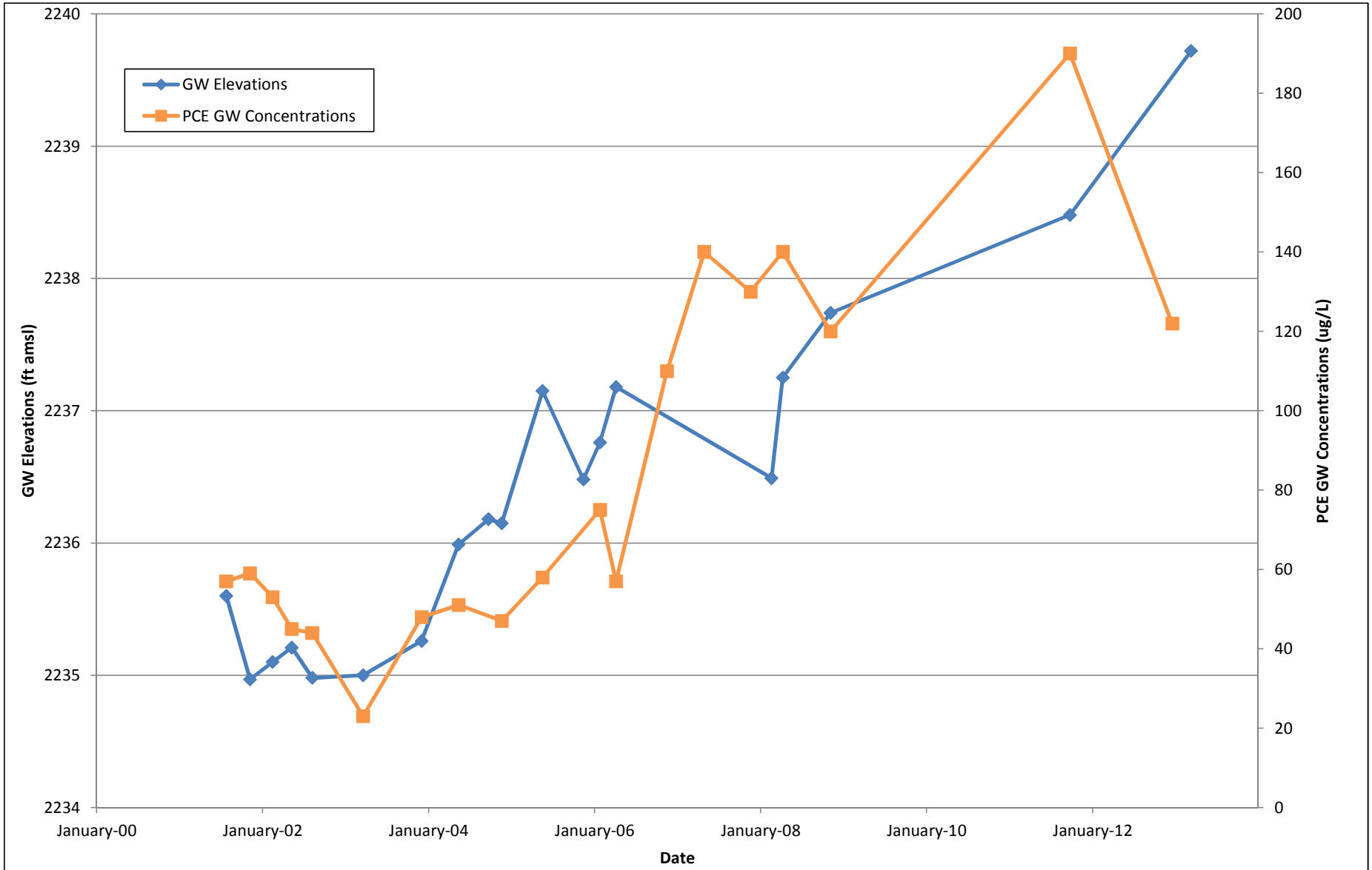
PROJECT NO. 233005

PROJECT NAME BP LOU RI

FIGURE 29
CONCEPTUAL SITE MODEL
BROADWAY-PANTANO WQARF SITE
LANDFILL OPERABLE UNIT

Figure 30
WR-274A Groundwater Elevations versus PCE Groundwater Concentrations



Notes: Groundwater samples collected from 2003 through 2011 were collected at a depth of 5 feet below the water table. The sample collected in 2012 was collected using a passive diffusion bag at a depth of 25 feet below the water table. GW = groundwater, ft amsl = feet above mean sea level, ug/L = micrograms per Liter