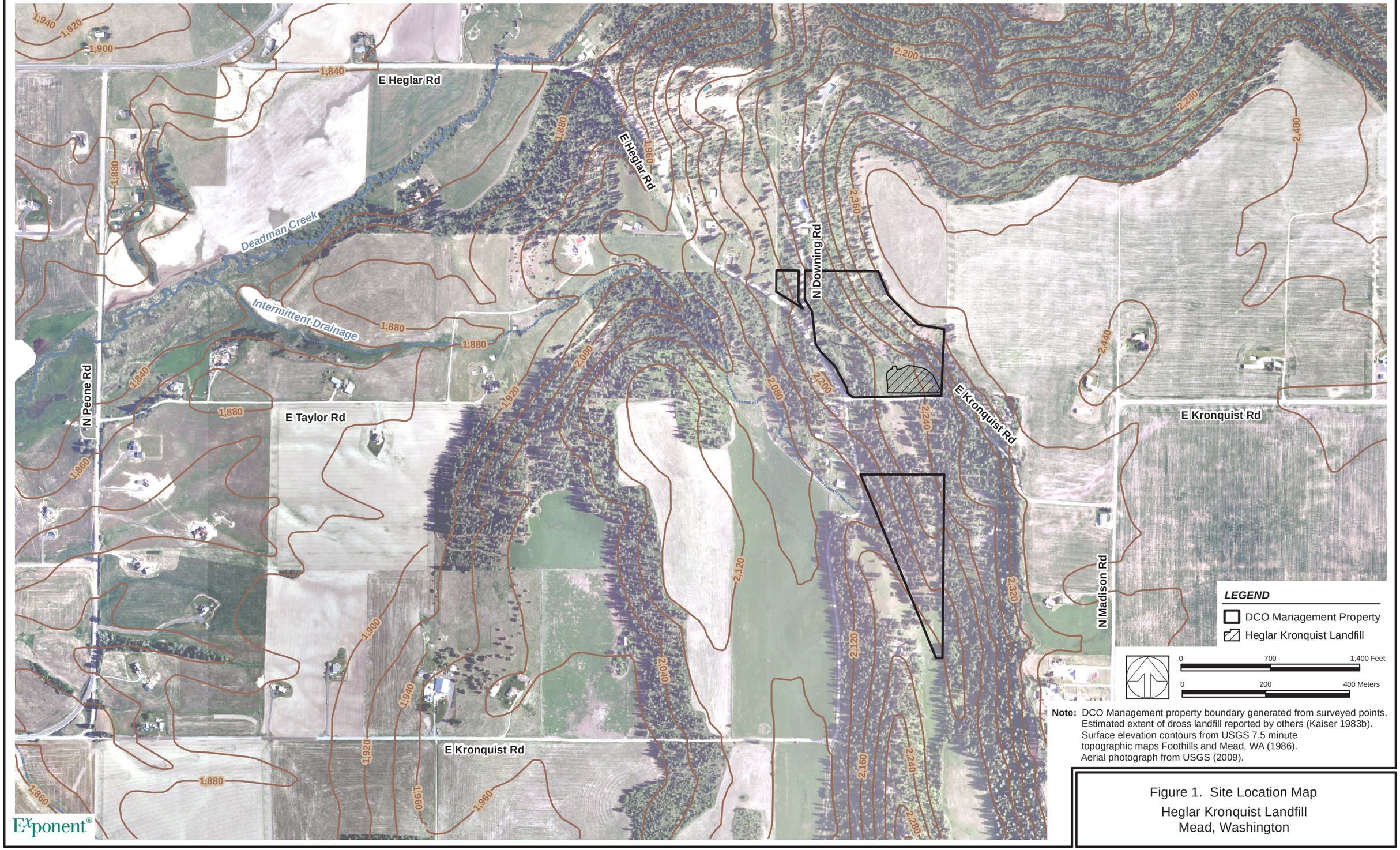
Figures



Note: DCO Management property boundary generated from surveyed points. Estimated extent of dross landfill reported by others (Kaiser 1983b). Surface elevation contours from USGS 7.5 minute topographic maps Foothills and Mead, WA (1986). Aerial photograph from USGS (2009).

Figure 1. Site Location Map
Heglar Kronquist Landfill
Mead, Washington

Exponent®

HC-2
HC-3
SW-6
HC-8
HC-1
HC-5 North
BH-8 North
BH-8 South
3bbc (HC-7)
HC-4
BH-7
4aad
SW-4 (3bcb)
HC-5 South
BH-13
4ada (HC-6)
Deadman Creek
SW-8
MW-1
BH-3
3bcc
Intermittent Drainage
4bcd
MW-3
BH-15
3bcd-1
3bcd-2
4acc-1
3b
BH-10
3bcd-3
4acc-2
SW-5
BH-4
MW-4
BH-5
5add
3cbb-1
(HC-9/HC-10)
Test Hole
BH-2
3caa
3cbb-2
BH-1
MW-5
BH-9
MW-6
3cba
HC-16
SW-3 (3cbd-1)
BH-12
SW-2 (3cbd-2)
BH-11
SW-1 (3cca)
BH-6
MW-2
MW-2a
4cdd
4ccc
10bba-2
10bba-1
HC-15
HC-12
10bbc
HC-14
HC-11
10bcb-1
10bcb-2
HC-13
Peone Creek
SW-7

LEGEND

- Monitoring Well Location (new)
- Existing/Former Private Well or Monitor Well Location
- RI Lithologic Soil Boring Location
- RI Surface Water Sampling Location
- Heglar Kronquist Landfill

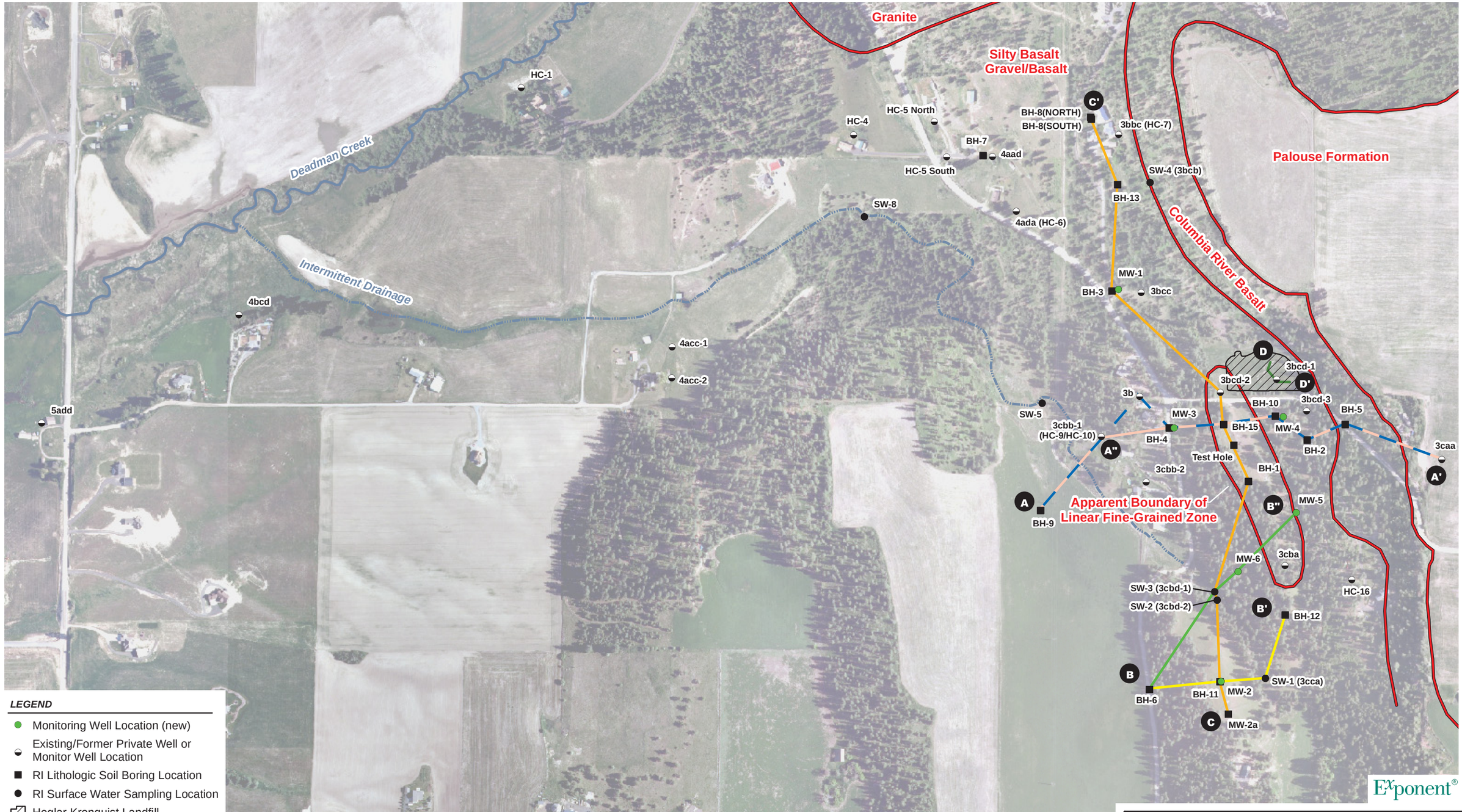
Notes: All features and locations, including drainages, not surveyed in 2010 are approximate.
Estimated extent of dross landfill reported by others (Kaiser 1983b).
Aerial photograph from USGS (2009).

0 800 1,600 Feet
0 250 500 Mete

Exponent®

Figure 2. Groundwater, Surface Water, and Lithologic Boring Sampling Locations
Heglar Kronquist Landfill
Mead, Washington

Final



LEGEND

- Monitoring Well Location (new)
- Existing/Former Private Well or Monitor Well Location
- RI Lithologic Soil Boring Location
- RI Surface Water Sampling Location
- Heglar Kronquist Landfill

Notes: All features and locations, including drainages, not surveyed in 2010 are approximate.
Estimated extent of dross landfill reported by others (Kaiser 1983b).
Groundwater was not found at location MW-2a.
Aerial photograph from USGS (2009).

Figure 3. General Geologic Map of Site
Heglar Kronquist Landfill
Mead, Washington

LEGEND

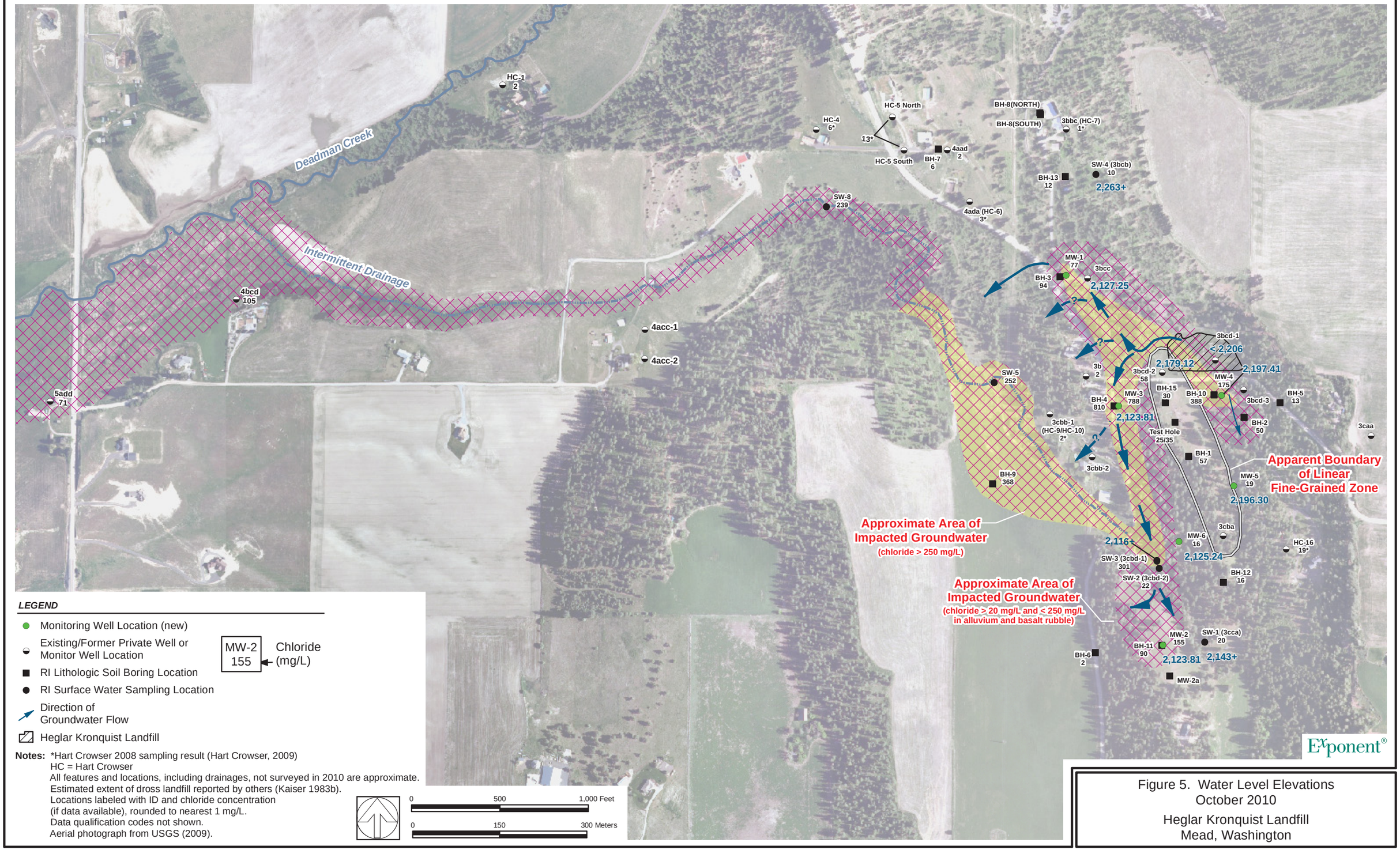
- RI Gas Vent Sampling Location
- RI Ambient Air Sampling Location
- RI Dross Borehole Sampling Location
- Gas Vent - not present
- Existing Monitor Well Location
- DCO Management Property
- Heglar Kronquist Landfill
- Fence line
- Subsurface pipe for gas vent system

Notes: AOS = RI ambient air sampling location on landfill fence line
ALF = RI ambient air sampling location on landfill
GV = RI gas vent sampling location
DCO Management property and fence line have been surveyed.
Estimated extent of dross landfill and features reported by others (Kaiser 1983b).
Aerial photograph from USGS (2009).

0 50 100 Feet
0 15 30 Meters

Figure 4. Site Conditions and Landfill Sampling Locations

Heglar Kronquist Landfill
Mead, Washington



LEGEND

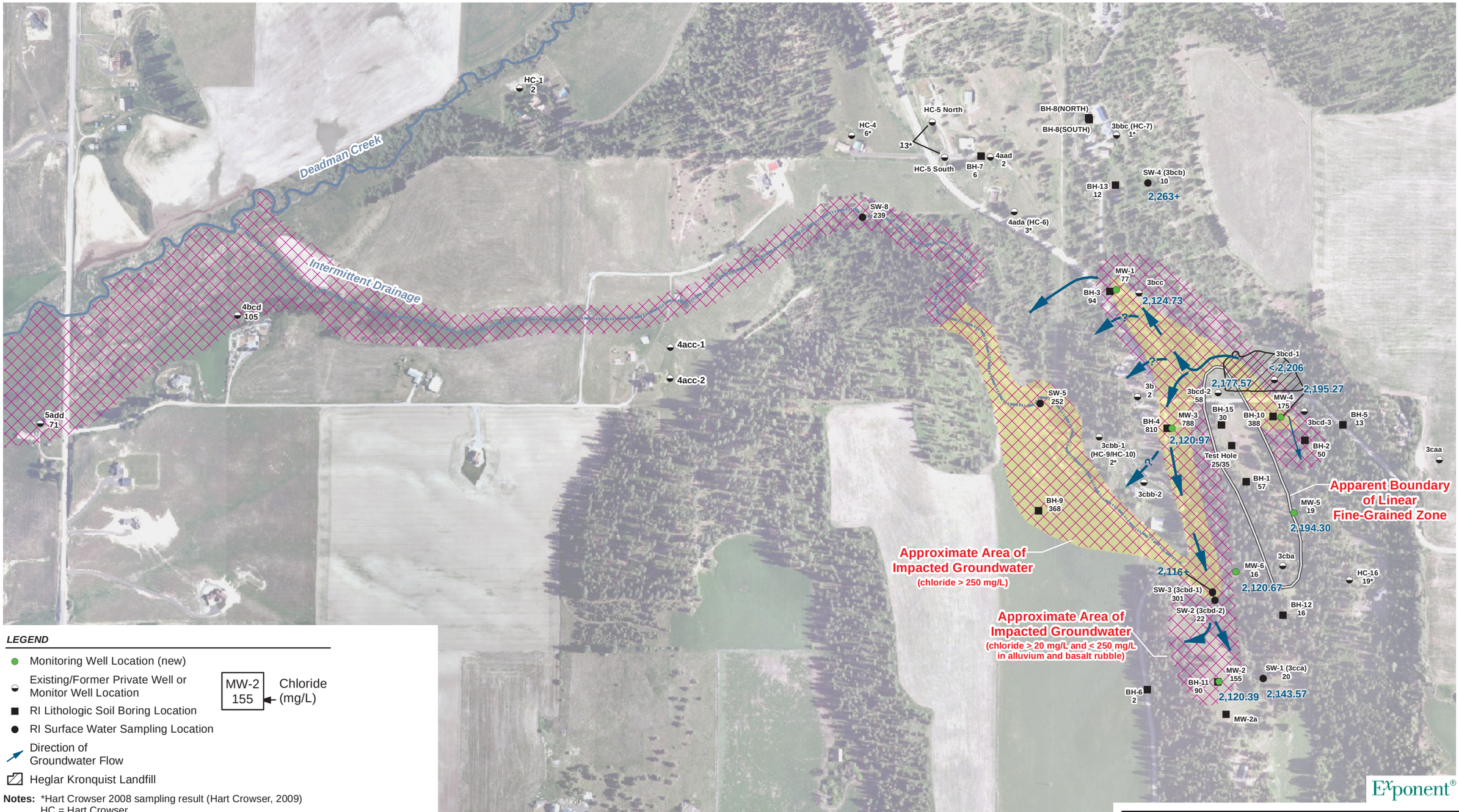
- Monitoring Well Location (new)
- Existing/Former Private Well or Monitor Well Location
- RI Lithologic Soil Boring Location
- RI Surface Water Sampling Location
- Direction of Groundwater Flow
- Heglar Kronquist Landfill

MW-2 155 ← Chloride (mg/L)

Notes: *Hart Crowser 2008 sampling result (Hart Crowser, 2009)
HC = Hart Crowser
All features and locations, including drainages, not surveyed in 2010 are approximate.
Estimated extent of dross landfill reported by others (Kaiser 1983b).
Locations labeled with ID and chloride concentration (if data available), rounded to nearest 1 mg/L.
Data qualification codes not shown.
Aerial photograph from USGS (2009).

Figure 5. Water Level Elevations
October 2010

Heglar Kronquist Landfill
Mead, Washington



LEGEND

- Monitoring Well Location (new)
- Existing/Former Private Well or Monitor Well Location
- RI Lithologic Soil Boring Location
- RI Surface Water Sampling Location
- Direction of Groundwater Flow
- Heglar Kronquist Landfill

MW-2 / 155 ← Chloride (mg/L)

Notes: *Hart Crowser 2008 sampling result (Hart Crowser, 2009)
HC = Hart Crowser
All features and locations, including drainages, not surveyed in 2010 are approximate.
Estimated extent of dross landfill reported by others (Kaiser 1983b).
Locations labeled with ID and chloride concentration (if data available), rounded to nearest 1 mg/L.
Data qualification codes not shown.
Aerial photograph from USGS (2009).

0 500 1,000 Feet

0 150 300 Meters

Exponent®

Figure 6. Water Level Elevations
January 2011

Heglar Kronquist Landfill
Mead, Washington

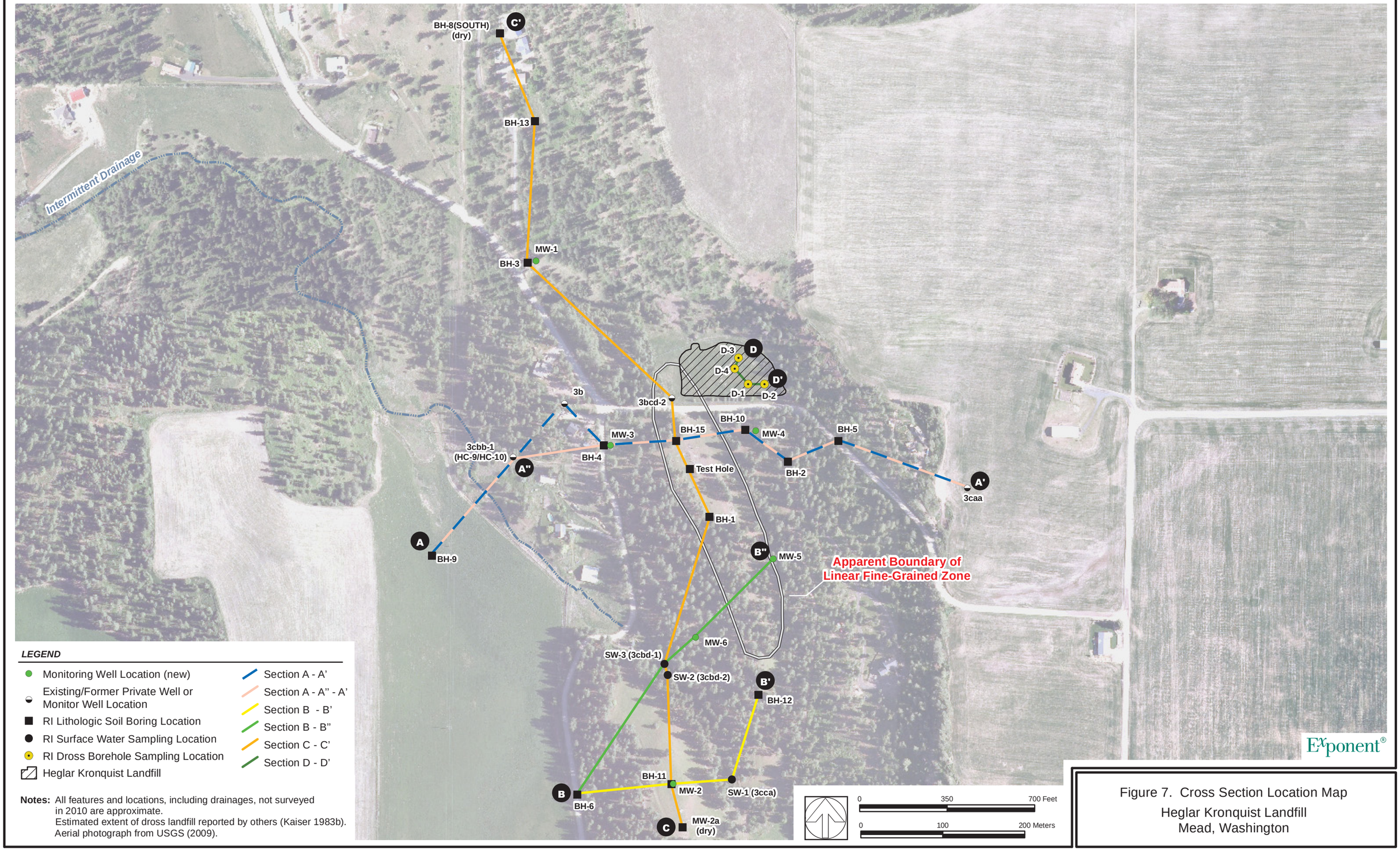
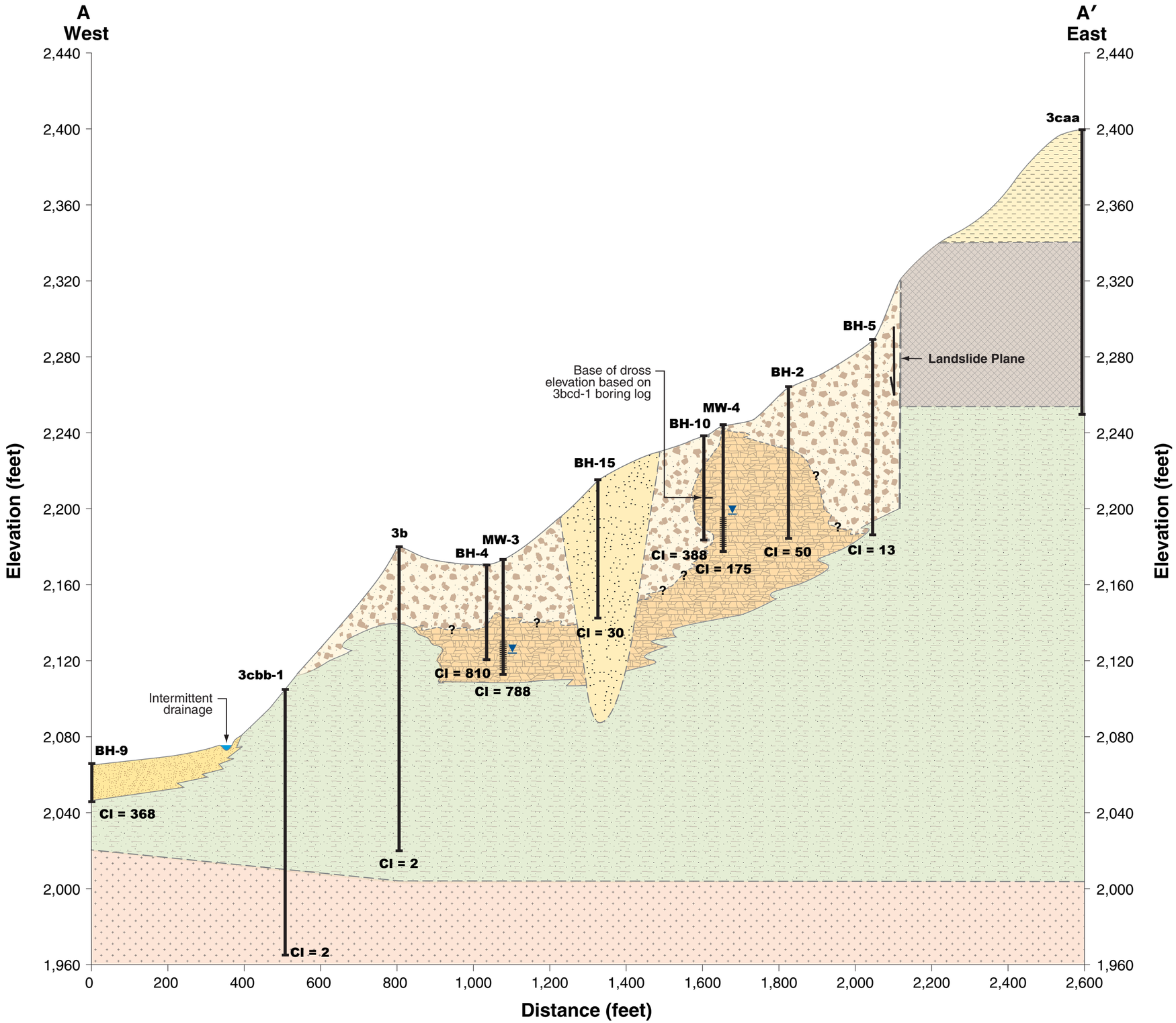
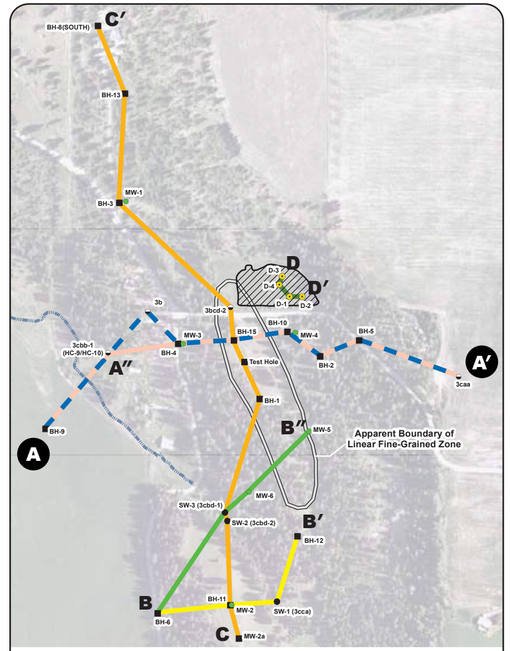


Figure 7. Cross Section Location Map

Heglar Kronquist Landfill
Mead, Washington





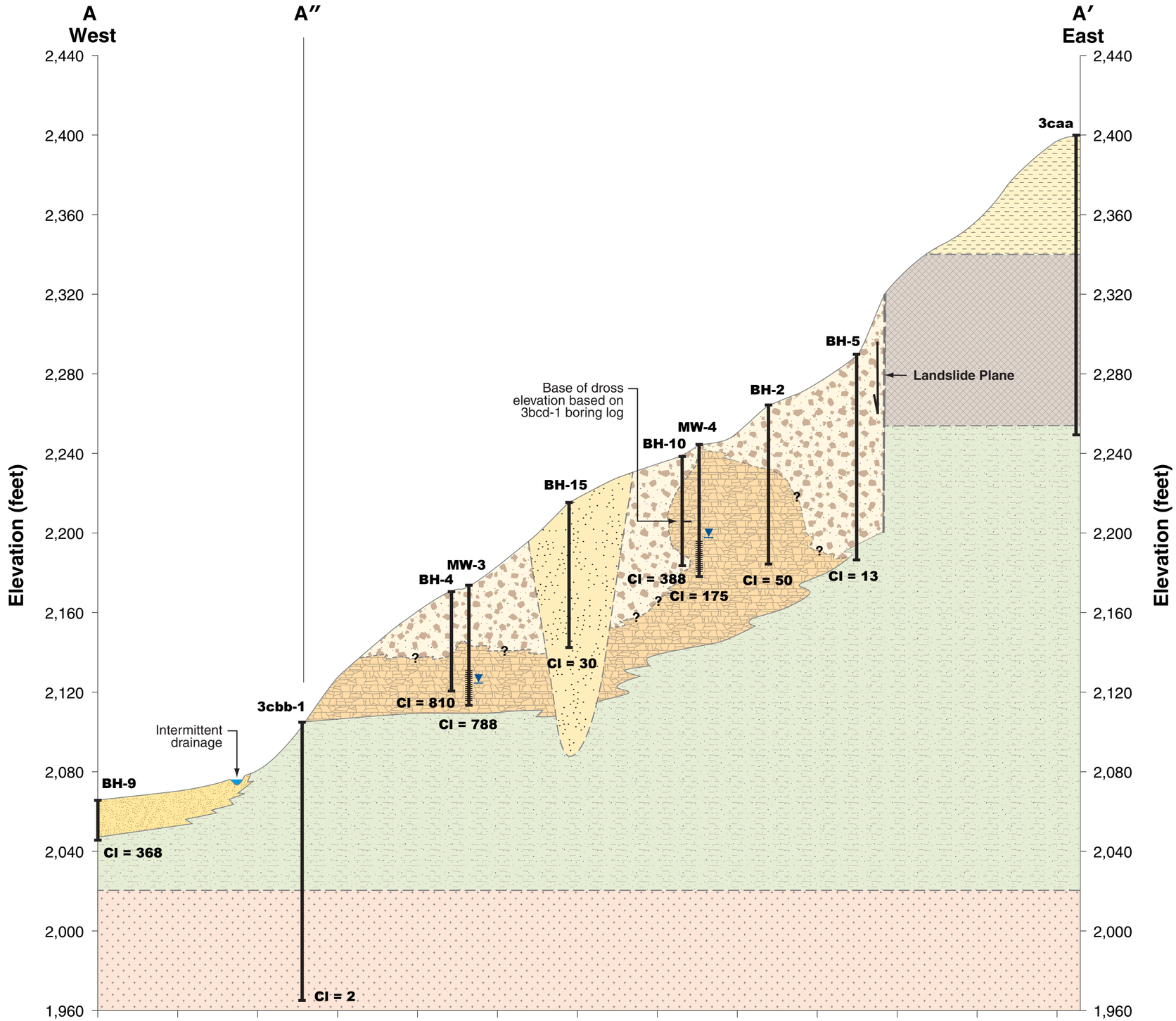
LEGEND

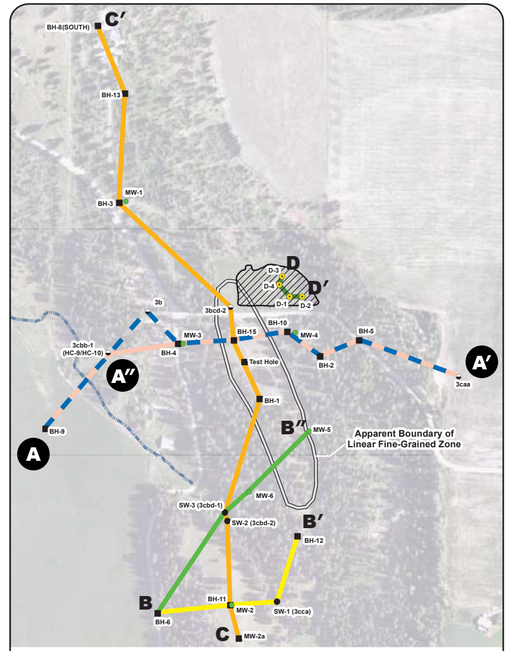
- Alluvium
- Landslide Block (basalt blocks, silty clayey basalt gravel with some thin sands)
- Landslide Block (clayey, sandy silt or silty clay, sand)
- Landslide Block (basalt)
- Palouse Formation
- Columbia River Basalt
- Latah Formation
- Granite
- **Cl = 2** Chloride sample result (mg/L)
- October 2010 water level elevation

Notes: All locations not surveyed in 2010 are approximate.

Chloride concentrations rounded to the nearest 1 mg/L.

Figure 8. Cross Section A (West) – A′ (East)
Heglar Kronquist Landfill
Mead, Washington





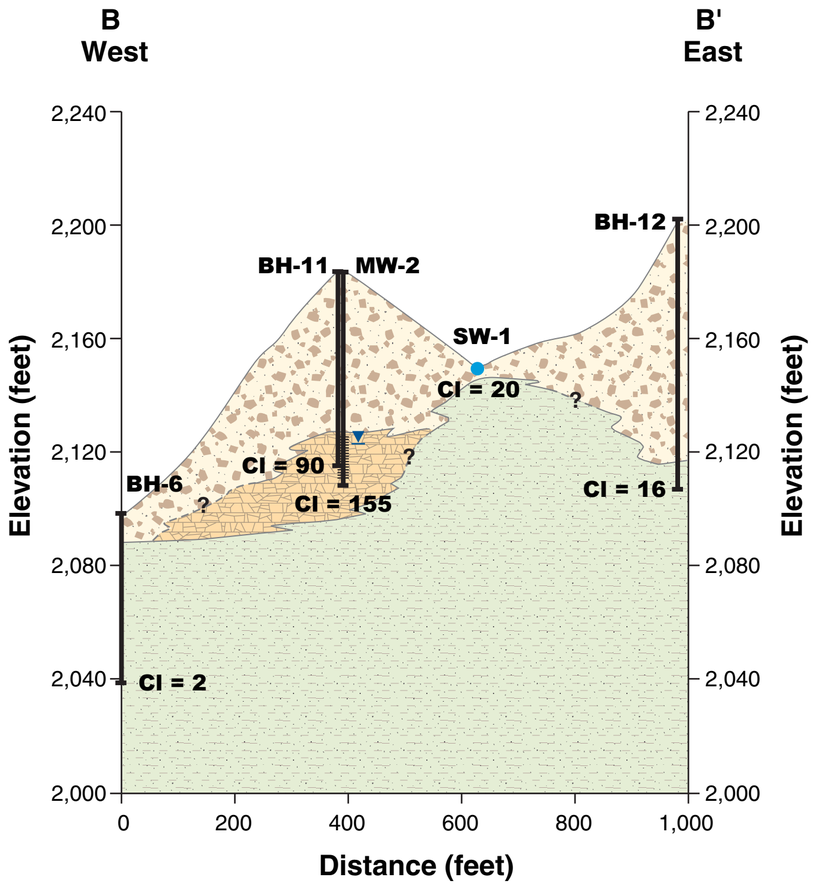
LEGEND

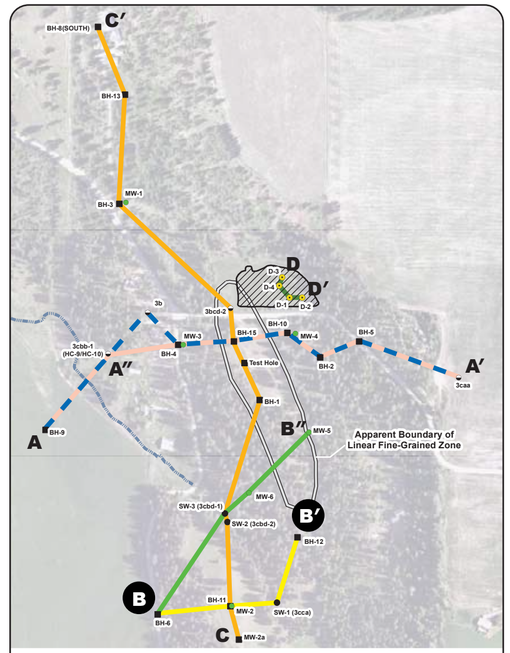
- Alluvium
- Landslide Block (basalt blocks, silty clayey basalt gravel with some thin sands)
- Landslide Block (clayey, sandy silt or silty clay, sand)
- Landslide Block (basalt)
- Palouse Formation
- Columbia River Basalt
- Latah Formation
- Granite
- **Cl = 2** Chloride sample result (mg/L)
- October 2010 water level elevation

Notes: All locations not surveyed in 2010 are approximate.

Chloride concentrations rounded to the nearest 1 mg/L.

Figure 9. Cross Section A (West) – A″ – A′ (East)
Heglar Kronquist Landfill
Mead, Washington





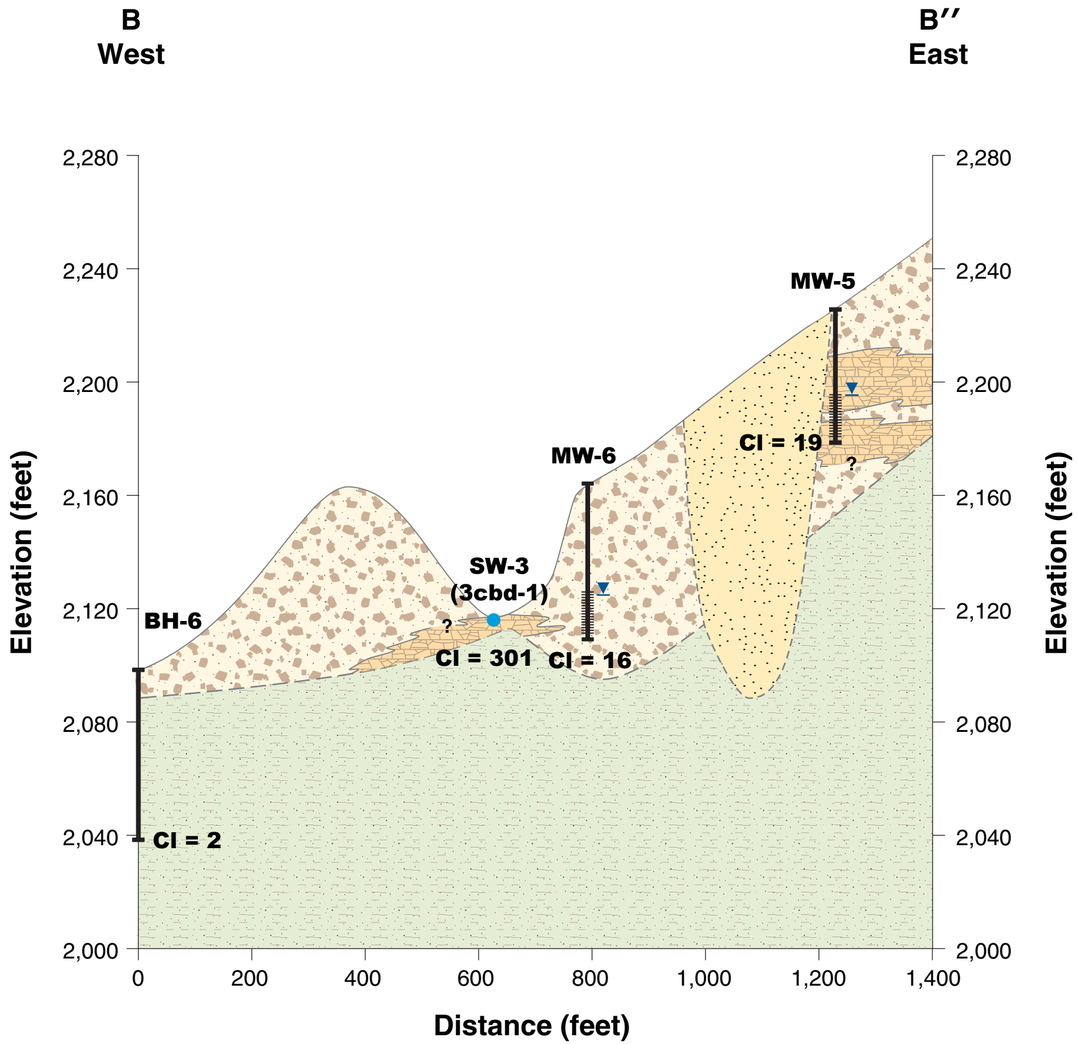
LEGEND

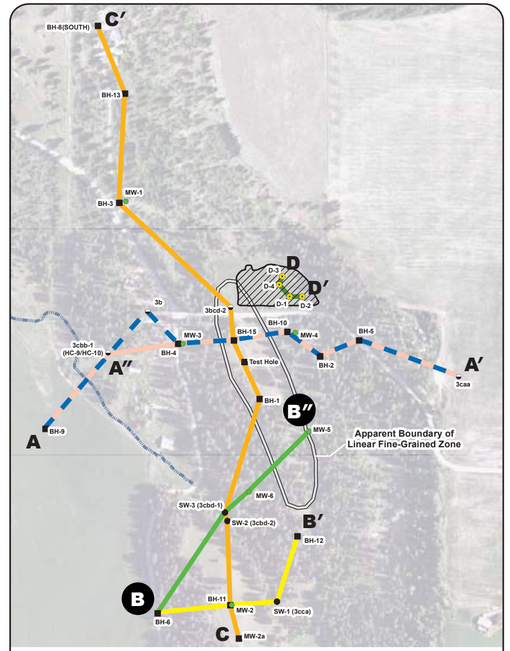
- Alluvium
- Landslide Block (basalt blocks, silty clayey basalt gravel with some thin sands)
- Landslide Block (clayey, sandy silt or silty clay, sand)
- Landslide Block (basalt)
- Palouse Formation
- Columbia River Basalt
- Latah Formation
- Granite
- **Cl = 2** Chloride sample result (mg/L)
- October 2010 water level elevation

Notes: All locations not surveyed in 2010 are approximate.

Chloride concentrations rounded to the nearest 1 mg/L.

Figure 10. Cross Section B (West) – B' (East)
Heglar Kronquist Landfill
Mead, Washington





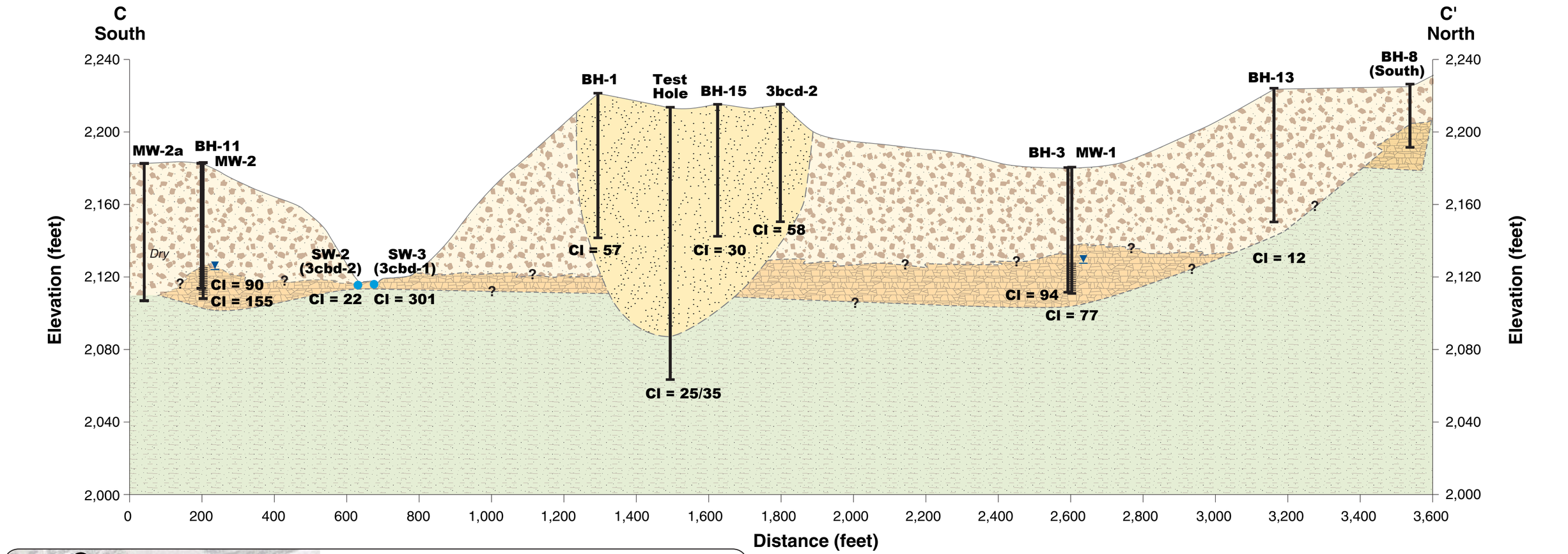
LEGEND

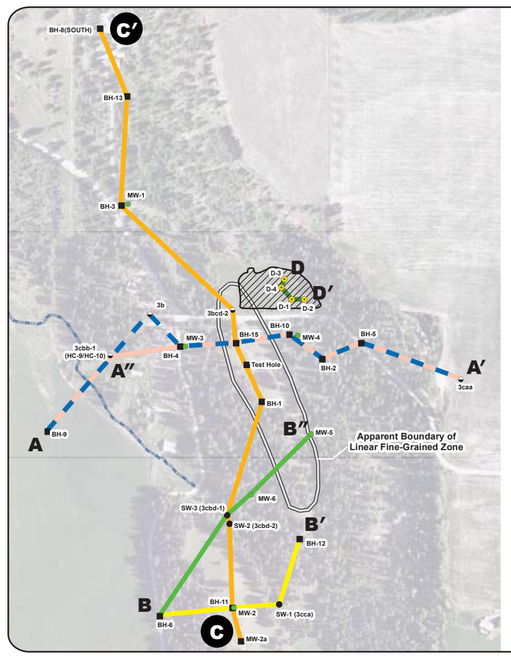
- Alluvium
- Landslide Block (basalt blocks, silty clayey basalt gravel with some thin sands)
- Landslide Block (clayey, sandy silt or silty clay, sand)
- Landslide Block (basalt)
- Palouse Formation
- Columbia River Basalt
- Latah Formation
- Granite
- **Cl = 2** Chloride sample result (mg/L)
- October 2010 water level elevation

Notes: All locations not surveyed in 2010 are approximate.

Chloride concentrations rounded to the nearest 1 mg/L.

Figure 11. Cross Section B (West) – B'' (East)
Heglar Kronquist Landfill
Mead, Washington



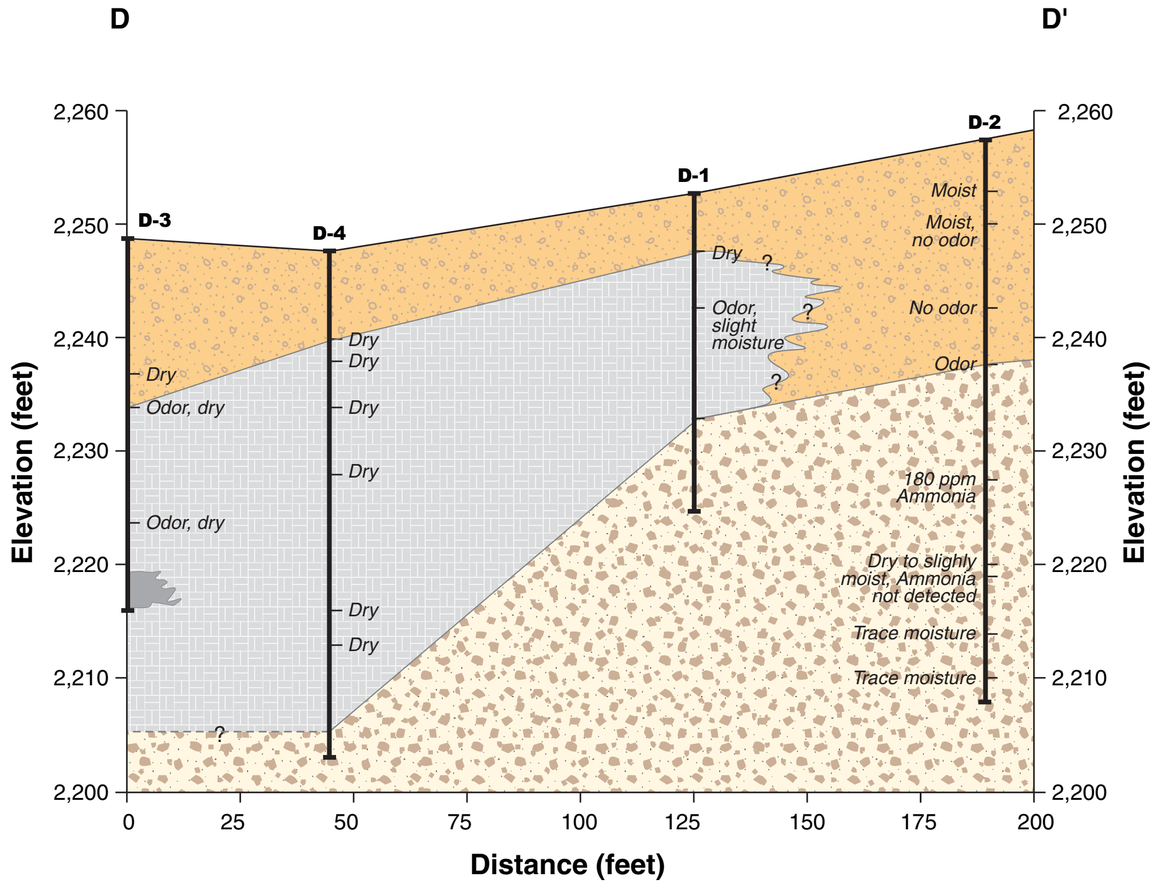


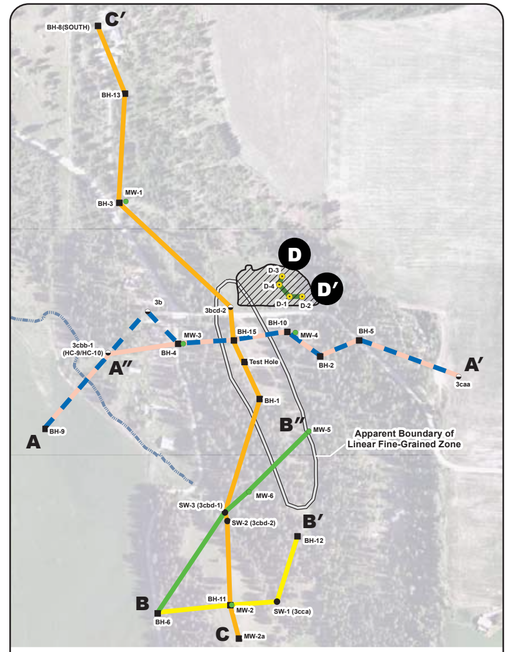
LEGEND

- Alluvium
- Landslide Block (basalt blocks, silty clayey basalt gravel with some thin sands)
- Landslide Block (clayey, sandy silt or silty clay, sand)
- Landslide Block (basalt)
- Palouse Formation
- Columbia River Basalt
- Latah Formation
- Granite
- **Cl = 2** Chloride sample result (mg/L)
- ▼ October 2010 water level elevation

Notes: All locations not surveyed in 2010 are approximate.
Chloride concentrations rounded to the nearest 1 mg/L.

Figure 12. Cross Section C (South) – C' (North)
Heglar Kronquist Landfill
Mead, Washington





LEGEND

- Metal Fragments
- Silt, Sand, Clay with some Gravel
- Dross
- Landslide Block (basalt blocks, silty clayey basalt gravel with some thin sands)

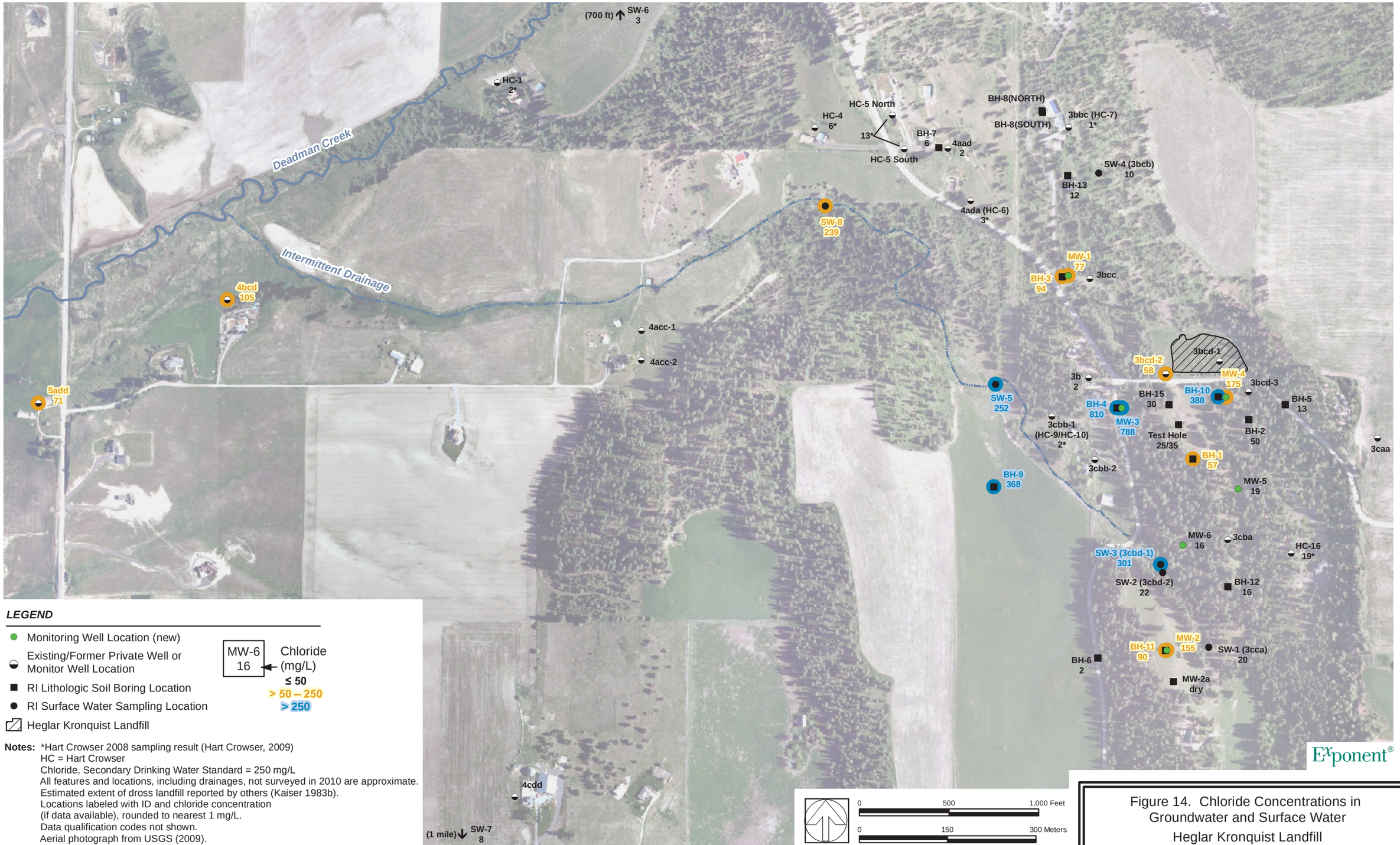
Notes:

All locations not surveyed in 2010 are approximate.

Ammonia measurements are estimated values measured in the field.

Figure 13. Cross Section D – D′

Heglar Kronquist Landfill
Mead, Washington



LEGEND

- Monitoring Well Location (new)
- Existing/Former Private Well or Monitor Well Location
- RI Lithologic Soil Boring Location
- RI Surface Water Sampling Location
- Heglar Kronquist Landfill

MW-6 16 ← Chloride (mg/L)

- ≤ 50
- > 50 – 250
- > 250

Notes: *Hart Crowser 2008 sampling result (Hart Crowser, 2009)
HC = Hart Crowser
Chloride, Secondary Drinking Water Standard = 250 mg/L
All features and locations, including drainages, not surveyed in 2010 are approximate.
Estimated extent of dross landfill reported by others (Kaiser 1983b).
Locations labeled with ID and chloride concentration
(if data available), rounded to nearest 1 mg/L.
Data qualification codes not shown.
Aerial photograph from USGS (2009).

Figure 14. Chloride Concentrations in Groundwater and Surface Water

Heglar Kronquist Landfill
Mead, Washington

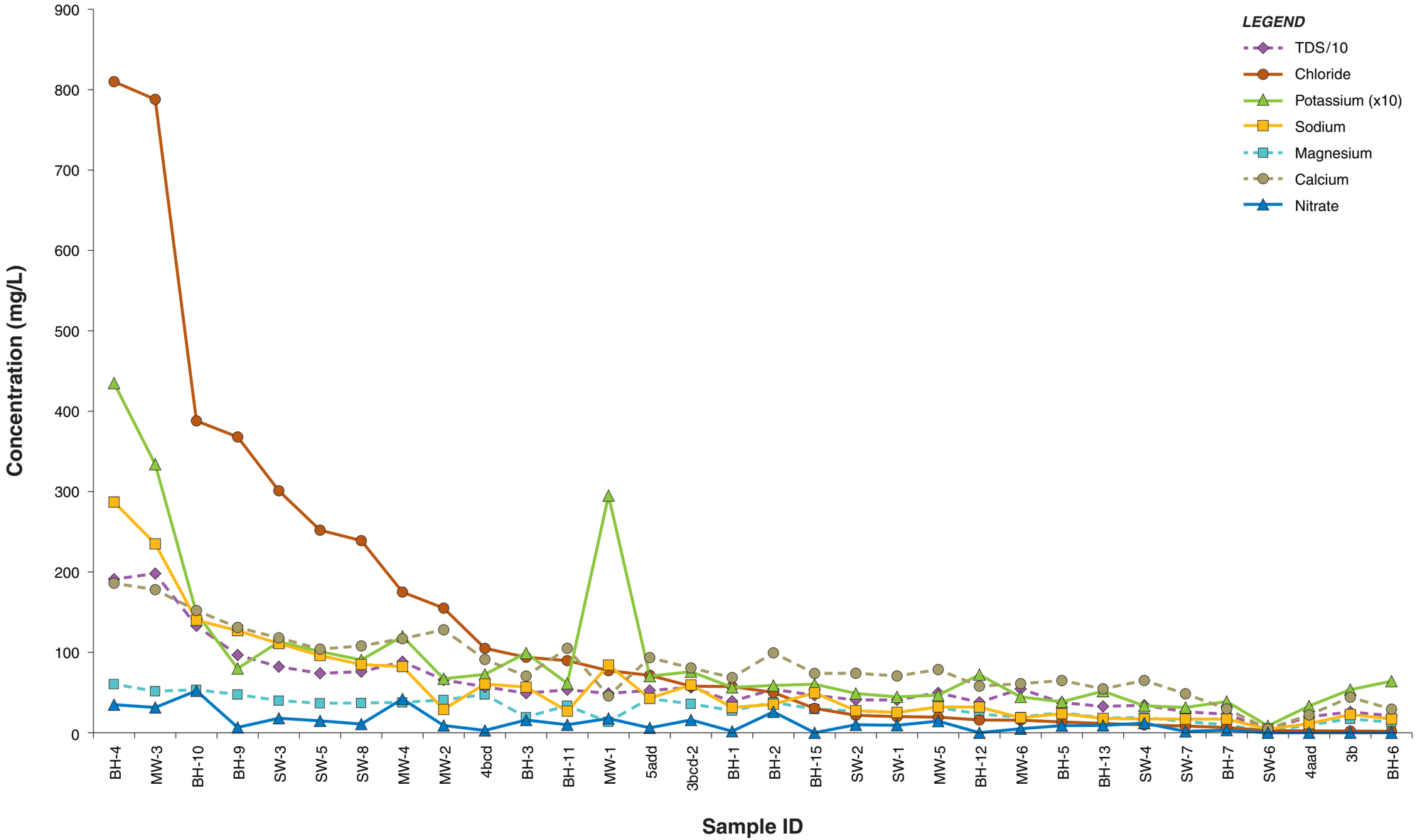


Figure 15. Water Quality Graph
Heglar Kronquist Landfill
Mead, Washington

(700 ft) SW-6 44

HC-1

Deadman Creek

HC-4

HC-5 North

HC-5 South

BH-7 230

4aad 198

BH-8 North

BH-8 South

3bbc (HC-7)

SW-4 (3bcb) 342

BH-13 327

4ada (HC-6)

SW-8 759

Intermittent Drainage

MW-1 489

BH-3 491

3bcc

4bcd 572

4acc-1

4acc-2

5add 526

SW-5 739

3bcd-1

3bcd-2 563

3b 259

MW-4 883

3bcd-3

BH-15 465

BH-10 1,330

BH-5 375

BH-4 1,910

MW-3 1,980

BH-2 540

3cbb-1 (HC-9/HC-10)

Test Hole

3caa

BH-1 391

3cbb-2

MW-5 496

BH-9 967

MW-6 545

3cba

HC-16

SW-3 (3cbd-1) 821

SW-2 (3cbd-2) 408

BH-12 378

BH-6 210

BH-11 535

MW-2 657

SW-1 (3cca) 408

MW-2a

4cdd

(1 mile) SW-7 261

LEGEND

- Monitoring Well Location (new)
- Existing/Former Private Well or Monitor Well Location
- RI Lithologic Soil Boring Location
- RI Surface Water Sampling Location
- Heglar Kronquist Landfill

BH-3 491 ← TDS (mg/L)

≤ 500

> 500

Notes: * Hart Crowser 2008 sampling result (Hart Crowser, 2009)
HC = Hart Crowser
TDS, Secondary Drinking Water Standard = 500 mg/L
All features and locations, including drainages, not surveyed in 2010 are approximate.
Estimated extent of dross landfill reported by others (Kaiser 1983b).
Locations labeled with ID and TDS concentration
(if data available), rounded to nearest 1 mg/L.
Data qualification codes not shown.
Aerial photograph from USGS (2009).

0 500 1,000 Feet

0 150 300 Meters

Exponent®

Figure 16. Total Dissolved Solids (TDS) Concentrations in Groundwater and Surface Water
Heglar Kronquist Landfill
Mead, Washington

(700 ft) SW-6 < 0.113
HC-1 < 0.05*
Deadman Creek
Intermittent Drainage
HC-4 2.18*
HC-5 North
7.04*
HC-5 South
BH-7 3.22
4aad < 0.036
BH-8(NORTH)
BH-8(SOUTH)
3bbc (HC-7) < 0.05*
SW-4 (3bcb) 12.0
BH-13 9.02
SW-8 10.8
4ada (HC-6) 0.76*
MW-1 17.7
BH-3 15.8
3bcc
4bcd 2.88
4acc-1
4acc-2
5add 6.04
3bcd-1
3bcd-2 15.9
3b 0.045
MW-4 42
3bcd-3
BH-5 8.8
BH-10 52.2
SW-5 14.8
BH-15 < 0.061
BH-4 34.9
MW-3 31.4
BH-2 26.0
3cbb-1 (HC-9/HC-10) < 0.05*
Test Hole
BH-1 1.82
3caa
3cbb-2
BH-9 6.59
MW-5 14.4
MW-6 4.95
3cba
HC-16 13.5*
SW-3 (3cbd-1) 18.0
SW-2 (3cbd-2) 9.93
BH-12 < 0.009
MW-2 8.97
SW-1 (3cca) 9.26
BH-6 < 0.052
BH-11 9.93
MW-2a dry
4cdd
(1 mile) SW-7 1.63

LEGEND

- Monitoring Well Location (new)
- Existing/Former Private Well or Monitor Well Location
- RI Lithologic Soil Boring Location
- RI Surface Water Sampling Location
- Heglar Kronquist Landfill

SW-1 9.26 ← Nitrate (mg/L)
≤ 10
> 10

Notes: * Hart Crowser 2008 sampling result (Hart Crowser, 2009)
HC = Hart Crowser
Nitrate, Primary Drinking Water Standard = 10 mg/L
All features and locations, including drainages, not surveyed in 2010 are approximate.
Estimated extent of dross landfill reported by others (Kaiser 1983b).
Locations labeled with ID and nitrate concentration (if data available).
Data qualification codes not shown.
Aerial photograph from USGS (2009).

0 500 1,000 Feet
0 150 300 Meters

Exponent®

Figure 17. Nitrate Concentrations in Groundwater and Surface Water
Heglar Kronquist Landfill
Mead, Washington

HC-1
2*
Deadman Creek
HC-4
6*
HC-5 North
13*
HC-5 South
BH-8(NORTH)
BH-8(SOUTH)
3bbc (HC-7)
1*
4aad
2
BH-7
6
BH-13
12
SW-4 (3bcb)
10
SW-8
239
4ada (HC-6)
3*
Intermittent Drainage
4bcd
105
4acc-1
4acc-2
MW-1
77
BH-3
94
3bcc
3bcd-1
3bcd-2
58
3b
2
SW-5
252
3bcd-3
BH-15
30
BH-10
388
MW-4
175
BH-5
13
5add
71
BH-4
810
MW-3
788
BH-2
50
3caa
3cbb-1
(HC-9/HC-10)
2*
Test Hole
25/35
3cbb-2
BH-1
57
BH-9
368
Apparent Boundary
of Linear
Fine-Grained Zone
MW-5
19
3cba
HC-16
19*
Approximate Area of
Impacted Groundwater
(chloride > 250 mg/L)
SW-3 (3cbd-1)
301
MW-6
16
BH-12
16
SW-2 (3cbd-2)
22
Approximate Area of
Impacted Groundwater
(chloride > 20 mg/L and < 250 mg/L
in alluvium and basalt rubble)
BH-11
90
MW-2
155
SW-1 (3cca)
20
BH-6
2
MW-2a
dry
4cdd

LEGEND

- Monitoring Well Location (new)
- Existing/Former Private Well or Monitor Well Location
- RI Lithologic Soil Boring Location
- RI Surface Water Sampling Location
- Heglar Kronquist Landfill
- Direction of Groundwater Flow

MW-2
155
Chloride (mg/L)

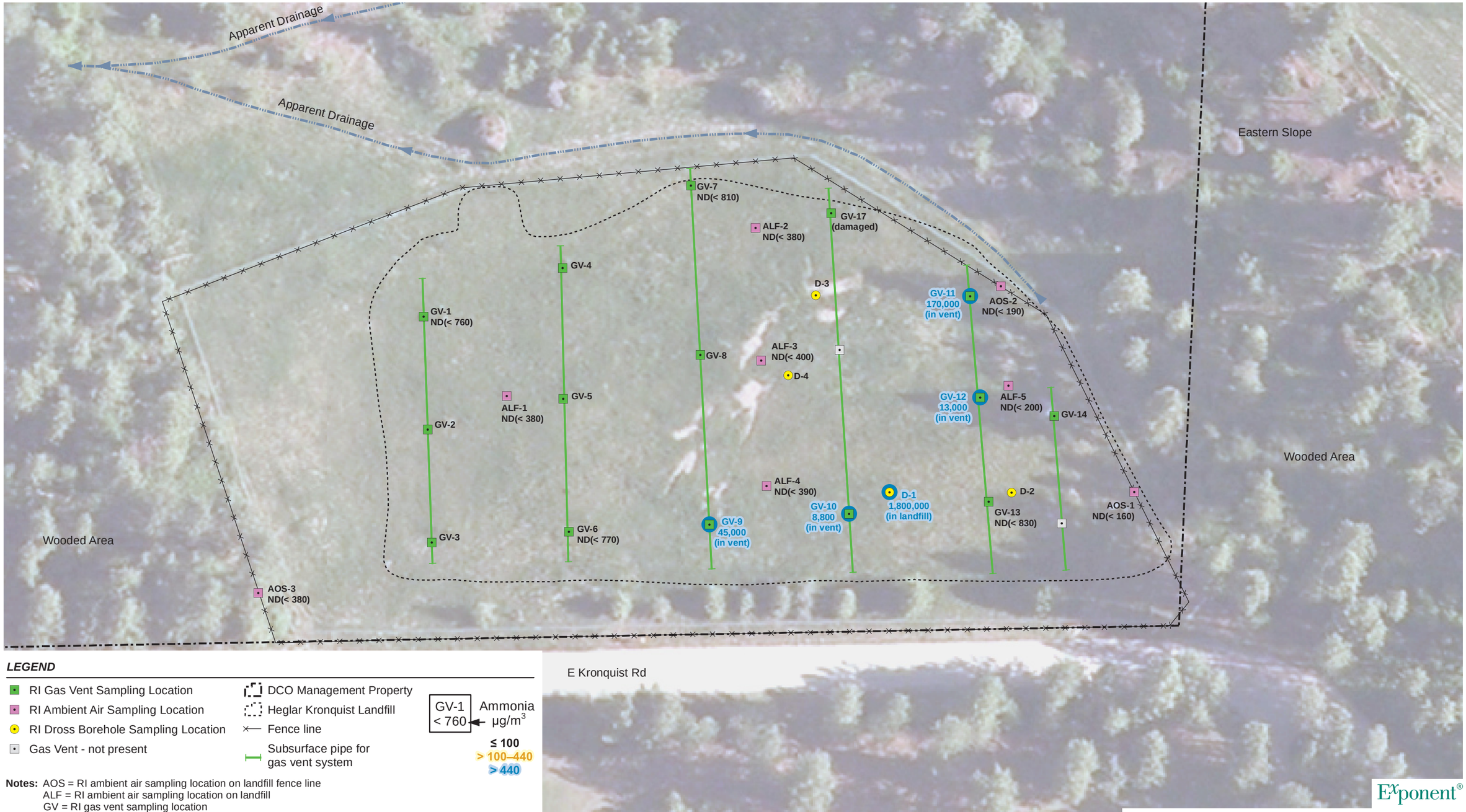
Notes: *Hart Crowser 2008 sampling result (Hart Crowser, 2009)
HC = Hart Crowser
All features and locations, including drainages, not surveyed in 2010 are approximate.
Estimated extent of dross landfill reported by others (Kaiser 1983b).
Locations labeled with ID and chloride concentration
(if data available), rounded to nearest 1 mg/L.
Data qualification codes not shown.
Aerial photograph from USGS (2009).

0 500 1,000 Feet
0 150 300 Meters

Exponent®

Figure 18. Approximate Area of Impacted Groundwater

Heglar Kronquist Landfill
Mead, Washington



LEGEND

- RI Gas Vent Sampling Location
- RI Ambient Air Sampling Location
- RI Dross Borehole Sampling Location
- Gas Vent - not present
- DCO Management Property
- Heglar Kronquist Landfill
- Fence line
- Subsurface pipe for gas vent system

GV-1 < 760 — Ammonia µg/m^3

- ≤ 100
- > 100–440
- > 440

Notes: AOS = RI ambient air sampling location on landfill fence line
ALF = RI ambient air sampling location on landfill
GV = RI gas vent sampling location
DCO Management property and fence line have been surveyed.
Estimated extent of dross landfill and features reported by others (Kaiser 1983b).
Ammonia EPA PRGS for ambient air only = 100 µg/m^3 (residential) and 440 µg/m^3 (industrial).
Non-detects with reporting limits greater than the standards are not shown as exceedances.
Data qualifications codes not shown.
Aerial photograph from USGS (2009).
ND(< 770) = ammonia not detected at the analytical reporting limit shown.

0 50 100 Feet
0 15 30 Meters

Figure 19. Ammonia Concentrations in Air

Heglar Kronquist Landfill
Mead, Washington

Apparent Drainage

Apparent Drainage

Eastern Slope

Wooded Area

Wooded Area

GV-7
ND(< 2.5)

ALF-2ND
(< 0.47)

GV-17
(damaged)

GV-4

AOS-2
ND(< 0.42)

D-3

GV-11
6.9
(in vent)

GV-1
ND(< 2.6)

GV-8

ALF-3
ND(< 0.45)

D-4

ALF-5
ND(< 0.47)

GV-5

ALF-1
ND(< 0.45)

GV-12
ND(< 20)

GV-14

GV-2

ALF-4
ND(< 0.46)

D-1
ND(< 22)

GV-13
6.4
(in vent)

D-2

AOS-1
ND(< 0.45)

GV-10
12
(in vent)

GV-9
9.8
(in vent)

GV-3

GV-6
ND(< 2.6)

AOS-3
ND(< 0.45)

E Kronquist Rd

LEGEND

- RI Gas Vent Sampling Location
- RI Ambient Air Sampling Location
- RI Dross Borehole Sampling Location
- Gas Vent - not present
- DCO Management Property
- Heglar Kronquist Landfill
- Fence line
- Subsurface pipe for gas vent system

GV-1
< 2.6
Chloroethane µg/m^3

- ≤ 3
- > 3–30
- > 30

Notes: AOS = RI ambient air sampling location on landfill fence line
ALF = RI ambient air sampling location on landfill
GV = RI gas vent sampling location
DCO Management property and fence line have been surveyed.
Estimated extent of dross landfill and features reported by others (Kaiser 1983b).
Chloroethane MTCA clean-up standards for ambient air only = 3 µg/m^3 (Method B) and 30 µg/m^3 (Method C).
Non-detects with reporting limits greater than the standards are not shown as exceedances.
Data qualifications codes not shown.
Aerial photograph from USGS (2009).
ND(< 2.5) = chloroethane not detected at the analytical reporting limit shown.

0 50 100 Feet

0 15 30 Meters

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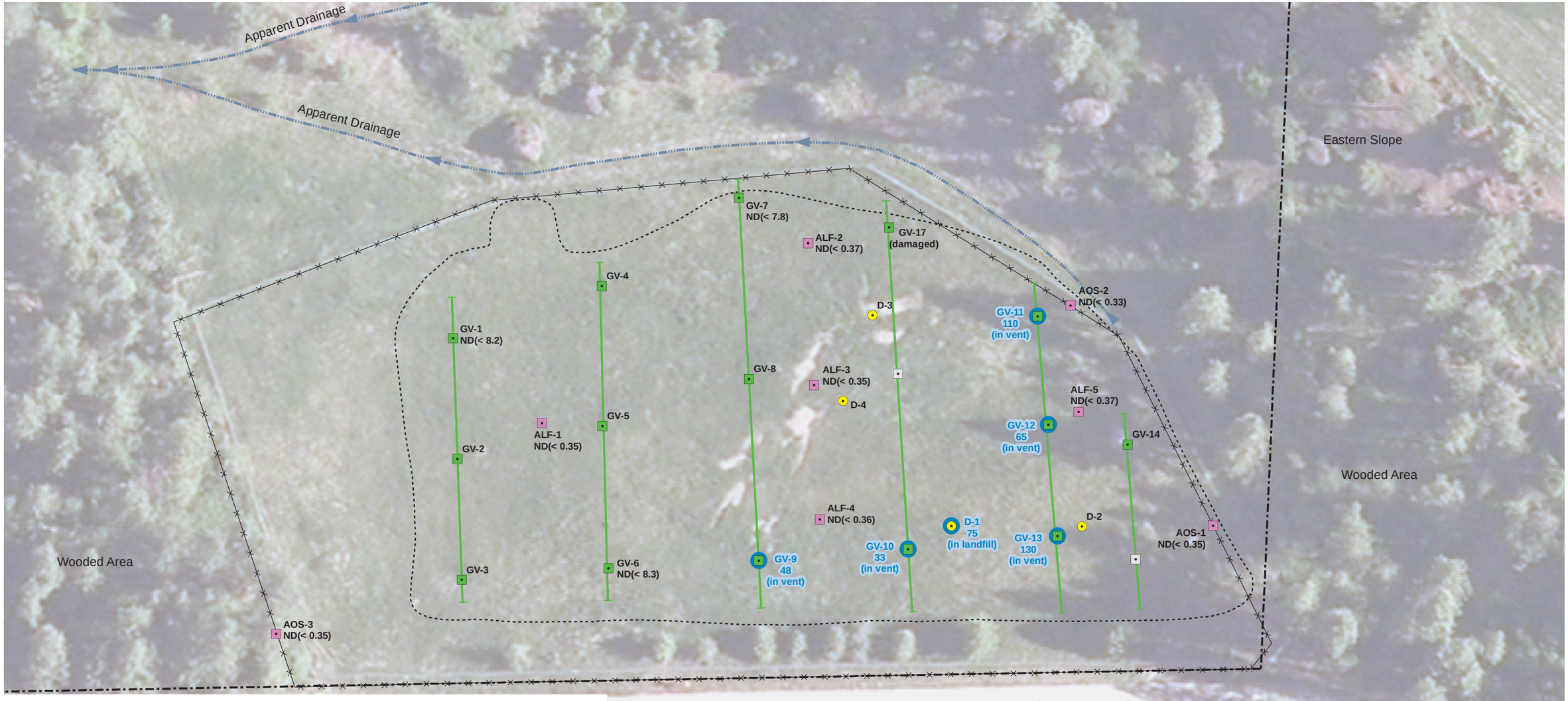
Figure 20. Chloroethane Concentrations in Air

Heglar Kronquist Landfill
Mead, Washington



LEGEND

- RI Gas Vent Sampling Location
- RI Ambient Air Sampling Location
- RI Dross Borehole Sampling Location
- Gas Vent - not present
- DCO Management Property
- Heglar Kronquist Landfill
- Fence line
- Subsurface pipe for gas vent system

GV-1 < 8.2 — Chloromethane µg/m^3

- ≤ 1.4
- > 1.4–14
- > 14

Notes: AOS = RI ambient air sampling location on landfill fence line
ALF = RI ambient air sampling location on landfill
GV = RI gas vent sampling location
DCO Management property and fence line have been surveyed.
Estimated extent of dross landfill and features reported by others (Kaiser 1983b).
Chloromethane MTCA clean-up standards for ambient air only = 1.4 µg/m^3 (Method B) and 14 µg/m^3 (Method C).
Non-detects with reporting limits greater than the standards are not shown as exceedances.
Data qualifications codes not shown.
Aerial photograph from USGS (2009).
ND(< 7.8) = chloromethane not detected at the analytical reporting limit shown.

0 50 100 Feet
0 15 30 Meters

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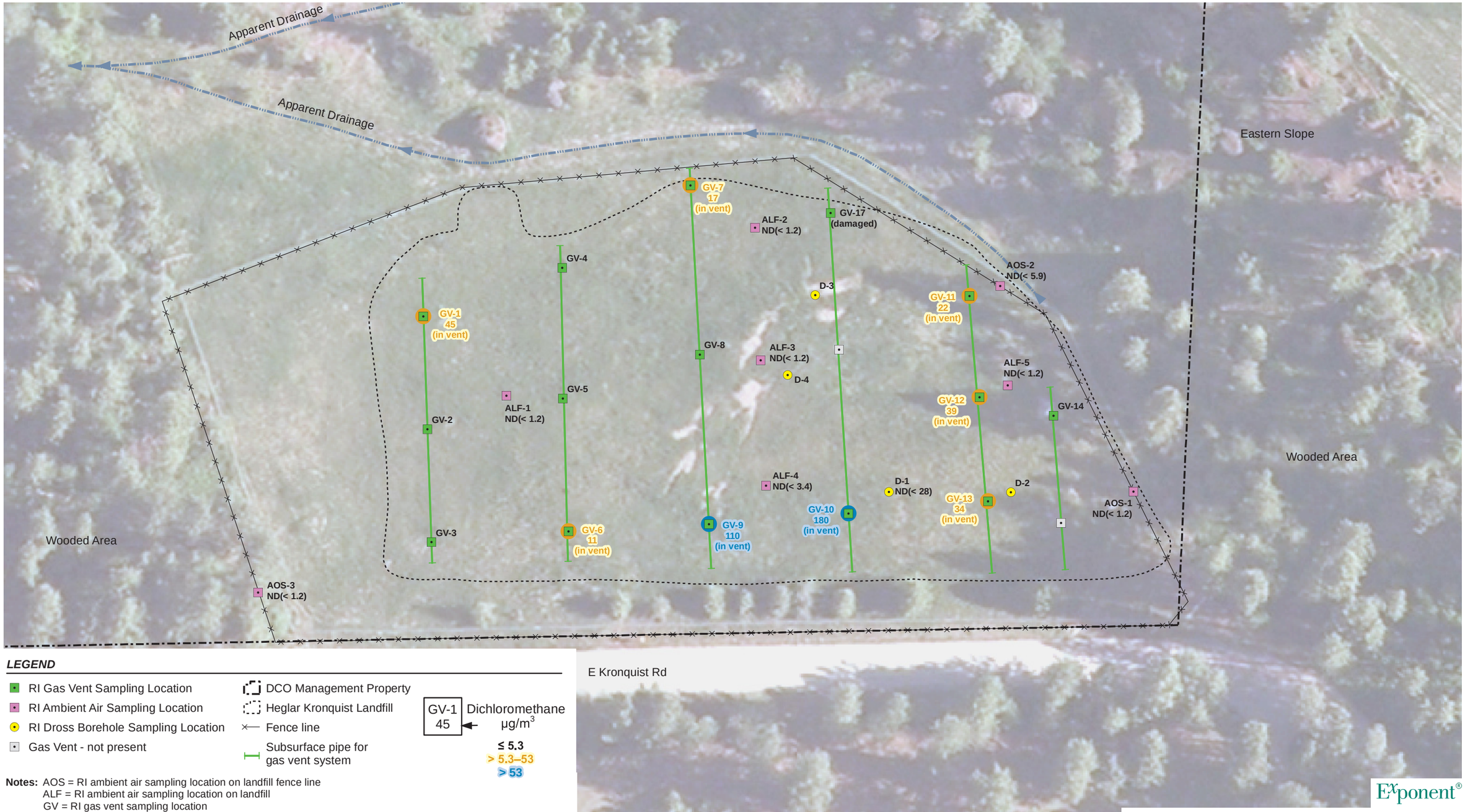
Figure 21. Chloromethane Concentrations in Air

Heglar Kronquist Landfill
Mead, Washington



LEGEND

- RI Gas Vent Sampling Location
- RI Ambient Air Sampling Location
- RI Dross Borehole Sampling Location
- Gas Vent - not present
- DCO Management Property
- Heglar Kronquist Landfill
- Fence line
- Subsurface pipe for gas vent system

GV-1 45 — Dichloromethane µg/m^3

- ≤ 5.3
- > 5.3–53
- > 53

Notes: AOS = RI ambient air sampling location on landfill fence line
ALF = RI ambient air sampling location on landfill
GV = RI gas vent sampling location
DCO Management property and fence line have been surveyed.
Estimated extent of dross landfill and features reported by others (Kaiser 1983b).
Dichloromethane MTCA clean-up standards for ambient air only = 5.3 µg/m^3 (Method B) and 53 µg/m^3 (Method C).
Non-detects with reporting limits greater than the standards are not shown as exceedances.
Data qualifications codes not shown.
Aerial photograph from USGS (2009).
ND(< 1.2) = dichloromethane not detected at the analytical reporting limit shown.

0 50 100 Feet
0 15 30 Meters

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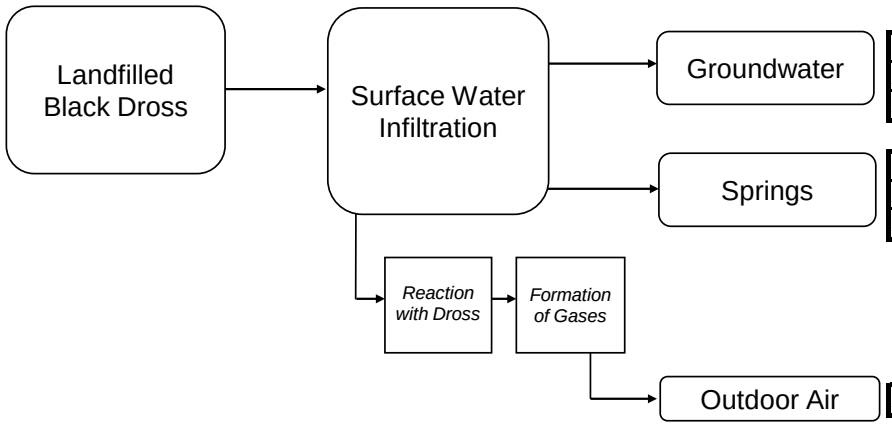
Figure 22. Dichloromethane Concentrations in Air
Heglar Kronquist Landfill
Mead, Washington

FIGURE 23

Conceptual Site Model

Heglar Kronquist Landfill
Mead, Washington



EXPOSURE ROUTE	HUMAN: CURRENT: CONSTRUCTION WORKER	HUMAN: CURRENT: ADULT / CHILD RESIDENT	HUMAN: FUTURE: CONSTRUCTION WORKER	HUMAN: FUTURE: ADULT / CHILD RESIDENT	ECOLOGICAL: CURRENT: TERRESTRIAL (PRIMARILY LIVESTOCK)	ECOLOGICAL: FUTURE: TERRESTRIAL (PRIMARILY LIVESTOCK)
Groundwater						
Oral	–	•	–	•	•	•
Dermal	–	•	–	•	•	•
Inhalation	–	–	–	–	–	–
Springs						
Oral	–	• (incidental)	–	• (incidental)	•	•
Dermal	–	•	–	•	•	•
Inhalation	–	–	–	–	–	–
Outdoor Air						
Inhalation	•	•	•	•	–	–

• = Potentially complete exposure pathway.

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