

Memorandum

To: Valley Landfills, Inc.

Date: October 6, 2025

From: Todd Umstot

Subject: Estimated Drawdown and Monitoring Plan – Coffin Butte Landfill Expansion

Geo-Logic Associates (GLA) has conducted modeling to estimate the effect of expansion of the Coffin Butte Landfill in Corvallis, Oregon on the water table and the potential to dewater private water supply wells south of the expansion. Valley Landfills, Inc. (VLI; a wholly owned subsidiary of Republic Services, Inc. ["Republic"]) has proposed to expand the Coffin Butte Landfill to a new landfill cell in an area south of Coffin Butte Road. The modeling used an analytical solution to estimate the position of the water table before and after expansion and to calculate potential drawdown. This method assumes the fractured basalt bedrock behaves as a porous medium and therefore provides a conservative estimate of broader groundwater impacts. Results indicate that any water-level changes from the expansion would be comparable to fluctuations typically caused by seasonal precipitation, which typically range from 3 to 8 feet in site monitoring wells, and have been observed to be as much as 16 feet in some wells. As an additional safeguard, VLI will install a network of four "sentinel" monitoring wells along the southern boundary of the development prior to excavation of the new cell. Water levels in these wells will be monitored regularly as part of the landfill's routine monitoring program to ensure protection of nearby water users.

Methodology for Groundwater Drawdown Estimation

Groundwater flow in an unconfined aquifer is non-linear because transmissivity varies with the saturated thickness (i.e., with water-table elevation). Under the Dupuit assumption of horizontal flow, and for a homogeneous, isotropic, continuous porous medium with a flat, impermeable base (datum), steady, laminar conditions, and uniform areal recharge (W) between two constant-head boundaries ($(h=h_1)$ at $(x=0)$ and $(h=h_2)$ at $(x=L)$), the hydraulic-head distribution ($h(x)$) is given by (Woessner and Poeter, 2020, Box 6-7):

$$h_x = \sqrt{h_1^2 - \frac{(h_1^2 - h_2^2)x}{L} + \frac{W}{K}(L-x)x}$$

Where:

h_x = head at x some distance from the origin, $x=0$ (L)

x = distance from the origin (L)

h_1 = head at the origin (L)

h_2 = head at L (L)

L = distance from the origin to h_2 (L)

K = hydraulic conductivity (L/T)

W = recharge rate (L/T)

Drawdown was calculated using paired analytical model runs for each cross-section. For each section, two simulations were performed:

- Baseline run – representing current conditions, including groundwater discharge near Coffin Butte Road.
- Excavation run – representing the proposed landfill cell excavation, with the head boundary at the origin shifted to the excavated landfill base near Tampico Ridge.

The difference between the excavation and baseline runs for a given cross-section represents the estimated drawdown. Two cross-sections were analyzed (Figure 1), and on these cross-sections, the estimate post-excavation groundwater surface is shown:

- A northeast–southwest section through the Berkland domestic well (Figure 2).
- A north–south section through the Holdorff domestic well (Figure 3).

The analytical solution, with the homogenous and isotropic assumptions, is conservative in that it likely gives an over-estimate of drawdown. The datum is assumed at 0 feet MSL. The mean annual recharge is 22 inches per year (in/yr) with a range from 16 in/yr to 25 in/yr (Conlon et al., 2005). All domestic wells are reported to be completed in basalt. The geometric mean hydraulic conductivity, estimated from the specific capacity of nearby domestic wells, is 0.75 feet per day (ft/day; Tuppan, 2025). At the existing landfill, slug tests in basalt yielded a geometric mean of 0.63 ft/day, while pumping tests produced a value of 7.6 ft/day, resulting in an overall geometric mean of 2.70 ft/day (EMCON, 1994). Based on these results, the sensitivity range for hydraulic conductivity was set between 0.63 ft/day and 2.7 ft/day.

Cross-Section A-A': Berkland Well

For the cross-section A-A', the landfill boundary was set at 240 ft, based on April 2024 groundwater elevation contours (VLI, 2025). The right-hand side boundary was set to the static water level in the Merrill Well (258.52 ft; Tuppan, 2025). At the Berkland Well, calibrating the model to the well's static head gives an estimated drawdown of 11 ft. Using mean parameter values (recharge of 22 in/yr and hydraulic conductivity of 0.75 ft/day), the estimated drawdown is 10 ft. Sensitivity analysis with hydraulic conductivity values of 0.63 to 2.7 ft/day and recharge of 16 to 25 in/yr produced a drawdown range of 0 to 14 ft. With water column thicknesses ranging from 189 to 357 ft, the estimated drawdown is unlikely to significantly impact well yield.

Cross-Section B-B': Holdorff Well

For cross-section B-B', the landfill boundary was set at the 260-ft contour from April 2024 groundwater maps (VLI, 2025). The right-hand side boundary was set to the static water level in the BENT 50952 Well (391 ft; OWRD, 2025). At the Holdorff Well, calibrating to the static head gives an estimated drawdown of 17 ft. Using mean parameter values, the estimated drawdown is 15 ft. Sensitivity analysis (hydraulic conductivity 0.63 to 2.7 ft/day; recharge 16 to 25 in/yr) produced a drawdown range of 7 to 17 ft. With a water column thickness of 103 ft, the well should continue to yield water, assuming limited dynamic drawdown.

In summary, conservative estimates of groundwater flow conditions in the site vicinity suggest that the estimated drawdown associated with the proposed development may range from 0 to 17 feet. These drawdown estimates are similar to fluctuations in groundwater elevations associated with seasonal changes in precipitation, which have been observed to range from three to 16 feet in monitoring wells surrounding the landfill.

Proposed Sentinel Well Network

As required by condition of approval OP-13 in the Conditional Use Permit (Benton County File LU-24-027), the proposed expansion project includes construction of four monitoring wells along the southern boundary of the development area. As stated in OP-13:

Groundwater Monitoring.

(A) Well Volume Impacts. The Applicant shall take the following methodological, step-by-step approach to monitoring and evaluation of potential groundwater impacts to wells on adjacent properties.

(i) As part of the proposed expansion project and prior to excavation of the new cell in the expansion area, a network of four monitoring wells will be constructed along the southern side of the development. (Anticipated/approximate well locations are shown on Exhibit 50, though terrain and other ground conditions may dictate some adjustment in placement). Water levels in these four wells will be regularly monitored as part of the CBL routine monitoring program. These wells will effectively function as "sentinel" wells to provide an added level of monitoring.

(ii) Should these four new wells show four successive decreases demonstrating a 10% decrease in the potentiometric surface over the baseline established prior to excavation, or a dramatic change across two events (not associated with local climactic conditions or residential water use), the Applicant will request the ability to evaluate yield and water levels at residential wells. As part of this analysis VLI may install additional sentinel wells to the south of the four new monitoring wells.

(iii) If the sentinel wells show a decrease that is affecting neighbors that is unrelated to local climate conditions or changes in residential use, VLI will conduct outreach to those neighbors to evaluate and implement mutually agreeable solutions at VLI's expense.

(iv) VLI will remain open to discussion with interested residents about their wells and water levels and will promptly respond to any concerns or complaints.

These "sentinel" wells will provide an added level of groundwater monitoring and will be installed before excavation of the new cell begins. Water levels in the sentinel wells will be measured regularly as part of the Coffin Butte Landfill monitoring program. If necessary, additional sentinel wells may be installed farther south. Should a confirmed decrease affecting neighboring wells be linked to VLI operations, VLI is committed to outreach and to implementing mutually agreeable solutions at its expense.

Conclusion

Modeling indicates that the proposed Coffin Butte Landfill expansion is unlikely to significantly affect nearby domestic wells, as predicted drawdown is small compared to available water columns and within the range of natural seasonal fluctuations. To ensure protection of neighboring water users, VLI will install sentinel wells prior to excavation and will monitor these wells prior to and following excavation as part of the routine monitoring program for the site. VLI will implement a response plan should unexpected impacts occur.

References

Benton County Community Development Department – Planning Division, Coffin Butte Landfill – Conditional Use Permit Supplemental Staff Report, File LU-24-027, 152 p.

Conlon T.D., Wozniak, K.C., Woodcock, D., Herrera, N.B., Fisher, B.J., Morgan, D.S., Lee, K.K., and Hinkle, S.R., 2005, Ground-Water Hydrology of the Willamette Basin, Oregon: U.S. Geological Survey Scientific Investigations Report 2005–5168, 83 p.

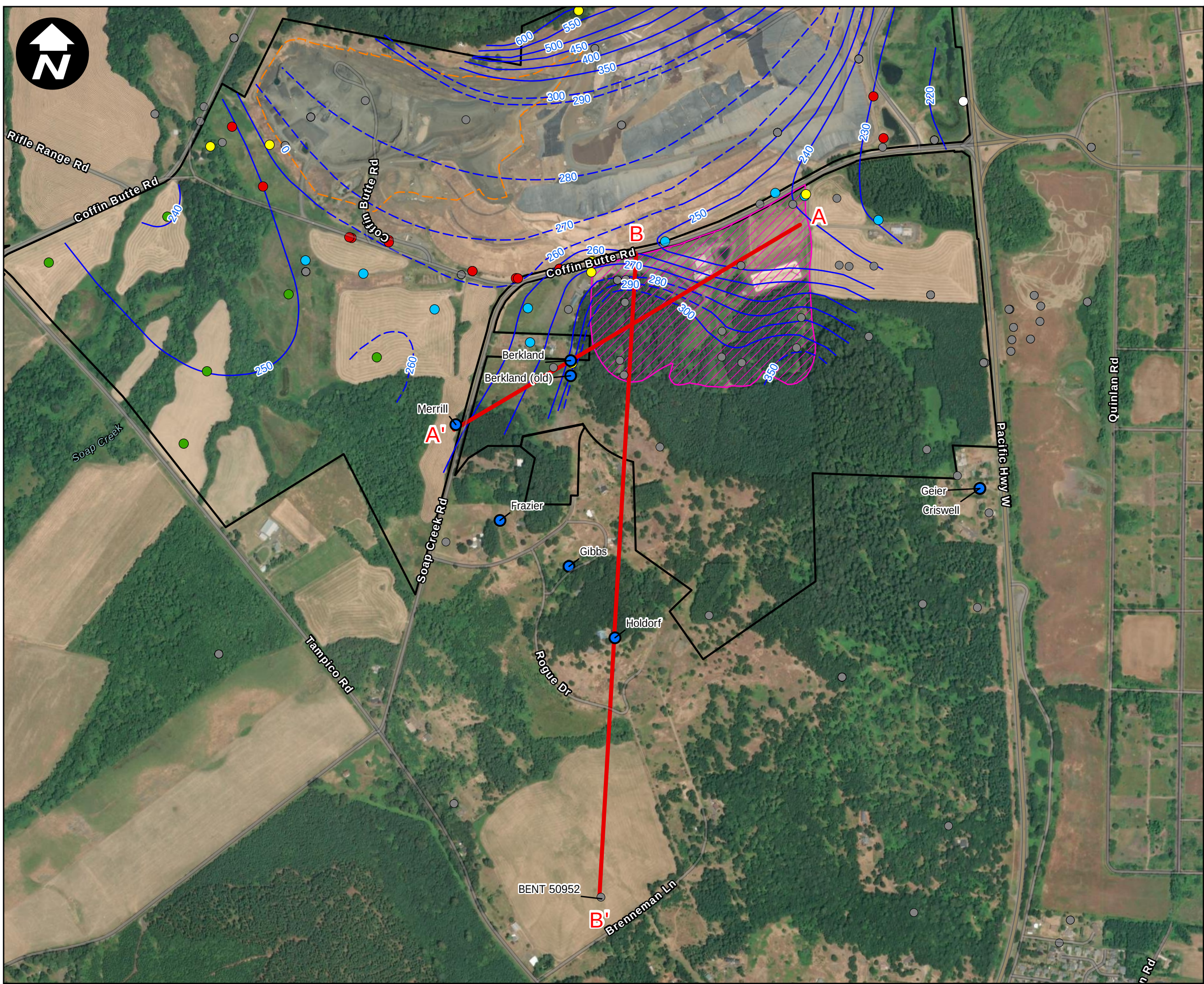
EMCON. 1994. Remedial Investigation and Additional Hydrogeologic Investigation Report, Coffin Butte Landfill, Benton County, Oregon. Prepared for Valley Landfills, Inc., by EMCON Northwest, Inc., Portland, Oregon. February 4.

Oregon Water Resources Department (OWRD), 2025. Well log report for well BENT 50952 [Well Report Query database]. Retrieved June 10, 2025. Oregon Water Resources Department. https://apps.wrd.state.or.us/apps/gw/well_log/Default.aspx

Tuppan Consultants, 2025. Spreadsheet "Domestic wells-0527-2025.xlsx".

Valley Landfills, Inc. (VLI) 2025. 2024 annual environmental monitoring report: Coffin Butte Landfill, Benton County, Oregon. Prepared by Geo-Logic Associates, Inc. for Oregon Department of Environmental Quality, March 2025.

Woessner, W. W. and E. P. Poeter, 2020. Hydrogeologic properties of earth materials and principles of groundwater flow. The Groundwater Project. <https://doi.org/10.21083/978-1-7770541-2-0>

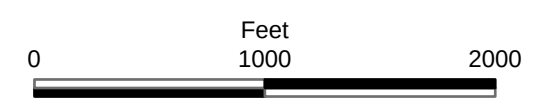


Explanation

- Domestic well location
- OWRD well location
- Cross section line
- October 2024
groundwater elevation
contour (dashed where
inferred)
- Landfill property
- Expansion area

Landfill wells

- Compliance
- Detection
- Observation
- Other
- Wetland piezometers
- Unspecified



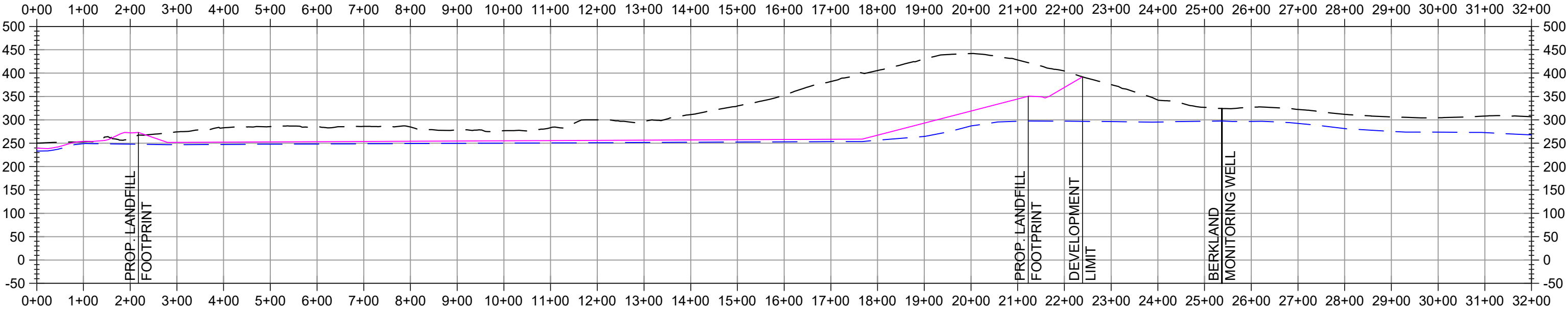
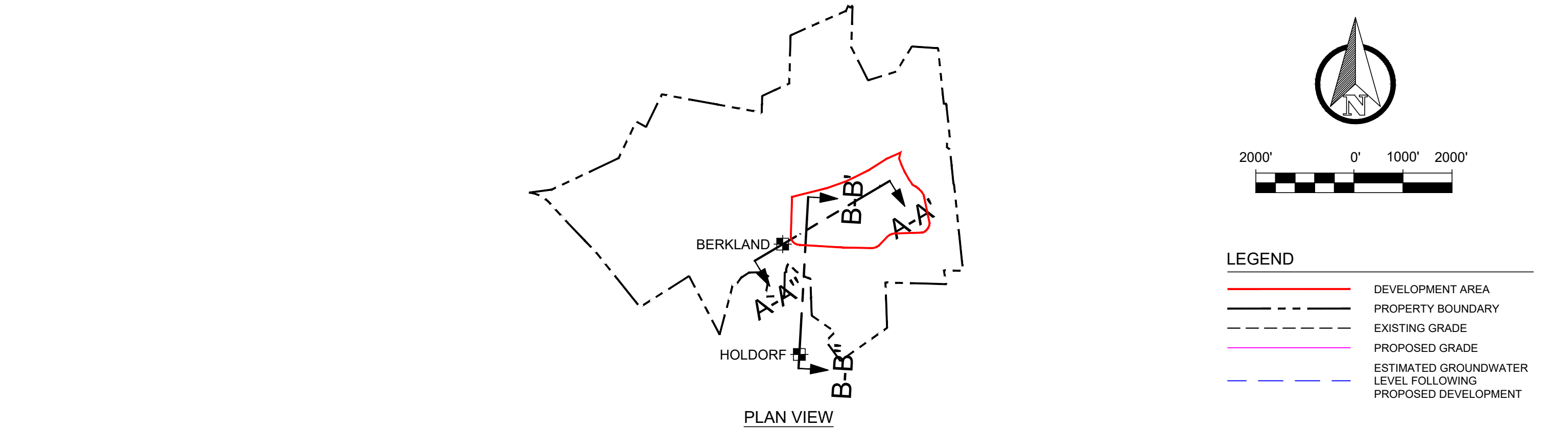
Source: ESRI World Imagery Hybrid (2025)
Oregon Water Resource Department (2025)

Figure 1

**Dupuit Solution
Cross Section Lines**

COFFIN BUTTE LANDFILL
REPUBLIC SERVICES, INC.

N:\COFFIN BUTTE\AU24.1090 - ENVIRONMENTAL MONITORING\5_CAD\2024 ENVIRONMENTAL MONITORING REPORT\FIG 2_CROSS SECTION A-A'.DWG June 12, 2025 - 12:12 PM BY: GLA-USER



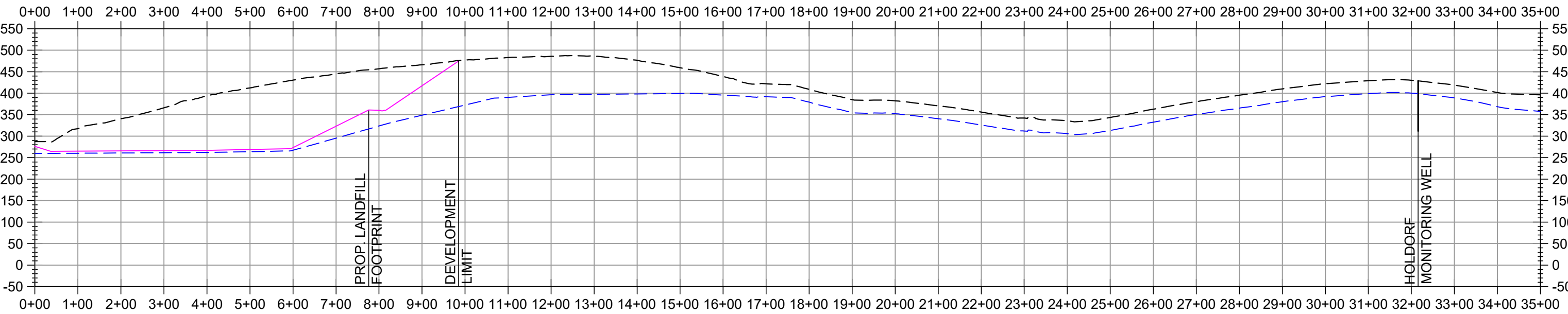
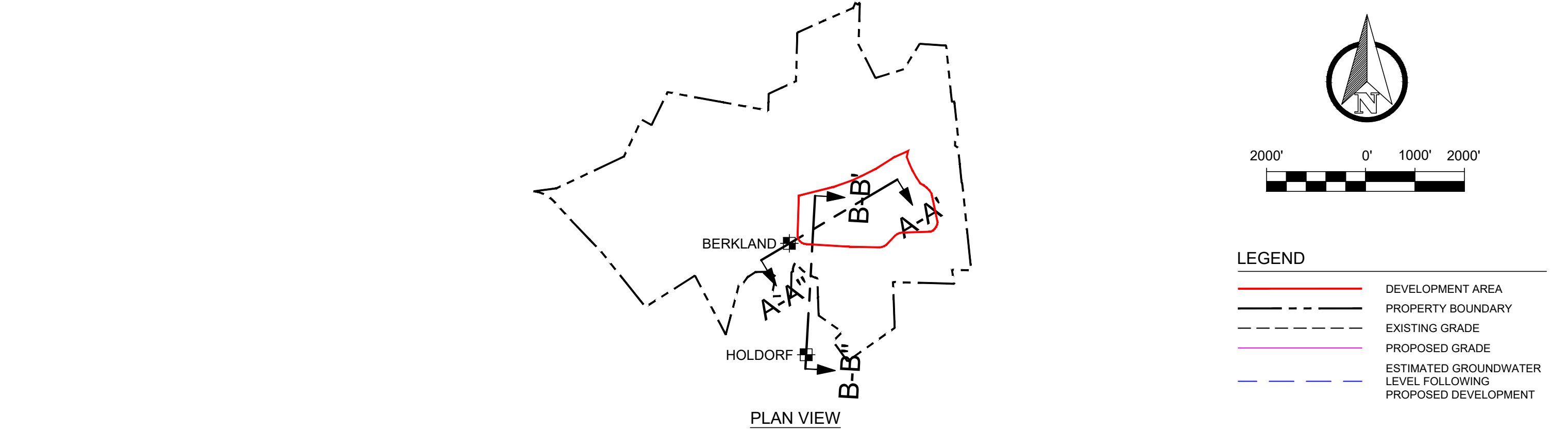
COFFIN BUTTE LANDFILL RESPONSE TO COMMENTS - CUP APPLICATION BENTON COUNTY, OREGON			FIGURE NO. 2
SECTION A-A'			PROJECT NO. AU24.1090.00
DATE OF ISSUE: 06/11/2025	DRAWN BY: SMD	APPROVED BY: JH	

Geo-Logic
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Applicant's Exhibit 68

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N:\COFFIN BUTTE\AU24.1090 - ENVIRONMENTAL MONITORING\5_CAD\2024 ENVIRONMENTAL MONITORING REPORT\FIG 3_CROSS SECTION B-B'.DWG June 12, 2025 - 11:58 AM BY: GLA-USER



COFFIN BUTTE LANDFILL RESPONSE TO COMMENTS - CUP APPLICATION BENTON COUNTY, OREGON			FIGURE NO. 3
SECTION B-B'			PROJECT NO. AU24.1090.00
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APPROVED BY:		JH	
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