Benton County Solid Waste Process Workgroup

Subcommittee A.1 Landfill Size/Capacity/Longevity

Subcommittee Report to Workgroup

DRAFT

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Section 0: Background

A. Charge

i. Workgroup charter and bylaws 8-23-2022

From the Benton County Talks Trash" Workgroup Charter and Bylaws document, Topic A:

A. Develop Common Understandings to form the basis of the work.

1) A chronological history of key Coffin Butte Landfill topics:

a. Size;

b. Specific locations;

c. Conditions of past land use approvals;

d. Compliance with prior land use approvals and SWMP;

e. Reporting requirements;

f. Assumptions (e.g. when will the landfill close;)

g. Economics (i.e. Benefit – Cost, etc.;) and

h. Examples from other jurisdictions hosting landfills, e.g.:

i. Typical land use conditions of approval; and

ii. Issue sequencing, (e.g. in what order are landfill versus hauling approvals done, etc.

ii. Subcommittee A.1 charge

The A.1 subcommittee was charged with a subset of the tasks listed above. Specifically, per the A.1 Subcommittee web page:

Charge A: Common Understandings Tasks

1) A chronological history of key Coffin Butte Landfill topics:

1. Size;
2. Specific locations;
3. Assumptions (e.g. when will the landfill close;)

Thus the A.1 subcommittee addresses components 1(a), 1(b) and 1(f) of the workgroup charter Topic A tasks.

Charge 3 “Assumptions” is interpreted to mean estimation of the landfill operational lifetime including the assumptions behind this estimation.

Note that for the A.1 subcommittee, “chronological history” is limited specifically to these three topics; a more general history of the landfill will be addressed by another body.

iii. Common Terms

Landfill means a facility for the disposal of solid waste involving the placement of solid waste on or beneath the land surface. ORS 459.005(14)

Sanitary landfills are intended as biological reactors (bioreactors) in which microbes will break down complex organic waste into simpler, less toxic compounds over time.

Disposal site means land and facilities used for the disposal, handling or transfer of, or energy recovery, material recovery and recycling from solid wastes, including but not limited to dumps, landfills, sludge lagoons, sludge treatment facilities, disposal sites for septic tank pumping or cesspool cleaning service, transfer stations, energy recovery facilities, incinerators for solid waste delivered by the public or by a collection service, composting plants and land and facilities previously used for solid waste disposal at a land disposal site. ORS 459.005 (8)

Regional disposal site means a disposal site that receives, or a proposed disposal site that is designed to receive more than 75,000 tons of solid waste a year from outside the immediate service area in which the disposal site is located. As used in this subsection, "immediate service area" means the county boundary of all counties except a county that is within the boundary of the metropolitan service district. For a county within the metropolitan service district, "immediate service area" means the metropolitan service district boundary. ORS 459.005 (22)

From all particular measures, a landfill is a subset of a disposal site.

Landfill cell means a discrete volume of a landfill which uses a liner system to provide isolation of solid waste from adjacent cells of solid waste. (RI 250-RICR=140-05-1)

Coffin Butte Landfill is a regional disposal site and an engineered sanitary landfill in Benton County, north of Corvallis, located off Coffin Butte Road. In progress: Verify that this language applies to cells 1 and 1a.

B. Membership Composition

The A.1 Subcommittee membership is composed of four primary representative groups:

1. Franchisee: 3 members (Ian Macnab, Ginger Rough, Bill Bromann, all of Republic Services)
2. Benton County community members: 4 members (Chuck Gilbert*, Mark Yeager*, Ken Eklund*, Paul Nietfeld)
3. County governments: 3 members (Daniel Redick (Benton County), Brian May (Marion County), Shane Sanderson (Linn County))

Daniel Redick, a Benton County Community Development Department staff member, acts as Chair of this subcommittee.

Sam Imperati, the workgroup facilitator, normally attends subcommittee meetings and provides guidance in regard to aligning with workgroup objectives.

* Also members of the Solid Waste Advisory Council and the Disposal Site Advisory Committee for Benton County

C. Document Organization

This document is organized into sections that correspond to the "Charge" items assigned to the A.1 Subcommittee (i.e. Sections 1, 2, 3 correspond to Charges 1, 2, 3).

References to specific sections in this document are in the format <Section #>.<Subsection Letter>.<Subpart Designation>. Thus this location would be referenced as 0.C, and the A.1 Subcommittee Charge may be found in 0.A.ii.

Section 1: Landfill Size

A. Physical Real Estate Footprint

i. History

Per the 2002 MOU Benton County & Valley Landfills MOU Relating to Land Use Issues (2002):

- History prior to 1974 in progress
- 1974 CUP approved landfill activities on 184 acres north of Coffin Butte Road.
- 1983 rezoning added 10 acres for landfill activities north of Coffin Butte Road, for a total of 194 acres.
- Since 1983, the total acreage of the permitted landfill site has remained largely unchanged.
- Franchisee (VLI) agrees that the approximately 56-acre parcel south of Coffin Butte Road, while zoned LS, would not be used for disposal of solid waste unless approved by a conditional use permit and Department of Enviromental Quailty permit for solid waste landfill use. (Language source? In progress)
- Total acreage owned by landfill franchisee unstated.

A1-KF-1: *194 acres zoned landfill site. An additional 56-acre parcel south of Coffin Butte Road, while zoned LS, would not be used for disposal of solid waste unless approved by a conditional use permit and Department of Environmental Quality permit for solid waste landfill use.*

ii. Images

Reported circa 1941 aerial view of Coffin Butte area, before Camp Adair.

Wide aerial view dated 6-10-63 (1963). Pond on south side of Coffin Butte was a result of military quarry operation.

Reported 1978 image of vehicles in line at the landfill.

2008 aerial view, from the 2008 Coffin Butte Landfill Annual Report, Republic Services, Inc.

Aerial image from Fall 2022.

A1-KF-2: *The landfill has changed visually over time.*

iii. Current footprint

The real estate footprint of the landfill is shown in Figure 1: Properties associated with the landfill, numbered in coordination with the table in Appendix C, and Figure 2: Property map, with years each property was purchased by a landfill-affiliated organization, below. See Appendix C for a detailed table of landfill property by taxlot.
*(e.g. 1983 CUP: "*not exceed 2 acres during the periods of October 15 to June 1 and to not exceed 3/ 4 of an acre during all other periods.*").* Discussion of this language in progress

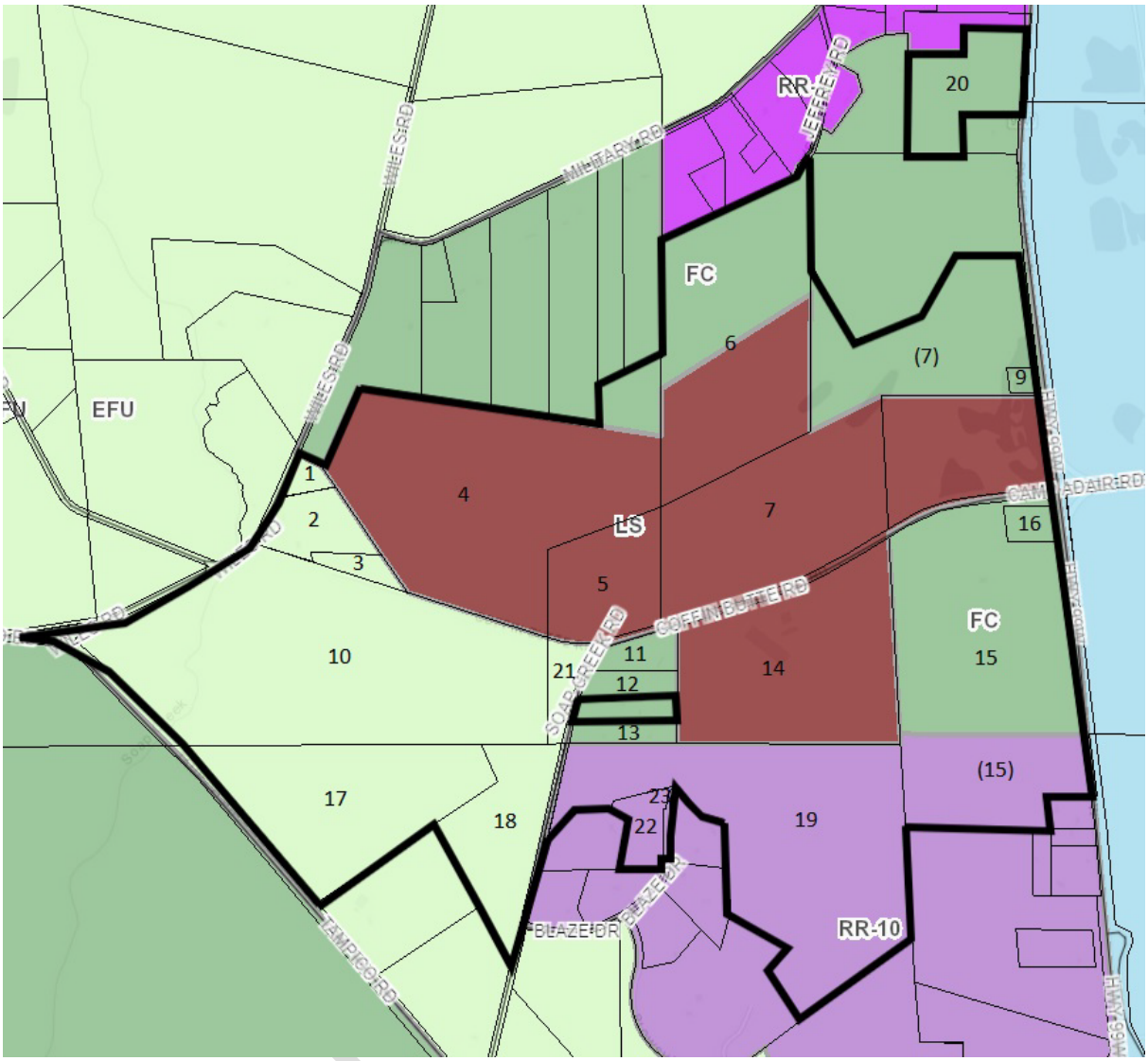


Figure : Properties associated with the landfill, numbered in coordination with the table in Appendix C, and color-coded by zoning.

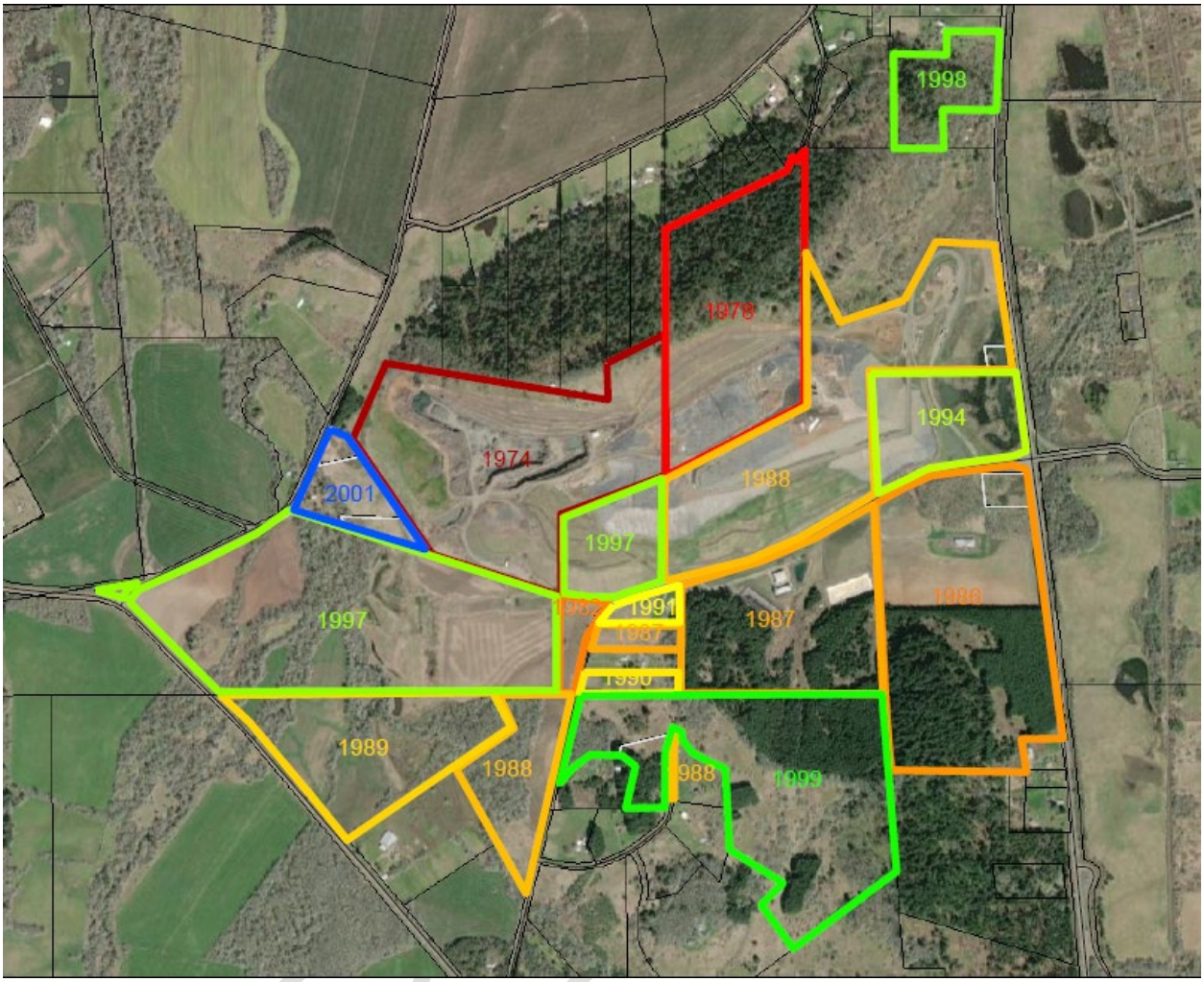


Figure : Property map, with years each property was purchased by a landfill-affiliated organization

Updating tax lot dates purchased on map. In progress. Dates should be updated for properties zoned LS, which were likely purchased prior to 1983.

A1-KF-3: *23 tax lots associated with the landfill. Five tax lots include landfill cell disposal area. The most recent tax lots associated with the landfill were purchased in 2001 (non-disposal areas).*

B. Permitted Disposal Capacity

i. Historical permitted capacity benchmarks

The following table lists total expected/calculated permitted capacity for selected points in time. Note that before approximately CY 2000 the Coffin Butte annual reports are inconsistent in presenting an estimate of this capacity; thus historical figures (e.g. 1983) are typically derived from a combination of archival data. For all but the latest figure (CY 2021), the figures should be interpreted as rough estimates and not precise volume numbers. The intent of providing the historical numbers is to demonstrate the growth of the expected/planned landfill size over time.

Date	Total Capacity (yd^3)	Notes
1983	13,134,000	Capacities defined in the 2003 Site Development Plan for the cells ultimately located on the fill areas shown in *Figure 8: Proposed 1983 Rezoning Map* areas (Cells 2-5) Republic to include Cell 1 volume. In progress.
2003	22,134,000	Addition of West and East triangles (3,400,000 yd^3 and 5,600,000 yd^3 respectively); calculated from 2003 Site Development plan 1999 cell volume figures
~~?~~	35,531,000	With Cell 6, estimated at 13,397,000 yd^3 Date of addition of Cell 6 in progress.
2004	39,594,002	2004 Coffin Butte Landfill Annual Report
2013	39,172,992	2013 Coffin Butte Landfill Annual Report
2021	38,997,848	2021 Coffin Butte Landfill Annual Report

Table 1: Historical Capacity Values

To include historical lifespan projections and anticipated closure dates, instead of permitted capacity. Consult DEQ permit documents. In progress.

ii. Capacity utilization 2001 – 2021

The plot below shows the total permitted airspace and the available (remaining) airspace over the period 2001 – 2021. Note that as of end 2021 approximately 44% of the total permitted capacity remained unused.

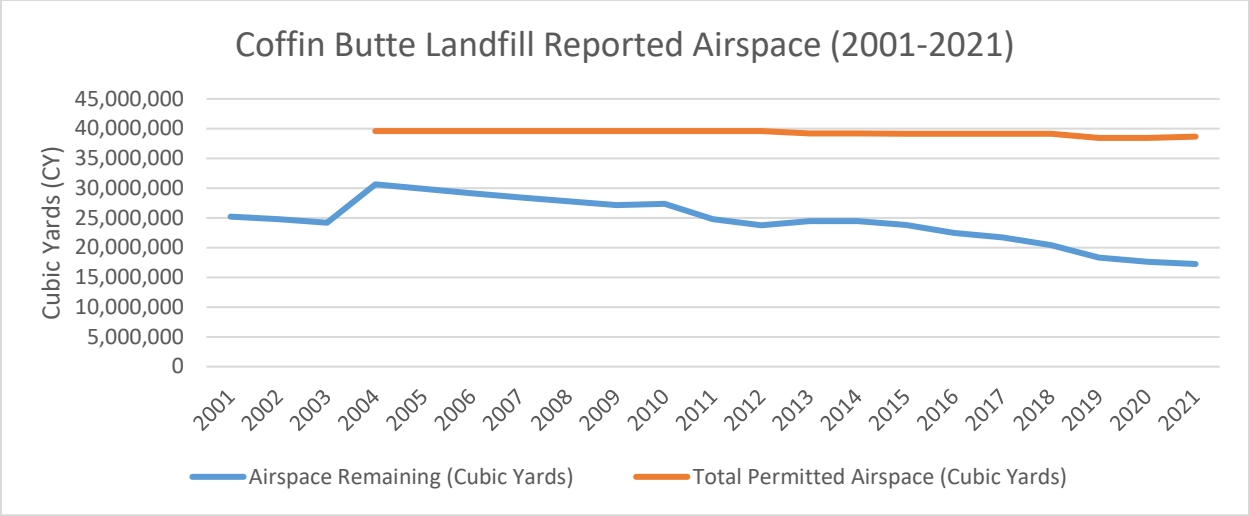


Figure 1: Coffin Butte Airspace Total/Remaining 2001 - 2021

A1-KF-5: *Reported remining airspace increased by over 6,000,000 Cubic Yards between 2003 and 2004. Since 2004, reported remaining airspace has decreased gradually, while total permitted airspace has remaining somewhat constant. As of end 2021 approximately 44% of permitted capacity remained unused.*

iii. Near-term (circa 2025) capacity adjustments for 5-year operating plan

Republic Services is currently in discussion with both Knife River ~~and Benton County~~ regarding necessary permitting/steps to begin excavation of the quarry (future cell 6). Clarify language on quarry excavation. In progress.

C. Intake Volume

In progress. Change section title to scale weight, tonnage.

Coffin Butte intake volume is documented in the annual reports produced by the landfill franchisee. Benton County has annual reports on file for years 1993 – 2021 (inclusive) with the exception of year 2000; intake data for 2000 is available in the 2021 report. Note that with older (pre-2008) reports, the annual intake volume figure is sometimes difficult to determine precisely due to inconsistent values stated within a given annual report (e.g. narrative summary vs. intake volume table) and/or discrepancies in values referenced in subsequent annual reports (e.g. historical comparisons). Where discrepancies exist within a given annual report, the figure documented in the intake volume table is used. See Appendix A for a detailed listing of the annual intake volumes used in this document.

i. 2000 and 2020 Landfill Franchise Agreement Intake Limits

Work in Progress: Explaining 2000 and 2020 Franchise agreement tonnage limits

Both the 2000 Landfill Franchise Agreement and the 2020 Landfill Franchise Agreement preface the definition of their respective solid waste intake limits with an acknowledgement of potential "adverse effects to the County's infrastructure and environmental conditions due to increased annual volumes of Solid Waste accepted at the Landfill."

Each of these agreements then defined an intake limit (in Tons/yr.). In the 2000 agreement, intake levels in excess of the limit allowed the County to reassess infrastructure and environmental impacts relative to a baseline established in 2001, and, if adverse impact was found, to force a renegotiation of the Franchise Fee and/or Host Fee. The 2020 agreement noted that the total tonnage deposited into the landfill in any calendar year "shall not exceed" the limit level.

In both agreements the intake limits were defined immediately following the acknowledgement of potential adverse impact from increased annual volumes. In both agreements the intake limits were defined in the same section of the agreement as the adverse impact clause (Section 8 of the 2000 agreement, Section 5 of the 2020 agreement).

The calculation of the intake limit defined in the 2000 agreement is somewhat complex; see Appendix A for details of this calculation. The result of this calculation is that the intake limit defined in the 2000 agreement is set at 600,000 Tons in any calendar year or 1,200,000 Tons in any period of two consecutive calendar years, with both figures increasing by 2% per year. The intake limit defined in the 2020 agreement was stated as a flat 1,100,000 Tons per calendar year. Both of these limits are included in Figure 4: Coffin Butte Landfill Intake 1993 - 2021 below.

A1-KF-7: *Both the 2000 Landfill Franchise Agreement and the 2020 Landfill Franchise Agreement acknowledge the potential for "adverse effects to the County's infrastructure and environmental conditions due to increased annual volumes of Solid Waste accepted at the Landfill."*

A1-KF-8: *Both the 2000 Landfill Franchise Agreement and the 2020 Landfill Franchise Agreement define landfill solid waste intake limits immediately following and in the same document section as the acknowledgement of the potential for adverse effects.*

ii. Recent intake volume: 1993 – 2021

Annual intake volume for 1993 – 2021 is shown in Figure 2.

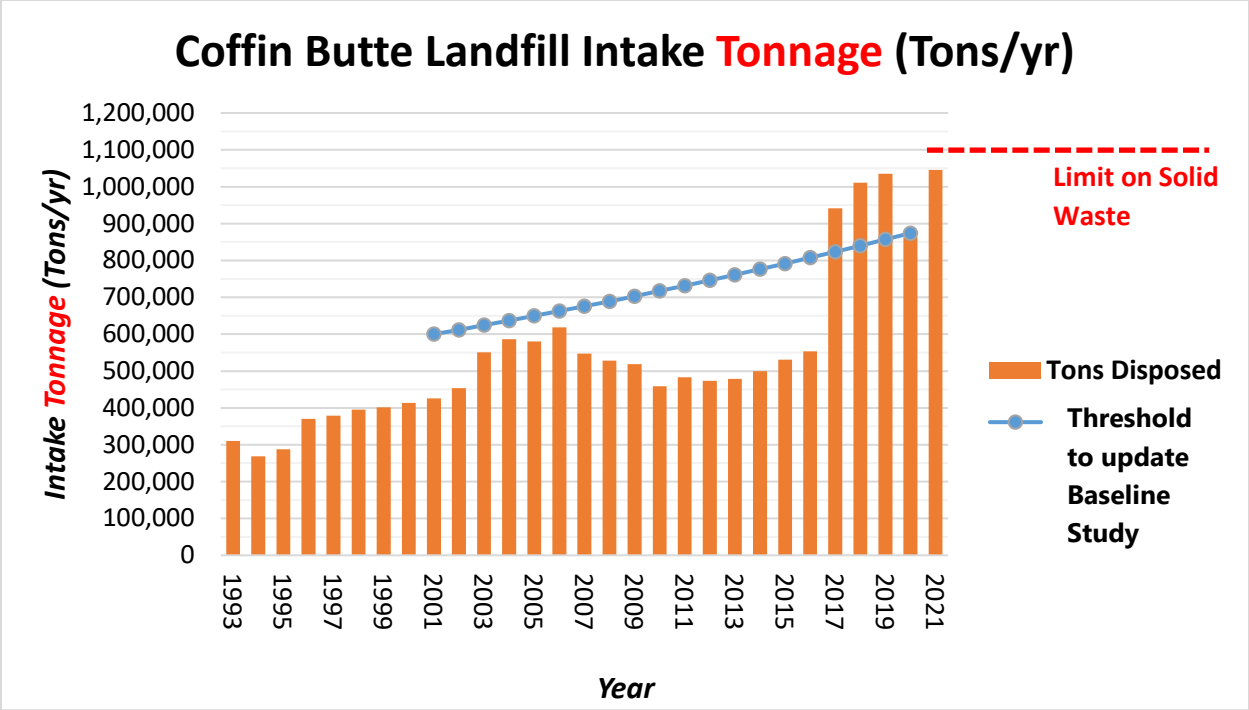


Figure 2: Coffin Butte Landfill Intake 1993 - 2021

Comments/discussion:

A1-KF-9. The 2000 Franchise agreement included a tonnage threshold (blue line) at which an updated baseline study may be conducted to determine the impacts of the landfill on infrastructure and the environment, which then could result in increases to the landfill fees paid to the county.

A1-KF-10. Work in Progress: Explaining 2000 and 2020 Franchise agreement tonnage limits

A1-KF-11. Due to an expected additional influx of volume in 2017 resulting from the disruption onset of the closure process for Riverbend landfill in Yamhill County, in December 2016 the franchisee and Benton County executed a MOU acknowledging an expected increase in Coffin Butte intake volume "for a term of 1-2 years."

A1-KF-12. In documents provided to the A.1 Subcommittee, representatives of the franchisee have indicated that the approximately 70% year-over-year increase in CY2016-2017 was primarily due to redirected flow from Riverbend to Coffin Butte. 2017-2019 volume increases are primarily due to the diversion of waste from Riverbend Landfill, in an effort to extend landfill life, and also rapid population growth in Willamette Valley and Western Oregon.

A1-KF-13. The 2020 Landfill Franchise Agreement states that the total tonnage deposited at the Landfill shall not exceed 1.1M tons per calendar year until "application to expand the Landfill on to the Expansion Parcel are granted (following any and all appeals to final judgement)." The 2020 intake limit is denoted in the chart by the dashed red line ("2020 FA Limit.")

A1-KF-14. The slow downward trend in intake volume in the 2006-2010 period is explained by the franchisee as resulting from the economic downturn of 2008.

A1-KF-15. The drop in volumes to Coffin Butte in 2020 is due to the global COVID-19 pandemic, coupled with diversion of tonnage from Riverbend Landfill to other landfills besides Coffin Butte. However, tonnage volumes increased again in 2021 due in part to changes in lifestyle/development/at home shopping patterns as a result of the pandemic, as well as debris from the Oregon wildfires.

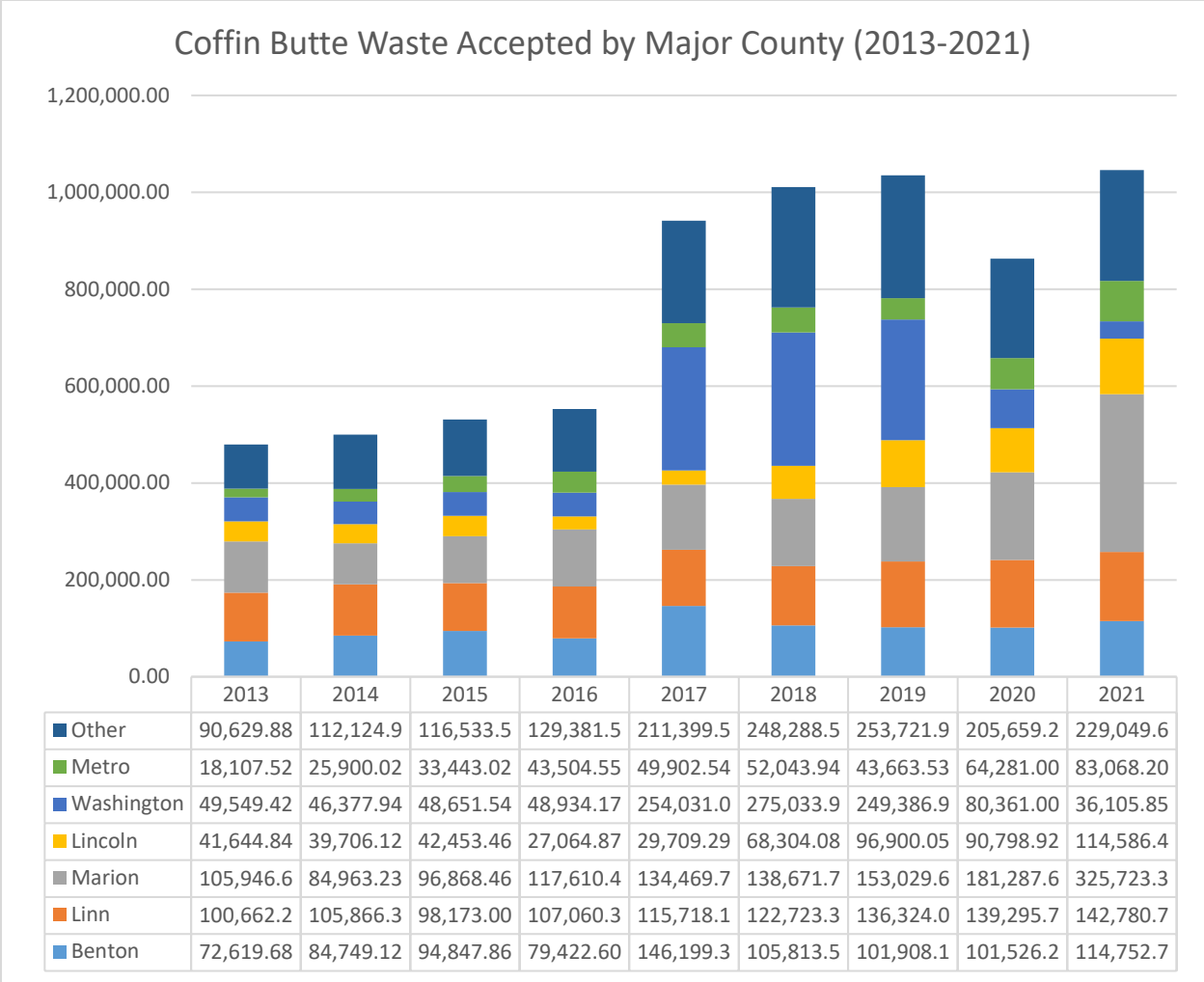
A1-KF-16. Increased business development at the landfill impacted accepted tonnage.

A1-KF-17. The amount of waste placed into the landfill has grown dramatically over the past 40 years. In 1983, 375 tons per day were placed into the landfill (117,000 tons per year). By 1993, the tonnage volume increased to 310,000 tons per year. In 2003 550,000 tons were placed into the landfill. By 2013, the waste tonnage was 479,000, and in 2021, 1,046,000 tons were emplaced.

A1-KF-18. Due to an expected additional influx of tonnage in 2017 (approximately 70% year-over-year increase in CY2016-2017 was partially due to redirected flow from Riverbend to Coffin Butte(approximately 70% year-over-year increase in CY2016-2017 was due to redirected flow from Riverbend to Coffin Butte), in December 2016 the franchisee and Benton County executed a MOU agreeing to an expected increase in Coffin Butte intake volume "for a term of 1-2 years." The slow downward trend in intake volume in the 2006-2010 period is explained by the franchisee as resulting from the economic downturn of 2008. The decreased intake volume in 2020 is attributed to the Covid-19 outbreak.

iii. Intake volume by source 2016 – 2021

See chart below for a breakdown of the Coffin Butte intake by source county for the period 2013-2021. This period includes the significant intake volume increase of 2016-2017.



	2013	2014	2015	2016	2017	2018	2019	2020	2021
Other	90,629.88	112,124.9	116,533.5	129,381.5	211,399.5	248,288.5	253,721.9	205,659.2	229,049.6
Metro	18,107.52	25,900.02	33,443.02	43,504.55	49,902.54	52,043.94	43,663.53	64,281.00	83,068.20
Washington	49,549.42	46,377.94	48,651.54	48,934.17	254,031.0	275,033.9	249,386.9	80,361.00	36,105.85
Lincoln	41,644.84	39,706.12	42,453.46	27,064.87	29,709.29	68,304.08	96,900.05	90,798.92	114,586.4
Marion	105,946.6	84,963.23	96,868.46	117,610.4	134,469.7	138,671.7	153,029.6	181,287.6	325,723.3
Linn	100,662.2	105,866.3	98,173.00	107,060.3	115,718.1	122,723.3	136,324.0	139,295.7	142,780.7
Benton	72,619.68	84,749.12	94,847.86	79,422.60	146,199.3	105,813.5	101,908.1	101,526.2	114,752.7

Figure 3: Intake by Source, 2013 - 2021

Table

Table

Work In Progress: Adding discussion and details explaining this chart.

***A1-KF-20**: Washington County waste tonnage accepted at the landfill increased by over 400% between 2016-2017, with the increased tonnage continuing through 2019.*

iv. Long-term intake volume TBD – 2021

Work In Progress: A long-term intake volume plot (from circa early 1980s to present)

D. Landfill Structure

i. Overview

The disposal area and surrounding lots are shown in Figure 6: Property and Cell Structure Overview, 2021 Site Development Plan below. This drawing is reproduced from the 2021 Site Development Plan, Appendix A, Drawing No. G03, and is reproduced here for convenience.

ii. Cell detail

Detail on individual disposal cells and the active dates for these cells is shown in Figure 7: Cell Structure Detail with Cell Activation Dates below. Dates are summarized in the following table.

Area	Date Opened	Date Capped/Closed
Closed Landfill (Burn Dump)	1940's	
Cell 1	Late 1970's	
Cell 1A	Late 1970's	
Cell 2A	1988	
Cell 2B	1994	
Cell 2C	1995	
Cell 2D	1998	
Cell 3A	2003	
Cell 3B	2004	
Cell 3C	2005	
Cell 3D Phase I	2007	
Cell 3D Phase 2	2009	
Cell 4	2012	
Cell 5A	2014	
Cell 5B	2018	
Cell 5C	2020	
Cell 5D	2022	
Cell 5E	Future	
Cell 6 (Quarry Area)	Future	

Table 2: Cell Open/Closed Detail

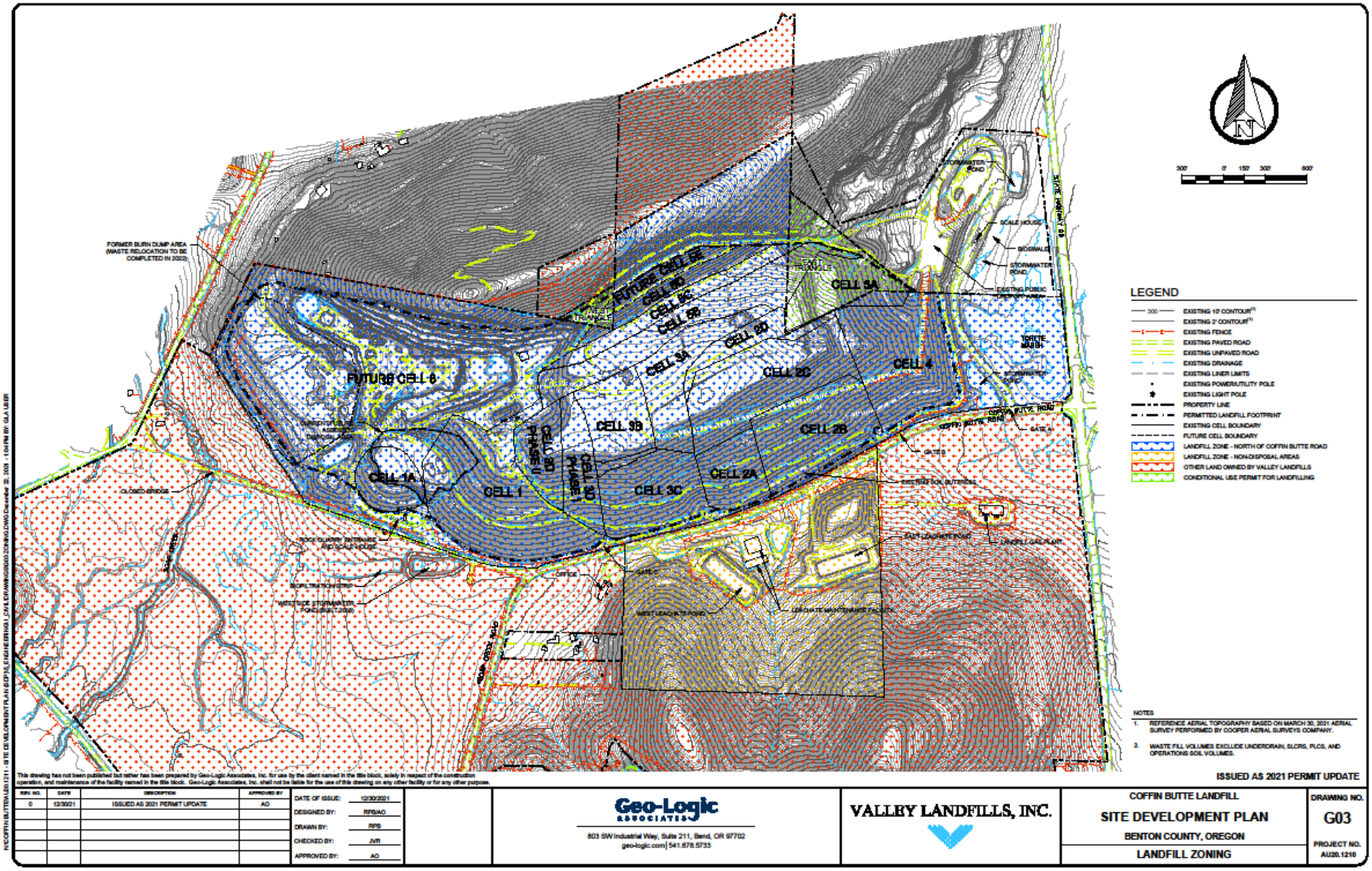
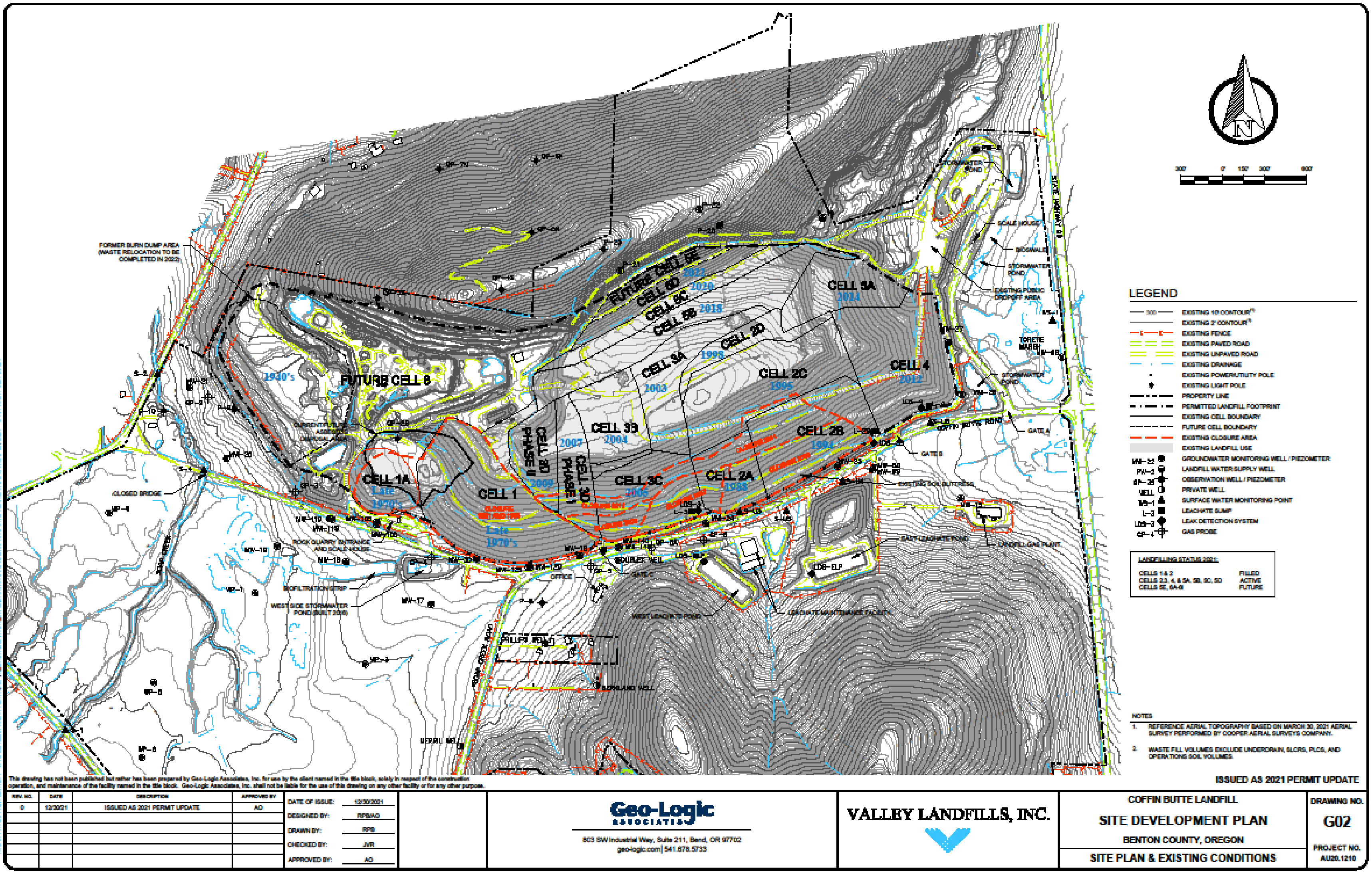

LEGEND
EXISTING 10' CONTOUR
EXISTING 2' CONTOUR
EXISTING FENCE
EXISTING PAVED ROAD
EXISTING UNPAVED ROAD
EXISTING DRAINAGE
EXISTING LINER LIMITS
EXISTING POWER/UTILITY POLE
EXISTING LIGHT POLE
PROPERTY LINE
PERMITTED LANDFILL FOOTPRINT
EXISTING CELL BOUNDARY
FUTURE CELL BOUNDARY
LANDFILL ZONE - NORTH OF COFFIN BUTTE ROAD
LANDFILL ZONE - NON-DISPOSAL AREAS
OTHER LAND OWNED BY VALLEY LANDFILLS
CONDITIONAL USE PERMIT FOR LANDFILLING
NOTES
1. REFERENCE AERIAL TOPOGRAPHY BASED ON MARCH 30, 2021 AERIAL SURVEY PERFORMED BY COOPER AERIAL SURVEYS COMPANY.
2. WASTE FILL VOLUMES EXCLUDE UNDERDRAIN, SLCRS, PLCS, AND OPERATIONS SOIL VOLUMES.
ISSUED AS 2021 PERMIT UPDATE
FUTURE CELL 6
CELL 1A
CELL 1
CELL 3B
CELL 3C
CELL 2A
CELL 2B
CELL 2C
CELL 3A
CELL 4
FUTURE CELL 5E
FUTURE CELL 5D
FUTURE CELL 5C
FUTURE CELL 5B
FUTURE CELL 5A
Geo-Logic ASSOCIATES
803 SW Industrial Way, Suite 211, Bend, OR 97702
geo-logic.com | 541.678.5733
VALLEY LANDFILLS, INC.
COFFIN BUTTE LANDFILL
SITE DEVELOPMENT PLAN
BENTON COUNTY, OREGON
LANDFILL ZONING
DRAWING NO. G03
PROJECT NO. AU20.1210

Figure 4



FUTURE CELL 8
CELL 1A
CELL 1
CELL 3D PHASE II
CELL 3D PHASE I
CELL 3B
CELL 3C
CELL 3A
CELL 2A
CELL 2B
CELL 2C
CELL 2D
CELL 4
CELL 5A
CELL 5B
CELL 5C
CELL 5D
FUTURE CELL 5E
LEGEND
ISSUED AS 2021 PERMIT UPDATE
Geo-Logic ASSOCIATES
VALLEY LANDFILLS, INC.
COFFIN BUTTE LANDFILL
SITE DEVELOPMENT PLAN
BENTON COUNTY, OREGON
SITE PLAN & EXISTING CONDITIONS
DRAWING NO.
G02

Figure 5

A1-KF-21. Map of the landfill shows current and planned cells (G-03)

Section 2: Specific Locations

This section summarizes the primary actions and events that define the current Coffin Butte landfill footprint.

A. 1983 Rezoning Action

Per Benton County PC-83-07-C, in ~~1938~~ 1983 a new zoning category ("LANDFILL SITE") was created for Benton County. Approximately 266 acres of land owned by Valley Landfill, Inc. were rezoned with this classification. Of these 266 acres, 194 acres, all on the north side of Coffin Butte Road, were approved for waste disposal. The acreage on the south side of Coffin Butte Road can be permitted for waste disposal if a CUP is obtained from Benton County.

At the time the application for a zone change was filed in 1983, the landfill was receiving "approximately 375 tons of refuse per day" per PC-83-07 applicant filing.

Figure 8: Proposed 1983 Rezoning Map denotes the originally proposed outline for land to be rezoned as Landfill Site (LS). Note that the northernmost section of the proposed area, extending north from the ridgeline of Coffin Butte, was ultimately not rezoned as LS due to concerns from neighbors. Also note that the expected areas of landfill are delineated in this drawing: Completed fill (west side), Present fill (southwest section), and Future fill (large area in center/east).

The overview map included in the Benton County & Valley Landfills MOU Relating to Land Use Issues (2002) document, included here as *Figure 9: Zoning Map (2002 MOU)*, clarifies the zoning boundaries.

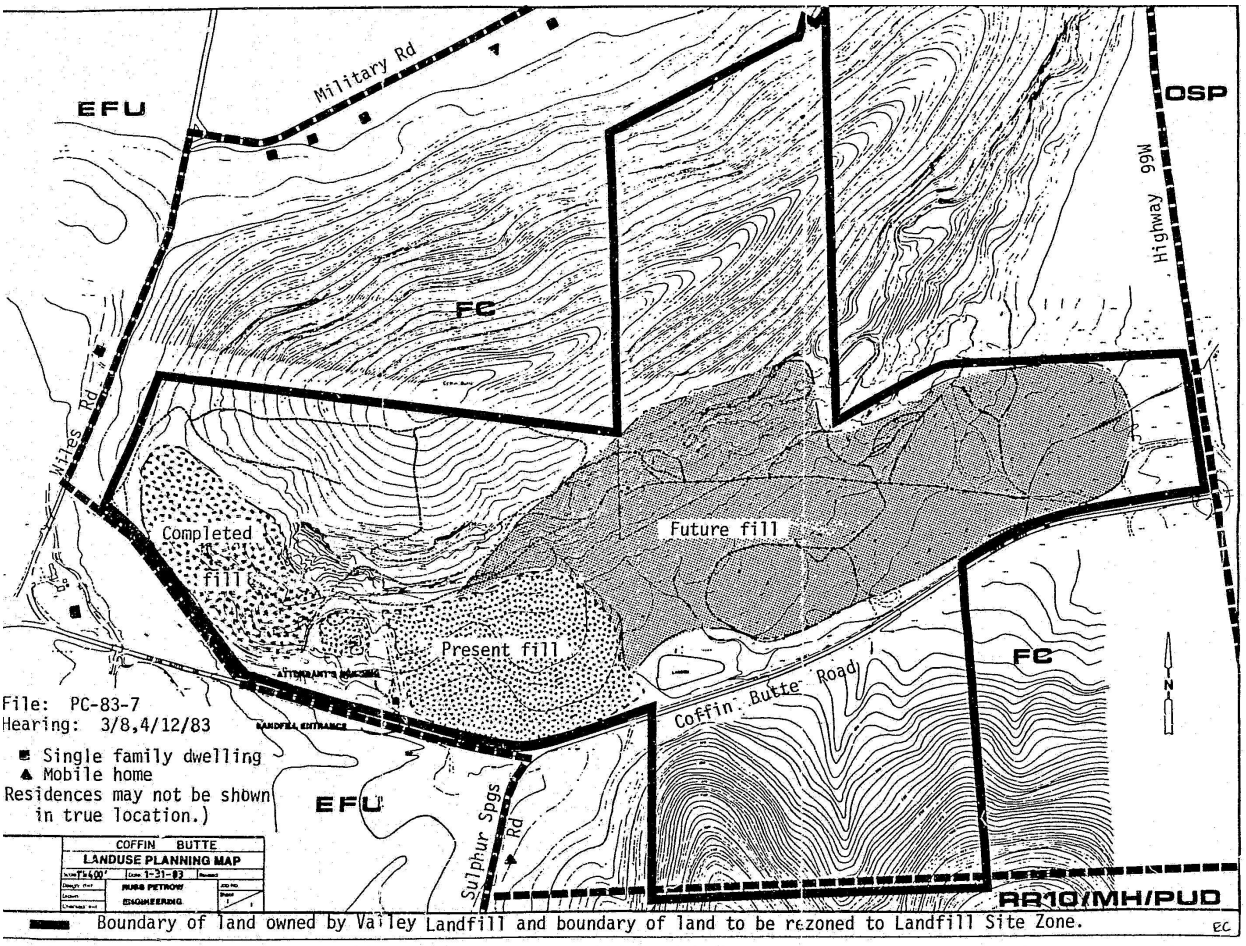


Figure 6: Proposed 1983 Rezoning Map

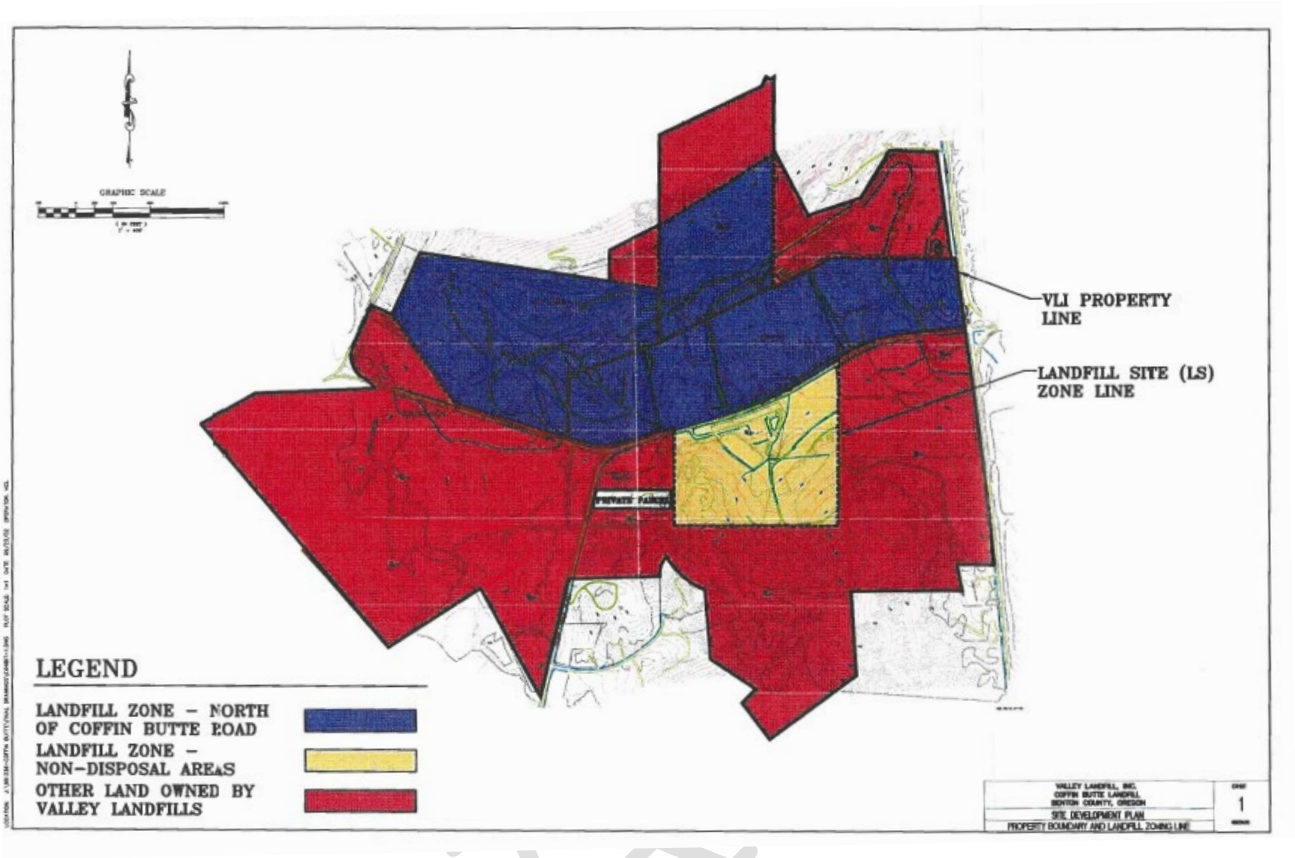


Figure 7: Zoning Map (2002 MOU)

A1-KF-22. The overview map included in the Benton County & Valley Landfills MOU Relating to Land Use Issues (2002) document, included here as Figure 6, clarifies the zoning boundaries. Of these 266 acres, 194 acres, all on the north side of Coffin Butte Road, were approved for waste disposal.

B. West and East Triangle Additions

Two landfill areas were added in 2002 and 2003:

- The "West Triangle" was approved for landfill activities via Conditional Use Permit in 2002. This area is located on land zoned Forest Conservation (FC). Approximately 3,400,000 yd^3 of expected landfill capacity were added by the approval of the West Triangle.
- The "East Triangle" was approved for landfill activities via Conditional Use Permit in 2003. This area is located on land zoned Forest Conservation (FC). Approximately 5,600,000 yd^3 of expected landfill capacity were added by the approval of the East Triangle.

See Benton County document PC-03-11 for details.

Thus, a total of approximately 9,000,000 yd^3 of landfill capacity was added in the 2002 – 2003 period. This constituted an approximately 68.5% increase in total permitted capacity using the cell capacity figures shown in Table 3.1 of the Site Development Plan Amendment A2 in document PC-03-11..

C. Cell 6 (Quarry) Addition

Need information from Benton County regarding the instrument formally approving Cell 6.

D. LS Zone Parcel South of Coffin Butte Road

As part of the 1983 action considering the requests for rezoning of several parcels from Forest Conservation to Landfill Site, the Benton County Planning Department submitted a Staff Report. Within this report (Staff Report P2361/7 Page 3; Benton County document PC-83-07 Page 13) a Staff Comments section noted

"Benton County Solid Waste Advisory Council recommended approval of the requests [for rezoning] subject to two conditions:

1. No landfill be allowed on north face of Coffin Butte.
2. No landfill be allowed on property south of Coffin Butte Road [Taxlot 104180001107, Index 14 in Appendix C].

These two conditions were also requested by the North Benton Citizens Advisory Committee (CAC) and they recommended approval of the requests.

Staff concurs with these conditions. The property on the North face of Coffin Butte (approximately 30 acres) should remain under the Comprehensive Plan Designation of Forestry Conservation (FC), from the crest of the butte North."

However, the Benton County Planning Department Staff Report went on to state

"The other issue concerning the property south of Coffin Butte Road can be resolved through Conditions of Development placed on any approval of the site plan by the Planning Commission. The proposed zone allows no additional landfill activities unless approved by the Planning Commission at a public hearing. Therefore, the Commission may limit expansion into any area that is not appropriate for a landfill."

The staff recommendation was adopted as submitted by the Planning Commission in their April 26, 1983 meeting. The Staff Report was expressly adopted as Finding 4(a) by the Benton County Board of Commissioners and incorporated into the resulting Order on June 15, 1983.

Thus, Benton County Planning staff modified the clear directive from the Solid Waste Advisory Council (SWAC) and the recommendation of the North Benton Citizens Advisory Committee by weakening the terms governing the property south of Coffin Butte Road from "No landfill be allowed" to "...no additional landfill activities unless approved by the Planning Commission at a public hearing."

The approval of both SWAC and CAC for the 1983 rezoning action was conditioned on the agreement that no landfill would be allowed on the parcel south of Coffin Butte Road.

Additionally, per the Board of Commissioners Order of June 15, 1983, approval of additional landfill activities on the LS-zoned parcel south of Coffin Butte Road (Taxlot 104180001107, Index #14 in Appendix C) requires only 1) approval of the site plan by the Planning Commission and 2) approval by the Planning Commission at a public hearing.

A1-KF-23: *In the 1983 rezoning action the Benton County Planning Department diluted SWAC and CAC recommendations from "No landfill be allowed on property south of Coffin Butte Road" to "no additional landfill activities unless approved by the Planning Commission at a public hearing."*

A1-KF-24: *Per the Board of Commissioners Order of June 15, 1983, approval of additional landfill activities on the LS-zoned parcel south of Coffin Butte Road (Taxlot 104180001107, Index #14 in Appendix C) requires only 1) approval of the site plan by the Planning Commission and 2) approval by the Planning Commission at a public hearing.*

- *More research required*

Section 3: Landfill Life Projections

E. Baseline: Projection to End 2022

Definitions:

Landfill Life ≡ Expected time remaining in which the landfill will continue to accept waste, typically in Years.

End of Life (EOL) ≡ Expected calendar date when the landfill ceases to accept waste, typically in Calendar Years AD.

A. Historical Landfill Life Projections

Date of Projection	Projected EOL (CY)	Reference/Comment
2001	2049	2001 Annual Report, prior to addition of East and West Triangles and Cell 6 47.5 years from Beginning 2002 Based on 425,000 Tons/year and 0.8 Tons/yd^3
2003	Late 2070	2003 Site Development Plan, Page 57, Table 3.1 71.1 Years from Oct 1999 Includes Cells 1-6 and East and West Triangles Based on 400,000 Tons/year and 0.8 Tons/yd^3
2021	2039	2021 Site Development Plan, Appendix B With detailed breakdown of planned Cell 6 structure and corresponding subcell life expectancy Based on 846,274 Tons/year and 0.8 Tons/yd^3

Table 3: Historical EOL Projections

B. Nominal Life Projection CY 2023 to End of Life

The landfill life projections shown below are provided by the franchisee.

Work in-progress, and items to address in this section:

- Likely somewhere between the two scenarios – 14.54-15.99 year site life*.
- Derived from Republic Services annual measurements
- Describe the underlying method for calculating these numbers
- List assumptions
- *Includes quarry, which currently has unexcavated rock
- Quarry sequencing/staging – timeline and description. May be combination of options.
- Where the landfill is currently receiving waste stands over a number of previous cells. At the time of transition to place liner in the quarry, they will be starting a new footprint, without a lot of area to fill on top of or against. Considering efficiencies of fill and stability of hill. Larger footprint needed when starting fill that is not leaning against existing fill/cell.
- Add potential factors that could change the site development plan expectations

Scenario 1
Tons per Year 1,000,000 Tons
Projected Remaining Airspace 12/31/22 16,008,557 CY
2022 3-year Density Avg 0.999 Tons/CY
Site Life 15.99 Years

Scenario 2
Tons per Year 1,100,000 Tons
Projected Remaining Airspace 12/31/22 16,008,557 CY
2022 3-year Density Avg 0.999 Tons/CY
Site Life 14.54 Years

Definitions:
Tons per Year: Projected tonnage based off recent history* and 2020 Franchise Agreement Tonnage Cap (1.1 M Tons /year).

Projected Remaining Airspace: Airspace remaining at the end of 2022 based off projected 2022 tons and 2022 3-year density average

2022 3-year Density Avg: Average density measured during 2020, 2021 and 2022, measurements

Site Life: Time to fill the projected remaining airspace, including the airspace currently unexcavated in the quarry area, given the projected Tons per Year intake rate

*Variables can and do impact tonnage and available airspace, and can include changes in disposal and diversion rates, natural disasters and other unforeseen market changes, etc.

A1-KF-25. *The most recent estimates from Republic Services project the site life of the landfill to be between 14.54-15.99 years, with two scenarios of accepting either 1,000,000 tons/year or 1,100,000 tons/year, each at a 2022 3-year Density Average of 0.999 Tons/CY, which assumes the quarry area will be fully excavated by the time the current cell disposal areas are full.*

A1-KF-26. *The quarry dynamics are construction of the needed cells for future disposal areas. The herculean construction task is to excavate basalt rock to form the excavated design dimensions for construction of future disposal cells. The assumption is that the excavated rock and the construction of future cells keep pace with the demands of increased volumes of refuse needed for disposal without interruption.*

A1-KF-27. *The complexities of demand and availability of refuse disposal is the crux of the puzzle to provide a viable sustainable material management process under consideration.*

C. Events and Factors with Potential Lifetime Impact

Events and Factors which could potentially impact the landfill site life include:

- Landfill contracts and business choices
- Recession
    - Example: 2008 Recession
- Wildfire
    - Example: 2020 wildfire debris tonnage
- Impacts to other disposal facilities
    - Example: Riverbend Landfill
- Contaminated soils – spills –
    - Example: fuel tanker that spilled on highway 99
- Impacts to waste recovery system
    - Example: China's 2017-2018 policies on importing waste materials
- Population growth
    - Example: Benton County's population is forecasted to grow steadily through 2071, with a population of over 120,000 in 2040[1]
- Quarry excavation schedule
- DEQ regulations regarding cell development below the water table
- Landfill Expansion
- Removal of tonnage cap
- Availability of landfill alternatives
- Diversion of waste to other landfill sites
- Waste generators reducing per-capita disposal
- Legislation impacting landfill operations
- Legislation impacting waste generation
- Legal Action
- Activism
- Climate change impacts to landfill operations
- Landfill facility and technical challenges
- Staffing in the local and regional solid waste industry
- Solid Waste transportation options
- lifestyle changes (i.e., increased at home shopping as we saw during the pandemic),
- acts of Mother Nature (such as wildfires)
- adjustments in diversion/recycling rates, and
- tonnage volume in the broader market.
- Include footnotes that show we cannot predict the outcome or impact of every scenario

[1] https://www.pdx.edu/population-research/sites/g/files/znldhr3261/files/2021-06/Final_Report_Benton.pdf

Work In-Progress:

- List examples using known information, not projections, but historic data for context
- Not just Coffin Butte Landfill impacts, but generally all landfills
- Impacts may not be immediate, but experienced over the course of years.
- Working on coming to consensus on how much detail to include in this section and the scenario sections that follow.

A1-KR-1. The Sustainable Materials Management Plan should further develop scenarios and factors that may impact the landfill lifespan, including detailed analyses of likely projections.

Baseline Scenario

The baseline scenario described in Part A, above, graphically displays the landfill's longevity as shown in Figure 3.2, below:

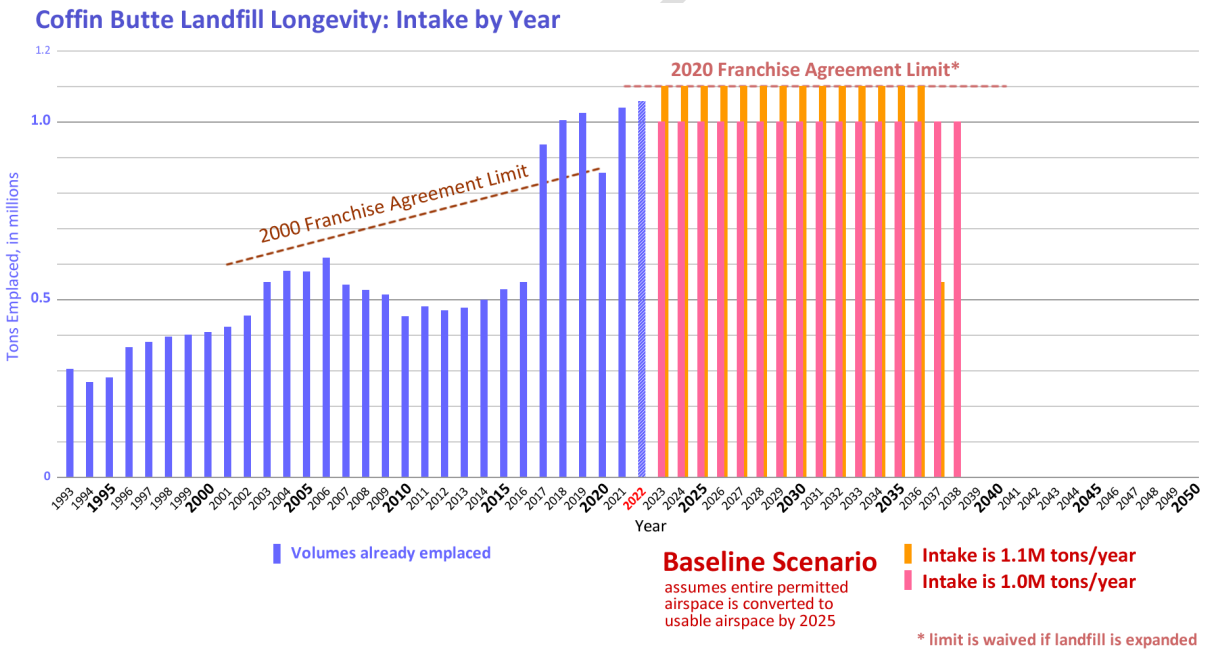


Figure 3.2

This scenario is termed a baseline because it is a simple projection that more sophisticated scenarios can be built upon. As indicated in its Assumptions, this baseline scenario is not a "default future"; it is not realistic, in that it references itself only, has no supporting data, is aspirational, and does not incorporate outside factors. It is our baseline because it models the idealized parameters (and longevity) intended for the landfill by the landfill's owner, which is: a steady annual intake of between 1M and 1.1M tons for the duration of the landfill's 14.5-16 year site life (to 2037-2039).

Scenarios built upon the Baseline: Quarry Levels

Roughly 2.7 million cubic yards of the landfill's permitted airspace is currently unavailable because it is unexcavated rock. The landfill's owner holds a surface mining permit for this rock, and franchises it to Knife River as a quarry. For the past few years Knife River has currently quarried the rock at a rate of roughly 150,000 cubic yards a year, so at a normal pace the airspace will not be fully available until the year 2040.

This poses a dilemma for the landfill's owners, because the landfill is on track to fill its current cell in 3 years, when it will look to move operations into the quarry area. The landfill and the quarry cannot safely overlap their operations in the airspace. Ideally, the quarry would pre-excavate all the rock by year-end 2024, and the landfill would then prepare the quarry site for landfilling. Alternatively, the landfill could use a new permitted area (a landfill expansion) as a "bridge" to give the quarry more time to pre-excavate, but it seems unlikely that a landfill expansion could be (a) successful and (b) legally resolved in time to be useful.

We do not currently know how much rock can be pre-excavated before landfilling operations move into the quarry airspace. We can display the possibility range graphically, in Figure 3.3.

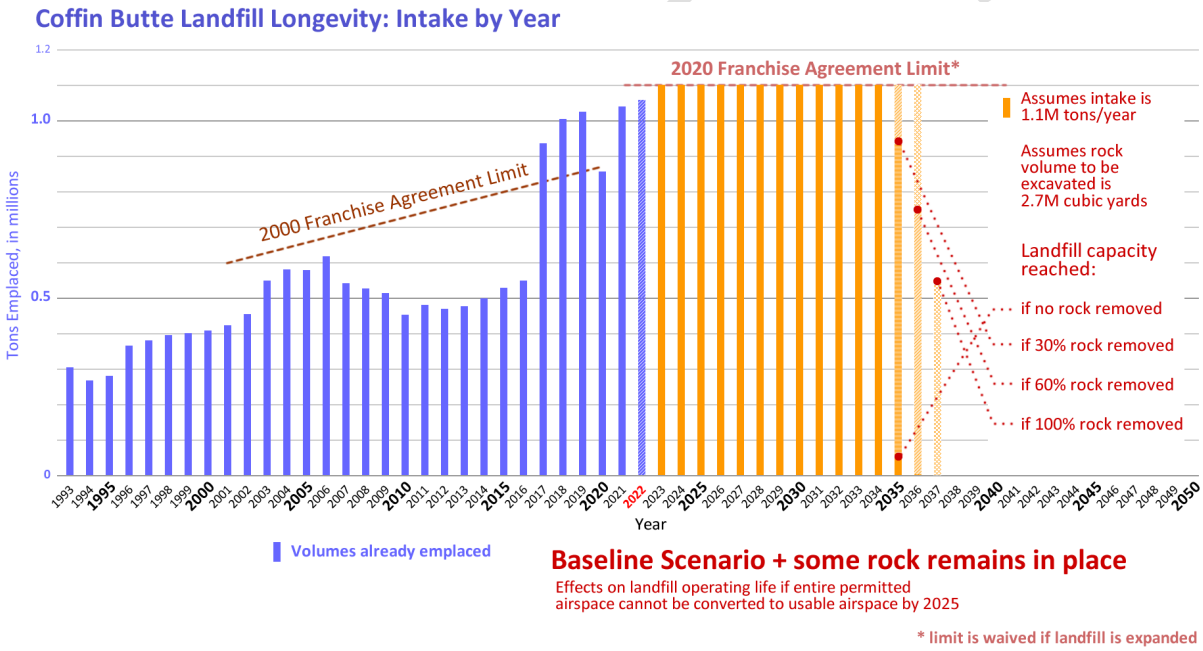


Figure 3.3

Scenarios built upon the Baseline: Water Table

A (currently unquantified) portion of the landfill's permitted airspace seems to lie below the groundwater level, and it is unclear at this time whether or not Oregon DEQ regulations will allow this

theoretical airspace to be used. if not permitted, actual permitted airspace would decrease and the lifespan of the landfill would shorten, in proportion to the volume affected.

Scenarios built upon the Baseline: Expansion(s)
Scenarios built upon the Baseline: Expansion(s)
The baseline scenario may only be fully realized in combination with a landfill expansion – to serve as a bridge landfilling site that allows time for the quarry airspace to be pre-excavated. The landfill owner has indicated that it will apply for such an expansion, likely in the first half of 2023. Almost certainly this expansion site would be the area south of Coffin Butte Road that is already zoned as Landfill Site; it's unlikely that the expansion would involve the airspace over the road itself, as closing the road proved problematic in the 2021 expansion attempt. We can roughly estimate the size of this expansion airspace as 6M cubic yards.

This application may be followed by others, either to continue to act as bridges for quarry excavation or to take advantage of the removal of the intake cap, which happens once the first expansion is approved, according to the 2020 Franchise Agreement. These further expansions may close Coffin Butte Road or seek to rezone other areas around the landfill as Landfill Sites.

We can represent the effect this set of scenarios would have on baseline longevity, as Figure 3.4.

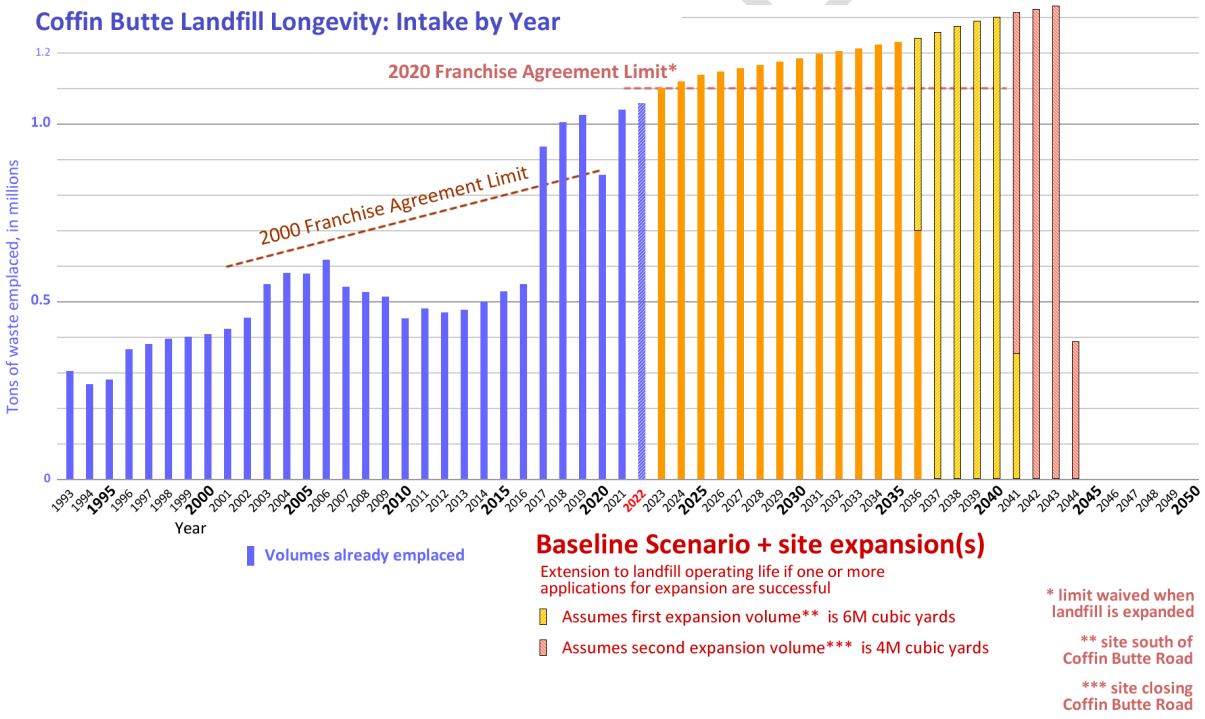
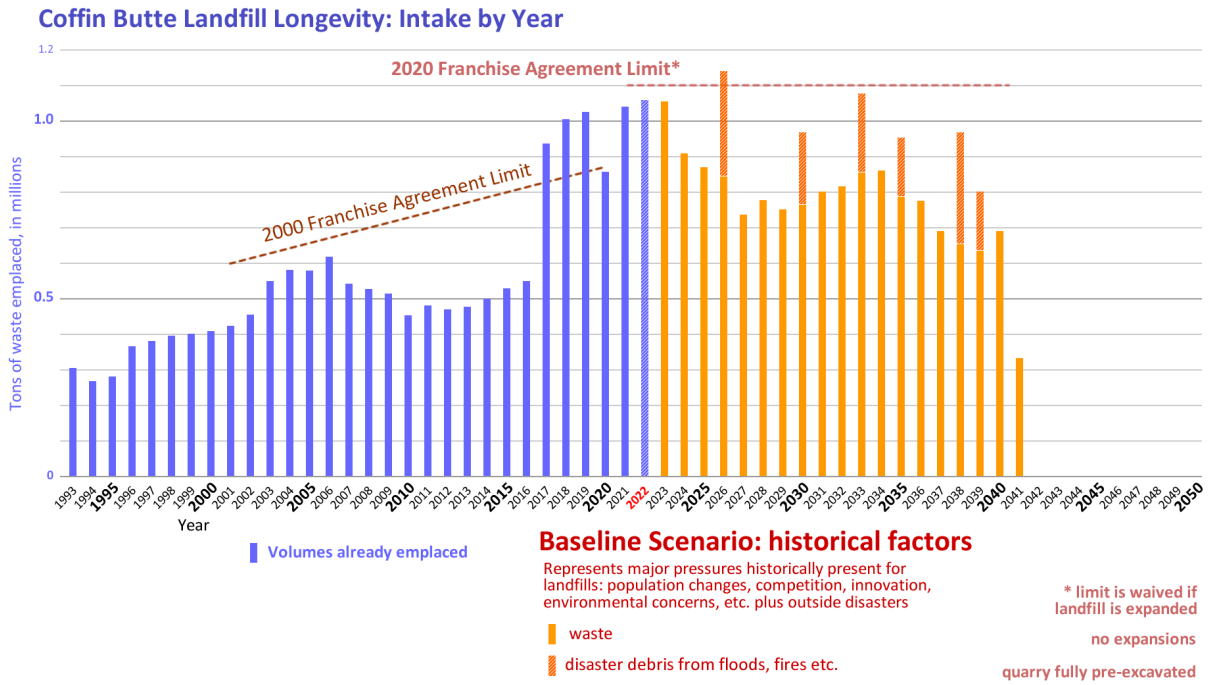


Figure 3.4



Scenarios built upon the Baseline: Historical Variance

Scenarios built upon the Baseline: Historical Variance

The baseline scenario is derived primarily from the annual intake the landfill owner has achieved and would like to maintain. In reality such stability occurs rarely if ever. Historically, the annual intake of a landfill is determined by many factors, many beyond the owner's ability to control or to counteract by expanding the wasteshed.

The following graphic (Figure 3.5) shows variance due to (a) slow but steady demand by people to reduce their "tax" of garbage disposal costs, (b) growing demand by people for less polluting alternatives to waste disposal, (c) growing population in the wasteshed, (d) competitive pressure from innovative alternatives to landfilling, (e) sudden spikes in intake due to wildfires, floods, and other climate-related disasters, and (f) pressure by the landfill owner to maintain intake via downward pricing and cost-cutting. These "human factors" are discussed more fully in Section 4.

Figure 3.5

Scenarios built upon the Baseline: Climate Crisis Legislation/Legal Action/Activism

Scenarios built upon the Baseline: Climate Crisis Legislation/Legal Action/Activism
People all over the world are growing increasingly concerned about the threat the uncontrolled release of greenhouse gases poses to the ecosystems that human societies depend upon. In the United States, this fight is focused on the release of methane, a potent greenhouse gas. Landfills are major sources of greenhouse gas emissions, especially methane. In its Methane Emissions Reduction Plan, the US government is using all available tools to identify and reduce methane emissions from all major sources. The Inflation Reduction Act of 2022 prioritized curtailing methane pollution in the oil and gas industry sector, initiating a program that catalyzes pollution detection and offers incentives for reduction and imposes penalties for continued releases of methane into the atmosphere. At the same time, environmentally engaged citizens are suing governmental agencies, and investors are suing corporations, for failing to act responsibly on the climate crisis. These signals of change are discussed in Section 4.

Since methane is not "destroyed" nor does it become carbon neutral, the best way to mitigate landfill methane is never to create it in the first place, i.e., to divert waste, especially organic waste, from ever entering a landfill. This is a fundamental logic when curtailing landfill methane.

The preceding graphic (Figure 3.5) does not take into account these increasing pressures for action. The following graphic (Figure 3.6) shows one range of possible effects of these regulatory, legal, political and competitive pressures.

<graphic to come>

Figure 3.6

Section 4: Human Factors Affecting Landfill Size/Capacity/ Longevity – Ken Eklund

Assessing Human Factors

Although the physical parameters of Coffin Butte Landfill play a role in its longevity ("operating life"), human factors drive the actual outcome, because they determine the inflow of material that fills up the landfill's permitted volume (and shape that volume itself). Unlike the physical factors, human factors – by which we mean decisions and agreements such as business and legal obligations, legislation, enforcement, civic action and attitudes, technological advances,

risk assessments and risk taking, individual and collective values and choices, and so on – have the power to shift the landfill's operating life very quickly. Estimations of the operating life of the Coffin Butte Landfill necessarily rely on assessments and assumptions about the entire system that feeds waste to the landfill, and this wider system is created by, motivated by, operated by, and continuously being changed by human factors.

When mapping possible futures, experts use different methods to assess human factors than they do for physical factors. "Scenario planning" poses *what if* questions to anticipate future possibilities. "Futures signaling" looks for events that indicate coming trends or movements. Using these futurecasting methods is important because for many people, cognitive biases limit their view of the future to be a mere extension of the present, with only incremental changes, even though their actual experience is of a world in which radical and disruptive changes are occurring at an ever-faster rate. "Imagination training" can be a useful tool to be more successful at discerning these patterns of ~~change~~ change.

The Climate Change Imperative, and Methane

People all over the world are growing increasingly concerned about the threat the uncontrolled release of greenhouse gases poses to the ecosystems that human societies depend upon. The 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27) took place from 6 to 20 November this year, and hosted more than 100 Heads of State and Governments and over 35,000 participants who engaged in high-level meetings and key negotiations regarding climate action.[i] UN Secretary-General António Guterres said that more needs to be done to drastically reduce emissions now. "The world still needs a giant leap on climate ambition… we can and must win this battle for our lives." He urged the world not to relent "in the fight for climate justice and climate ambition."[ii]

In the United States, this fight is focused on the release of methane, a potent greenhouse gas. The US is one of the world's top 10 methane emitters, and methane emissions are a major contributor to climate change, "which is why President Biden is taking critical, commonsense steps at home to reduce methane across the economy." Last year the US announced that it was joining with more than 100 world governments to meet a Global Methane Pledge and reduce the world's methane emissions 30% from 2020 levels by 2030. Humans produce the bulk of methane pollution, and atmospheric concentrations of methane have been trending upward for more than a decade, with 2020 seeing the biggest one-year jump on record.

Through the 2021 Methane Emissions Reduction Plan, the US government is using all available tools – "commonsense regulations, catalytic financial incentives, transparency and disclosure of actionable data, and public and private partnerships – to identify and cost-effectively reduce methane emissions from all major sources." As part of this Plan, in a carrot-and-stick manner, the EPA has begun to both catalyze multi-pronged action against, and assess penalties for, the release of methane into the atmosphere.

Landfills are major sources of greenhouse gas emissions. Landfilling inherently creates methane as a natural byproduct of the decomposition of organic material in landfills. Landfill gas is composed of roughly 50 percent methane (the primary component of natural gas), 50 percent

carbon dioxide (CO_2) and a small amount of non-methane organic compounds. Methane and carbon dioxide are odorless; “landfill smell” is from the trace non-methane organic compounds.

In the past methane pollution has been difficult to quantify. For landfills, historically the EPA has relied on theoretical calculations to estimate pollution, but these mathematical models by definition produce estimates, not exact data – useful at a national level but less so at a per-landfill level. In response, other organizations have engineered their own models that are more useful for assessing emissions at a particular landfill. In recent years, focus has shifted to better direct measurement technologies for more accurate and transparent emissions reporting.

Using area measurement tools deployed on satellites, aircraft, and towers, the Environmental Defense Fund has shown that landfill outputs are generally higher than EPA calculations indicate. Carbon-Mapper, a joint public-private enterprise, focuses on identifying super-emitters, because a previous flyover project across California discovered that only 1% of sites produced 50% of methane emissions, and the largest emissions were from landfills. Carbon-Mapper plans to launch two satellites in 2023, building to a suite of 20 satellites eventually; these will join other systems such as Kayrros, a French company, and MethaneSAT, a subsidiary of the EDF.

These developments all signal a changed operating environment for Coffin Butte Landfill, one in which its greenhouse gas emissions move from being unknown and unexamined to being an open number impacting waste flows, operating costs, regulatory fines, corporate investment levels, public action, and more. Coffin Butte Landfill may be a particular target for negative effects, because its wet environment converts waste to methane quickly. This section details several Scenarios which explore these impacts upon the landfill’s anticipated operating life.

It’s important to note here that landfill methane poses a lesser-of-evils situation. The best-case environmental outcome for methane, once it is generated from municipal solid waste, is for it to oxidize into carbon dioxide, i.e., for it to transition from a quick-acting high-impact greenhouse gas into a slower-acting, durable greenhouse gas. Methane is not “destroyed” nor does it become carbon neutral. Therefore, the best way to mitigate landfill methane is never to create it in the first place, i.e., to divert waste, especially organic waste, from ever entering a landfill. This is a fundamental logic at work with landfill methane now and into the future.

Scenarios

A. Climate Crisis Legislation

Scenario: the methane-corrective measures imposed on the oil/gas industry are extended into the landfill industry, focusing on incentives to prevent methane from being emitted but including penalties for methane pollution. This extension happens in the year 2024.

In this scenario, as they are doing in the oil/gas industry, federal and state environmental agencies offer billions of dollars in incentives tailored to catalyze efforts that can curtail landfill methane.

In this scenario, federal and state environmental agencies announce and implement financial penalties (fines) for methane release to the atmosphere. As is currently happening in the oil/gas industry, these penalties are eased in over a four-year period, and cap at a rate around $1550 per metric ton in 2022 dollars.

In general, the effect of this carrot + stick scenario on Coffin Butte Landfill's operating life would be to lengthen it. The incentives would attract recyclers and other entities to target the high-organic sector of the landfill's intake (about a quarter of total intake mass) for diversion away from the landfill, and the penalties would bring the landfill operator into alignment with this diversion (and reduction of profit). This would be a sea change in the wasteflow, creating knock-on opportunities to create circular economies for other types of waste, motivated by environmental concerns, economic efficiencies, and other reasons.

It's also possible that this scenario would shorten the operating life of Coffin Butte Landfill, even precipitously, if the prospective penalties for incoming waste (plus the penalties for methane emissions from waste already emplaced) cut unacceptably into the profit schema of the landfill owner. The likelihood of this eventuality depends upon the actual methane output of the landfill, which is currently undocumented.

The signal for this scenario is strong, because it is based upon the stated goals of the US government, its commitments to climate action to the world, and goals and provisions already in place with the US 2021 Methane Emissions Reduction Plan.

Another legislative scenario to mention briefly, related to the climate crisis: efforts to limit atmospheric carbon widen to non-methane sources in the US, in the form of a carbon tax and/or subsidies for rail electrification. This scenario would disrupt the current operations in the Coffin Butte wasteshed, by establishing new incentives to transport waste by rail rather than truck. This scenario is likely to extend the operating life of Coffin Butte Landfill, which has no rail connection and depends on trucking for its inflow. If entities can transport waste more economically by rail to cleaner landfills or to regional waste reclamation centers, that would cut inflow to Coffin Butte Landfill.

B. Climate Crisis Legal and Shareholder Action

Scenario: Environmentally engaged citizens sue governmental agencies (and investors sue corporations) for failing to act on the climate crisis. These lawsuits compel action to reduce emissions of greenhouse gases, which in turn boost efforts to divert material, especially food and other high organic waste, from being landfilled at Coffin Butte Landfill. In this scenario, these lawsuits have the potential to occur across the wasteshed.

Signals for this scenario set exist in plenty. Groups of environmentally engaged citizens are already pursuing lawsuits against states and nations; such cases appear regularly in the news as current ones wind their way through the courts and new ones are filed. Climate activism is already widespread in Oregon and the landfill's wasteshed includes areas disposed politically toward this kind of legal action. Benton County is more likely than most to be targeted for this kind of lawsuit, as its population generally prioritizes environmental concerns and the County has not shown concern over greenhouse gas emissions in its administration of Coffin Butte Landfill.

"I started looking at the world through a new lens recently — when my older daughter gave me the incredible news that I'll become a grandfather next year… I can sum up the solution to climate change: We need to eliminate global emissions of greenhouse gases by 2050… We need to revolutionize the entire physical economy… If we don't get to net-zero emissions, our

grandchildren will grow up in a world that is dramatically worse off." The grandfather-to-be is Bill Gates, a major shareholder in Republic Services' stock.

This scenario would further extend the operating life of the landfill if methane studies show that Coffin Butte Landfill is a worse polluter than alternative landfills in drier climates (if Coffin Butte Landfill converts waste to methane more quickly, for example). The legal action would then not only divert high-organic material out of the wastestream, but divert unsorted waste away from Coffin Butte Landfill to less-polluting alternatives.

C. Climate Crisis Environmental Activism

Scenario: Environmental activists accelerate their efforts to increase accountability for, and limit waste intake at, Coffin Butte Landfill. These efforts consist mostly of expansion to the current level of civic engagement but also branch out as protests and other direct action when civic engagement cannot produce the depth and velocity of change required for environmental protection.

This scenario is similar to, and operates in tandem with, the "legal action" scenario, and has a similar effect of reducing intake at the landfill. Activism happens more quickly however, so the primary impact of this scenario is as an across-the-board accelerant and forcer for all the environmentally motivated changes being discussed in this section.

Signals for environmental activism's impact on the operating life of Coffin Butte Landfill are very strong. Environmental activism has already caused the single most impactful event on the operating life of Coffin Butte Landfill in its history: activists stopped the expansion of the Riverbend Landfill in Yamhill County, which effectively doubled trash intake at Coffin Butte Landfill to its current high level. Local activism is why the County has assembled its Workgroup studying the future of solid waste management in Benton County, and local activists feature prominently in the work done by the Workgroup so far.

D. Climate Crisis Effects Upon Landfill Operating Life

Scenarios: effects of the climate crisis itself circle back to affect the operating life of Coffin Butte Landfill, by increasing the incidence of wildfires, floods, droughts, and other disruptions to the landfill's extensive infrastructure; by causing rapid and novel shifts in population migrations and attitudes; by posing threats to the landfill's operational status itself.

Signals for this set of scenarios are strong. Worldwide, the number and severity of climate events and disasters is growing, made more extreme by climate-crisis effects. Locally, in 2020 the Beachie Creek–Lionshead wildfire generated about a third of a million tons of debris for Coffin Butte Landfill. The region continues to slide into multi-year drought, which extends the fire season in an area already at risk with high forest fuel loads. The Willamette Valley now has a regular "smoke season." Rain events are growing in severity, increasing chances for flood events in the landfill's wasteshed and on the landfill itself. As a creator of flammable methane, the landfill has clear potential for a major fire event; it has caught fire in the past, which on one occasion called for a large fire response and took over 24 hours to bring under control.

Despite these trends, the Pacific Northwest is seen as a haven for those elsewhere who have been even more severely impacted by heat, fire, flood and other disasters.

In the main, climate crisis events are likely to shorten the landfill's operating life. Fires and flooding have the potential to generate debris flows that will consume capacity, as would a population boost from climate refugees relocating into the wasteshed. None of these natural disaster waste streams are counted in the "tonnage cap" included in the 2020 franchise agreement.

The most extreme scenarios shorten the landfill's operating life precipitously. The landfill itself could have a flooding event, where leachate cannot be pumped out fast enough or overflows its collection ponds for example, with effects unknown upon the landfill's ability to continue operations. Wildfire is a clear existential threat, as landfills are full of both incendiary methane and flammable material; landfill fires can burn deep, are difficult to fight and have been known to burn for years and take over a hundred million dollars to extinguish.

These events concatenate: a storm event, for example, might knock out power to the landfill for an extended period, which then leads to a flood event as pumps cannot operate. An earthquake could cause both a power outage, which collapses the landfill's ability to operate its methane extraction system, and multiple wildfires, which threaten to ignite the uncontrolled methane. In such scenarios, the landfill is not a direct threat to human life and thus not a priority for firefighters or other emergency action, so any incident can snowball.

E. Longevity: Post-Operational Costs

Climate legislation, activism, crisis events, and so on are all increasing the burden of monitoring and maintaining public safety for the decades required after the landfill ceases operations. It's estimated that the landfill will continue to produce significant amounts of methane for 20 years after it closes, for example. If that methane is incurring penalties, who will be paying them? If trees need to be prevented from growing on the landfill cover, who will be performing that maintenance? And so on, through a growing list of like questions.

Scenario: As a clearer picture of the landfill's post-operational burden emerges, it sparks action to cut the landfill's waste intake. This effort may be initiated by the County, in an effort to both reduce the landfill's pollution impacts and to put off the day when responsibility for the landfill is transferred to the County; it may be initiated by citizens, in an effort to both reduce the pollution impacts and to delay transition to another waste management scheme; it may be initiated by the landfill owner, in an effort to delay incurring expensive post-operation environmental mitigations, and/or to keep alive the legal option to file for expansion.

Signals for this scenario include the current litigation at Riverbend Landfill in Yamhill County, where the landfill owner is trying to avoid closing the landfill by taking in a minimal amount of trash per year, and county citizens are suing to force the landfill to close.

F. Unforeseen Novel Effects

The scenarios listed above have signals that are easy to discern, and they manifest in more or less familiar ways. The level of change at work here, however, signals the strong possibility for novel and unforeseen effects, especially concatenating ones. In the same way that COVID manifested itself in a myriad of ways that were difficult to anticipate, the climate crisis is causing changes with ripple effects that have yet to become apparent.

These effects inject (more) uncertainty into the agreements and infrastructure of the landfill's wasteshed, which in turn steers the entities in the wasteshed toward reducing their waste flows and increasing the resilience of their waste management by seeking other options. The unforeseen effects of climate change are likely to increase the landfill's operating life.

G. Contractual Obligations

From day to day the wasteflow to Coffin Butte Landfill is governed by business contracts that Republic Services holds with various entities; the landfill's wasteshed is defined and redefined by these contracts. Republic Services will not provide detail about these contracts, citing their proprietary nature, so the wasteflow's net effect upon the operating life of the landfill is undocumented.

Imagination Training

When thinking about the future, it's common for people to manifest a cognitive bias toward the status quo, to think the future is settled as an extension of the present. This bias can manifest itself even when change is clearly underway. To counteract this bias, it's useful to require the arguments FOR the continuation of the status quo (rather than just accepting it as being unquestioningly able to continue).

To refute the idea that measures to prevent methane leaks will be extended from the oil/gas industry to the landfill industry, for example, would require a line of reasoning as to why those measures wouldn't be extended into the landfill industry (which is known to leak methane).

Another example: minimizing the role of environmental activism (as a human factor in the landfill's operating life) would require a line of reasoning as to why such activism will cease impacting the state's landfilling ecosystem or will not continue to grow at its current pace.

Imagination training is also useful in exposing areas where data still holds sway, even though it is now known to be limited or obsolete, i.e., where an old idea perseveres purely through momentum or inertia. An example would be the methane emissions level at Coffin Butte Landfill: to persist in relying on an obsolete EPA estimate would require a line of reasoning as to why that estimate should hold sway over modern direct measurements.

Determining Landfill Longevity - Ken Eklund

< summary of human factors to come >

< graphic to come >

Appendix A: Intake Volume and Capacity Data

Coffin Butte annual intake volume, derived from 1993-2021 Coffin Butte Annual Report (CBAR) documents. CY 2000 is highlighted to indicate this value was derived from the 2001 report because the 2000 report document is unavailable.

Year	CBAR Volume (Tons)
1993	310,648
1994	268,472
1995	287,932
1996	369,835
1997	378,919
1998	395,751
1999	401,408
2000	413,493
2001	425,723
2002	453,261
2003	550,506
2004	586,076
2005	580,275
2006	618,340
2007	546,996
2008	528,396
2009	519,058
2010	458,590
2011	482,951
2012	473,550
2013	479,160
2014	499,687
2015	530,971
2016	552,979
2017	941,430
2018	1,010,879
2019	1,034,934
2020	863,210
2021	1,046,067

Appendix B: Capacity Data and Site Life Projections

Year	Annual CBR Tons Scaled Intake	CBR Density Aerials	CBR Annual Airspace Used (CY) Landfilled	CBR Remaining Airspace (CY)	Geo Logic 2021 Plan Consumed Airspace (YD)	Geo Logic 2021 Plan Remaining Airspace (YD)
1993	310,648					
1994	268,472					
1995	287,932					
1996	369,835					
1997	378,919 Averaged					
1998	395,751					
1999	403,697					
2000	413,493					
2001	426,000	0.9 tons/cy	473,000			
2002	457,000	0.98 tons/cy	461,000			
2003	550,360	0.98 tons/cy	561,592			
2004	589,147	0.80 tons/cy	736,434			
2005	580,275	0.80 tons/cy	725,334			
2006	624,875	0.80 tons/cy	781,094			
2007	546,996	0.80 tons/cy	683,746			
2008	528,395	0.80 tons/cy	660,494			
2009	519,058	0.80 tons/cy	648,823			
2010	458,590	0.892 tons/cy	514,111	39,594,002		
2011	482,951	0.1.0375 tons/cy	465,495	24,807,718		

2012	473,440	0.83 tons/cy	572,825	23,741,813		
2013	479,160	0.92 tons/cy	523,100	24,458,567		
2014	499,687	0.92 tons/cy	545,510	24,458,363		
2015	530,971	0.89 tons/cy	595,593	23,839,138		
2016	552,979	0.93 tons/cy	592,689	22,453,729		
2017	941,430	0.97 tons/cy	969,048	21.727,371		
2018	1,010,879	0.99 tons/cy	1,021,090	20,427,503		
2019	1,034.934	0.80 tons/cy	1,293.668	18,352,257		
2020	863,210	1.0 tons/cy	863,210	17,621,208		
2021	1,046,067	0.98 tons/cy	1,046,415	17,249,778	1,072,037	4,834,330
2022					1,057,700	3,776,631
2023					1,057,700	2,718,931
2024					1,057,700	1,661,232
2025					1,057,700	603,532
2026					1,057,700	1,028,093
2027					1,057,700	999,823
2028					1,057,700	1,685,254
2029					1,057,700	626,554
2030					1,057,700	1,428,675
2031					1,057,700	370,975
2032					1,057,700	391,696
2032					1,057,700	1,020,066
2034					1,057,700	1,977,627
2035					1,057,700	919,927
2036					1,057,700	1,157,678
2037					1,057,700	99,978
2038					664,409	664,409

The data table to the left references the year, intake tons, density, annual airspace used and remaining airspace for Coffin Butte landfill.

The following Year 2021 is a summary of information used for the annual reports for Coffin Butte landfill.

Each year Republic Services produces an annual report for Coffin Butte Landfill & Pacific Region Compost (CBR).

In particular, during year of 2021 the landfill accepted 1,046,067 tons of solid waste. Based on historical aerial fly-over data, the average effective density of the in-place waste at the Coffin Butte Landfill is 0.98 tons/cy (1,961 lbs. /cy – 2021 Operational Density). Therefore, an estimated 1,067,415 cubic yards of airspace was used for the year. A total of 21,389,767 cubic yards has been consumed as of December 31, 2021. The remaining capacity for the entire permitted landfill footprint as of the end of 2021 was approximately 17,249,778 cubic yards. This information is updated annually with aerial flyovers. Using 0.80 tons/cy, the remaining available landfill space expressed in tons is about 13,799,822 tons. Using an average disposal rate of approximately 750,000 tons per year, there are about 18.40 years of landfill space available. If we use our 3-year density average of 0.93 tons/cy, the site life extends to 21.38 years.

This illustrates the importance of density on landfill site life.

As the density (compaction) is lowered per ton of solid waste due to the varying waste compostion, then more headspace is consumed in the landfill thereby lowering landfill space available.

The remaining Airspace (CY) in the table to the left for Year2022 is adjusted for Scenario 2 data provided by Ian MacNab member of Subcommittee A1 – Republic Services.

Reference MacNab's e-mail of 11/22/22 – Coffin Butte Landfill Capacity, which outlines the following scenarios for for site life of the landfill.

Site life scenarios are based on the capping of the cells when reaching the final design elevation of the landfill, but does not include the decomposition cycle of the solid waste when the cell is capped.

Site:	Coffin Butte Landfill
Project Name:	2021 Site Development Plan Update
Date:	12/23/2021
Calc By:	ASO
Reviewed By:	RB

Projected Daily Waste Receipt 2,959 tons/day (from 2021 5 Yr Fill Plans)

Assume [1] 0.0 % growth rate

Operational Density 0.8 ton/cy (from 2021 5 Yr Fill Plans)

Operational Days 286 days/year

Remaining Site Life 18 Years

Note [1]: Growth Rate Based On Site Aerial Budget Model

Year	Consumed Airspace (cy)	Remaining Airspace (cy)	
2021	1,072,037	4,834,330	*Cell 5D/5E Constructed Remaining from 3/30/21 survey date
2022	1,057,700	3,776,631	
2023	1,057,700	2,718,931	
2024	1,057,700	1,661,232	
2025	1,057,700	603,532	
2026	1,057,700	1,028,093	Construct Phase 6A (Add 1,482,260 cy)
2027	1,057,700	999,823	Construct Phase 6B (Add 1,029,430 cy)
2028	1,057,700	1,684,254	Construct Phase 6C (Add 1,742,130 cy)
2029	1,057,700	626,554	
2030	1,057,700	1,428,675	Construct Phase 6D (Add 1,859,820 cy)
2031	1,057,700	370,975	
2032	1,057,700	391,696	Construct Phase 6E (Add 1,078,420 cy)
2033	1,057,700	1,020,066	Construct Phase 6F (Add 1,686,070 cy)
2034	1,057,700	1,977,627	Construct Phase 6G (Add 2,015,260 cy)
2035	1,057,700	919,927	
2036	1,057,700	1,157,678	Construct Phase 6H (Add 1,295,450 cy)
2037	1,057,700	99,978	
2038	1,057,700	664,409	Construct Phase 6I (Add 1,622,130 cy)
2039	664,409	0	

BC

Year	Annual CBR Intake Tons	CBR Density Ration	CBR Annual Airspace Used (CY)	CBR Remaining Airspace (cy)
1993	310,648			
1994	268,472			
1995	287,932			
1996	369,835			
1997	378,919			
1998	395,751			
1999	403,697			
2000	413,493			
2001	426,000	0.9	473000	25,238,000
2002	457,000	0.98	561,592	24,776,627
2003	550,360	0.98	561,592	24,209,320
2004	589,147	0.80	736,434	24,513,192
2005	580,275	0.80	725,344	29,916,144
2006	624,875	0.8	781,094	29,135,051
2007	546,996	0.8	683,746	28,451,306
2008	528,395	0.8	660,494	27,785,082
2009	519,058	0.8	648,823	27,136,259
2010	458,590	0.892	514,111	27,382,241
2011	482,951	1.0375	465,495	24,807,718
2012	473,440	0.83	572,825	23,741,843
2013	479,160	0.92	523,100	24,458,567
2014	499,687	0.92	545,510	23,839,138
2015	530,971	0.89	595,593	23,839,138
2016	552,979	0.93	592,689	22453729
2017	941,430	0.97	969,048	21,727,371
2018	1,010,879	0.99	1,021,090	18,015,098
2019	1,034,934	0.8	1,293,668	18,352,257
2020	863,210	1	863,210	17,621,208
2021	1,046,067	0.98	1,067,415	17,249,778
2022	1,100,000	0.999	1,089,900	16,008,557
2023	1,100,000	0.999	1,089,900	14,918,657
2024	1,100,000	0.999	1,089,900	13,828,757
2025	1,100,000	0.999	1,089,900	12,738,857
2026	1,100,000	0.999	1,089,900	11,648,957
2027	1,100,000	0.999	1,089,900	10,559,057
2028	1,100,000	0.999	1,089,900	9,469,157
2029	1,100,000	0.999	1,089,900	8,379,257
2030	1,100,000	0.999	1,089,900	7,289,357
2031	1,100,000	0.999	1,089,900	6,199,457
2031	1,100,000	0.999	1,089,900	5,109,557
2033	1,100,000	0.999	1,089,900	4,019,657
2034	1,100,000	0.999	1,089,900	2,929,757
2034	1,100,000	0.999	1,089,900	1,839,857
2035	1,100,000	0.999	1,089,900	749,957
2036	750,708	0.999	749,957	0

Appendix C: Landfill Properties

Coffin Butte Landfill Properties					
	Tax Lot #	**Current Zone**	**Previous Zone (Change Date)**	**Property Use**	**Date Acquired and Ownership**
1	105130000901	Exclusive Farm Use	Agricultural and Forestry (AF) (1982)	Agriculture	March 2001, Valley Landfills, Inc. Deed 295810-01
2	105130000900	Exclusive Farm Use	Agricultural and Forestry (AF) (1982)	Agriculture, barn	March 2001, Valley Landfills, Inc. Deed 295810-01
3	105130000902	Exclusive Farm Use	Agricultural and Forestry (AF) (1982)	Agriculture	March 2001, Valley Landfills, Inc. Deed 295810-01
4	105130001000	Landfill Site/ Forest Conservation (Northeast Corner)	Forest Conservation Forty Acre Minimum (FC-40) (1983)	Disposal Cell 1A, Cell 1, Cell 5, Future Cell 6, Current/Future Asbestos Disposal area, Rock quarry entrance and scale house (2021 SDP); Quarry excavation and landfilling in FC zone (2002)	October 1974, Valley Landfills, Inc. Deed M-50855 Consolidated with Tax Lot 105130000205 (4.69 ACRE) and Tax Lot 105130000204 (1.74 ACRE) in 1992
5	104180001106[2]	Landfill Site	Forest Conservation Forty Acre Minimum (FC-40) (1983)	Disposal Cell 1, Cell 3	November 1994, Valley Landfill, Inc. Deed M-192291-94 Segregated Parcels 104180001108 (29.22 AC) & 104180001109 (51.39 AC) in 2011. Went from 100 acres to 20.15
6	104180000301	Landfill Site (South)/ Forest	Forest Conservation Forty Acre	Disposal Cell 5 and forested hillside	March 1978, Valley Landfills, Inc. Deed M-91774

[2] Highlighted cells show the properties which Republic Services said were likely purchased prior to the 1983 zoning changes. More research is needed.

Coffin Butte Landfill Properties					
	Tax Lot #	**Current Zone**	**Previous Zone (Change Date)**	**Property Use**	**Date Acquired and Ownership**
		Conservation (North)	Minimum (FC-40) (1983)		Segregated from 104180000300 in 1972
7	104180000801[3]	Landfill Site/ Forest Conservation	Forest Conservation Forty Acre Minimum (FC-40) (1983)	Disposal Cell 2, Cell 3, Cell 4, Cell 5, Scale house, public disposal area, stormwater ponds, bioswale, Toretie Marsh (2021 SDP); landfilling in FC zone (2003); transfer facility, stormwater conveyance/detention, container/drop box storage area, landfill construction staging/storage area (2011)	July 1988, Valley Landfills, Inc Deed M-102558-88 Segregated from 104180000800 in 1988
8	104180001108[4]	Landfill Site	Forest Conservation Forty Acre Minimum (FC-40) (1983)	Disposal Cell 4, Entrance, stormwater pond, Toretie Marsh (2021 SDP)	November 1994, Valley Landfill, Inc. Deed M-192291-94 Segregated from 104180001106 in 2011
9	104180000900	Forest Conservation	Agricultural and Forestry (AF) (1982)	Wetland, pond	July 1988, Valley Landfills, Inc. Deed 1988-101891 Segregated from 104180000800 in 1968
10	105130000800	Exclusive Farm Use	Agricultural and Forestry (AF) (1982)	Stormwater treatment facility (pond and biofiltration strip) (2015), Soap Creek, Agriculture	February 1997, Valley Landfills, Inc Deed 1997-224922
11	104180001101	Forest Conservation	Rural Residential, 5	Construction staging/storage area, office (2013)	December 1991, Valley Landfills, Inc Deed 142396-91

[3] Highlighted cells show the properties which Republic Services said were likely purchased prior to the 1983 zoning changes. More research is needed.
[4] Highlighted cells show the properties which Republic Services said were likely purchased prior to the 1983 zoning changes. More research is needed.

Coffin Butte Landfill Properties					
	Tax Lot #	**Current Zone**	**Previous Zone (Change Date)**	**Property Use**	**Date Acquired and Ownership**
			Acre Minimum (1982)		
12	104180001104	Forest Conservation	Rural Residential, 5 Acre Minimum (1982)	Construction staging/storage area (2013)	January 1987, Valley Landfills Inc. Deed 1987-086356 Segregated from 104180001101 in 1969
13	104180001102	Forest Conservation	Rural Residential, 5 Acre Minimum (1982)	Vacant, non-forested land	March 1990, Valley Landfills, Inc Deed 123022-90
14	104180001107[5]	Landfill Site	Forest Conservation Forty Acre Minimum (FC-40) (1983)	Leachate Maintenance facility/leachate ponds (2021 SDP)	August 1987, Valley Landfills, Inc. Deed 1987-092809 Segregated from 104180001100 in 1977
15	104180001200	Forest Conservation	Rural Residential, 5 Acre Minimum (1982)	2.2 Megawatt power generation facility (originally on lot 1100) (1994)	September 1986, Valley Landfills, Inc. Deed 1986-081011
16	104180001000	Forest Conservation	Rural Residential, 5 Acre	forest	March 1986, Valley Landfills, Inc. Deed 1986-077318

[5] Highlighted cells show the properties which Republic Services said were likely purchased prior to the 1983 zoning changes. More research is needed.

Coffin Butte Landfill Properties					
	Tax Lot #	**Current Zone**	**Previous Zone (Change Date)**	**Property Use**	**Date Acquired and Ownership**
			Minimum (1982)		Segregated from 104180001100 in 1968
17	105240000200	Exclusive Farm Use	Agricultural and Forestry (AF) (1982)	Agriculture, forest, creeks	December 1989, Valley Landfills, Inc Deed M-118414-89
18	105240000103	Exclusive Farm Use	Agricultural and Forestry (AF) (1982)	Minor Land Partition 1980-017312; Formerly part of 105240000100	April 1988, Valley Landfill Inc. Deed 1988-099247 Segregated from 105240000100 in 1980
19	10419B001600	Rural Residential - 10	RR-10 Planned Unit Development (PUD)	Vacant residential Former subdivision/Planned Development BCS-78-5, LD-82-11, Tampico Ridge Subdivision vacated in 1988	December 1999, Valley Landfills, Inc. Deed 1999-276868 Segregated from 10419B000100/00200/01400 in 1988, Segregated from 10419B001601 in 1999
20*	104180000200	Forest Conservation		Forested land	01/07/1998, purchased by Peltier Real Estate Co Deed 239947-98 Taxes paid by Republic Services
21*	104180001105	Exclusive Farm Use		Agriculture	October 1982, purchased by Peltier Real Estate Co Deed 1982-041706 Taxes paid by Republic Services Property Tax
22*	10419B000300	Rural Residential - 10	RR-10	Vacant residential	09/07/1999, purchased by Peltier Real Estate Co Deed 277841-99 Taxes paid by Republic Services

Coffin Butte Landfill Properties					
	Tax Lot #	**Current Zone**	**Previous Zone (Change Date)**	**Property Use**	**Date Acquired and Ownership**
23	10419B001301	Rural Residential - 10	RR-10	Vacated right-of-way Former subdivision/Planned Development BCS-78-5, LD-82-11, part of Tampico Ridge Subdivision vacated in 1988	September 1988, Valley Landfills Inc. Deed M-106768-88 Formerly part of 10419B000300

[i] Endnotes to come.

[ii] Endnotes to come…