From:	Ken Eklund
To:	REDICK Daniel
Cc:	Sam Imperati; Benton County Talks Trash
Subject:	The missing Section 3 texts
Date:	Tuesday, January 17, 2023 1:04:17 PM
Attachments:	Master Working Document Subcommittee A1 Report v5 Section 3 KE.docx Master Working Document Subcommittee A1 Report v5 Section 3 KE.pdf

Hi Daniel,

Here are the Section 3 texts that are missing from the latest draft of the A1 subcommittee master report, converted to Word format. To help with format compatibility, I have simplified this document by deleting everything except Section 3, and accepting all edits (comments, however, should be preserved). I'll attach a PDF of the document also, so you have something to refer to if things get gwonkly in the Word version.

All best,

Ken

Ken Eklund, writerguy

Creator of
World Without Oil
Ed Zed Omega
FutureCoast
and other storymaking games

Section 3: Landfill Life Projections

A. Baseline: Projection to End 2022

Intake at Coffin Butte Landfill in 2022 have not been finalized at the time of this writing, so we are using the projected figure of 1M tons. This gives us a projected volume of 16,008,557 cubic yards as of end-of-year 2022. This projected volume is Remaining Permitted Airspace, not available airspace; it includes a significant volume of unexcavated rock.

B. Nominal Life Projection CY 2023 to End of Life

The figure below (Figure 3B-1) establishes a baseline, a simple operational projection that more sophisticated scenarios can be built upon. 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). As indicated in its Assumptions, this baseline scenario is not a "default future"; it is not realistic, in that it references itself only and does not incorporate outside factors.

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

Assumptions:

Tons per Year – Projected tonnage based on recent history (2019,2021) and 2020 FA tonnage cap (1.1M tons/yr). Does not reflect variables such as changes in disposal and diversion rates, natural disasters, market and regulatory changes, etc.

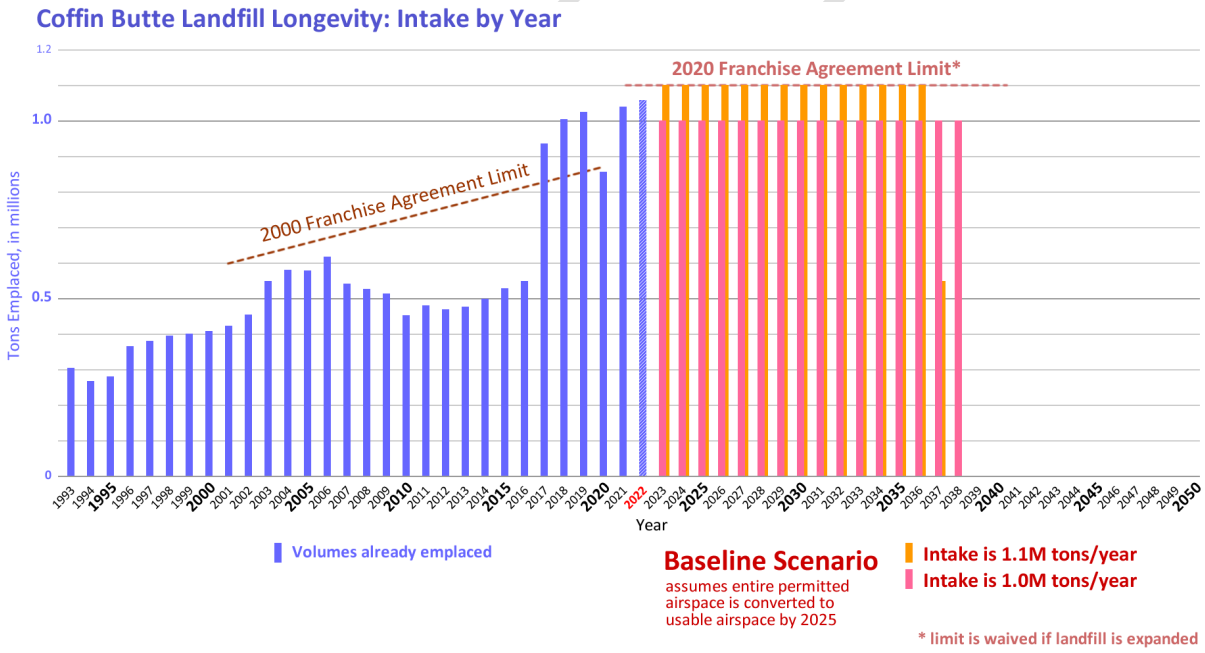
Projected Remaining Airspace – Airspace consumed in 2022 based on projected 2022 tonnage and 3-year Density Average. "Remaining airspace" includes approximately 2.7M cubic yards of quarry rock; how much of, and by when, this rock can be converted to airspace is currently unknown. 2022 quarry extraction freed up approximately 140,000 cubic yards.

2022 3-year Density Average – derived from 2020-22 measurements. 2022 density based on 2021 measurements.

Site Life – Time to fill the projected remaining airspace, including the airspace currently unexcavated.

(These I believe are qualifiers to the numbers in Figure 3B-1. Someone should write them out for real but I don't feel qualified to do that)

- Derived from Republic Services annual measurements
- Describe the underlying method for calculating these numbers
- 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



The longevity timeline in the baseline is shown in Figure 3B-2; this figure includes historic data for context.

The baseline is a simple longevity projection prepared by the landfill owner for operational purposes, and by design does not reflect the influence of real-world variables. To estimate the landfill's real-world operational lifetime, these influences must be considered. We have identified some of these influences and outline their possible effects in Section 3C. For simplicity's sake, we will use the 1.1M tons/year

assumption ("Scenario 2") and also assume full conversion of rock space in the quarry area into usable airspace as the baseline in Section 3C.

C. Events and Factors with Potential Lifetime Impact

Although the physical parameters of Coffin Butte Landfill play a role in its longevity, 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 of 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 and the events they bring about.

The subcommittee has generated a Table of potential factors impacting site life, and characterized some of them briefly and others in more detail. Our goal was to begin to describe the "terrain" that the landfill's future will traverse. This list is not exhaustive and our characterizations limited; we hope a more complete list and more detailed characterizations will come as Benton County prepares a Sustainable Materials Management Plan.

⬅️_Factors that shorten landfill life (trend the fill rate to baseline or beyond)

Landfill contracts and business choices

Landfilling at Coffin Butte is a business, subject to the standard pressures of customer loyalty, competitive pressure, price resistance, etc. This factor will tend to keep the landfill life at baseline, as the landfill owner strives to counteract any decline in intake by growing the wasteshed / by lowering prices, etc.

➡️⬅️ Shortens landfill life (only as far as the baseline)

Lifestyle changes

Our society is constantly affording new opportunities for consumers to participate in, and this increased economic activity tends to generate more waste.

➡️⬅️ Shortens landfill life (only as far as the baseline)

Quarry excavation schedule

Our baseline assumes that 100% of the landfill's permitted airspace be converted into actual usable airspace before it is required for landfilling, but it is unclear at the time of this writing

how much of the rock currently occupying the airspace is going to be successfully excavated. The timeline may require that some or all of the rock is left in place. Example: a similar situation occurred earlier in the landfill's history, and quarryable rock was covered over with landfill.

An expanded discussion and visualization of this factor is included below.

⬅️ Shortens landfill life by not liberating landfill airspace

Water table concerns and regulation

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, or if permitted, will be cost-effective for the landfill owner to undertake. If the portion below the groundwater line is not usable / used, airspace would decrease and the lifespan of the landfill would shorten, in proportion to the volume affected.

⬅️ Shortens landfill life by not liberating landfill airspace

Area wildfires, floods, earthquakes and other disasters

Disasters can produce large amounts of debris. Example: Coffin Butte Landfill took in approximately 350,000 tons of debris in late 2020-early 2021 from the multiple area wildfires in 2020. The incidence of wildfire and flooding are generally expected to increase due to climate change. Disaster debris does not count toward the landfill's intake cap.

⬅️ Shortens landfill life by consuming landfill airspace

Impacts to other disposal facilities

Coffin Butte Landfill currently takes in about 1/3 of the trash generated in Oregon. If a provider of the other 2/3 can no longer service its wasteshed, it creates a business opportunity for the landfill owner to expand the Coffin Butte wasteshed. Example: in 2016 the Riverbend Landfill in Yamhill County lost its bid to expand, and because it was nearly full, this enabled the landfill owner to capture its flows of approximately 500,000 tons of waste yearly for Coffin Butte Landfill.

➡️⬅️ Shortens landfill life only as far as the baseline, if intake cap is maintained

⬅️ Shortens landfill life if intake cap is set aside

Impacts to the waste recovery system

The landfill owner depends on outside suppliers for many services outside of landfilling, and if these relationships break down, then material that was formerly diverted ends up in the

landfill. Example: Chinese recycling companies imposed new quality standards on imported recycled plastic in 2017-2018, and local recycling efforts could not meet those standards.

⬅️ Shortens landfill life by consuming landfill airspace

Population growth

As the wasteshed adds more people, it also adds the waste they generate. Example: Benton County's population is forecasted to grow steadily through 2071, with a population of over 120,000 in 2040.[1]

⬅️ Shortens landfill life (only as far as the baseline)

Localized fires, floods, spills and other disasters

Localized disasters can produce landfill material. Example: a fuel tanker that spilled on highway 9 generated many tons of contaminated dirt.

⬅️ Shortens landfill life by consuming landfill airspace

⬅️⬅️_Factors that shorten landfill life (threaten landfill operations)

Landfill fire

Although it is very rare, landfills can catch fire, either on their surface or as exothermic reactions deep under their surface. The ubiquitous presence of methane, a flammable gas, is a risk factor. A landfill fire ignited by an area wildfire is a troubling possibility. Exothermic reactions are deep in the landfill itself and take years to extinguish.

⬅️ Shortens or ends landfill life by ending operations

➡️ Factors that lengthen landfill life (diminish the fill rate)

Landfill expansion – removal of tonnage cap

Expansion. The baseline may only be fully realized in combination with a landfill expansion, which would create an alternate 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. The new site would likely be the same as the 2021 application site, the zone currently used for landfill operations south of Coffin Butte Road.

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

An expanded discussion and visualization of this factor is included below.

➡️ Extends landfill life by increasing permitted volume

Removal of tonnage cap. If an expansion is approved, by terms of the 2020 Franchise Agreement, the tonnage cap of 1.1M tons/year is removed, enabling the landfill owner to increase the Coffin Butte wasteshed without limit.

⬅️ Shortens landfill life by enabling increased fill rates

Successful competition from other disposal facilities

The landfill owner competes in the marketplace to establish and maintain the Coffin Butte wasteshed, and other facilities can and do successfully prevail. Example: although Washington County sent over 275,000 tons of waste to Coffin Butte Landfill in 2018, that amount decreased precipitously and was down to 36,000 tons in 2021, due presumably to successful competition by another disposal facility.

➡️ Extends landfill life by reducing source waste and therefore fill rate

Improvements to the waste recovery system / alternatives to landfilling

Waste recovery. We say the material headed for the landfill is “waste,” but the truth is, the majority of that material has productive utility. This profit incentive often is buttressed by cultural imperatives not to waste resources. The result is a wide array of initiatives at work ranging from system-wide resource recycling programs down to grassroots freesharing collaboratives. Examples: Too many to list, but the Food Donation Improvement Act, passed in 2022 with bipartisan support and signed into law in Jan 2023, aims to catalyze a major effort to address both hunger and the climate crisis by reducing food waste in America.[2]

➡️ Extends landfill life by reducing source waste and therefore fill rate

Landfill alternatives. Waste recovery is often augmented with measures that seek to prevent the harmful effects of landfilling, to get “beyond landfilling” by diverting materials to dedicated processing facilities or alternative disposal sites.

➡️ Extends landfill life by reducing source waste and therefore fill rate

Obsolescence. Landfilling is an old technology, and alternative processes already exist. Examples of this abound in Europe, where EU member nations are working together to move beyond landfilling.

➡️ Extends landfill life by reducing source waste and therefore fill rate

[2] https://www.washingtonpost.com/business/americas-food-waste-problem-is-a-hunger-solution-in-disguise/2023/01/06/a6f5ba22-8dbe-11ed-b86a-2e3a77336b8e_story.html

Reductions in waste generation

Systemic. No one enjoys throwing things away, but the systems by which we acquire and use material goods are often designed to generate trash. These systems are being redesigned to either recycle materials or to eliminate their trash components. Examples: there are many to choose from, but a focus right now is extended producer responsibility (EPR) initiatives such as Oregon SB 582, the Plastic Pollution and Recycling Modernization Act passed in 2021, which provides “a much more accessible, responsible and stable recycling system.”[3]

➡️ Extends landfill life by reducing source waste and therefore fill rate

Cultural. People individually can prioritize reducing waste, often in response to cultural or systemic cues. Example: the current recycling system relies on social engagement with issues of environmental awareness and action to inspire its volunteer actions to reuse, recycle, compost, etc. Historically, as shown in the historical data, this engagement goes up (and per-capita trash generation goes down) during Democratic administrations, when environmental issues are emphasized; the reverse is generally true during Republican administrations, when they are not.

➡️Extends landfill life by reducing source waste and therefore fill rate

Equity. Groups of people in the Coffin Butte wasteshed do not have equal access to recycling or other elements of waste reduction; measures are being designed to correct this. Example: Oregon SB 582, the Plastic Pollution and Recycling Modernization Act, contains provisions to fund reuse and waste prevention programs in these communities.[4]

➡️ Extends landfill life by reducing source waste and therefore fill rate

Recessions

Recessions reduce economic activity, which generally reduces the amount of waste produced throughout the wasteshed. Example: the Crash of 2008 can explain in part the historical intake decline beginning in late 2008 and continuing through 2012.

➡️ Extends landfill life by reducing source waste and therefore fill rate

Materials transportation

Materials with inherent value currently go into landfills just because where they are is not where they need to be for that value to be extracted. Investments and improvements into relevant transportation systems (such as intermodal transfer stations, which enable materials to be shipped more economically by rail) can enable materials to become less wasteful and less environmentally harmful and participate more fully in circular economies.

[3] https://www.wastetodaymagazine.com/news/oregon-signs-extended-producer-responsibility-law-packaging/

[4] https://www.wastetodaymagazine.com/news/oregon-signs-extended-producer-responsibility-law-packaging/

➡️ Extends landfill life by reducing source waste and therefore fill rate

The climate crisis

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. A major focus of activism worldwide is the release of methane, because methane is a potent and quick-acting greenhouse gas. Landfills are major sources of greenhouse gas emissions, especially methane, in the United States. Activism thus constitutes a powerful and growing force that is highly motivated to push forward actions that move beyond landfilling. Example: grassroots environmental activists successfully prevented landfill owners from expanding their landfills in both Yamhill and Benton counties in the last ten years.

➡️ Extends landfill life by reducing methane-generating waste going into the landfill

Litigation and Shareholder Action. Environmentally engaged citizens are suing governmental agencies, and investors are suing corporations, for failing to act responsibly on the climate crisis, and to force action to address the crisis. Example: the worldwide campaign of atmospheric trust litigation organized by Our Children's Trust, a public interest nonprofit law firm headquartered in Eugene.

➡️ Extends landfill life by reducing methane-generating waste going into the landfill

Legislation. The pressure generated by the public, science, financial, and industry communities concerned about the climate crisis is manifesting in legislation. Examples: in its 2021 Methane Emissions Reduction Plan, the US government is mobilizing "all available tools to identify and reduce methane emissions from all major sources," and in its 2023 Food Donation Improvement Act, it targets food waste, "the most common material found in landfills, constituting an estimated 24% of material" which generates large quantities of methane emissions.[5]

➡️ Extends landfill life by reducing methane-generating waste going into the landfill

➡️⬅️ Novel factors on landfill life

Pandemics

The COVID pandemic has had a significant but mixed impact on landfill life, which can be characterized as a profound reduction in waste generation in 2020 and a resurgence of

[5] https://www.whitehouse.gov/wp-content/uploads/2021/11/US-Methane-Emissions-Reduction-Action-Plan-1.pdf

waste generation in 2021, likely due to lifestyle adaptations such as increased at-home shopping. The pandemic will continue to have an effect as long as it is endemic.

➡️ Extends landfill life by reducing economic activity and therefore fill rate

➡️⬅️ Trends toward baseline by incentivizing activities that generate more waste

(These bullet points not yet addressed in the text above)

- Climate change impacts to landfill operations
- Landfill facility and technical challenges
- Staffing in the local and regional solid waste industry
- adjustments in diversion/recycling rates, and
- tonnage volume in the broader market.

List various known factors impacting longevity

~~Include footnotes that show we cannot predict every scenario~~

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.

Selected scenario expanded views

To help with visualizing the factors, a few of them are discussed in greater detail below.

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.

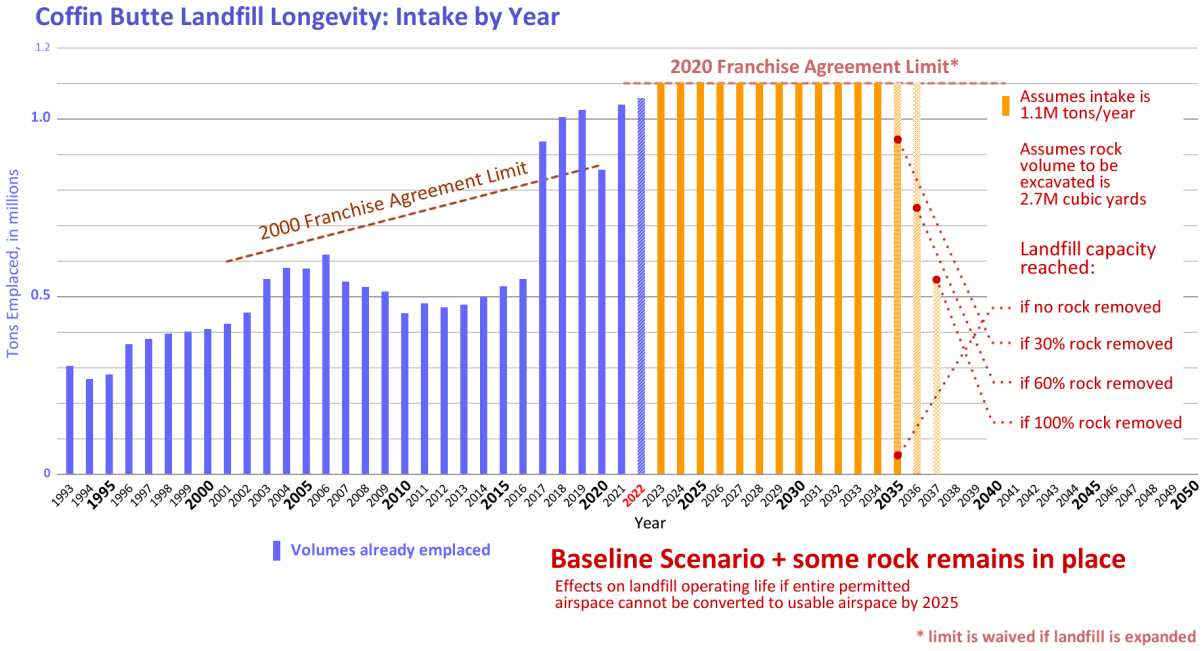

Figure 3.3

Scenarios built upon the Baseline: 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.

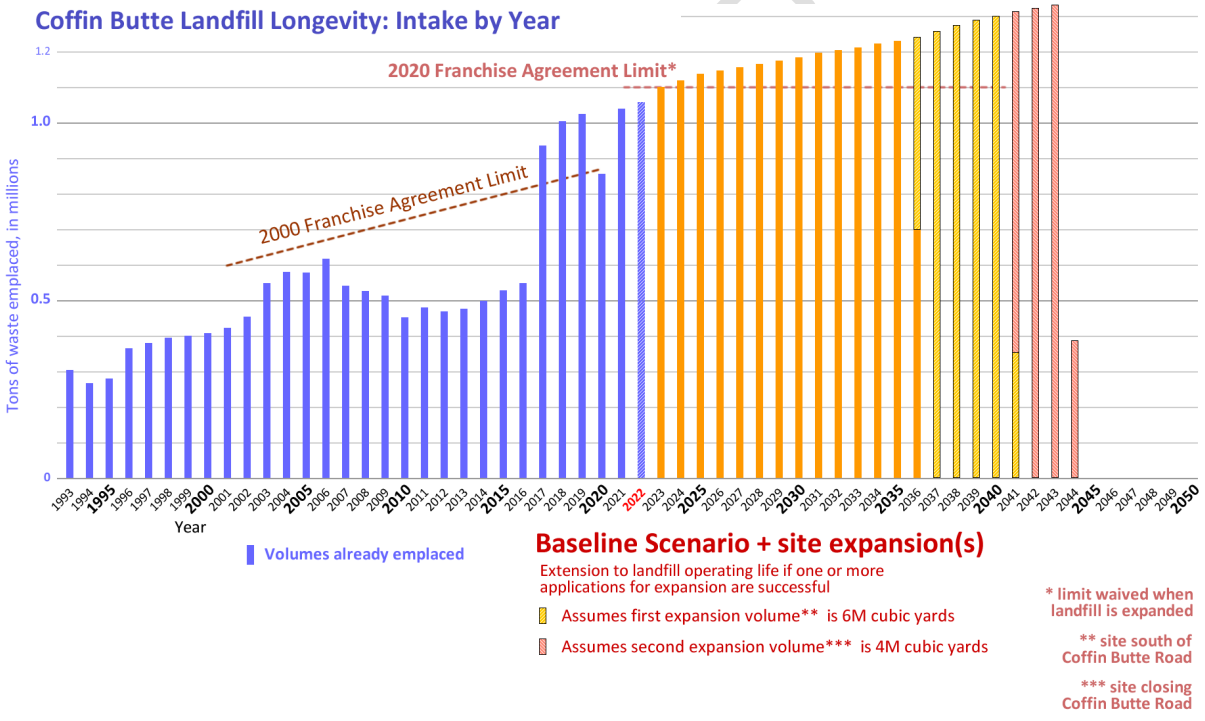

Figure 3.4

Scenarios built upon the Baseline: Historical Variance

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.

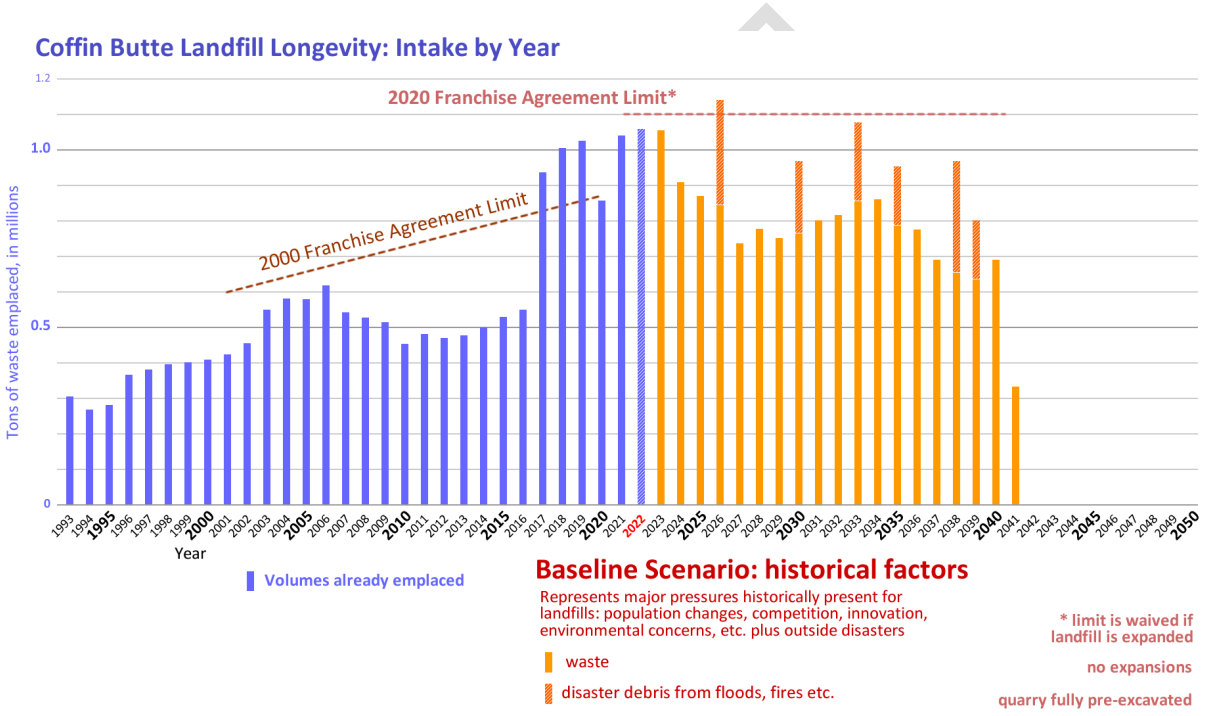

Figure 3.5

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