Waste Bulking Study Report

Study for Evaluating Availability of Traditional and Alternative Bulking Agents Originating within the State of Maine

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Acronyms

BGS	Maine Bureau of General Services
CDD	Construction and Demolition Debris
EPEC	Eagle Point Energy Center
JRL	Juniper Ridge Landfill
MDEP	Maine Department of Environmental Protection
MRC	Maine Review Committee
MSW	Municipal Solid Waste
POTW	Publicly-Owned Treatment Works
TRC	TRC Companies
WWTP	Wastewater Treatment Plant

Executive Summary

Recent Maine legislation, LD 1191, banning the land-application of Wastewater Treatment Plant (WWTP) biosolids due to the potential presence of PFAS within the material led to an increase in biosolids material being sent to Maine landfills. The high water-content of biosolids makes them challenging to place within a landfill, require specific waste placement procedures including blending with drier, higher-strength wastes used to bulk the material, and provide adequate drainage during disposition. This increased quantity of biosolids sent to Maine landfills has led to a need to evaluate the availability of bulking agents originating in Maine to stabilize landfills accepting these materials.

The State of Maine Department of Administrative and Financial Services, Bureau of General Services (BGS), contracted with TRC Companies, Inc. (TRC) to complete the *Study for Evaluating Availability of Traditional and Alternative Bulking Agents Originating within the State of Maine* which has the following objectives:

1. Evaluate the type/quantity of bulking agents needed to safely dispose of the WWTP biosolids produced in the State within solid waste landfills in Maine; and
2. Evaluate whether sufficient and consistent amounts of bulking agent originating in Maine are available to support continued acceptance of the current levels of municipal biosolids and other wet wastes at the Juniper Ridge Landfill and other solid waste landfills in Maine after July 1, 2025.

This study summarizes the results of, and included a review of, the types and quantities of waste managed within the state, collection of waste samples for physical characterization, and performance of a geotechnical assessment to provide recommendations for proper waste placement practices including determining potential ratios of bulking wastes necessary to adequately stabilize biosolids within a landfill setting under various placement practices. Additionally, the study included a review and update of the state's landfill capacity.

This study found that many of Maine's landfills are approaching capacity and, that without increasing capacity at the State-owned landfill, the currently permitted landfill capacity could be consumed within 10 years. Additionally, without adequate bulking wastes, the placement of increased biosolids material would lead to changes in operations at landfills including reduced slopes and final elevations, to ensure stability, which would decrease capacity further. Additionally, the availability of bulking waste experiences seasonal fluctuation due to Maine's climate, with construction projects slowing during the winter months leading to a reduced availability of CDD, its processing residue, and contaminated soil. While there are planned installations of sludge drying and processing technologies in the State, these are not projected to be operational until late 2025 and mid-2026.

Waste management options based on the study findings include the continuation of bulking practices at current ratios of 4-parts bulking materials to 1-part biosolids until biosolids processing technologies are implemented, developing additional capacity at JRL, and the potential development of biosolids monofill facilities to allow for increased diversion of Construction and Demolition Debris and other wastes from landfills.

1.0 Introduction

TRC Companies, Inc. (TRC) was selected by Bureau of General Services (BGS) in August 2024 to complete the *Study for Evaluating Availability of Traditional and Alternative Bulking Agents Originating within the State of Maine*. The study was conducted during the months of August through November of 2024.

1.1 Purpose

The purpose of this study is to determine the quantity and availability of traditional and alternative bulking agent materials within the State of Maine to be used by landfills to achieve a stable waste mass. This study summarizes the results and includes a review of the types and quantities of waste managed within the state, collection of waste samples for physical characterization, and performance of a geotechnical assessment to provide recommendations for proper waste placement practices, including evaluating potential ratios of bulking wastes necessary to adequately stabilize biosolids within a landfill setting under various placement practices. Additionally, the study included a review and update of the state's landfill capacity.

1.1.1 Legislative Background

In April 2022, during the second regular session of the 130th Maine legislature, two bills were passed nearly simultaneously that had the potential to impact waste management within the State of Maine, particularly at the state-owned Juniper Ridge Landfill (JRL).

LD 1911, "An Act To Prevent the Further Contamination of the Soils and Waters of the State with So-called Forever Chemicals," banned the land application, sale and distribution of biosolids-based soil amendments. With the elimination of reuse options for biosolids, the bulk of these materials were redirected to secure, lined, landfills within the state.

LD 1639, "An Act To Protect the Health and Welfare of Maine Communities and Reduce Harmful Solid Waste", revised the definition of "waste generated within the State" which previously classified products from a processing facility within the state of Maine that received waste originating outside of the State of Maine as in-state waste. Specifically, LD1639 limits the amount of residue that may be disposed of in the State to the weight of the solid waste initially generated in the State by that facility in its annual reporting period and eliminates provisions of the law regarding recycling and source reduction requirements for solid waste processing facilities that accept exclusively construction and demolition debris. The previous definition allowed for unrestricted disposal of residuals from Maine processing facilities within Maine's landfills.

1.1.2 Need

While LD 1911 and LD1639 were not connected, the former led to an increase in wet wastes (i.e., biosolids) requiring disposal within Maine landfills and the latter reduced the availability of bulking materials available to landfills in Maine traditionally used for the placement of these less stable wastes.

Shortly after passage of these bills, JRL received a large and unexpected amount of biosolids material and an inadequate quantity of bulking material to place in accordance with the procedures outlined in the Facility's Operations Manual. The significant and sudden nature of the changes to the waste mix did not allow JRL time to consider alternative placement measures that would allow the volume of biosolids to be disposed of in a stable manner without the use of a bulking material.

This led to an operating area within the landfill that was temporarily not suitable for waste haul vehicles and difficult for the operation of waste placement equipment, including the typical bulldozers and compactors, resulting in a brief shutdown at the facility which accepts the majority of the biosolids produced in the state of Maine. The incident triggered a temporary stay on LD 1639, allowing for use of previously approved bulking agents. LD 1639 will go back into effect on July 1, 2025.

Due to the aforementioned legislative changes and the impacts observed on the operations at JRL, there is a need to evaluate the physical properties of biosolids being disposed of in Maine Landfills, waste placement methodologies that would result in a stable waste mass, and the availability of bulking material where traditional waste bulking will be required to understand whether the State generates sufficient and consistent bulking material to stabilize landfills accepting an increased amount of biosolids and other wet wastes throughout all seasons and into the future.

1.2 Objective

The objective of this study was to:

1. Evaluate the type/quantity of bulking agents needed to safely dispose of the WWTP biosolids produced in the solid waste landfills in Maine, and

2. Evaluate whether sufficient and consistent amounts of bulking agent are available as in-state waste to support continued acceptance of the current levels of municipal biosolids and other wet wastes at the Juniper Ridge Landfill and other solid waste landfills in Maine after July 1, 2025.

1.3 Site Description

The JRL is a state-owned landfill which was originally owned by the James River Paper Company, Inc. In 1993 the James River Paper Company was issued a license (license #S-020700-7A-A-N) to construct and operate a 68-acre secure landfill for the disposal of pulp and papermaking residuals, bottom ash, and burn pile ash. On October 21, 2003, the MDEP issued conditional approval for the transfer of the licenses for the WOTL from Fort James Operating Company to the SPO (DEP #S-02700-WR-M-T and #L-019015-TH-C-T). The transfer became effective when the sale of the landfill to SPO occurred on February 5, 2004, and JRL is now permitted to receive Maine-generated non-hazardous solid waste material streams including Municipal Solid Waste (MSW) bypass, construction and demolition debris (CDD) and its processing residuals, sludges and biosolids, ash, contaminated soils, and other waste streams as approved by the Maine Department of Environmental Protection (MDEP). JRL operations are regulated pursuant to the MDEP Rules Chapters 400, 401, and 405, and the landfill holds licenses through the MDEP which cover the 2004 operational transfer from Fort James (#S-020700-WR-M-T), as well a vertical increase in 2004 (#S-020700-WD-N-A) and an expansion in 2017 (#S-020700-WD-BI-N). JRL is located within a 780-acre property in Old Town,

ME, with a physical address of 2828 Bennoch Rd, in Alton, ME, and has a currently permitted solid waste footprint of approximately 122 acres.

The landfill was purchased, designed, and permitted to serve as a secure solid waste disposal facility to meet the disposal needs of the citizens of the State of Maine. The landfill is designed and operated to be protective of human health and the environment and is constructed with a composite liner meant to capture contaminants from the waste and limit potential release to the groundwater beneath or to the surrounding areas.

From the bottom up, the landfill consists of an underdrain system designed to direct groundwater away from the liner system, an augmented secondary liner system consisting of an extra foot of compacted clay, a secondary composite liner system, a leak detection system, a primary composite liner system, leachate collection and off-site treatment for liquid in contact with waste, landfill gas collection and control infrastructure, stormwater management, and a water quality monitoring network. All leachate generated on-site is collected and transported to the ND OTM LLC (ND Paper) wastewater treatment plant in Old Town, ME, for treatment. JRL currently consists of 16 permitted cells which hold a permitted 19.55 million cubic yards of capacity. At the time of the submission of the 2023 Annual Report, a total of 5.4 million cubic yards of permitted capacity remained at the JRL.

Other features located at the JRL include a 2-mile primary access road, a maintenance and operations building as well as several ancillary storage buildings and associated parking areas, a dual scale house, a stormwater detention pond which was historically used for leachate storage, five primary leachate storage pumps, a leachate haul truck loading rack, a water haul truck loading rack, detention/sedimentation ponds located throughout the facility's footprint, a construction laydown area to facilitate ongoing construction activities on-site, a storage and processing pad for any clean wood debris and railroad ties that are brought to site, a paved perimeter road, Thiopaq gas scrubbing system, a Renewable Natural Gas (RNG) processing facility, and two landfill gas flares which are separately owned, one by the JRL and the other by the RNG processing facility.

1.4 Current Use of the Site

The JRL is currently an open operational landfill that accepts and disposes of non-hazardous solid waste streams generated within the State of Maine. Waste streams are comingled during placement, with the physical and chemical characteristics of the waste considered to ensure maintained drainage and stability at the landfill. At the end of each day, daily cover, usually as compacted soil, CDD fines, or alternate daily cover foam, is applied to working areas and is then removed or worked into the waste at the beginning of the following day of operations. Daily cover is applied to limit the release of odors and minimize the potential for vector attraction. JRL's operational hours are Monday through Friday from 6:00am to 5:00pm, and Saturday from 7:00am through 12:00pm. The landfill is closed on Sundays.

2.0 Technical Approach

To perform an analysis of the types and quantities of waste managed within the State, TRC performed a review of the most recent 2 years of annual reports for landfills, transfer stations, and processing facilities submitted to the MDEP that were available as of the date of this study. Upon completion of

the data review, facilities were contacted to obtain additional information regarding potential future expansion or closure plans.

Data collected during the annual report reviews was used to select sources of biosolids and bulking materials for collection of waste samples for physical characterization. The wastes selected for analysis represented a mixture of the sources of the greatest quantity of a given waste material (e.g., large wastewater treatment facility), sources of varying waste properties (e.g., anaerobically digested biosolids), and homogenous bulking agents (e.g., construction and demolition debris processing fines, ash, and auto-shredder residue). The intent of this effort was to evaluate the individual strength properties including moisture content (ASTM D2216), Atterberg Limits (ASTM D4318), grain size sieve (ASTM D422), visual lab description (ASTM D2488), and waste mixture properties including remolded CU triaxial test (ASTM D4767), confining pressures, and recompacted test moisture and density.

The material properties obtained during sampling were used, in conjunction with site specific landfill geometry and placement practices, including compaction equipment properties, to perform a geotechnical assessment to evaluate waste placement practices that will result in a stable waste mass and, when bulking is required, the ratio of bulking wastes necessary to adequately stabilize biosolids within a landfill setting. Wastes containing bulky, heterogeneous materials cannot be representatively sampled for small-scale laboratory analysis; available literary values were used for these materials within the geotechnical analysis.

2.1 Annual Report Review

Upon initiation of the study, TRC contacted MDEP to receive copies of the most recent 2-years of annual reports for transfer stations, landfills, and processing facilities. TRC received reports for 159 transfer stations, 25 landfills, and 9 processing facilities. The results of the review of these documents are discussed below.

2.1.1 Transfer Stations Within the State of Maine

2.1.1.1 Current Capacity

There are currently 159 permitted transfer facilities in the State of Maine according to 2022 and 2023 annual reports received by the MDEP from transfer stations located in all counties throughout the State. In 2023, these stations reportedly transferred a total of approximately 1,063,183 tons of waste to licensed landfills, processing facilities, incinerators, and recycling plants. Figure 1 provides a visual representation of each county's transfer activity by tons of MSW and CDD waste relocated to Maine landfills, with the remainder shown as recycled material.

2.1.1.2 Characterizations By County – 2023

While TRC reviewed all waste movement throughout the state, the waste materials handled by transfer stations are generally limited to those materials originating from individual residents or commercial entities. Industrial or special wastes like ash, biosolids, and contaminated soils are not transferred through these facilities. Additionally, while it is important to note that municipalities are

taking every effort to divert materials from landfills and recycle materials like metals, glass, cardboard, etc., those materials were not considered with this analysis since we are focused on materials to be blended with biosolids within Maine landfills.

Table 1 below presents the quantity of MSW and CDD that was handled by Maine transfer stations in 2023 by county.

Table 1. MSW and CDD Transferred in Maine in 2023 by County

County	MSW (tons)	CDD (tons)
Androscoggin	683	11,805
Aroostook	9,158	2,705
Cumberland	80,568	122,639
Franklin	4,206	829
Hancock	31,039	2,035
Kennebec	40,374	25,695
Knox	6,396	1,469
Lincoln	6,594	3,267
Oxford	9,409	1,755
Penobscot	7,621	29,811
Piscataquis	4,157	1,212
Sagadahoc	34,679	17,046
Somerset	17,527	24,474
Waldo	1,094	1,075
Washington	11,250	18,052
York	34,644	5,803
Totals	**299,399**	**269,672**

Discussion of the destination for each waste type is provided below. Discrepancies in the following figures are due to a number of factors which are presented and discussed in Section 2.1.1.3.

2.1.1.2.1 Androscoggin County

Androscoggin County transfer stations accepted and transferred a reported total of approximately 31,160 tons of material during 2023, with approximately 11,805 tons of CDD waste and 683 tons of MSW waste being hauled to landfills. Landfills that received waste from Androscoggin County transfer stations include Crossroads (Norridgewock) Landfill, Juniper Ridge Landfill, and the Lewiston Landfill. The remaining 18,672 tons of material was hauled to recycling facilities and incineration.

2.1.1.2.2 Aroostook County

Aroostook County transfer stations accepted and transferred a reported total of approximately 25,155 tons of material during 2023, with approximately 2,705 tons of CDD waste and 9,158 tons of MSW waste being hauled to landfills. The only landfill that received waste from Aroostook County

transfer stations was the Aroostook Waste Solutions Tri-Community Landfill. The remaining 13,247 tons of material was hauled to recycling facilities.

2.1.1.2.3 Cumberland County

Cumberland County transfer stations accepted and transferred a reported total of approximately 265,176 tons of material during 2023, with approximately 122,369 tons of CDD waste and 80,568 tons of MSW waste being hauled to landfills. Landfills that received waste from Cumberland County transfer stations include Juniper Ridge Landfill, Crossroads (Norridgewock) Landfill, and the Brunswick Landfill. The remaining 61,501 tons of material was hauled to recycling facilities.

2.1.1.2.4 Franklin County

Franklin County transfer stations accepted and transferred a reported total of approximately 16,534 tons of material during 2023, with approximately 829 tons of CDD waste and 4,206 tons of MSW waste being hauled to landfills. The only landfill that received waste from Franklin County transfer stations in 2023 was the Crossroads (Norridgewock) Landfill. The remaining 11,053 tons of material was hauled to recycling facilities.

2.1.1.2.5 Hancock County

Hancock County transfer stations accepted and transferred a reported total of approximately 48,565 tons of material during 2023, with approximately 2,035 tons of CDD waste and 31,039 tons of MSW waste being hauled to landfills. The only landfill that received waste from Hancock County transfer stations in 2023 was the Juniper Ridge Landfill. The remaining 15,412 tons of material was hauled to recycling facilities.

2.1.1.2.6 Kennebec County

Kennebec County transfer stations accepted and transferred a reported total of approximately 299,266 tons of material during 2023, with approximately 25,695 tons of CDD waste and 40,374 tons of MSW waste being hauled to landfills. Both the Juniper Ridge Landfill and the Crossroads (Norridgewock) Landfill received waste from Kennebec County transfer stations. The remaining 234,068 tons of material was hauled to recycling facilities.

2.1.1.2.7 Knox County

Knox County transfer stations accepted and transferred a reported total of approximately 18,747 tons of material during 2023, with approximately 1,469 tons of CDD waste and 6,396 tons of MSW waste being hauled to landfills. Landfills that received waste from Knox County transfer stations include the Crossroads (Norridgewock) Landfill, Juniper Ridge Landfill, and the Rockland Landfill. The remaining 10,876 tons of material was hauled to recycling facilities.

2.1.1.2.8 Lincoln County

Lincoln County transfer stations accepted and transferred a reported total of approximately 29,874 tons of material during 2023, with approximately 3,267 tons of CDD waste and 6,594 tons of

MSW waste being hauled to landfills. The Crossroads (Norridgewock) Landfill was the only landfill to receive wastes from Lincoln County transfer stations. The remaining 19,440 tons of material was hauled to recycling facilities.

2.1.1.2.9 Oxford County

Oxford County transfer stations accepted and transferred a reported total of approximately 38,351 tons of material during 2023, with approximately 1,755 tons of CDD waste and 9,409 tons of MSW waste being hauled to landfills. The only landfill that received waste from Oxford County transfer stations in 2023 was the Crossroads (Norridgewock) Landfill. The remaining 27,142 tons of material was hauled to recycling facilities.

2.1.1.2.10 Penobscot County

Penobscot County transfer stations accepted and transferred a reported total of approximately 64,268 tons of material during 2023, with approximately 29,811 tons of CDD waste and 7,621 tons of MSW waste being hauled to landfills. Landfills receiving waste from Penobscot County transfer stations include Juniper Ridge Landfill, Dolby Landfill, and Crossroads (Norridgewock) Landfill. The remaining 26,560 tons of material was hauled to recycling facilities.

2.1.1.2.11 Piscataquis County

Piscataquis County transfer stations accepted and transferred a reported total of approximately 7,384 tons of material during 2023, with approximately 1,212 tons of CDD waste and 4,157 tons of MSW waste being hauled to landfills. Landfills receiving waste from Piscataquis County transfer stations include Juniper Ridge Landfill, Dover-Foxcroft Landfill, Crossroads (Norridgewock) Landfill, and Pine Tree Landfill. The remaining 1,940 tons of material was hauled to recycling facilities.

2.1.1.2.12 Sagadahoc County

Sagadahoc County transfer stations accepted and transferred a reported total of approximately 59,847 tons of material during 2023, with approximately 17,046 tons of CDD waste and 34,679 tons of MSW waste being hauled to landfills. Landfills receiving waste from Sagadahoc County transfer stations include the Juniper Ridge Landfill, Crossroads (Norridgewock) Landfill, and the Bath Landfill. The remaining 8,122 tons of material was hauled to recycling facilities.

2.1.1.2.13 Somerset County

Somerset County transfer stations accepted and transferred a reported total of approximately 47,927 tons of material during 2023, with approximately 24,474 tons of CDD waste and 17,527 tons of MSW waste being hauled to landfills. Landfills receiving wastes from Somerset County transfer stations include the Hartland Landfill, Crossroads (Norridgewock) Landfill, and the Juniper Ridge Landfill. The remaining 5,800 tons of material was hauled to recycling facilities.

2.1.1.2.14 Waldo County

Waldo County transfer stations accepted and transferred a reported total of approximately 2,937 tons of material during 2023, with approximately 20 tons of CDD waste and 1,075 tons of MSW waste being hauled to landfills. Landfills receiving waste from Waldo County transfer stations include the Juniper Ridge Landfill and Crossroads (Norridgewock) Landfill. The remaining 1,843 tons of material was hauled to recycling facilities.

2.1.1.2.15 Washington County

Washington County transfer stations accepted and transferred a reported total of approximately 30,030 tons of material during 2023, with approximately 18,052 tons of CDD waste and 11,250 tons of MSW waste being hauled to landfills. Landfills receiving waste from Washington County transfer stations include Juniper Ridge Landfill, Crossroads (Norridgewock) Landfill, and the Baileyville CDD Landfill. The remaining 728 tons of material was hauled to recycling facilities.

2.1.1.2.16 York County

York County transfer stations accepted and transferred a reported total of approximately 77,812 tons of material during 2023, with approximately 5,803 tons of CDD waste and 34,644 tons of MSW waste being hauled to landfills. Landfills receiving waste from York County transfer stations include the Crossroads (Norridgewock) Landfill and Juniper Ridge Landfill. The remaining 37,497 tons of material was hauled to recycling facilities.

2.1.1.3 Considerations, Discussions and Potential Data Gaps

Transfer station data was analyzed to better understand current waste streams in the State of Maine and the flow of such streams. Analyzing this data shows potential available materials within the State that could be used as bulking agents at landfills that accept biosolids and will need an increase in such materials in order to ensure landfill stability. These trends are shown on Figure 1, with waste types and quantities broken down by County.

Cumberland and Kennebec counties transferred a considerable amount more waste than any other county, both moving upwards of 260-300,000 tons of waste during 2023, with no other county approaching 100,000 tons. However, Cumberland County transferred a considerable amount more CDD waste than Kennebec County, with it taking up the majority of materials moved for the year, and recyclables taking the lead for Kennebec County. Cumberland County is the most populated county in Maine, which could contribute to the larger quantities of CDD waste generated in this area to facilitate more construction projects that other areas of the State. Drawing from this area for bulking material will likely be the most realistic source of bulking material for landfills receiving biosolids materials, however the State does show that other communities can offer CDD materials as well as seen on Figure 1.

Data gaps for this study rest largely on the accuracy and consistency of annual reports submitted by the transfer stations themselves. It was difficult to obtain data trends of transferred wastes within the State due to the inconsistency of report submissions. Observed inconsistencies include:

- Failure of some facilities to submit an annual report;
- Differences in how a facility reported quantities of material, including unit variations;
- Reporting inconsistencies, including waste-type comingling in reported numbers;
- Failure to specify the quantity of a type of waste listed as received; and
- Anecdotal acceptance of small quantities of miscellaneous materials that may be reflected in the total material quantities but not discussed in the detailed descriptions above.

2.1.2 Landfills within the State of Maine

Landfills in Maine can be divided into five main categories. These include municipal, state-owned, commercial, industrial, and CDD. For the purposes of this report, since municipal, state-owned, and commercial landfills within the state of Maine handle the majority of the residential waste and the state's biosolids, TRC grouped them together under a single designation, Residential Waste Landfills. The waste deposited in Residential Waste Landfills is summarized in Table 2 below. Figure 2 depicts landfill data gathered during this review.

Table 2. Waste Disposed in Residential Waste Landfills in 2023

Facility Name	MSW (tons)	Biosolids (tons)	CDD (tons)	CDD Fines (tons)	Ash (tons)	Contaminated Soils (tons)	ADC/Auto-shredder residue (tons)	Other Wastes* (tons)
Aroostook Waste Solutions - Presque Isle Landfill	4,410	-	874	-	43	-	-	94
Aroostook Waste Solutions - Tri-Community Landfill	30,769	959	9,506	-	163	-	-	13,880
City of Bath Landfill	4,557	1,290	770	-	-	-	-	3
Hartland Landfill	-	9,528	21,202	-	125	4,594	-	1,396
Juniper Ridge	274,691	66,176	425,937	50,774	4,663	4,095	-	8,027
Crossroads Landfill – Norridgewock	203,093	3.992	71,387	-	-	-	79,578	121,563
Hatch Hill - Augusta	35,041	-	9,949	-	-	107	10,187	-
ecomaine	-	-	-	-	41,755	-	-	6,169

Table 2. Waste Disposed in Residential Waste Landfills in 2023

Facility Name	MSW (tons)	Biosolids (tons)	CDD (tons)	CDD Fines (tons)	Ash (tons)	Contaminated Soils (tons)	ADC/Auto -shredder residue (tons)	Other Wastes* (tons)
Lewiston Solid Waste	-	-	395	-	16,050	-	-	268
Sanford Sewage District	-	3,324	-	-	-	-	-	-
Totals	552,560	85,269	540,019	50,774	62,799	8,795	89,765	151,400

Biosolids total unavailable for Waste Management as it is combined within another waste category
*e.g. crushed stone, grit, compost, sand, knots, leather scraps, lime grit, spoiled foods, asbestos, oil spill debris, etc.

The capacity for each landfill is based on the current fill rates for that facility and will be impacted by future residential and commercial development within the state as well as additional waste diversion measures. Closures of landfills in certain regions will also result in the redirection of wastes to other facilities and impact their long-term capacity. The estimated remaining life for each facility is presented in Table 3 below. The final column presents remaining life without added capacity at JRL.

Table 3. Residential Waste Landfill Capacity

Facility Name	Facility Size	Remaining Capacity	Annual Fill Rate	Remaining Life (projected years of capacity)
Aroostook Waste Solutions - Presque Isle Landfill	23.8 acres	1,244,384 cy	10,234 cy (2023)	21 years
Aroostook Waste Solutions - Tri-Community Landfill	39 acres	1,311,400 cy	48,732 cy (2023)	22 years
City of Bath Landfill	25 acres	293,650 cy	14,300 cy	22 years
Hartland Landfill	8.3 acres 572,000 cy licensed	295,700 cy	50,000 cy	6 years
Juniper Ridge	122 acres 19.55 million cy	5,356,397 cy	975,775 cy	5 years
Crossroads Landfill - Norridgewock	48.6 acres	7,277,267 cy	511,902 cy	14 years
Hatch Hill - Augusta	20 acres active	348,000 cy	80,000 cy	4 years
ecomaine	52.9 acres	2,058,964 cy	13,411 cy	153 years

Table 3. Residential Waste Landfill Capacity

Facility Name	Facility Size	Remaining Capacity	Annual Fill Rate	Remaining Life (projected years of capacity)
Lewiston Solid Waste	1,088,803 cy	411,760 cy	15,482 cy	26 years
Sanford Sewage District	5 acres	0 cy	-	0 years - landfill capacity reached in 2023

2.1.2.1 Aroostook Waste Solutions – Presque Isle and Tri-Community Landfills Overview

Aroostook County is serviced primarily by the Presque Isle and Tri-Community Landfills, which are owned and operated by Aroostook Waste Solutions. These facilities are approximately 23.8 and 39 acres in area and located in Presque Isle and Fort Fairfield, respectively. Certain incoming waste streams at the Presque Isle Landfill, such as special and bulky wastes had historically been diverted for disposal at the Tri-Community Landfill. Beginning in July of 2023, however, all wastes received at the Presque Isle Landfill were then diverted for disposal at the Tri-Community Landfill, as the facility in Presque Isle had reached its constructed capacity. Aroostook Waste Solutions is now operating both the Presque Isle and Tri-Community Landfills as a single operation and will resume operations in Presque Isle in the future, as is discussed in Section 2.1.2.4.

2.1.2.1.1 Wastes Accepted

In 2023, the Presque Isle Landfill accepted approximately 5,283.68 tons of combined municipal solid waste (MSW) and construction and demolition debris (CDD), along with 137.5 tons of wastes from other sources. Wastes from other sources, in this case, refers largely to general and non-hazardous industrial special wastes, as well as wood ash used at the landfill as daily cover material.

The Tri-Community Landfill accepted approximately 40,274.84 tons of combined MSW and CDD, 9,040.39 tons of materials used as daily cover (i.e., wood ash, bark, and intermediate cover), and 5,961.24 tons of other wastes in 2023. Due in part to the diversion of waste from the Presque Isle Landfill, the Tri-Community Landfill experienced an increase of approximately 8,000 tons in its total waste acceptance from 2022 to 2023.

2.1.2.2 Current Capacity

While the Presque Isle Landfill has no constructed capacity remaining, it has 1,244,384 cubic yards of additional unconstructed permitted capacity. The Tri-Community Landfill has 223,365 cubic yards of remaining constructed capacity, with an additional 1,088,035 cubic yards of unconstructed permitted capacity. At this time, utilizing the combined waste placement quantity for both landfills in 2023, the Tri-Community Landfill has an estimated remaining life of 22 years and Presque Isle has an additional 21 years.

2.1.2.3 Operations Overview

The Presque Isle Landfill is currently operating a transfer station for residential use to aid in the collection and subsequent transport of waste to the Tri-Community Landfill. The Tri-Community Landfill operates six days per week and is placing all waste received into cells 1-4, 9, and 10.

2.1.2.4 Future Plans for Expansion or Closure

Per the 2023 annual report, Aroostook Waste Solutions plans to continue diverting waste to the Tri-Community Landfill until it has reached its permitted capacity. At that time, if no further expansion is approved for the Tri-Community Landfill, operations will resume at the Presque Isle Landfill. Aroostook Waste Solutions presented a plan for the development of both landfills which details the proposed expansion through the year 2032. Cells 1-4, 9, and 10 are expected to be full by 2026, with final cover placed over them by 2029. Cells 5 and 6 were to be constructed in 2023, with Cell 6 accepting MSW beginning in 2024. Cells 5 and 6 are projected to be full by 2032, at which point the facility will expand into further permitted areas. No immediate plan has been proposed for the expansion of the Presque Isle Landfill, but Aroostook Waste Solutions intends to place final cover over the filled cells by 2025.

2.1.2.5 City of Bath Landfill Overview

The Bath Landfill is a municipally owned 25-acre landfill accepting waste generated in Bath and the following nearby municipalities: Augusta, Arrowsic, Bowdoinham, Brunswick, Dresden, Durham, Georgetown, Harpswell, Lewiston, Phippsburg, Pittston, Richmond, Rockland, South Bristol, Topsham, West Bath, Wiscasset, and Woolwich. The site contains an unlined waste dump that was in operation from the 1940s until its transition to a sanitary landfill in 1977 and closure in 1982. The current landfill is a 15-acre secure landfill that was permitted in 2003.

2.1.2.5.1 Wastes Accepted

The facility accepted approximately 4,557 tons of MSW, 770 tons of CDD, 3.08 tons of asbestos, and 1,290 wet tons of wastewater sludge in 2023. Additionally, 13,721 tons of soil materials were used as daily cover. The Landfill did not experience any significant changes in total MSW acceptance between 2022 and 2023. The amount of accepted MSW generated outside of Bath has exhibited a downward trend since 2014 but has remained relatively steady over the past 3 years.

2.1.2.5.2 Current Capacity

The Bath Landfill has 293,650 cubic yards of remaining constructed capacity, giving the facility an expected remaining life of 22 years at current waste acceptance rates. The Landfill has no additional unconstructed permitted capacity remaining.

2.1.2.5.3 Operations Overview

The Landfill is currently placing the majority of waste received into cell 3, with some being placed in cell 2 until it has reached its full capacity. The Landfill operates five days per week for waste acceptance and disposal. Upon entry into the facility, vehicles containing waste to be disposed of are

weighed, and the waste is inspected to ensure that it may be placed in the Landfill. Waste accepted by the Landfill is compacted daily by a landfill compactor and subsequently covered. The City accepts biosolids produced by its WWTP and, since it is a small percentage of the overall waste accepted, is able to blend them upon receipt with other available wastes. This is done through typical waste spreading and thin lift placement with other wastes placed above to bury the biosolids and reduce the risk for odors.

2.1.2.5.4 Future Plans for Expansion or Closure

The Bath Landfill did not report any plans for closure or expansion.

2.1.2.6 Hartland Secure Landfill Overview

The Hartland Secure Landfill is an approximately 8.3-acre municipal landfill owned and operated by the Town of Hartland. The secure landfill has been operated since 1992 when the attenuation landfill was closed.

2.1.2.6.1 Wastes Accepted

Until 2015, the landfill was operated solely for the disposal of the biosolids produced by the Town's Publicly-Owned Treatment Works (POTW) and tannery waste form the local industry. In 2016 the landfill received approval to accept other special wastes including CDD, ash, and contaminated soil. The facility accepted approximately 9,528 tons of wastewater sludge, 21,202 tons of CDD, 125 tons of ash, and 4,594 tons of contaminated soil in 2023.

2.1.2.6.2 Current Capacity

The Hartland Secure Landfill has 295,700 cubic yards of remaining constructed capacity, giving the facility an expected remaining life of 6 years at current waste acceptance rates. The Landfill has no additional unconstructed permitted capacity remaining.

2.1.2.6.3 Operations Overview

The landfill is currently placing the majority of waste received into Cell 4. The Landfill operates 5 days per week for waste acceptance and disposal. Upon entry into the facility, the waste is inspected to confirm that it may be placed in the Landfill. Hartland operates in small cells (3-acre average) to minimize open area and leachate production. Due to the percentage of biosolids accepted at the landfill, Hartland operators follow a waste placement plan, developed following observed instability and a waste slide that occurred in 2016. The plan details waste mixtures and placement protocol intended to promote drainage and maintain waste stability. Biosolids accepted by the Landfill are spread in a thin lift and covered within 2-hours with ground or whole CDD. Hartland owns a grinder that is used, whenever possible, on the landfill to reduce the material size of the CDD accepted. This process maximizes their compaction efforts and leads to a well-blended waste mixture.

2.1.2.6.4 Future Plans for Expansion or Closure

The Town of Hartland has no plans for future expansion and intends to close the landfill upon reaching final capacity.

2.1.2.7 Juniper Ridge Landfill Overview

Juniper Ridge Landfill is an approximately 122-acre state-owned landfill located in Old Town that has been in operation since 1996. The Landfill operated as an industrial landfill until 2004 when it was purchased by the State.

2.1.2.7.1 Wastes Accepted

Juniper Ridge Landfill accepted a total of 834,363 tons of waste in 2023, 751,402 tons of which were combined MSW and CDD. Additionally, 51,022 tons of CDD wood fines, chipped clean wood from CDD, soil equivalent foam, and virgin soil were used as daily cover material. This figure represents a slight decline in waste acceptance from 2022, when approximately 933,649 tons of waste were accepted into the Landfill.

2.1.2.7.2 Current Capacity

Juniper Ridge currently has a remaining permitted capacity of 5,356,397 cubic yards, 2,129,897 of which have been constructed. The majority of the existing constructed capacity is located in cells 13, 14, and 15.

2.1.2.7.3 Operations Overview

Juniper Ridge Landfill, while state-owned, is operated by NEWSME Landfill Operations, LLC (a subsidiary of Casella) and is open for waste disposal six days per week. Waste is characterized upon entrance to the facility before being placed and compacted as outlined in the operations manual. Casella operates JRL in cells designed to optimize disposal needs and minimize leachate production. The cells are constructed to dispose of approximately 1-2 years of currently required capacity and average 7.5 acres in size. Biosolids are spread in thin lifts and blended with other wastes (MSW, CDD, contaminated soils) as they are placed directly above. The wastes are blended as the teeth of the compactor penetrate both the upper lift of waste and the biosolids. Waste is covered daily using approved daily cover material to minimize odors and prevent vectors. Waste is primarily being placed in cells 13-15, with some being sent to Cells 1, 2, 3A, and 3B to regain capacity in previously settled areas and bring the cells to their finished proposed grades.

Additionally, Casella has made efforts to divert a portion of the accepted MSW from disposal at Juniper Ridge Landfill. Through sorting and sending out recyclables, sending waste to incinerators and processing facilities, and sending waste to other Maine landfills, approximately 395,396 tons of waste were diverted from disposal at Juniper Ridge Landfill in 2023.

2.1.2.7.4 Future Plans for Expansion or Closure

The most recent proposed expansion of the landfill was permitted in 2017. Six of the seven permitted cells included in this expansion have been constructed, with the construction of the sixth cell reaching completion in 2024. A public benefit determination was issued by the MDEP in October 2024 for the next expansion of the landfill currently being sought. The proposed expansion is for approximately 61 acres and will add an additional 11.9 million cubic yards of capacity if approved.

2.1.2.8 Crossroads (Norridgewock) Landfill Overview

Crossroads Landfill, also referred to as the Norridgewock Landfill, located in Norridgewock, ME, is a 48.6-acre facility owned and operated by Waste Management Disposal Services of Maine.

2.1.2.8.1 Wastes Accepted

Crossroads (Norridgewock) Landfill accepted 203,092.62 tons of MSW, 71,386.87 tons of CDD, and 121,562.93 tons of special waste. In 2023 this facility landfilled a reported 3,992.28 tons of municipal wastewater treatment plant sludge originating in four Maine municipalities: Biddeford, Skowhegan, Paris, and South Paris. Additionally, the landfill accepted 79,578 tons of approved special wastes that were used on-site as alternate daily cover and 4,404 cubic yards of soil to be used as daily cover.

2.1.2.8.2 Current Capacity

Crossroads Landfill has a remaining constructed capacity of 472,733 cubic yards with an additional 6,804,534 cubic yards of permitted unconstructed capacity. Based on these numbers, the Landfill has an estimated remaining life of 14 years. The remaining capacity is located in Phases 8 and 14 of the Landfill.

2.1.2.8.3 Operations Overview

The landfill accepts waste for disposal 5 days per week. Waste is determined to be acceptable or unacceptable upon entrance to the facility. Acceptable waste is placed in cells and compacted by a landfill compactor immediately. Daily cover consisting of soil or approved alternate daily cover is used on-site. Waste placement occurs primarily in Phase 14 and select parts of Phase 8.

2.1.2.8.4 Future plans for Expansion or Closure

The landfill plans to continue development of Phase 14 until its entire permitted capacity has been constructed. Phase 14 is proposed to be constructed in five parts, two of which were constructed in 2023 and 2024. There is no further plan for expansion once Phase 14 is fully constructed.

2.1.2.9 Hatch Hill Landfill Overview

Hatch Hill is a municipally owned and operated landfill located in Augusta that has been in operation since 1986 and accepts waste from the following municipalities: Augusta, Chelsea, Farmingdale, Gardiner, Hallowell, Manchester, Randolph, Whitefield, and Pittston. The site contains a previously

used open burning dump and sanitary landfill that was in operation from the 1950s until 1986 when the current landfill was permitted. The active portion of the Landfill is approximately 20 acres in area.

2.1.2.9.1 Wastes Accepted

The Landfill accepted a total of 103,589.03 tons of waste in 2023, 169.12 tons of which were classified as special waste. Daily cover used at the facility is typically auto shredder residue, gravel, or ground wood chips. Approximately 10,187 tons of auto shredder residue, 12,004 cubic yards of gravel, and 486 tons of ground wood chips were used in 2023. Hatch Hill did not report receipt of biosolids in 2023.

2.1.2.9.2 Current Capacity

Based on an aerial survey conducted in 2023, the landfill has approximately 348,000 cubic yards of constructed capacity remaining, with no additional permitted capacity. This gives the facility an estimated remaining life of 4 years.

2.1.2.9.3 Operations Overview

Hatch Hill Landfill operates 5 days per week for waste acceptance. Waste accepted is placed in Expansion III, compacted, and covered using daily cover materials.

2.1.2.9.4 Future Plans for Expansion or Closure

Based on discussions with management of the Hatch Hill Landfill, the landfill is moving forward with plans for vertical increase and will evaluate future expansion plans as it reaches the end of its capacity. In April of 2024 the Hatch Hill Landfill submitted a vertical expansion application to the MDEP which is currently being reviewed and processed.

2.1.2.10 Carpenter Ridge Landfill Overview

Carpenter Ridge Landfill is an unconstructed state-owned landfill that was permitted in 1996 to ensure capacity was available for the residents of Maine. The Landfill, located in Lincoln County, is permitted to occupy a 34.6-acre space, and provide approximately 1.8 million cubic yards of capacity. At an estimated rate of 100,000 cubic yards per year, this facility would have an expected life of 18 years. With the state's purchase of JRL and its available capacity, Carpenter Ridge was not constructed but permits have been maintained for emergency disposal. Landfill cells would need to be designed to meet current standards, approved by MDEP, and constructed prior to any waste acceptance. This process typically takes 2-3 years to complete.

2.1.2.11 ecomaine Landfill Overview

ecomaine, a non-profit organization owned by 20 municipalities in Maine, operates a 52.9-acre landfill located on the border between South Portland and Scarborough. The facility has been in operation since 1978 and accepts primarily MSW ash from the ecomaine waste to energy plant in Portland.

2.1.2.11.1 Wastes Accepted

The ecomaine Landfill accepted 47,924 tons of waste in 2023, 41,755 tons of which were MSW incinerator ash. The remainder of the waste was comprised of crushed glass, grits and screenings, and miscellaneous other wastes. In 2023, the facility also temporarily accepted raw MSW that was diverted from disposal at Juniper Ridge Landfill. Raw MSW was held temporarily in the Landfill, before being backhauled to the ecomaine incinerator. The ash was then delivered back to the Landfill for disposal. Ash placed in the Landfill does not require daily cover and as such, no daily cover was used in 2023. Wood chips were used as temporary daily cover for the raw MSW but were later removed and sent to the incinerator. ecomaine does not accept biosolids for disposal.

2.1.2.11.2 Current Capacity

The ecomaine Landfill has 903,963.66 cubic yards of constructed capacity remaining, with an additional 1,155,000 cubic yards of unconstructed permitted capacity. ecomaine has a calculated remaining lifespan of 153 years at the current fill rate.

2.1.2.11.3 Operations Overview

As stated previously, the ecomaine Landfill accepts primarily combusted MSW ash from their incinerator in Portland. While permitted to accept MSW, the Landfill does not typically accept it for permanent disposal.

2.1.2.11.4 Future Plans for Expansion or Closure

The facility plans to continue constructing the remainder of the capacity that has been permitted. There are no immediate plans for closure, and reports have indicated that the facility will be pursuing future expansion.

2.1.2.12 Lewiston Landfill Overview

The City of Lewiston operates a 15.8-acre landfill for the disposal of ash from the Maine Waste to Energy facility in Auburn and CDD collected by the City of Lewiston.

2.1.2.12.1 Wastes Accepted

The Lewiston Landfill accepted 16,713 tons of waste in 2023, 16,050 tons of which were MSW incinerator ash. The remainder of the waste was comprised of CDD and crushed rock. The Lewiston Landfill does not accept biosolids for disposal.

2.1.2.12.2 Current Capacity

The Lewiston Landfill has 411,760 cubic yards of capacity remaining. With an annual fill rate of 15,482 cy per year, there are approximately 26 years of remaining life at the landfill.

2.1.2.12.3 Operations Overview

As stated previously, the Lewiston Landfill accepts primarily combusted MSW ash from the Maine Waste to Energy Facility.

2.1.2.12.4 Future Plans for Expansion or Closure

The facility has no current plans for expansion.

2.1.2.13 CDD Landfills Overview

There are a number of less than 6-acre CDD landfills in Maine located in regions of the state that were historically remote from larger landfills or processing facilities. These landfills are unlined and have been permitted and operated since the early 1990's. These facilities typically accept a small quantity of CDD from the local municipalities for disposal each year. The 2023 acceptance rates and remaining capacity for the less than 6-acre CDD landfills are presented in Table 4 below.

Table 4. 2023 Waste Acceptance Rates for Less than 6-acre CDD Landfills

Facility Name	Facility Size	Remaining Capacity	Annual Acceptance Rate (cy)	Remaining Life (projected years of capacity)
Penquis CDD – Milo Landfill	3.5 acres	37,410 cy	446	87 years
Dover-Foxcroft Landfill	3.2 acres	38,637 cy	255	151 years
Mechanic Falls Landfill	53,982 cy	52,488 cy	521	Not provided
Oakland CDD Landfill	257,000 cy (initial 1993 proposal)	180,588 cy (based on volume of waste assessed in December 2022 subtracted from initial 1993 permitted capacity)	-	43 years estimated in 1994
Orono CDD Landfill	5 acres	34,900 cy (phases 1 and 2) 29,600 cy constructed currently	1,692	44 years (phases 1 and 2)
Brewer CDD Landfill	No Annual Report Provided			
Mid-Maine CDD Landfill	No Annual Report Provided			

The total CDD waste accepted into the landfills in 2023 was 2,913 cy.

Annual reports from the following CDD landfills were among those reviewed: Dover-Foxcroft Landfill, Penquis, Mechanic Falls Landfill, and Orono CDD Landfill. No official annual report was provided for the Oakland CDD Landfill, but documentation regarding the facility's capacity was reviewed.

2.1.2.13.1 Wastes Accepted

The landfills for which annual reports were reviewed accepted approximately 2,913 cubic yards of CDD in 2023. The Dover-Foxcroft Landfill accepted 255 tons of CDD and used an estimated 25 cubic yards of cover soil. This represented a decrease in the quantity of accepted CDD from 2022, when the facility accepted nearly 3 times the amount of waste accepted in 2023. The Mechanic Falls Landfill accepted 521 cubic yards of CDD and 136 cubic yards of sand and gravel to be used as daily cover. The Orono CDD Landfill accepted 1,691.5 cubic yards of CDD and utilized 338 cubic yards of sand and gravel as cover material.

2.1.2.13.2 Current Capacity

There is an estimated remaining capacity of 38,637 cubic yards in the Dover-Foxcroft Landfill. At the recorded 2023 waste acceptance rate, the Dover-Foxcroft Landfill has a remaining life of 151 years. The Mechanic Falls Landfill has a remaining capacity of 52,488 cubic yards, corresponding to a projected remaining life of 106 years. The Orono CDD Landfill has a remaining constructed capacity of 34,900 cubic yards, which provides the facility with an estimated remaining life of 44 years. There is an additional permitted Phase III of the Landfill, which has a design capacity of 36,600 cubic yards. The Oakland CDD Landfill was permitted in 1994 with a design capacity of 257,000 cubic yards. At the time of permitting, the Landfill was expected to have a lifetime of approximately 43 years, lasting until 2037. As of December 2022, there is an estimated 180,588 cubic yards of capacity remaining, indicating that waste is being placed in the landfill at a slower rate than originally anticipated in 1994.

2.1.2.13.3 Operations Overview

Each of the facilities are owned and operated by the municipalities in which they are located. The Lewiston Solid Waste Landfill operates five days per week, accepting waste generated in Lewiston only, and is currently placing waste in Cell 5. The Mechanic Falls Landfill operates a transfer station on the same property. The Orono CDD Landfill operates two days per week, accepting waste from Orono residents only. The Dover-Foxcroft Landfill is currently operating in Phase II.

2.1.2.13.4 Future Plans for Expansion or Closure

Due to a change in the permitting requirements for CDD landfills, permitting additional capacity for these landfills has become difficult. Although no annual reports were received for Brewer or Mid-Maine, TRC is aware that each of these facilities were actively evaluating expansions. Each would increase the landfill size to maintain a less than 6-acre footprint. Mechanic Falls Landfill has a new cell development plan in the works to be released in 2024 which will free up some CDD capacity. The Orono CDD landfill has plans to develop a Phase III but only once Phases I and II are full. The Oakland Landfill has constructed five out of their six permitted cells with no current plans to construct the sixth cell.

2.1.3 Processing Facilities and Incinerators

Maine has a limited number of processing and/or incineration facilities that accept waste materials from its citizens. Figure 3 depicts data gathered on Maine processing facilities.

There are currently only two operating Waste-to-Energy incinerators, both located in the southern part of the state. These include ecomaine in Scarborough and Maine Waste-to-Energy in Auburn. Both of these facilities produce MSW ash which are disposed within landfills specifically developed for incinerator ash.

There are currently five facilities in Maine which handle the majority of the construction and demolition debris and metals processing in the state. These include:

- WIN Waste Innovations-Aggregate Recycling Corp in Arundel
- Grimmel Industries in Topsham
- Resource Waste Services of Lewiston
- Jeffrey A Simpson, Inc in Sanford
- Richard Carrier Trucking in Skowhegan

Each of these facilities recovers a percentage of material for reuse and sends the non-recoverable portion to a landfill for final disposal or use as an alternate daily cover.

There are currently 3 additional proposed facilities and a sludge dryer that may impact the flow of waste in Maine within the next 5 years. These include Eagle Point Energy Center (EPEC) in Orrington, the Municipal Review Committee's (MRC) waste facility in Hampden, the VIRIDI anaerobic digester proposed for the Brunswick Landing, and a sludge dryer proposed to be co-located with the Crossroads Landfill owned by Waste Management in Norridgewock. As each of these facilities are brought online, they will divert wastes from the landfills for processing with a reduced volume of residual being sent for disposal.

These facilities are discussed in more detail below.

2.1.3.1 Incinerator Wastes Accepted

The ecomaine facility is made up of 20 owner member communities and accepts MSW waste from 73 communities. The facility provides both recycling and waste-to-energy services to its members. Maine Waste-to-Energy (MWE) is made up of 12 member communities and accepts MSW from 15 communities. MWE provides waste-to-energy services to its members.

2.1.3.2 Bypass/Residuals Produced

MSW ash produced at the incinerators is disposed within landfills specifically designed and constructed to deal with the residuals from the incinerators. The ecomaine facility's ash is taken to the onsite landfill while MWE's ash is taken to the Lewiston Solid Waste Landfill. ecomaine produces an average of approximately 35,000 CY of ash per year while MWE produces approximately 16,000 CY per year.

2.1.3.3 Processing Facility Wastes Accepted

The breakdown of wastes processed at Maine's processing facilities is provided in the tables below. Table 5 shows the wastes originating within the state while Table 6 shows those wastes originating from outside of Maine. In 2023, 170,341 tons of waste materials originating in the state of Maine and 173,879 tons of waste materials originating from outside of the state were processed.
Resource Waste Services, one of the state's largest CDD processing facilities, has performed upgrades to its process over the last few years and has increased the percentage of CDD processed, originating from within the state of Maine, from 9% 3 years ago to between 40 and 50% in the current year. They plan to exceed 50% in the future. They estimate quantities of Maine CDD processed in the future at 160 to 170,000 tons per year.

Table 5. In-State Waste Processed in Maine

Facility Name	Mixed CDD (T)	Aggregate (T)	Clean Lumber / Yard Debris (T)	Ferrous Metals (T)
WIN Waste Innovations – Aggregate Recycling Corp	15,411	260	162	-
Grimmel Industries	18,540	-	-	45,771
Resource Waste Services of Lewiston	53,270	-	-	-
Richard Carrier Trucking	110	-	-	-
Jeffrey A Simpson, Inc	28,341	200	8276	-
Total Tonnage	**115,672**	**460**	**8,438**	**45,771**

Table 6. Out-of-State Waste Processed in Maine

Facility Name	Mixed CDD (T)	Aggregate (T)	Clean Lumber / Yard Debris (T)	Ferrous Metals (T)
WIN Waste Innovations – Aggregate Recycling Corp	37,440	17	291	-
Grimmel Industries	-	-	-	856
Resource Waste Services of Lewiston	125,739	-	-	-
Richard Carrier Trucking	9,536	-	-	-
Jeffrey A Simpson, Inc	-	-	-	-

Table 6. Out-of-State Waste Processed in Maine

Facility Name	Mixed CDD (T)	Aggregate (T)	Clean Lumber / Yard Debris (T)	Ferrous Metals (T)
Total Tonnage	**172,715**	**17**	**291**	**856**

2.1.3.4 Bypass/Residuals Produced

The residuals or waste materials produced by the processing facilities and disposed of/or utilized by the landfills located in Maine include mixed CDD residuals, CDD fines, bulky waste, and auto-shredder residue. A total of 159,691 tons of residual waste was placed in Maine landfills. It is important to note that both CDD fines and auto-shredder residue are used by landfills as alternate daily cover (ADC) and replace the need for placement of a clean soil product over the waste each day. The breakdown of residues produced are provided in Table 7 below. Based on acceptance rates and residuals quantities in 2023, processing facilities diverted 53.6% of materials from landfills with 46.4%, or 159,691 tons of residuals sent to landfills for use as daily cover and bulking waste.

Table 7. Processing Facility Residuals Handled by Maine Landfills

Facility Name	Mixed CDD (T)	Aggregate (T)	Clean Lumber / Yard Debris (T)	Ferrous Metals (T)
WIN Waste Innovations – Aggregate Recycling Corp	20,658	-	326	-
Grimmel Industries	-	-	-	11,793
Resource Waste Services of Lewiston	78,532	41,245	-	-
Richard Carrier Trucking	-	-	-	-
Jeffrey A Simpson, Inc	26,046	1,749	-	-
Total Tonnage	**104,578**	**42,994**	**326**	**11,793**

As discussed above, Resource Waste expects to process 160-170,000 tons of in-state CDD moving forward. They currently produce a residual of bulky waste at approximately 30% of the processed waste. With this, they estimate that they will produce approximately 60,000 tons of bulky waste from materials originating in the state of Maine moving forward.

2.1.3.5 Proposed Solid Waste Facilities/Process Upgrades

There are currently four facilities being proposed in the state of Maine that would manage wastes produced by its residents. Three of the facilities are proposed to process biosolids to reduce the

volume requiring landfill disposal. Two of the proposed facilities will be located in the eastern part of the state, Hampden and Orrington, and have existing contracts for waste processing/disposal. The third facility would be located in Brunswick and the final facility will be co-located with the Crossroads Landfill in Norridgewock.

The facility located in Hampden is owned by the Municipal Review Committee and has been designed with an overall waste handling capacity of 180,000 tons. It would receive MSW from local communities, sort for recycling, and process waste with the final stage being anaerobic digestion for 6-8 million gallons of paper and organic waste. This facility is currently under contract to manage 100,000 tons of MSW but would have the capacity to digest biosolids as well. The current schedule for operation is set to begin in mid-2025 with operation of the Material Recovery Facility (MRF)
The facility in Orrington, known as Eagle Point Energy Center (EPEC), will have the capacity to incinerate 300-350,000 tons of MSW and is currently scheduled to be operational with the first boiler starting up in summer 2025 and the second in fall/winter 2025/2026. EPEC is currently under contract to manage 200,000 tons of MSW for it 44 member communities. EPEC is not being designed to manage biosolids.
An anaerobic digester is proposed to be located in Brunswick, by Viridi, to address a portion of the biosolids disposal needs for the state. The facility is designed with an annual capacity of 85,000 tons and is scheduled to be operational in Quarter 2 of 2026.

The final facility is a sludge dryer proposed by Waste Management to be co-located in Norridgewock with their existing Crossroads Landfill. The dryer is being designed to handle approximately 200 tons/day and to dry materials from 80% water to 20% water. This process will minimize the need to bulk materials for placement in the landfill. This facility is currently licensed by the MDEP as of February 2024 and is also proposed to be operational in the second quarter of 2026.

2.1.3.6 Bypass/Residuals Produced

The Hampden facility's permits specify a recycling rate of 50%. This includes materials to be utilized by the landfill for daily cover. Based on this condition, and early discussions with the facility, TRC has assumed that approximately 50,000 tons of waste residuals will be sent to the landfill during early operation. This is likely to improve as operations continue.

The EPEC facility will reduce the volume of waste needing final disposition within a landfill through its incineration process. Incineration typically yields an 85% reduction so with a contracted waste acceptance of 200,000 tons, we estimate 30,000 tons of ash will need to be placed within the landfill.

The anaerobic digestion facility is estimating an annual residual waste production of 10,000 tons from the processed 85,000 tons proposed. This amounts to a reduction of 88%.

The sludge dryer will dewater the biosolids material prior to disposal within the landfill reducing approximately 200 tons/day or 73,000 tons/year (at 365 days) to approximately 50 tons/day or just over 18,000 tons/year.

2.1.3.7 Discussion

Waste management facilities in Maine are evolving with many of the processing and recycling facilities currently relying on materials originating from outside of the state for their operations. New facilities are due to come onboard within the next few years with the capacity to help divert up to 300,000 tons of MSW and 130,000 tons of biosolids from our landfills, but these facilities are not yet operational and may face challenges as they begin operations. Additionally, each of the new facilities will create residuals, although at a reduced volume, that will need ultimate disposal. The state's landfills will need to maintain capacity to meet the needs of its citizens during and after the transition.

Table 8 below describes the quantities of wastes that were disposed within Maine landfills in 2023.

Table 8. Total Waste Disposal in Maine Residential Waste and CDD Landfills

Waste Type	Quantity
Biosolids	85,269 tons
CDD	541,039 tons*
CDD Fines	50,774 tons
Ash	62,799 tons
ADC/Auto-shredder Residue	89,765 tons
MSW	552,560 tons
Contaminated Soil	8,795 tons
Miscellaneous Waste	151,400 tons

* CDD accepted at all Maine landfills assuming 700 lbs/cy at CDD landfills.

2.2 Facility Outreach and Coordination with Stakeholder Organizations

Upon completion of the review of available waste information, TRC staff performed outreach to select landfills and processing facilities as well as the Maine Water Environment Association (MEWEA) which is an organization comprised of the wastewater treatment facilities (WWTFs) in Maine. The purpose of the outreach was to discuss proposed plans for landfill development, new processing capacity, and potential changes to waste management needs due to increasing volumes of biosolids or plans for biosolids diversion.

During discussions with MEWEA, it was made clear that they are concerned about the ability of Maine landfills to provide safe, reliable disposal of the produced biosolids materials but that, at this point due to the speed of legislative changes and current infrastructure upgrade projects, they are not able to evaluate other disposal/treatment options at this time.

TRC used the expected biosolids production increases in the calculations for future capacity needs.

WWTFs in general have seen increases in biosolids volumes between 10% to 20% over the past 20 years due to supporting increased population, community growth, and new industries. With this in mind, they anticipate similar growth rates over the next 10 to 20 years.

Unlike other wastes managed in Maine, biosolids cannot currently be diverted from the landfills through reduction, reuse, and recycling efforts. Biosolids production is due to the biological wastes directed to each WWTF which increases with population and economic growth. As stated in a follow-up email, they believe their "only options to control future biosolids production are to stop receiving septage, to not allow any growth, and to deny any new industrial activity."

Similar to other utilities and infrastructure in Maine, many of the WWTPs are currently in the process of upgrading equipment to meet new requirements, address maintenance concerns, increase efficiency, and reduce the risk of release of pollutants. Additionally, they are aware that they may be required to provide additional PFAS treatment for their effluent in the near future. Adding these costs to the increased costs for biosolids disposal that many of them have faced with the land application ban, facility owners have not yet been able to focus on additional technologies for biosolids treatment or reduction.

Landfill and Processing Facility specific information obtained during the facility outreach is included in Section 2 above.

3.0 Geotechnical Analysis

Biosolids placed within landfills present slope stability and operational concerns due to their physical characteristics, being of excessive moisture, and lacking substantive strength when stockpiled. These materials require careful mixing and placement to specified grades and design considerations. Landfilled biosolids require strict placement methodologies and/or mixing with stabilizing (bulking) materials to increase stability during spreading and after closure.

TRC was tasked with identification of appropriate bulking materials, analyzing the stability of biosolids alone and when mixed with those bulking agents, and developing recommendations for proper waste placement methodologies.

3.1 Historical Sludge/Biosolids Placement in Maine

Industrial landfills in Maine have a long history of sludge disposal. For decades, papermills in the state have operated landfills developed specifically for the disposal of wastes from their processes. Disposal of these materials require large operating areas to allow for waste placement in thin lifts with the use of bulldozers only. The waste at these landfills is placed specifically to allow for dewatering and evaporation and, since dewatered sludge has a low permeability, each facility is constructed with drainage layers and/or vertical drains to direct leachate to the collection system located at the base of the landfill or into trenching and pipes that run up the slopes of the landfill. Additionally, external landfill slopes are often reduced to 4 or 5 horizontal: 1 vertical instead of the standard 3:1 slopes developed at MSW and CDD landfills. These shallower slopes reduce the available volume within the same footprint at these sites. For comparison purposes, the Dolby III Landfill, also currently owned by the State, was permitted in 1984 with a footprint of 70 acres and a capacity of 5.1 million cy

(300,000 cy/yr for 17 years). This equates to 72,857 cy/acre. JRL's most recent expansion was for 9.35 million cy over 54 acres or 173,148 cy/acre.

Prior to the acquisition of JRL by the State in the early 2000s, the landfill had been operated as an industrial landfill. The early cells were filled with papermill sludge with a small percentage of ash from the mill's processes. Areas of the landfill were unstable at the time, with sludge that had begun to liquify in place. In order to safely dispose of additional waste within the landfill, a waste mixing program was conducted within a previously constructed cell that had not yet received waste material. Once the appropriate waste mixture was determined for the proposed geometry of the landfill, waste that had been previously placed in Cells 1 and 2 were stabilized in place with the addition of bulky materials, CDD processing fines, ash, and other approved, available wastes.

The Hartland Landfill was initially permitted as a sludge monofill for the disposal of biosolids from the Town's WWTP. At the time of development, 94% of the influent to the WWTP originated from the local tannery meaning that 94% of the material within the biosolids was industrial waste. The landfilled sludge was slightly dryer than the biosolids from a traditional residential WWTP but like all biosolids, as it dewatered, it solidified and prevented the drainage of leachate to the base of the landfill. Without added internal drainage, the landfill experienced a slide in 2016 that prevented operators from utilizing portions of the landfill or the ability to place cover material. This caused considerable odor concerns in the surrounding area. Like JRL, Hartland conducted a mixing program to stabilize the waste and has been operating in accordance with that protocol since, allowing for waste placement and compaction to maximize the use of the landfill's approved footprint and capacity.

3.2 Geotechnical Investigation

For this portion of the study, TRC sampled and tested different biosolids waste streams as well as bulking material waste from landfills in Maine to characterize the physical properties of these materials. Additionally, these materials were co-mingled and tested to evaluate the strength potential when mixed at select volume ratios.

3.2.1 Sampling Plan

TRC performed bulk-sampling of four biosolids waste streams and three bulking material waste streams. In addition to the characteristics of the materials, they were also selected due to the prevalence of the materials within the state. The samples were gathered by TRC personnel in 5-gallon buckets for laboratory testing. Due to the inconsistent nature of typical waste material, including bulk construction and demolition debris, samples of relatively uniform/homogeneous materials (i.e. fine-grained, soil-like consistency) were collected from locations where large material was not present. Waste materials sampled included MSW incinerator ash, CDD fines, and auto-shredder residue. Figure 4 provides photographs of material sources during the sampling effort.

TRC performed sampling on October 8 and October 9, 2024. Representative bulking material samples were taken from stockpiles within the active faces of each landfill. Biosolids samples were taken from wastewater treatment plants prior to hauling off-site.

Table 9 below shows the waste sampling summary for the chosen waste streams represented in this study. The table shows the location of the waste sources, visual classification, and sampling name identification (ID) assigned by TRC.

Table 9: Waste Sampling Plan

Waste Sample ID	Sample Source Location	Field Visual Classification
Biosolid Waste		
BS-1	Portland Water District 225 Douglass St, Portland, ME 04102	Biosolids
BS-2	Bangor Wastewater Treatment Plant 760 Main St, Bangor, ME 04401	Biosolids
BS-3	Lewiston-Auburn Clean Water Authority 535 Lincoln St, Lewiston, ME 04240	Digested Biosolids
BS-4	Greater Augusta Utility District 12 Williams St, Augusta, ME 04330	Biosolids
Bulking Material Waste		
WS-1	Hatch Hill Landfill 112 Hatch Hill Rd, Augusta, ME 04330	Auto shredder fluff
WS-3	ecomaine 64 Blueberry Rd, Portland, ME 04102	MSW ash
WS-4	Juniper Ridge Landfill 2828 Bennoch Rd, Alton, ME 04468 Landfill Location: Old Town, ME 04468	CDD Fines

3.2.2 Test Methods and Logic

Waste samples were sent to TRC's lab at Mount Laurel in New Jersey and analyzed for the individual strength properties including Moisture Content (ASTM D2216), Atterberg Limits (ASTM D4318), Grain Size Sieve (ASTM D422), and Visual Lab Description (ASTM D2488). Figure 5 presents photographs of samples drying in the laboratory on the first day and after the drying process was complete, as drying of the material was necessary for testing. The process to dry the material included spreading the material out in a flat container to increase surface area of air contact and turning the material with heated fans under a bench scale plastic "greenhouse" type shelter.

Properties of the individual materials were reviewed by TRC's geotechnical engineers to determine the materials that would give the most conservative waste strength properties when combined in the lab. The selected materials were then combined to mimic waste mixtures that may be disposed within the landfill. The combined materials were analyzed for mixture properties including Direct Shear Tests (ASTM 3080) under specific confining pressures.

3.2.2.1 Sample Material Variability

Due to the observed physical makeup of each biosolid sample, grain size distribution testing (ASTM D422) and classification was not performed. Waste chunks, fibrous material, and organics would have inaccurately skewed the results for each sample if tested in this manner. TRC instead relied on visual classification (ASTM D2488) and received moisture condition (ASTM D2216) to identify likely stability characteristics, refer to Appendix A. From there, a representative biosolid material and waste bulking material was chosen for further strength testing to model what TRC deemed as a conservative stability analysis. The results of the lab testing are provided in Attachment A.

3.3 Slope Stability Modeling

To evaluate the impacts on waste strength due to the introduction of additional biosolids into landfills, a global stability analyses was performed by TRC to evaluate the expected adjusted factor of safety. TRC utilized the Juniper Ridge Landfill Expansion Application Volume III (SME, 2015) to develop representative stability models that match typical landfill design geometry and characterization for a given Maine landfill.

The critical condition for the final configuration is based on the permitted geometry of the landfill components. The conditions evaluated were modeled in the slope stability software Slide2©, version 9.008c, by Rocscience. The full analyses can be found in Attachment B.

3.3.1 Waste Mix Ratios

TRC evaluated waste strengths and stability under three different conditions. Historically, the landfills within the state of Maine have introduced a variable amount of biosolids within their landfills, making day-to-day operations difficult when large amounts of biosolids are placed within the landfill, creating softer and unstable hauling, spreading, and compacting conditions for operations personnel. Based on known trends within the JRL landfill, for example, stability conditions can require the stoppage of waste spreading within the active landfill, as machinery and equipment begin to sink. This is due to the influx of biosolids into the landfill at one time, creating soft ground conditions.

To quantify the reduction in strength from the introduction of biosolids into the landfill, TRC prepared three mix ratios utilizing Biosolid sample BS-3 and waste sample WS-3. The materials were each mixed by the percentage volume listed below:

- 15% Biosolid with 85% Waste sample
- 20% Biosolid with 80% Waste sample
- 25% Biosolid with 75% Waste sample

Each sample was mixed at the natural moisture content and lightly compacted to simulate mixing during landfill operations. The samples then underwent shear testing to estimate strength conditions under expected short-term and long-term loading conditions of the landfill. The results of the lab analysis can be seen in Attachment A.

3.3.2 Testing Overview

As depicted in the results from the laboratory testing, expected shear strength of the mixed waste reduced significantly when volume ratios of biosolids increased between 20% and 25% biosolids. The angle of internal friction, a shear strength property of soil defined by the point at which soil begins to experience sliding failure under shear stress, decreased from approximately 40 degrees to 30 degrees. This reduction of strength is indicative of observed real-world conditions, in which landfill operations have approximated that stability issues arise when biosolids generally make up over 30% by volume of the waste spreading for consecutive days.

3.3.3 Slope Stability Analysis

Two design sections were developed to evaluate the short-term and long-term stability conditions of typical landfill constructed within the state of Maine. For the sake of continuity, the final cover (long-term) design section was chosen based on a section evaluated in JRL's Expansion Application Vol. III (SME, 2015). An intermediate section was also developed to simulate open conditions on the landfill. This section confined a maximum side slope of 4:1, with a distributed load placed on the upper portion of the open face of the waste to simulate hauling loads. A load pressure of 450 psf was chosen based on TRC's industry experience. The section summary plates can be seen in Attachment B.

The slopes were analyzed using the Spencer Method which satisfies both moment and force equilibrium. The slopes were modeled using both long term and short-term conditions. Global circular slip surfaces, including the most critical surface, which was identified by the model to be the most likely to fail, were analyzed along the proposed slopes. The results were compared to the minimum design requirements set forth by the MDEP. The full analyses can be found in Attachment B.

As shown in the global stability calculation, modeling a 4:1 intermediate and final cover slope produces factors of safety below the minimum required value (1.3 for open conditions and 1.5 for closed conditions) set forth by MDEP (Ch. 401.2.F.1.a). As such, TRC did not model steeper slopes, even though a maximum slope of 33% (3:1) is allowable under MDEP Ch. 401, understanding the results would show an even lower factor of safety than what was modeled to begin with. During discussions with JRL Operational staff, it was noted that in order to maintain stability of the external landfill slopes, biosolids are not placed within 50 feet of the slope. This limited placement of biosolids near the slope allows for overall waste placement to the 3:1 design slopes allowed in the Maine Solid Waste Management Regulations.

TRC modeled a conservative filling approach for the sake of this report, in which biosolids and bulking waste was mixed throughout the waste mass in open and closed conditions. The models suggest that the increase in biosolids will create stability factors below the 1.3 threshold for open conditions. As discussed in Section 3.4.2 and 3.4.3 of the report, design and operation considerations may create more stable conditions than that which was modeled, such as the inclusion of drainage blankets, and perimeter berms built of only bulking or more stable waste masses that can be modeled to steeper slopes, if applicable. These considerations should be incorporated into design and operation standards for a given permitted landfill and carried out within stability models to demonstrate the designed slope remains above required factor of safety requirements.

3.4 Discussion

Based on the results above, along with the lab testing, strength conditions within the waste mass would be expected to reduce substantially once mixing ratios increase at or above 20% of biosolids by volume. This reduction of strength is demonstrated in the stability model, where the Factor of Safety is shown to fall considerably compared to the lesser volume mixes.

Laboratory analyses of biosolids materials determined the samples of these types of wastes to have an average natural moisture content of approximately 250%, with the wettest material almost reaching 400% moisture content. This highlights the significance of the typical water saturation of these types of materials and demonstrates why biosolids are so unstable when placed in landfills without the appropriate stability countermeasures supplied by bulking materials or changes in landfill geometry and addition of drainage media.

The results from the slope stability analysis suggests the introduction of biosolids within other solid waste streams, in this case ash fines, lowers the strength parameters and the stability of the waste mass. This, as noted above, is comparable to the observations made by landfill operators in the State of Maine who have reported considerable stability decline within active faces of landfill when large amounts of unbulked biosolids are placed.

While the resulting strength decline from biosolids had a clear effect on the short-term conditions of the landfill section, the long-term stability of the waste mass was not as significantly impacted. This is likely due to the consolidating nature of the waste, in which natural dewatering would be expected to occur with a proper contact water (leachate) removal system in place. A final cover system is also expected to benefit the conditions of the waste mass by providing a solid barrier from environmental and physical impacts (e.g., weather and machinery).

It is understood that oversized CDD waste makes up a large portion of existing waste streams (in terms of tonnage) within landfills in the state of Maine. Oversized CDD could not be tested or modeled for this investigation. The size variability of this material makes it nearly impossible to test with existing ASTM standards. Additionally, waste spreading and placement can be inconsistent, based on seasonal availability and physical makeup.

However, based on TRC's experience with landfill operations and waste characterization, as well as available published studies, TRC believes oversized CDD waste mixing with other bulking agents and biosolids would further increase the strengths of the waste mass. Oversized waste sources such as crushed concrete, building materials, oversized organics materials such as large wood chunks, etc. can help in displacing moisture from the softer biosolids materials. CDD material such as crushed concrete is a good source of binding material, as cement-laden sources help to bond to wet environments, creating stable working surfaces. The physical characteristics of the individual CDD material often provides significant strength when intertwined with lesser strength material. Oversized waste also helps as a bridging layer, as biosolids can fill in voids without reducing strength impacts on the surface.

3.4.1 Potential Operational Impacts

The introduction of large amounts of biosolids into existing landfills will have impacts on operations. Biosolids are generally placed in landfills under wet and soft conditions. Care will need to be taken to avoid negative and/or unsafe impacts from landfilling the waste. As discussed above, when large amounts of waste consists of biosolids (over 30%), landfill operations have been observed to be halted at times due to the hauling, dumping, and spreading issues caused by soft ground conditions, leading to sinking equipment. While a 4-parts bulking material:1-part biosolids material mixing ratio is recommended for standard waste placement operations, stabilization of biosolids in landfills will depend on other factors which may cause the need for this ratio to be adjusted. If weather conditions are wet, for example, the amount of bulking material should be increased in order to ensure stabilization. The condition of the biosolids material when it arrives on site should also be assessed to determine the bulking ratio to be used on a case-by-case basis. A delivery of biosolids material that is highly liquified will need a greater amount of bulking material, while a dryer delivery may not require as much bulking agent. Furthermore, the ratio may be adjusted depending on where in the landfill material is being placed. The outer slopes of a landfill require more stability, and thus an increase in bulking material to ensure stabilization, while the center of a cell may not need as much bulking material in order to reach a stable waste mass. Based on field observations, as well as the analytical calculations performed, the following recommendations can be considered when landfilling biosolids with other solid waste.

- Stockpiling bulking waste material within the active area of the landfill to be used for mixing with biosolids. The bulking material is seen as a stabilizer for the soft, wet biosolids and can assist in creating a more stable operating surface during dumping and land spreading.
- Developing non-biosolid access roads/berms made of bulking material or similar to allow hauling and dumping without the need to drive on biosolid material.
- Utilizing low-ground pressure spreading equipment and articulated dump trucks to mitigate sinking and operational halting in softer ground conditions when biosolids are landfilled.
- Developing a large footprint active face of the landfill or larger dumping and spreading area to spread very thin waste lifts when biosolids are landfilled. This would assist in the drying and dewatering process of the biosolids, creating firmer ground conditions over time.
- Providing temporary cover protection from rain and snow prior to mixing, based on weather conditions.

These recommendations are seen as day-to-day considerations that may assist with biosolid spreading operations, assuming mixing with bulking material waste is the chosen methodology for landfilling. If larger amounts of biosolids are expected to be landfilled, in so much that bulking materials are not available or not a viable option during landfilling, further landfill design considerations should be evaluated.

3.4.2 Landfill Design Considerations

More impactful landfill design considerations may be required for circumstances such as the landfilling of large quantities of biosolids compared with other waste streams in a single landfill, or landfilling *only* biosolids in a landfill. Biosolid landfilling presents complications because of the

structural stability characteristics of the material. Dewatering issues can develop, and slope stability impacts can also develop when not placed with additional care or to design specifications. The following design considerations should be made when landfilling large quantities of biosolids.

- Construct drainage blankets within the active face of the landfill consisting of typically 6- to 12-inch sand layers typically every 5 to 10 vertical feet of waste filling between biosolids to assist in dewatering and consolidation of waste over time.
- Construct vertical drains within the waste mass to assist in movement of leachate to the collection system at the base of the landfill.
- Design and construction of perimeter and internal dikes around landfill cells to keep biosolid waste "in-place" during filling operations. The perimeter dikes also assist in slope stability to avoid blow-outs and slope failures over time. These dikes are typically made up of general fill or beneficially reusable waste that is suitable for hauling and containment. These dikes also work as access routes for dumping during filling operations.
- Design and construction of maximum slope grades of 4:1 or 5:1 (H:V) during final grading to avoid global stability failures during closed conditions.

These recommendations have an obvious impact on airspace availability, as the constraints of landfill biosolids can reduce airspace when implementing drainage blankets, containment dikes, etc. When reviewing available land space for expansion when it comes to landfilling biosolids, the constraints of the material should be considered. Larger landfill footprints may be necessary to develop desired airspace, given the nature of the material.

3.4.3 Study Limitations

Limitations became evident during this investigative and analytical process. The sampling investigation was limited to sources available to TRC at the time of this project. Additionally, samples were observed to be "un-testable" due to the physical characteristics. Most of the waste sources were made up of non-soil natured materials such as fibers, debris, wood chips, etc. This constraint makes it difficult to develop standardized testing to further characterize these materials. The samples chosen for this investigation were determined as the most testable and representative material to mimic a conservative approach to the introduction of biosolids into other waste masses.

Additionally, the sampled biosolids were saturated. While the sampled moisture conditions are representative to how the materials are placed in landfills, the wet soils created challenges for geotechnical analysis. Drying the waste samples took much longer than expected. As the waste was made up of organics, fibers, debris, etc. care was taken to not "cook" or burn the samples in high heat conditions to preserve the integrity of the samples. Therefore, air drying and low-heat drying were available methods of drying the samples, prolonging the testing schedule.

While the bulking material is considered representative of wastes biosolids would be mixed with in a typical landfill, more expansive testing should be considered to quantify how different bulking agents mix and strengthen the biosolid waste. Additionally, TRC understands that landfills bring in much larger, oversized, waste material with considerable strength characteristics. This material could not be properly sampled and tested given the constraints of lab equipment. While TRC assumes that

oversized bulking material improve strength and possibly lower moisture contents of the overall waste mass, research and historical testing information was not available, so oversized bulking materials were removed from consideration with regards to the strengthening of the biosolid mixture. TRC considers evaluating the smaller sized bulking material with biosolids and no oversized waste material component as a conservative approach. The use of oversized material within waste masses has been known to provide more stable conditions, historically.

4.0 Statewide Waste Discussion

4.1 Effective Available Bulking Materials

TRC identified the following materials as having the potential to bulk biosolids:

- Construction and Demolition Debris (CDD)
- Oversized Bulky Waste (OBW)
- CDD Processing Fines
- Auto-shredder Residue
- Ash
- Contaminated soils

Samples were obtained, as appropriate, and a geotechnical analysis was performed using the available strength information to evaluate the quantity of materials that would be required to bulk the state's biosolids. Discussion of the findings of the analysis and availability of each material is discussed below.

4.1.1 Material Overview

Construction and Demolition Debris

Construction and Demolition debris (CDD) in Maine has historically been managed through disposal at both lined and unlined (less than 6-acre) landfills or recycling at our processing facilities. In 2023, approximately 454,000 tons of CDD was managed in the state of Maine.

CDD, due to its large particle size provides structural support in landfills and when placed alone has been shown to be stable at side slopes up to 2.5 horizontal to 1 vertical. Mixing CDD with other wastes also creates voids that allows for improved leachate drainage and gas recovery, especially in landfills that accept biosolids.

Oversized Bulky Waste

Oversized bulky waste (OBW) is material such as furniture and mattresses that are not easily recycled and often produced as a waste material at CDD processing facilities. Due to the types of materials used in the manufacturing process, OBW does not often have much value in recycling or reclamation. Like CDD, OBW's large particle size makes it a good material to use when bulking less stable materials like biosolids.

CDD Processing Fines

CDD Processing Fines are a byproduct of CDD processing and recycling and is a smaller particle material that contains wood debris, dirt, and small pieces of metal (nails, screws, etc.) that may fall or are removed from the processed material before it is shipped off for reuse. This material, although it does not provide the same level of structural support as whole CDD, mixes well with wet wastes during waste placement to provide a uniform waste layer and can absorb some liquid from the biosolids.

Auto-shredder Residue

Auto-shredder residue is a byproduct of the metals recycling processes that behaves similarly to the CDD Processing Fines. It is comprised of the smaller particle materials that are sifted out of the recycled metals and is generally small pieces of plastic, metal, dirt, and fabric.

Ash

Ash is produced from the incineration of both MSW and wood waste in Maine. Ash generally has a higher pH and, when blended with biosolids at a high enough ratio, has a tendency to solidify. While this may seem like an ideal mixture, if additional wastes are not blended into the waste mix, this combination can easily create layers within the landfill that block the vertical flow of leachate and gases. When liquids are not able to move within the waste, pressures can build up and lead to leachate seeps and instability.

Contaminated Soils

Contaminated soils are produced during the completion of clean-up projects. While soils can also add stability to the waste, clean-up project locations are unpredictable and can lead to the need to dispose of any soil type, in any quantity. While some soils, like gravel, will add stability and promote drainage, disposal of clay like soils can reduce drainage in landfills and will need to be mixed with other larger particle materials.

4.1.1.1 Material Source and Geographic Location

While the Juniper Ridge Landfill is located in Penobscot County, more than 83% of the CDD handled at Maine transfer stations originates in other counties. Additionally, the 2 largest CDD processing facilities are located approximately 120 and 167 miles south of the landfill. These facilities are responsible for 88% of the processing residual sent to JRL and currently used for waste bulking.
The only 2 operating MSW incinerators are also located approximately 120 and 140 miles south of JRL. These facilities are currently responsible for the production of all of the MSW ash in Maine.

4.1.1.2 Material Compatibility with Typical Landfill Liner Systems

Materials identified as potential bulking agents for biosolids in the state of Maine are wastes that have been historically, and are currently, accepted for disposal at RCRA Subtitle D lined landfills within the state. Materials have been previously characterized and are considered non-hazardous and, in some cases, have been issued beneficial use permits as alternate daily cover. Identified waste materials have been considered compatible with typical landfill liner systems.

Placement of wastes within 5 feet of the landfill liner system must be done carefully and materials must be selected that will not puncture the membrane or block access to the leachate collection

system. This initial waste placement is often referred to as the "select lift" of waste. Whole CDD and bulky wastes must not be placed within the select lift due to the potential risk for puncture. Additionally, materials like biosolids, that contain limited void space or do not readily drain should not be placed alone, without mixing, as the select lift since they can blind, or block access, to the leachate collection system below.

New wastes proposed for disposal within any landfill must be initially characterized, with re-analysis performed on a frequency as required by the facility's approved waste characterization plan.

4.1.1.3 Costs Associated with Delivery to Landfill

Currently all materials identified for mixing with biosolids at Maine landfills are wastes already accepted for disposal at one of Maine's landfills. JRL currently accepts the largest quantities of these materials, but it also accepts the most biosolids. The only material not disposed of at JRL are MSW ashes from ecomaine and MWE. These materials are handled at landfills specifically operated for their disposal, the ecomaine landfill and the Lewiston Landfill. While these landfills are designed to meet current regulatory requirements for subtitle D secure landfills and could be permitted to safely dispose of other wastes with MDEP approval, they have not currently accepted them in the past. If these facilities decided to transport ash to JRL, there would be an added cost for transporting materials more than 100 miles. If the landfills decided to accept biosolids for disposal, landfill capacity would be used more rapidly, odor controls would need to be instituted, and landfill gas considerations would be required. These items would add costs to the operations of the landfills.

4.1.1.4 Availability of Material

In 2023, there were 541,039 tons of CDD, 50,774 tons of CDD fines, 62,799 tons of ash, 89,765 tons of auto-shredder residue and ADC, and 8,795 tons of contaminated soil disposed within Maine landfills.

CDD and contaminated soil acceptance rates are typically higher in warmer months when the weather is most conducive to construction projects. CDD fines and OBW from processing facilities are currently available year-round due to the ability to process waste from outside of Maine. Based on conversations with Resource Waste, they have increased their Maine CDD input and are proposing to accept more than 50% of their CDD input from within the State of Maine moving forward, however, CDD rates in Maine are reduced by more than 50% during winter months. MSW ash is produced at a consistent rate year-round but the bulk of this material is currently produced in the southern part of the state and handled in landfills specifically permitted, designed, and constructed to manage it.

4.1.1.5 Public Benefits of Material Use as Bulking Agent

Materials proposed for bulking biosolids are waste materials that currently have no other purpose. Bulking of biosolids allows for the continued stable placement of the state's waste and maintains the landfill's capacity at its current geometry. If adequate waste material is not available for the safe disposal of biosolids, our WWTPs will have no viable disposal option, and our landfills would be forced to change their currently designed waste grades. The revised grades would likely include shallower slopes with lower overall elevations. This change equates to less useable capacity from the same

overall footprint. It will also lead to higher disposal costs, due to the need to build larger landfill footprints with lower capacity. The unreliable disposal capacity for our WWTPs would also make future expansion projects at the WWTPs less likely and would limit the potential for economic development due to new commercial or industrial facilities.

4.2 Seasonality of Material Availability

Biosolids material quantities do not vary greatly throughout the year, causing the need for consistent availability of bulking materials to ensure year-round landfill stability. While Annual Reports do not break down tonnages of available material by season, it is TRC's experience at both Maine's CDD landfills and Residential Waste Landfills, that CDD acceptance rates decline in the winter months. This decline is due to the reduction in outdoor projects during the colder months. It is typical of the construction industry in Maine to have more projects booked for warmer months, with less construction continuing through the winter to avoid health and safety risks, laborer shortages, high utility prices, and logistical impediments that frozen conditions create. As much of the most beneficial bulking materials come from construction and demolition debris, this has an impact on how landfills are able to supplement biosolids deliveries during the winter months. It is also important to note that while landfills may have a surplus of CDD (quantity of materials greater than that needed for stability) during the summer months, it is not possible to store CDD at landfills or processing facilities for later use. Uncompacted, unprocessed, CDD can lead to increased litter, vectors (as animals can use these piles for shelter), and potential risk for landfill fires.

This reduced CDD rate was experienced at JRL in March 2023 when the in-state waste definition changed and waste materials from Resource Waste (which had supplemented its process stream with out-of-state materials) could not be accepted. This led to a biosolids acceptance at the landfill that accounted for 30-50% of all wastes accepted for multiple days in a row. This decrease in CDD waste resulted in an unstable waste surface that led to a temporary closure of the landfill.

TRC obtained CDD acceptance data from both Resource Waste and the Town of Hartland for 2023 and 2024. This data was broken down by month and demonstrates that rates of available material does fluctuate throughout the calendar year. For example, in-state CDD accepted at Resource Waste in January was 2,156 tons and 3,886 tons in 2023 and 2024 while CDD accepted in May was 5,193 tons and 8,158 tons. Assuming a 30% bulky waste production rate, oversized bulky material available for biosolids bulking would range from 646 to 1,166 tons in January and 1,558 to 2,447 tons May. CDD accepted at the Hartland Landfill for bulking in December 2023 was 2,157 tons and 3,289 tons in August 2024. While Resource Waste is only one source of bulking materials, the fluctuation observed in their acceptance rates and in the acceptance rates at the Hartland Landfill provides evidence of what is also observed at other facilities that accept CDD for processing or disposal in Maine.

Material testing and geotechnical analysis continue to support a mixing ratio of 4-parts bulking agent to 1-part biosolids. This ratio has been used successfully by the Town of Hartland Landfill and is the current operating ratio at JRL.

As presented above, just over 85,000 tons of biosolids were disposed of in Maine landfills in 2023. At an assumed ratio of 4:1, 340,000 tons/year of bulking material would be needed for landfill placement. This would amount to approximately 28,333 tons per month of bulking material. This quantity would be expected to increase annually with future economic development, and based on discussions with MEWEA, could be expected to grow by 10% over the next 10 years amounting to the need for over 30,000 tons per month by 2034.

Additionally, there is a finite quantity of CDD available within the state of Maine for use in landfills as a bulking agent and for diversion to processing facilities for recycling. The rate of CDD availability is variable, based on the season and the strength of the economy which drives new construction as well as redevelopment. The rate of CDD acceptance at JRL has varied from 299,611 tons to 347,016 tons since 2019 with the largest increase of 7.7% occurring in 2020 followed by a 1% decrease in 2021. While the state's policies favor diversion of wastes from landfills it must be understood that with the sudden increase in wet wastes directed to landfills, at least in the short-term, there is a minimum quantity of bulky material, like CDD, needed to maintain stable operations as outlined in the geotechnical discussions above. Likewise, when a processing facility is faced with changes to the availability of raw material, for instance a change in waste classification, other sources of available material are sought out to maintain their business model. In cases like these, CDD becomes a commodity with competing end uses. As in all cases of supply and demand, this will drive up the price of the CDD for disposal or processing through lower tipping fees collected by the facilities. Unlike other industries, "production" of CDD cannot be increased to meet demand, however, and will ultimately lead to operational concerns for both facility types.

Based on TRC's review of the waste quantities disposed of and processed within the state, the bulking properties of the available wastes, and the reduced and unpredictable availability of CDD and its processing residuals, further reduction of the quantity of CDD and its residuals available for disposal at JRL (and other landfills that accept biosolids) will be detrimental to the stability of the landfills as they are currently operated especially during winter months. As the quantity of unprocessed/ undried biosolids disposed in landfills is reduced in the future through the use of new and proposed technologies, this need for bulking materials should also decline.

4.3 Statewide Solid Waste Disposal Capacity

The most critical disposal capacity in Maine currently revolves around the need to dispose of biosolids. Table 10 presents the capacities for the landfills that currently handle the majority of the biosolids. Based on current disposal rates, JRL and the Hartland Landfill managed 93% of the state's biosolids in 2023. Both of these facilities will be out of their currently permitted capacities within 6 years. Hartland Landfill has no plans to develop additional capacity. This will direct an additional 11.7% toward JRL and/or Crossroads Landfill. The final column in the table provides an estimated remaining capacity that represents an annual waste increase of 3% per year to account for economic and population growth through the state with wastes from JRL and Hartland Landfill directed to Crossroads Landfill after 5 years without additional capacity at JRL and all of Maine's waste directed to AWS and Bath after 8.5 years with no additional capacity available at Crossroads Landfill.

A growth rate of 3% was selected based on Maine's historic data as presented in the MDEP's 2024 Material Management Plan and 2022 Capacity Report, historical waste acceptance rates at JRL,

national trends in waste production, and to reflect potential short-term disposal needs for PFAS impacted waste materials. While the average waste production rate from 2018 to 2022 in Maine was calculated as 1.3%, the increase from 2018-2019 was 3.9% and from 2019-2020 was 5.5%. Additionally waste acceptance rates at JRL from 2015-2022 increased by an average 5.8% per year. Waste production rates increased worldwide during the COVID pandemic with a report issued by the National Institute of Health showing wastes increasing in Ontario, Canada by 15% and 13.3% in New York City. While Maine's rate increase was not that dramatic, there was an overall increase observed. Additionally, in Maine, there was an increase in landfilled waste in recent years due to the biosolids spreading ban. While biosolids are the first PFAS waste to be redirected to the landfills, it is quite possible that an increase in disposal of other, previously recycled wastes, will be temporarily needed to prevent the recycling of PFAS containing materials. We will also likely see an increase in contaminated soils and construction debris from projects funded by the National Infrastructure Bill. For these reasons, TRC selected a slightly higher annual growth rate than the calculated annual average.

Table 10: Remaining Capacities of Landfills in Maine Accepting Biosolids

Facility Name	Biosolids (tons)	% of State's Biosolids	Remaining Capacity (CY)	Remaining Operational Life (at current rate)	Remaining Operational Life (assuming 3% increase per year)
Aroostook Waste Solutions	959	1.2	2,555,784	43 years	9.5 yrs
City of Bath Landfill	1,290	1.6	293,650	22 years	9.5 yrs
Hartland Landfill	9,528	11.7	295,700	6 years	5.5 yrs
Juniper Ridge	66,176	81.4	5,356,397	5 years	5 years
Crossroads Landfill - Norridgewock	-	-	7,277,267	14 years	8.5 yrs
Sanford Sewage District	3,324	4.1	0	0 yrs	
Totals	**81,277**	-	-	-	-

4.3.1 1-3 Year Analysis

In the next 1-3 years, it is projected that waste production will increase 3% each year as discussed above, and that the State will be able to accommodate these increases based on current projected remaining capacities at landfills within the state that currently accept biosolids materials.

4.3.2 3-5 Year Analysis

In the next 3-5 years, the 3% increase in production year-over-year will cause a 15% increase in waste production by the end of the time period, as well as the possible closure of at least one of the sludge-accepting landfills in the State will put a strain on the other landfills.

4.3.3 5-10 Year Analysis

During the next 5-10 years, without added capacity at JRL, it is projected that waste production will increase by approximately 15-30% and all available landfill capacity would be consumed.

5.0 Conclusions

The following conclusions have been made based on information collected during this study:

1. Solid waste management in Maine is evolving with many municipal landfills nearing capacity within the next 10 years and the Crossroads Landfill, our only commercial landfill, nearing capacity within approximately 14 years.

2. Without expanding capacity at the Maine state-owned landfill, all of the wastes produced in Maine would be directed to other, smaller landfills and all of the currently licensed capacity, for disposal of residential wastes and biosolids, would be utilized within 10 years.

3. The disposal of biosolids within Maine landfills requires careful mixing and placement practices to ensure a stable waste mass, proper drainage, and adequate gas collection. While the anaerobic digester proposed in Brunswick, the MRC facility in Hampden, and the sludge dryer proposed for the Crossroads Landfill in Norridgewock may help reduce the volume of biosolids sent to the landfills in the future, these are not online yet and will take some time to become fully operational.

4. Without an adequate volume of waste materials for bulking, landfills currently accepting biosolids would be forced to source alternative materials that have not been historically accepted at landfills, like clean wood materials and gravel, in order to maintain current operational geometry and available capacity. These materials are all resources used in the construction industry in Maine for development of new roads, land development, etc. Should landfills rely upon these materials for bulking, not only is landfill capacity being consumed by non-waste materials but additional borrow sources/ gravel pits would need to be identified and developed, potentially leading to further land disturbance. The need to obtain these materials will increase the cost of operations at the landfills and therefore likely increase the disposal fees charged to municipal WWTPs for biosolids at landfills.

5. Without adequate bulking materials, landfills in Maine would be forced to change their operational geometry, lessening the side slopes and decreasing the overall permitted elevation. This will reduce the available capacity of each currently licensed footprint and would require the development of larger landfill cells to manage the same amount of biosolids material.

6. Based on TRC's review of the quantity, bulking properties, and availability of wastes processed and disposed of within the State, any reduction in the quantity of available CDD and its residuals will be detrimental to the stability of the landfills that dispose of biosolids as they are currently operated, especially during the winter months.

7. Estimates for the ratio of bulking materials to biosolids is 4-parts to 1-part. This ratio should be adjusted for changing material, site, and weather conditions. Using data from 2023, this would require approximately 320,000 tons of bulking material annually. Based on discussions with WWTP operators through MEWEA, we can expect that number to increase by 10% over the next 10 years to account for economic and population growth.

6.0 Discussion of Waste Management Options for Consideration

TRC found that the quantities of CDD and CDD processing materials available for placement in Maine landfills in 2023 were adequate to bulk the biosolids required to be disposed within these same landfills. Other bulking wastes, with similar physical properties, were not identified. Based on discussions with landfill operators, and our experience with landfill procedures, it is understood that operators are able to adjust placement procedures slightly during the winter months when CDD materials are less prevalent but must maintain the average 4:1 ratio of bulking material to biosolids to ensure stable waste placement. Landfill owners and/or operators track incoming wastes to help ensure safe operations and actively seek the waste materials needed to maintain stable operations. Any reduction to the current quantity of available CDD, due to changes in waste definition, reduced construction or redevelopment projects, or additional changes to regulations directing CDD materials away from landfills, would be detrimental to the stability of the landfills and reduce the effectiveness of the landfill gas and leachate collection systems, especially during the winter months, without a simultaneous reduction in biosolids quantities requiring disposal and/or water content of the biosolids material.

The following additional options are presented based on information collected during this study:

1. Siting of additional biosolids treatment or processing technologies, such as anaerobic digestion and sludge drying would reduce the need for bulking materials for disposal of wet wastes placed in the state's landfills. Based on the geography of the state and the current location of existing and proposed infrastructure, an additional facility in the central part of the state would help address biosolids disposal needs of municipalities located north of Bangor. While the initial cost of this type of facility may be considerable, beyond typical operating and maintenance costs, the lifespan of this type of facility would not require extensive annual capital costs.

2. While facilities have been proposed to help meet the needs of Maine for disposal of biosolids and their processing residuals, these facilities are not predicted to be operational until 2026. This means that landfills will be required to accept wet wastes at the quantities they have been handling for at least 2 more years. Given this timeline, waste bulking should continue at the ratios determined by the geotechnical analysis to ensure leachate drainage and stability within the landfills.

Given the projected potential increases in waste requiring disposal in Maine, and the fact that the State has responsibility for providing capacity for its residents into the future, additional state-owned landfill capacity will be required.

3. Given the geotechnical concerns of biosolids disposal and the required bulking wastes needed to place it within typical MSW and special waste landfills, the state could consider developing biosolids monofill landfills. This type of operation could reduce the need for bulking agents, allowing for the potential diversion of materials from the landfill, but would result in larger operating landfill footprints therefore higher capital costs for annual construction and potentially higher leachate treatment costs. Odor and gas management would also need to be considered.

Attachment A: Laboratory Results

SUMMARY OF LABORATORY TEST DATA

Project Name: Waste Bulking Agent Evaluation
Client Name: State of Maine Bureau of General Services
TRC Project #: 605893

SAMPLE IDENTIFICATION			REMARKS
Source #	Sample #	Depth (ft)	
Portland Water District	BS-1	GRAB	Upon receipt of sample, material exhibited a strong organic-like odor. Material visually contained fibers and deleterious material. After fully drying the material, it was determined that a classification test was not feasible due to the relatively high percentage of fibrous and deleterious materials observed. These inclusions would skew the results of the grain size distribution (by weight) and therefore would not be representative of the actual soil materials.
Bangor Wastewater Treatment Plant	BS-2	GRAB	Upon receipt of sample, material exhibited a strong organic-like odor. Material visually contained fibers and deleterious material. Mold started to grow on the material as it was air drying. After fully drying the material, it was determined that a classification test was not feasible due to the relatively high percentage of fibrous and deleterious materials observed. These inclusions would skew the results of the grain size distribution (by weight) and therefore would not be representative of the actual soil materials.
Lewiston-Auburn Clean Water Authority	BS-3	GRAB	Upon receipt of sample, material exhibited a strong organic-like odor (not as strong as BS-1, BS-2 & BS-4). Material visually contained fibers and deleterious material After fully drying the material, it was determined that a classification test was not feasible due to the relatively high percentage of fibrous and deleterious materials observed. These inclusions would skew the results of the grain size distribution (by weight) and therefore would not be representative of the actual soil materials.
Greater Augusta Utility District	BS-4	GRAB	Upon receipt of sample, material exhibited a strong organic-like odor. Material visually contained fibers and deleterious material. After fully drying the material, it was determined that a classification test was not feasible due to the relatively high percentage of fibrous and deleterious materials observed. These inclusions would skew the results of the grain size distribution (by weight) and therefore would not be representative of the actual soil materials.
Hatch Hill Landfill	WS-1	GRAB	Material visually contained fibers and deleterious material, and industrial waste. After fully drying the material, it was determined that a classification test was not feasible due to the relatively high percentage of fibrous and deleterious materials observed. These inclusions would skew the results of the grain size distribution (by weight) and therefore would not be representative of the actual soil materials.
Ecomaine	WS-3	GRAB	Material contained gravel-sized slag, construction debris (ie. Plastic, metal, screws, etc) and silt-like fines. A classification test was completed on this material.

DRAWN BY: TBT 01/13/25

CHECKED BY: JPB 01/13/25

SUMMARY OF LABORATORY TEST DATA

Project Name: Waste Bulking Agent Evaluation
Client Name: State of Maine Bureau of General Services
TRC Project #: 605893

SAMPLE IDENTIFICATION			REMARKS
Source #	**Sample #**	**Depth (ft)**	
Juniper Ridge Landfill	WS-4	GRAB	Material visually contained fibers and deleterious material, and industrial waste. After fully drying the material, it was determined that a classification test was not feasible due to the relatively high percentage of fibrous and deleterious materials observed. These inclusions would skew the results of the grain size distribution (by weight) and therefore would not be representative of the actual soil materials.

DRAWN BY: TBT 01/13/25

CHECKED BY: JPB 01/13/25

SUMMARY OF LABORATORY TEST DATA

Project Name: Waste Bulking Agent Evaluation
Client Name: State of Maine Bureau of General Services
TRC Project #: 605893

Source #	Sample #	Depth (ft)	Natural Moisture Content			
			Wet Wt + Tare (g)	Dry Wt + Tare (g)	Tare (g)	% Moisture Content
Portland Water District	BS-1	GRAB	1417.00	663.54	375.00	261.1
Bangor Wastewater Treatment Plant	BS-2	GRAB	1226.00	580.13	378.86	320.9
Lewiston-Auburn Clean Water Authority	BS-3	GRAB	767.92	457.26	378.73	395.6
Greater Augusta Utility District	BS-4	GRAB	1666.00	1311.00	568.00	47.8
Hatch Hill Landfill	WS-1	GRAB	1170.00	1040.96	515.61	24.6
Ecomaine	WS-3	GRAB	2795.00	2397.35	503.89	21.0
Juniper Ridge Landfill	WS-4	GRAB	1690.83	1417.43	294.39	24.3

DRAWN BY: TBT 01/13/25

CHECKED BY: JPB 01/13/25

SUMMARY OF LABORATORY TEST DATA

Project Name: Waste Bulking Agent Evaluation
Client Name: State of Maine Bureau of General Services
TRC Project #: 605893

SAMPLE IDENTIFICATION			Soil Group (USCS System)	Specific Gravity	GRAIN SIZE DISTRIBUTION USCS GRADATION				Moisture Content (%)	PLASTICITY			
Source #	Sample #	Depth (ft)			Gravel (%)	Sand (%)	Silt (%)	Clay (%)		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Liquidity Index (%)
Ecomaine	WS-3	GRAB	GM	2.56	44.8	32.3	22.9		21.0	NP	NP	NP	-

DRAWN BY: TBT 01/13/25

CHECKED BY: JPB 01/13/25

SUMMARY OF LABORATORY TEST DATA

Project Name: Waste Bulking Agent Evaluation
Client Name: State of Maine Bureau of General Services
TRC Project #: 605893

SAMPLE IDENTIFICATION			Moisture Content (%)	TARGET COMPACTION TEST		
Source #	Sample #	Depth (ft)		Form of Compaction in one 6" Proctor Mold at Natural Moisture Content	Target Compaction Test - Maximum Dry Density at Natural Moisture Content (pcf)	Target Compaction Test - Maximum Wet Density at Natural Moisture Content (pcf)
15% BS-3 / 85% WS-3[1,2]	COMBINED	GRAB	28.7	10.0 lb Hammer/56 Blows/5 lifts	81.1	104.3
20% BS-3 / 80% WS-3[1,3]	COMBINED	GRAB	47.1	10.0 lb Hammer/56 Blows/5 lifts	66.9	98.4
25% BS-3 / 75% WS-3[1,4]	COMBINED	GRAB	47.3	10.0 lb Hammer/56 Blows/5 lifts	67.8	99.9

Notes:

(1) Each Sample mixture was completed using a cylinder with the dimensions of 3-inch diameter by 6-inch high. Material was placed in lifts (total of 5) and vibrated to compact as much as possible.
(2) Sample mixture contained 1 part BS-3 to 5 and 2/3rd parts WS-3.
(3) Sample mixture contained 2 parts BS-3 to 8 parts WS-3.
(4) Sample mixture contained 2 parts BS-3 to 6 parts WS-3.

DRAWN BY: TBT 01/13/25 CHECKED BY: JPB 01/13/25

SUMMARY OF LABORATORY TEST DATA

Project Name: Waste Bulking Agent Evaluation
Client Name: State of Maine Bureau of General Services
TRC Project #: 605893

SAMPLE IDENTIFICATION			Assumed Specific Gravity[1]	Moisture Content (%)	VOLUMETRIC PROPERTIES			SHEAR STRENGTH PROPERTIES					
Source#	Sample #	Depth (ft)			Dry Unit Weight, PCF[2]	Void Ratio	Degree of Saturation (%)	Type of Test	Normal Stress (PSI)	Failure Stress (PSI)	Strain (%)	Angle of Internal Friction (Degrees)	Cohesion (PSI)
15% BS-3 / 85% WS-3	COMBINED	GRAB	2.56	28.1	81.4	0.96	74.8	DS	10.0	9.2	13.4	40.3	0.15
				28.5	80.9	0.97	74.8		25.0	20.3	17.5		
				28.8	81.1	0.97	75.9		50.0	42.9	20.0		
20% BS-3 / 80% WS-3	COMBINED	GRAB	2.56	46.9	67.1	1.38	86.8	DS	10.0	9.6	14.4	39.1	0.55
				47.3	67.2	1.38	87.8		25.0	19.1	15.8		
				47.5	67.0	1.38	87.7		50.0	41.7	14.3		
25% BS-3 / 75% WS-3	COMBINED	GRAB	2.56	47.0	68.1	1.35	89.3	DS	10.0	11.8	20.0	30.7	4.65
				47.4	67.6	1.37	88.9		25.0	17.5	10.3		
				47.4	68.3	1.34	90.5		50.0	35.1	19.9		

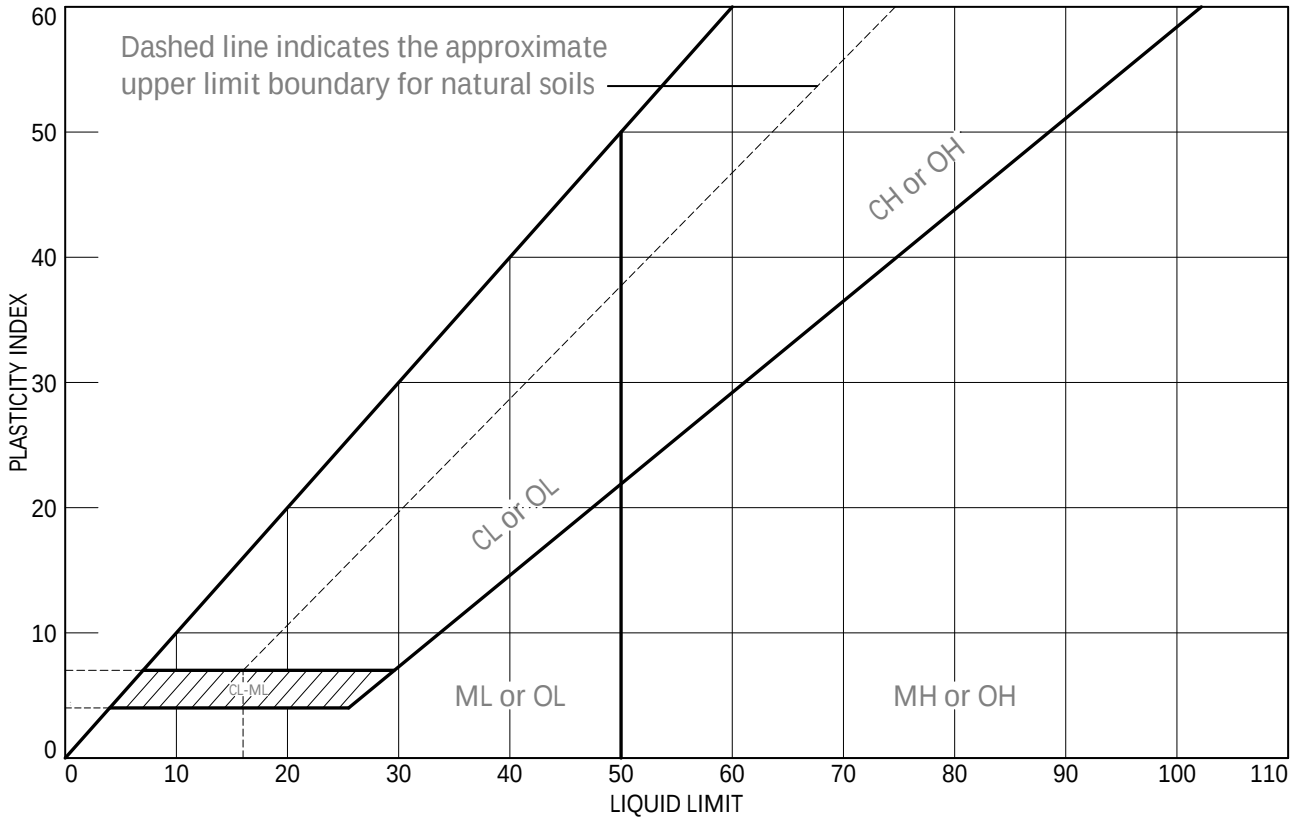
Notes:

(1) Assumed Specific gravity used for Direct Shear Test was the determined specific gravity for sample WS-3.
(2) Specimens remolded to approximate maximum dry density at natural moisture content determined by a Target Compaction Test.

DRAWN BY: TBT 01/13/25

CHECKED BY: JPB 01/13/25

Atterberg Limits and Moisture Content Report



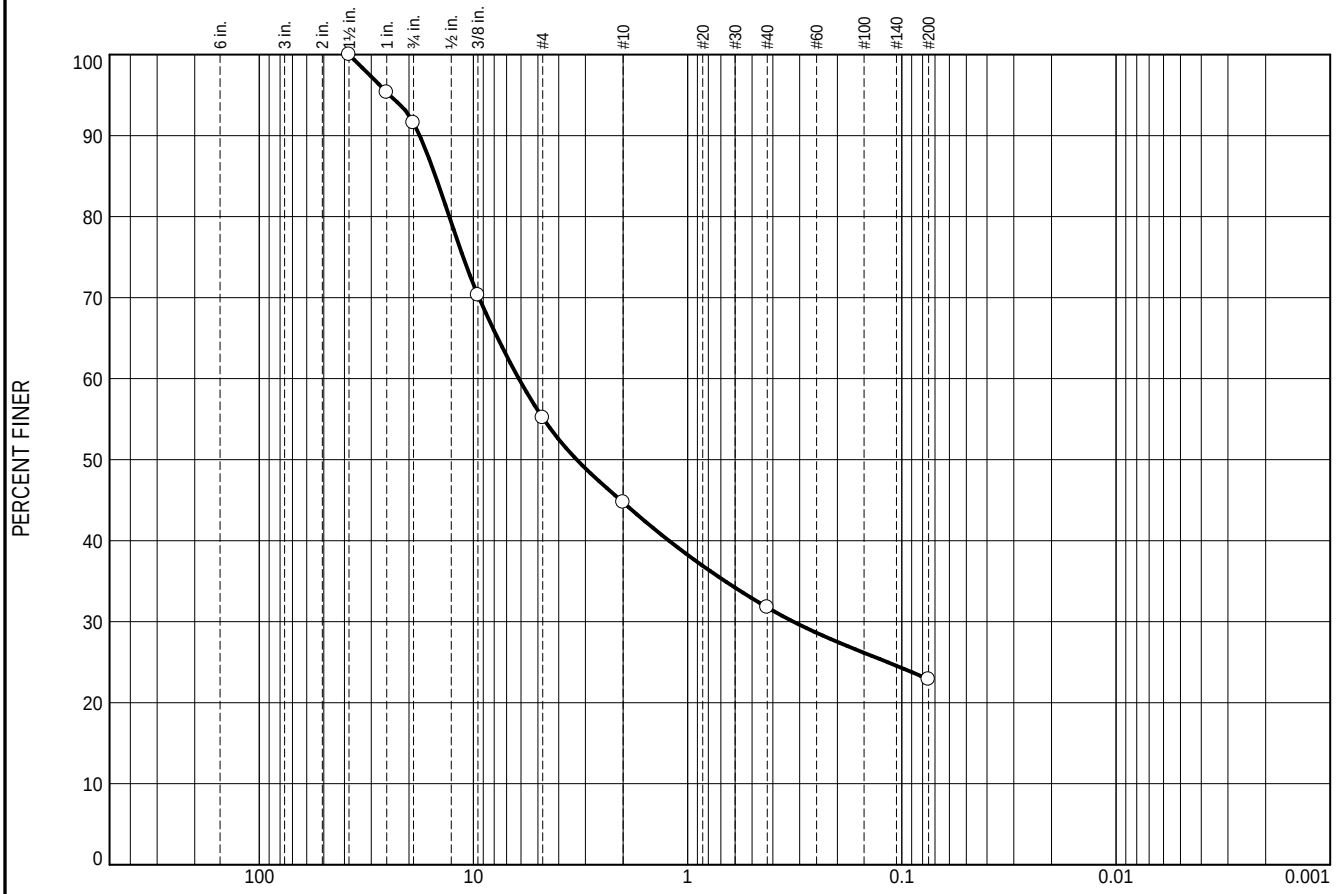
SOIL DATA								
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	ECOMAINE	WS-3	GRAB	21.0	NP	NP	NP	GM

TRC
Engineers, Inc.
Mt. Laurel, NJ

Client: State of Maine Bureau of General Services
Project: Waste Bulking Agent Evaluation

Project No.: 605893 Figure 1

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	8.4	36.4	10.5	12.9	8.9	22.9	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	15.0397	6.1430	3.2960	0.3209				

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ GRAY SILTY GRAVEL WITH SAND	11/20/24	GM	21.0

Project No. 605893 Client: State of Maine Bureau of General Services

Project: Waste Bulking Agent Evaluation

○ Source of Sample: ECOMAINE Depth: GRAB Sample Number: WS-3

TRC Engineers, Inc.

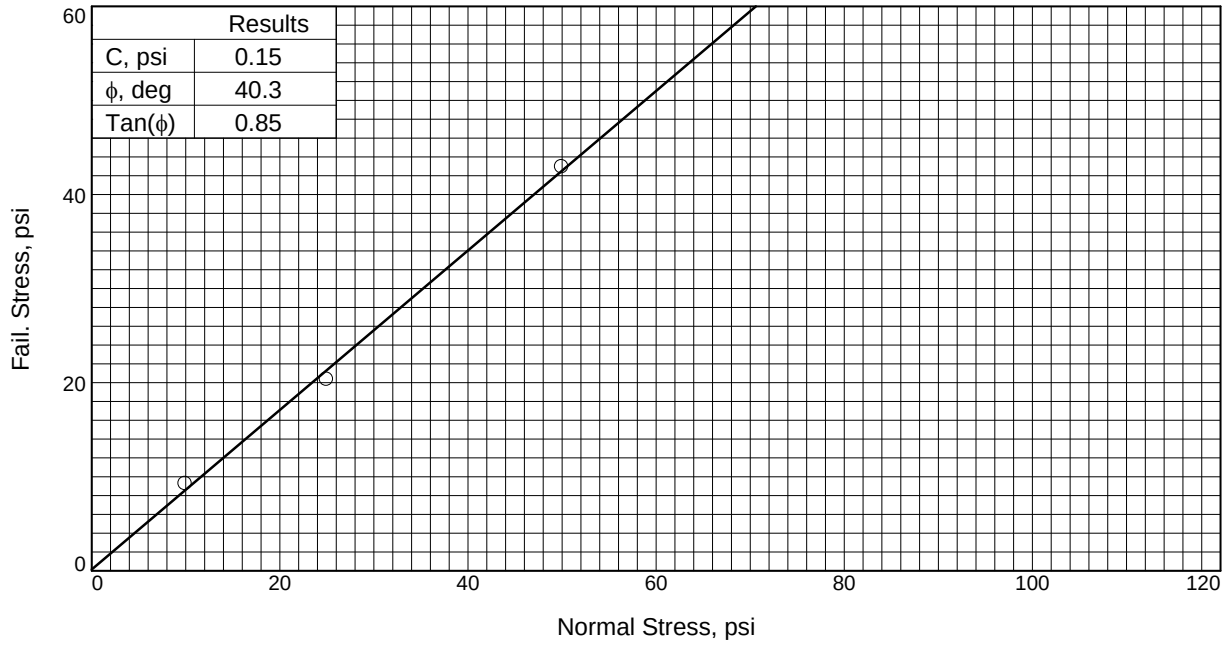
Mt. Laurel, NJ

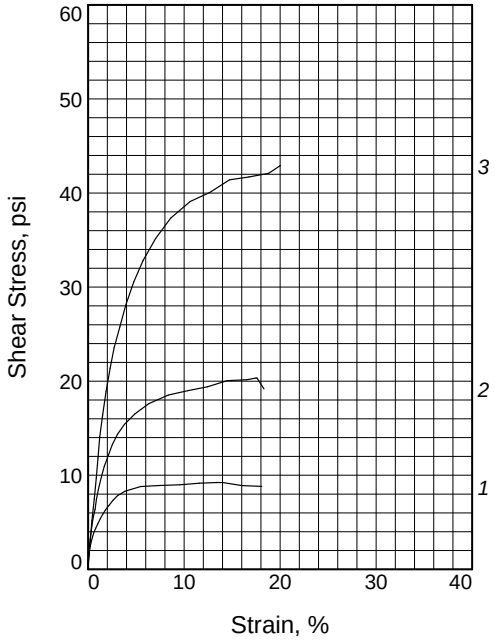
Remarks:

○SAMPLE DESCRIPTION BASED ON USCS

Figure 2

Tested By: JC 11/20/24 Checked By: JPB 11/25/24





Sample No.		1	2	3
Initial	Water Content, %	28.1	28.5	28.8
	Dry Density, pcf	81.4	80.9	81.1
	Saturation, %	74.8	74.8	75.9
	Void Ratio	0.9633	0.9744	0.9717
	Diameter, in.	2.50	2.50	2.50
	Height, in.	0.98	0.98	0.98
At Test	Water Content, %	28.7	32.5	30.6
	Dry Density, pcf	87.5	91.7	92.0
	Saturation, %	88.7	111.8	106.5
	Void Ratio	0.8273	0.7429	0.7364
	Diameter, in.	2.50	2.50	2.50
	Height, in.	0.91	0.87	0.86
Normal Stress, psi		9.97	25.00	49.99
Fail. Stress, psi		9.23	20.33	42.91
Strain, %		13.4	17.5	20.0
Ult. Stress, psi				
Strain, %				
Strain rate, in./min.		0.001	0.001	0.001

Sample Type: REMOLDED*
Description: BLACK/GRAY SILTY GRAVEL WITH SAND (WITH ORGANICS)

Assumed Specific Gravity= 2.56
Remarks: *SEE NOTES ON SUMMARY TABLE

Client: State of Maine Bureau of General Services

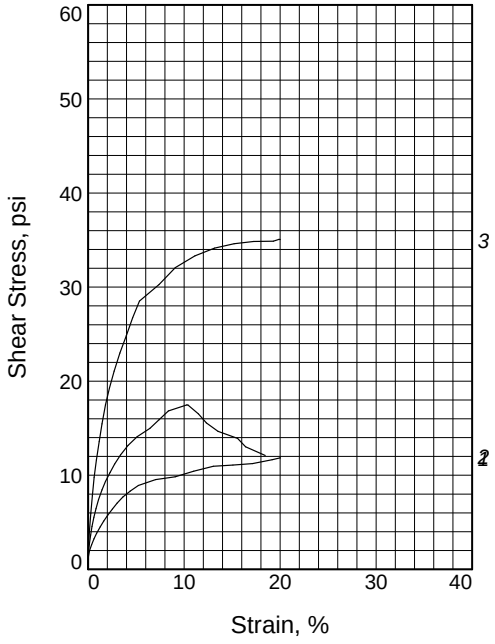
Project: Waste Bulking Agent Evaluation

Source of Sample: 15% BS-3 / 85% WS-3 **Depth:** GRAB
Sample Number: COMBINED BULK
Proj. No.: 605893 **Date Sampled:**

DIRECT SHEAR TEST REPORT
TRC Engineers, Inc.
Mt. Laurel, NJ

Figure 3

Tested By: JC 11/19/24 **Checked By:** JPB 11/25/24



Sample No.		1	2	3
Initial	Water Content, %	47.0	47.4	47.4
	Dry Density, pcf	68.1	67.6	68.3
	Saturation, %	89.3	88.9	90.5
	Void Ratio	1.3481	1.3652	1.3402
	Diameter, in.	2.50	2.50	2.50
	Height, in.	0.98	0.98	0.98
At Test	Water Content, %	54.1	46.4	43.0
	Dry Density, pcf	73.1	77.8	84.2
	Saturation, %	117.0	112.6	122.7
	Void Ratio	1.1848	1.0547	0.8982
	Diameter, in.	2.50	2.50	2.50
	Height, in.	0.91	0.85	0.80
Normal Stress, psi		9.99	24.99	49.97
Fail. Stress, psi		11.84	17.47	35.07
Strain, %		20.0	10.3	19.9
Ult. Stress, psi				
Strain, %				
Strain rate, in./min.		0.001	0.001	0.001

Sample Type: REMOLDED*
Description: BLACK/GRAY SILTY GRAVEL WITH SAND (ORGANICS)

Assumed Specific Gravity= 2.56
Remarks: *SEE NOTES ON SUMMARY TABLE

Client: State of Maine Bureau of General Services

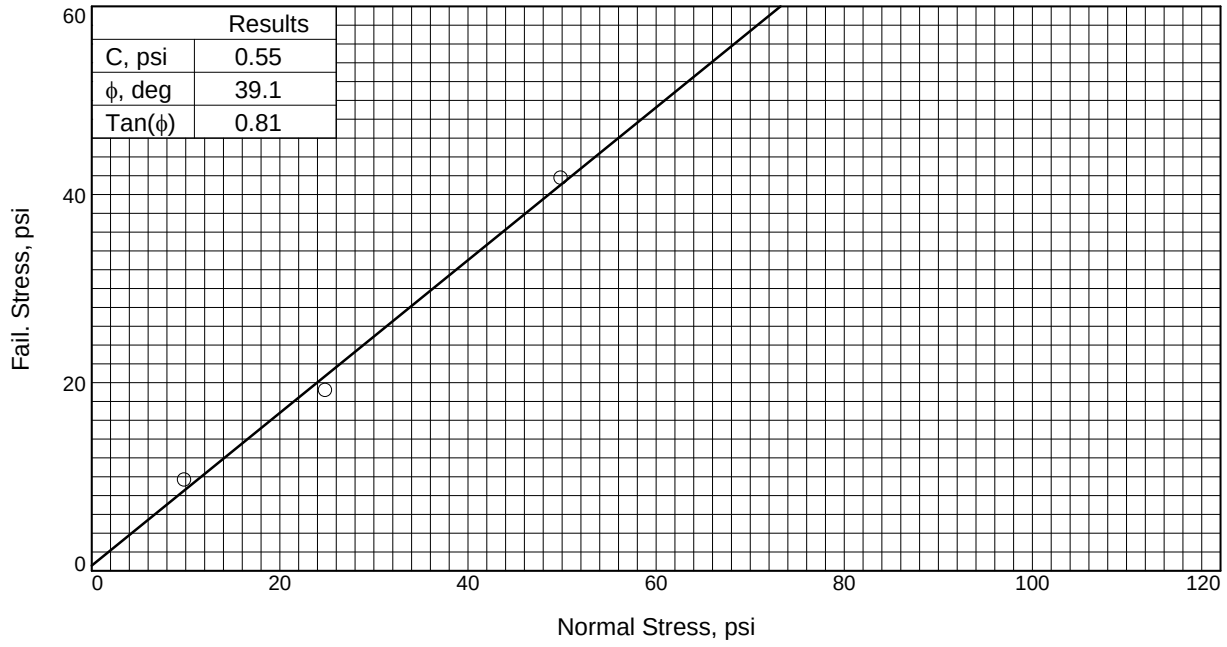
Project: Waste Bulking Agent Evaluation

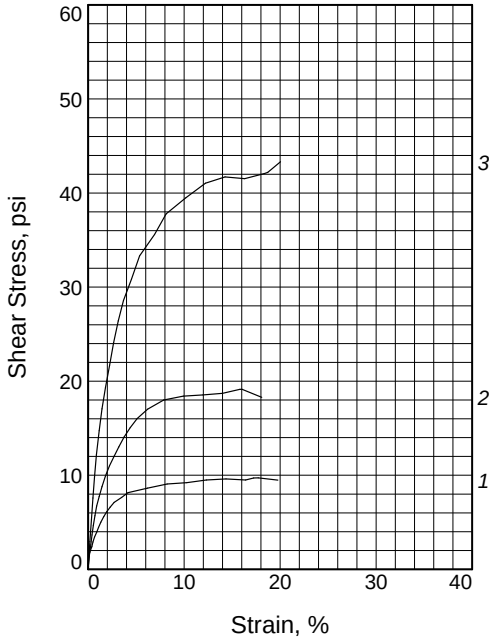
Source of Sample: 25% BS-3 / 75% WS-3 **Depth:** GRAB
Sample Number: COMBINED BULK
Proj. No.: 605893 **Date Sampled:**

DIRECT SHEAR TEST REPORT
TRC Engineers, Inc.
Mt. Laurel, NJ

Figure 5

Tested By: TBT 11/23/24 **Checked By:** JPB 11/25/24





Sample No.		1	2	3
Initial	Water Content, %	46.9	47.3	47.5
	Dry Density, pcf	67.1	67.2	67.0
	Saturation, %	86.8	87.8	87.7
	Void Ratio	1.3816	1.3794	1.3844
	Diameter, in.	2.50	2.50	2.50
	Height, in.	0.98	0.98	0.98
At Test	Water Content, %	47.0	41.7	37.3
	Dry Density, pcf	73.0	78.7	83.4
	Saturation, %	101.2	103.5	104.1
	Void Ratio	1.1883	1.0304	0.9168
	Diameter, in.	2.50	2.50	2.50
	Height, in.	0.90	0.84	0.78
Normal Stress, psi		9.91	24.89	49.94
Fail. Stress, psi		9.61	19.13	41.70
Strain, %		14.4	15.8	14.3
Ult. Stress, psi				
Strain, %				
Strain rate, in./min.		0.001	0.001	0.001

Sample Type: REMOLDED*
Description: BLACK/GRAY SILTY GRAVEL WITH SAND (ORGANICS)

Assumed Specific Gravity= 2.56
Remarks: SEE NOTES ON SUMMARY

Client: State of Maine Bureau of General Services

Project: Waste Bulking Agent Evaluation

Source of Sample: 20% BS-3 / 80% WS-3 **Depth:** GRAB

Sample Number: COMBINED BULK

Proj. No.: 605893 **Date Sampled:**

DIRECT SHEAR TEST REPORT
TRC Engineers, Inc.
Mt. Laurel, NJ

Figure 4

Tested By: JC 11/21/24 **Checked By:** JPB 11/25/24

TRC # 605893: Waste Bulking Agent Evaluation

Initial sample before drying

Sample after drying

Portland Water District, BS-1, BULK, Grab

TRC # 605893: Waste Bulking Agent Evaluation

Initial sample before drying

Sample after drying

Bangor Wastewater Treatment Plant, BS-2, BULK, Grab

TRC # 605893: Waste Bulking Agent Evaluation

Initial sample before drying

Sample after drying

Lewistown-Auburn Clean Water Authority, BS-3, BULK, Grab

TRC # 605893: Waste Bulking Agent Evaluation

Initial sample before drying

Sample after drying

Greater Augusta Utility District, BS-4, BULK, Grab

TRC # 605893: Waste Bulking Agent Evaluation

Initial sample before drying

Sample after drying

Hatch Hill Landfill, WS-1, BULK, Grab

TRC # 605893: Waste Bulking Agent Evaluation

Initial sample before drying

Sample after drying

Ecomaine, WS-3, BULK, Grab

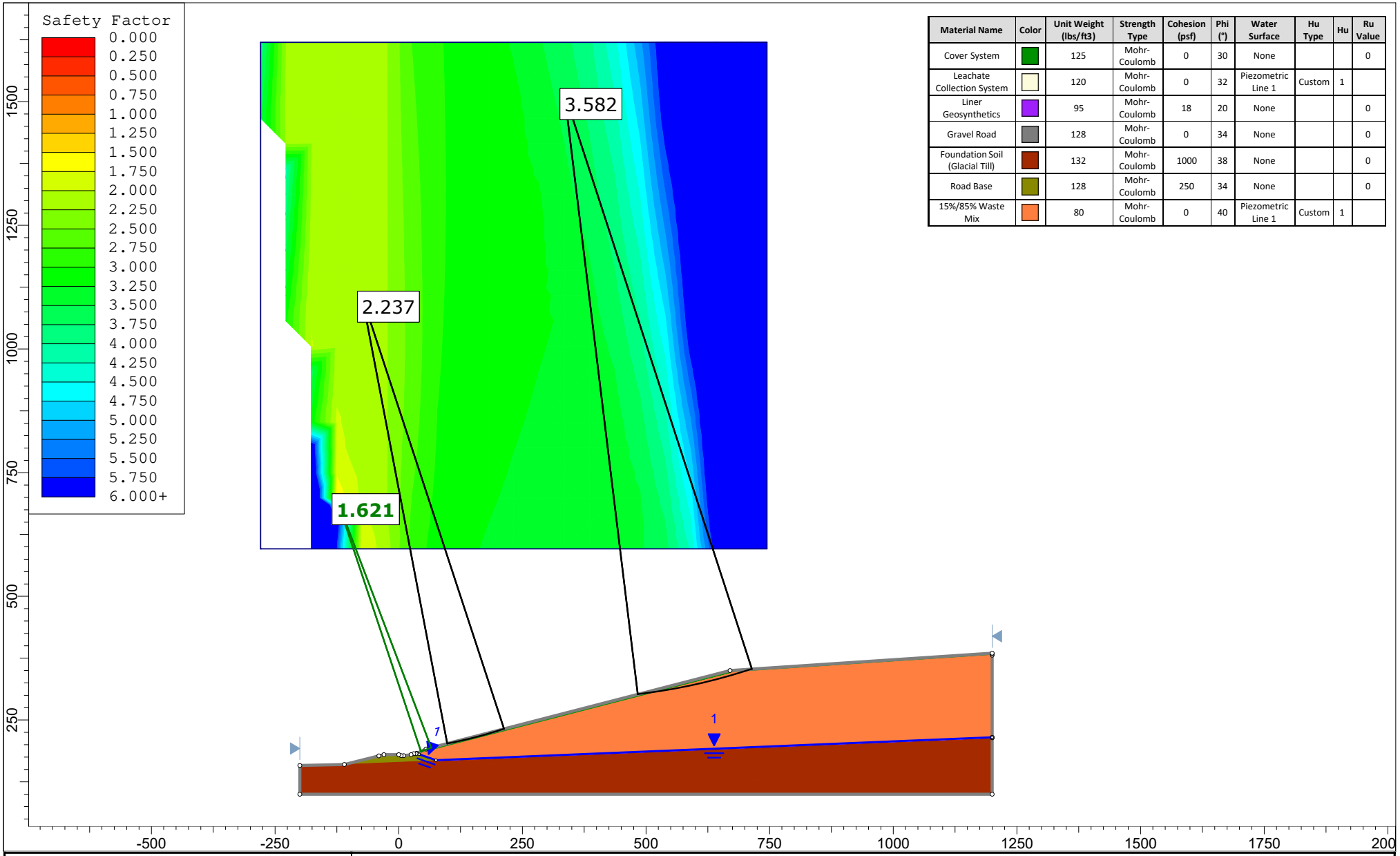
TRC # 605893: Waste Bulking Agent Evaluation

Initial sample before drying

Sample after drying

Jupiter Ridge Landfill, WS-4, BULK, Grab

Attachment B: Geotechnical Assessment

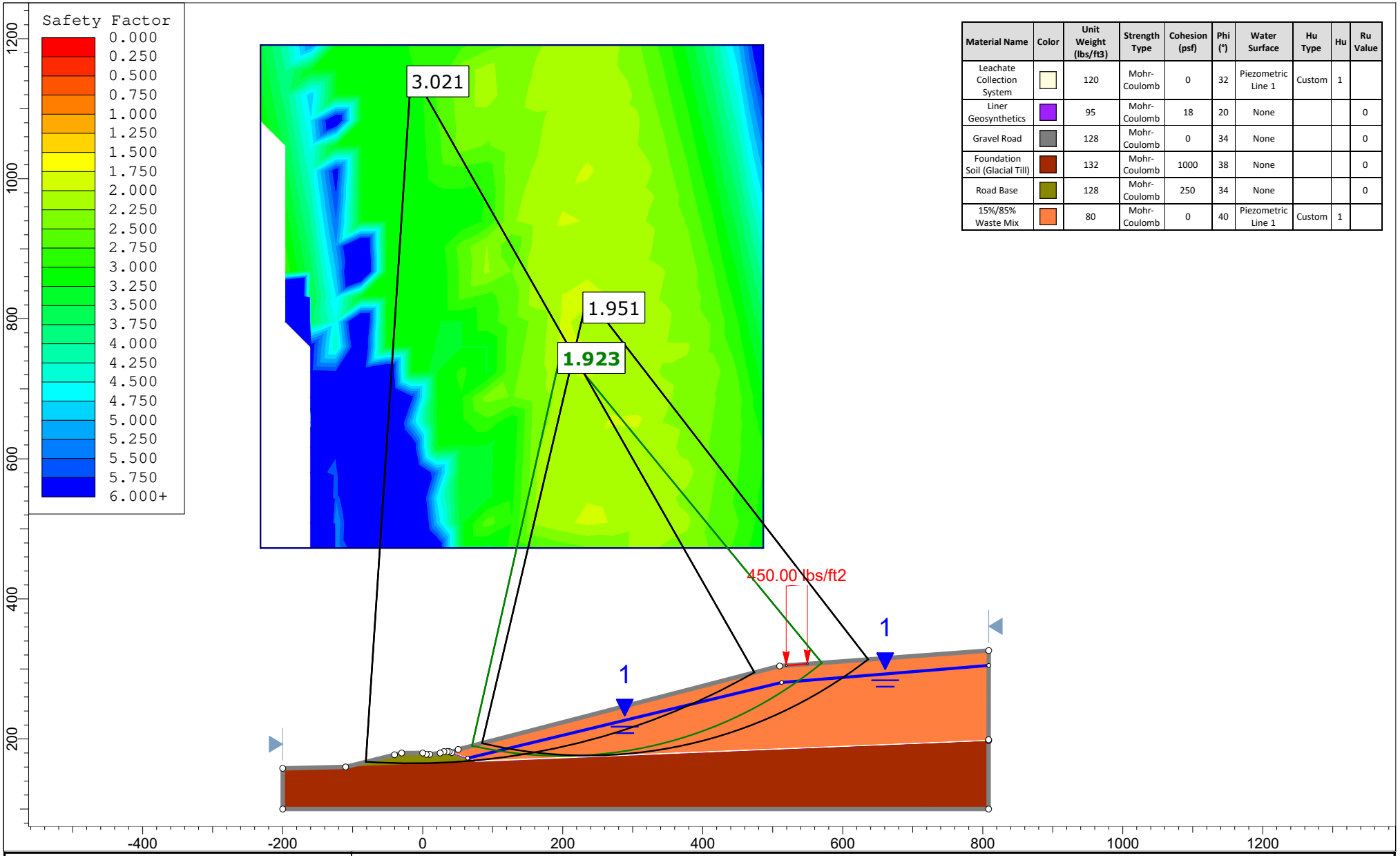


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Cover System		125	Mohr-Coulomb	0	30	None			0
Leachate Collection System		120	Mohr-Coulomb	0	32	Piezometric Line 1	Custom	1	
Liner Geosynthetics		95	Mohr-Coulomb	18	20	None			0
Gravel Road		128	Mohr-Coulomb	0	34	None			0
Foundation Soil (Glacial Till)		132	Mohr-Coulomb	1000	38	None			0
Road Base		128	Mohr-Coulomb	250	34	None			0
15%/85% Waste Mix		80	Mohr-Coulomb	0	40	Piezometric Line 1	Custom	1	

TRC

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section B-B' - Mix Ratio 15%/85%	Analysis Method	Spencer
Drawn By	Z. Bauman	Company	TRC
Date	11/25/2024 2:33:17 PM	File Name	Maine BGS Bulking Study.slmd

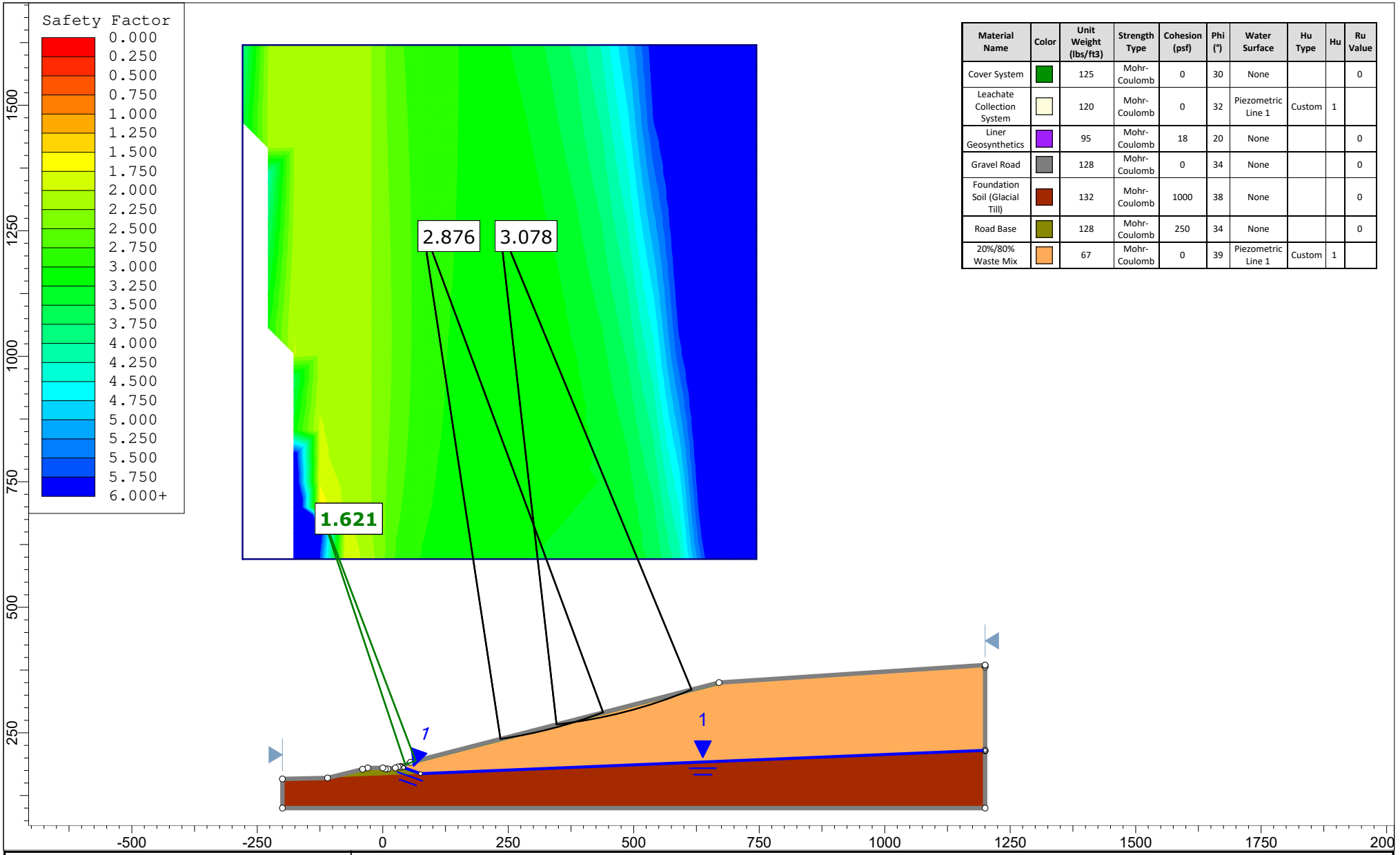


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Leachate Collection System		120	Mohr-Coulomb	0	32	Piezometric Line 1	Custom	1	
Liner Geosynthetics		95	Mohr-Coulomb	18	20	None			0
Gravel Road		128	Mohr-Coulomb	0	34	None			0
Foundation Soil (Glacial Till)		132	Mohr-Coulomb	1000	38	None			0
Road Base		128	Mohr-Coulomb	250	34	None			0
15%/85% Waste Mix		80	Mohr-Coulomb	0	40	Piezometric Line 1	Custom	1	

TRC

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	Typ. Open Conditions (Short Term) 15%/85%	*Analysis Method*	Spencer
Drawn By	Z. Bauman	*Company*	TRC
Date	11/25/2024 2:33:17 PM	*File Name*	Maine BGS Bulking Study.slmd

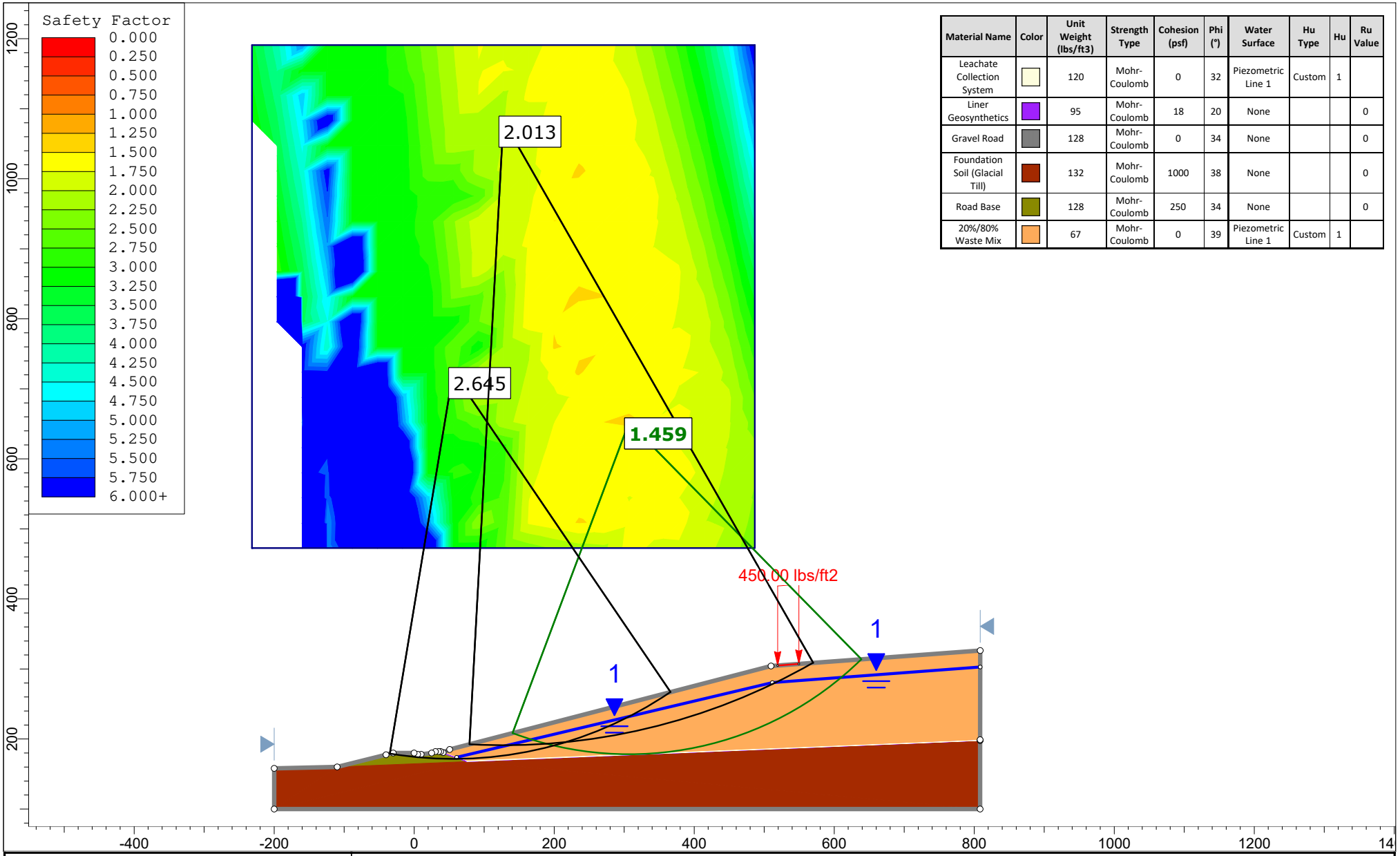


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Cover System		125	Mohr-Coulomb	0	30	None			0
Leachate Collection System		120	Mohr-Coulomb	0	32	Piezometric Line 1	Custom	1	
Liner Geosynthetics		95	Mohr-Coulomb	18	20	None			0
Gravel Road		128	Mohr-Coulomb	0	34	None			0
Foundation Soil (Glacial Till)		132	Mohr-Coulomb	1000	38	None			0
Road Base		128	Mohr-Coulomb	250	34	None			0
20%/80% Waste Mix		67	Mohr-Coulomb	0	39	Piezometric Line 1	Custom	1	

TRC

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section B-B' - Mix Ratio 20%/80%	Analysis Method	Spencer
Drawn By	Z. Bauman	Company	TRC
Date	11/25/2024 2:33:17 PM	File Name	Maine BGS Bulking Study.slmd

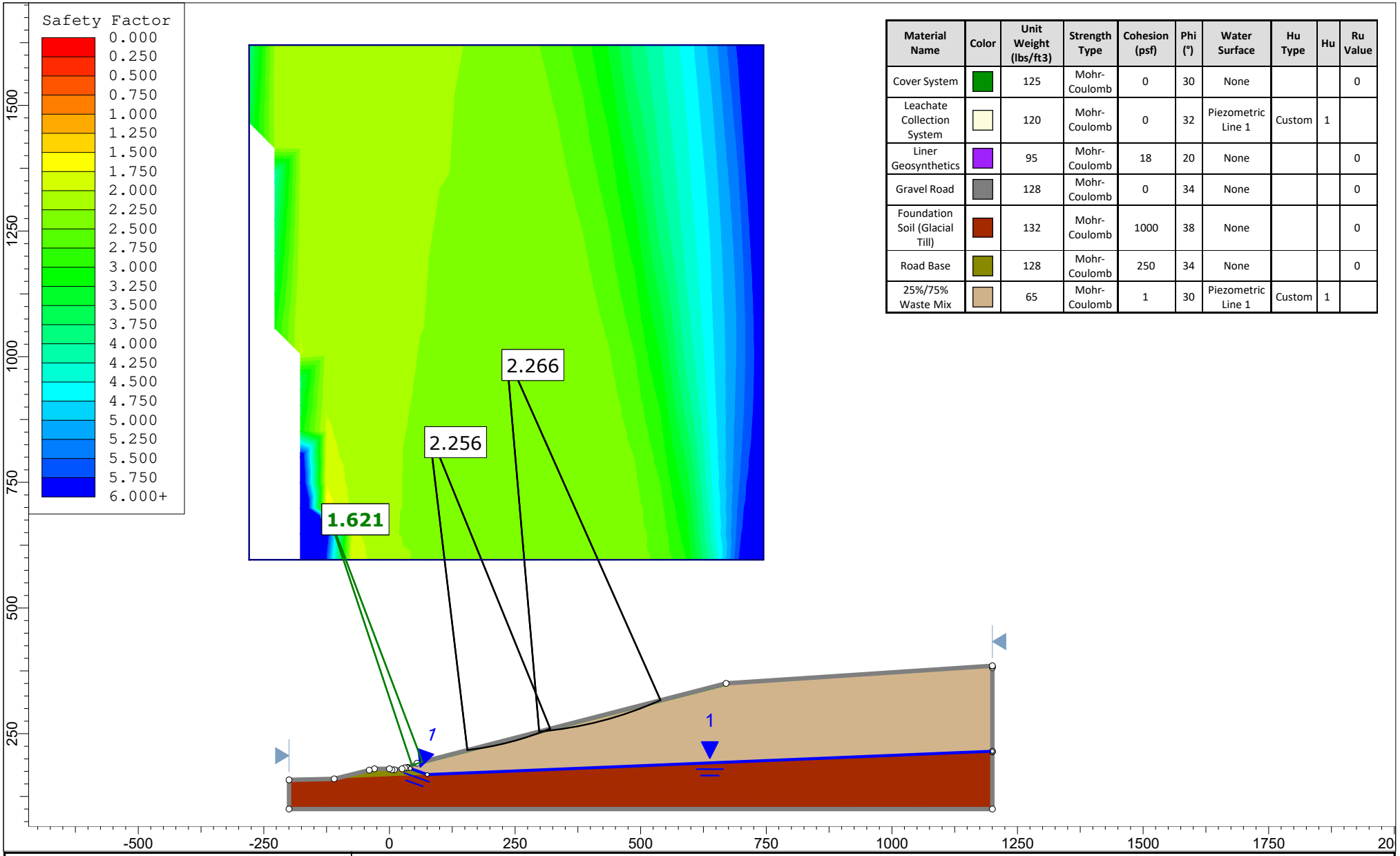


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Leachate Collection System		120	Mohr-Coulomb	0	32	Piezometric Line 1	Custom	1	
Liner Geosynthetics		95	Mohr-Coulomb	18	20	None			0
Gravel Road		128	Mohr-Coulomb	0	34	None			0
Foundation Soil (Glacial Till)		132	Mohr-Coulomb	1000	38	None			0
Road Base		128	Mohr-Coulomb	250	34	None			0
20%/80% Waste Mix		67	Mohr-Coulomb	0	39	Piezometric Line 1	Custom	1	

TRC

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	Typ. Open Conditions (Short Term) 20%/80%	*Analysis Method*	Spencer
Drawn By	Z. Bauman	*Company*	TRC
Date	11/25/2024 2:33:17 PM	*File Name*	Maine BGS Bulking Study.slmd

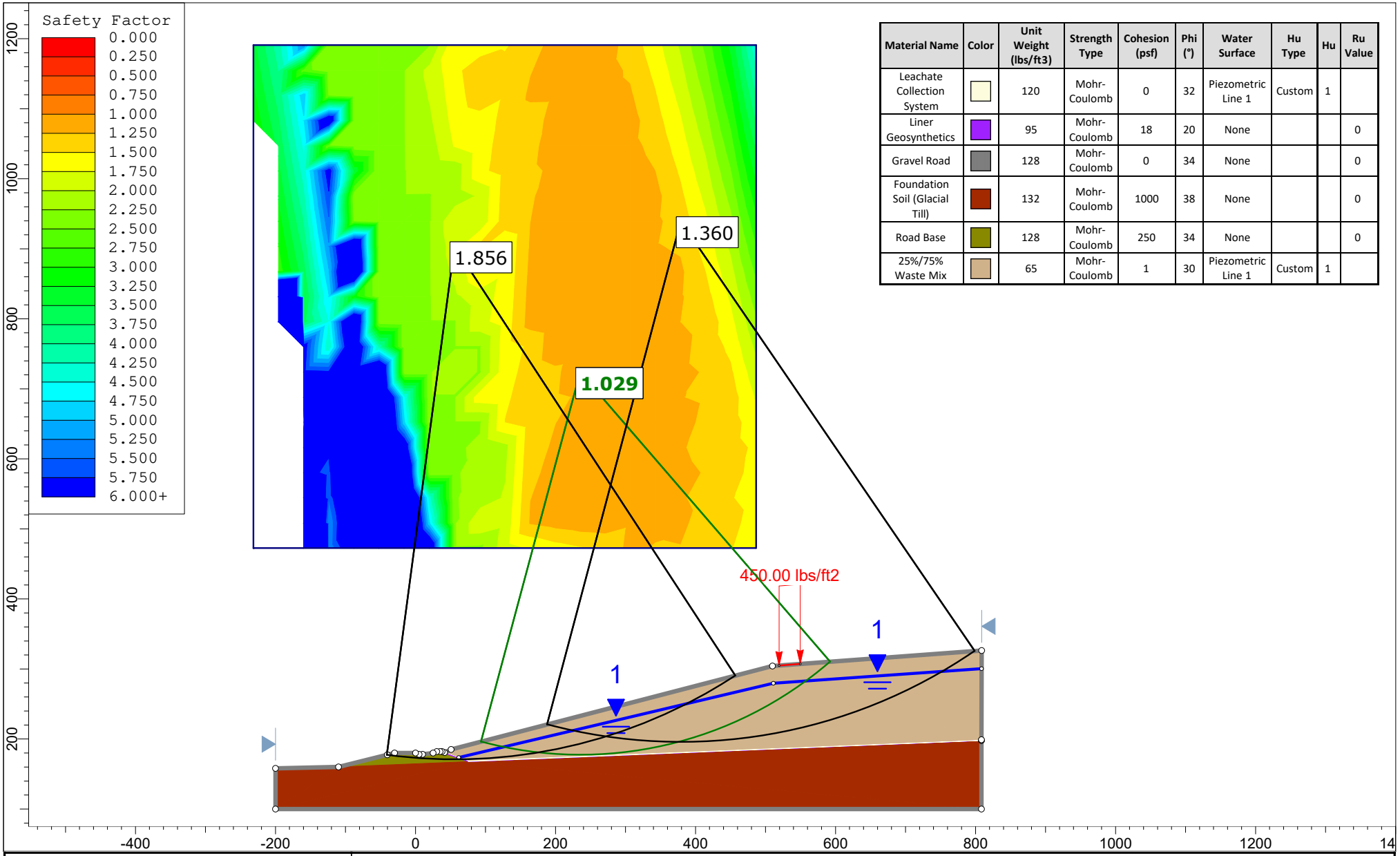


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Cover System		125	Mohr-Coulomb	0	30	None			0
Leachate Collection System		120	Mohr-Coulomb	0	32	Piezometric Line 1	Custom	1	
Liner Geosynthetics		95	Mohr-Coulomb	18	20	None			0
Gravel Road		128	Mohr-Coulomb	0	34	None			0
Foundation Soil (Glacial Till)		132	Mohr-Coulomb	1000	38	None			0
Road Base		128	Mohr-Coulomb	250	34	None			0
25%/75% Waste Mix		65	Mohr-Coulomb	1	30	Piezometric Line 1	Custom	1	

TRC

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	Section B-B' - Mix Ratio 25%/75%	Analysis Method	Spencer
Drawn By	Z. Bauman	Company	TRC
Date	11/25/2024 2:33:17 PM	File Name	Maine BGS Bulking Study.slmd



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (°)	Water Surface	Hu Type	Hu	Ru Value
Leachate Collection System		120	Mohr-Coulomb	0	32	Piezometric Line 1	Custom	1	
Liner Geosynthetics		95	Mohr-Coulomb	18	20	None			0
Gravel Road		128	Mohr-Coulomb	0	34	None			0
Foundation Soil (Glacial Till)		132	Mohr-Coulomb	1000	38	None			0
Road Base		128	Mohr-Coulomb	250	34	None			0
25%/75% Waste Mix		65	Mohr-Coulomb	1	30	Piezometric Line 1	Custom	1	

TRC

SLIDEINTERPRET 9.034

Project	Slide2 - An Interactive Slope Stability Program		
Group	Typ. Open Conditions (Short Term) 25%/75%	*Analysis Method*	Spencer
Drawn By	Z. Bauman	*Company*	TRC
Date	11/25/2024 2:33:18 PM	*File Name*	Maine BGS Bulking Study.slmd

Figure 1: Accepted Waste by Maine Transfer Stations by County

Accepted Waste by Maine Transfer Stations by County

As Reported in 2023 Annual Reports

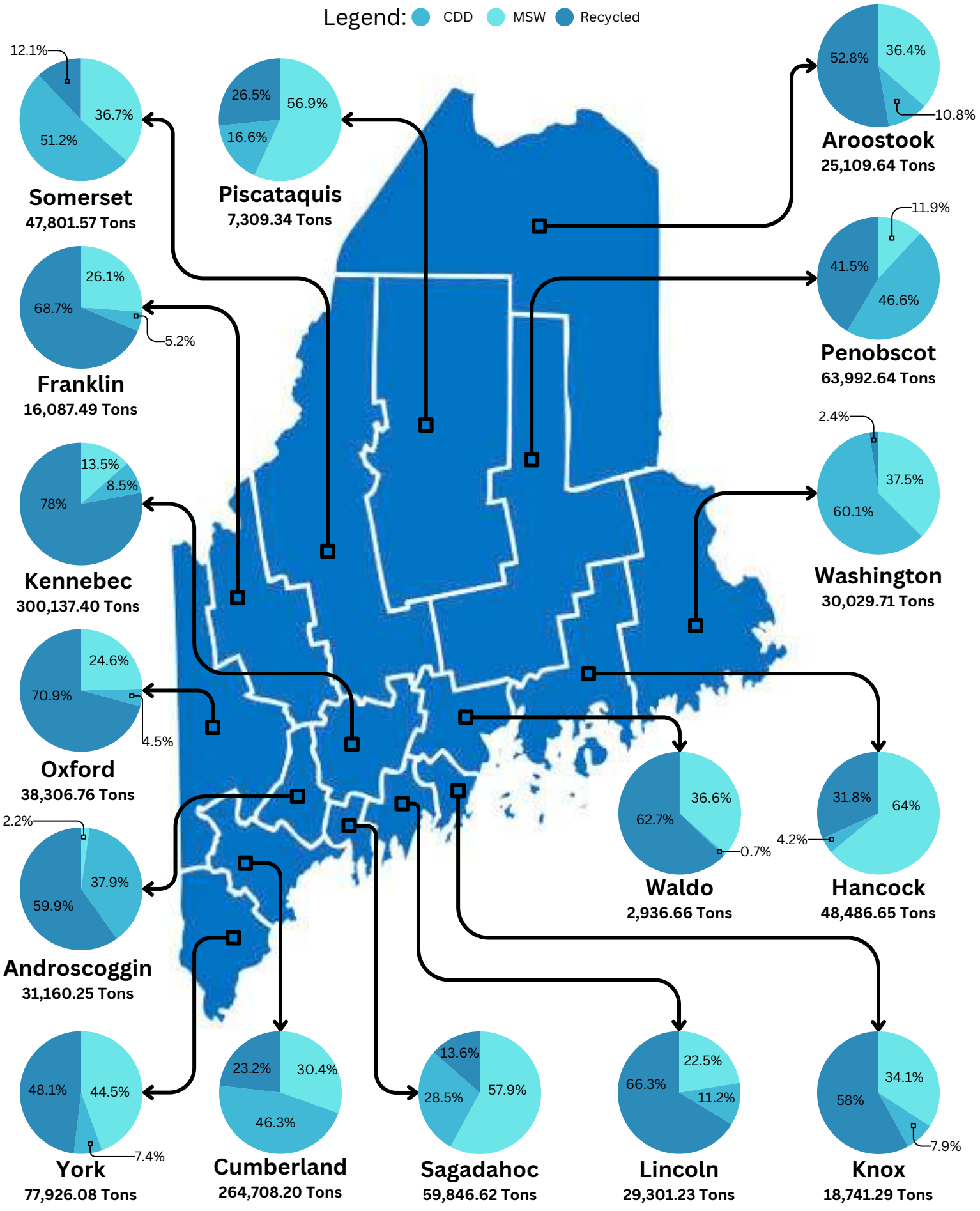
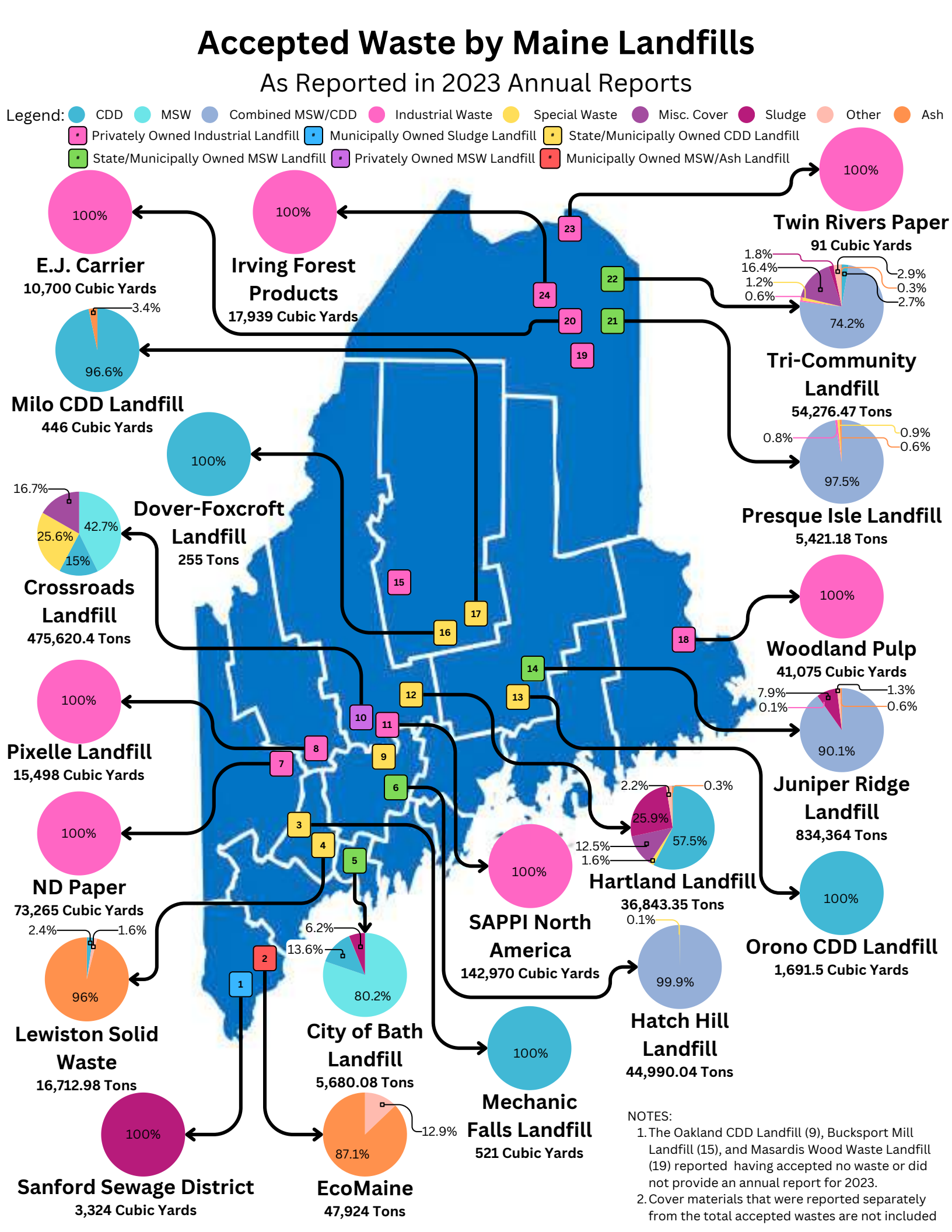


Figure 2: Accepted Waste by Maine Landfills

Accepted Waste by Maine Landfills

As Reported in 2023 Annual Reports



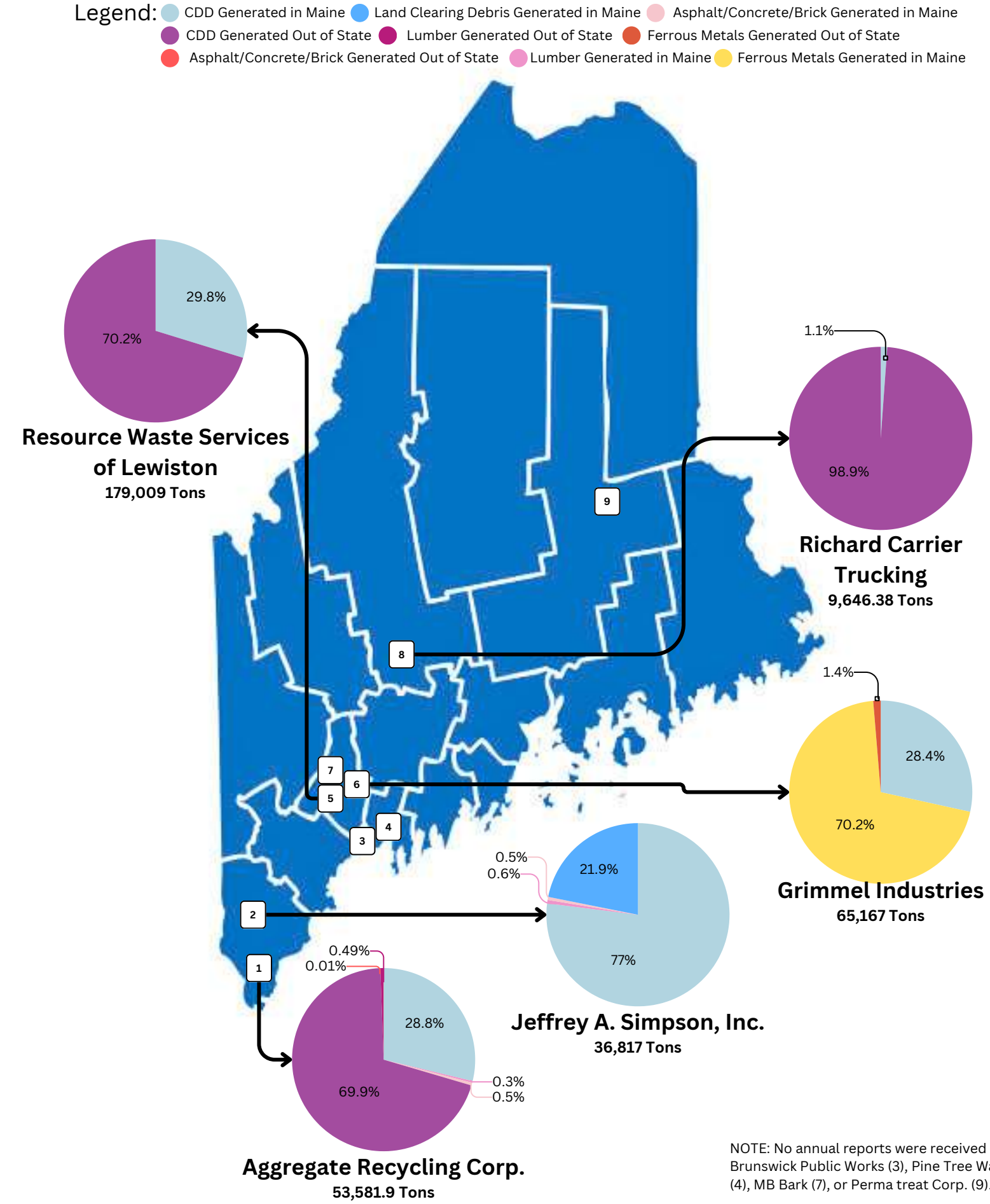
NOTES:

1. The Oakland CDD Landfill (9), Bucksport Mill Landfill (15), and Masardis Wood Waste Landfill (19) reported having accepted no waste or did not provide an annual report for 2023.
2. Cover materials that were reported separately from the total accepted wastes are not included

Figure 3: Accepted Waste by Maine Processing Facilities

Accepted Waste by Maine Processing Facilities

As Reported in 2023 Annual Reports



NOTE: No annual reports were received for Brunswick Public Works (3), Pine Tree Waste (4), MB Bark (7), or Perma treat Corp. (9).

Figure 4: Sampling Effort Photolog

PHOTOGRAPHIC LOG

Client Name: *State of Maine Bureau of General Services*

Project No. 605893.0000.0000

Photo No. 1

Date: 10/9/2024

Facility Location:
Landfill at 64 Blueberry Road, Portland

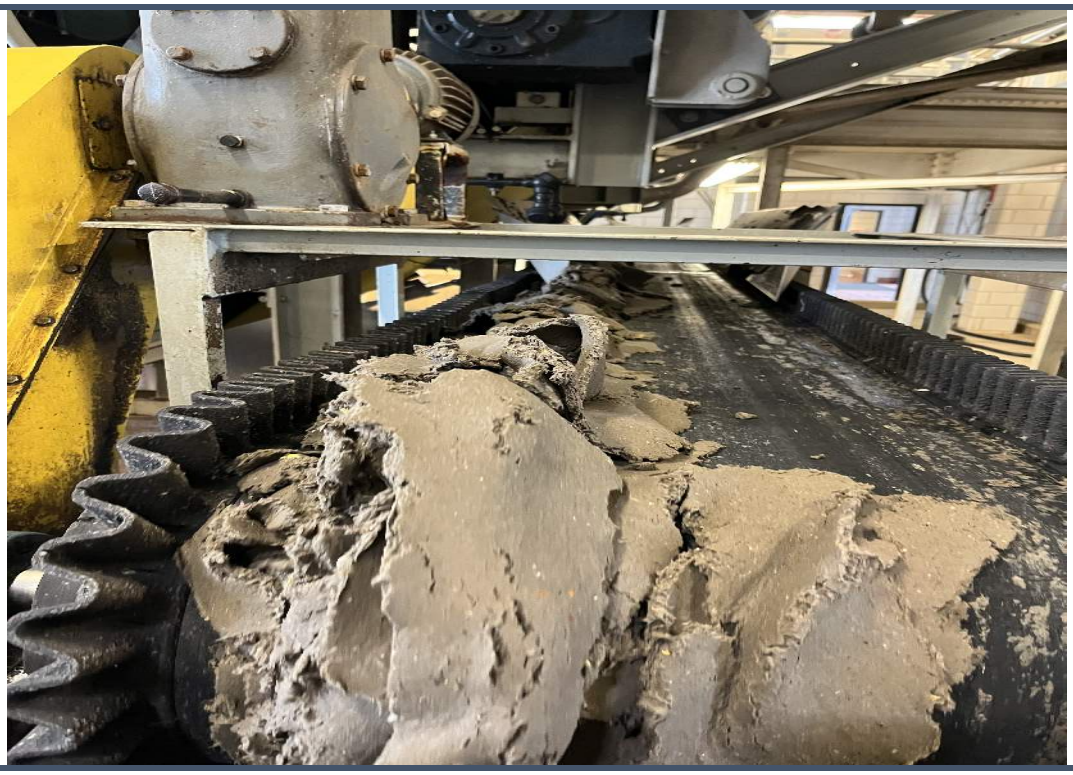
Description:
EcoMaine Landfill, MSW Ash Pile. WS-3

Photo No. 2

Date: 10/10/2024

Facility Location:
760 Main St, Bangor

Description:
Bangor Waste Water Treatment Plant Biosolids coming off press. BS-2



PHOTOGRAPHIC LOG

Client Name: *State of Maine Bureau of General Services*

Project No. 605893.0000.0000

Photo No. 3

Date: 10/9/2024

Facility Location:
535 Lincoln St, Lewiston

Description:
Lewiston-Auburn Clean Water Authority Digested Biosolids. BS-3

Photo No. 4

Date: 10/10/2024

Facility Location:
33 Jackson Ave., Augusta

Description:
Greater Augusta Utility District Biosolids Coming out of the press. BS-4

PHOTOGRAPHIC LOG

Client Name: *State of Maine Bureau of General Services*

Project No. 605893.0000.0000

Photo No. 5

Date: 10/10/2024

Facility Location:
2828 Bennoch Road, Old Town

Description:
Top of Juniper Ridge Landfill CDD Fines.WS-4A

Photo No. 6

Date: 10/10/2024

Facility Location:
2828 Bennoch Road, Old Town

Description:
Top of Juniper Ridge Landfill Mixed CDD.WS-4B

Figure 5: Laboratory Sample Drying Photolog

PHOTOGRAPHIC LOG

Client Name: *State of Maine Bureau of General Services*

Project No. 605893.0000.0000

Photo No. 1

Date: 10/14/2024

Laboratory Location:
16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description:
Portland Water District, BS-1, GRAB, biosolids, Day 1 of air drying. Black organic silt with fibrous material.

Photo No. 2

Date: 1/13/2025

Laboratory Location:
16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description:
Portland Water District, BS-1, GRAB, biosolids, black organic silt with fibrous material. Photo taken after drying process complete.

PHOTOGRAPHIC LOG

Client Name: *State of Maine Bureau of General Services*

Project No. 605893.0000.0000

Photo No. 3

Date: 10/14/2024

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: Bangor Wastewater Treatment Plant, BS-2, GRAB, biosolids, day 1 of air drying. Black organic silt with fibrous material.

Photo No. 4

Date: 1/13/2025

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: Bangor Wastewater Treatment Plant, BS-2, GRAB, biosolids, black organic silt with fibrous material. Photo taken after drying process complete.

PHOTOGRAPHIC LOG

Client Name: *State of Maine Bureau of General Services*

Project No. 605893.0000.0000

Photo No. 5

Date: 10/14/2024

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: Lewiston-Auburn Clean Water Authority, BS-3, GRAB, digested biosolids, day 1 of air drying. Black organic silt with sand.

Photo No. 6

Date: 1/13/2025

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: Lewiston-Auburn Clean Water Authority, BS-3, GRAB, digested biosolids, black organic silt with sand. Photo taken after drying process complete.

PHOTOGRAPHIC LOG

Client Name: *State of Maine Bureau of General Services*

Project No. 605893.0000.0000

Photo No. 7

Date: 10/14/2024

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: Greater Augusta Utility District, BS-4, GRAB, biosolids, day 1 of air drying. Black organic silt.

Photo No. 8

Date: 1/13/2025

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: Greater Augusta Utility District, BS-4, GRAB, biosolids, black organic silt. Photo taken after drying process complete.

PHOTOGRAPHIC LOG

Client Name: *State of Maine Bureau of General Services*

Project No. 605893.0000.0000

Photo No. 9

Date: 10/14/2024

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: Hatch Hill Landfill, WS-1, GRAB, auto shredder fluff, day 1 of air drying. Dark brown organic silt with fibrous material.

Photo No. 10

Date: 1/13/2025

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: Hatch Hill Landfill, WS-1, GRAB, auto shredder fluff, dark brown organic silt with fibrous material. Photo taken after drying process complete.

PHOTOGRAPHIC LOG

Client Name: *State of Maine Bureau of General Services*

Project No. 605893.0000.0000

Photo No. 11

Date: 10/14/2024

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: ecomaine, WS-3, GRAB, MSW ash, day 1 of air drying. Black organic sandy silt.

Photo No. 12

Date: 1/13/2025

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: ecomaine, WS-3, GRAB, MSW ash, black organic sandy silt. Photo taken after drying process complete.

PHOTOGRAPHIC LOG

Client Name: *State of Maine Bureau of General Services*

Project No. 605893.0000.0000

Photo No. 13

Date: 10/14/2024

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: Juniper Ridge Landfill, WS-4, GRAB, CDD fines, day 1 of air drying. Dark brown organic silt with fibrous material.

Photo No. 14

Date: 1/13/2025

Laboratory Location: 16000 Commerce Parkway, Suite B2, Mt. Laurel, NJ 08054

Description: Juniper Ridge Landfill, WS-4, GRAB, CDD fines, dark brown organic silt with fibrous material. Photo taken after drying process complete.