Burton Legacy Landfill Closure Plan

Prepared for:

Regional District of Central Kootenay

ISSUED FOR USE

Prepared by:

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1. Background

The Regional District of Central Kootenay (RDCK) has ownership and control of several Legacy Landfills which have historically received municipal solid waste with various levels of closure. As these sites are no longer receiving waste the RDCK is looking to abandon the permits for these sites and as such has been instructed to complete Closure Plans for each site. This report seeks to satisfy the requirements set out by the Ministry of Environment and Park's (ENV) for final closure of the sites and abandonment of the permits.

To develop the Closure Plan, Sperling Hansen Associates (SHA) has relied on background information provided by the RDCK, gained from a Request for Information made to the ENV. These documents include:

- Paper Correspondence from ENV (1977-2000, 132 pages)
    - Includes original permit and ENV inspection reports, etc.
- 1978 Resume for Permit Application
- 1993 Amended Permit PR-05065
- 2003 Draft Operational Certificate to Replace Permit PR-05065
- 2012 ENV Inspection Report and Photos
- 2019 ENV Inspection Report and Photos

SHA conducted a site visit on May 24, 2025 to gather further information and ensure that the landfill can be closed according to the satisfaction of the Ministry of Environment prior to permit abandonment. A site photolog is provided in Appendix A.

2. Introduction and Site History

The Burton Landfill is located just southeast of the community of Burton, on a portion of land described as Lot 1, District Lot 7700, Plan 6834, Kootenay District (Figures 1 and 2). The site is bounded by natural forests except for a BC Hydro right of way along the northwest portion of the site. It seems likely that the waste footprint encroaches on this right of way as the site was originally provided by BC Hydro for the community.

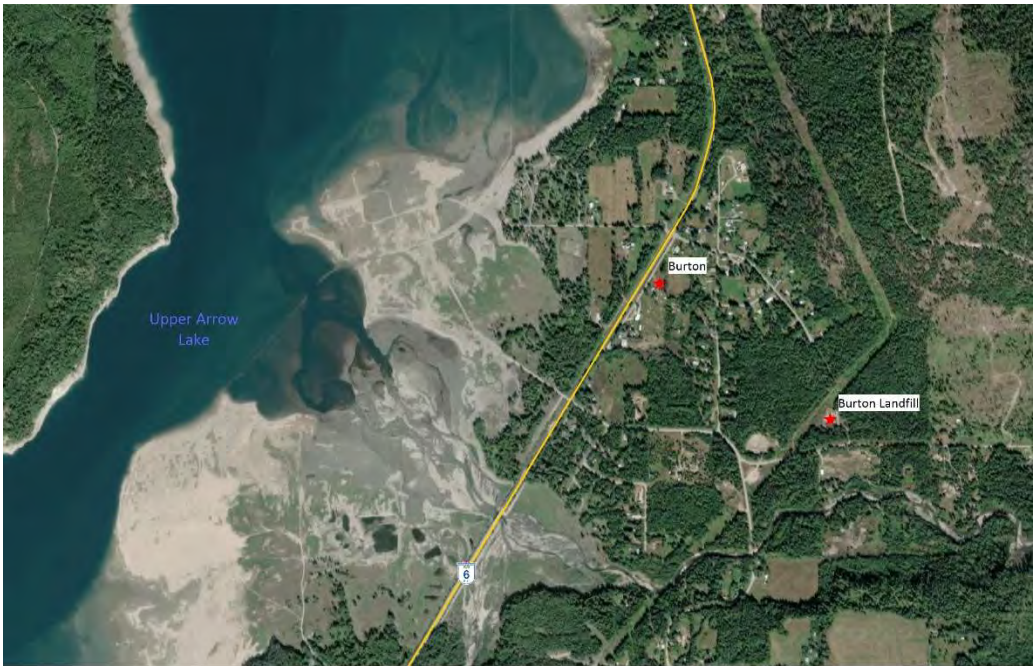

Figure 1: Location of Burton Landfill

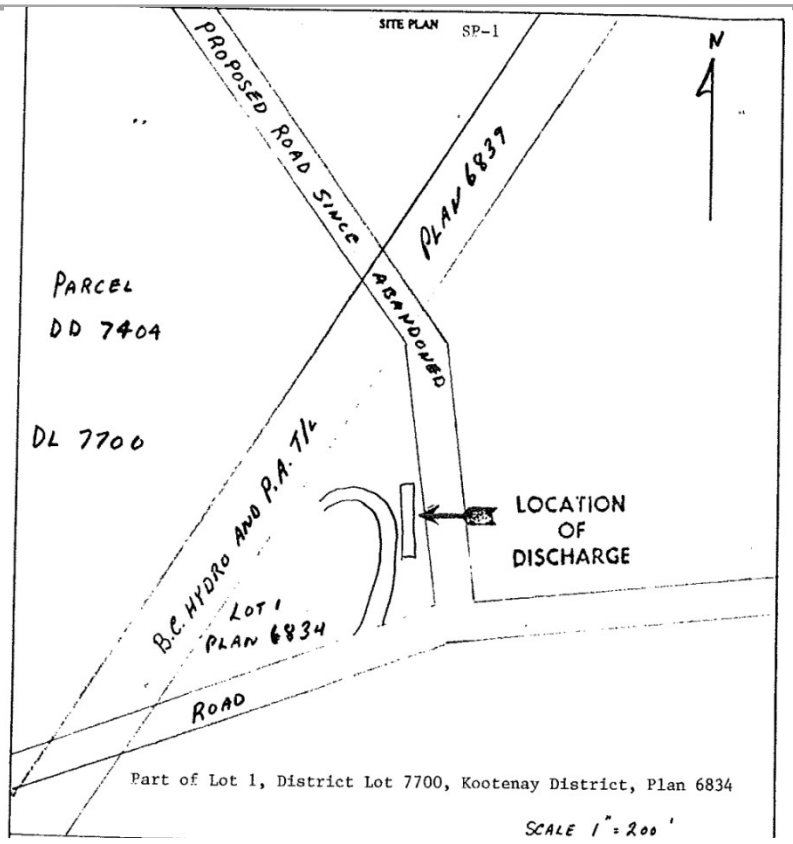

Figure 2: Site Map from 1993 Amended Permit

The landfill was originally established by BC Hydro as the town of Burton had to be relocated due to the higher water levels of the Arrow Lakes in conjunction with the Columbia River Project. The relocation of the town took place in the late 1960s, but no permit was issued for the site until 1978 when the RDCK took over the site. The RDCK took over the site provided that BC Hydro rehabilitate the site and provide a 'generous' trench for continued landfilling.

Landfilling at the site likely ceased around 2000, as a letter was received by the RDCK in July of that year from Ministry of Environment, Lands, and Parks acknowledging that unauthorized disposal of waste at the closed site seemed to have stopped. A transfer station was established at the site in 1999 which continues to be operated by the RDCK today, the operational areas of which are presented in drawing PRJ25043-BURTON-1.

The amount of waste that has been disposed of at the Burton site is unclear and difficult to estimate, but a BC Municipal Solid Waste Landfill Survey estimated the quantity of waste to be estimated at 30,000 m^3. While this survey is undated, it also asked for the expected quantity of waste to be received in 1995, indicating that this is likely from 1994 or early 1995, just before Regional Districts were required to prepare Solid Waste Management Plans. As the expected intake for 1995 was 750m^3, extending this intake to 1999 when the landfill closed gives an estimated volume of waste of 33,750m^3. With an average density of 0.6 tonnes/m^3, the estimated tonnage of waste in place at the Burton site is around 20,000 tonnes.

3. Final Cover

There are no records of the final cover placed at the Burton landfill during closure in the late 1990s, but SHA conducted a hand auger investigation to determine the cover present on the site. 5 locations were investigated around the site, with the results of each investigation presented in

Table 1, and locations presented in dwg. PRJ25043-BURTON-2. It was found that the cover consisted of an initial layer of established mosses and grass, with the remaining layers consisting of sandy pit run gravels and some silt, with a minimum thickness of 300mm in all areas. No auger holes were advanced within the operational area, as SHA deemed that this area had aggregates placed to support regular vehicle traffic and general transfer station operations.

Table 1: Hand Auger Investigation Results

#	Location	Depth	Results
1	South portion of closed landfill	0.3 m	0 to 0.1m – vegetation and topsoil 0.1 to 0.3m – pit run gravels with sand
2	East portion of closed landfill	0.45m	0 to 0.1m – vegetation and topsoil 0.1 to 0.45m – pit run gravels with sand
3	Wood stockpile area	0.3m	0 to 0.1m – woodchips 0.1 to 0.3m – silty sand
4	West portion of closed landfill	0.5m	0 to 0.2m – vegetation and topsoil 0.2 to 0.5m – silty sand with cobbles
5	Northwest corner of closed landfill	0.3m	0 to 0.1m – vegetation 0.1 to 0.3m – pit run gravels

The Landfill Criteria lists several objectives of the final cover design for any landfill in Section 5.8: Final Cover Design. These are listed below, and the following sections explain how the current cover system either meets these objectives or how more work will be required:

- Prevent exposure of humans and/or wildlife to MSW
- Control infiltration of precipitation
- Minimize the uncontrolled release of methane to the atmosphere
- Limit erosion and release of sediment to surrounding surface waters
- Control release of odours
- Minimize oxygen infiltration and fire risk

Given the minimum 300mm of material that has been placed on top of the waste in addition to the established vegetation on the landfill surface, SHA believes that there is minimal risk of exposure of MSW to humans or wildlife. Given the age of the waste, there is also minimal odour or fire risk, and the surface of the landfill showed no signs of erosion or sediment transport.

However, during SHA's site visit it was clear throughout the areas not used for current operations that waste trenches were previously present. This was seen through depressions on the landfill surface caused by settlement of the waste, which is difficult to capture in photos but presented in dwg. PRJ25043-BURTON-2.

These depressions likely promote infiltration especially during the spring months when snowmelt may accumulate in these areas. Due to the relatively flat nature of the site, SHA believes that it will not be possible to meet the minimum grade requirements of the Landfill Criteria without significant efforts, and SHA also believes that it will be sufficient to add materials to these areas to obtain positive drainage and direct surface water away from the landfill area. The material to

be used will depend on the outcome of the groundwater monitoring as discussed in Section 8 and the recommendations at the end of this report.

It should be noted that there is likely waste within the BC Hydro Right-of-Way, given the contours of the site and the photos found showing waste trenches close to the power lines (Figure 3). At this time, SHA believes that it is not necessary to remove the waste within the right of way as this will likely cause more exposure of waste and potential for litter to be spread around the site.

Figure 3: Photo showing trench and fill operation within power line area at the Burton Landfill site. ENV records show photo was taken in November of 1994.

4. Surface Water Management

The Landfill Criteria lists several objectives of the Surface Water Management Plan in Section 10.3.2:

- Preserve the natural hydrologic cycle for the landfill site
- Document how surface water will be managed on site, including both run-on and run-off.
- Promote diversion of clean water to minimize leachate production and groundwater recharge.
- Protect the surface water quality in the off-site surface water bodies receiving drainage from the landfill site.
- Provide a design for surface water control works that will ensure drainage coming onto and leaving the landfill site does not result in interruptions to the site operations.
- Provide a design that will maintain run-off from the site with minimal sediment and at rates that are consistent with pre-development flows.
- Identify the surface water management works required for the control of erosion, sediment transport, flood risk, water quantity and water quality.
- Provide the meteorological data applicable to the site, results of the hydrologic modeling stipulated in Section 5.6 and the detail design of ditches, down-chutes, culverts, retention ponds, and other surface control infrastructure

There are 3 main surface water bodies in the general site area. The closest is Caribou Creek, located approximately 250m to the South of the site, with a small tributary located around 950m to the East of the site. Lower Arrow Lake is the final receptor of any surface water from the site, located 1.2km West of the site, with Caribou Creek flowing into the lake. These surface water bodies are shown in Figure 4.

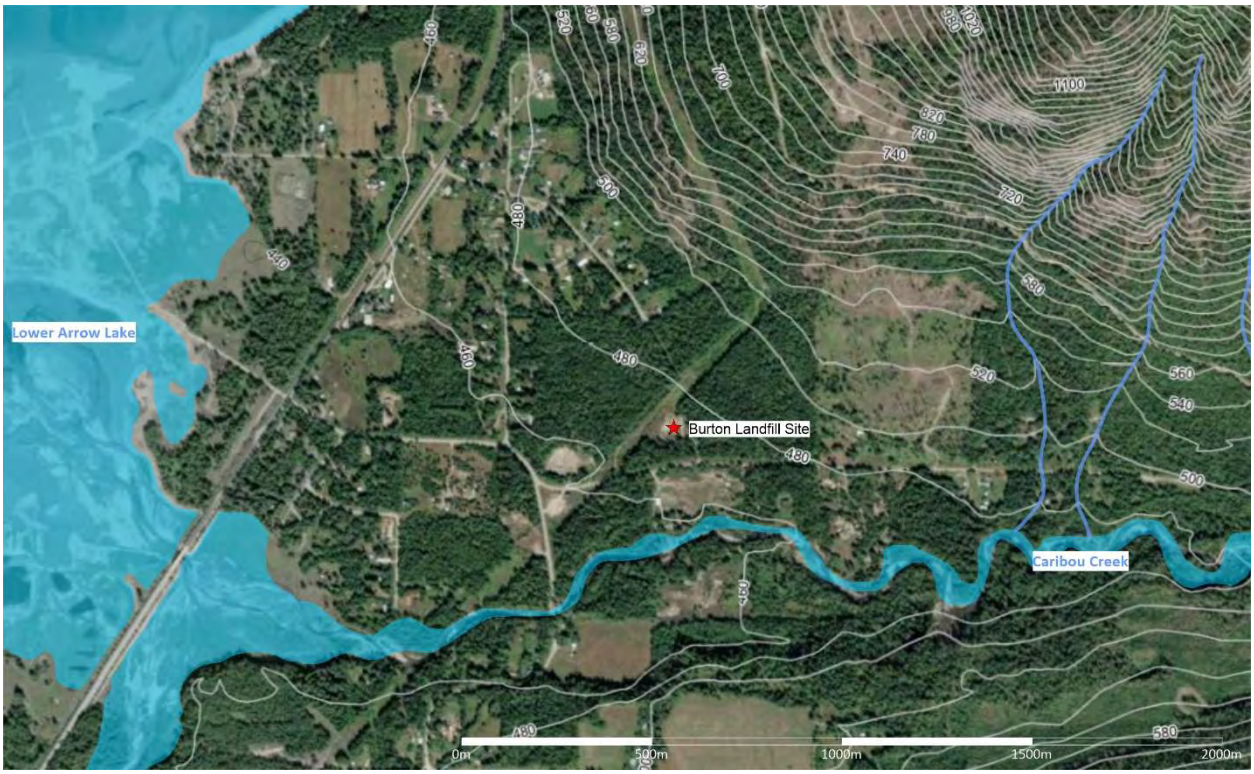

Figure 4: Surface water bodies in the area of the Burton Landfill site.

While on site, SHA observed no evidence of erosion or sediment transport, indicating that much of the surface water likely infiltrates through the pervious cover surrounding the site. As discussed in Section 3, SHA recommends that material be added to the site to provide better overall drainage and prevent ponding of surface water within the observed depressions. SHA believes that the type of material required will depend on monitoring results as discussed in Section 8 of this report.

As required by the Landfill Criteria, climate data for the site is provided in Table 1. There is no data available for Burton, but 1981-2010 climate normal data was available for Fauquier, located 18.9km from the site.

Table 1: 1981-2010 Climate Normals data for Fauquier, BC

Month	Daily Average (°C)	Rainfall (mm)	Snowfall (cm)	Precipitation (mm)
Jan	-1.7	24.9	48.9	73.8
Feb	-0.6	24.7	19.6	44.3
Mar	3.4	48.5	8.4	56.9
Apr	7.8	61.3	0.3	61.6
May	12.2	76.1	0	76.1
Jun	15.8	90.1	0	90.1
Jul	18.7	66.6	0	66.6
Aug	18.2	47.4	0	47.4
Sep	13.1	56.3	0	56.3
Oct	7.2	63.5	0.4	63.8
Nov	2	61.7	19.4	81.1
Dec	-1.7	26.2	47.2	73.4
Year	7.9	647.2	144.1	791.3

5. Site Maintenance

The Burton Transfer Station site is well maintained, with minimal litter from transfer station operations observed in the area. There was however some litter observed along the Southwest side of the site, along with some minor debris and waste observed around the metal pile, leftover from 'push-up' during operations. (Figures 5 and 6) This litter and debris should be removed from the site and disposed of properly, and the metal pile edges cleaned up to ensure that no waste is left over from previous landfilling operations.

Figures 5 and 6: Litter and debris observed in SW corner of site.

6. Leachate Management

No signs of leachate staining were observed while SHA was on site, indicating that there likely is no leachate escaping the surface of the landfill, including the toe of any slope within the power line area. SHA's experience throughout the province of BC and database of leachate generation potentials of different sites has found that there is a generally linear relationship between leachate

generation potential and the precipitation received at the site. Given the precipitation received at the site as identified in Table 1, the Burton landfill site has a moderate leachate generation potential (Figure 7). Given the age of the waste is old enough that any leachate being produced is relatively weak and there is no evidence of leachate breakouts on the landfill surface, there are no leachate management works required at this time.

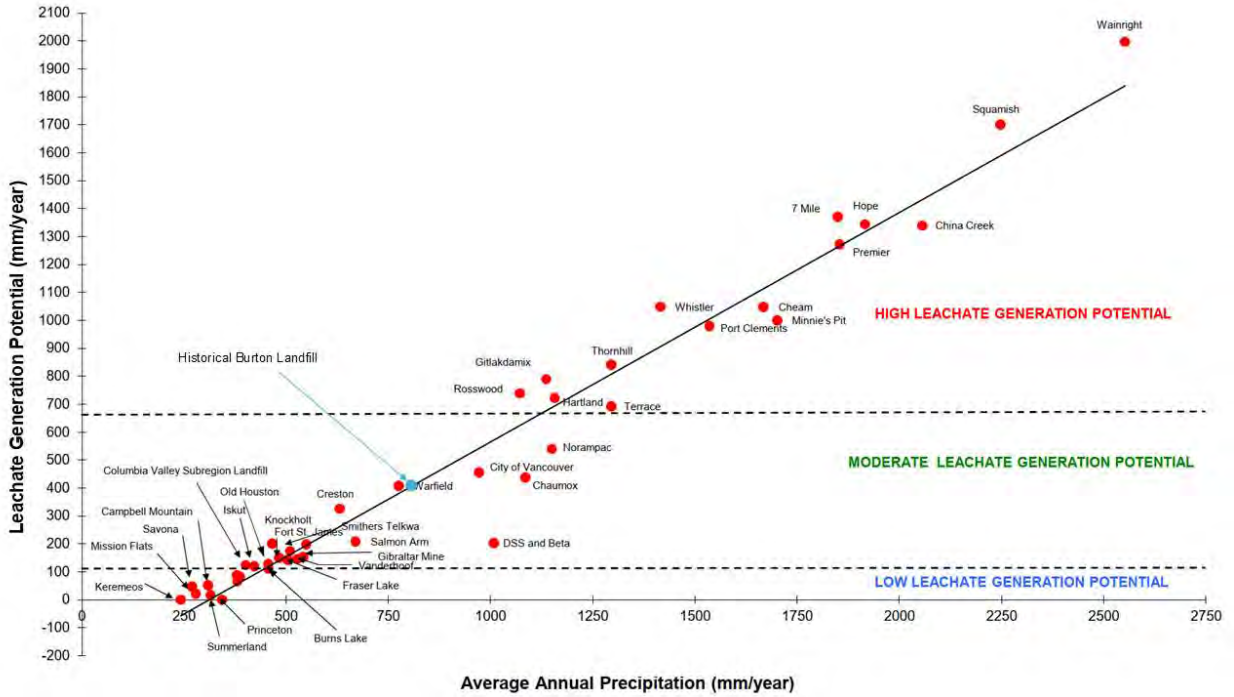

Figure 7: Leachate Generation Potential of Landfill Sites Within BC.

7. Landfill Gas Management

Landfill Gas (LFG) is a by-product of natural decomposition of organic material in landfills. The two main components of landfill gas are methane (CH4) and carbon dioxide (CO2), which vary in concentration through several parameters, including waste composition, age of the waste, and the level of atmospheric air intrusion into the landfill. [1]

After waste is placed, it takes 1 to 3 years for the landfill to produce amounts of gas large enough to be noticed. Following this, peak production of landfill gas occurs 5 to 7 years after placement, after which the amount of gas produced is significantly reduced. After 20 years, almost all gas will have been produced from waste, but small amounts of gas may be produced for up to 50 years after waste is placed in the landfill. [1] Given that the waste in the Burton Landfill was last placed at around 25 years ago, it is unlikely that the landfill is currently producing any significant amount of landfill gas.

8. Contaminating Lifespan and Environmental Monitoring

The MSW Landfill Criteria provides a standard contaminating lifespan of 50 years for landfills with less than 100,000 tonnes of waste in place. However, with only 20,000 tonnes of estimated waste in place, the Burton landfill provides minimal opportunity for leachate generation at the site and as such SHA believes that the minimum contaminating lifespan of 30 years may be used for this site. Given that the last waste was placed sometime around the year 2000, the contaminating lifespan extends until 2030.

Based on the contours surrounding the site as well as the surface water elements in the area, SHA has inferred that groundwater flows in a general North to South direction at the Burton site, towards the creek located 250m south of the landfill. A review of the available data including the groundwater well registry shows that there are no groundwater wells directly downgradient of the inferred groundwater direction (Figure 8). The records for the three wells in closest proximity to the site (50080, 126916, and 129631) were examined further, revealing that the water table at the site is likely around 10 to 15m below ground level (bgl).

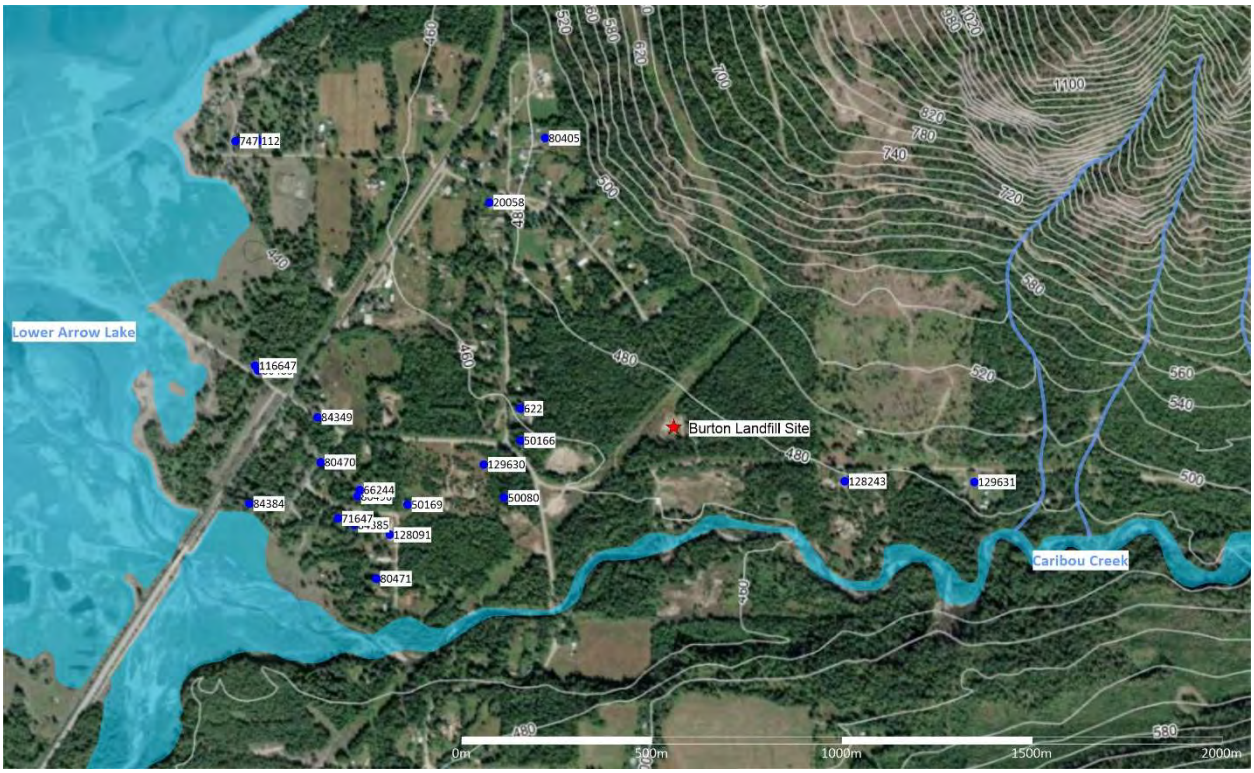

Figure 8: Groundwater Wells and Surface Water Elements in Proximity to the Burton Site.

As previously discussed, the waste was last placed at the Burton site in 2000 which means that any leachate produced is likely relatively weak. To confirm this, SHA worked with the RDCK to procure water quality records for Caribou Creek which has been used to supply drinking water for several properties downstream in the past few decades. Routine monitoring of the creek downstream from the landfill was undertaken between 2010 and 2013 to evaluate potential impacts to surface water quality with the following conclusions made from the results: [2]

1. “Nitrite and nitrate concentrations indicate no evidence of contamination related to nitrogen loading or leachate from the transfer station or legacy landfill.”
2. “Alkalinity and bicarbonate results reflect a naturally low-mineral stream environment, with seasonal variability driven by hydrologic conditions rather than anthropogenic sources.”
3. “Overall, Caribou Creek at [the monitoring site] exhibits high quality surface water conditions.”

Given these results showing high water quality in Caribou Creek, the likely groundwater receptor from the Burton site, SHA is confident that the site is not causing any detectable contamination. Therefore, no monitoring is recommended for this site.

9. ENV Closure Plan Requirements

When the RDCK submitted an Application for Permit Abandonment to the ENV, the ENV indicated that this closure plan should address several specific sections of the Landfill Criteria. This section details how these sections are followed within this closure plan or provides justification for exemption from these criteria.

9.1 Section 5.8 – Final Cover Design

Final cover design for the historical Burton Landfill site is discussed in Section 3: Final Cover. As discussed throughout this report, SHA believes that the cover is currently sufficient to prevent exposure of waste, but more cover is required to prevent ponding of water during the spring season. Material should be applied to the depressions visible within the landfill surface to prevent this ponding and promote drainage of any surface water.

The monitoring discussed in Section 8 will determine if low-permeability soil is required for covering the landfill surface. Should adverse impacts be found, low-permeability soil as per the landfill criteria should be utilized to cover the site to limit further infiltration and leachate production. However, should no impacts be found, material well suited for vegetation growth should be utilized to promote rapid vegetation establishment.

9.2 Section 5.9 – Final Contours

The list below outlines the final contour requirements as outlined in the BC Landfill Criteria:

- Final contours shall be constructed at grades not steeper than 3H:1V.
- Recommended plateau area is slope not less than 10H:1V. Can be reduced up to 25H:1V for geomembrane systems.
- Surface water control benches shall be provided on the landfill final contours every 15 vertical metres or less.

The Burton landfill site is very flat as indicated in drawing PRJ25043-BURTON-3, and SHA believes that it will take significant effort to meet the grades within the landfill criteria. As the intent of the grades is to promote runoff of surface water, SHA believes that the recommendations made surrounding additional landfill cover material will be sufficient to meet the runoff requirements of the Criteria.

9.3 Section 7.0 – Closure and Post-Closure Criteria

This document presents the Closure Plan for the Burton Landfill site and seeks to update the Closure according to the 2016 BC Landfill Criteria for MSW. Post-closure operation has been undertaken since the site was closed and converted to a Transfer Station in 1999. The contaminating lifespan and post-closure monitoring requirements are discussed in Section 8: Contaminating Lifespan and Environmental Monitoring.

9.4 Section 10.3 – Design, Operations, and Closure Plan

According to the Landfill Criteria, each landfill is required to have current and up to date a Design, Operations, and Closure Plan (DOCP) prepared by a qualified professional. This plan is to demonstrate that the landfill will be ‘planned, designed, constructed, operated, monitored, and closed in accordance with the “Criteria”’. SHA believes that as this landfill is no longer receiving waste, the preparation of a DOCP is an exercise that will have no benefit to the site, the Ministry, or the RDCK in closure of the site. Rather, SHA believes that as the only aspects of the DOCP left to be addressed are the monitoring and final closure, this closure plan will be sufficient to satisfy the requirements of the DOCP according to the Criteria.

Further to this, SHA has included recommendations and strategies within this Closure Plan for management of surface water (Section 9.5 and Section 4) and has included language around the LFG generation potential of the site. This Closure Plan, which is required in the DOCP, documents how the facilities environmental controls will be maintained following closure to meet all performance criteria.

9.5 Section 10.3.2 – Surface (Storm) Water Management Plan

The surface water management has been addressed in Section 4: Surface Water Management.

9.6 Section 10.3.4 – Closure Plan

Each landfill is required to have a closure plan, and Sections 1 through 8 of this report seek to satisfy the requirements set forth in the Criteria for Closure Plans. This includes:

- Final cover design to meet requirements and objectives
- Surface water management
- General site maintenance
- Leachate management
- Landfill Gas Management
- Environmental monitoring during the contaminating lifespan
- Practical and implementable contingency measures

Due to the older nature of the site, there are no contingency measures identified at this time.

10. Recommendations

Following the review of historical documents and SHA's site visit at the Historical Burton Landfill, SHA has the following recommendations for the site to consider the landfill properly closed and ready for abandonment of the permit:

1. Apply material well suited for vegetation growth to obtain positive drainage away from historic waste filled trenches.
    a. Low permeability soil is recommended, but if the monitoring carried out as per Recommendation 3 shows no adverse groundwater impacts, material can simply be suited to rapid vegetation growth.
2. Clean up litter and debris from areas surrounding the site and dispose of accordingly.

Table 3 presents the expected/recommended timelines for the implementation of these recommendations. These implementation timelines are subject to approval of this closure plan by the ENV, otherwise modifications may be required.

Table 3: Recommended Implementation Timeline

Task	Initiation	Duration	Completion
Clean up litter and debris from site	2025	1 Week	2025
Apply cover material	2026	1 Month	2026

11. Statement of Limitations

Sperling Hansen Associates (SHA) have prepared this report on behalf of the Regional District of Central Kootenay (RDCK) in accordance with generally accepted engineering practices, to a level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions in British Columbia.

The report is based on site visits, project experience, and analysis of data compiled during the preparation of this report from several sources, done by SHA staff. Except where specifically stated to the contrary, the information on which this study is based has been obtained from external sources. This external information has not been independently verified or otherwise examined by SHA to determine its accuracy and completeness. SHA has relied in good faith on this information and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the reports as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation.

The report is intended solely for the use of the RDCK. Any use which other parties makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such other parties. SHA does not accept any responsibility for other uses of the material contained herein nor for damages, if any, suffered by any third party because of decisions made or actions based on this report. Copying of this intellectual property for other purposes is not permitted.

The findings and conclusions of this report are valid only as of the date of this report. The interpretations presented in this report and the conclusions and recommendations that are drawn are based on information that was made available to SHA during the course of this project. Should additional new data become available in the future, SHA should be requested to re-evaluate the findings of this report and modify the conclusions and recommendations drawn, as required.

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September 18th, 2025

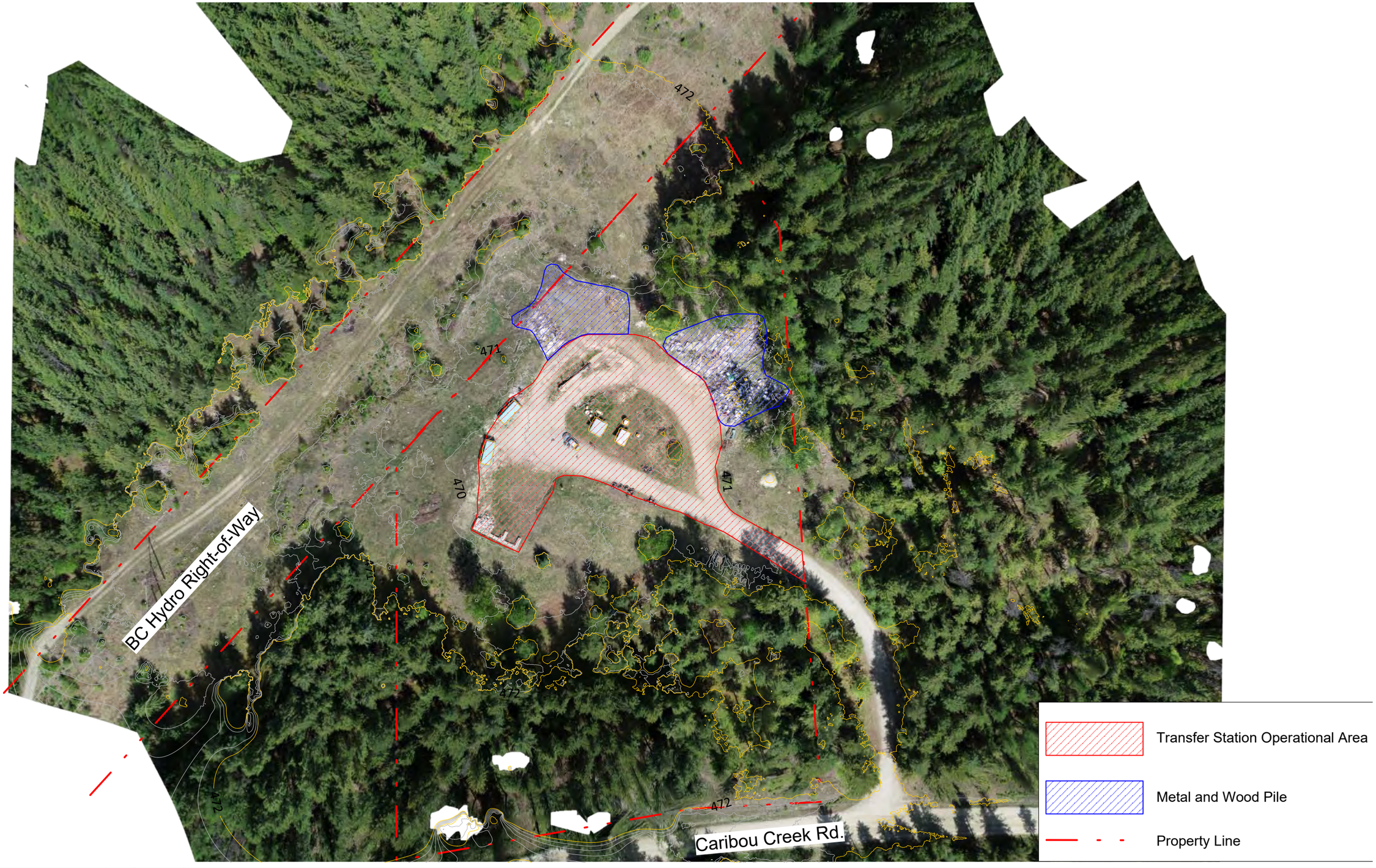
12. References

[1] Agency for Toxic Substances and Disease Registry, "Landfill Gas Primer - An Overview for Environmental Health Professionals," ATSDR, November 2001. [Online]. Available: https://www.atsdr.cdc.gov/hac/landfill/html/ch2.html. [Accessed 10 June 2025].

[2] C. Gainham, Interviewee, *Caribou Creek Water Quality Data.* [Interview]. 28 August 2025.

[3] Health Canada, "Guidelines for Canadian Drinking Water Quality: Guideline Technical Document - Ammonia," Government of Canada, Ottawa, 2016.

[4] British Columbia Ministry of Water, Land and Resource Stewardship, "British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Guideline Summary," MWLRP, Victoria, 2025.



No.	DATE yr/m/day	REVISIONS	DRAWN	CHK'D	APP'D

SPERLING HANSEN ASSOCIATES — CELEBRATING 30 YEARS OF ENGINEERING EXCELLENCE

REGIONAL DISTRICT CENTRAL KOOTENAY

DESIGN BY: -
DRAWN BY: M. DOORNBOS
DATE CREATED: 2025/08/15
SHA PROJECT #: PRJ25043

RDCK LEGACY LANDFILL CLOSURE PLANS

BURTON LANDFILL

DRAWING NO.	REV	SHEET
PRJ25043-BURTON-1	1	1

N

Auger 3

Auger 4

Auger 5

Auger 1

Auger 2

Visible Settlement/Historical Trenches

Estimated Waste Footprint

Property Line

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CELEBRATING 30 YEARS OF ENGINEERING EXCELLENCE

No.	DATE yr/m/day	REVISIONS	DRAWN	CHK'D	APP'D

REGIONAL DISTRICT CENTRAL KOOTENAY

DESIGN BY: -

DRAWN BY: M. DOORNBOS

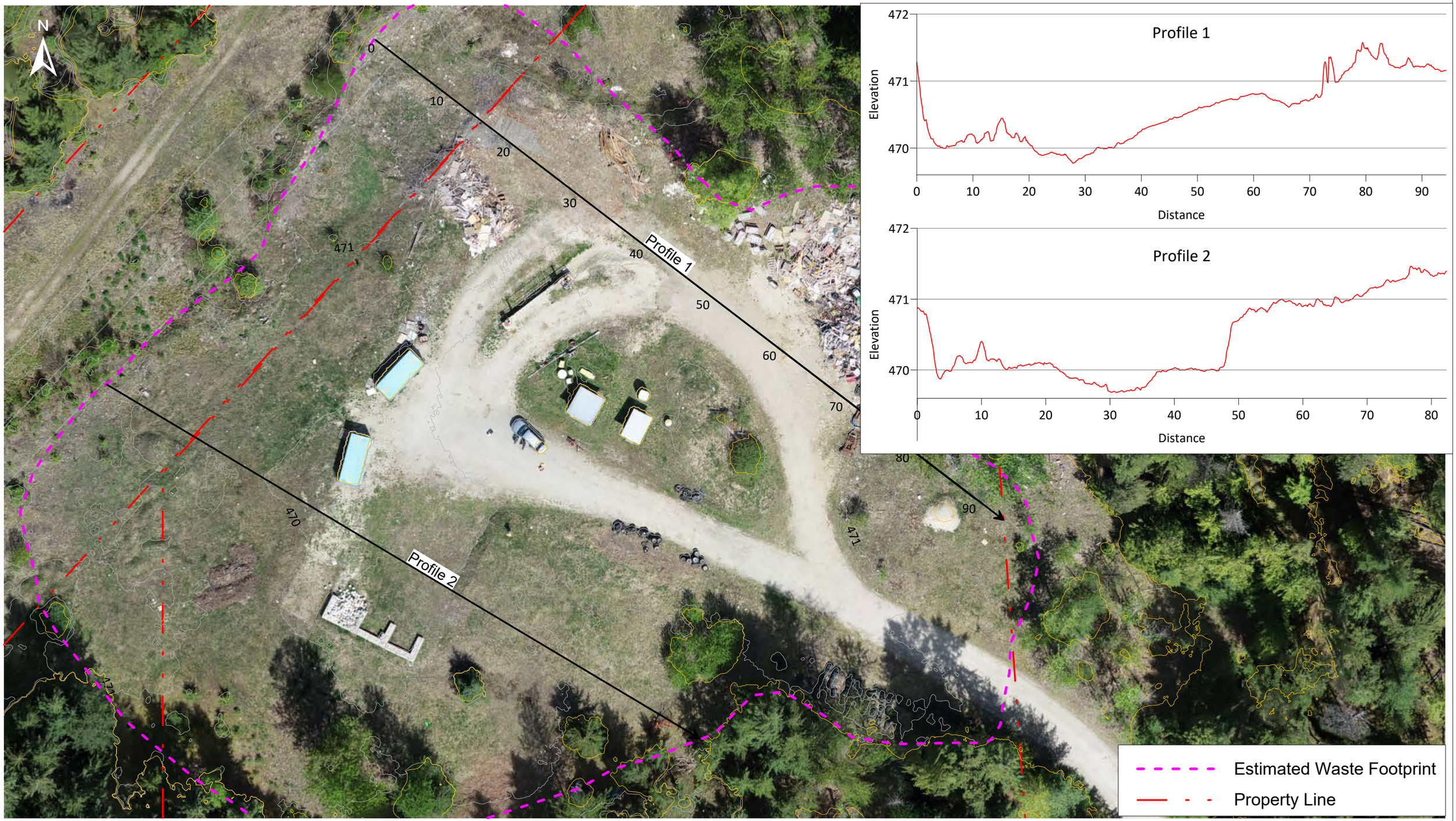
DATE CREATED: 2025/08/15

SHA PROJECT #: PRJ25043

RDCK LEGACY LANDFILL CLOSURE PLANS

BURTON LANDFILL

DRAWING NO.	REV	SHEET
PRJ25043-BURTON-2	1	1



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DRAWN BY: M. DOORNBOS

DATE CREATED: 2025/08/15

SHA PROJECT #: PRJ25043

RDCK LEGACY LANDFILL CLOSURE PLANS

BURTON LANDFILL

DRAWING NO.	REV	SHEET
PRJ25043-BURTON-3	1	1

APPENDIX A
Site Photolog

Photo 1: Overview of Burton Landfill site, looking North.

Photo 2: Burton Site overview.

Photo 3: Woodpile area with recycling area in background.

Photo 4: Landfill area with signs of settlement noted while on site.

Photo 5: West side of site with debris and pieces of farm equipment visible in treeline.

Photo 6: Overview of site, with Caribou Creek visible on right side of photo.

Photo 7: Typical cover found on site.

Photo 8: Cover investigation location 1 in Southern portion of site.

Photo 9: Equipment left on site.

Photo 10: Debris found in Southwestern area of site.

Photo 11: Attendant shack in middle of site.

Photo 12: View of transfer stations operation area from entrance road.

Photo 13: Litter and debris found in Southeast area of site.

Photo 14: Litter and debris in white goods storage/metal pile area.

Photo 15: Transfer station area, looking Southwest.

Photo 16: Berm/short slope within power line area, likely part of historical trench and fill.

Photo 17. Berm/short slope within power line area, likely part of historical trench and fill.

Photo 18: Litter found in Western area of site.

Photo 19: Metal pile with white goods area on left of photo.

Photo 20. Typical vegetation established on landfill area.