CEDAR HILLS REGIONAL LANDFILL
2020 SITE DEVELOPMENT PLAN AND
FACILITY RELOCATION

FINAL ENVIRONMENTAL IMPACT STATEMENT

King County
Department of
Natural Resources and Parks
Solid Waste Division

Waste **Prevention** | *Resource* **Recovery** | *Waste* **Disposal**

www.kingcounty.gov/solidwaste

Note:
Some pages in this document have been purposely skipped or blank pages inserted so that this document will print correctly when duplexed.

FINAL
ENVIRONMENTAL IMPACT STATEMENT

KING COUNTY
CEDAR HILLS REGIONAL LANDFILL
2020 SITE DEVELOPMENT PLAN
AND FACILITY RELOCATION

Prepared by

King County

King County Department of Natural Resources and Parks
Solid Waste Division
King Street Center
201 South Jackson Street, Suite 701
Seattle, Washington 98104-3855

March 2022

Prepared in compliance with the State Environmental Policy Act, Revised Code of Washington 43.21C as amended, and its implementing rules, Washington Administrative Code 197-11.

Fact Sheet

Project Title

Final Environmental Impact Statement (DEIS); Cedar Hills Regional Landfill, 2020 Site Development Plan and Facilities Relocation.

Nature and Location of Proposal

The Cedar Hills Regional Landfill (CHRLF or landfill) is located on a 920-acre site in unincorporated King County at 16645 228th Avenue SE, Maple Valley, approximately 4 miles south of Issaquah and 6 miles east of Renton. The property is accessed from Cedar Grove Road and consists of the north one-half of Section 28 and Section 21 (except the northeast quarter of the northeast quarter), Township 23 North, Range 6 East, Willamette Meridian. Use of the CHRLF property for solid waste disposal is allowed under a Special Permit approved by the King County Board of County Commissioners in 1960.

King County Department of Natural Resources and Parks, Solid Waste Division (KCSWD) has been placing waste in a refuse cell called Area 8 since July 2019. Area 8 is a 31.4-acre area which was approved for development by the King County Council in 2010 following the publication of an EIS evaluating several development alternatives. In addition to Area 8, there is remaining capacity for waste in Areas 5 and 6, which will be filled after Area 8 reaches capacity under the current site development plan. Together with waste diversion, operational efficiencies, and ongoing settlement of refuse, the current site development is expected to provide disposal capacity at the landfill until approximately 2028.

In 2000, King County entered into a Settlement Agreement for several consolidated class action cases (hereinafter referred to as the "Settlement Agreement") which requires King County to make a good faith effort to keep the maximum height of areas 5, 6, and 7 of the landfill at or below 788 feet above mean sea level, while affirming that garbage shall not be disposed of, nor soils stockpiled, within 1,000 feet of the property line at the landfill. On April 24, 2019, the King County Council approved the *2019 Comprehensive Solid Waste Management Plan* (Solid Waste Comp Plan) (King County 2019d), which authorized the KCSWD to consider alternatives to maximize the capacity of the CHRLF consistent with the terms and conditions of the 2000 Settlement Agreement.

Based on the 2020 tonnage forecast, maximizing the development of the landfill could extend capacity past 2040, the year through which the Amended and Restated Solid Waste Interlocal agreements with King County cities are in effect.

The No Action Alternative in this Final EIS involves completing and maintaining the landfill as prescribed by the Cedar Hills Regional Landfill 2010 Site Development Plan – Project Program Plan (2010 Plan) (King County 2010b) and is expected to provide disposal capacity at the landfill until approximately 2028. Area 8 would be developed to a permitted volume of 7,840,000 cubic yards. Main landfill support facilities would remain in their current locations, including removal, refurbishment, or replacement of some facilities at the end of their useful life, and would include temporary use of interim offsite facilities. All development under the No Action Alternative is allowed under the existing Special Permit and the current Municipal Solid Waste Landfill Permit.

Action Alternatives 1 through 3 expand upon the No Action Alternative with the development of additional capacity, with different sequencing in landfilling, leading to increased years of life. The three action alternatives provide a range of development scenarios that would extend the capacity of the landfill between nine and eighteen years (a range from 2037 to 2046), or between approximately 11 million and 26 million cubic yards. The landfill development activities specific to the action alternatives are as listed below.

- Alternative 1 would develop approximately 34 acres for construction of a new refuse area in the southeast portion of the landfill (proposed Area 9), with landfilling in Areas 8 and 9 to no more than 800 feet above mean sea level. Landfilling would also occur in existing landfill Areas 5 and 6, to no more than 788 feet above mean sea level. No additional landfilling would take place in the Main Hill, Southeast Pit, Central Pit, or Areas 2/3, 4, and 7. Based on current tonnage predictions, this alternative would add approximately 12 million cubic yards and nine years (to approximately 2037) to the landfill capacity. Landfill support facilities would also be relocated. (Details regarding relocation options are provided below).
- Alternative 2 would develop approximately 34 acres for construction of a new refuse area in the southeast portion of the landfill (proposed Area 9), with landfilling in Areas 8 and 9 to no more than 830 feet above mean sea level. Landfilling would also occur in existing landfill Areas 5 and 6, to no more than 788 feet above mean sea level. Additional landfilling would take place in approximately nine acres in the southern portion of Areas 2/3, 4, and Central Pit to 788 feet. No additional landfilling would take place in the Main Hill, Southeast Pit, or Area 7. Based on current tonnage predictions, this alternative would add approximately 13 million cubic yards and 10 years (to approximately 2038) to the landfill capacity. Landfill support facilities would also be relocated. (Details regarding relocation options are provided below).
- Alternative 3 would develop approximately 34 acres for construction of new refuse areas in the southeast portion of the landfill (proposed Area 9), approximately 66 acres in northwest portions of Areas 2/3 and 4, and the northeast portion of Main Hill and Central Pit, with landfilling in all of these areas and in Area 8 to no more than 830 feet above mean sea level. Landfilling would also occur in existing landfill Areas 5 and 6, to no more than 788 feet above mean sea level. No additional landfilling would take place in the Southeast Pit or Area 7. A King County-owned property adjacent to the northeast corner of the landfill would be added into the landfill site, thus revising the site boundary, and maintaining 1,000-foot buffer inside the revised site boundary. Based on current tonnage predictions, this alternative would add approximately 26 million cubic yards and 18 years (to approximately 2046) to the landfill capacity. Landfill support facilities would also be relocated. (Details regarding relocation options are provided below).

All three action alternatives would require relocation of landfill support facilities in order to construct proposed Area 9 and consider the same three options for their relocation:

- Option 1 would pursue a Special Use Permit to relocate and build landfill support facilities within the existing southern buffer zone. This would include but not be limited to the truck scale/scale house, truck wash, heavy equipment maintenance facility (cat shack), emergency generator, a small Moderate Risk Waste storage area, some tractor and trailer parking, the truck maintenance building, employee parking, office space, and laboratory space.
- Option 2 would pursue a Special Use Permit to relocate and build landfill support facilities within the existing northern buffer zone, including, but not limited to the truck maintenance building, parking, office space, and laboratory space. This option would also relocate and build some landfill support facilities in the south, but not within the buffer. These would include but not be limited to the truck scale/scale house, truck wash, heavy equipment maintenance facility (cat shack), emergency generator, a small Moderate Risk Waste storage area, and some tractor and trailer parking.
- Option 3 would relocate and build landfill support facilities at an offsite location at 3005 NE 4th Street in Renton, adjacent to King County's Renton Recycling and Transfer Station. The Renton site was evaluated during the *2019 Cedar Hills Regional Landfill Support Facilities Evaluation* (King County 2019c). The facilities to be relocated include a portion of the vehicle maintenance shop (for repairing tractors, trailers, operations vehicles, and passenger vehicles), employee offices, and parking for employees, tractors, trailers, and operations vehicles. This option would also relocate and build some landfill support facilities in the north or south areas of the landfill site. The truck scale/scale house, truck wash, heavy equipment maintenance facility (cat shack), emergency generator, a small Moderate Risk Waste storage area, and some tractor and trailer parking would be relocated in the south. None of these facilities will be located in the buffer.

Proponent

King County Department of Natural Resources and Parks, Solid Waste Division (KCSWD)

Date of Implementation

Upon adoption by the King County Council of a preferred alternative, a Site Development Plan for the selected alternative will be prepared and submitted to Council for approval. The Solid Waste Division anticipates preparation of final design and subsequent construction of the selected alternative to begin in 2023.

SEPA Responsible Official and Lead Agency

Pat D. McLaughlin, Division Director
King County Solid Waste Division

Contact Person

Kinyan Lui, Project Manager
King County Solid Waste Division
King Street Center, 201 S. Jackson Street, Suite 701
Seattle, Washington 98104
206-263-3685

Email: klui@kingcounty.gov

Required Permits and Approvals

King County Council

- Approval of the Cedar Hills Regional Landfill 2020 Site Development Plan and Facilities Relocation budget
- Approval of Special Permit modification or of new Special Use Permit to allow non-landfilling uses within the buffer and, under Alternative 3, to incorporate adjacent King County-owned property into the landfill site

Renton Community & Economic Development

- Approval of a Hearing Examiner Conditional Use Permit and Site Plan Review
- Demolition and building permits for relocating operation and maintenance facilities under Option 3 of all action alternatives
- Drainage review for stormwater management systems

King County Department of Local Services, Permitting Division

- Demolition and building permits for relocating operation and maintenance facilities under Options 1 and 2 of all action alternatives
- Drainage review for stormwater management systems

King County Department of Natural Resources and Parks, Wastewater Treatment Division

- Wastewater discharge permit—existing permit for discharge of leachate to sanitary sewer system may need to be modified for volume under all alternatives

Public Health – Seattle & King County

- Municipal solid waste handling permit—must be revised when new disposal areas become operational

Puget Sound Clean Air Agency

- Notice of construction and approval under the New Source Performance Standards

- Modification of the Title V air permit for the operation of a major source of air pollutants pursuant to Title V of the 1990 Clean Air Act Amendment

Washington State Department of Ecology

- Baseline general permit under National Pollutant Discharge Elimination System (NPDES) for offsite discharge of stormwater runoff during construction

Authors

King County Solid Waste Division
See Chapter 18 for Authors and Principal Contributors.

Date of Draft EIS Issuance

September 16, 2020

Date Draft EIS Comments Were Due

All comments were due no later than November 6, 2020.

Time and Place of Public Hearing

Due to COVID-19 restrictions, an online Open House was available for the duration of the comment period.

Date of Final EIS Issuance

March 22, 2022

Final Document Availability

The Final EIS and appendices are available for review electronically on the project website at: <https://www.kingcounty.gov/cedar-hills-development>. Due to COVID-19, King County libraries are not currently accepting documents. If you would like to review a paper copy of the Final EIS, please contact the Solid Waste Division at 206-477-4466 to make arrangements.

Date of Final Action

Expected in Summer of 2022.

Subsequent Environmental Review

The Final EIS will be used, as appropriate, to satisfy State Environmental Policy Act, or SEPA, environmental review requirements for actions needed to implement the selected alternative. However, additional environmental review may be needed for some project actions, particularly those involving local building permits.

Location of EIS Background Data

Background information and all documents incorporated by reference in this Final EIS are available for review at the office of the King County Solid Waste Division (see address of contact person, above).

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

ASIL	acceptable source impact level
ADCM	alternative daily cover material
ADT	average daily traffic
BEW	Bio Energy Washington
BMP	best management practice
BPA	Bonneville Power Administration
Btu	British thermal unit
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Cfm	cubic feet per minute
CFR	Code of Federal Regulations
CHRLF	Cedar Hills Regional Landfill
CG	Cedar Grove Composting, Inc.
CO	carbon monoxide
CO_2	carbon dioxide
County	King County, Washington
CSW	contaminated stormwater
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
DCE	cis-1,2-dichloroethene
DMR	discharge monitoring report
Draft EIS	Draft Environmental Impact Statement
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EPA	US Environmental Protection Agency
FHWA	Federal Highway Administration

Final EIS	Final Environmental Impact Statement
FTA	Federal Transit Administration
g/s	grams per second
GHG	greenhouse gas
GMA	Washington State Growth Management Act
g_n	standard gravitational acceleration
HDPE	high-density polyethylene
ILA	interlocal agreement
ISGP	Industrial Stormwater General Permit
KCC	Metropolitan King County Council
KCDOT	King County Department of Transportation
KCSWD	King County Department of Natural Resources and Parks, Solid Waste Division
KCWTD	King County Department of Natural Resources and Parks, Wastewater Treatment Division
L_{eq}	equivalent sound level
LEPS	Leachate Effluent Pump Station
LOS	level of service
Lv	velocity level in decibels
MCY	million cubic yards
mg/L	milligrams per liter
MSE wall	mechanically stabilized earthen wall
MSW	municipal solid waste
NAAQS	National Ambient Air Quality Standards
NFS	CHRLF North Flare Station
NHP	Natural Heritage Program
NMOC	non-methane organic compounds
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
O_3	ozone

PCE	tetrachloroethene
PHS	Priority Habitats and Species
PM_{10}	particulate matter with diameters generally 10 micrometers and smaller
$PM_{2.5}$	particulate matter with diameters generally 2.5 micrometers and smaller
POTW	publicly operated treatment works
ppm	parts per million
PPV	peak particle velocity (inches per second)
PSCAA	Puget Sound Clean Air Agency
PSE	Puget Sound Energy
Public Health	Public Health – Seattle & King County
QCF	Queen City Farms
RA-5	Rural Area, 5-acre minimum lot size (zoning designation)
RA-10	Rural Area, 10-acre minimum lot size (zoning designation)
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RMS	root mean square
SCAP	King County Strategic Climate Action Plan
SCREEN3	screening-level air dispersion model (EPA)
SEPA	State Environmental Policy Act
SO_2	sulfur dioxide
SO_x	sulfur oxides
SPCC	spill prevention, control, and countermeasures plan
SSWA	South Solid Waste Area
SWANA	Solid Waste Association of North America
SWDM	Surface Water Design Manual
SWPPP	stormwater pollution prevention plan
TAC	toxic air contaminant
TAPs	toxic air pollutants
TCE	trichloroethene (trichloroethylene)

µg/m3	micrograms per cubic meter
USC	United States Code
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey
VC	vinyl chloride
WAC	Washington Administrative Code
WDFW	Washington Department of Fish & Wildlife
WDNR	Washington State Department of Natural Resources
WEBR	Waste export by rail
WSDOT	Washington State Department of Transportation
WSGWC	Washington State Groundwater Criteria
WTE	Waste to Energy Facility

Summary

This section provides a summary of the issues addressed in this Final EIS as required under Washington Administrative Code (WAC) 197-11-440(4).

Background

In 2010, the King County Council approved a development and closure plan under which the King County Department of Natural Resources and Parks, Solid Waste Division (KCSWD) currently operates the Cedar Hills Regional Landfill (CHRLF). The Cedar Hills Regional Landfill 2010 Site Development Plan – Project Program Plan (2010 Plan) approved development of the CHRLF through Area 8. In 2019, the King County Council approved the *2019 Comprehensive Solid Waste Management Plan* (Solid Waste Comp Plan), which provides policy direction for the County's management of its solid waste. The Solid Waste Comp Plan calls for the County to "[f]urther develop the Cedar Hills regional landfill to maximize disposal capacity." (King County 2010b)

Purpose and Need

Purpose of the Project

The purpose of this project is to maximize the capacity and lifespan of the Cedar Hills Regional Landfill in accordance with the King County Council approved *2019 Comprehensive Solid Waste Management Plan* (Solid Waste Comp Plan).

Need for the Project

The proposed project is needed so KCSWD can continue to provide reliable and cost-effective solid waste disposal services to its ratepayers. Per the Solid Waste Comp Plan, developing the CHRLF to the maximum extent feasible has the lowest impact on rates of all disposal options considered, the lowest greenhouse gas emissions, and the lowest risk due to long-term experience in its operation. (King County 2019d)

Additional factors contribute to the need to use existing solid waste infrastructure as efficiently as possible and to maximize the utility and use of the CHRLF:

- The County's existing solid waste infrastructure
- Existing Interlocal Agreements with King County cities
- Decisions made by the County through the 2019 Solid Waste Comp Plan process

Existing Solid Waste Infrastructure

With existing infrastructure developed over the past half-century to support in-county landfill disposal, this option is less expensive than the projected cost of other disposal options, such as transporting waste to an out-of-county landfill or a waste-to-energy or other waste-conversion facility(ies). By extending the life of the landfill and delaying the transition to a new disposal method, the County can delay the expenses and subsequent rate increases that will be needed to accommodate this transition.

Existing Interlocal Agreements

Under RCW 70.95.080, cities may choose to either prepare their own solid waste plans or participate in the development of a single plan that covers the incorporated and unincorporated areas of the county. Within King County, 37 cities (all cities in the county except Seattle and Milton) have chosen to participate in the development of a single plan and have signed Interlocal Agreements (ILAs) with King County that establish the County as the solid waste planning authority <https://kingcounty.gov/depts/dnrp/solid-waste/about/interlocal-agreements.aspx>. The original ILAs were 40-year agreements that ran through 2028. By early 2018, all the cities signed the Amended and Restated ILAs that were extended through 2040. The ILAs commit King County for the life of the agreements to provide transfer and disposal services for participating cities and establish disposal fees to generate necessary revenue to cover solid waste management costs, while recognizing that solid waste system users benefit from predictability of system costs and operations (King County 2010b).

Decisions Made by the County Through the 2019 Solid Waste Comprehensive Plan Process

Washington State law requires that each county, in cooperation with the cities located in the county, prepare and implement a coordinated plan to manage solid waste, including landfill management and solid waste disposal. King County's recently approved Solid Waste Comp Plan directed KCSWD to further develop the CHRLF to maximize disposal capacity consistent with the terms and conditions of the 2000 Settlement Agreement. Further, the Solid Waste Comp Plan directed King County's Office of Performance, Strategy and Budget to engage with the Solid Waste Division and the regional partners to develop a plan for long-term disposal, to be recommended to the King County Executive, who will transmit legislation to the King County Council implementing the next long-term disposal method. The Executive will transmit to the Council a progress report that outlines how this plan will be developed, including timing for development and transmittal of this plan, by December 31, 2021 (King County 2019d).

Specific Project Objectives

Specific project objectives are:

- To respond to recent policy directives of the King County Council relevant to solid waste management.

- To meet customer service needs while being cost efficient with resources.
- To maximize cost-effective waste prevention, waste reduction, and recycling, while maintaining adequate transfer and disposal capabilities for non-recycled waste.
- To design, operate, and maintain the County's solid waste system in a manner that protects public health and the environment, conserves energy and natural resources, and minimizes greenhouse gas emissions.
- To comply with federal, state, and local regulations governing solid waste management and property development.
- To respond to issues raised by neighbors, the public, partner cities, unincorporated area councils, the Solid Waste Advisory Committee, the Metropolitan Solid Waste Management Advisory Committee, and the solid waste industry.

Environmental Review Process

Overview

The State Environmental Policy Act (SEPA) is intended to ensure that environmental values are considered during decision-making by state and local agencies. SEPA mandates a process to identify and analyze alternatives, potential environmental impacts, and mitigation measures associated with governmental decisions.

For any proposal involving a decision on a specific project, the state SEPA Rules require that a threshold determination be made (WAC 197-11-310(1)) to determine whether implementation of the project has the potential to result in significant adverse impacts on the environment. For the current proposal to expand the capacity of the CHRLF, the KCSWD has determined that at least one or more of the alternatives under this proposal has the potential to result in significant adverse impacts on the environment. A SEPA EIS is therefore required (WAC 197-11-330(4)). The purpose of an environmental impact statement (EIS) is to "ensure that SEPA's (State Environmental Policy Act) policies are an integral part of the ongoing programs and actions of state and local government" (WAC 197-11-400(1)).

This Final EIS identifies potential significant impacts; describes mitigation measures that can be used (and in many cases, are currently used) to avoid such impacts or reduce them below significant levels; and summarizes any significant unavoidable adverse impacts (that is, significant impacts that cannot or will not be mitigated). Beneficial impacts are also discussed where relevant to the choice among alternatives.

Public Involvement Prior to the Draft EIS

Meetings with CHRLF neighbors have varied in frequency, participation, and format over the years. Beginning in March 1986, CHRLF area residents and KCSWD staff met to discuss conditions and activities at the landfill in meetings called the "Cedar Hills Citizens Review Committee." Since 2011, KCSWD has held meetings with neighbors twice a year (spring and fall), and at least one landfill tour per year has been offered (currently suspended due to COVID-19). In addition to the twice-yearly community meetings with CHRLF neighbors, KCSWD sends topic-specific notices to the list of neighbors and other stakeholders when an activity is likely to affect the neighbors. Outreach has also included multiple correspondence, phone calls, and face-to-face conversations with neighbors.

SEPA Scoping

Scoping (WAC 197-11-408) is required to “[i]dentify reasonable alternatives and probable significant adverse environmental impacts” and to “[e]liminate from detailed study those impacts that are not significant”. The official EIS scoping period for this proposal began on July 25, 2019 with the KCSWD’s issuance of a Determination of Significance and Request for Comments on Scope of Environmental Impact Statement. The KCSWD held a SEPA scoping open house on August 12, 2019 during the 30-day comment period, which ended on August 26, 2019. The scoping notice was sent to approximately 3,800 people within a two-mile radius of the CHRLF. During the scoping meeting and the comment period, the KCSWD received a total of 64 written comments, oral comments documented by a court reporter, website comments, emails, telephone conversations, and letters.

Issuance of Draft EIS and Draft EIS Comment Period

A comment period of 45 days (WAC 197-11-502(5)(b)) began with the issuance of the Draft EIS on September 16, 2020. A public online open house was held during the entire comment period to receive oral and written comments. KCSWD extended the comment deadline by one week due to a web site technical issue, with comments due no later than November 6, 2020. KCSWD considered all the comments received and determined that additional or revised environmental studies were needed to proceed with preparation of this Final EIS, including those focused on health risk, air toxics, odor, noise and vibration, and aesthetics.

Issuance of Final EIS

This Final EIS has been prepared to include modifications to the text of the EIS stemming from the comments received to the Draft EIS.

As part of SEPA requirements, this Final EIS contains a Responsiveness Summary, which provides the public with responses from KCSWD to all the questions and comments that were received during the public comment period for the Draft EIS. The Responsiveness Summary groups the comments/questions by topic area and chapter and provides KCSWD’s response. Each comment received, or a link to the comment if voluminous, is provided following the summary. The text of the Final EIS was revised as needed to clarify or correct information.

Description of Alternatives

The Final EIS evaluates four alternatives, including a No Action Alternative and three action alternatives.

The No Action Alternative in this Final EIS involves completing and maintaining the landfill as prescribed by the Cedar Hills Regional Landfill 2010 Site Development Plan – Project Program Plan (2010 Plan) (King

County 2010b) and is expected to provide disposal capacity at the landfill until 2028. Area 8 would be developed to a permitted volume of 7,840,000 cubic yards. Main landfill support facilities would remain in their current locations, including removal, refurbishment or replacement of some facilities at the end of their useful life, and may include temporary use of interim offsite facilities. All development under the No Action Alternative is allowed under the existing Special Permit and the current Municipal Solid Waste Landfill Permit.

Action Alternatives 1 through 3 expand upon the No Action Alternative with the development of additional capacity, with different sequencing in landfilling, leading to increased years of life. The three action alternatives provide a range of development scenarios that would extend the capacity of the landfill between nine and 18 years (a range from 2037 to 2046), or between approximately 11 million and 26 million cubic yards. The landfill development activities specific to the action alternatives are as listed below:

- Alternative 1 would develop approximately 34 acres for construction of a new refuse area in the southeast portion of the landfill (proposed Area 9), with landfilling in Areas 8 and 9 to no more than 800 feet above mean sea level. Landfilling would also occur in existing landfill Areas 5 and 6, to no more than 788 feet above mean sea level. No additional landfilling would take place in the Main Hill, Southeast Pit, Central Pit, or Areas 2/3, 4, and 7. Based on current tonnage predictions, this alternative would add approximately 12 million cubic yards and nine years (to approximately 2037) to the landfill capacity. Landfill support facilities would also be relocated. (Details regarding relocation options are provided below).
- Alternative 2 would develop approximately 34 acres for construction of a new refuse area in the southeast portion of the landfill (proposed Area 9), with landfilling in Areas 8 and 9 to no more than 830 feet above mean sea level. Landfilling would also occur in existing landfill Areas 5 and 6, to no more than 788 feet above mean sea level. Additional landfilling would take place in approximately nine acres in the southern portion of Areas 2/3, 4, and Central Pit to 788 feet. No additional landfilling would take place in the Main Hill, Southeast Pit, or Area 7. Based on current tonnage predictions, this alternative would add approximately 13 million cubic yards and 10 years (to approximately 2038) to the landfill capacity. Landfill support facilities would also be relocated. (Details regarding relocation options are provided below).
- Alternative 3 would develop approximately 34 acres for construction of new refuse areas in the southeast portion of the landfill (proposed Area 9), approximately 66 acres in northwest portions of Areas 2/3 and 4, and the northeast portion of Main Hill and Central Pit, with landfilling in all of these areas and in Area 8 to no more than 830 feet above mean sea level. Landfilling would also occur in existing landfill Areas 5 and 6, to no more than 788 feet above mean sea level. No additional landfilling would take place in the Southeast Pit or Area 7. A King County-owned property adjacent to the northeast corner of the landfill would be added into the landfill site, thus revising the site boundary, and maintaining 1,000-foot buffer inside the revised site boundary. Based on current tonnage predictions, this alternative would add approximately 26 million cubic yards and 18 years

(to approximately 2046) to the landfill capacity. Landfill support facilities would also be relocated. (Details regarding relocation options are provided below).

All three action alternatives would require relocation of landfill support facilities in order to construct proposed Area 9 and consider the same three options for their relocation:

- Option 1 would pursue a Special Use Permit to relocate and build landfill support facilities within the existing southern buffer zone. This would include but not be limited to the truck scale/scale house, truck wash, heavy equipment maintenance facility (cat shack), emergency generator, a small Moderate Risk Waste storage area, some tractor and trailer parking, the truck maintenance building, employee parking, office space, and laboratory space.
- Option 2 would pursue a Special Use Permit to relocate and build landfill support facilities within the existing northern buffer zone, including, but not limited to the truck maintenance building, parking, office space, and laboratory space. This option would also relocate and build some landfill support facilities in the south, but not within the buffer. These would include but not be limited to the truck scale/scale house, truck wash, heavy equipment maintenance facility (cat shack), emergency generator, a small Moderate Risk Waste storage area, and some tractor and trailer parking.
- Option 3 would relocate and build landfill support facilities at an offsite location at 3005 NE 4th Street in Renton, adjacent to King County's Renton Recycling and Transfer Station. The Renton site was evaluated during the *2019 Cedar Hills Regional Landfill Support Facilities Evaluation* (King County 2019c). The facilities to be relocated include a portion of the vehicle maintenance shop (for repairing tractors, trailers, operations vehicles, and passenger vehicles), employee offices, and parking for employees, tractors, trailers, and operations vehicles. This option would also relocate and build some landfill support facilities in the north or south areas of the landfill site. The truck scale/scale house, truck wash, equipment maintenance facility (cat shack), emergency generator, a small Moderate Risk Waste storage area, and some tractor and trailer parking would be relocated in the south. None of these facilities will be located in the buffer.

Summary of Potential Impacts

Potential environmental impacts were evaluated for development of each of the three action alternatives as well as the No Action Alternative. Where appropriate for an environmental element, mitigation measures were identified which could be implemented to address adverse impacts.

Table S-1. Summary of Alternatives, Impacts, Mitigation Measures, and Significant Unavoidable Adverse Impacts.

Alternative	Impacts, Mitigation Measures, and Significant Unavoidable Adverse Impacts
No Action: 11 MCY 8 years to 2028 max. elev. 788’	Impacts and Mitigation Measures • Landfill closes the earliest of all alternatives, alternative long-term waste disposal would need to be in place by 2028. • Soil import needed for final year of operation. No adverse impacts expected on geology and soils. • Shortest timeframe for intermittent air and odor impacts, KCSWD is utilizing BMPs, engineering practices, monitoring program, and complaint response program to minimize air and odor impacts. • Earliest revegetation of closed areas after operations cease; wildlife use of site may increase. • Leachate and stormwater managed to protect salmonid habitat downstream. • Implementation of updated 2019 bird management plan. • It is uncertain whether project-level GHG-related impacts on global climate charge are significant. • With implementation of plan to improve performance of leachate lagoons, emissions from lagoons may be further reduced. • With mitigation, no adverse noise impacts to the community. Vibration levels generally remain below the threshold for noticeability. • The least visual impact, with the landfill increasing in size at the south end with Area 8 development, but no significant impact. Maintain current mitigation including screening, vegetation, lighting systems, and grading. • Transportation impacts would continue for the shortest time. Significant Unavoidable Adverse Impacts • GHG emissions from the project (under all alternatives), when combined with other global sources, are considered a significant unavoidable adverse cumulative impact. • I-405 Southbound On-Ramp/SR 169/SE Renton Maple Valley Highway/Sunset Boulevard North, Issaquah Hobart Road SE/SR 18 Westbound Ramps and 154th Place SE/SR 169/SE Renton Maple Valley Highway intersections impacts are considered cumulative, significant, and unavoidable adverse impacts that would occur with or without the action alternatives. After monitoring and determination for when the onset of the impact would occur, improvement to the intersection would reduce impacts to existing levels.

Table S-1 (continued). Summary of Alternatives, Impacts, Mitigation Measures, and Significant Unavoidable Adverse Impacts.

Alternative	Impacts, Mitigation Measures, and Significant Unavoidable Adverse Impacts
Action Alternative 1: 12 MCY more than under the No Action Alternative +9 years to 2037 max. elev. 800’	Impacts and Mitigation Measures • Additional nine years to develop long-term alternative waste disposal. • Soil import needed for 10 years. Adverse impacts on earth mitigated by adhering to stringent federal and state design standards for landfill systems and implementing effective BMPs during construction and during post-construction operation and maintenance. • Longer timeframe for intermittent air and odor impacts, KCSWD would implement BMPs and engineering practices, monitoring program, and complaint response program to minimize air and odor impacts. • Later revegetation of closed areas after operations cease, wildlife use of site may increase, but later than under No Action. • Leachate and stormwater managed to protect salmonid habitat downstream. • Implementation of updated 2019 bird management plan. • Under Options 1-3, three to 15 acres of vegetation would be cleared, and wildlife would likely disperse to adjacent habitats. • Trees would be preserved when possible and replanted, cleared areas revegetated, and noxious weeds controlled. • It is uncertain whether project-level GHG-related impacts on global climate charge are significant. • With implementation of plan to improve performance of leachate lagoons, emissions from lagoons may be further reduced. • Even with implementation of adequate mitigation for landfill-related noise, a reduction of about 6 dBA in nighttime noise from BEW would be needed to reduce projected noise levels below the 39 dBA standard. The practicality of this level of BEW noise reduction is uncertain, but with mitigation, no adverse noise impacts to the community. Vibration levels generally remain below the threshold for noticeability. • The least visual impact of action alternatives, with the landfill increasing in bulk at the south end, but no significant impact. Maintain current mitigation including screening, vegetation, lighting systems, and grading. • Transportation impacts would continue for longer than the No-Action Alternative. Significant Unavoidable Adverse Impacts • Loss of forested vegetation and conversion for construction and operation of the north and south facility options would be a significant unavoidable adverse impact to wildlife that use this habitat. • GHG emissions from the project (under all alternatives), when combined with other global sources, are considered a significant unavoidable adverse cumulative impact. • I-405 Southbound On-Ramp/SR 169/SE Renton Maple Valley Highway/Sunset Boulevard North, Issaquah Hobart Road SE/SR 18 Westbound Ramps and 154th Place SE/SR 169/SE Renton Maple Valley Highway intersections impacts are considered cumulative, significant, and unavoidable adverse impacts that would occur with or without the action alternatives. Improvement of intersection after monitoring onset of impact would reduce impacts to existing levels.

Table S-1 (continued). Summary of Alternatives, Impacts, Mitigation Measures, and Significant Unavoidable Adverse Impacts.

Alternative	Impacts, Mitigation Measures, and Significant Unavoidable Adverse Impacts
Action Alternative 2: 13 MCY more than under the No Action Alternative +10 years to 2038 max. elev. 830’	Impacts and Mitigation Measures • Additional 10 years to develop long-term alternative waste disposal. • Soil import needed for 11 years. Adverse impacts on earth mitigated by adhering to stringent federal and state design standards for landfill systems and implementing effective BMPs during construction and during post-construction operation and maintenance. • Longer timeframe for intermittent air and odor impacts, KCSWD would implement BMPs and engineering practices, monitoring program, and complaint response program to minimize air and odor impacts. • Later revegetation of closed areas after operations cease, wildlife use of site may increase, but later than under No Action and Alternative 1. • Leachate and stormwater managed to protect salmonid habitat downstream. • Implementation of updated 2019 bird management plan. • Under Options 1-3, three to 15 acres of vegetation would be cleared, and wildlife would likely disperse to adjacent habitats. • Trees would be preserved when possible and replanted, cleared areas revegetated, and noxious weeds controlled. • It is uncertain whether project-level GHG-related impacts on global climate charge are significant. • With implementation of plan to improve performance of leachate lagoons, emissions from lagoons may be further reduced. • Even with implementation of adequate mitigation for landfill-related noise, a reduction of about 6 dBA in nighttime noise from BEW would be needed to reduce projected noise levels below the 39 dBA standard. The practicality of this level of BEW noise reduction is uncertain, but with mitigation, no adverse noise impacts to the community. Vibration levels generally remain below the threshold for noticeability. • Slightly increased visual impact, with the landfill increasing in bulk over a larger area, but no significant impact. Maintain current mitigation including screening, vegetation, lighting systems, and grading. • Transportation impacts would continue for longer than the No-Action Alternative and Alternative 1. Significant Unavoidable Adverse Impacts • Loss of forested vegetation and conversion for construction and operation of the north and south facility options would be a significant unavoidable adverse impact to wildlife that use this habitat. • GHG emissions from the project (under all alternatives), when combined with other global sources, are considered a significant unavoidable adverse cumulative impact. • I-405 Southbound On-Ramp/SR 169/SE Renton Maple Valley Highway/Sunset Boulevard North, Issaquah Hobart Road SE/SR 18 Westbound Ramps and 154th Place SE/SR 169/SE Renton Maple Valley Highway intersections impacts are considered cumulative, significant, and unavoidable adverse impacts that would occur with or without the action alternatives. Improvement of intersection after monitoring onset of impact would reduce impacts to existing levels.

Table S-1 (continued). Summary of Alternatives, Impacts, Mitigation Measures, and Significant Unavoidable Adverse Impacts.

Alternative	Impacts, Mitigation Measures, and Significant Unavoidable Adverse Impacts
Action Alternative 3: 26 MCY more than under the No Action Alternative +18 years to 2046 max. elev. 830’	Impacts and Mitigation Measures • Additional 26 years to develop long-term alternative waste disposal. • Soil import needed for 19 years. Adverse impacts on earth mitigated by adhering to stringent federal and state design standards for landfill systems and implementing effective BMPs during construction and during post-construction operation and maintenance. • Longest timeframe for intermittent air and odor impacts, KCSWD would implement BMPs and engineering practices, monitoring program, and complaint response program to minimize air and odor impacts. • Latest revegetation of closed areas after operations cease, wildlife use of site may increase, but later than under No Action and Alternatives 1 and 2. • Leachate and stormwater managed to protect salmonid habitat downstream. • Implementation of updated 2019 bird management plan. • Under Options 1-3, three to 15 acres of vegetation would be cleared, and wildlife would likely disperse to adjacent habitats. • Trees would be preserved when possible and replanted, cleared areas revegetated, and noxious weeds controlled. • It is uncertain whether project-level GHG-related impacts on global climate charge are significant.. • With implementation of plan to improve performance of leachate lagoons, emissions from lagoons may be further reduced. • Even with implementation of adequate mitigation for landfill-related noise, a reduction of about 6 dBA in nighttime noise from BEW would be needed to reduce projected noise levels below the 39 dBA standard. The practicality of this level of BEW noise reduction is uncertain, but with mitigation, no adverse noise impacts to the community. Vibration levels generally remain below the threshold for noticeability. • The most visual impact, with the landfill increasing in bulk over a larger area, but no significant impact. Maintain current mitigation including screening, vegetation, lighting systems, paint colors, and grading. • Transportation impacts would continue for the longest period of time. Significant Unavoidable Adverse Impacts • Loss of forested vegetation and conversion for construction and operation of the north and south facility options would be a significant unavoidable adverse impact to wildlife that use this habitat. • GHG emissions from the project (under all alternatives), when combined with other global sources, are considered a significant unavoidable adverse cumulative impact. • I-405 Southbound On-Ramp/SR 169/SE Renton Maple Valley Highway/Sunset Boulevard North, Issaquah Hobart Road SE/SR 18 Westbound Ramps and 154th Place SE/SR 169/SE Renton Maple Valley Highway intersections impacts are considered cumulative, significant, and unavoidable adverse impacts that would occur with or without the action alternatives. Improvement of intersection after monitoring onset of impact would reduce impacts to existing levels.

MCY – Million cubic yards BMP – Best management practice GHG – Greenhouse gas SR – State Route
dBA – A-weighted decibel BEW – Bio-Energy Washington

1.0 INTRODUCTION AND BACKGROUND

This chapter provides an introduction and background to this Final Environmental Impact Statement (Final EIS); Cedar Hills Regional Landfill, 2020 Site Development Plan.

The chapter is divided into seven sections. Section 1.1 describes the purpose of the document. Section 1.2 describes the history of the CHRLF's development. Section 1.3 describes the CHRLF's current facilities and operational characteristics, including specific physical features of the landfill. Section 1.4 summarizes the objectives of the proposal under evaluation in this document. Section 1.5 describes the environmental and public review process for this proposal taken to-date and planned for the future. Section 1.6 presents the projected King County solid waste disposal volumes for the future. The final section, Section 1.7, provides a description of how impacts are organized and analyzed in this Final EIS and presents important definitions of impact for the reader.

1.1 Introduction

This Final EIS Cedar Hills Regional Landfill, 2020 Site Development Plan has been prepared by the King County Department of Natural Resources and Parks, Solid Waste Division (KCSWD). The purpose of this Final EIS is to identify and evaluate the potential significant adverse environmental impacts of three action alternatives for adding capacity to the Cedar Hills Regional Landfill (CHRLF). The potential impacts of the action alternatives are compared with the potential impacts of the No Action Alternative, which is development as currently allowed under the approved Cedar Hills Regional Landfill 2010 Site Development Plan – Project Program Plan (2010 Plan) (King County 2010b). This Final EIS also proposes reasonable mitigation measures to minimize impacts.

Under the No Action Alternative, the CHRLF is expected to reach its permitted capacity in 2028, based on 2019 solid waste tonnage forecasts; this estimate assumes that no further landfill development would occur beyond what is planned in the 2010 Plan. Action Alternatives 1 through 3 provide a range of development scenarios that would extend the capacity of the landfill between nine and 18 years (a range from 2037 to 2046), or between approximately 11 million and 26 million cubic yards. All action alternatives will require relocation of the administration and maintenance facilities currently located in the southeast corner of the CHRLF property. The Final EIS evaluates three options for facilities relocation. Each of these options could be selected for any action alternative.

1.2 Background

The CHRLF is located on a 920-acre site in unincorporated King County at 16645 228th Avenue SE, Maple Valley. The site is approximately four miles south of Issaquah and six miles east of Renton (see Figures 1-1 and 1-2). The site is accessed from Cedar Grove Road and consists of the northern one-half of Section 28 and Section 21 (except the northeast quarter of the northeast quarter), Township 23 North, Range 6 East, Willamette Meridian. King County owns the landfill property; KCSWD pays rent to the County for use of the property.

Since 1965, the CHRLF has provided for the safe and efficient disposal of the county's solid waste. Solid waste disposal at the CHRLF is allowed under a Special Permit, approved by the King County Board of County Commissioners in 1960 (Appendix A). The permit allows the operation of a sanitary landfill and specifies that a 1,000-foot-wide buffer be maintained around the perimeter of the site for the protection of the surrounding properties. The Special Permit stipulates that "no sanitary operations" should be allowed within the buffer. As the property owner, King County, not KCSWD, may authorize other uses within the buffer. Historically, this has included construction and operation of a residential alcohol treatment center (now converted to transitional housing center–Passage Point), and a greenhouse operation run by the King County Parks Division in the east buffer. KCSWD is responsible for the maintenance of the buffer, as it pertains to landfill-related activities. See Section 2.1.4 for more information on land uses allowed in the buffer.

Aerial photographs taken in the 1970s and 1980s indicate that some solid waste disposal occurred in the east buffer (specifically the SE Pit Refuse Area and portions of the Main Hill Refuse Area).

In addition to the 920-acre parcel that constitutes the landfill property, the County owns a 20-acre parcel northeast of the landfill property line (Parcel 2123069001) (Figure 1-2).

Under the terms of a 1985 settlement agreement in Hanni et al. v. King County et al., King County agreed to establish a citizen's review committee to monitor conditions at the landfill and report to the community. Section 1.5.2 describes the evolution of the Committee's work through to today. The parties to the this settlement agreement also agreed on the following terms affecting use of the 1,000-foot buffer zone: 1) garbage may not be deposited in the buffer zone; 2) the buffer zone may be used for operating facilities such as pump stations; 3) King County may enter the buffer zone to construct, repair, or maintain any facility required to mitigate offsite impacts of the landfill; and 4) the County may apply to modify its special permit to allow disposal of garbage within the buffer zone, pursuant to standard procedures for permit modification.

In addition to being influenced by residential and commercial growth in the county, the amount of incoming waste has fluctuated over the years in response to changes in the county solid waste system. Those changes have included the closure of all of the county's rural landfills starting in the late 1980s and ending with the closure of the Vashon Island landfill between 1999 and 2002. King County evaluated four alternatives to increase capacity to the CHRLF in 1998, covering minimum to maximum scenarios. The impacts were evaluated in the *Final EIS for Cedar Hills Landfill Site Development Plan* (King County 1998) and ultimately resulted in development of Areas 5, 6, and 7 – the minimum scenario.

In 2000 King County entered into a Settlement Agreement for several consolidated class action cases (hereinafter referred to as the "Settlement Agreement") that requires King County to make a good faith effort to keep the maximum height of Areas 5, 6, and 7 of the landfill at or below 788 feet above sea level, while affirming that garbage shall not be disposed of, nor soils stockpiled, within 1,000 feet of the property line at the landfill.

Estimates in the *Final 2001 Comprehensive Solid Waste Management Plan* indicated that the CHRLF would reach its permitted capacity and close in 2012. With the *Draft 2009 Comprehensive Solid Waste Management Plan*, this projected closure date was extended to 2018, due in large part to the implementation of best management practices in daily landfill operations, natural settling of the waste through decomposition, and ongoing waste prevention and recycling. The estimated 2018 closure date (based on 2009 solid waste tonnage forecasts) assumed that no further landfill development would occur beyond what was planned in the 1998 Site Development Plan.

In 2007, based on early studies of options for future landfill development and the associated cost savings over transporting waste to an out-of-county landfill or to a waste-to-energy or other waste conversion facility, KCSWD presented the following recommendation in the *Solid Waste Transfer and Waste Management Plan*, which was approved by the King County Council in 2007:

> *Explore opportunities for taking advantage of available landfill capacity to extend the life of this cost-effective disposal option; revise the Cedar Hills Site Development Plan and seek to maximize the capacity (lifespan) of the landfill, subject to environmental constraints, relative costs to operate, and stakeholder interests.*

A subsequent comparative evaluation of alternatives for disposal (R.W. Beck 2007) confirmed that in-county landfill disposal was significantly less expensive than the projected cost of other disposal options. Based on the preliminary analyses and recommendation, KCSWD initiated preparation of an EIS to identify and evaluate development alternatives for the CHRLF. Based on the *2010 Final EIS for CHRLF Site Development Plan* (KCSWD 2010) and other considerations such as cost and future flexibility, KCSWD recommended a preferred alternative to develop Area 8. King County Council approved the Project Program Plan and final selection of the development alternative in 2010.

Figure 1-3 shows all current development areas at CHRLF, marked by the landfill bottom footprint. Table 1-1 provides a summary of development phases at CHRLF. For each phase, Table 1-1 shows the years active, bottom area, and volume in place. The bottom area is the lowest surface footprint of the individual area, usually established by the bottom liner.

Table 1-1. Cedar Hills Regional Landfill Refuse Areas.

Disposal Area	Years Active	Bottom Area	Volume in Place (cubic yards)
Former South Solid Waste Area (SSWA)	1963–1974	Unlined (approx. 30-acre footprint)	Waste was removed from this area in 2017 and relocated to Areas 5 and 7
Main Hill Refuse Area	Late 1960s–Mid 1980s	Unlined (approx. 145-acre footprint)	18,300,000 CY
Southeast Pit Refuse Area	1981–Mid 1980s	Unlined (approx. 8-acre footprint)	405,000 CY
Central Pit Refuse Area	1986–1988	Approx. 55 acres	4,000,000 CY
Area 2/3	1988–1991	Approx. 60 acres	9,150,000 CY
Area 4	1991–2000	Approx. 44 acres	10,200,000 CY
Area 5	2000–2005	70 Acres (30 acres overlay Area 4 and 10 acres overlay Central Pit)	8,400,000 CY
Area 6	2005–2010	40 Acres (16 acres overlays unlined Main Hill)	6,800,000 CY
Area 7	2010–2019	19 acres	9,800,000 CY
Area 8	2019–Current	32 acres	7,840,000 CY (capacity)

KCSWD operations and maintenance and administration facilities are located in the southeast portion of the landfill parcel (Figure 1-4) and in the north portion of the landfill parcel (Figure 1-5) and include approximately 50 portable and permanent buildings built primarily during the 1970s and 1980s.

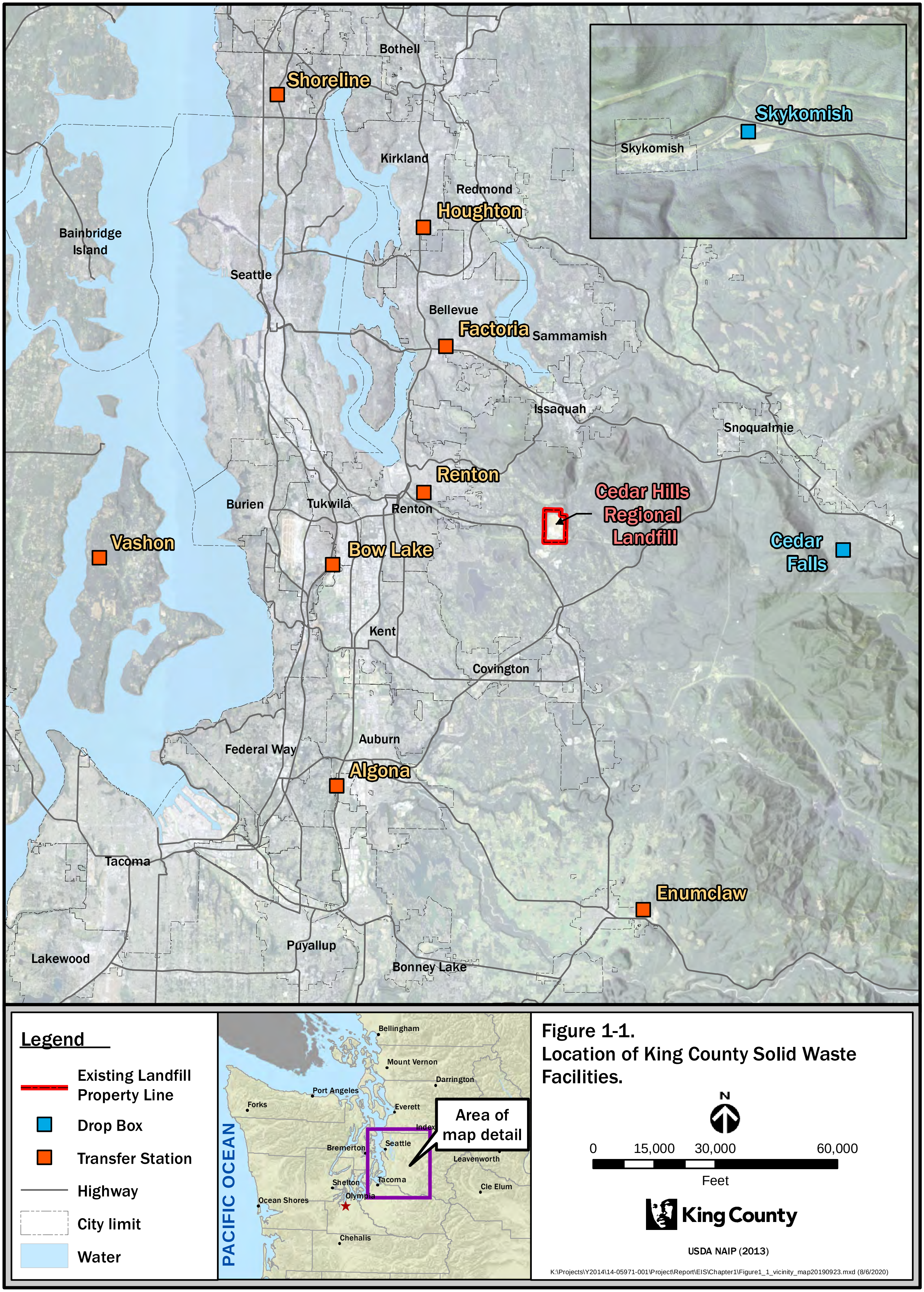
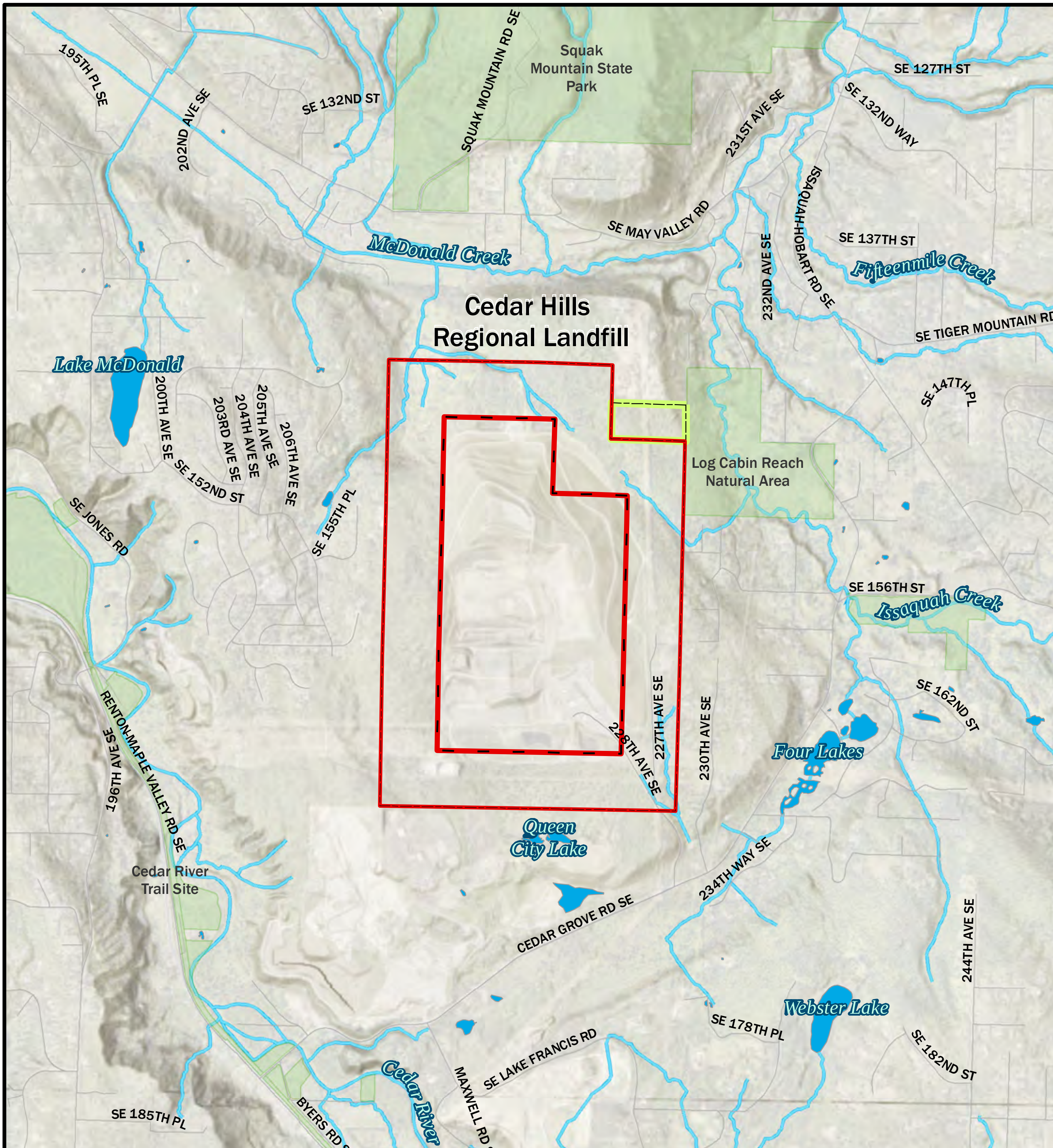


Figure 1-1.
Location of King County Solid Waste Facilities.



Legend

- Existing Landfill Property Line
- Existing 1000ft Buffer
- 20 acre Property Parcel
- Waterbody
- Park
- Road
- Stream

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 1-2.
Vicinity of Cedar Hills Regional Landfill.

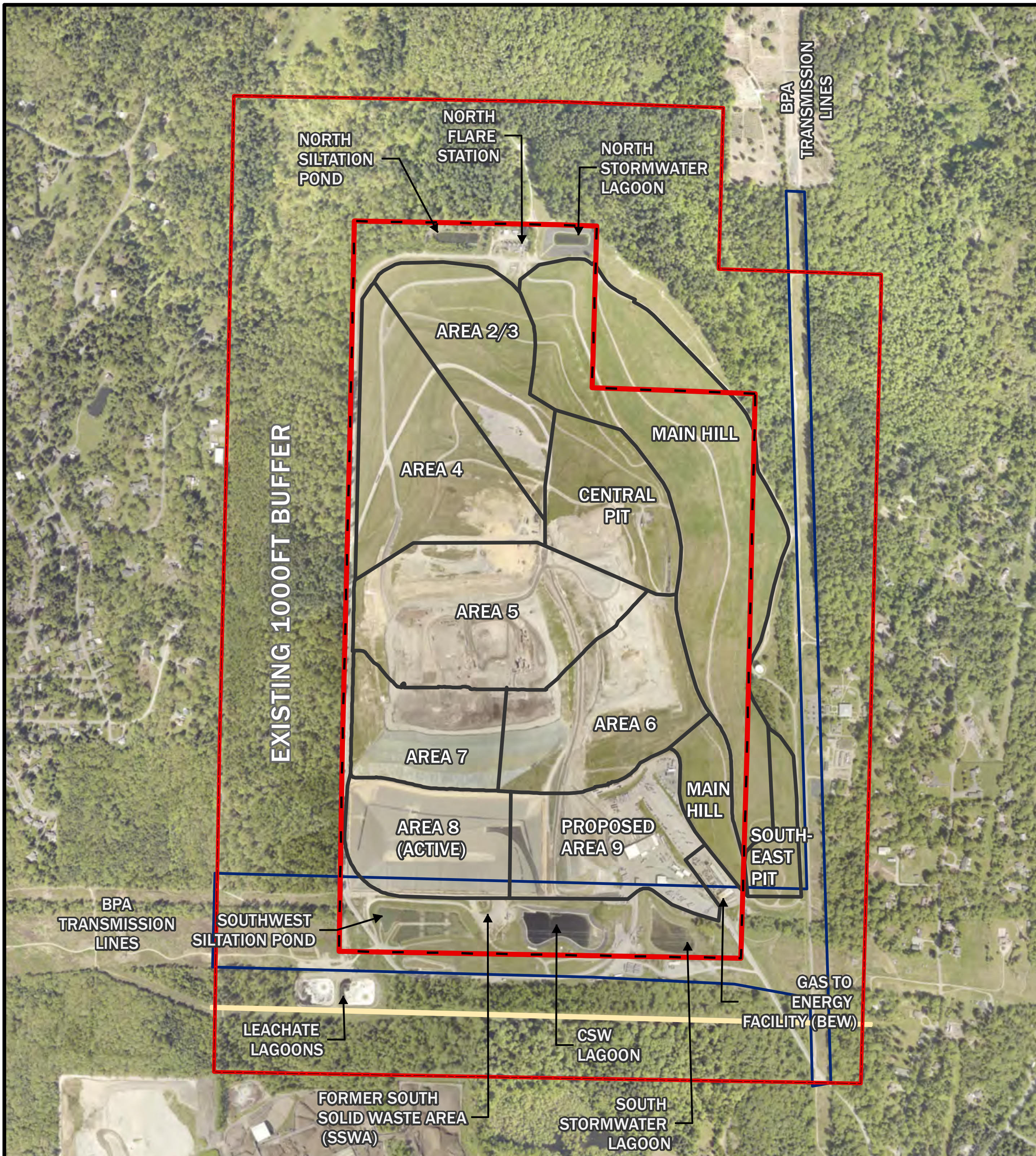
N

0 1,500 3,000 6,000 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter1\Figure1_2_VicinityCHRL_nolabels.mxd (8/11/2020)



Legend

- Existing Landfill Property Line
- Existing 1000ft Buffer
- BPA Easement
- Northwest Pipeline Easement
- Disposal Area Botton Linear Footprint

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 1-3. Landfill Disposal Areas in the Cedar Hills Regional Landfill.

N

0 562.5 1,125 2,250 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter1\Figure1_3_ExistingLandFillAreas.mxd

1.3 Current CHRLF Facilities and Operations

The CHRLF comprises 11 solid waste disposal areas, shown in Figure 1-3. Table 1-2 provides a summary of disposal areas at CHRLF, including current status; bottom liner material and related governing regulations in effect at the time; closure type and governing regulations in effect at the time; and the cover system material.

Table 1-2. Cedar Hills Regional Landfill Refuse Areas Status, Liners, and Governing Regulations.

Disposal Area	Status	Lining System Material/ Governing Regulation	Closure Type/Governing Regulation	Cover System Material
Former South Solid Waste Area (SSWA)	700,000 CY of waste relocated from unlined SSWA to lined cell in 2017; Minor waste left at bases of BPA towers in SSWA	None/None	Final: WAC 173-304	HDPE
Main Hill Refuse Area	Closed with final cover	None/None	Final: WAC 173-304	HDPE
Southeast Pit Refuse Area	Closed with final cover	None/None	Final: WAC 173-304	HDPE
Central Pit Refuse Area	Closed with final cover	HDPE/PVC/WAC 173-304	Final: WAC 173-304	HDPE
Area 2/3	Closed with final cover	HDPE/WAC 173-304	Final: WAC 173-351	HDPE
Area 4	Closed with final cover	HDPE/WAC 173-304	Interim and Final: WAC 173-351	HDPE/ LLDPE
Area 5	Closed on side slopes with final cover; interim cover on top area	HDPE/WAC 173-351	Interim and Final: WAC 173-351	LLDPE
Area 6	Closed on side slopes with final cover; interim cover on top area	HDPE/WAC 173-351	Interim and Final: WAC 173-351	LLDPE
Area 7	Closure in process	HDPE/WAC 173-351	Interim and Final: WAC 173-351	LLDPE
Area 8	Active disposal area currently receiving solid waste	HDPE/WAC 173-351	WAC 173-351	NA

BPA: Bonneville Power Administration
HDPE: high density polyethylene
PVC: polyvinyl chloride
LLDPE: linear low-density polyethylene

CHRLF operates seven days a week, 362 days per year (closed for Christmas, Thanksgiving, and New Years' Day). Operating hours vary depending on the type of activity, with normal operating hours as follows:

- Trucks arriving and departing – 6:00 a.m. to 9:30 p.m. weekdays, 6:00 a.m. to 5:30 p.m. Saturdays and Sundays.
- Landfilling operations – 6:00 a.m. to 7:00 p.m. weekdays, 6:00 a.m. to 4:30 p.m. Saturdays and Sundays.

- Maintenance staff hours – 5:30 a.m. to 11:00 p.m. weekdays, 6:00 a.m. to 4:30 p.m. Saturdays, Sundays, and holidays.
- Administrative staff hours – 7:00 a.m. to 5:00 p.m. weekdays. Closed holidays and weekends.
- A limited number of staff are on site overnight to monitor operational and environmental control systems.

The landfill operates with a staff of approximately 130 to 150 employees during the week, with about 30 to 40 employees present on the weekends.

Most of the waste delivered to the CHRLF is municipal solid waste from residential and non-residential sources. Of the approximately 800,000 to one million tons of solid waste disposed each year, between 6,000 and 9,000 tons is designated as special wastes. These wastes include asbestos-containing materials, industrial wastes, contaminated soil, over-sized materials, treated biomedical wastes, treatment plant grit and vactor wastes, and other miscellaneous materials. Special wastes are segregated and disposed of differently than the general waste stream, when necessary for safety reasons or when required by law, as prescribed by the CHRLF Operations Plan (KCSWD 2019c) or by federal or state law.

Solid waste is delivered to the CHRLF primarily by KCSWD transfer vehicles and occasionally by private vehicles. All vehicles arriving with waste are weighed at the scale house before traveling along designated onsite haul routes to the active area of the landfill where they deposit their loads. After the vehicles deposit their loads, they return along the onsite haul roads and pass through a truck wash facility to clean their undercarriage and tires. Vehicles that do not have a recorded tare weight return to the scale house where they are weighed again so that landfill staff can determine the weight of deposited waste material.

In 2007, the King County Council approved the Solid Waste Transfer and Waste Management Plan (KCSWD 2006). This plan put forth renovation and replacement of the KCSWD's transfer station system to include equipment to compact the solid waste into enclosed transfer trailers or containers. By compacting waste before transport for disposal, fewer transfer vehicles are needed to transport a given amount of solid waste to the CHRLF. The enclosed transfer trailers or containers also significantly reduce the potential for litter during transport.

In addition to the vehicles hauling solid waste to the active disposal area, or working face, typical equipment used in the landfilling operation includes bulldozers, compactors, scrapers, excavators, motor graders, tippers, and off-road dump trucks. At the end of each day, an approved daily cover material, usually soil or tarps, is applied over all waste received during the day.

In 2009, KCSWD implemented several operational changes to improve efficiency and minimize costs of landfill operations. The landfill began using tippers to unload transfer trailers. Tippers are large pieces of equipment that allow garbage trailers to be backed onto the tipper surface, and then tilts the trailer, allowing the garbage to slide out of the back and into the refuse area. The tippers have several benefits, including some reduction in heavy equipment use, a smaller active work area, increased operational efficiency (quicker unloading times), and reduced travel distances for transfer trailers over non-asphalt surfaces (reducing potential fugitive dust emissions). CHRLF also transitioned refuse placement from 15-foot lifts to 30-foot lifts. A lift is the thickness of each layer of waste placed in a given refuse area. Placement of refuse in 30-foot lifts reduces the amount of soil cover and rock material needed; provides better refuse-to-refuse contact between lifts; and reduces time spent reclaiming soil and rock.

Physical features of the CHRLF relevant to the operations of the landfill are detailed in the following subsections. These features are shown in Figures 1-3, 1-4, and 1-5.

Facility	Description	Facility	Description
1	Front Office (Reception/ Admin)	10	Scale House
2	Conference Room B/ IT/ Roaming office	11	New Eqpt. Operator's Trailer
3	Conference Room C/ IT Server rm	12	Eq. Operator's Old locker (Boot Trailer)
4	Engineering Trailer/Lab/copy room	12A	Eq. Operator's Trailer Locker (Remodel)
5	Truck Driver Lunch Room Trailer	12B	Utility Break Trailer
6A	Dry Storage	12C	Boot Shed
6B	Electrician Office	13	WW Compressor
7 (Stores)	Stores	16	Generators
7B	Shipping/Receiving	29	OPS Administration Office (Scott, Bill, Mark, HR)
7C	Shop Trailer Bay and Pit Area (bay 1,2,3) Middle of the building (bldg. 7)	44	Truck Wash
7D	Tire Shop and Bay 4 Trailer Bay	44A	Truck Wash West Restroom
7E	Bay 5 - East Weld Shop	44B	Truck Wash East Restroom
7F	Bay 6 - West Weld Shop	44C	Pressure Wash Room (PW)
8	Carpenter's Shop	46	Fuel Island
9	Wastewater shed	45A	New CAT SHACK
9B	Carpenter Storage	50	Chlorine Shed

**Figure 1-4.
Location of Cedar Hills Regional Landfill Facilities.**

N

King County

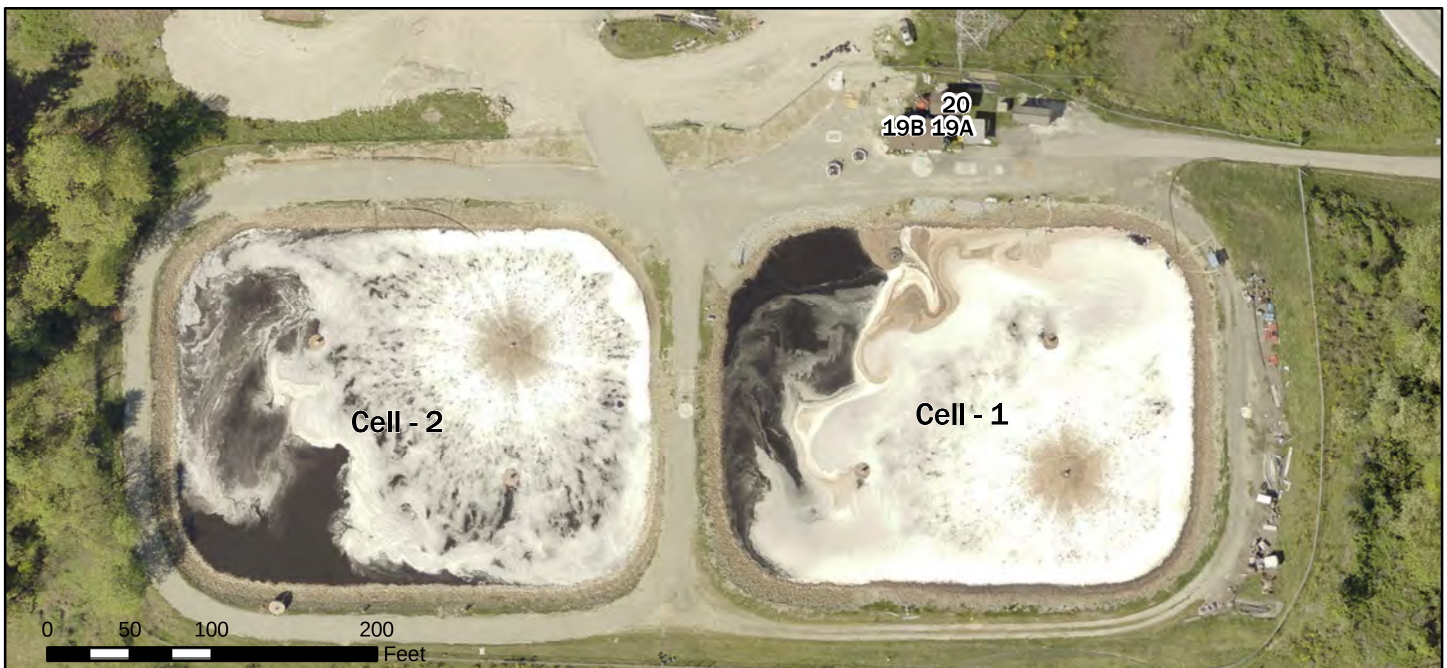
0 80 160 320 Feet

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter1\Figure1_4_CHRLFacilityLocations.mxd (8/6/2020)

NORTH FLARE STATION

LEACHATE LAGOONS



Facility	Description
19A	Leachate Effulent Pump Station, Pump Control Room
19B	Leachate Effulent Pump Station / H_2 O_2 Room
20	Leachate Effulent Pump Station, Elec Panels
22	Storage Building
23	Leachate Effulent Gas Office
24	NE Generator Building
25	Storage Building
26	Emergency Generator
27	Enclosed Flares
28	Trailer-Mounted Flare
29	Migration Control Flare

Figure 1-5. Detail View of North Flare Station and Leachate Lagoon Facilities at the Cedar Hills Regional Landfill.

N

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter1\Figure1_5_CHRLFacilityLocations.mxd (8/11/2020)

1.3.1 Buffer Zone

State regulation WAC 173-351-140(3)(b) requires a 250-foot buffer between the active landfill area and residentially zoned property, and a 100-foot buffer between the active landfill area and non-residentially zoned property. However, a Special Permit, approved by the King County Board of Commissioners in 1960, specified that a 1,000-foot buffer be established around the CHRLF. Requirements for the buffer were stipulated in the 1960 Special Permit. A copy of this permit can be found in Appendix A.

The buffer consists primarily of wooded area, but the density of the vegetation varies, with the highest densities in the northern buffer and the lowest in the southeastern buffer. Over the years, some land uses have been allowed by King County in the buffer. The current status of activity in the buffer is as follows (see Figure 1-3):

- West and North: The north buffer area is heavily wooded and maintained in a natural state. The west buffer area is largely wooded, with some portions cleared sometime between 1977 and 1981 and now dominated by second-growth forest. There are no disturbances to critical areas. Some gas probes and groundwater wells are installed for environmental monitoring. Dirt roads provide access to these environmental systems.
- South: The buffer to the south is mostly wooded and remains in a natural state. Allowed uses in this area of the buffer include two lined leachate treatment lagoons. The lower quarter of the Bonneville Power Administration (BPA) easement containing power transmission lines traverses the buffer and is cleared of vegetation (see Section 2.2.5). This is also the location of the 75-foot-wide Northwest Pipeline easement which is also cleared of vegetation (see Section 2.2.6). Dirt roads provide access to these areas.
- East: The buffer to the east is partially wooded. It contains power transmission lines and several allowed uses, including the landfill access road, 228th Avenue SE, in the southeast corner; a non-potable water tank used by CHRLF; and Passage Point, a King County-owned transitional housing facility.

Aerial photographs taken in the 1970s and 1980s indicate that some solid waste disposal occurred in the east buffer (the SE Pit Refuse Area and portions of the Main Hill Refuse Area).

1.3.2 Clean Stormwater Facilities

The objective of the CHRLF stormwater system is to collect stormwater, provide treatment and flow control to meet regulatory requirements, and safely convey the treated stormwater from the landfill property. Clean stormwater (stormwater that has not been in contact with refuse) is diverted to detention or siltation ponds to control flow and remove sediment and is then discharged to wetlands and streams on the perimeter of the property. Stormwater flows from the southern half of the landfill through a system of ditches and pipes to the South Stormwater Lagoon and then through a bioswale to the southeast property line. From there, stormwater flows through a series of pipes and catch basins along the west side of 228th Avenue SE, and daylighting and infiltrating in a roadside ditch along the north side of Cedar Grove Road SE, which provides a path to the Cedar River. The water infiltrates beneath the ditch before reaching the Cedar River; or the Southwest Siltation Pond and connected water quality sand filter and then downstream through open channels to Queen City Lake. Stormwater flows from the northern half of the landfill in a system of ditches and pipes to the North Siltation Pond and then the North Stormwater Lagoon, and downstream through open channels to wetlands in the northwest buffer area.

The Southwest Siltation Pond includes a combined detention and wet pond and a sand filter (formerly the South Central Stormwater Pond). It is located in the previously excavated South Solid Waste Area (SSWA) and collects stormwater runoff from closed landfill areas at the southeast end of the CHRLF and from the support facilities area. The facilities comprising the Southwest Siltation Pond have been designed to provide flow control and water quality treatment in accordance with the King County Surface Water Design Manual requirements and have been designed to meet all requirements of the Washington State Dam Safety Office (KCSWD 2016b). The combined detention and wet pond has 24 acre-feet of active storage and flow is released at a controlled rate by the outlet control structure. Water quality treatment is provided by a series of wet pond cells with wetland plantings in the combined detention and wet pond as well as a sand filter downstream of the outlet control structure. The design of the Southwest Siltation Pond is described in the *Cedar Hills Regional Landfill Southwest Siltation Pond Relocation Final Drainage Report* (KCSWD 2016b).

The South Stormwater Lagoon was originally constructed in 1987, re-constructed in 2007 for clean stormwater and is located west of the site entrance. This facility accepts flows from approximately 190 acres of CHRLF, including closed portions of the southeast end of the landfill (including the Southeast Pit and the southern portion of the Main Hill) and the support facilities area. The South Stormwater Lagoon discharges offsite along the south property line along 228th Avenue SE and Cedar Grove Road.

The North Siltation Pond and the North Stormwater Lagoon accept flows from approximately 200 acres of covered refuse areas in the north area of the landfill, including Area 2/3, Main Hill, portions of Area 4, and portions of the Central Pit. A series of culverts and open ditch channels conveys the flow into an unnamed stream in the northwest corner of the property.

Sediment is usually removed once every two years from the North Stormwater Lagoon and once annually from the North Siltation Pond and the Southwest Siltation Pond. The South Stormwater Lagoon is vegetated and sediment is removed as needed.

1.3.3 Contaminated Stormwater Facilities

Contaminated stormwater (CSW) is generated when surface water runoff contacts refuse, such as when waste is first disposed but has not yet been covered. At CHRLF, CSW is collected separately from leachate and uncontaminated (clean) stormwater runoff. Collection, conveyance, and temporary storage of CSW runoff is achieved through a system of berms, ditches, pipes, and culverts, which direct CSW flows to the CSW lagoon located southeast of Area 8 (Figure 1-3). The CSW lagoon stores the CSW and helps with pre-settling of solids before discharging to the leachate lagoons and ultimately offsite to a King County Wastewater Treatment Division (KCWTD) publicly owned treatment works (POTW).

The CSW lagoon was constructed in 2016 as part of the facilities relocation associated with Area 8 development. The CSW lagoon design criteria were based on the regulatory requirements outlined in the WAC as well as the modeling and KCSWD-specified criteria detailed in the *King County Cedar Hills Regional Landfill Area 8 Engineering Report* (KCSWD 2017). The CSW lagoon provides 12 million gallons of storage to attenuate surface runoff during peak storm events up to the 100-year, 24-hour design storm, which in turn protects the leachate lagoons from similar events. It is lined with a double high-density polyethylene (HDPE) lining system, including 60-mil HDPE geomembrane, composite drainage net, a second layer of 60-mil HDPE geomembrane, and prepared subgrade to prevent exposure of the underlying area to CSW. The design of the CSW lagoon and associated conveyance facilities is documented in the *Area 8 Development and Facility Relocation Contaminated Surface Water Design Report* (KCSWD 2016).

1.3.4 Leachate Lagoons

Leachate is produced when water percolates through decomposing waste and accumulates organic and inorganic contaminants. At CHRLF, leachate is collected in a drainage layer that lines the bottom of the refuse area and is discharged through pipes within landfill cells and diverted to two leachate lagoons located in the southwest corner of the site. As described in the preceding section, the leachate lagoons also receive contaminated stormwater. The leachate lagoons also handle wastewater from the gas to energy plant (see Section 1.5.5), offices, Passage Point, and equipment wash water.

The leachate lagoons were originally designed with sufficient capacity for all leachate generated through the development of Area 7 during the 100-year storm. During the Area 8 design, an analysis of the storage capacity of the lagoons indicated that the existing capacity of the lagoons was sufficient to manage the peak flows associated with the development and operation of Area 8 (KCSWD 2016b). However, improvements to the leachate lagoon piping were required to convey the flow between the leachate lagoons and the Leachate Effluent Pump Station (LEPS), which is located just north of the east lagoon.

The design capacity of the lagoons is 12.25 million gallons at a water surface elevation of 518 feet above mean sea level. Within the leachate lagoons, the CSW and leachate mix is aerated as preliminary treatment before discharge into the KCWTD’s sanitary sewer system and POTW for final treatment and disposal.

KDSWD is currently examining methods and technologies to upgrade the performance of the leachate lagoons with respect to discharge pretreatment requirements under Wastewater Discharge Permit No. 7842- 03 for CHRLF administered by the King County Industrial Waste (KCIW) Discharge Program (See Appendix E), and with respect to air emissions during leachate aeration.

1.3.5 Landfill Gas Processing Facility

Landfill gas (LFG) is generated from the decomposition of waste buried in the landfill. Typically, LFG is about 50 percent methane and 50 percent carbon dioxide and water vapor, by volume. Landfill gas also contains small amounts (<1 percent) of nitrogen, oxygen, hydrogen, non-methane organic compounds (NMOC), and trace amounts of inorganic compounds. At CHRLF, blowers create a negative pressure in a system of perforated pipes located within the refuse. The negative pressure draws landfill gas into the perforated pipes, and the collected gas is then routed to the Landfill Gas Processing Facility located in the southeast portion of the landfill.

The Landfill Gas Processing Facility has been in operation since October 2010 and is owned and operated by Bio Energy Washington (BEW). KCSWD leases 2 acres within the southeast area of CHRLF property to BEW, which processes LFG into pipeline-quality biogas and electric power by separating methane gas from the landfill gas. Carbon dioxide and all other contaminant gases are removed and disposed of by burning at the BEW thermal oxidizing unit. When the plant cannot conform to the pipeline gas quality requirements or during any processing problem, landfill gas is flared in the BEW high-temperature flare, which is regularly tested to ensure that air emissions do not exceed applicable environmental regulatory levels. BEW emits flue gas from the engine generators that is dispersed through stacks to comply with Puget Sound Clean Air Agency (PSCAA) permit requirements. It also produces a limited quantity of liquid effluent (mainly landfill gas condensate, plus other process wastewater) that is discharged into the CHRLF leachate collection system, as well as spent sulfur removal media (which were historically disposed at CHRLF until early 2020, but are no longer accepted).

1.3.6 North Flare Station

The North Flare Station, a facility that flares landfill gas, is located at the north end of the landfill area. There are five enclosed flares at the station and one utility flare with a combined design capacity of more than 15,000 standard cubic feet of landfill gas per minute. Prior to October 2010, when the BEW gas-to-energy plant began operation, all collected LFG was disposed of by burning at the North Flare Station. Since October 2010, the operation of the BEW gas-to-energy plant has substantially reduced the use of the North Flare Station and it now flares approximately twice per month, although this may vary throughout the year. The flares are maintained in operating condition to handle gas flaring during any time the BEW gas plant shuts down or is operating at partial capacity. The flare station is automated to operate and control gas delivery to the BEW gas processing plant. The automation system alerts staff to irregular conditions. Staff are on site 24 hours per day, seven days per week to respond to any of these alerts and general operation of the gas collection system.

1.3.7 Maintenance and Administrative Facilities

CHRLF houses critical functional groups necessary to maintain operation of the CHRLF and provide support for King County's waste transfer system and network of closed landfills. These groups include scale house operators, landfill operators, landfill operations management, utility crews, wastewater crews, Facility Engineering and Science Section (FESS) staff, Recycling and Environmental Services (RES) staff, Information Technology (IT) staff, LFG crews, transportation crews (truck drivers), maintenance and shop crews, administration and receiving, Human Resources staff, and safety crews. In addition, construction contractors use maintenance facilities as staging areas for landfill development and facility maintenance.

A number of buildings and open areas support the functional groups listed above, including administrative offices, operator and truck driver locker rooms and break rooms, a heavy equipment maintenance building (cat shack), maintenance shop, a truck wash building, scales, a scale house, parking areas for employees and tractors and transfer trailers, contractor staging areas, soil stockpiles, a fueling station, and an area for storage of parts and equipment. Buildings and support facilities at CHRLF are shown in Figure 1-4.

Table 1-3 shows the functional groups, including number of personnel in the group and associated infrastructure at CHRLF.

Table 1-3. Functional Groups and Staff and Infrastructure.

Function	Personnel	Location
Scale house	2	Building 10 (scale house)
Landfill operators	17	Building 33 (office), Building 11 (break room), Building 12/12A (lockers and restroom)
Landfill operations management	4	Building 29 (office)
Utility crew	18	Building 6A/B (office), Building 11 (break room), Building 12B (lockers, restroom, storage)
Wastewater crew	5	Building 33 (office), Building 11 (break room), Building 12/12A (lockers and restroom), Building 9 (storage), Buildings 13, 19, and 20 (utility)
FESS	8	Buildings 1 and 4 (office), Building 1 (break room, lockers), Building 4 (laboratory)
RES	5	
IT staff and communications equipment	1	Building 3 (office)
LFG crew	5	Building 23 (office, lockers, restroom, and break room)
Transportation (truck drivers)	41	Building (29 (office), Building 5 (break room), Buildings 30 and 31 (lockers and restroom)
Maintenance and Shop	36	Building 48 (office), Building 48 (break room) Building 7C (lockers and restroom), Buildings 9C/D/E/F,8, 9B, and 45 (lubrication and maintenance shop), Building 7E/F (mechanical and welding), Building 7D (tire shop), Building 45 (cat shack)
Stores	7	Buildings 6A and 7A/B (stores)
Administration and receiving, human resources, safety, support staff (visitor)	10	Buildings 1 and 29 (office), Buildings 3 and 29 (break room), Building 2 and 3 (multipurpose), Building 1 (storage), Building 16 (utility)

1.3.8 Operating Standards and Compliance

KCSWD must operate the CHRLF in compliance with the King County Board of Health Solid Waste Regulations (Title 10), the conditions of the Municipal Solid Waste Landfill Permit issued by Public Health-Seattle & King County (Public Health) (Public Health 2019; see Appendix B), and the approved Plan of Operations required by that permit. As part of the annual renewal, Public Health evaluates whether current landfill operations conform with state and local regulations for municipal solid waste landfills. If violations that can be corrected are occurring, Public Health issues a “nonconforming permit” that specifies the corrective action to be taken.

The CHRLF is a complex industrial site that must meet a variety of federal, state, and local regulations designed to protect public health and the environment (see Section 2.1). The environmental control systems described in Section 1.3 and Section 2.3.1.1 are incorporated into landfill design, construction, and operation. These controls are intended to mitigate the potential adverse impacts of the landfill and are taken into consideration in the impact analyses presented in subsequent chapters.

There have been instances in the CHRLF's history when KCSWD has been found to be in violation of certain permit standards or when systems have failed or become inoperable. For example, the CHRLF has experienced pipeline breaks, surface soil slumping following heavy rain events, and migration of LFG. These events and conditions are also considered in the analyses, particularly as they relate to human health (see Chapter 8). KCSWD takes seriously the effort to maintain, monitor, and prevent potential accidents and permit violations and is engaged in a program of continuous improvement of all landfill designs, systems, and procedures including those prescribed for emergency response. Recent improvements have included:

- Designed and constructed new LFG pipeline to BEW; use of old BEW LFG pipeline as backup for periods when new primary line is undergoing testing, maintenance, etc.
- Upgraded leachate lagoons
- Added LFG and leachate collection to Area 7, with more planned as part of final closure
- Upgraded equipment for emissions monitoring
- Improved surface water treatment on south end of the landfill with additional stormwater pond and sand filter and upgraded South Stormwater Lagoon in 2017
- Increased monitoring of leachate flow and constituents

These improvements to the LFG, leachate, CSW, groundwater, and stormwater management systems, among others, have improved KCSWD's ability to meet permit requirements and regulatory standards.

CHRLF is authorized to discharge wastewater to the POTW under Waste Discharge Permit No. 7842-03, issued by the King County Industrial Waste (KCIW) program on October 24, 2018. The discharge permit specifies limits for nine metals and several other water quality parameters.1 KCSWD was notified of violations of the permit discharge loading limits for arsenic and chromium in a Compliance Order dated December 21, 2018 (KCIW Program 2018b), which was superseded and replaced by a Revised Compliance Order, dated October 29, 2019 (KCIW Program 2019). The Revised Compliance Order requires improvements to the existing pretreatment system at the landfill such that wastewater discharged to the sewer system meets permit discharge criteria.

[1] The discharge permit specifies discharge limits for nine metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc) and the following additional water quality parameters: cyanide, total soluble sulfides, pH, and hydrogen sulfide.

1.3.8.1 Inspection, Maintenance and Emergency Response Procedures

Regular landfill inspection and maintenance procedures are conducted at CHRLF and included in the Cedar Hills Regional Landfill Plan of Operation (KCSWD 2019c). Regular site inspections are conducted by CHRLF Operations staff and by Public Health. KCSWD FESS staff also conduct periodic inspections. Inspection requirements exist for most of the systems and facilities on site. Many of these requirements have been thoroughly described in existing documents developed for CHRLF, located at the Main Administration Office at CHRLF and at the KCSWD website <https://kingcounty.gov/depts/dnrp/solid-waste.aspx>.

CHRLF has a robust emergency response protocol to minimize impacts of releases of LFG, leachate, and CSW in case of pipe, liner, tank, or other system failure. Staff are on site 24 hours a day, seven days a week to monitor operational and environmental control systems. Emergency responses for hazardous materials are described in KCSWD's *Hazardous Materials Emergency Response Plan, Cedar Hills Regional Landfill*, included in Appendix D.1 of the Cedar Hills Regional Landfill Plan of Operation (KCSWD 2019c), available at the KCSWD website <https://kingcounty.gov/depts/dnrp/solid-waste.aspx>. Public notification protocols exist for notification of neighbors in the event of operational or environmental control system deviations from normal operation.

1.4 Objectives of the Proposal

The design of action alternatives for the CHRLF is intended to be consistent with the following policies contained in the Solid Waste Comp Plan, approved by the King County Council in April 2019:

> "D-1 Operate and maintain the Cedar Hills Regional Landfill to meet or exceed the highest federal, state, and local standards for protection of public health and the environment."
>
> "D-2 Maximize the capacity and lifespan of the Cedar Hills Regional Landfill."
>
> "D-5 Garbage will not be disposed of, nor shall soils be stockpiled, within 1,000 feet of the property line at the landfill, in accordance with the Settlement Agreement. The solid waste division shall reserve sufficient funds to acquire any parcels from willing sellers as necessary to establish or maintain the buffer."

Specific project objectives are:

- To respond to recent policy directives of the King County Council pertaining to solid waste management.
- To meet customer service needs while being cost efficient with resources.
- To maximize cost-effective waste prevention, waste reduction, and recycling, while maintaining adequate transfer and disposal capabilities for non-recycled waste.

- To design, operate, and maintain the County's solid waste system in a manner that protects public health and the environment, conserves energy and natural resources, and minimizes greenhouse gas emissions.
- To comply with federal, state, and local regulations governing solid waste management and property development.
- To respond to issues raised by neighbors, the public, partner cities, unincorporated area councils, the Solid Waste Advisory Committee, the Metropolitan Solid Waste Management Advisory Committee, and the solid waste industry.

1.5 Environmental Review Process

1.5.1 Overview

SEPA is intended to ensure that environmental values are considered during decision-making by state and local agencies. SEPA mandates a process to identify and analyze alternatives, potential environmental impacts, and mitigation measures associated with governmental decisions.

For any proposal involving a decision on a specific project, the state SEPA Rules require that a threshold determination be made to determine whether implementation of the project has the potential to result in significant adverse impacts on the environment (WAC 197-11-310(1)). For the current proposal to expand the capacity of the CHRLF, KCSWD determined that at least one or more of the alternatives under this proposal had the potential to result in significant adverse impacts on the environment. A SEPA EIS was therefore required (WAC 197-11-330(4)). The purpose of an environmental impact statement (EIS) is to "ensure that SEPA's … policies are an integral part of the ongoing programs and actions of state and local government" (WAC 197-11-400(1)).

This Final EIS identifies potential significant impacts; describes mitigation measures that can be used (and in many cases, are currently used) to avoid such impacts or reduce them below significant levels; and summarizes any significant unavoidable adverse impacts (that is, significant impacts that cannot or will not be mitigated). Beneficial impacts are also discussed where relevant to the choice among alternatives.

1.5.2 Public Involvement Prior to the Draft EIS

Meetings with CHRLF neighbors have varied in frequency, participation, and format over the years. Beginning in March 1986, CHRLF area residents and KCSWD staff met to discuss conditions and activities at the CHRLF in meetings called the "Cedar Hills Citizens Review Committee." Those meetings were originally established as a requirement of the Ernest Hanni, et al. v. King County, et al. settlement agreement for the purpose of monitoring conditions and activities at the landfill. The committee included a chairperson, two non-litigant area residents, and two KCSWD representatives. The meetings occurred with varying regularity and attendance, and after ten years of functioning under the original format, the members revised their purpose, goals, and activities for future engagement.

Since 2011, KCSWD has held meetings with neighbors twice a year (spring and fall), and at least one landfill tour per year is offered (currently suspended due to COVID-19). Standing meeting agenda items include operational, construction, and environmental monitoring activities, landfill gas-to-energy facility updates, and time for questions and answers. Meeting notices are mailed to approximately 3,800 surrounding addresses and emailed to approximately 800 neighbors and other stakeholders.

In addition to the twice-yearly community meetings with CHRLF neighbors, KCSWD sends topic-specific notices to the list of neighbors and other stakeholders when an activity is likely to affect the neighbors. This includes long-range planning efforts; planned maintenance and operational projects that are anticipated to have odor, noise, traffic, or other impacts; and unforeseen events involving the landfill.

Outreach has also included multiple correspondence, phone calls, and face-to-face conversations with neighbors.

The KCSWD website for community meetings has information about outreach efforts, tours, and meetings: <https://www.kingcounty.gov/depts/dnrp/solid-waste/facilities/landfills/cedar-hills-meetings.aspx>.

1.5.3 SEPA Scoping

Scoping (WAC 197-11-408) is required to "[i]dentify reasonable alternatives and probable significant adverse environmental impacts" and to "[e]liminate from detailed study those impacts that are not significant." The official EIS scoping period for this proposal began on July 25, 2019 with the KCSWD's issuance of a Determination of Significance and Request for Comments on Scope of Environmental Impact Statement. The KCSWD held a SEPA scoping open house on August 12, 2019 during the 30-day comment period, which ended on August 26, 2019. The scoping process allowed the public, Tribes, and regulatory agencies to comment on the proposed alternatives, issues of environmental concern, potential adverse impacts, and how the EIS should address those issues, including mitigation measures and permits. The scoping notice was sent to approximately 3,800 people within a two-mile radius of the CHRLF. During the scoping meeting and the comment period, the KCSWD received a total of 64 written comments, oral comments documented by a court reporter, website comments, emails, telephone conversations, and letters.

Scoping comments included a diversity of comments and information pertaining to potential impacts for many of the elements of the environment referenced in the Scoping Notice (see <https://kingcounty.gov/~/media/depts/dnrp/solid-waste/facilities/documents/CHRLF-plan-2020-DS-scoping-notice.ashx?la=en>. The elements noted in comments included air/odor, geology, water, land use, recreation, noise/vibration/human health, climate, plants and animals, cultural resources, aesthetics, groundwater, traffic, and public services and utilities. Additional comments focused on the landfill's location, landfill design, regulatory compliance, and the Action Alternatives.

In response to the scoping comments, KCSWD issued a Draft EIS after consideration of scoping comments and making appropriate changes, including incorporating the noted areas of interest into the DEIS evaluation, and eliminating Energy from the list of elements to be evaluated as a stand-alone chapter. In compliance with SEPA, the Draft EIS examined the potential for impacts to earth; air (including odor); water (including surface and groundwater quality and quantity); plants and animals; greenhouse gas emissions; environmental/human health; noise and vibration; land and shoreline use (including recreation); aesthetics, light and glare; transportation; and public services and utilities.

1.5.4 Issuance of Draft EIS and Draft EIS Comment Period

A comment period of 45 days (WAC 197-11-502(5)(b)) began with the issuance of the Draft EIS on September 16, 2020. A public online open house was held at <https://www.kingcounty.gov/cedar-hills-development> to receive oral and written comments. KCSWD extended the comment deadline by one week due to a web site technical issue, with comments due no later than November 6, 2020. KCSWD considered all the comments received and determined that additional or revised environmental studies were needed to proceed with preparation of this Final EIS, including those focused on health risk, air toxics, odor, noise and vibration, and aesthetics.

1.5.5 Issuance of Final EIS

This Final EIS has been prepared to include any modifications to the text of the EIS stemming from the comments received on the Draft EIS. As required under SEPA , this Final EIS contains a Responsiveness Summary, which provides the public with responses from KCSWD to all the questions and comments that were received during the public comment period for the Draft EIS. The Responsiveness Summary groups the comments/questions by topic area and chapter and provides KCSWD's response. Each comment received, or a link to the comment if voluminous, is provided following the summary. The text of the Final EIS was revised as needed to clarify or correct information.

1.6 Future Solid Waste Disposal Volumes

A projection of solid waste disposal volumes was used to develop the alternatives analyzed in this EIS. In 2019, the CHRLF received 868,532 tons of garbage and consumed approximately 1,085,665 cubic yards of the CHRLF's capacity, resulting in a measured in-place waste density of 0.8 tons per cubic yard. KCSWD prepared the forecast shown in Table 1-4 in February 2020; this forecast reflects modeled growth averaging about 1.1 percent per year through 2030 and 1.7 percent through 2050.

Landfill area capacities and tentative dates of landfill closure have been provided for the alternatives based on February 2020 data; however, it should be noted that the forecast is adjusted regularly for fluctuations in solid waste tonnage and is subject to change.

Table 1-4. Solid Waste Forecast for King County to 2050.

Year	Forecast Tons[1,2]	Forecast Landfill Volume Consumed (cubic yards)[3]
2019	868,532	1,085,665
2020	904,476	1,130,595
2021	910,300	1,137,875

Table 1-4 (continued). Solid Waste Forecast for King County to 2050.

Year	Forecast Tons[1,2]	Forecast Landfill Volume Consumed (cubic yards)[3]
2022	925,699	1,157,124
2023	928,939	1,161,174
2024	932,179	1,165,224
2025	932,865	1,166,081
2026	933,551	1,166,939
2027	939,279	1,174,099
2028	948,603	1,185,754
2029	966,684	1,208,355
2030	983,117	1,228,896
2031	999,830	1,249,788
2032	1,016,828	1,271,035
2033	1,034,114	1,292,643
2034	1,051,694	1,314,618
2035	1,069,572	1,336,965
2036	1,087,755	1,359,694
2037	1,106,247	1,382,809
2038	1,125,053	1,406,316
2039	1,144,179	1,430,224
2040	1,163,630	1,454,538
2041	1,183,412	1,479,265
2042	1,203,530	1,504,412
2043	1,223,990	1,529,987
2044	1,244,797	1,555,997
2045	1,265,959	1,582,449
2046	1,287,480	1,609,350
2047	1,309,367	1,636,709
2048	1,331,626	1,664,533
2049	1,354,264	1,692,830
2050	1,377,286	1,721,608

Notes:

1 Excludes the City of Seattle and Milton.

2 Actual data provided for 2019 only; all other figures were estimated for the purposes of this analysis – the forecast tonnage may have been updated since this analysis was performed.

3 Based on measured conversion rate of 0.8 tons per cubic yard.

1.7 How This EIS Analyzes Impacts

This Final EIS discusses direct, indirect, and cumulative impacts associated with the three action alternatives compared with the No Action Alternative. Ecology's SEPA guidance defines the types of impacts as follows:

- Direct impacts are caused by the action and occur at the same time and place. For example, a new residential development may propose to place fill in a wetland in order to construct a road (a direct impact).
- Indirect impacts are caused by the action and are later in time or farther removed in distance, but they are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. For example, a new road will encourage increased development in the area because of the improved access (an indirect impact).
- Cumulative impacts are the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. For example, increased runoff and contaminants from a development would be added to the volumes and levels of contamination from similar developments surrounding the wetland (cumulative impacts).

The action alternatives propose landfill development that results in an extension of the landfill capacity to various points in the future: Action Alternative 1 is estimated to reach capacity in 2037; Action Alternative 2 in 2038; and Action Alternative 3 in 2046 (see Chapter 2). King County has not yet selected the long-term disposal option that will be used once the CHRLF reaches its capacity under the alternative selected as the result of this EIS process, although the *2019 Comprehensive Solid Waste Management Plan* indicates it could be either waste export by rail to a regional landfill or a waste-to-energy (mass burn) facility located somewhere in King County.

For each element of the environment (Chapters 3 through 14), the potential direct, indirect, and cumulative impacts for each alternative are evaluated and compared with the No Action Alternative to the point at which each alternative reaches capacity. However, in order to compare equally the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS considers potential indirect impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046, which is the estimated capacity year for Action Alternative 3. This necessarily involves documenting potential indirect impacts associated with the alternative long-term disposal options under policy consideration. For each element, a qualitative summary of these indirect impacts is provided for ease of comparison, with more detailed discussion of potential impacts located and incorporated by reference herein, in Chapter 5 of the *Final EIS for the 2019 King County Comprehensive Solid Waste Management Plan* <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

2.0 ALTERNATIVES

This chapter describes three action alternatives, along with the No Action Alternative, for the CHRLF 2020 Site Development Plan.

The description of alternatives is divided into four sections. Section 2.1 identifies the key state and local regulations that govern the development and operation of the landfill. Section 2.2 describes alternatives that KCSWD considered but rejected. Section 2.3 describes the landfill and facilities development, design and construction, and operational elements common to all the action alternatives. Section 2.4 summarizes the unique characteristics of each action alternative and the No Action Alternative. The final section, Section 2.5, provides a comparison of the estimated landfill area, capacity, and operating life by alternative.

2.1 Regulatory and Compliance Requirements

The WAC establishes requirements for the development and operation of landfills in Washington state; these requirements are applicable to the No Action Alternative and all action alternatives. In addition, Public Health regulates the CHRLF under the Code of the King County Board of Health – Title 10: King County Solid Waste Regulations. The Air Operating Permit issued by PSCAA sets forth compliance standards and procedures that the CHRLF must follow. King County establishes zoning and land use controls applicable to property and land use activities within its jurisdiction.

2.1.1 Washington Administrative Code

KCSWD operates the CHRLF in accordance with state regulations that set standards for landfill design, development, operation, closure, and environmental protection.

2.1.1.1 Minimum Functional Standards

The primary regulatory standards applicable to the CHRLF are contained in WAC 173-351, Criteria for Municipal Solid Waste Landfills. WAC 173-351 establishes minimum statewide standards for the location of municipal solid waste landfills in Washington state. These criteria also implement regulations under the federal Resource Conservation and Recovery Act (RCRA), as amended in 1984, and Section 405(d) of the Clean Water Act (CWA), as amended, to ensure the protection of human health and the environment.

WAC 173-351 contains standards regarding:

- Landfill location, including a required minimum distance between active areas and adjacent residentially zoned land of at least 250 feet.
- Operation, including criteria relating to:
    - Exclusion of dangerous waste
    - Cover material
    - Control of disease vectors

- Control of explosive gases
- Protection of air quality
- Access control
- Control of run-on/runoff
- Control of stormwater management
- Restrictions on landfilling liquids
- Recordkeeping
- Annual reporting

- Design of new landfill units, in particular standards for liners and leachate collection systems.
- Groundwater and surface water monitoring.
- Closure and post-closure maintenance.
- Financial assurance.
- Permitting.

Standards relating to surface water and groundwater monitoring and stormwater management are described further below.

2.1.1.2 Surface Water Monitoring and Stormwater Management

Under WAC 173-351-200, landfill owners or operators must design, construct, and maintain surface water run-on/runoff control systems to prevent flow onto active portions of the landfill resulting from the 24-hour, 25-year storm event. This regulation also states that landfills shall not discharge pollutants into waters of the state (including wetlands) that cause a violation of surface water quality standards. To meet this requirement, King County conducts monthly surface water monitoring. Under any of the three action alternatives, the existing monitoring program would be evaluated and revised as appropriate to incorporate the new landfill development. Stormwater discharges from the landfill also must meet the requirements specified in the King County Surface Water Design Manual (KCSWDM, King County 2016), the Washington State Department of Ecology (Ecology) 2019 Stormwater Management Manual for Western Washington (SWMMWW) (Ecology 2019) and the Industrial Stormwater General Permit (ISGP) to comply with requirements of WAC 173-201A and WAC 173-220. The ISGP specifies implementation of best management practices (BMPs) for maintaining onsite water quality, the quality of water discharging from the site, and water quality monitoring requirements for the facility. A stormwater pollution prevention plan (SWPPP) is also required by the ISGP. The current SWPPP for the CHRLF would be modified to incorporate changes necessary to implement any of the three action alternatives selected for implementation. Construction activities on site are required to comply with Ecology's Construction Stormwater General Permit (CSWGP) issued for construction of the landfill disposal areas.

2.1.1.3 Groundwater Monitoring

WAC 173-351-400 through 490 provides detailed requirements for groundwater monitoring at landfills including:

- Groundwater monitoring system requirements and corrective actions
- Performance standards for groundwater monitoring system design
- Groundwater sampling and analysis requirements
- Groundwater reporting
- Statistical methods for groundwater monitoring
- Detection monitoring program
- Assessment monitoring program
- Agency roles in corrective actions
- Groundwater modeling
- Hydrogeological reporting requirements

A key purpose of the groundwater monitoring program is to determine whether the surrounding groundwater has been affected by landfill operations. The determination is primarily accomplished through groundwater sampling and analysis. If analysis of groundwater sampling indicates landfill-generated contamination, Ecology and Public Health must be notified and corrective action must be taken. The CHRLF currently has a quarterly groundwater monitoring program in place for its ongoing operations. Under any of the alternatives, this existing monitoring program would be evaluated and revised as needed to incorporate any new landfill development.

2.1.1.4 Additional State Regulations

Additional state regulations applicable to design, development, operation, closure, and environmental protection include the following:

- WAC 173-200 Water Quality Standards for Ground Waters of the State of Washington
- WAC 173-201A Water Quality Standards for Surface Waters of the State of Washington
- WAC 173-216 State Waste Discharge Permit Program
- WAC 173-220 National Pollutant Discharge Elimination System Permit Program
- WAC 173-303 Dangerous Waste Regulations
- WAC 173-304 Minimum Functional Standards for Solid Waste Handling
- WAC 173-340 Model Toxics Control Act – Cleanup

- WAC 173-350 Solid Waste Handling Standards
- WAC 173-401 Operating Permit Regulation (Air Quality)

2.1.2 Public Health – Seattle & King County

KCSWD must operate the CHRLF in compliance with the King County Board of Health Solid Waste Regulations (Title 10), the conditions of the Municipal Solid Waste Landfill Permit issued by Public Health (Public Health 2019; see Appendix B), and the approved Plan of Operations required by that permit. The current Municipal Solid Waste Landfill Permit, which extends to May 7, 2029, must be renewed annually and includes a variety of items:

- A list of compliance tasks and a schedule principally related to Area 8.
- A list of successful demonstrations of compliance with Chapter WAC 173-351 that were made for various landfill units in King County's application for the 2019 permit or in previous permit applications. These demonstrations include CHRLF's compliance with location restrictions, performance standards for groundwater monitoring systems design, statistical methods for groundwater monitoring, financial assurance criteria, and compliance with King County's current solid waste management plan.
- A list of landfill areas and leachate and CSW facilities, and authorized activities at those units.
- The required construction, certification, and approval process for new or expanded landfill units.
- Operational and maintenance requirements, including:
    - Plans of operation
    - Waste acceptance and screening
    - Compaction and daily cover
    - Minimum standards of performance
    - Control of explosive gas
    - Compliance with the Washington state implementation plan approved under the federal Clean Air Act
    - Prevention/control of disease vectors
    - Run-on and run-off control systems
    - Restrictions on liquid waste
    - Recordkeeping
    - Control of dust, litter, insect breeding, and the onsite presence of personnel when the landfill is open for disposal

  - Availability of sufficient reserve equipment
  - Clear marking of boundaries of active areas
  - Maintenance of monitoring systems
  - Prohibition of public access
  - Prohibition of biosolids disposal
  - Prevention of unauthorized access and illegal dumping
  - Weighing and recording weight of all incoming waste and keeping the active face as small as possible
- Groundwater monitoring program and hydrogeologic report.
- Surface water, leachate, and landfill gas monitoring.
- Closure and post-closure plans.
- General permit conditions.
- Reporting.

2.1.3 Puget Sound Clean Air Agency

The CHRLF has an Air Operating Permit issued by PSCAA (permit number 10138). The permit provides air emission limits, performance standards, and monitoring, reporting, and recordkeeping requirements. PSCAA developed its air permitting requirements in accordance with WAC 173-401 with the stated purpose to "…establish the elements of a comprehensive Washington state air operating permit program consistent with the requirements of Title V of the Federal Clean Air Act (CAA) [42 U.S.C. 7401, et seq.]." Under the Air Operating Permit, KCSWD is required to monitor surface concentrations of methane along the perimeter of the gas collection area, as well as throughout the landfill, in a pattern that traverses the landfill at 30-meter intervals. A background concentration of methane is determined by moving a monitoring probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells. Any reading of 500 parts per million (PPM) or more above background at any location at the CHRLF is recorded as an exceedance, and re-sampling is required. If the exceedance continues, corrective action is required, such as placing additional cover or active gas control in the exceedance area. KCSWD also visually monitors opacity, or the degree to which light is blocked, throughout the CHRLF including from the landfill gas flares (North Flare Station), disposal area (fugitive dust), and fueling areas. KCSWD conducts monthly inspections of the facility for visible emissions. Inspections are performed while the equipment is in operation during daylight hours. If visible emissions are observed during the scheduled inspection or at any other time, KCSWD takes corrective action as soon as possible (but no later than 24 hours after the initial observation) until there are no visible emissions. Alternatively, KCSWD may record the opacity using the reference test method and may shut down the unit or activity until it can be repaired. KCSWD is also required to record, investigate, and respond to complaints regarding odor, fugitive dust, and related nuisances. Air quality and odor impacts are discussed in Chapter 4, Air and Odor.

2.1.4 Allowed Land Uses

Solid waste disposal at the CHRLF is allowed under a Special Permit approved by the King County Board of Commissioners in 1960. The permit allows a sanitary landfill, not “an open garbage dump,” and specifies that there will be no burning of garbage. The permit specifies that a 1,000-foot-wide buffer zone be maintained in its natural state around the perimeter of the site for the protection of the surrounding properties. It further stipulates that “no sanitary operations” occur within the buffer “other than access.” KCSWD is responsible for the maintenance of the buffer, as it pertains to landfill-related activities; however, KCSWD does not have full control of the buffer. King County owns the landfill property, including the buffer; KCSWD pays rent to the County for its use. As the property owner, King County, not KCSWD, may authorize other uses in the buffer. Both landfill and non-landfill related uses that have been allowed in the buffer since 1960 are summarized below. Aerial photographs taken in the 1970s and 1980s indicate that some solid waste disposal occurred in the east buffer (the SE Pit Refuse Area and portions of the Main Hill Refuse Area), contrary to the Special Permit conditions.

In 2000 King County entered into a Settlement Agreement for several consolidated class action cases (hereinafter referred to as the "Settlement Agreement") that requires King County to make a good faith effort to keep the maximum height of Areas 5, 6, and 7 of the landfill at or below 788 feet above sea level, while affirming that garbage shall not be disposed of, nor soils stockpiled, within 1,000 feet of the property line at the landfill.

2.1.4.1 Landfill-Related Uses

In the late 1980s, use of the buffer was modified to allow facilities that would mitigate offsite impacts of the landfill. Accordingly, two leachate pretreatment lagoons were constructed in the southwest corner of the buffer and other environmental control systems, such as landfill gas monitoring wells, were installed.

In 1992, a permit was issued for a non-potable water tank in the eastern buffer zone, which provides water for fire suppression and dust control on the CHRLF property.

2.1.4.2 Non-Landfill-Related Uses

In 1966, construction of the Cedar Hills Alcohol Treatment Center to the east of the landfill was approved. In 1975, the treatment center was approved for expansion to include the addition of greenhouses and recreational field facilities. The treatment center has since re-opened as Passage Point. The facility provides transitional housing and support to parents returning to the community after a period of incarceration who are reuniting with their children. The area of the buffer zone on which the Passage Point facility is located is not owned or managed by KCSWD.

2.1.4.3 Zoning and Permitting

The existing Special Permit is included in Appendix A.

The landfill site is currently zoned RA-10. Under King County zoning, a landfill is defined as a regional use and in the RA-10 zone requires a Special Use Permit. Changes to the landfill property boundary and/or any change in the buffer zone would require revision to the existing Special Permit or issuance of a new Special Use Permit. Placing support facilities within the perimeter buffer could also require revision to the existing Special Permit or issuance of a new Special Use permit (see Section 2.4). The decision criteria applicable to a Special Use Permit are provided in King County Code 21A.44.050:

> A special use permit shall be granted by the county, only if the applicant demonstrates that:
>
> A. The characteristics of the special use will not be unreasonably incompatible with the types of uses permitted in surrounding areas;
>
> B. The special use will not materially endanger the health, safety and welfare of the community;
>
> C. The special use is such that pedestrian and vehicular traffic associated with the use will not be hazardous or conflict with existing and anticipated traffic in the neighborhood;
>
> D. The special use will be supported by adequate public facilities or services and will not adversely affect public services to the surrounding area or conditions can be established to mitigate adverse impacts;
>
> E. The location, size and height of buildings, structures, walls and fences, and screening vegetation for the special use shall not hinder or discourage the appropriate development or use of neighboring properties; and
>
> F. The special use is not in conflict with the policies of the Comprehensive Plan or the basic purposes of this title. (Ord. 10870 § 626, 1993).

Consistency with Special Use Permit decision criteria and consistency of the EIS alternatives with King County land use policies and regulations is discussed in Chapter 11, Land and Shoreline Use.

2.1.5 BPA Restrictions

Portions of the CHRLF property contain easements for BPA, including an 800-foot-wide easement for high-voltage transmission lines that cross the southern end of the site east to west (partially within the area permitted for landfilling), and a 150-foot-wide electrical easement running north-south located in the eastern buffer. Any project proposing to use these easements requires approval from BPA before the commencement of work. BPA has established the following typical criteria for work near its towers and wires on previous projects:

- Equipment and facilities will maintain a minimum distance of at least 20 feet from the wires at all times.

- Equipment, machinery, and vehicles traveling on BPA's right-of-way will not come closer than 25 feet from any BPA structure or guy anchor ground attachment point.
- Access to transmission line structures by BPA's maintenance crews will not be interfered with or obstructed.
- The BPA's right-of-way will be restored to its original condition or better following construction. No grade changes to facilitate disposal of overburden (excess soil) will be allowed.

Specific criteria provided by BPA through design review and coordination meetings for development of facilities within the easement are as follows:

- Ponds or lagoons located within the easement must be constructed to a maximum elevation of at least six feet below the nearest BPA tower pad elevation.
- No grading associated with ponds or lagoons is allowed within the tower buffer areas.
- Access roads are required to be five feet higher than the water level at maximum capacity.
- Roads for BPA access must be 30 feet wide.
- BPA access road grades must not exceed 8 percent.
- Roads must have two access points to avoid heavy equipment turnaround in tight areas.
- All features must be outside of a 30-foot radius from any conductors.
- Contractor must restore all backfill a minimum of 100 feet from all points where tower steel enters the earth.
- No work is allowed within the easement area when winds exceed 30 miles per hour (mph).
- No work is allowed within the easement area when snow is in the forecast.

2.1.6 Other Easement Restrictions

Other known utility easements on site include a 75-foot-wide easement for Northwest Pipeline Corporation gas pipeline located about 400 feet inside the southern property line east to west, within the buffer zone, and an additional 100-foot-wide King County waterline easement crossing the southern end of the site east to west. In November 2019, KCSWD was presented with a recorded deed that purports to grant three easements across the CHRLF property. The first is a roadway easement running north-south within the buffer zone near the southeast entrance to the property; the second is a roadway easement running north-south from the southern property boundary to location near the heavy machinery maintenance facility called "station 40;" the third is a roadway easement running east-west within the buffer zone near the southern property boundary. KCSWD is currently researching these potential roadway easements.

2.2 Alternatives Considered but Rejected

A wide range of techniques and alternatives were originally identified that would expand capacity at the CHRLF. KCSWD identified various site development techniques based on information gained through professional experience and through extensive research of site development techniques used by different municipal solid waste landfills in North America and Europe. Many of these techniques were incorporated into the development of 12 alternatives that were evaluated with selection criteria focused on:

- landfill capacity created
- engineering and operational factors
- environmental and local area considerations, including equity/social justice consistent with King County's *Equity and Social Justice Strategic Plan*
- cost

All of the selection criteria contained within the four categories listed above were conceived and applied to identify project alternatives that meet the purpose and need of the project, and to satisfy the objectives of the proposal (see Section 1.4).

Based on application of the evaluation criteria, the four highest scoring alternatives were brought forward for design refinement and costing. After further discussion, KCSWD added preliminary design and costing of a maximum capacity alternative and an alternative with an altered southeast area configuration.. Additional information about the analysis of alternatives can be found in KCSWD's *2017 Site Development Alternatives for Cedar Hills Regional Landfill–Final Report* (KCSWD 2017b).

From the six alternatives identified in the 2017 Site Development Alternatives analysis, KCSWD brought forward three as the action alternatives to be evaluated in this EIS, all of which were determined to best meet the project's purpose and need and project objectives. The process for this EIS is described in Chapter 1. Rejected alternatives include:

- Alternatives A and C from the 2017 Site Development Alternatives analysis posed engineering complexity and higher levelized lifecycle costs (per-ton and total capital costs) without sufficient capacity benefits.
- Alternative B from the 2017 Site Development Alternatives analysis posed engineering complexity, likely environmental and neighbor impacts, and higher levelized lifecycle costs (per-ton and total capital costs) without sufficient capacity benefits.

Additional small design adjustments were made to the alternatives in order to be consistent with commitments established by the 2000 Settlement Agreement (see Section 1.2).

Each action alternative evaluated in this EIS requires the relocation of the landfill's main support facilities, currently located in the southeast portion of the landfill. KCSWD therefore identified and evaluated a range of relocation options. KCSWD conducted five stakeholder workshops to solicit input on critical success factors, evaluation factors, and advantages and disadvantages of each option, as well as to receive feedback on each option. One option was removed from consideration due to potential issues that could lengthen the time required for purchasing and permitting the property. Another option was removed because the property became unavailable. Three support facilities relocation options were brought forward for evaluation in this EIS. Each of these relocation options is compatible with any of the landfill development action alternatives, so each option is included with each landfill development action alternative. Additional information about the support facilities evaluation can be found in KCSWD's *2019 Cedar Hills Regional Landfill Support Facilities Evaluation—Phase 2 Report* (KCSWD 2019b).

The No Action Alternative and the final action alternatives described in this chapter represent the range of options available to King County to meet the project's objectives, and the SEPA EIS process provides an effective method to evaluate and compare the merits of different choices. King County did not consider the option of developing a replacement landfill either in King County or elsewhere, in keeping with policy established in the 2001 Comprehensive Solid Waste Management Plan. Conditions in King County such as land availability, environmental considerations, public acceptance, cost, and other issues would impede any effort to site a replacement landfill in the county (King County 2019d).

The preferred alternative chosen by the King County Council must be within the range of alternatives evaluated in this EIS and may include elements of more than one proposed alternative. If the chosen alternative is not within the range of alternatives evaluated in this EIS, additional environmental review would be required.

2.3 Common Characteristics of the Action Alternatives

The following subsections discuss the characteristics or activities that will be included with all action alternatives. First is an overview of the landfill development that will occur under all action alternatives, followed by a more detailed description of the various elements of design and construction that will be used during all landfill development activities, including environmental controls. Included in this is a description of the procedures and guidelines used in managing the landfill during operations and maintenance activities. Second is an overview of support facility relocation activities that will occur under all alternatives, followed by a more detailed description of the elements of design and construction to be used during facility development activities.

2.3.1 Common Landfill Development Activities

All alternatives assume that existing landfill disposal Areas 5 and 6 will be filled to a height not to exceed 788 feet above mean sea level and permanently closed, and Area 8 will be filled to a height of 788 feet above mean sea level. Area 7 will be permanently closed during the summer of 2022 and no additional filling is proposed there. These activities constitute landfill development components of the No Action Alternative discussed in Section 2.4.1. The action alternatives are designed to expand the capacity of the landfill beyond that of the No Action Alternative by developing new or expanded disposal areas, leading to increased years of operation.

The following landfill development would occur under all action alternatives:

- Development of a new refuse area: For all action alternatives, construction of a new landfill disposal area would occur in the southeastern corner of the landfill (proposed Area 9) that contains the existing landfill support facilities and would extend east to the Southeast Pit, north to Area 6, west to Area 8, and south to the BPA easement. Before any landfilling, the area would be prepared with a liner system and other environmental controls as described in Section 2.3.1.1. All action alternatives would develop additional landfill capacity to at least 800 feet above mean sea level in Areas 8 and 9.
- Excavation/relocation of soil and solid waste, and soil surcharging: Each action alternative would involve the excavation and relocation of a substantial amount of soil. The clean soil (i.e., soil free of solid waste) could be exported or sold for private use, or stockpiled on site and used for landfill cover material – either as daily cover on the active face of the landfill or interim/final cover on areas being prepared for closure. Soil stored for use on site would be stockpiled over previously filled areas as a soil surcharge.

  Soil surcharging involves placing soil in stockpiles 20 to 30 feet high over previously landfilled areas to increase and accelerate the rate of settlement. After surcharging, the soil stockpile and interim cover would be removed, and additional solid waste could be placed in the disposal area before the placement of final cover. The surcharge soil would then be used as daily or final landfill cover material. Soil stored on closed areas would be removed and used as daily or final landfill cover material.

  At no time during stockpiling or surcharging would the maximum elevation of those areas exceed 830 feet above mean sea level; soil surcharging or stockpiling would not exceed 788 feet above mean sea level in Areas 5, 6, and 7. Soil that is mixed with solid waste will be sorted on site to separate the materials and recover any clean soil that can be reused at the landfill. Material not recovered for reuse and any unsorted materials would be disposed of in the active area of the landfill each day.

2.3.1.1 Common Elements of Landfill Design and Construction

Construction and development of the landfill are conducted in accordance with stringent requirements for protection of public health and the environment. What follows is a description of the common design features and systems and the associated environmental controls that will be used in developing all action alternatives. Excavation of previously landfilled areas is used in only some of the action alternatives. Where applicable, all the environmental controls would be employed under the No Action Alternative as well.

Liner System

A landfill liner is required on the bottom and side slopes of a landfill cell before placement of waste in the cell. The design criteria for landfill liner systems specified in WAC 173-351-300 require a composite liner consisting of an upper and lower component. The upper component consists of a minimum 60-millimeter-thick high-density polyethylene (HDPE) geomembrane. The lower component consists of a minimum 2-foot- thick, low-permeability (1 x 10-7 centimeter per second or less) layer or approved alternative, such as a geosynthetic clay liner.

Liner systems for the three action alternatives would consist of the following components (from top to bottom):

- Uppermost drainage layer material to facilitate the collection of leachate (see below)
- Geotextile layer over the geomembrane
- 60-millimeter-thick HDPE geomembrane
- A low-permeability liner such as a geosynthetic clay liner or a minimum 2-foot-thick, low-permeability soil layer
- Minimum 1-foot-thick select fill layer (low-permeability soil screened so maximum particle size is two-inches) underlying the geosynthetic clay liner (if used for the low-permeability liner in place of the 2-foot-thick soil liner)

Quality assurance/quality control, as required by WAC 173-351-730, would be provided by an independent third-party professional and would include preparation of a construction quality assurance/quality control plan.

Lining Over Unlined Refuse Area (LOURA)

When a new compliant refuse area is to be constructed over an existing refuse area (or any part thereof) that was constructed without a bottom liner, a WAC 173-351-300-compliant bottom liner is placed over the unlined refuse area before placement of waste in the new cell. KCSWD has constructed a small LOURA at CHRLF as part of its existing Area 6. Such a liner provides a compliant liner system allowing expansion over old waste areas.

All action alternatives include the use of LOURA for some portion of new refuse area development. The design criteria for landfill liner systems are specified in WAC 173-351-300. Before beginning any construction activities, and during the planning and design process, a LOURA configuration would be reviewed and approved by Public Health and Ecology. KCSWD would ensure:

- Design for proper gas and liquid collection below the LOURA system.
- Tying of the new liner and leachate collection system to the existing infrastructure.
- Slope stability for potential slip surfaces along the LOURA liner, taking into account fill sequencing.
- Stability of the Leachate Collection and Removal System (LCRS) on top of the LOURA system, given expected settlement.

Quality assurance/quality control for the integrity of the liner system would follow the requirements of WAC 173-351-730.

Leachate Collection System

Leachate is generated when water percolates through the solid waste in a landfill. Design standards for the leachate collection system are provided in WAC 173-351-300, which specifies that the leachate collection system must be designed and constructed to maintain less than a 1-foot depth of leachate over the liner system, except in the leachate sump area, where the depth may not exceed 2 feet.

For all landfill development under all action alternatives, perforated piping would be placed within a minimum 1-foot-thick drainage layer in the landfill cell to collect the leachate. In general, the drainage layer is expected to be between 1.5 and 2 feet thick to provide the required leachate collection, and to provide separation between the liner system and the waste. Leachate would flow by gravity or be pumped from the collection system through subsurface piping to the existing leachate aeration lagoons in the southwest corner of the landfill.

To ensure the existing leachate lagoons would have adequate capacity to contain the leachate generated by any of the action alternatives, KCSWD would minimize infiltration by continuing the current practice of minimizing the extent at any given time of the open active face of the landfill and interim-covered refuse areas. In addition, any necessary improvements identified during either the final closure design of existing areas, or during final design of future areas, would be implemented as required. These improvements may include but are not limited to the use of interim geomembrane covers; appropriate construction sequencing; and any other engineering, construction, and/or operational best practices identified that would further control leachate flow volumes.

Following pre-treatment in the lagoons by aeration, or future implemented methods or technologies, the leachate would be discharged to the KCWTD sanitary sewer system and POTW.

Interim and Final Cover

A final landfill cover is required on completed slopes in accordance with the design criteria specified in WAC 173-351-300, requiring a composite liner consisting of an upper and lower component. Soil or exposed geomembrane interim cover is placed on surfaces that will be exposed for one or more wet seasons or areas that will be inactive for extended periods of time and will be covered by future landfilling.

The WAC does not provide specific requirements for interim cover systems such as those used at CHRLF that are intended to have only a limited lifespan (e.g., 5 to 8 years for Area 7). The Public Health Municipal Solid Waste Permit for CHRLF sets forth general requirements for placing additional cover soils over refuse areas that are not actively receiving waste (BHC 2012).

Interim and final cover systems are installed during closure of each refuse area, and can include interim top deck, interim side slope, and final cover. Closure of refuse areas at CHRLF is typically phased in order to minimize leachate and CSW, optimize LFG collection, and eliminate the potential for leachate seeps. The phased closure is reviewed yearly and updated based on changes in landfilling operation and waste tonnage projections. Interim final or final cover is installed annually in consecutive summer construction seasons.

The primary objectives for interim covers include:

- Improve soil stability and erosion control
- Provide effective separation of clean stormwater and CSW
- Provide active and passive landfill gas emission controls
- Control leachate seeps

Interim top deck and interim side slope covers are quite similar to one another, in that they typically incorporate a 12-inch select fill layer overlain by topsoil that supports a hydro-seeded grass mix and a gas collection system that utilizes trenches; these have a shorter-term design life than a final cover system.

The primary design objectives for final cover system are included in the regulations and considered in the evaluation of alternatives:

- Restrict infiltration
- Provide cover system stability and erosion control
- Accommodate settlement
- Provide landfill gas control
- Provide drainage control

Additional considerations provide supplemental design requirements, such as vector controls, operations and maintenance, life expectancy, etc. Final cover systems typically include three 12-inch soil layers-- a vegetative soil, a sand drain layer, and a select fill layer. Strip drains, an HDPE geomembrane, and a geosynthetic clay layer (GCL) are placed between the drain sand and select fill. Gas collectors are installed in collection trenches near the top of refuse. KCSWD landfill closure design for final and interim covers meets the low permeability requirement of 10-5 cm/sec (King County 2012).

Because the final cover is permanent, its design life should meet and exceed the closure period requirements of 30 years.

Stormwater Management

Clean stormwater is runoff from areas of the landfill with interim or final cover that has not come into contact with refuse. This stormwater would be collected in ditches or subsurface piping in and around the landfill cells and transported to storage/treatment facilities, such as the Southwest Siltation Pond or the South Stormwater Lagoon. All stormwater collected from around the new landfill areas in the south would similarly be collected and transported to these stormwater facilities. Discharges from the Southwest

Siltation Pond currently travel through a sand filter and exit the CHRLF along the south property line and ultimately flow to Queen City Lake. Discharges from the South Stormwater Lagoon flow through a bioswale to the southeast property line then through a series of pipes and catch basins along the west side of 228th Avenue SE before daylighting and infiltrating in a roadside ditch along the north side of Cedar Grove Road SE, which provides a path to the Cedar River. The water infiltrates beneath the ditch before reaching the Cedar River. This stormwater routing system would be maintained for all of the action alternatives. Stormwater flows from the northern half of the landfill in a system of ditches and pipes to the North Siltation Pond or the North Stormwater Lagoon, and then flows downstream through a series of underground pipes, combining and then discharging to an unnamed stream in the northwest corner of the property. All stormwater collected from around the new landfill areas in the north would similarly be collected and transported to these stormwater facilities or stormwater facilities located close by.

Stormwater that comes into contact with solid waste is considered CSW and is kept separated from the clean stormwater via a series of berms and ditches. Under all action alternatives, CSW would be collected and conveyed to the existing CSW lagoon. From the CSW lagoon, stormwater is conveyed to the leachate lagoons and then on to the sanitary sewer system for discharge. Future CSW discharges would be routed in a similar manner.

Erosion and Sediment Control

Under all action alternatives, erosion and sediment control would be required both during construction of new landfill cells and during filling operations. Erosion and sediment control requirements are presented in Ecology’s SWMMWW (Ecology 2019) and the KCSWDM (King County 2016). These documents include BMPs to be used to minimize soil erosion and subsequent offsite sediment transport, which minimizes impacts to offsite surface water.

The current CHRLF SWPPP, which includes an erosion and sediment control plan, would be revised to control erosion and sediment transport during all new construction and filling operations. The revised plan would be reviewed and approved by Ecology. Requirements for erosion and sediment control to be used during construction are contained in Ecology’s Construction Stormwater General Permit (CSWGP) issued for construction of the landfill disposal areas. Additional requirements are specified in Ecology’s SWMMWW.

Requirements of the CSWGP would likely include the following:

- Installation of sediment control features
- Protection of drain inlets
- Slope protection and stabilization of soil
- Stabilization of construction site entrances
- Runoff flow control and sediment control

Landfill Gas and Odor Control

For all action alternatives, the existing landfill gas collection system would be expanded to accommodate the new landfill disposal areas. Landfill gas would be collected under vacuum produced by blowers. The landfill gas would initially be collected using horizontal perforated piping placed within the landfilled solid waste at appropriate intervals. The horizontal collection piping would be connected to gas manifold pipes and larger header piping.

Collected landfill gas would then be conveyed through the main header pipe to the North Flare Station where it is either 1) sent on to the BEW landfill gas-to-energy facility for final processing into pipeline-quality gas or 2) combusted at the flare station.

Systems in place to control odor include the landfill gas collection system and the placement of daily or final cover over disposal areas. Under the action alternatives, expansion of the landfill gas collection and conveyance systems would capture landfill gas generated during the decomposition of waste over time. The emission of surface odors would be controlled by keeping the active face of the landfill as small as possible and by covering the active areas with daily cover as well as placing interim or final cover systems on areas that have reached final grades. KCSWD is also considering alternative designs for leachate and LFG collection and conveyance that would potentially reduce odor. Once testing is complete and design improvements confirmed, those alternative designs would be included for all new refuse disposal areas.

The effectiveness of gas and odor control systems would be monitored regularly, taking corrective measures in the event of any exceedances of regulatory standards.

Excavation of Previously Landfilled Areas

For some of the action alternatives, previously landfilled areas would be excavated to create additional refuse capacity and to properly integrate new liner, leachate, and stormwater collection/conveyance facilities with existing systems. The excavated material would be sorted on site; material not recovered for reuse (solid waste), and any unsorted materials, would be landfilled each day. During the excavation of previously landfilled areas, odors would be controlled by keeping the working area as small as practical, covering the working face at the end of each day, and using misting equipment to neutralize odors in the work area as needed. Before beginning any excavation activities, a plan for environmental controls during the excavation would be reviewed and approved by Public Health and PSCAA. Before removing any soil and solid waste, KCSWD would confer with the appropriate regulatory agencies as needed.

Soil Surcharging

Soil to be used for surcharging could come from several areas of the landfill, depending on the action alternative being considered. All action alternatives would use soil from existing soil stockpiles, clean soil recovered from any previously landfilled areas that are excavated, or soil from new areas excavated for landfill development. Before beginning soil surcharging activities, a plan will be developed to address environmental controls and the impacts of soil loads on the existing controls systems, including the gas collection wells and leachate collection system. The plan will be submitted to Public Health for review and approval.

KCSWD has previously placed soil surcharge on landfilled areas without any negative impacts to the environmental systems. Thus, it is not anticipated that the application of soil surcharge over other landfilled areas would impact the cover system, leachate collection systems, or bottom liners. In addition, the soil surcharge should have no impact on vertical landfill gas collection wells, and only negligible impacts from settlement on horizontal landfill gas collectors—likely only to the landfill gas collectors in the uppermost layer below the thickest portion of the soil surcharge stockpile. (HDR 2008).

Controls that have been implemented in the past include:

- Separation/identifier material such as plastic or geotextile is put down prior to stockpile
- Surface water is properly routed and rerouted
- Erosion control is placed on stockpile slopes (e.g., vegetation, plastic, straw, erosion-control blankets)
- Stockpile height is limited to the permitted landfill filling elevation
- Access to the LFG collection connection and monitoring points is maintained

Any impact from settlement would be mitigated through regular maintenance activities for the landfill gas collection system. For example, soil surcharging has the potential to cause restriction of buried surface collectors, which could create LFG hotspots. If this were to occur, additional collection trenches would be installed in hotspot areas. If leachate seeps develop, collection trenches would be installed and leachate would be routed to the leachate system.

Use of Construction Equipment

Earthmoving construction equipment would be needed to excavate landfill cells, prepare underlying soil and bottom (subgrade) layers, construct bottom liners, and build access roads and stormwater conveyance systems. The operation of heavy equipment during construction of a landfill cell would typically occur within the hours defined for landfill operations (see Section 1.5). Construction activities that generate noise levels below established limits may occur during other hours.

Typical equipment needed to complete construction would include the following:

- Scrapers, dump trucks, and excavators for cell excavation and transportation of soil to stockpile areas
- Bulldozers for grading and preparation of final subgrade
- Compactors and rollers for compaction of final subgrade
- Dump trucks for delivery of selected fill and drainage material

- Motor graders for construction of access roadways and various other grading activities
- Backhoes or small excavators for installing stormwater conveyance systems

Some final closure construction would occur up to approximately 18 months after the landfill reaches capacity for all alternatives.

Construction and Demolition of Facilities

Construction of new disposal area(s) and facilities associated with all action alternatives would typically begin two to three years before the existing facilities reach capacity or are removed to allow uninterrupted landfill operation. Construction and demolition would be sequenced to minimize disruptions to landfill operations, and contractors would be required to coordinate activities closely with landfill operators.

2.3.1.2 Summary of Common Landfill Operations

Daily Cover

As with daily filling of the active landfill cell, operations for all landfilling would include placement of daily cover material at the end of each working day. At CHRLF, soil is used for daily cover in combination with tarps (the Tarpomatic® system). At the end of each day, the Tarpomatic® system is used to cover as much of the active face as possible while a lift is in the process of being filled to a specified height within the disposal cell. The top and side of the daily cell and any portion of the active face not covered by the tarps are covered with a compacted six-inch soil layer.

Interim Cover and Closure

The maximum final elevation of all landfill disposal areas, including final cover, would be from 788 feet to 830 feet above mean sea level, depending on the action alternative being considered. Once the designed solid waste fill elevation is reached, filling of the landfill cell would cease and cell closure activities would begin. These activities would include placement of interim cover followed by final cover and installation of the impermeable landfill cap.

Maximizing Landfill Capacity

One or more techniques would be used under all of the action alternatives to create additional capacity in landfill disposal areas. The capacity would be used for disposal of additional solid waste, while remaining within the permitted footprint and design elevation of the landfill. Soil surcharging is one technique (discussed earlier); other methods currently in use include the following:

- Recycling and reusing landfill materials such as soil cover, road rock, and tipping area rock.
- Using alternative daily cover materials – This involves using non-soil materials as daily cover on the active landfill area to decrease the volume of soil needed daily and increase the amount of

space available in the landfill. For example, tarps or synthetic cover systems are often used as alternative daily cover at landfills.

- Operational practices for improvements in landfill compaction, including leachate (moisture) addition, standardizing lift thickness, increasing compactor passes, increasing the weight of the compactor, frequent replacement of compactor wheels and feet, and final cover strategies to promote waste stabilization and settlement or for the use of exposed geomembrane cover systems. All of these practices would require approval from Public Health.

Each of the alternatives would also include the following operational activities:

- Monitoring of solid waste delivered to the landfill for unacceptable materials and adherence to a waste acceptance policy
- Compaction of solid waste and application of an approved daily cover material
- Landfilling, stockpiling, and closure at a maximum elevation of between 788 and 830 feet above mean sea level, depending on the action alternative considered
- Adherence to applicable regulations for surface water and groundwater quality
- Management of landfill gas through operation of a landfill gas collection and treatment system
- Measures to deter birds from entering the active landfill area
- Collection and treatment of stormwater prior to discharge
- Control of acceptance of liquid wastes
- Maintenance of records according to the approved Plan of Operations
- Measures to control dust, litter, and standing water
- Measures to ensure availability of reserve operational equipment
- Maintenance of boundary markers
- Monitoring programs for fugitive gas emissions from the landfill surface, lateral gas migration, flare emissions, and meteorological conditions to verify that air quality meets appropriate standards
- Monitoring programs for groundwater, surface water, and leachate to ensure water quality standards are met
- Maintenance of fences and barriers to prevent unauthorized access to the landfill
- Adherence to permitted hours of operation
- No solid waste disposal or stockpiling activities in the buffer zone

2.3.2 Common Support Facilities Relocation Activities

All action alternatives assume that existing landfill support facilities would be moved from existing locations to other locations on the landfill property or to a site in Renton (Figures 2-1 and 2-2) to allow for construction and landfilling of proposed Area 9. The Renton site was evaluated during the 2019 Cedar Hills Regional Landfill Support Facilities Evaluation (King County 2019c) and brought forward into this DEIS due to its current ownership by King County, the undeveloped condition of the parcel, its proximity to the CHRLF and King County recycling and transfer stations, its transportation access, and the industrial uses surrounding much of the property. The site meets all objectives outlined for landfill support facilities.

Each of these relocation options could be selected for any action alternative. All action alternatives would relocate the following landfill support facilities by moving them from their current locations further south on the property:

- The truck scale and scale house, used to weigh incoming and outgoing refuse vehicles
- The vehicle wash building, used to prevent the spread of dirt and refuse in the surrounding communities and street network
- The heavy equipment maintenance facility (cat shack), used to maintain off-road equipment such as tracked excavators and earth movers
- Emergency generator
- Moderate Risk Waste storage area – used for temporary storage of hazardous materials improperly disposed at the facility and spill cleanup residues
- Some tractor and refuse trailer parking used for parking empty trailers waiting for service, or full trailers awaiting tipping on the active landfill face. Additional tractor and trailer parking would be placed elsewhere under the different action alternatives

The remaining facilities would be moved to the north or south, or to a site in Renton, depending on the support facility relocation option chosen. These facilities include but are not limited to:

- Tractor/trailer maintenance building and shop
- Tractor/trailer and employee parking
- Administration building (including offices, cubicles, multipurpose rooms, lunch/break room, showers, restrooms, lockers, storage, training room, and IT infrastructure)
- Laboratory space

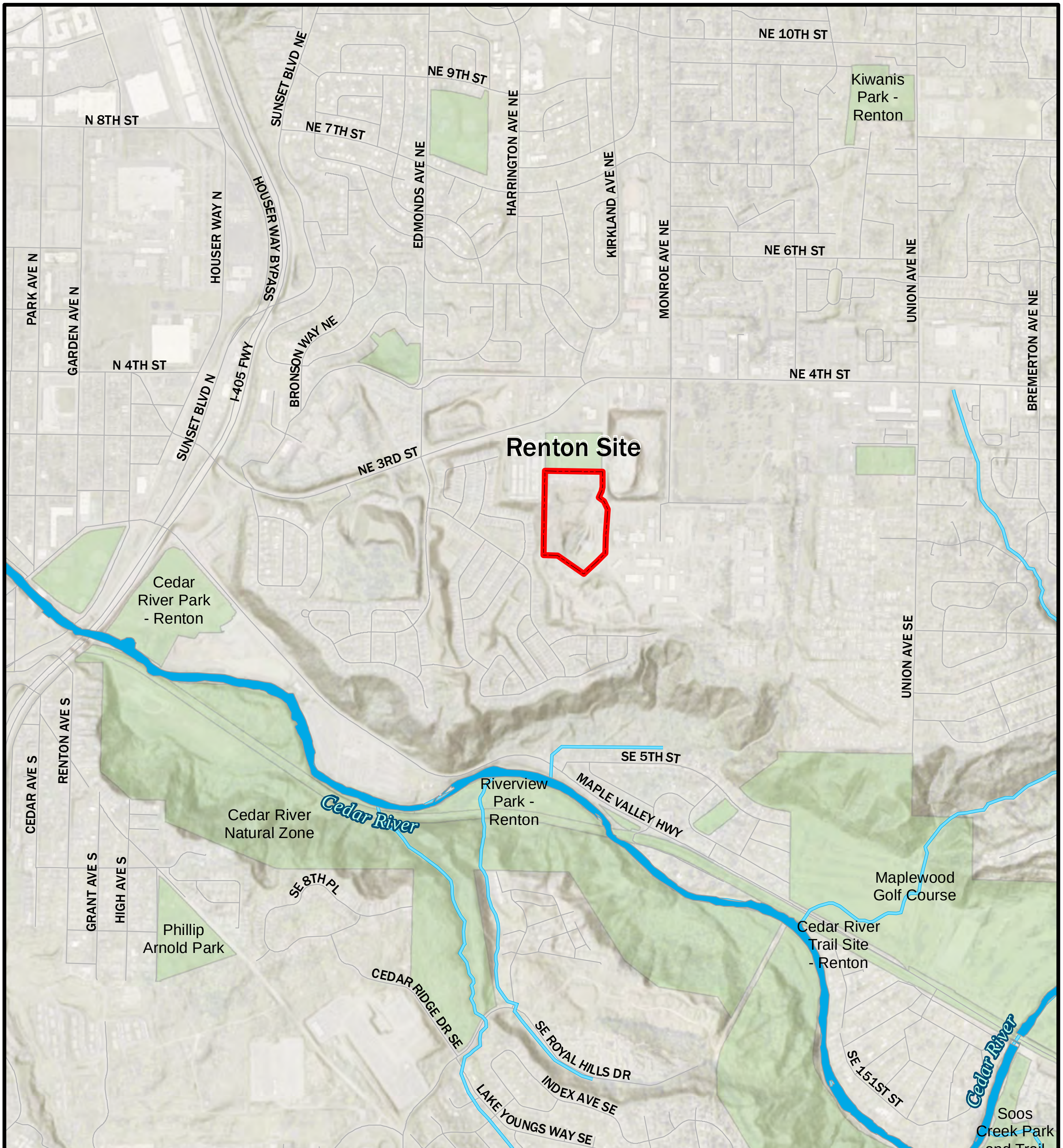
2.3.2.1 Common Elements of Support Facilities Design and Construction

Demolition, construction, or modification of maintenance, administrative, and other landfill support facilities would be conducted in accordance with the King County Code.

2.3.2.2 Summary of Common Support Facilities Operation

Each of the alternatives would include the following operational activities:

- Maintenance of heavy equipment and tractor/trailers
- Maintenance of roads and health and safety systems
- Employee and visitor parking
- Tractor and trailer parking
- Operation of the scale and entry system
- Management and administrative functions of the landfill operations, FESS, and RES
- Adherence to applicable regulations for surface water and groundwater quality
- Collection and treatment of stormwater prior to discharge
- Maintenance of records according to the approved Plan of Operations
- Measures to control dust, litter, and standing water
- Maintenance of fences and barriers to prevent unauthorized access to the landfill
- Adherence to permitted hours of operation



Legend

Renton Site Boundary

Park

Cedar River

Stream

Road

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 2-1.
Vicinity Map of Renton Site.

N

0 750 1,500 3,000 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter2\Figure2_1_VicinityMap_Renton.mxd (8/10/2020)

Legend

- Renton Site Boundary
- Relevant Properties
- KC Parks

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 2-2.
Existing Renton Site.

N

0 75 150 300 Feet

King County

ESRI (2019)
K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter2\Figure2_2_ExistingMap_Renton.mxd (8/11/2020)

2.4 Features Distinguishing the Alternatives

The action alternatives are a combination of three landfill development options and three landfill support facility relocation options. Each of the landfill development options adds areas and/or heights of development leading to increased landfill capacity. Each of the landfill support facility relocation options moves facilities out of the space proposed for Area 9 development to parts of the landfill property in the north or south, or to a site in Renton.

As described earlier, all of the action alternatives have the following similarities:

- Development of a new refuse area in the southwest corner of the landfill (proposed Area 9)
- Landfilling in existing landfill Areas 5 and 6 to no more than 788 feet above mean sea level
- Excavation/relocation of soil and solid waste and potential use of the soil stockpiles for soil surcharging and landfill cover material
- Use of liner over unlined refuse areas (LOURA)
- Relocation of some or most landfill support facilities to areas of the landfill property other than their current location, or to a site in Renton
- Construction of new disposal area(s) and facilities beginning two to three years before the existing areas reach capacity or facilities are removed to allow uninterrupted landfill operation

The No Action Alternative and the unique characteristics of each action alternative are described in the following subsections. Section 2.5 presents a summary of the alternatives, as well as an estimated schedule for landfilling and construction.

2.4.1 No Action

The No Action Alternative involves completing and maintaining the landfill as prescribed in the 2010 Plan and is expected to provide disposal capacity at the landfill to approximately 2028, as currently permitted.

2.4.1.1 No Action Landfill Development

Existing Areas 5 and 6 would be developed to a height not to exceed 788 feet above mean sea level and permanently closed. Area 7 reached the specified height in 2019 and completion of final closure is scheduled for Summer 2022. Area 8 would be developed to the permitted elevation of 788 feet above mean sea level and permanently closed (see Figure 2-3). Currently permitted capacity is about 11 million cubic yards.

2.4.1.2 No Action Landfill Support Facilities

Under the No Action Alternative, facilities located in the southeast portion of the landfill site would remain in their current location. The No Action Alternative would include removal, refurbishment or in-kind replacement of some of these facilities at the end of their useful life as a normal matter of maintaining safe and healthy work spaces for County employees, and may include temporary use of interim offsite facilities.

2.4.1.3 No Action Land Use

All development under the No Action Alternative is allowed under the existing Special Permit without modification.

2.4.1.4 No Action Soil Management

It is estimated that the landfill soil stockpile areas will be exhausted of clean surplus soil by approximately late 2027 under the No Action Alternative. The soil has been stockpiled on site for various operational uses, including daily and final landfill cover for Areas 5, 6, 7 and 8, as appropriate. Additional soil needed for final filling and closure operations would be imported from off site. If soil remained after final closure, surplus soil would be graded on site or removed, depending on the quantity.

Legend

- Existing Landfill Property Line
- Existing 1000ft Buffer
- Action Alternative Grading (10ft)
- BPA Easement
- Northwest Pipeline Easement
- Planned Filling Under No Action

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 2-3. Cedar Hills Regional Landfill 2020 Site Development Plan: No Action Alternative.

N

0 562.5 1,125 2,250 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter2\Figure2_3_NoActionAlternative.mxd

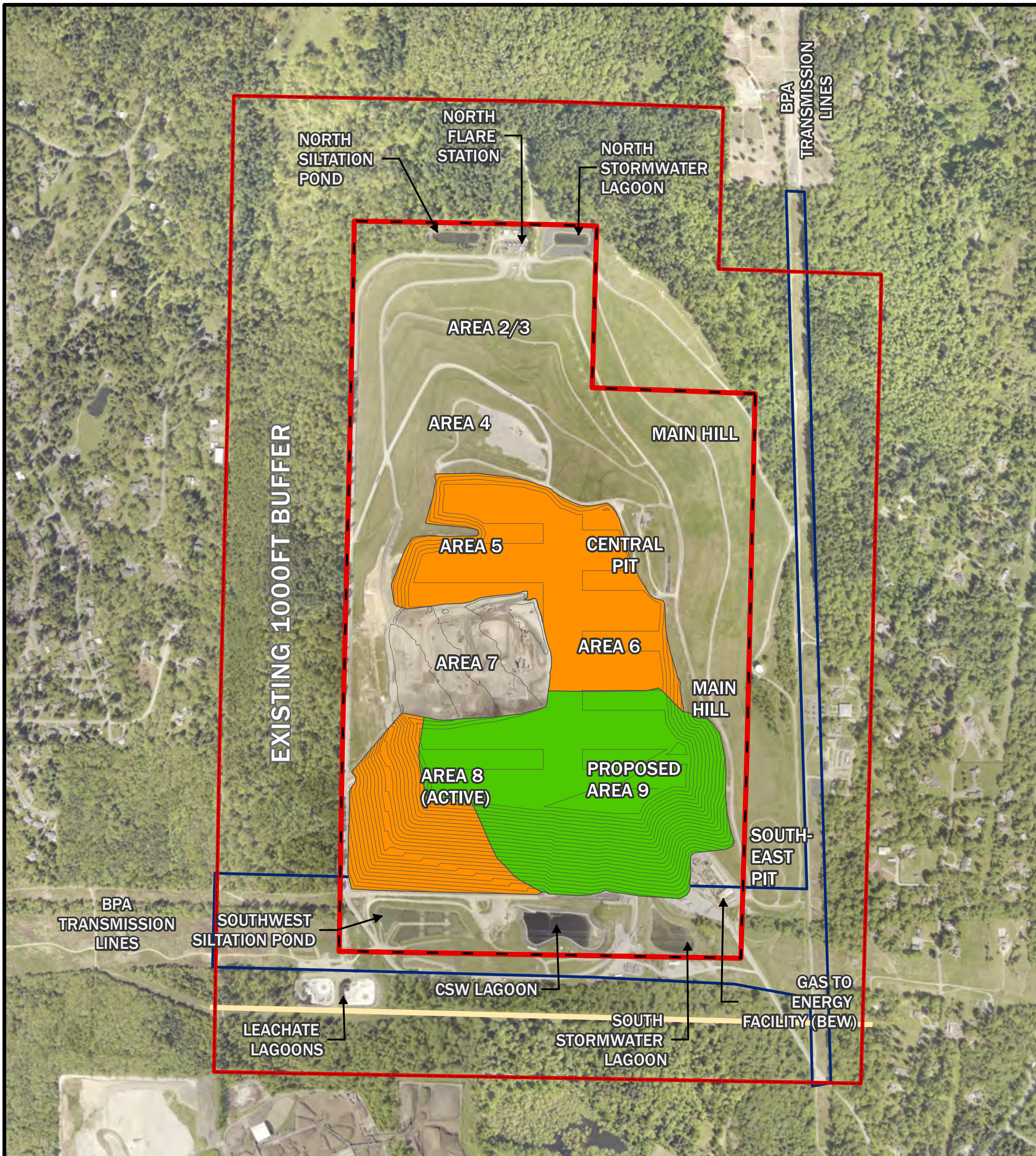
2.4.2 Action Alternative 1

Action Alternative 1 is expected to add approximately 12 million cubic yards to the currently permitted disposal capacity at the landfill and approximately nine years (to approximately 2037) to the landfill life.

2.4.2.1 Action Alternative 1 Landfill Development

Under Action Alternative 1, existing Areas 5 and 6 would be developed to a height not to exceed 788 feet above mean sea level and permanently closed. Area 8 would be developed from the permitted elevation of 788 feet above mean sea level to a maximum elevation of 800 feet above mean sea level and permanently closed. Alternative 1 would develop 34 acres for construction of a new refuse area in the southeast corner (proposed Area 9) to 800 feet above mean sea level, and permanently closed (see Figure 2-4). Relocation, retrofitting, or replacement would be required for but not limited to landfill gas infrastructure, onsite leachate infrastructure, CSW infrastructure, stormwater infrastructure, access roads, fencing, and other environmental controls and utilities throughout the affected refuse areas, as appropriate to the final design.

No additional landfilling would take place in the Main Hill, Southeast Pit, Central Pit, and Areas 2/3, 4, and 7. This alternative would add approximately 12 million cubic yards to the currently permitted landfill capacity.



Legend

- Existing Landfill Property Line
- Existing 1000ft Buffer
- Action Alternative Grading (10ft)
- BPA Easement
- Northwest Pipeline Easement
- Planned Filling Under No Action
- Proposed Filling for Action Alternative 1

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 2-4. Cedar Hills Regional Landfill 2020 Site Development Plan: Action Alternative 1.

N

0 562.5 1,125 2,250 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter2\Figure2_4_ActionAlternative1.mxd

2.4.2.2 Action Alternative 1 Landfill Support Facilities

Alternative 1 includes three options for the relocation of landfill support facilities, and these options are the same for all action alternatives:

1. Option 1 would pursue a Special Use Permit to place the new facilities within the southern buffer zone (see Figure 2-7). If a Special Use Permit is approved, Option 1 would relocate and build main landfill support facilities in the south, including but not limited to the scale/scale house, truck wash, heavy equipment maintenance facility (cat shack), some tractor and trailer parking, the truck maintenance building, employee parking, office space (including operator break room and locker rooms), laboratory/storage space, and various utility/storage buildings.
2. Option 2 would pursue a Special Use Permit to place the new facilities within the northern buffer zone (see Figure 2-8). If a Special Use Permit is approved, Option 2 would relocate and build main landfill support facilities in the north in the area around the North Flare Station including but not limited to the truck maintenance building, most tractor and trailer parking, employee parking, office space (including operator break room and locker rooms, lab/storage space, and various utility/storage buildings). The North Stormwater Lagoon would remain in its current location. The North Siltation Pond would be retrofitted as a covered vault or moved from its current location further east of the North Flare Station. This option would also relocate and build the scale/scale house, truck wash, cat shack, and some tractor and trailer parking in the south, but not within the buffer zone.
3. Option 3 would relocate and build landfill support facilities at an offsite location at 3005 NE 4th Street in Renton, adjacent to King County's Renton Recycling and Transfer Station (see Figure 2-9). The facilities to be relocated include a portion of the vehicle maintenance shop (for repairing tractors, trailers, operations vehicles, and passenger vehicles), employee offices, and parking for employees, tractors, trailers, and operations vehicles. This option would also relocate and build some landfill support facilities in the north or south (except the scale/scale house, truck wash, Cat shack, emergency generator, a small Moderate Risk Waste storage area, and some tractor and trailer parking relocated in the south), none of which will be located in the buffer.

2.4.2.3 Action Alternative 1 Land Use

With Facilities Relocation Options 1 or 2 (above), KCSWD would pursue a Special Use Permit to place the new facilities within the existing southern or northern buffer zones. With Option 3, a Conditional Use Permit would be required for development at the Renton site, as well as associated demolition and building permits and drainage review for stormwater management systems.

2.4.2.4 Alternative 1 Soil Management

Clean soil (i.e., soil free of solid waste) excavated from new landfill areas could be exported or sold for private use or stockpiled on site and used for landfill cover material. Even with soil stockpiling, it is estimated that the landfill soil stockpile areas will be exhausted of clean surplus soil by approximately late

2026 under Action Alternative 1. The soil has been stockpiled on site for various operational uses, including daily and final landfill cover for Areas 5, 6, 7, and 8, as appropriate. Additional soil needed for filling and closure operations would be imported from off site. If soil remained after final closure, surplus soil would be graded on site or removed, depending on the quantity.

2.4.3 Action Alternative 2

Action Alternative 2 is expected to add approximately 13 million cubic yards to the currently permitted disposal capacity at the landfill and approximately ten years (to approximately 2038) to the landfill life.

2.4.3.1 Action Alternative 2 Landfill Development

Under Action Alternative 2, Areas 5 and 6 would be developed to a height not to exceed 788 feet above mean sea level and permanently closed. Area 8 would be developed from the permitted elevation of 788 feet above mean sea level to no more than 830 feet above mean sea level and permanently closed (see Figure 2-5).

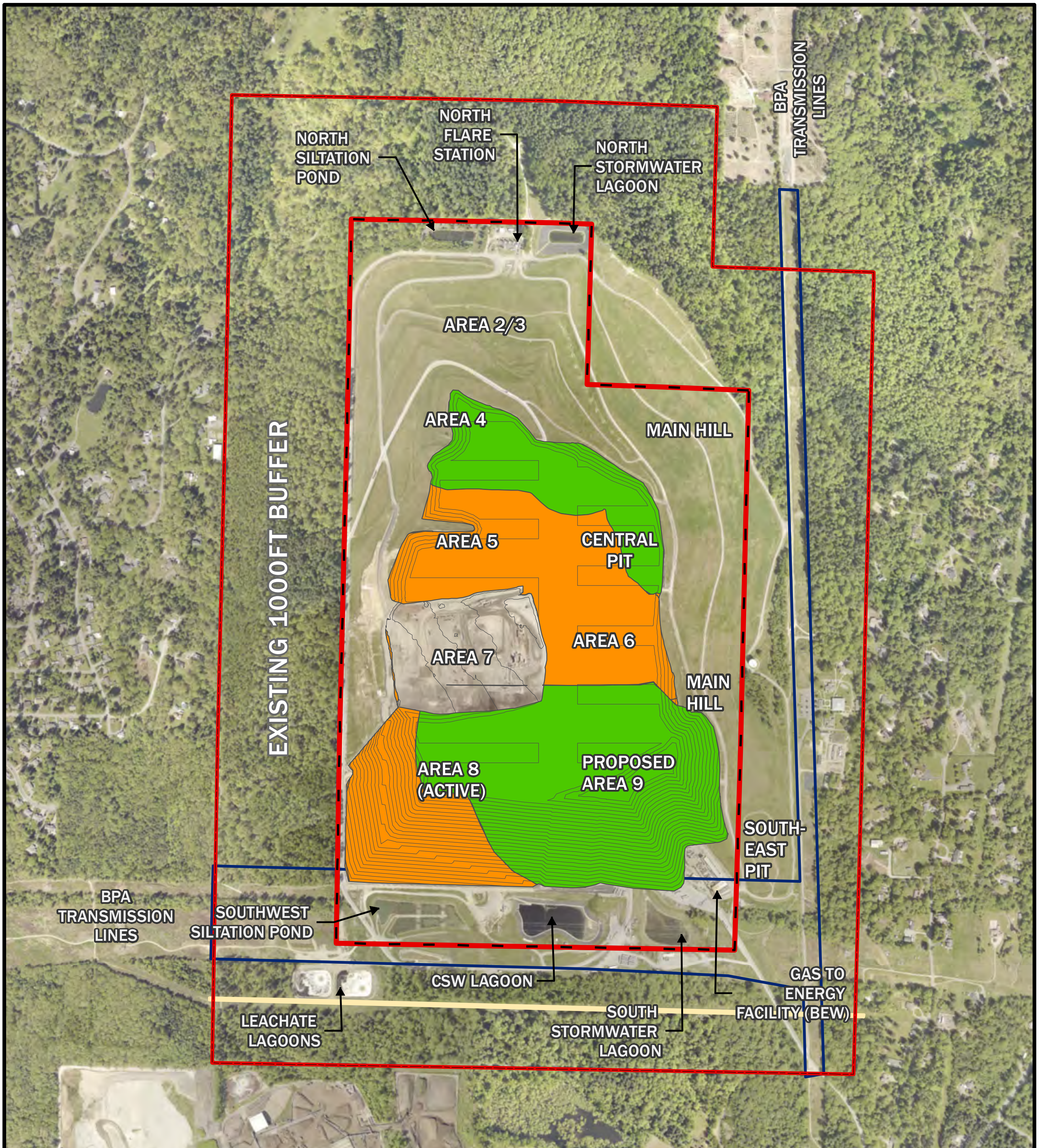
The southern portions of Areas 2/3, 4, and Central Pit would be developed to a height not to exceed 788 feet above mean sea level and permanently closed. Alternative 2 would develop 43 acres for construction of a new refuse area in the southeast corner (proposed Area 9) to no more than 830 feet above mean sea level, after which it would be permanently closed. Relocation, retrofitting, or replacement would be required for but not limited to landfill gas infrastructure, onsite leachate infrastructure, CSW infrastructure, stormwater infrastructure, access roads, fencing, and other environmental controls and utilities throughout the affected refuse areas, as appropriate to the final design.

No additional landfilling would take place in the Main Hill, Southeast Pit, and Area 7. This alternative would add approximately 13 million cubic yards to the landfill capacity.

2.4.3.2 Action Alternative 2 Landfill Support Facilities

Alternative 2 includes the same three options for the relocation of landfill support facilities as described above in Section 2.4.2.2, Alternative 1 Landfill Support Facilities:

1. Relocate main landfill support facilities in the south (see Figure 2-7)
2. Relocate main landfill support facilities in the north, with some landfill support facilities relocated in the south, but not in the buffer (Figure 2-8)
3. Relocate main landfill support facilities to a site in Renton, with some landfill support facilities relocated in the south or north, but not in the buffer (Figure 2-9)



Legend

- Existing Landfill Property Line
- Existing 1000ft Buffer
- Action Alternative Grading (10ft)
- BPA Easement
- Northwest Pipeline Easement
- Planned Filling Under No Action
- Proposed Filling for Action Alternative 2

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 2-5. Cedar Hills Regional Landfill 2020 Site Development Plan: Action Alternative 2.

N

0 562.5 1,125 2,250 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter2\Figure2_5_ActionAlternative2.mxd

2.4.3.3 Action Alternative 2 Land Use

With Facilities Relocation Options 1 or 2 (above), KCSWD would pursue a Special Use Permit to place the new facilities within the existing southern or northern buffer zones. With Option 3, a Conditional Use Permit would be required for development at the Renton site, as well as associated demolition and building permits and drainage review for stormwater management systems.

2.4.3.4 Action Alternative 2 Soil Management

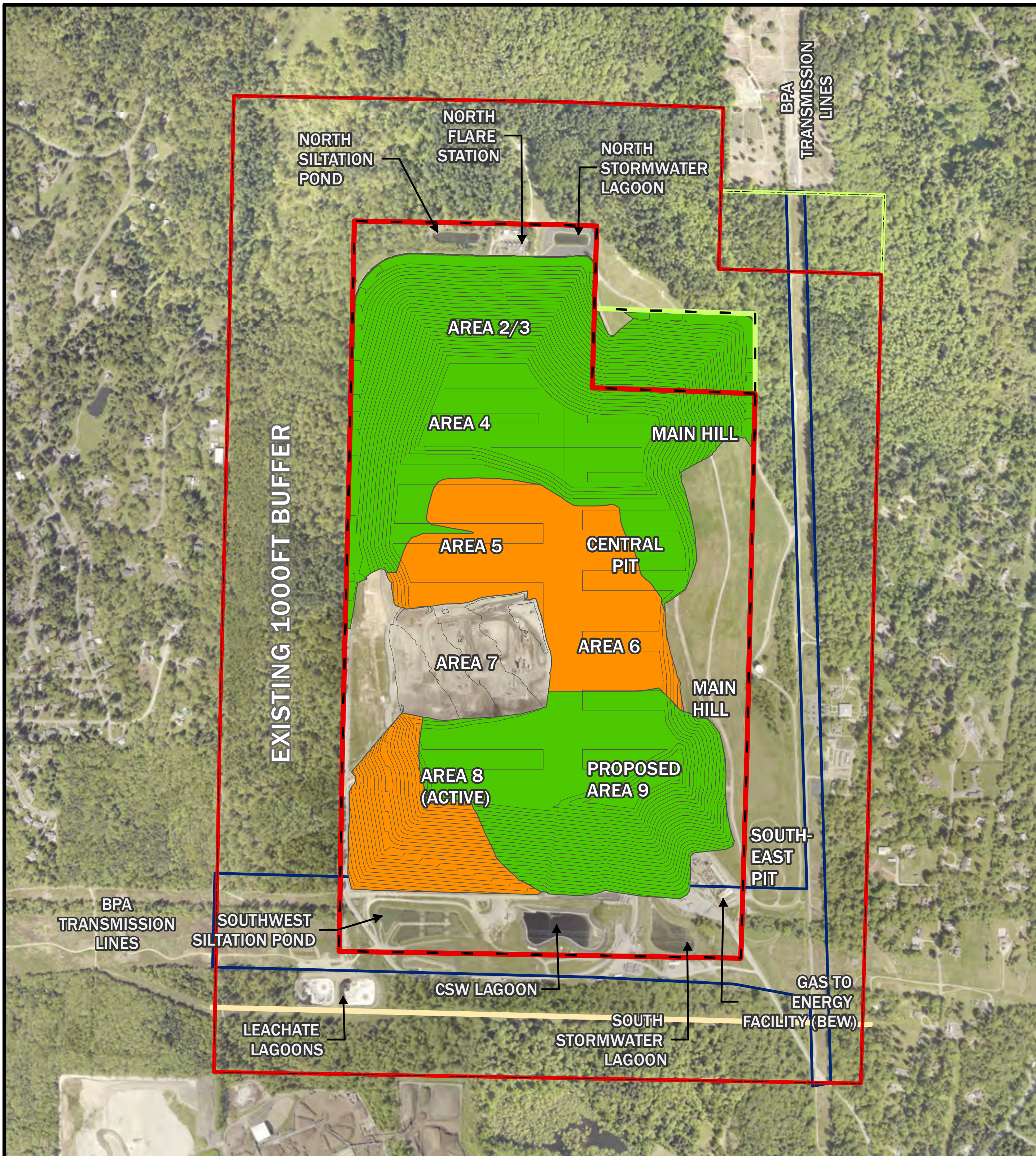
Clean soil (i.e., soil free of solid waste) excavated from new landfill areas could be exported or sold for private use or stockpiled onsite and used for landfill cover material. Even with soil stockpiling, it is estimated that the landfill soil stockpile areas will be exhausted of clean surplus soil by approximately late 2027 under Action Alternative 2. The soil has been stockpiled on site for various operational uses, including daily and final landfill cover for Areas 5, 6, 7, and 8, as appropriate. Additional soil needed for filling and closure operations would be imported from off site. If soil remained after final closure, surplus soil would be graded on site or removed, depending on the quantity.

2.4.4 Action Alternative 3

Action Alternative 3 is expected to add approximately 26 million cubic yards to the currently permitted disposal capacity at the landfill and approximately 18 years (to approximately 2046) to the landfill capacity.

2.4.4.1 Action Alternative 3 Landfill Development

Areas 5 and 6 would be developed to a height not to exceed 788 feet above mean sea level and permanently closed. Area 8 would be developed from the permitted elevation of 788 feet above mean sea level to no more than 830 feet above mean sea level, and permanently closed. Alternative 3 would develop 34 acres for construction of a new refuse area in the southeast corner (proposed Area 9) to no more than 830 feet above mean sea level, after which it would be permanently closed (see Figure 2-6).



Legend

- Existing Landfill Property Line
- Existing 1000ft Buffer
- Proposed Revised Property Line
- Proposed Revised Buffer Line
- Action Alternative Grading (10ft)
- BPA Easement
- Northwest Pipeline Easement
- Planned Filling Under No Action
- Proposed Filling for Action Alternative 3

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 2-6. Cedar Hills Regional Landfill 2020 Site Development Plan: Action Alternative 3.

N

0 562.5 1,125 2,250 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter2\Figure2_6_ActionAlternative3.mxd

The northwest portions of Areas 2/3 and 4 would be developed to no more than 830 feet above mean sea level, and permanently closed. Development of this area would not extend into the revised buffer, nor would it impact the North Siltation Pond or North Flare Station. The existing refuse areas slope to a low point at the northwest corner of the area and would require the implementation of a mechanically stabilized earthen (MSE) berm to optimize capacity in this area. An MSE berm consists of sacrificial steel wire mesh at the berm face and geogrid reinforcement backfilled with selected structural fill material. The face of the berm is more vertical (i.e., 2H:1V) than typical landfill slopes (i.e., 3H:1V), thereby reducing the amount of soil backfill and minimizing lateral encroachment. The berm face is often vegetated to prevent erosion and UV exposure (see Section 3.2.1.5.1 for additional details). Excavation of refuse would be required to tie the new liner into the existing bottom liner. Preliminary estimates indicate that approximately 2,435,000 cubic yards of material are located within the area, a combination of solid waste and soil. It is estimated that approximately one-half of that soil could be sorted and recovered for onsite uses with the remainder re-landfilled.

Development in the northeast and northwest areas would encompass approximately 66 acres.

A soil berm approximately 20 feet in height would be constructed along the northeast boundary of the proposed refuse area. A soil berm relies on its mass, without mechanical reinforcement, to add stability and allow additional capacity to be added.

Excavation of refuse in the northeast area would be required to install the new leachate system. Preliminary estimates indicate that approximately 735,000 cubic yards of material are located within the area; a combination of solid waste and soil. It is estimated that approximately one-half of that soil could be sorted and recovered for onsite uses with the remainder re-landfilled.

The existing North Stormwater Lagoon and North Siltation Pond would be retrofitted to support the northeast and northwest refuse areas. The facilities would be sized to meet current regulations for all stormwater flows routed north. The North Siltation Pond may be relocated to the east, depending on the support facilities relocation option chosen. CSW and leachate would be conveyed to the existing pump station at the north end.

Relocation, retrofitting, or replacement would be required for but not limited to landfill gas infrastructure, onsite leachate infrastructure, CSW infrastructure, stormwater infrastructure, access roads, fencing, and other environmental controls and utilities throughout the affected refuse areas, as appropriate to the final design.

No additional landfilling would take place in the Southeast Pit or Area 7. This alternative would add approximately 26 million cubic yards to the landfill capacity.

2.4.4.2 Action Alternative 3 Landfill Support Facilities

Alternative 3 includes the same three options for the relocation of landfill support facilities as described above in Section 2.4.2.2, Alternative 1 Landfill Support Facilities:

1. Relocate main landfill support facilities in the south (Figure 2-7)

2. Relocate main landfill support facilities in the north, with some landfill support facilities relocated in the south, but not in the buffer (Figure 2-8)
3. Relocate main landfill support facilities to a site in Renton, with some landfill support facilities relocated in the south or north, but not in the buffer (Figure 2-9)

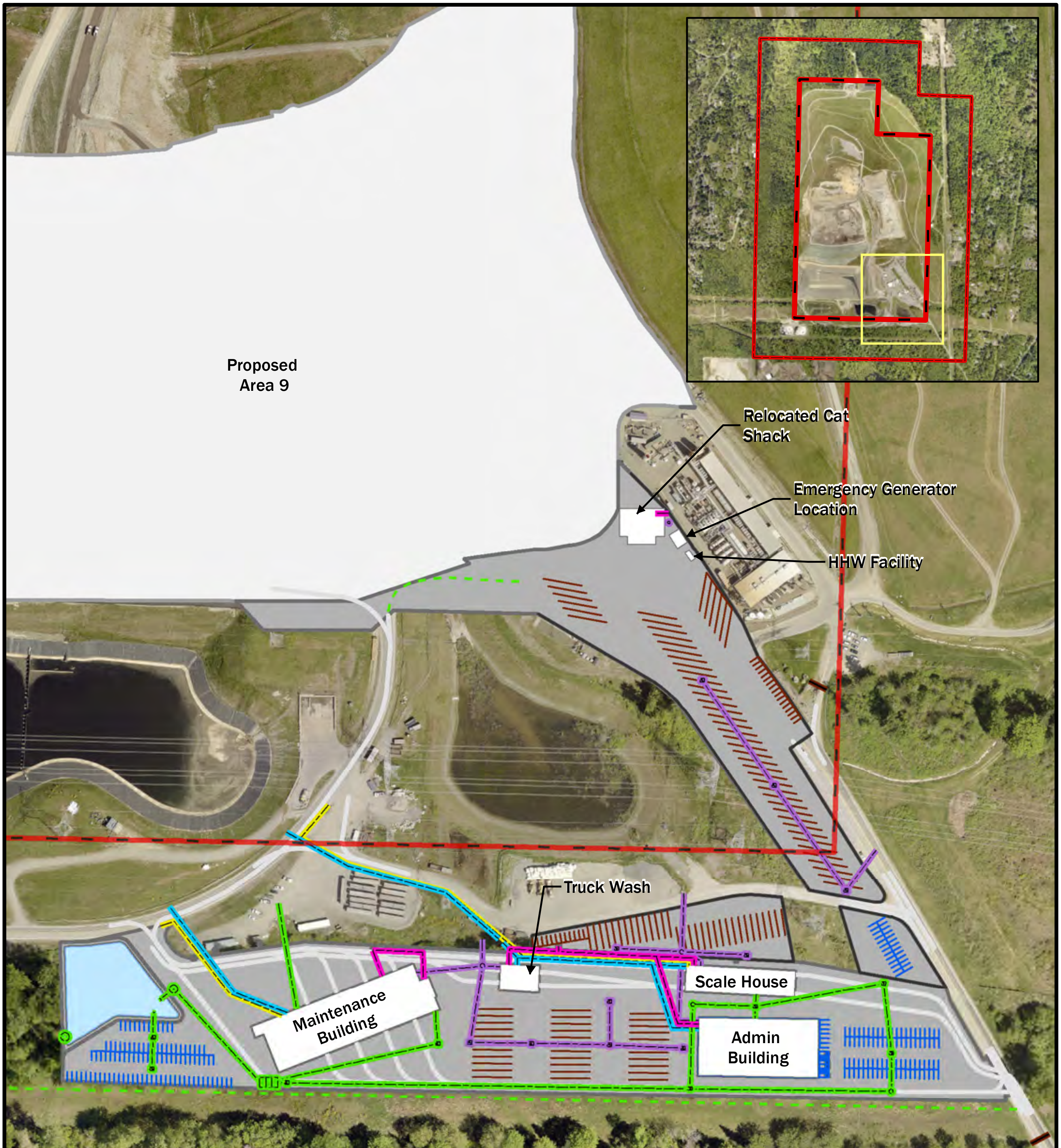
2.4.4.3 Action Alternative 3 Land Use

With Facilities Relocation Options 1 or 2 (above), KCSWD would pursue a Special Use Permit to place the new facilities within the existing southern or northern buffer zones.

Property owned by KCSWD at the northeast corner would be incorporated into the site parcel, and thus revise the landfill property line. No landfilling or soil stockpiling would take place within 1,000 feet of the revised property line. Incorporation of additional property into the landfill parcel will require revision to the existing Special Permit or issuance of a new Special Use permit under King County Code chapters 21A.42 and 20.22.

2.4.4.4 Action Alternative 3 Soil Management

Clean soil (i.e., soil free of solid waste) excavated from new landfill areas could be exported or sold for private use or stockpiled onsite and used for landfill cover material. Even with soil stockpiling, it is estimated that the landfill soil stockpile areas will contain no clean surplus soil by approximately late 2027 under Action Alternative 3. The soil has been stockpiled on site for various operational uses, including daily and final landfill cover for Areas 5, 6, 7, and 8, as appropriate. Additional soil needed for filling and closure operations would be imported from off site. If soil remained after final closure, surplus soil would be graded on site or removed, depending on the quantity.



Legend

Existing 1000ft Buffer	Asphalt
Electric	Gate
Storm Drain	Ditch
Water	Traffic Flow
Power	Buildings
Sewer	New Stormwater Pond
Employee/Vistitor Parking	Paved Area
Truck/Trailer Parking	Proposed Area 9

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 2-7.
Facility Option 1 South.

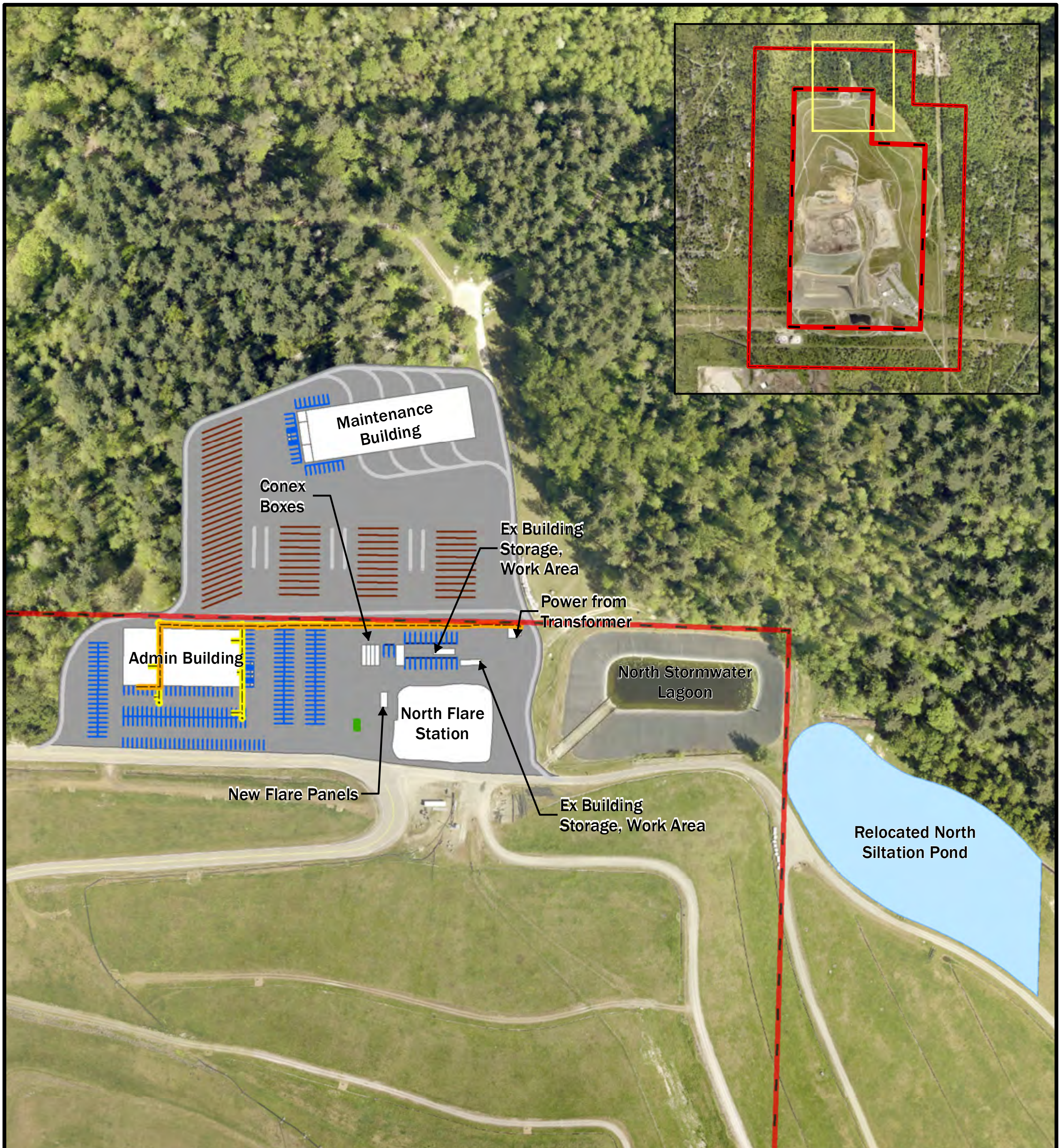
N

0 150 300 600 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter2\Figure2_7_SouthOption.mxd (8/11/2020)



Legend

- Existing 1000ft Buffer
- Electric
- Sewer
- Employee/Vistitor Parking
- Curb
- Truck/Trailer Parking
- Mounted Trailer
- Ditch
- New Stormwater Pond
- Paved area
- Buildings

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 2-8.
Facility Option 2 North.

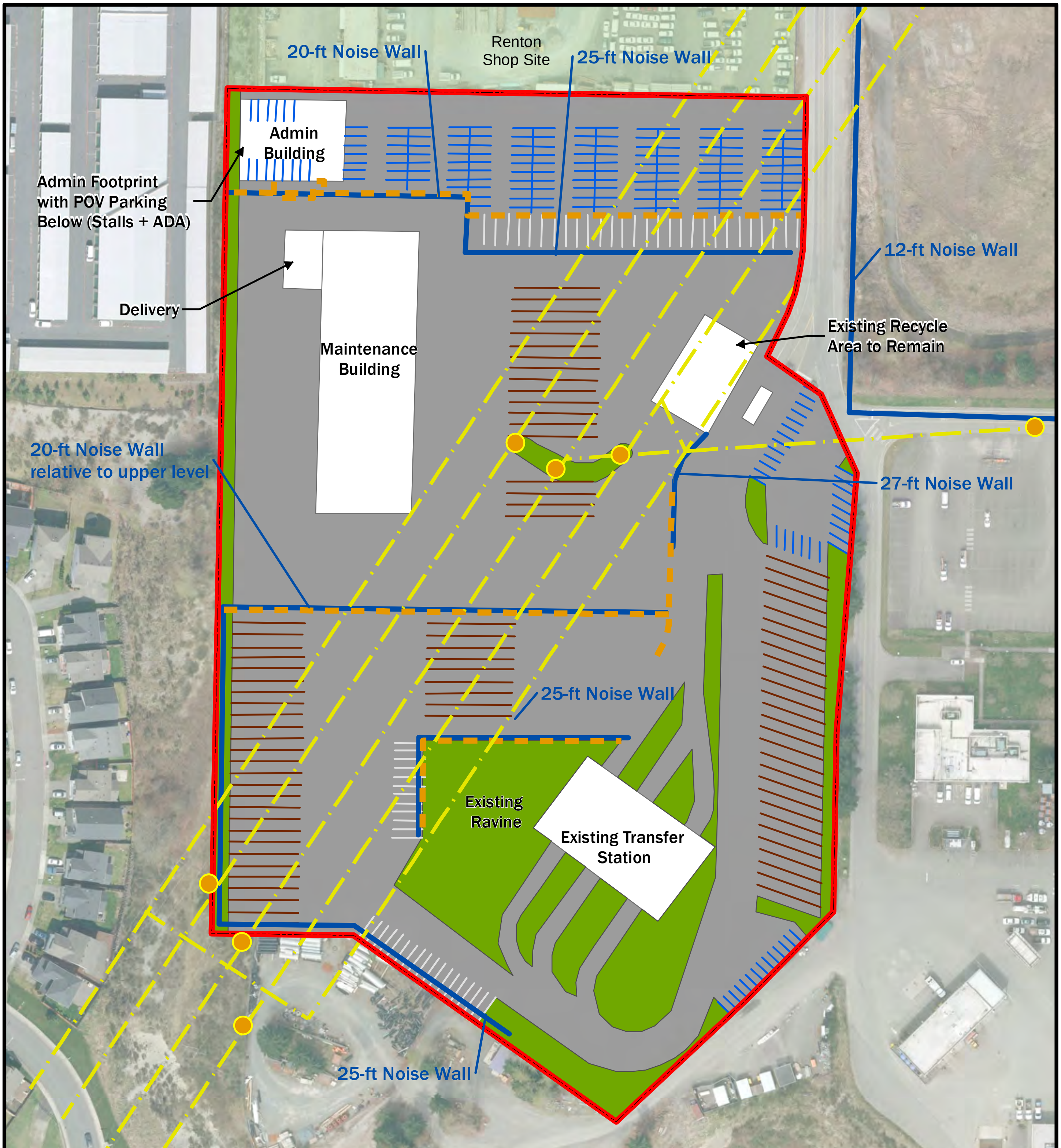
N

0 135 270 540 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter2\Figure2_8_NorthOption.mxd (8/11/2020)



Legend

- Renton Site Boundary
- Building
- Landscape
- KC Parks
- Paved area
- Electric Tower
- Powerlines
- Retaining Wall
- Employee/Vistitor Parking
- Tractor Parking
- Truck/Trailer Parking
- Noise Wall

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 2-9.
Facility Option 3 Renton.

N

0 75 150 300 Feet

King County

ESRI (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter2\Figure2_9RentonOption.mxd (1/14/2022)

2.5 Summary of Alternatives

The action alternatives present a range of options for continued use of the CHRLF beyond the anticipated closure date of 2028 under the No Action Alternative. The purpose and need for the project are described in the Summary and the project objectives are discussed in Section 1.4. All of the action alternatives were developed and selected for analysis in this DEIS because they best meet the project's purpose and need, and project objectives. Each of the action alternatives would be designed and operated in compliance with all applicable federal, state, and local laws and regulations. Table 2-1 provides a comparison of the estimated area, additional capacity, extended life, estimated year of capacity, and facility support locations associated with each alternative.

Table 2-1. Estimated Landfill Area, Capacity, and Life Span by Alternative—Beyond 2028.

Alternative	New Fill Area (Acres)1	Estimated Additional Capacity (MCY)2	Estimated Total Capacity (MCY)	Estimated Extended Landfill Life3 (Years)	Estimated Year CHRLF Reaches Capacity	Options for Location of Landfill Support Facilities
No Action		--	11	--	2028	
Action Alternative 1: Landfilling in Areas 8 and 9 to 800 feet Landfilling in Areas 5 and 6 to 788 feet	34	12	23	9	2037	Option 1 – South Option 2 – North Option 3 – Renton
Action Alternative 2: Landfilling in Areas 8 and 9 to 830 feet Landfilling in Areas 5 and 6 to 788 feet Landfilling in southern portion of Areas 2/3, 4, and Central Pit to 788 feet	43	13	24	10	2038	Option 1 – South Option 2 – North Option 3 – Renton
Action Alternative 3: Landfilling in Areas 8, 9, NE, and NW to 830 feet Landfilling in Areas 5 and 6 to 788 feet Landfilling in northwest Areas 2/3 and 4 to 830 feet Landfilling in northeast portions of Main Hill and Central Pit to 830 feet	100	26	37	18	2046	Option 1 – South Option 2 – North Option 3 – Renton

MCY: million cubic yards

1 Reflects plan view acres, including filling side slopes of previously lined areas and areas with new liner

2 No Action Alternative estimated capacity is as currently permitted. All Action Alternative estimated capacity numbers are in addition to No Action capacity.

3 Estimates of extended life assume that all solid waste would be disposed of at CHRLF and are based on forecast tonnage values shown in Table 1-4. Number of years reflect those beyond current estimated No Action closure of 2028.

3.0 EARTH

This chapter describes how implementation of any of the action alternatives, including the facility relocation options, could affect geology and soils at the CHRLF and the Renton sites, compared to the No Action Alternative. The discussion includes the potential for earthquake, landslide, and liquefaction hazards, and erosion concerns.

This environmental review determined that, if mitigation measures are implemented, there would be no significant unavoidable adverse impacts, to earth at the CHRLF or the Renton sites during construction or operation of any of the alternatives, including the facility relocation options.

3.1 Affected Environment

3.1.1 Geologic Setting and Topography

The CHRLF and Renton sites lie in the middle portion of the Puget Lowland, an elongated topographic and geological depression situated between the Olympic Mountains on the west and the Cascade Mountains on the east. The Puget Lowland is filled with a complex sequence of glacial and non-glacial sediments that overlie Tertiary (66 to 2.6 million years ago) bedrock. The Vashon Glaciation is the most recent glaciation that has changed the region’s topography (Galster and Laprade 1991). Over 15,000 years ago, the large icesheet that covered much of the Puget Lowland during the Vashon Glaciation retreated to the north, leaving a variety of glacial landforms and associated sediments.

The CHRLF and Renton sites lie on a glacial upland known as the Coalfield Drift Plain that is part of a broad glacial drift plain that occupies the Puget Lowland from the Olympic Mountains to the Cascade Range (Luzier 1969).

The CHRLF is located in an area of rolling topography, near the location of the former coal mining town of Cedar Mountain. Pre-development elevations at CHRLF ranged from a high of about 650 feet above sea level along the western property line to a low of slightly less than 350 feet above sea level at the northwestern corner. Past landfilling activities have raised the elevation in the central part of the site to about above 788 feet above sea level. The land surface slopes down in all directions from the landfill site.

The Renton site is located in the Renton Highlands and slopes down from north to south. Elevations at the Renton site range from 338 feet above sea level near the northwest corner of the site, to 284 feet above sea level near the south-central part of the site.

In the Renton Highlands area, the Coalfield Drift Plain is bounded by post-glacial river valleys that developed after the retreat of the glaciers (post-glacial) including the May Creek Valley to the north, and the Cedar River Valley to the south. In the Cedar Mountain area, river valleys dissect the Coalfield Drift Plain and form numerous small lakes and wetlands. Approximately one-half mile south of the site, an east–west trending valley (the Cedar Grove Channel) connects the Cedar River and Issaquah Creek valleys. Rosengreen (1965) interprets Cedar Grove Channel as an abandoned glacial meltwater channel formed during the Vashon Glaciation. The channel contains several wetland areas and ponds that are not drained by a surface stream. In wet winter months, excavation along roadside ditches often shows groundwater seepage at the contact between the permeable sandy and gravel soils and the less permeable glacial till beneath. The May Creek Valley lies approximately one-half mile north of the landfill site. Mason Creek drains the portion of the May Creek Valley directly north of the landfill and flows east as a tributary of Issaquah Creek.

3.1.2 Soils and Geologic Units

The near-surface geology of the Puget Lowland is dominated by sediments associated with the advance and retreat of the icesheet associated with the Vashon Glaciation. As this icesheet advanced over the Puget Lowland, it deposited a random mixture of clay, silt, sand, and gravel with little internal stratification referred to as glacial till. Fresh, unweathered glacial till is usually very dense and resistant to erosion.

As the icesheet advanced and then retreated it deposited sediments of widely varying grain sizes that then mixed with water melting from the glacier to form a broad plain of well graded silt, sand, and gravel deposited in and surrounding glacial meltwater channels. Advance outwash comprises silt, sand, and gravel that in places is well stratified. Outwash is typically a dense material.

3.1.2.1 Cedar Hills

The following descriptions of soils and geologic units are summarized from information contained in the Site-Wide Hydrogeologic Report (CH2M HILL and UES 2004) and the Area 7 Hydrogeologic Report (HDR 2008). Previous studies of CHRLF site geology, hydrogeology, and hydrology prepared before 2004 are identified in the Site-Wide Hydrogeologic Report. Explorations at CHRLF have identified seven primary soil and geologic units at the site. Listed from youngest at the surface to oldest at deep bedrock, these units are: 1) surface deposits, fill, and waste, 2) recent alluvium, 3) recessional outwash, 4) Vashon till including ice contact deposits, 5) advance outwash, 6) pre-Vashon deposits (e.g., silts and clays), and 7) sedimentary bedrock (see Table 2.1-1).

Table 3-1. General Geologic Sequence and Nomenclature.

Youngest	Modified land (Holocene); Qm	Fill, Waste
	Younger alluvium (Holocene); Qyal	Recent alluvium.
	Recessional outwash; Qvr (likely either Qvr1 or Qvr2)	Recessional outwash.
	Ice contact deposits; Qvi (likely Qvi1)	Stratified drift, ice contact deposits (including lacustrine ice contact deposits).
	Till; Qvt	Till, Vashon till (including lodgment till and ablation till).
	Advance outwash (Qva)	Pre-Vashon deposits: silty gravels, silty sandy gravels, gravelly silts, and gravelly sandy silts, with few discrete sand or silt interbeds.
	Pre-Fraser deposits (Qpf)	Pre-Vashon deposits: lacustrine sands and silts Pre-Vashon deposits: lacustrine of fluvial sands and silts Pre-Vashon deposits: alluvial gravels (includes alluvial fan, braided river, and braidplain deposits) Pre-Vashon deposits: fluvial gravels Pre-Vashon deposits: fluvial sands and silts
	Pre-Fraser deposits (Qtb)	pre-Vashon deposits: massive lacustrine or glaciolacustrine clays and silts.
	Renton Formation	Sedimentary Bedrock
Oldest	Tukwila Formation	

[a] See the Site-Wide Hydrogeologic Report (CH2M HILL and UES 2004) for descriptions of USGS map units.

[b] See Table 2.2-1 in the Area 7 Hydrogeologic Report (HDR 2008) for additional descriptions of CHRLF site sediment types.

Surface Deposits, Fill, and Waste

Topsoil covers areas adjacent to and within CHRLF, and fill and waste have been placed within the permitted landfill boundary. The topsoil is typically a dark brown to brown, loose and soft, silty sand and silt with organic plant material and occasional small, rounded gravel and a few cobbles. In general, these surficial soils are less than 10 feet thick. Fill includes past landfilled waste as well as materials placed for roads and beneath and surrounding landfill facilities.

Recent Alluvium

Recent alluvium includes peat and fine sand and silt with abundant organic material, deposited in stream channels, swales, and enclosed depressions.

Recessional Outwash

Recessional outwash below the recent alluvium consists of yellow-brown and brown silt, sandy silt, and silty sand deposited by wind (loess). It also includes brown and orange-brown gravel and sand deposited in old river channels and deltas beneath CHRLF.

Vashon Till Including Ice Contact Deposits

From the top down, the Vashon till at the site includes a highly weathered zone, a weathered zone, and an un-weathered zone. The highly weathered zone is brown and medium dense; the weathered zone is grayish brown and dense; and the un-weathered zone is gray and very dense. All three zones contain silty sand with various amounts of gravel, few cobbles (about 5 percent to 10 percent by weight), and a few boulders (about 1 percent to 5 percent by weight). The weathered and un-weathered till also contains lenses of silt and sand. Past CHRLF operations have removed much of the till under the active or closed areas of the landfill. Where the till has not been removed, the thickness varies from minimal in the northern portion to over 100 feet in the southern portion of the site.

Till has high shear strength and low compressibility. It is a competent material for foundations. In general, the material is weakly cemented. Temporary excavations with slopes as steep as 0.5H:1V (horizontal:vertical) are stable for a few months to a few years, and permanent excavations are stable at 2H:1V or flatter slopes. Till soil is a suitable, commonly used material for structural fill at the CHRLF. With its high density, weak cementation, and high fines content, till is especially suitable as an underlying material for the landfill as it provides good natural containment due to relatively low permeability and strong foundation conditions.

Advance Outwash

This geologic unit underlies till except in the northern portion of the site, where it is the material at the ground surface. The unit is primarily sand, silty sand, and sandy gravel with lesser amounts of rounded gravel, cobbles, occasional boulders, and inter-beds (separate layers) of sandy silt, silt, and silty clay. The thickness of the advance outwash on the site varies from over 100 feet in the north to less than 50 feet in the south.

Advance outwash, like till, has high shear strength and low compressibility, and is also a competent material for foundation support. Temporary excavations with slopes as steep as 1.5H:1V are stable for a few months to a few years and permanent excavations are stable at slopes of 2H:1V or flatter. Outwash soil is suitable for and commonly used as structural fill material at the landfill site. It contains fewer fines and is less moisture-sensitive than till.

Pre-Vashon Deposits

These deposits include coarse- and fine-grained materials with wood and other organic materials. The characteristics of these materials are not as well documented as those of the glacial sediments. However, because a thick (more than 100 foot) overburden of Vashon glacial sediments has buried the material for at least 14,000 years, these pre-Vashon soils are well consolidated, and have high shear strength and low compressibility. The deeper portion of these deposits may be below the regional groundwater table.

Sedimentary Bedrock

Sedimentary bedrock below CHRLF includes quartzose silt and fine sand with minor calcareous cement in siltstone or sandstone.

Physical Features of Subsurface Earth Materials at CHRLF

As discussed in the preceding subsections, the majority of subsurface earth materials at the landfill consist of glacially deposited and consolidated sediments. The subsurface materials consist primarily of sand and gravel that have low clay contents, and can, therefore, be moved and placed readily even in wet conditions. These sediments have high shear strength and low compressibility. The landfill, therefore, has strong and stable foundation conditions. During the excavation of new landfill cells, the excavation sidewalls are generally stable for temporary cuts with slopes as steep as 0.5H:1V. The combination of this high soil stability and the existing leachate collection system in the landfill body, which keeps the solid waste and leachate drainage materials relatively dry, creates a very stable base. The presence of the stable base provides a high level of short-term and long-term stability for the landfill, its slopes, and surrounding infrastructure.

3.1.2.2 Renton Site

The dominant geologic unit underlying the Renton site as mapped by the Washington Department of Natural Resources (WDNR) is undifferentiated Vashon glacial outwash (WDNR 2002). The following sections describe surface soils as well as underlying geology at the site.

Surface Deposits

Fill material at the Renton site includes fill materials placed for roads, parking lots, and facilities. In general, these surficial fill materials are less than 10 feet thick. Surface soils at the Renton site are mapped as Arents, Everett material at the very north end of the site, and Pits on the remainder of the site (USDA 2019). Arents, Everett material is a gravelly sandy loam up to 8 inches thick underlain by very gravelly coarse sand to 60 inches. This soil is described as somewhat excessively drained and formed from basal till parent material. Pits soils are associated with gravel borrow pits formed in glacial till or similar material.

Vashon Undifferentiated Outwash

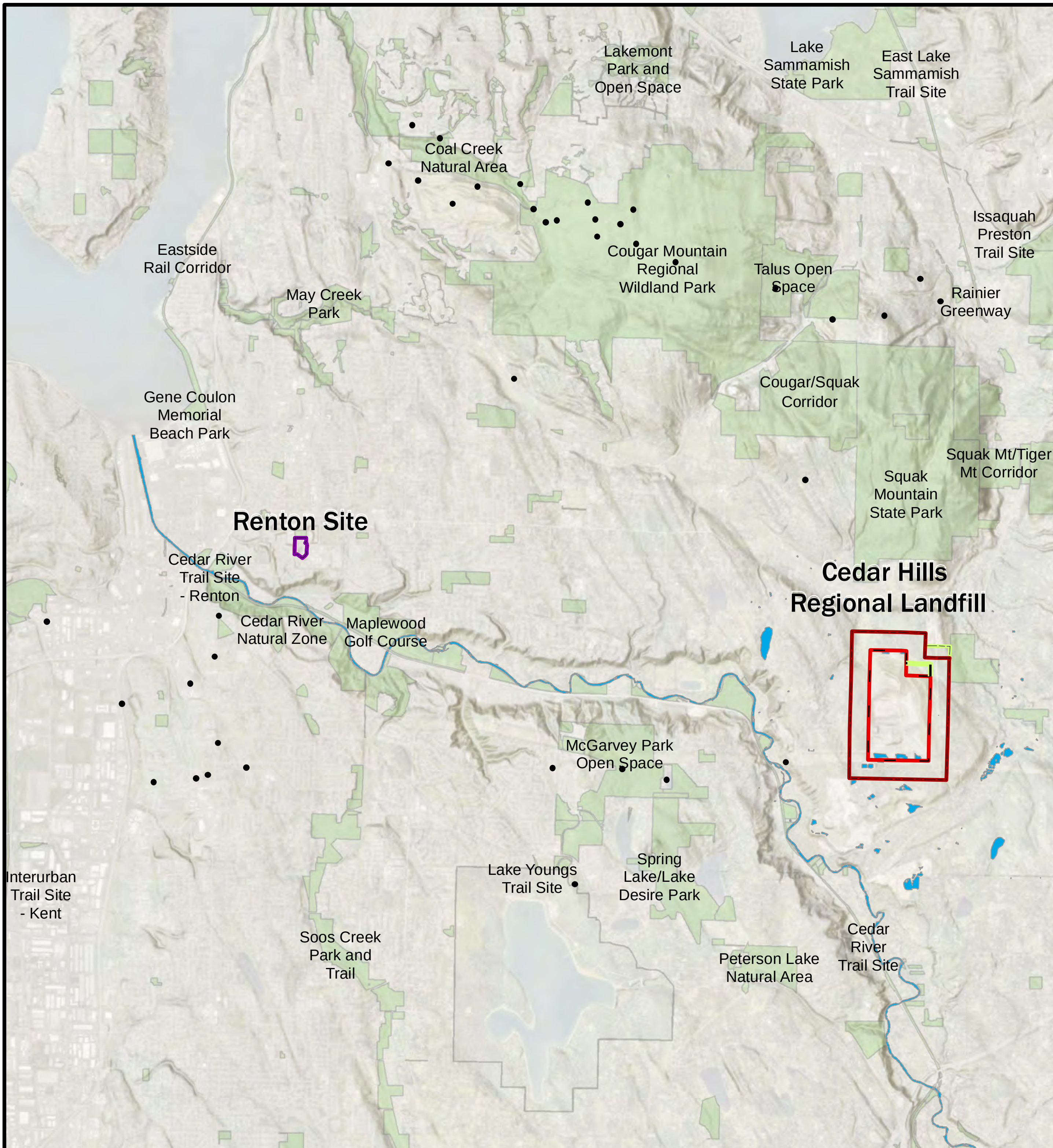
Undifferentiated Outwash underlies the Renton Site and consists primarily of recessional glacial outwash and proglacial (i.e., in front of the margin of a glacier) stratified sand, gravel, and cobbles. This geologic unit may also include advance glacial outwash as well as minor silt and clay interbeds deposited in delta, ice-contact, breach, and meltwater stream environments (WDNR 2002). This material has proven to be a stable and competent foundation supporting the existing Renton Transfer Station.

3.1.3 Environmentally Sensitive Areas

King County maintains an inventory of Environmentally Sensitive Areas within the County that is available online for review via the King County iMap Interactive Mapping Tool at <https://www.kingcounty.gov/services/gis/Maps/imap.aspx>. (King County 2019a).

3.1.3.1 Coal Mine Hazards

King County iMap identifies potential coal mine hazard areas in the Maple Valley Heights area and on the north side of Cedar Mountain (i.e., the Cedar Mountain Mine), approximately one-quarter mile to the southwest of CHRLF, and approximately one-half mile southeast of the Renton site, south of the Cedar River (King County 2019a). The Washington Geologic Information Portal similarly identifies the same historical coal mines in the vicinity of CHRLF and the Renton site (WDNR 2020a). The iMap and WDNR mapping is based on earlier detailed geologic investigations of the surrounding area by Vine (1969) and Walsh (1984). A study of Geology and Coal Resources of Central King County similarly identifies coal reserves and historical mining at Grand Ridge and Cedar Mountain. The areas described and mapped closely resemble those mapped in King County iMap (Walsh 1984). No coal mine hazard areas are identified adjacent to or beneath CHRLF or the Renton site (King County 2019a; Vine 1969; Walsh 1984; WDNR 2020a).



Legend

- Coal Mine Location
- Renton Site Boundary
- Cedar Hills Regional Landfill
- Waterbody
- Park
- Proposed Landfill Property Line (ALT. 3)
- Proposed 1000ft Buffer (ALT 3.)
- Existing 1000ft Buffer

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 3-1.
Coal Mine Locations Cedar Hill Regional Landfill and Renton Site.

N

0 3,800 7,600 15,200 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 3\Figure3_1_CoalMines_.mxd (8/11/2020)

3.1.3.2 Landslides and Landslide Hazards

No historical landslides or landslide hazard areas are identified adjacent to or at CHRLF or the Renton site (King County 2019a; WDNR 2020a).

3.1.3.3 Steep Slope Hazards

Steep slope hazard areas, defined using the following King County criteria (King County 2019a), are located at CHRLF:

- Steep slopes are defined as slopes greater than 40 percent grade (about 21 degrees slope) and greater than 10 feet high. Steep slopes are regulated as critical areas through the King County Zoning Code (21A.24) and development on or near steep slopes may be subject to restrictions.

Slope stability at CHRLF under both static and seismic loading conditions has been evaluated, including the northwest and northeast areas. The evaluation was completed to determine design requirements to achieve acceptable factors of safety. The analysis concluded that the computed factor of safety for the static condition was greater than the standard minimum design value of 1.5 for both the northeast and northwest areas and for all cases analyzed. Factors of safety computed for the seismic loading condition were less than 1.0 using the prescribed physical parameters but could be increased to 1.0 with relatively minor increases in assumed liner and waste strength (Golder 2015).

No steep slope hazard areas are mapped at the Renton site (King County 2019a).

3.1.3.4 Liquefaction Hazards

Liquefaction occurs when vibration or shaking of the ground increases pore pressures in saturated silty and sandy subsurface layers to result in a near total loss of shear strength in these layers. Liquefaction can result in the expulsion of sediment at the ground surface (i.e., sand boils), extensive ground settlement or heaving, horizontal land displacement (i.e., lateral spreading), and localized flooding. In general, materials susceptible to liquefaction include saturated, loose to medium-dense sands, particularly those below the water table.

CHRLF is mapped on the Washington Geologic Information Portal as having a high liquefaction susceptibility, likely due to the presence of layers of daily cover materials and municipal solid waste (WDNR 2020a). However, the risk of liquefaction at CHRLF is actually very low for the following reasons (HDR 2017):

- The waste has little or no susceptibility to liquefaction because the leachate (i.e., water) levels within landfill cells are controlled by active pumping and gravity drainage to prevent saturation of waste and fill layers. This control prevents leachate from accumulating higher than 1-foot above the bottom of the lined cells according to the landfill design.
- The regional aquifer water is at least 100 feet below the bottom of the landfill such that sediments below the landfill are not saturated.

- Any water trapped within the landfill body will not build up pore water pressure because refuse is very porous and well drained such that any excess pore water pressure generated during an earthquake can be expected to quickly dissipate.
- Any locally perched groundwater layers encountered during landfill development will be drained by interceptor drains. A perched water table is an accumulation of groundwater located above a water table in an unsaturated zone. The groundwater is usually trapped above a soil layer that is impermeable and forms a lens of saturated material in the unsaturated zone.
- The soils beneath the landfill are dense and highly consolidated, and thus not subject to liquefaction, regardless of groundwater conditions.

The Renton site is classified as having a low liquefaction susceptibility (Palmer et al. 1994).

3.1.3.5 Seismic Hazards

The CHRLF and the Renton sites are located in a seismic impact zone as defined by WAC 173-351-130(6) because they are located in the seismically active Puget Sound region. Seismic hazard analysis for landfill design considers all of the known and potential earthquake sources that could affect the CHRLF and Renton sites. However, King County's inventory of environmentally sensitive areas does not map any specific seismic hazard areas on or adjacent to CHRLF or the Renton sites (King County 2019a). A discussion of seismic hazards and earthquake risk is provided in the following sections.

Faults and Folds

The geological structure of the areas surrounding the CHRLF and the Renton sites has been investigated by geologists and geophysicists from US Geological Survey (USGS), WDNR, and academic institutions (e.g., University of Washington). The Seattle Fault Zone (SFZ) is a major fault zone identified in the central Puget Sound. The SFZ consists of a series of closely spaced east-west faults. The exact location of the SFZ faults has various interpretations because there are few clear surface features to readily mark their locations. In particular, the locations of individual faults of the SFZ at its eastern end near the CHRLF and Renton sites are not well defined. Mapping by the USGS, reported in research papers, and by WDNR show the closest location of the SFZ to the CHRLF from about 1 mile (WDNR 2020a) to 4 miles (USGS 2014).

The SFZ was analyzed for two potential hazards to CHRLF and Renton sites: a surface rupture hazard and the strength of strong ground shaking (i.e., earthquake ground motions) during an earthquake on the SFZ. For the assessment of fault rupture hazard for this EIS, the closer WDNR location is adopted. For the calculation of earthquake ground motions, the USGS location is used because the USGS National Seismic Model incorporates all of the mapped east-west faults of the SFZ. Modern studies demonstrate that earthquake ground motions show little variation for sites within about 5 miles of the fault generating the earthquake.

No maps, however, indicate that any SFZ traces underlie the CHRLF and Renton sites, the CHRLF landfill footprint, or locations within 200 feet of either the CHRLF or the Renton site. Accordingly, the CHRLF and Renton sites are not subject to surface fault rupture hazards associated with the SFZ.

Other faults and folds that are associated with coal mining have been identified in the region. Research indicates that local geological faults are associated with the past minable coal layers (Vine 1969). For example, a major northwest-striking fault is mapped to the west of the Cedar River as are a number of folds in rock along the Cedar River and areas to the west of the river. These features are more than three-quarters of a mile west of the landfill.

Landfill units at CHRLF must comply with the fault area location criterion of WAC 173-351-130 (5), which requires that “new MSWLF units and lateral expansions will not be located within 200 feet of a fault that has had displacement in the Holocene time [last 11,700 years]” (HDR 2017). Geomorphic investigations to identify potential surface geologic structures, including stratigraphic analysis based on subsurface borings completed at CHRLF, concluded that there is no discernable evidence for surface fault rupture or other geological structural discontinuities beneath the landfill footprint during the last 15,000 years (HDR 2017). Accordingly, the CHRLF site is not located within 200 feet of a Holocene-active fault.

Because CHRLF is located in a seismic impact zone, and to comply with the requirements of WAC 173-351-130(6), all landfill containment structures, including liners, leachate collection systems, and surface water control systems are designed to withstand certain seismic conditions that correspond to earthquake ground shaking with an approximate 2,475-year return period. This is a more protective standard than used to design bridges and other structures for life safety (i.e., a 475- to 1,000-year return period) to reflect the potential risk to human health and the environment if landfill environmental control systems are compromised due to an earthquake.

Earthquake Risk

The size and intensity of an earthquake and its effects are measured in several ways. The Washington Geologic Information Portal and the WDNR (2020a) provide information on scenarios for earthquakes of different origins and intensities in the Puget Sound area. The moment magnitude scale (M) is a measure of an earthquake’s *size* and amount of energy at the source, with the largest recorded earthquakes on earth exceeding a moment magnitude of M9. The M scale is like the Richter scale that many people are familiar with, but the M scale is more accurate and more commonly used.

The *intensity* of ground shaking at a particular location resulting from an earthquake is measured by the Modified Mercalli Intensity Scale (MMI). The MMI scale describes how people experience the earthquake shaking and its qualitative effect on structures and their contents.

While an earthquake has a single magnitude that describes energy released by the earthquake at its source, the intensity of shaking experienced by people depends on a number of factors, including the earthquake magnitude, the distance the person is from the earthquake source, and the underlying near-surface geologic materials. The MMI scale ranges from MMI 1 (shaking not felt) to 10+ (extreme shaking felt). An MMI of 7 is very strong shaking accompanied by nonstructural damage, while an MMI of 8 is severe shaking but only moderate damage to well-engineered structures.

The CHRLF and the Renton site are located in the Puget Lowland, a region with a substantial seismic hazard. The largest historic earthquake recorded in the Puget Lowland was an M6.75 and occurred in 1949 with an epicenter in the Nisqually area near Olympia (Golder 2020). Recent research indicates that the SFZ has experienced at least four surface ruptures indicating moderate to large earthquakes that originated on the SFZ in about the last 3,500 years (Nelson et al. 2014) with the most recent between 380 and 940 years ago. Mapping (WDNR 2020a) indicates that an earthquake on the Seattle Fault could have an intensity of MMI 8 at the CHRLF and Renton sites. More detail is available Appendix C.

Earthquake recurrence in the Puget Lowland is also influenced by the Cascadia Subduction Zone (CSZ), where the ocean crust off the Pacific Northwest coast is sinking beneath the North American continental plate approximately 70–100 miles off the Pacific Coast shoreline. The CSZ has four segments, with the Juan de Fuca plate off the coasts of Washington and Oregon being the segment located closest to CHRLF. The magnitude of an earthquake located along the CSZ varies depending on how many sections of the plate boundary fault are involved, the depth and location of the earthquake epicenter, and the amount of seismic displacement. A large earthquake in the Juan de Fuca plate section could be up to M9.1 with a recurrence interval estimated at 466 and 1555 years. A large earthquake along the entire Cascadia subduction zone could be up to M9.3 with a recurrence interval estimated at 611 and 2037 years (Rogers 1988; WGCEP 2003).

The USGS simulated the impact of a size M9.3 worst-case scenario earthquake and developed shake maps for the region that show an MMI 6 earthquake intensity in the area of the CHLRF and the Renton sites (USGS 2020). An MMI 6 earthquake intensity would produce strong shaking and slight damage to plaster and drywall.

The seismic design of landfills is governed by the requirements of RCRA Subtitle D (40 CFR 258). These regulations require evaluating risks associated with earthquakes as well as how the waste itself affects energy transmitted through the landfill and the impacts of an earthquake. The seismic hazard threshold is an earthquake ground motion with a 90 percent probability of not being exceeded during a 250-year period (or a ground motion with a 10 percent probability of being exceeded in a 250-year period) also referred as the average earthquake ground shaking level expected with a return period of 2,475 years. This is the same maximum considered earthquake shaking level for life-safety design of commercial and residential buildings intended for human occupancy.

Seismic Analyses Completed for CHRLF

A detailed study to develop seismic design criteria at CHRLF was performed in 2008 for the Area 7 development. The study used a mean peak horizontal, firm-ground acceleration (PGA [g]) of 0.56 g based on USGS 2002 National Seismic Hazard Map for the CHRLF area (Golder 2008). The major contributor to the mean PGA of 0.56 g was from an M 7.2 earthquake located on the reverse-slip SFZ about 4.5 mi (7 km) from the CHRLF site (HDR 2017). Both Area 6 and Area 7 designs used an approach suggested by United States Environmental Protection Agency (EPA) that applies one-half of the mean peak horizontal, firm-ground acceleration (PGA) as a pseudo-static horizontal load for the assessment of landfill slope stability. The one-half value is applied because the PGA is an instantaneous peak, and the average acceleration experienced over the full duration of earthquake shaking is substantially lower. This approach is the standard of practice in the landfill and geotechnical earthquake engineering industry. The reduction in PGA is prescribed by code and recognized by the Federal Highway Administration (Seismic Design – FHWA-NHI-11-032, 2011) and the EPA office of Research and Development (USEPA 1995).

If the results of the seismic stability analysis using the pseudo-static horizontal acceleration equal to one-half the PGA indicate a factor of safety equal to or greater than 1.0, the stability is considered acceptable and no movement is expected. If the factor of safety is less than 1.0, deformation analyses are performed to estimate the amount of movement; relatively small displacements up to 12 inches can often be accommodated by the cover or liner systems.

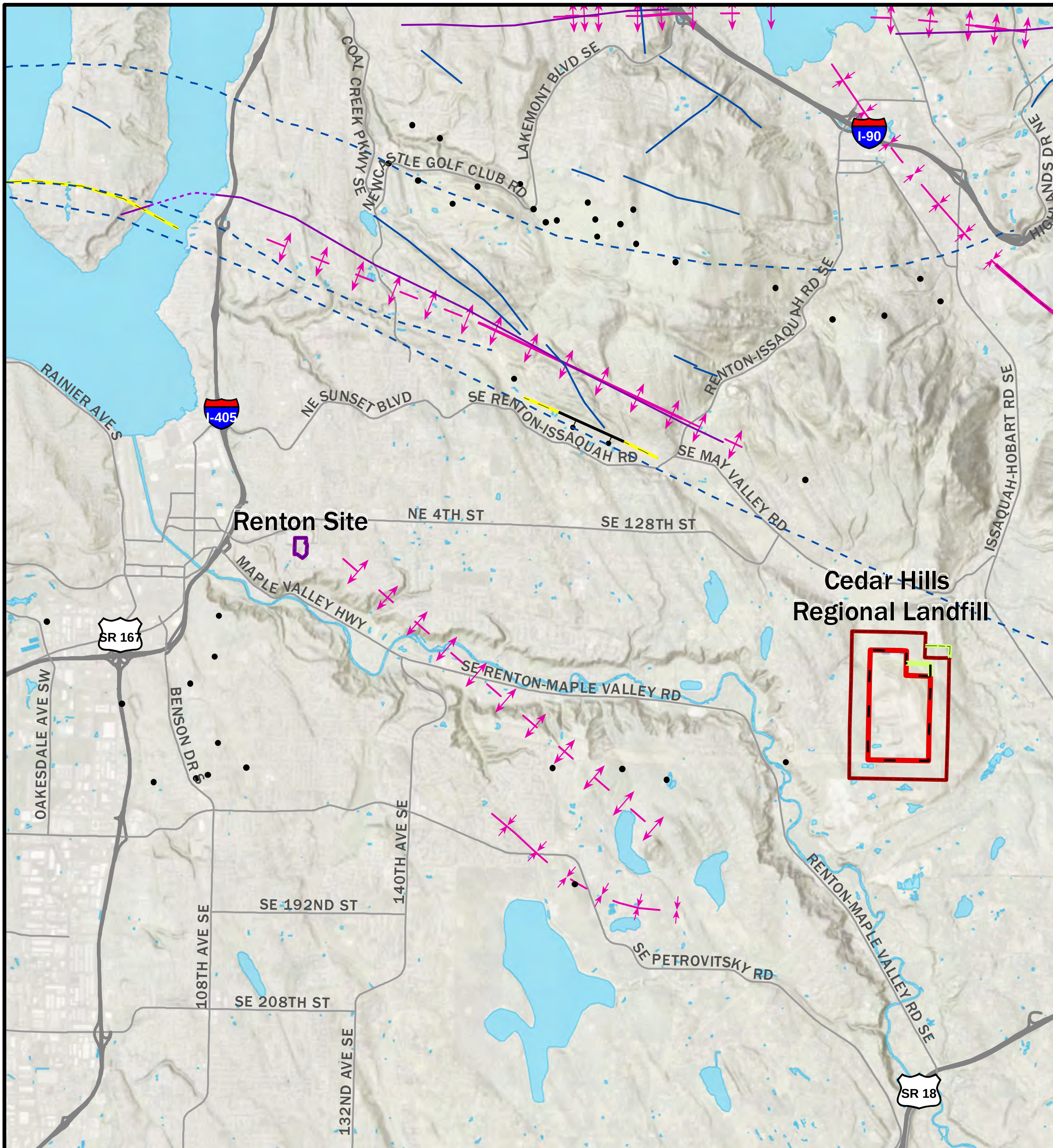
In 2015, to support site development alternatives, slope stability analyses were performed for both static and seismic (during an earthquake) cases (Golder 2015). As with the design of Area 6 and Area 7, the same pseudo-static horizontal acceleration value used in 2008 was used in the analysis to support site development alternatives (Golder 2008; Golder 2015).

In 2016, a deformation analysis was performed to evaluate the stability of the compacted soil liner (CSL) and geosynthetic clay liner (GCL) systems later installed in Area 8 (HDR 2017). The analysis considered a range of different magnitude earthquakes from moderate to large (M5.0 to 7.8) and great (M8.0 to 9.2) that could occur along the CSZ and affect CHRLF. The analysis concluded that the refuse system, including the liner, leachate collection system, landfill gas collection system, and related systems are expected to be stable even during very strong shaking associated with a 2,475-year return period, great magnitude earthquake (HDR 2017). The analysis also concluded that groundwater did not affect the results because it is well below the elevation of the refuse.

In 2018, the USGS updated its National Seismic Hazard Map (NSHM) with an updated horizontal peak ground acceleration (PGA) of 0.58 g for the CHRLF site (USGS 2020). The PGA of 0.58 g incorporates the ground shaking hazard from all earthquakes that could impact CHRLF (e.g., along the CSZ or SFZ, or in the Nisqually area). While an M 9.3 earthquake along the CSZ will produce significant strong ground shaking, the CSZ is located much farther away and represents less hazard than deep earthquakes originating below the site or along the SFZ.

In 2020, King County revised the CHRLF seismic analysis completed in 2008 to evaluate the change in PGA based on additional studies and updates to the NSHM (i.e., USGS 2002 to 2018) to determine potential seismic effects of the action alternatives at CHRLF (Golder 2020). This analysis concluded that the PGA increase from 0.56 g to 0.58 g is not considered significant with respect to the slope stability analysis results. However, the earthquake associated with the PGA changed from an earthquake located on the SFZ to a deep Juan de Fuca inslab earthquake (e.g., similar to the 2001 Nisqually earthquake). This change reflects the improved knowledge of the SFZ earthquake history and the relative importance of the deep inslab earthquake ground motions to the seismic hazard of the Puget Lowland.

Appendix C, Seismic Design Criteria Update Technical Memo contains additional details about the 2020 analysis.



Legend

- Coal Mine Location
- Renton Site Boundary
- Cedar Hills Regional Landfill
- Existing 1000ft Buffer
- Proposed Landfill Property Line (ALT. 3)
- Proposed 1000ft Buffer (ALT 3.)
- Waterbody
- Highway
- Main Road

Active Faults*
- Inferred fault trace
- Visible fault trace

Active Folds*
- Concealed fold trace
- Inferred fold trace

Type of Fault*
- Normal fault, location accurate
- Normal fault, location concealed

Type of Fold*
- Anticline, location accurate
- Anticline, location concealed
- Syncline, location accurate
- Syncline, location concealed

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.
SOURCE: WASHINGTON GEOLOGIC INFORMATION PORTAL JULY 2020.

Figure 3-2. Historical Coal Mines, Faults, and Folds Located near Cedar Hills Regional Landfill and Renton Site.

N

0 3,800 7,600 15,200 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 3\Figure3_2_500kFaultsFolds.mxd (8/11/2020)

3.1.3.6 Erosion Hazards

An erosion hazard area is mapped along streams with steep slopes at the northwest corner of CHRLF (King County 2019a). However, the slopes and grounds along the CHRLF boundaries, including areas at the northwest corner of the landfill, are protected with grassy vegetation. Dense forest with thick undergrowth dominates the areas beyond the developed landfill areas. Therefore, soil erosion at the boundaries of the CHRLF, including the northwest corner, and subsequent sediment transport off site are practically non-existent. Minor erosion in the landfill areas occurs occasionally during heavy rains in wet winter months, but CHRLF operations staff typically repair eroded areas within hours to a few days. These repairs include adding rock cover, placing hydroseed or straw over exposed soils, or other standard methods. KCSWD uses these and other BMPs in its operations at the landfill (see Section 3.3 below). These BMPs consist of policies and procedures designed to minimize erosion, control sedimentation, and protect water quality.

Ground cover at the Renton site consists mostly of a mix of grasses, shrubs, and trees, and asphalt pavement at the very north end of the site. Erosion at the relatively flat, currently undeveloped site is minimal.

3.2 Environmental Impacts

3.2.1 Direct and Indirect Impacts

3.2.1.1 No Action Alternative

Under the No Action Alternative, there would be no additional adverse environmental impacts. Ongoing impacts related to current landfill operations would continue as planned/permitted under the No Action Alternative. A total of approximately 11 million cubic yards of fill material (i.e., waste) would be placed in already permitted portions of the landfill.

3.2.1.2 Impacts Common to All Action Alternatives

The following subsections describe impacts associated with landfill development under the three Action Alternatives. Note that Area 7 will be permanently closed during the summer of 2022 and no additional landfill development is proposed.

Design and BMPs

The evaluation of impacts to earth assumes that well-recognized and proven engineering methods and techniques would be used to design and construct each of the action alternatives. In particular, the design and construction would consider the following:

- Potential seismic hazards associated with landfill design and the stability of landfill areas as required under RCRA Subtitle D (40 CFR 258).
- Effects on landfill mass stability due to the increase of overall landfill height.

- Potential for additional waste to cause hydrostatic pressure build-up resulting in an increase in demand on the internal drainage, and/or leachate collection system.
- Differential settlement as solid waste decomposes at varying rates within landfill cells.
- Seismic conditions and other environmentally sensitive conditions of the area.
- BMPs to control erosion and sedimentation during both construction and operation would be used to minimize the impacts of each action alternative.

3.2.1.3 Action Alternative 1

Impacts associated with Action Alternative 1 as a result of landfill development, relocating landfill support facilities, and buffer modifications, are discussed in the following subsections.

Landfill Development

Under Alternative 1, after relocating the support facilities, approximately 1,513,000 million cubic yards of soil would be excavated from the footprint of proposed Area 9, and the soil would be exported to other public or private entities needing soil. As soil is needed for operations, new soil would slowly be imported again for use on site as alternative daily cover.

Under Action Alternative 1, current and future landfill development in Areas 8 and 9 will continue to be designed to reduce hazards by adhering to the federal and state design standards that are in place at the time the design takes place. Therefore, the expanded or new landfill refuse areas are unlikely to pose any significant risks from the known seismic hazards. Design of the landfill cells will include analyses to confirm that the proposed geometry and additional weight of waste material will not result in failure of or through the foundation materials (i.e., the native glacial till).

Seismic Impacts

Under Action Alternative 1 seismic impacts and damage to the landfill systems are expected to be minimal based on studies of seismic hazards that are addressed in the landfill design. In the event of an earthquake, King County staff would inspect the following: landfill and landfill systems (as soon as safe and accessible) to identify any potential displacement of waste; integrity of slopes and the landfill cover system; piping that conveys leachate, stormwater, and landfill gas; stormwater ponds and leachate lagoons; roads, buildings, and other support facilities. KCSWD would coordinate repairs as soon as practicable.

Stability analysis conducted in 2002 for the Area 6 development considered worst case conditions, including deterioration of the cross stitching in the geosynthetic clay liner beneath the waste more than 100 years after landfill closure. The analysis calculated that the waste mass in Area 6 could be displaced up to 30 inches under seismic loading induced by the design earthquake (Golder 2008). Similar analysis completed in 2008 for the Area 7 development, which is similar in geometry to Area 6, concluded that the waste mass in the landfill could be displaced from 8.5 to 10.6 inches (Golder 2008). Even if displacement of waste occurs, the mass in place is expected to remain within the footprint of each landfill cell.

Stability analysis conducted in 2017 for the Area 8 development concluded that permanent displacements of the east and west slopes of Area 8 could vary from 0.1 to 1.1 feet and displacement of the south face could vary from 0.6 to 4.6 feet, but the landfill would be stable after shaking (HDR 2018). These analyses concluded that the calculated displacements are minimal and within the allowable factor of safety. As previously concluded, even if displacement of waste occurs, the mass in place is expected to remain within the footprint of each landfill cell.

Additionally, results of the 2020 stability analysis (see Appendix C) concluded that there has been only a minor 4 percent increase in the 2,475-year return period mean PGA for the CHRLF site. Despite two major revisions (2008, 2014) and one minor update (2018) to the USGS NHSM since completion of the 2008 analysis, a change in total hazard of less than 5 percent is considered to be within the normal uncertainties with current earthquake hazard models and of little or no engineering significance for slope stability assessment at the CHRLF.

Landslides/Slope Failure

Under Action Alternative 1, no slope failures are expected to occur under static or seismic loading conditions. Under normal landfill operations there would be no ground movement.

The analysis of potential failure of constructed slopes at the landfill accounts for the materials comprising the landfill cover system, soil saturation, and the drainage layer capacity and assumes that slopes will periodically receive significant rainfall. Comprehensive stability analyses have been performed to assess the potential for ground movement under static (i.e., normal landfill conditions) and seismic (i.e., earthquake) loading conditions. Landfill geometry and materials are selected to provide acceptable factors of safety against movement (i.e., factor of safety >1.5 for static loading and >1.0 for seismic loading). The design considers predicted seismic loading conditions and, if necessary, permits landfill movements within acceptable levels as established by the US EPA and standard industry practice.

Displacement analysis has been performed for CHRLF to confirm that modeled seismic displacements of the landfill mass and slopes (i.e., landslides) are within allowable factor of safety limits. A 1995 seismic stability study undertaken for Area 4 (CH2M Hill 1995) concluded that, for sliding on the base liner involving the whole landfill mass, average deformations during strong ground shaking with a 2,475-year return period would range from 4 to 10 inches, with maximum deformations of 14 inches. These values are generally within the limits of 6 to 12 inches considered acceptable for design of a geosynthetic liner system (Seed and Bonaparte 1992). Sliding of the cover resulting in less serious consequences than sliding on the base liner, would range from less than 4 inches to 60 inches, depending on a variety of factors including whether the slope is permanent or temporary. Cover sliding would involve only the cover soil layers and not involve refuse layers or the gas and leachate collection systems (CH2M Hill 1995).

Analysis performed in 2017 for the Area 8 Development using the US Geologic Survey computer program SLAMMER (Seismic Landslide Movement Modeled using Earthquake Records) showed that acceptable factors of safety are attained with slope friction angles of 33 degrees, which is achievable with the existing soil and geosynthetic cover materials (HDR 2017).

The design slope steepness for areas where waste will be placed will remain the same as existing slopes at CHRLF. Slope angles will not be increased or made steeper. The design slope steepness is also less than the value of "steep slopes" per King County criteria (King County 2019a), which is defined as being greater than 40 percent grade (about 22 degrees slope) and greater than 10 feet in height.

Minor sloughing of slopes may occur during seasonal storm events and during seismic events. Soil sloughed from slopes would collect in drainage ditches that run parallel to the toe of slopes, and slough areas would be repaired promptly (i.e., by regrading and reseeding sloughed areas to re-establish vegetation) as part of ongoing landfill maintenance activities (HDR 2018).

Liquefaction

Under Action Alternative 1, liquefaction is not expected to occur in soils or in waste material during earthquake shaking. The foundation soils beneath the landfill include dense to very dense Vashon Till, Advance Outwash, and Pre-Vashon deposits with high strength and low compressibility. These soils are not saturated, loose to medium dense sands that are typical of soils susceptible to liquefaction from ground shaking. The waste material is also not susceptible to liquefaction because it is a very heterogenous material with no significant amounts of clean sand.

In addition, although CHRLF is mapped by the Washington Geologic Information Portal as having a high liquefaction susceptibility, the water content in the waste material is actively managed by gravity dewatering to the leachate collection system. Lining systems are evaluated for failure during design based on the design-level earthquake shaking and assuming a worst-case scenario with the waste being saturated. The deformation analysis is discussed in Section 3.1.3.5. Excess water buildup in waste cells is not considered possible because liquid levels in the bottom of cells are managed by gravity or pump systems that prevent water levels from exceeding one foot of head above the bottom lining system, as required by Department of Ecology regulations. The leachate collection system also includes pumps in the currently active Area 8, and is designed to manage Precipitation falling that infiltrates into the cell until the final cover system is installed.

Interim cover systems are designed to reduce infiltration of stormwater, minimize contamination of surface water runoff, provide physical containment of the waste, prevent contact with the waste by wildlife, and allow basic landfill gas collection until the final cover system is constructed. The interim cover is not intended to replace the final cover, but rather it is an enhanced control system during operations to minimize environmental impacts to the extent practicable. Interim covers have been used successfully at CHRLF.

Leachate can occasionally accumulate within perched zones in landfill cells. If a leachate seep is identified during routine inspections of the final cover system, KCSWD takes immediate action to drain the leachate and repair the drainage system.

The regional aquifer groundwater is at least 100 feet below the bottom of the landfill. The refuse itself is very porous and pore water pressures generated during earthquake shaking will quickly dissipate. Any perched groundwater encountered during landfill development will be drained by interceptor drains installed during construction of the landfill cells.

Collection and Conveyance System Impacts

Facilities such as CHRLF are designed and tested to meet federal and state codes that take into account earthquakes and other hazards, to ensure that stringent factors of safety are met. Waste cells at the landfill are designed to prevent movement of the waste during an earthquake, which also limits damage to liners and piped systems within the landfill. Furthermore, structures above ground are designed to meet the earthquake code and to be readily removed from service and repaired if necessary. The piping used for landfill gas collection systems is designed and specified to withstand breakage from the weight of soil and refuse placed above it. The pressure of operating equipment on pipes decreases with depth because the added weight is distributed over a broader area. As waste is added to old cells, landfill gas extraction will continue and new landfill gas collection piping including more vertical collection wells will be installed to prevent lateral migration of landfill gas toward the landfill boundary.

Erosion

Under Action Alternative 1, minor soil erosion is expected to occur during construction. Soil erosion during construction will be managed using standard BMPs employed as specified in the site-specific SWPPP and per the requirements of the CSWGP issued by Ecology. Soil erosion after construction will be minimized using similar BMPs (i.e., maintaining vegetation on slopes) and repaired using the same methods currently employed as part of ongoing maintenance such as grading and reseeding to re-establish vegetation, or use of an alternative cover material compliant with WAC 173-351-100.

Minor excavation activities and impacts to earth may occur as a result of proposed incorporation of property near the northeast corner of CHRLF. Construction activities would include excavation for liner installation, environmental controls, and berm construction. Erosion will be managed during construction using BMPs, and post-construction erosion should be minimal to non-existent once vegetated cover is established along the site perimeter and over the landfill cover system.

Support Facility Options

The following subsections describe impacts associated with developing support facilities at the south or north areas of CHRLF, or at the Renton site.

South

The relocation of support facilities in the south end would include grading and fill placement to construct an approximately 33,000 square foot maintenance building, 25,000 square foot administration building, and relocated truck wash, scale house, and cat shack, as well as excavation and fill placement to build a new stormwater pond (0.74 acre). The buildings and foundations, paved parking areas, stormwater pond, and other features would be constructed on native glacial till and/or imported compacted fill. Approximately 19,000 cubic yards of imported fill would be placed and compacted, and three retaining walls to retain the fill material. The retaining walls would total 600 feet in length, with heights ranging from 4 to 26 feet tall, and be constructed along the south end of the development area. Local soil suppliers are expected to have adequate supplies to provide this fill material.

North

Relocating support facilities in the north would include grading and fill placement to construct an approximately 33,000 square foot maintenance building, 25,000 square foot administration building, and paved areas for truck and trailer parking, as well as excavation and fill placement to build a relocated 5-acre stormwater pond. The buildings and foundations, paved parking areas, stormwater pond, and other features would be constructed on native glacial till and/or imported compacted fill. Approximately 120,000 cubic yards of fill would be placed and compacted; no retaining walls would be constructed. Local soil suppliers are expected to have adequate supplies to provide this fill material.

Renton Site

Modification of the existing Renton site would include site grading and placement of approximately 37,500 cubic yards of fill in an existing topographic low spot within a local ravine, and construction of an approximately 37,500 square-foot maintenance building and 28,000 square-foot administration building. The preliminary site design incorporates vertical clearances and building setbacks required to safely build and operate facilities beneath the existing high voltage power lines. In addition, three retaining walls totaling 2,725 feet in length, with heights ranging from five to 15 feet tall, would be constructed to retain the fill to create stable parking areas for tractor trailers and employee parking. Building foundations would be constructed on native glacial till or imported compacted fill. Local soil suppliers are expected to have adequate supplies to provide this fill material.

3.2.1.4 Action Alternative 2

Impacts associated with Action Alternative 2 are discussed in the following subsections.

Landfill Development

Impacts under Action Alternative 2 would be similar to Alternative 1, except that this alternative would not require construction of any additional embankments or retaining walls. As under Alternative 1, current and future landfill development in Areas 8 and 9 would adhere to stringent federal and state design standards and will be unlikely to pose any significant risks due to seismic hazards.

Seismic Impacts, Landslides/Slope Failure Liquefaction, and Erosion

Under Action Alternative 2, the impacts from seismic events, slope failure, liquefaction, and erosion would be minimal and very similar to Action Alternative 1.

Support Facility Options

Impacts associated with developing support facilities under Action Alternative 2 at the south or north areas of CHRLF, or at the Renton site, are the same as described under Action Alternative 1.

3.2.1.5 Action Alternative 3

Impacts associated with Action Alternative 3 as a result of landfill development, relocating landfill support facilities, and buffer modifications, are discussed in the following subsections.

Landfill Development

Impacts under Action Alternative 3 would be similar to Alternatives 1 and 2, except that landfilling would also occur in the northwest portions of Areas 2/3 and 4 to a height of 830 feet, and in the northeast portions of the Main Hill and Central Pit to a height up to 830 feet. In addition, an MSE wall would be built at the northwest corner of the landfill and wrap around the base of Areas 2/3 and 4 to provide structural support and seismic protection for the additional refuse that would be placed there. The approximate dimensions and configuration of the MSE wall are shown in Figure 3-1. A soil berm built at the base of the northeast corner would provide similar support. As under Alternatives 1 and 2, future landfill development in these areas would adhere to stringent federal and state design standards and would be unlikely to pose significant risks due to seismic hazards.

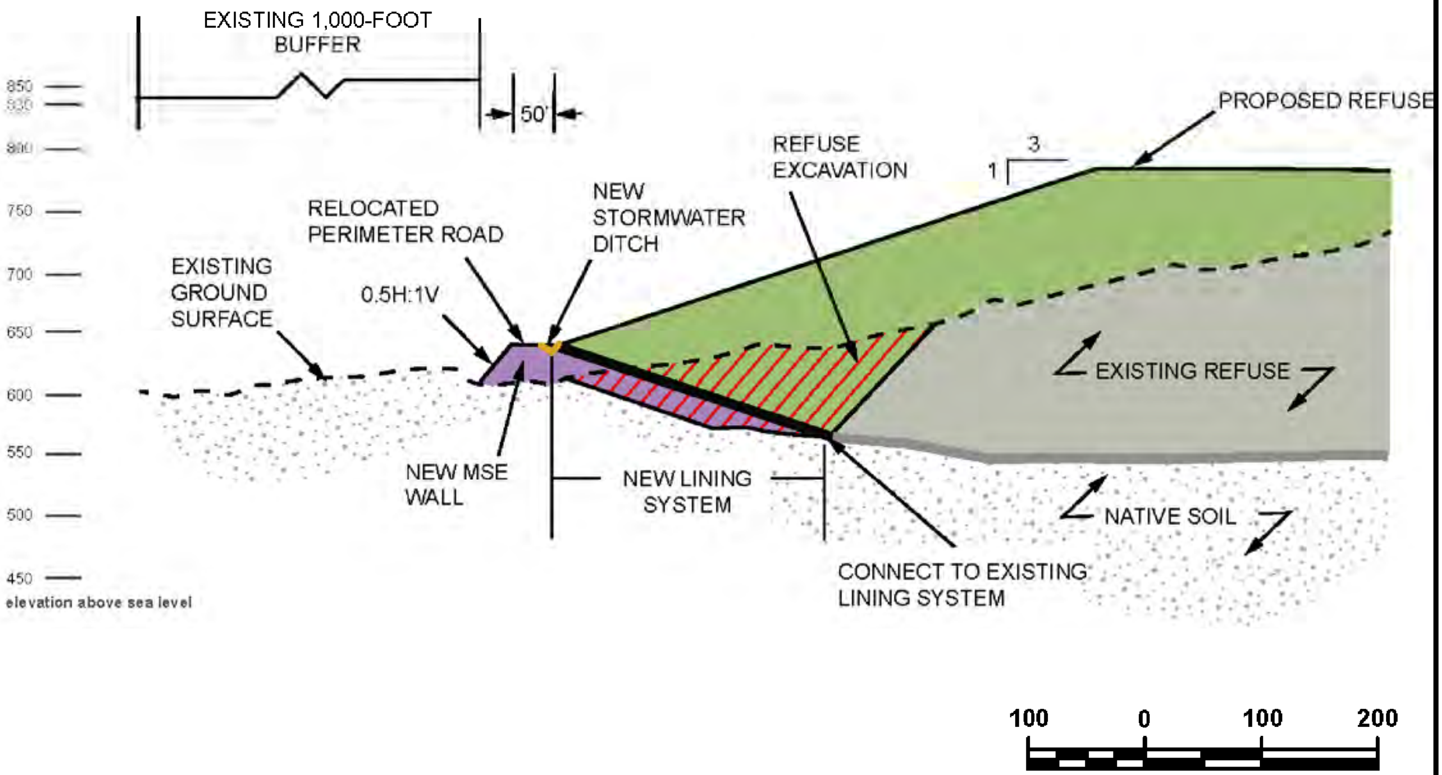


Figure 3-3. MSE Cross Section.

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 3\Figure3_3_MSE_Cross_SEction.mxd

Seismic Impacts, Landslides/Slope Failure, Liquefaction, and Erosion

Action Alternative 3 includes the use of MSE walls and soil berms in the northern areas of the CHRLF that utilize steeper slopes than those proposed under the other alternatives. These engineered structures would be designed in accordance with EPA guidance for seismic conditions with a minimum factor of safety of 1.0 for a design seismic event and a 1.5 factor of safety under static conditions. The stability of the MSE wall's interior slope is primarily a function of the shear strength of the material used to construct the wall. The exterior slope of an MSE wall would be reinforced with various geogrid elements and wire mesh facing. Its calculated stability includes the effects of the reinforcing elements and is based on the full height of the landfill behind the wall.

With these design standards to be used under Action Alternative 3, the impacts from seismic events, slope failure, liquefaction, and erosion would be minimal and very similar to those of Action Alternatives 1 and 2.

Support Facility Options

Impacts associated with developing support facilities under Action Alternative 3 at the south or north areas of CHRLF, or at the Renton site, are the same as described under Action Alternatives 1 and 2.

Based on the considerations discussed above, no significant impacts to earth during either construction or operation would be anticipated as a result of implementing any of the alternatives.

3.2.1.6 Indirect Impacts

The limited earth impacts from the landfill development and facility relocation activities at CHRLF and the facility relocation activities at the Renton site are unlikely to lead to additional projects or actions that would result in indirect impacts to earth. Existing sources of fill for development of the Renton site are adequate without the need for development of new supplies. No indirect impacts associated with landfill development or facility relocation options are anticipated for the CHRLF or Renton site with regards to earth

As discussed in Section 1.7, in order to compare the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046–the estimated year of capacity for Action Alternative 3. The impacts that would occur during these intervening years would not occur but for the proposed action selected and are therefore indirect effects.

For the No Action Alternative between 2028 and 2046, waste disposal could involve either waste export to a regional landfill or disposal at a WTE facility, which could be at the CHRLF site or another site. A regional landfill accepting waste from the County is likely to be an existing facility where earth disturbance has already occurred, so significant earth-related impacts associated with that landfill are unlikely to result from the County's waste export. Waste export may require development of an intermodal facility that could have earth impacts, although waste handled at such a facility would be enclosed within shipping containers and would therefore be unlikely to affect the surrounding environment; and the facility would likely be located in an industrial area that had already experienced pre-existing earth disturbance.

A WTE facility located at a previously undeveloped site could involve substantial soil disturbance and excavation. The extent of these impacts would be highly dependent on the specific facility location and design. The County's siting process to determine a location for a major facility such as an intermodal facility or a WTE would avoid sites with steep slopes and higher seismic risks.

For Alternatives 1 and 2, potential earth impacts that could occur after closure in 2038 and 2039, respectively, would be similar to those that could occur under the No Action Alternative. A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the 2019 King County Comprehensive Solid Waste Management Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

3.2.2 Cumulative Impacts

Activities associated with landfill development and facilities relocation, including those at the CHRLF and the Renton site, would contribute incrementally to overall past, present, and likely future impacts on earth locally and in the surrounding region due to ongoing development, but are not likely to be significant.

3.3 Mitigation Measures

As described in the preceding sections, adverse impacts on earth from implementing any of the action alternatives are mitigated by adhering to stringent federal and state design standards for landfill systems and implementing effective BMPs during construction and during post-construction operation and maintenance. No additional mitigation measures will be necessary.

Typical BMPs to control sediment erosion used at CHRLF, and those that would be implemented at the Renton site include the following:

- Control erosion at the source, when possible, in accordance with the 2016 King County Surface Water Design Manual (KCSWDM) (King County 2016) for CHRLF, or the Renton Surface Water Design Manual (RSWDM) (Renton 2017).
- Design and construct sediment ponds in accordance with Section D.4.5 of the KCSWDM.
- Intercept and convey surface water from disturbed areas to sediment ponds.
- Properly identify clearing limits before clearing.
- Provide perimeter protection (e.g., silt fence) downslope of areas to be disturbed before construction.
- Provide a location for stabilized construction entrances to limit the tracking of sediment from the construction area.
- Identify additional measures for wet-season construction. These may include covering stockpiled soil during the winter, hydroseeding, and runoff management.
- Inspect and maintain erosion and sedimentation control measures on a regular basis.

3.4 Significant Unavoidable Adverse Impacts

Based upon the analysis performed for this EIS, there would be no significant unavoidable adverse impacts to earth as a result of implementing any of the alternatives. Significant unavoidable adverse impacts are mitigated by adhering to stringent federal and state design standards for landfill systems and implementing BMPs during construction and during post-construction operation and maintenance.

4.0 AIR AND ODOR

This chapter describes how implementation of any of the action alternatives, including the facility relocation options, could affect air and odor in the vicinity of the CHRLF and the Renton site, compared to the No Action Alternative.

Three aspects of air quality are addressed: 1) criteria pollutants, which are air pollutants for which federal, state, or local agencies have established ambient air quality standards; 2) toxic air pollutants (TAP), which are air pollutants that have known, or suspected, human health effects but for which no air quality standards have been established; and 3) odor nuisance.

This environmental review determined that with mitigation, no significant unavoidable adverse impacts to air quality, including odor, would be anticipated at CHRLF or the Renton site during construction or operation of any of the alternatives, including the facility relocation options.

4.1 Affected Environment

4.1.1 Cedar Hills

Evaluation of the affected environment for air quality considers fugitive dust and other pollutants from operation of equipment on the landfill, erosion, and vehicle emissions; TAP from landfill gas and leachate; and potential odors from fugitive landfill gas emissions, leachate lagoons, and daily operations on the active face of the landfill.

Typically, landfill gas is about 50 percent methane and 50 percent carbon dioxide and water vapor, by volume. Landfill gas also contains small amounts of nitrogen, oxygen, hydrogen, non-methane organic compounds (NMOC), and trace amounts of inorganic compounds, some of which have strong, pungent odors. The NMOC include some TAP, which can cause adverse health effects in life-time exposure scenarios. Since 2010, landfill gas collected at the landfill has been primarily conveyed to the BEW gas-to-energy facility where the gas is processed into biogas and electrical power. Prior to the initiation of operation of the BEW facility in 2010, flares had been used to combust collected landfill gas. The landfill flares are now operated infrequently (during site-wide power outages or for testing and maintenance at BEW or the North Flare Station) and are an insignificant source of air emissions as the combustion of landfill gas in stack-tested flares destroys more than 99 percent of NMOC, including TAP). Chapter 8, Greenhouse Gas, provides additional detail on what happens to landfill gas once it is collected.

Leachate generated by the decomposition of waste or rainfall passing through active areas and into the waste mass is collected and sent to the leachate lagoons, where it is treated with aeration, and then is pumped to the KCWTD sanitary sewer system for further treatment at the Renton POTW and eventual disposal. Although aeration of the leachate helps to degrade the majority of TAP, volatilization in the lagoons releases some compounds into the air including ammonia and trace amounts of residual TAP.

Air quality is regulated through several agencies. The Federal Clean Air Act (42 U.S.C. § 7401) regulates criteria pollutants and TAP, while odor nuisance is regulated through county code and local air quality regulations.

40 CFR Part 60, referred to as the New Source Performance Standards and authorized under the Federal Clean Air Act, regulates operation of the CHRLF. The EPA is the jurisdictional agency and has delegated implementation of these standards to the states. The New Source Performance Standards include operational, monitoring, and reporting requirements that include periodic monitoring of the gas collection and destruction system and periodic monitoring of the surface of the landfill to determine if the requirement is being met that methane concentrations at the landfill surface not equal or exceed 500 parts per million (ppm).

Regulations for criteria pollutants are implemented by the Puget Sound Clean Air Agency (PSCAA) and include standards for six air quality parameters:

- particulate matter
- carbon monoxide
- sulfur oxides
- nitrogen oxides
- lead
- ground-level ozone

These standards are national and are established to protect human health.

Regulations for TAP are established on an industry basis and address specific compounds potentially emitted by the industry. The regulations for TAP are developed through coordinated efforts between the EPA, Ecology, and PSCAA.

Odor at solid waste facilities is regulated by PSCAA Regulation I and the Code of the King County Board of Health Title 10. These regulations prohibit odor that interferes with health and enjoyment of life or property beyond the facility boundary. The regulation of odor by these agencies is a qualitative evaluation and involves investigation of odor complaints.

4.1.1.1 Criteria Pollutants

Criteria pollutants that are relevant to the CHRLF include the following:

- Particulate matter which results primarily from fugitive dust produced when trucks and other vehicles travel on paved surfaces, when trucks and equipment operate on unpaved surfaces, and from particulate emissions from engines.
- Sulfur dioxide (SO_2), nitrogen oxides (NO_X), and carbon monoxide (CO) which are present in the exhaust from landfill-related vehicles and equipment.

PSCAA has primary jurisdiction over air quality in King County and authority to implement requirements promulgated by EPA through Title V Operating Permit. The CHRLF is located within an area designated by the EPA and PSCAA as an attainment zone for all criteria pollutants. This designation is given to areas within which the ambient standards for criteria pollutants have been met, using a continuous ambient air monitoring program year-round, operated independently by the state or by local agencies.

Particulate Matter (PM2.5 and PM10)

Federal air quality regulations implemented by PSCAA address two size fractions of particulate matter. PM10 is particulate matter (both solid particles and liquid droplets) that have an aerodynamic diameter of less than 10 micrometers, while PM2.5 is particulate matter with an aerodynamic diameter of less than 2.5 micrometers. The range of particles with diameters larger than 2.5 micrometers and smaller than 10 micrometers are commonly referred to as “inhalable coarse particles,” while particles 2.5 micrometers or smaller are commonly referred to as “inhalable fine particles.”

Ambient air quality standards for particulates are shown in Table 4-1 below.

Table 4-1. Dust Standards. Ambient Air Quality Particulate Standards.

Particulate Fraction	24-hour average (µg/m^3)	Annual average (µg/m^3)
PM10	150	No standard
PM2.5	35	12

µg/m^3–micrograms per cubic meter

A study has been conducted of the expected maximum emissions of particulates as a result of landfill construction and operation under the various alternatives, and it includes the results of dispersion modeling used to estimate future concentrations of particulates at offsite locations (see Appendix D, Air Quality and Odor Technical Memos).

Other Criteria Pollutants

Carbon monoxide from CHRLF-related traffic and equipment contributes minimally to regional CO levels. CO levels are a primary concern at congested intersections in urban and suburban areas. As discussed in the transportation section (Chapter 13), with recommended mitigation at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection, CHRLF traffic under any of the alternatives would cause no significant traffic impact, and CO is therefore not considered further in this section. Similarly, the emissions of sulfur dioxide and nitrogen oxides would minimally contribute to regional levels of these compounds. Hydrocarbons in fugitive emissions of landfill gas could contribute to ozone formation, but ground-level ozone is a regional issue and hydrocarbon emission at the landfill would contribute minimally to regional ozone levels. Lead is emitted to the air only in trivial amounts from landfill-related gasoline-powered construction or operations equipment.

4.1.1.2 Toxic Air Pollutants

Through WAC 173-460 (Controls for New Sources of Toxic Air Pollutants), the State of Washington regulates sources of 389 chemicals that are identified as TAP. PSCAA enforces WAC 173-460 through Regulation III.

For each of the 389 TAP, WAC 173-460 defines an acceptable source impact level (ASIL) as “a screening concentration of a toxic air pollutant in the ambient air.” WAC 173-460 also defines *de minimis* emissions as “trivial levels of emissions that do not pose a threat to human health or the environment” and defines a small quantity emission rate (SQER) as “a level of emissions below which dispersion modeling is not required to demonstrate compliance with acceptable source impact levels”.

The CHRLF has two sources of TAP, landfill gas and leachate. The TAP associated with these two sources are released in the form of uncollected (fugitive) landfill gas, the minor portion of collected gas that is directed to flares and not destroyed by combustion, and emissions from the aeration of the leachate lagoons.

A study of the expected emissions of TAP from the landfill under the various alternatives has been conducted, and it includes the results of dispersion modeling used to estimate future concentrations of TAP at offsite locations (see Appendix D, Air Quality and Odor Technical Memos).

4.1.1.3 Odor

Odor is the sensation (sense of smell) resulting from stimulation of the olfactory organs, and substances capable of stimulating the olfactory organs are called odorants. The ability to perceive odors and the physiological and emotional reaction to perceived odors varies dramatically among individuals. In general, females have a more acute sense of smell than males, and children have a more acute sense of smell than adults; the acuity of the sense of smell typically declines through a person’s lifetime. In addition to this variability in the human olfactory system, the number of chemical compounds present and the complexity of chemical processes in the atmosphere can make it difficult to identify and quantify the compounds causing the odor. Due to this variability, defining a specific concentration at which any odorant is detectable or causes an adverse impact is extremely difficult. Therefore, unlike criteria pollutants, there are no ambient air quality standards for odorous compounds, although some compounds are measured and regulated as TAP (as discussed in Section 4.1.2). Generally, odors are regulated and mitigated at the landfill through a multi-faceted odor management program.

Five sources at the CHRLF have the potential to generate odors: 1) leachate lagoons; 2) fresh garbage in the active face area, 3) exhaust from engines combusting landfill gas for energy, 4) flare emissions, and 5) landfill gas escaping the landfill as fugitive emissions. Observations and data indicate that the leachate lagoons and the active face are the two primary sources of odor at the landfill. The odors emitted from the active working face have two sources: the lift that is actively accepting waste and the previously filled lift underneath the lift being actively filled. The lift underneath the active lift would have had gas collection piping installed as it was being completed, but, under current operational procedures, the valves connecting those pipes to the overall collection system are not opened until the overlying lift is completed. This avoids introducing oxygen and nitrogen from the atmosphere into the gas collection system and the landfill. However, landfill gas, with its odoriferous compounds, can escape from the underlying lift and through the active working face into the atmosphere.

Washington state through WAC 173-400-040(5) regulates odor:

"Any person who shall cause or allow the generation of any odor from any source or activity which may unreasonably interfere with any other property owner's use and enjoyment of his property must use recognized good practice and procedures to reduce these odors to a reasonable minimum."

PSCAA regulates odorous emissions through section 9.11 (Emission of Air Contaminant: Detriment to Person or Property) of Regulation I, which states in part:

"(a) It shall be unlawful for any person to cause or allow the emission of any air contaminant in sufficient quantities and of such characteristics and duration as is, or is likely to be, injurious to human health, plant or animal life, or property, or which unreasonably interferes with enjoyment of life and property.

(b) With respect to odor, the Agency may take enforcement action under this section if the Control Officer or a duly authorized representative has documented all of the following:

1. The detection by the Control Officer or a duly authorized representative of an odor at a level 2 or greater, according to the following odor scale:
    - level 0 – no odor detected;
    - level 1 – odor barely detected;
    - level 2 – odor is distinct and definite, any unpleasant characteristics recognizable;
    - level 3 – odor is objectionable enough or strong enough to cause attempts at avoidance; and
    - level 4 – odor is so strong that a person does not want to remain present;
2. An affidavit from a person making a complaint that demonstrates that they have experienced air contaminant emissions in quantities and of such characteristics and duration so as to unreasonably interfere with their enjoyment of life and property; and
3. The source of the odor.

After receiving complaints of odor, a PSCAA inspector may visit the area when the odor is present. At the inspector's discretion, a notice of violation can be issued to the owner or operator of the odor source.

Some jurisdictions in and outside the United States have promulgated odor regulations that establish maximum thresholds for odor that use various metrics, for example dilutions-to-threshold (D/T) and (the equivalent) odor units (OU). Regulatory thresholds vary widely and typically depend on the nature of both the receptor and the source (McGinley and McGinley 2014). See impact discussion below and Appendix D for a description of the D/T and OU metrics, which are used in the analysis of impacts from the landfill.

Odor concentrations above 100 D/T (i.e., OU) would be expected to trigger complaints, while a level of 20 D/T would be expected to sometimes generate complaints. The specific effect on and response to specific odor levels will vary widely among individuals and will depend partly on their sensitivity, recent and longer-term odor experience, and the context in which the odor is encountered.

Odor History in the Site Vicinity

KCSWD employs best management and engineering practices to manage landfilling operations to minimize odor sources and targets a zero odor and complaint goal. To minimize odors from the active landfill face, KCSWD keeps the daily work area of the active face to a minimum and applies a temporary daily cover (currently either tarps and/or soil) to the work area at the conclusion of each day's activities. All the gas wells are monitored bio-monthly for quality and for any gas leakage. Incoming landfill gas data at the North Flare Station is monitored daily for signs of irregularities in gas quality and flow that might be symptomatic of possible leaks in the system and immediately investigated by field personnel.

Odor intensity is measured five times a day using the landfill industry-standards Nasal Ranger®. Odor measurements are made in the landfill buffer zone, around the active face, and around the leachate lagoons. The odor intensity is also measured daily in the morning in the neighborhood surrounding the CHRLF. Odor measurements are reported to PSCAA semi-annually and the data are available to the public. In addition, KCSWD investigates any complaints to determine if there was noncompliance with an applicable requirement of the landfill's Air Operating Permit and to correct any identified compliance problems as soon as possible.

A Complaint Response Plan (Odor, Fugitive Dust, and Nuisance) for the CHRLF is in effect and commits KCSWD to the following specific actions:

- Designate a responsible person to respond to and record complaints regarding odor, fugitive dust, or nuisance.
- Record and investigate complaints regarding odor (and fugitive dust or nuisance) as soon as possible, but no later than 12 hours after receipt of the complaint.
- Use good landfill industry-standard practices to correct any problems identified in the complaint investigations within 24 hours.
- Maintain records onsite of all complaints received regarding odor (and fugitive dust or nuisance) including the date, time, and nature of the complaint, the wind speed and direction at the time of the complaint, and the date, time, and nature of any corrective action taken.
- Maintain the complaint response plan onsite and available to PSCAA personnel upon request.
- If a unit or activity is found to be non-compliant with the landfill's Air Operating Permit, shut down the unit or activity if it is not returned to a compliant status within 24 hours of identification.

In 2017, KCSWD received about seven to eight complaints per month. In 2018 and 2019, the frequency of complaints was about one per month. KCSWD received a total of 22 complaints in 2020 and 15 in 2021 through October. PSCAA maintains records of odor complaints from across its jurisdiction but does not generally provide field investigations for complaints received. In 2019, PSCAA received 1,357 odor complaints for the Maple Valley area of which 881 (65 percent) cited Cedar Grove, 193 (14 percent) specified the landfill, and 283 (21 percent) were uncertain as to whether the source was the landfill or Cedar Grove (KCSWD 2020c).

4.1.2 Renton Site

Air quality at the Renton site is generally good, and the activities that would take place at this site are unlikely to materially affect air quality at the site or in its surroundings.

4.2 Environmental Impacts

4.2.1 Direct and Indirect Impacts

4.2.1.1 Landfill Development

Landfill Gas

Expected impacts under the various alternatives are derived from the results of modeling potential dispersion of various constituents emitted into the air from landfill activities. Modeling focused on the No Action Alternative and Alternative 3, which is expected to have the greatest air quality impact of any of the action alternatives. The various modeling efforts described below used the following assumptions/inputs (Appendix D – November 9, 2021 Update to Air Toxics Impacts):

- Methane generation rate factor of 0.057/year and methane generation capacity of 100 m^3 per megagram (Mg) of waste based
- NMOC concentration in landfill gas of 4,000 ppm (expressed as hexane)
- TAP concentrations in landfill gas based on most recent 2021 flare inlet and outlet test results and EPA's AP-42: Compilation of Air Emissions Factors for TAP not included in the flare inlet test results
- Landfill gas collection efficiency of 75 percent
- TAP destruction efficiency of 97.7 percent for flares and 97.2 for engines (typical efficiencies for flares or engines from EPA's AP-42: Compilation of Air Emissions Factors), except as noted below:
- Mercury – 0 percent (mercury passes through the flare or engine)

Leachate Lagoon Emissions

Calculated using peak daily leachate production under Alternative 3 (historical maximum daily rate increased to account for increased future landfill areas) and historical leachate analytic data. For ammonia, approximately 2 percent of the total ammonia expected to be released to the atmosphere.

Criteria Pollutants

Particulate Matter (PM10 and PM2.5)

Dispersion modeling, described in detail in Appendix D, Air Quality and Odor Technical Memos, was conducted to estimate particulate levels and associated impacts at locations along the landfill property boundary and at adjacent residences under the No Action Alternative and under Alternative 3. Alternative 3 is considered the worst-case scenario because it represents the largest quantity of additional waste disposed in the landfill and associated additional vehicular movement.

Modeling focused on major sources of fugitive dust, considered to be daily cover operations (including dozers and scrapers), and truck and other traffic on the public roads leading to the CHRLF. Several other sources of fugitive dust such as wind erosion from exposed surfaces and miscellaneous vehicular traffic were not included in the present inventory because they are expected to be of a much smaller magnitude than the major sources noted above. During occasional high wind events, wind erosion may be a larger source of fugitive dust, but peak modeled particulate concentrations typically occur during low wind events, when atmospheric dilution is poorest and wind erosion emissions are minimal. Thus, even though high wind events cause more movement of particulate matter, they are not the peak periods of concern for purposes of modeling facility impacts.

To determine potential impacts associated with particulate emissions, estimated levels of particulates generated by landfill construction and operations were added to estimated background particulate levels. Five days per week operation traffic volumes were used to calculate emissions, and the modeling for the landfill operating seven days per week was used to ensure a conservative approach that does not omit any adverse meteorological conditions that might occur on a weekend day. The highest resulting total levels at any receptor location were then compared to air quality standards. Background levels were based on data from an EPA monitor on Beacon Hill, Seattle. Because the Beacon Hill monitor is located within an urban area, the use of that monitor's data is likely to yield conservatively high estimated background levels for the area around the landfill. The results for The No Action Alternative and Alternative 3 are shown in Table 4-2 below.

Table 4-2. Maximum Expected Particulate Levels.					
Particulate Fraction		24-hour average (µg/m3)		Annual average (µg/m3)	
		Estimated maximum level	Standard	Estimated maximum level	Standard
No Action	PM10	50	150		None
	PM2.5	28	35	7.0	12
Alt 3–2046	PM10	56	150		None
	PM2.5	29	35	7.4	12

µg/m^3–micrograms per cubic meter

The estimated particulate levels under other action alternatives are expected to be less than those shown for Alternative 3 in Table 4-2. These levels are below the ambient standards, and therefore no significant air quality impact would result from fugitive dust at the landfill under any alternative.

Other Criteria Pollutants

Other criteria pollutants were not evaluated in detail for this EIS because they are not produced in large enough quantities to cause concern. Furthermore, none of the three action alternatives would cause increases in criteria pollutant emissions in quantities that would cause concern.

Toxic Air Pollutants

The evaluation of potential impacts due to the emission of TAP from the landfill involved a multi-step process, the details and results of which are described in Appendix D, Air Quality and Odor Technical Memos.

Step 1–The first step involved using historical compositional analyses of landfill gas and leachate to determine which TAP are contained in landfill gas and/or in leachate at CHRLF, and then calculating the amounts of each TAP emitted as fugitive gas and/or as emissions from leachate lagoons.

Step 2–The second step in the evaluation involved comparing the amounts calculated in the first step against two thresholds contained in WAC 173-460-150. The first threshold is a *de minimis* value defined as a “trivial” level of emission that does “not pose a threat to human health or the environment”. Those TAP that were calculated to exceed the *de minimis* value were then compared to a greater “small quantity emission rate” (SQER) defined as a level of emission “below which dispersion modeling is not required to demonstrate compliance with acceptable source impact levels.”

Step 3–In the third step, dispersion modeling was conducted for those TAP whose calculated emission amounts exceeded their respective SQER, to calculate expected concentrations at 122 residential locations adjacent to the west, north, and east sides of the landfill.

The results of the air toxics evaluation shows that the increase in TAP emissions associated with Alternative 3 are either below the Ecology evaluation thresholds or have modeled impacts less than Ecology ASIL, with the exception of 1,2-Dibromo-3-chloropropane (DBCP). Though this compound was not detected in analyses of the raw landfill gas, flare outlet, and leachate, one half of the maximum three run non-detect concentration was conservatively used in the modeling and the results indicate that DBCP may or may not be present in measurable levels.

In addition to TAP associated with landfill gas and leachate lagoon emissions, transfer trucks, haul trucks, and landfill equipment that use diesel fuel emit diesel engine exhaust particulates (DEEP), which is also a TAP. Modeling indicated that assuming the introduction of newer, lower-emitting equipment in future years, DEEP emissions under Alternative 3 in 2045 (the last full year of landfill operation under Alternative 3) would be lower than under the No Action Alternative in 2028. It is not certain what DEEP emissions after landfill closure would be under any of the alternatives due to uncertainty regarding the ultimate disposal location, whether the waste is exported or processed at a WTE, and, to a lesser degree, the location of support facilities.

Based on the above, construction and operation of the landfill would not result in significant adverse impacts due to the emission of TAP.

Odor

Observations at the landfill indicate that the primary odor sources are the active working face, which over time is moved within the landfill footprint as the location of landfilling is moved, and the leachate lagoons, which are located in the southwest corner of the landfill. Other potential sources of odor include fugitive landfill gas emissions, exhaust from engines burning landfill gas for energy, and flare emissions. These three other potential sources of odoriferous compounds are minor, and the odor analysis (Cedar Hills Odor Dispersion Modeling, November 9, 2021) contained in Appendix D focused on the two primary odor sources.

To establish baseline odor emission rates for modeling odor dispersion, odors were sampled at 14 locations on and near the landfill site. The three locations where the most intense odors were found were at the active working face, at the leachate lagoons, and a location in the southern portion of the landfill where meteorological conditions at the time of sampling and the nature of the odors indicated that the Cedar Grove composting facility was the source of odors for that sample. The strength of the odors in the samples from the leachate lagoons and active working face were characterized by the volumes of fresh air needed to dilute the sample to the threshold of detectability and were expressed in OU or, equivalently, D/T.

Using the EPA-approved AERMOD dispersion model, odor emission rates for the active working face and leachate lagoons were back-calculated from the respective samples to determine source emission rates. Then the dispersion model used the emission rates to calculate expected odor concentrations at potential receptors spaced at 100-meter intervals out to a minimum of 2,000 meters in all directions from the landfill boundary. The Odor Dispersion memo contained in Appendix D provides greater detail regarding the methodology of the modeling effort.

Because of the dominant characteristics of the local meteorology, modeling indicated that odor impacts would primarily extend to the northwest of the active working face and leachate lagoons. All model runs included odors from the leachate lagoons and the active working face at one of three locations: the current location in the south-central portion of the landfill (Area 8), a location on the central west edge of the landfill, and a location in the southeast corner of the landfill. Odor concentrations were plotted as OU (D/T), either for the highest modeled concentrations and for the concentrations that would not be exceeded 99 percent of the time (a cumulative total of about 44 hours in the approximately 4,436 hours that the landfill is operational and the active working face is open, in a year). Odor plots resulting from the modeling are shown below in Figures 4-1 and 4-2.

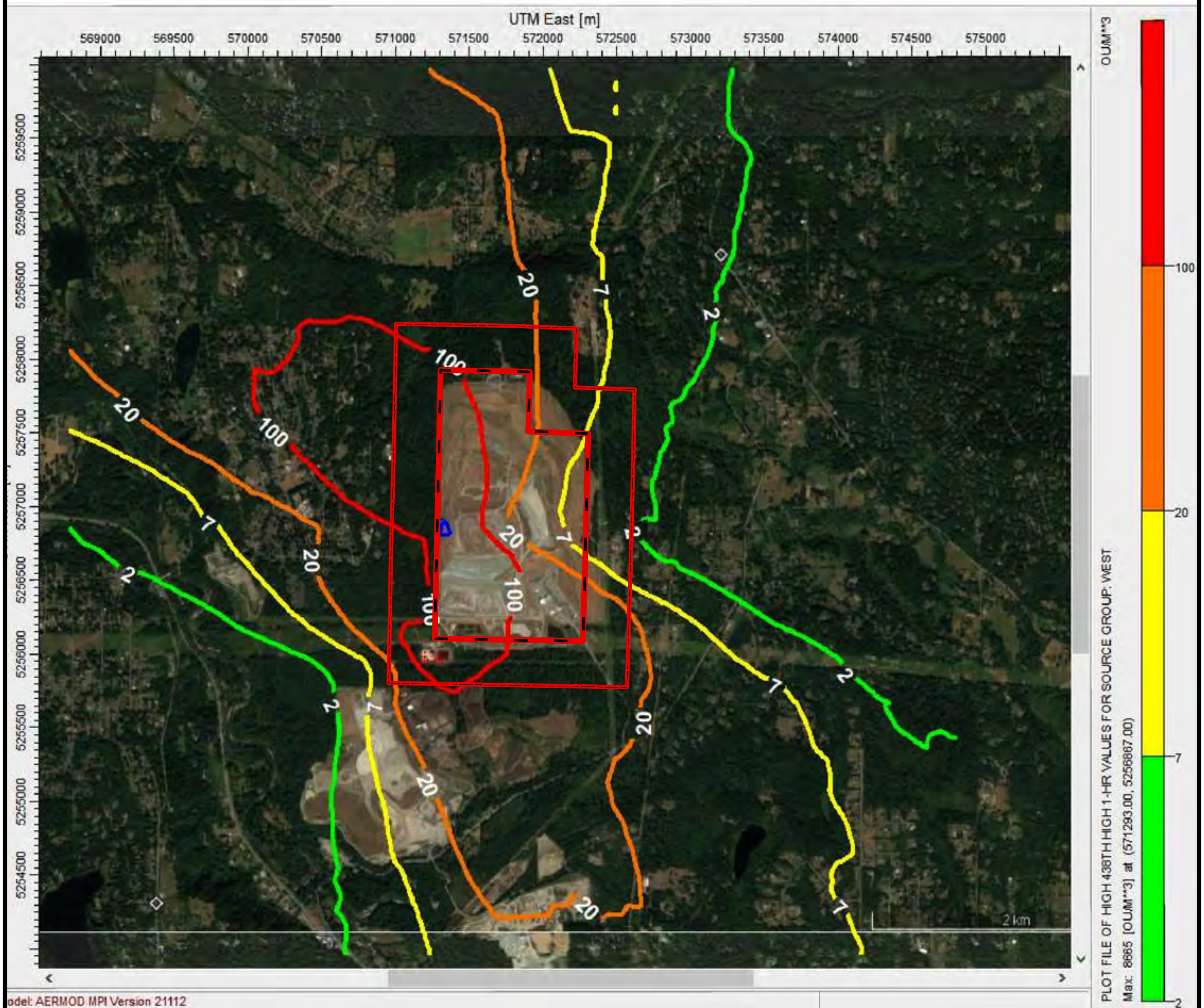
As an indication of the what the odor metric (OU or D/T) means in terms of the strength of odor experienced by the receiver, it is commonly found that odor concentrations above 100 OU will generally trigger complaints from people experiencing such odors, whereas 20 OU will sometimes generate complaints.

The modeling results indicate the following:

- The active working face would be the primary source of odors in the surrounding community under any of the alternatives
- Because of the character of the local meteorology, under any of the alternatives, odor impacts would primarily affect residential areas to the west and northwest of the landfill
- Under any of the alternatives, odor impacts to residential areas west and northwest of the landfill would be greatest when landfilling is taking place in the west half of the landfill footprint and more limited when landfilling would occur in the eastern half
- Under any of the alternatives, regardless of the location of the active working face, detectable odors at least moderate in intensity, would affect residential areas primarily west and north of the landfill 1 percent to several percent of the time that the active working face is open
- Under any of the alternatives and under rare meteorological conditions that historically have occurred once to a few times a year, detectable odor that most people would experience as intense would be experienced over most of the residential areas surrounding the landfill

In addition to the nature of odor impacts indicated by the modeling results, anecdotal observations also indicate that removal of the daily cover tarps at the beginning of a working day can cause a pulsed release of odoriferous compounds built up since the end of the previous working day.

Potential odor impacts would be greatest under Alternative 3 because this alternative provides the longest lifetime of the landfill and this alternative also includes waste excavation of approximately 2.8 million cubic yards of refuse (a mix of solid waste and soil). Excavation of refuse would release odors that would likely lead to odor impacts while excavation occurs. Excavation of about 2.4-2.5 million cubic yards of refuse from areas 2, 3, and 4 in the northwest portion of the landfill would take place over a period of about 30 months during 2029 to 2031. Within that 30-month period, no excavation would occur during the months of November and April. During the November-April period the excavation area would be covered to prevent odor emissions. In addition, excavation of about 0.4 million cubic yards from the northeast portion of the landfill would occur over a period of about 5 months in 2037.



Legend

Existing Landfill Property Line

Existing 1000ft Buffer

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 4-1. 99th Percentile Odor Concentration–West Working Face Option.

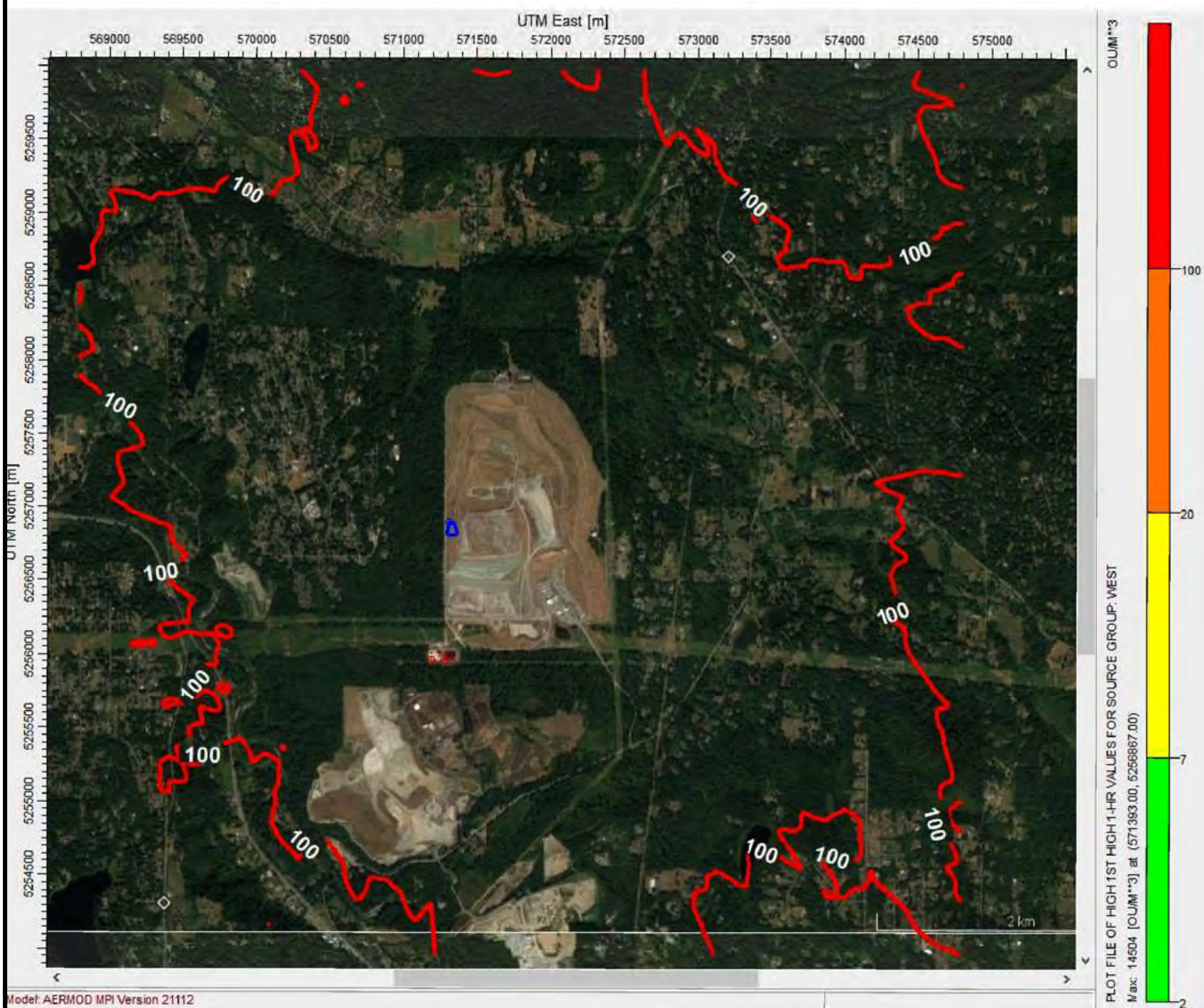
N

0 0.375 0.75 1.5 Miles

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter4\Figure4_1_99thPercentileOdorConcentration_WestWorkingFace.mxd



Legend

Existing Landfill Property Line

Existing 1000ft Buffer

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 4-2. Peak Odor Concentration–West Working Face Option.

N

0 0.375 0.75 1.5 Miles

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter4\Figure4_2_PeakOdorConcentration_WestWorkingFaceOption.mxd

The following variabilities and uncertainties affect how well the model results predict actual future impacts:

- People vary substantially in their sensitivity and response to odors
- The meteorological conditions used for the modeling are based on 2016-2020 data. Although future meteorological conditions are likely to be similar, they will almost certainly vary somewhat from 2016-2020 conditions

Despite these uncertainties, the potential odor impacts described above would be significant under any of the alternatives. Mitigation to address potential odor impacts is described below in Section 4.3.

Potential System Failures

A complex system such as the CHRLF could experience an unexpected system failure such as a pipeline break within the gas management system. The likelihood of such a failure is low, but, if it occurred could result in a pulsed release of landfill gas into the atmosphere and potentially a temporary increase in odors in the surrounding community. The impacts, however, of such a release would be limited and unlikely to be significant because of system controls currently in place. The collection and transmission pipelines are under vacuum throughout the landfill, and if a pipeline break occurred, the break would be detected rapidly because of atmospheric air intrusion and rapid pressure changes leading to shutdown of the affected pipeline, and diversion, if appropriate, of landfill gas to the flare system for destruction.

4.2.1.2 Facility Relocation Options

The primary potential air toxics impact at CHRLF or the Renton site from support facilities relocation is the emission of DEEP from empty waste delivery trucks travelling to and from the site. Dispersion modeling described in Appendix D, Air Quality and Odor Technical Memos, indicates that truck emissions would be less than the DEEP SQER. DEEP from facility construction traffic at CHRLF or the Renton site would be temporary and not significant. Significant fugitive dust or odor impacts are unlikely at the Renton site.

No waste transport or handling would occur at the Renton site under facilities relocation Option 3. Maintenance and repair of empty waste delivery trucks would occur within an enclosed building and shop. Based on the above, and the truck emission modeling results described in the preceding paragraph, odor impacts are not expected to occur at the Renton site.

4.2.1.3 Indirect Impacts

The limited air quality and odor impacts from the landfill development and facility relocation construction and operation at CHRLF and the facility relocation construction and operation at the Renton site are unlikely to lead to additional projects or actions that would result in indirect air and odor impacts.

As discussed in Section 1.7, in order to compare the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046–the estimated year of capacity for Action Alternative 3.

For the No Action Alternative between 2028 and 2046, waste disposal could involve either waste export to a regional landfill or disposal at a WTE facility, which could be at the CHRLF site or another site. A regional landfill accepting waste from the County is likely to be an existing facility with an existing landfill gas system and other measures in place to control air quality and odor impacts, so significant air-related impacts associated with that landfill are unlikely to result from the County's waste export. Waste export may require development of an intermodal facility that could have odor impacts, although waste handled at such a facility would be enclosed within shipping containers and the facility is likely to be located in an industrial area where odor-sensitive receptors, such as residences, schools, etc., are unlikely.

A WTE facility located at a site in the county has the potential to result in air quality and odor impacts. Although the extent of these impacts would be highly dependent on the specific facility location and design, the availability of proven air quality controls and regulatory requirements minimizes the likelihood of significant air or odor impacts. The County's siting process to determine a location for a major facility such as an intermodal facility or a WTE would favor sites where sensitive receptors are unlikely to be adversely affected.

For Alternatives 1 and 2, potential air and odor impacts that could occur after closure in 2038 and 2039, respectively, would be similar to those that could occur under the No Action Alternative. A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the Solid Waste Comp Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

4.2.2 Cumulative Impacts

Historically, adjacent industrial-zoned properties have been the major source of odors in the community surrounding CHRLF, and less frequent odor events from the CHRLF have added to the cumulative odor impacts. Over the past several years, odor complaints related to the CHRLF have declined substantially in frequency. Odor control programs in place and under evaluation as described below should further limit the frequency of odor events at the CHRLF so that odor impacts resulting from CHRLF operation under any of the alternatives should be minimal. Under all of the alternatives, activities associated with landfill development and facilities relocation, including those at the CHRLF and the Renton site, would contribute incrementally to the cumulative overall past, present, and likely future impacts on air quality in the region due to ongoing development.

4.3 Mitigation Measures

To minimize potential air quality and odor impacts from landfill operations, KCSWD has been implementing best management and engineering practices in designing, operating, and maintaining environmental control systems, including the landfill gas and leachate systems.

Mitigation of potential fugitive dust impacts associated with construction and operations would include continuation of the following measures that are currently being implemented at the landfill:

- Minimizing the area of exposed unpaved surfaces by:
    - Covering or stabilizing soil stockpiles and areas of disturbed soils
    - Keeping the working face as small as possible and therefore minimizing the area of daily cover
- Routinely sweeping the landfill's paved roads
- Routinely washing vehicles at the onsite vehicle wash facility

Mitigation of potential toxic air pollutant and odor impacts associated with construction and operation would include continuation of the following measures that are currently being implemented at the landfill:

- Maintaining the gas control system and expanding it into new disposal areas
- Keeping the working face as small as possible
- Applying daily, interim, and final cover
- Regular monitoring and maintenance of cover systems
- Regular maintenance and periodic upgrading of vehicles and construction equipment

Additional mitigation of potential odor impacts would focus on further reducing odor emissions from the active working face and the leachate lagoons. The following measures would reduce odors emitted from the active working face while preventing the introduction of oxygen into the waste:

- Prior to starting a new lift, place tarps over the trenches containing gas piping in the just completed underlying lift, and during the period that the new lift is being constructed, partially open valves connecting the piping in the underlying lift to the main collection system to draw gas generated in the underlying lift into the gas collection system. Only partially opening valves would limit intrusion of atmospheric air. To increase the effectiveness of this measure, tarps could be placed over the entire underlying lift rather than just over the gas pipeline trenches.
- Within a lift under construction, install temporary, sacrificial (would not be removed after use) piping to draw gas generated in that lift and convey the collected gas (which would be a mix of landfill gas and atmospheric gas) to a utility flare for destruction. This measure should also reduce the pulse of odoriferous compounds that can be emitted when the daily cover tarps are removed at the start of a working day. After completion of the new lift, the mitigation measure described under the previous bullet would be implemented if an overlying lift is constructed.

Implementing the above measures would increase the cost of landfill operation but should be effective at substantially reducing potential odor impacts.

With respect to potential odors from the leachate lagoons, the County is conducting an evaluation of potential options, including covers and chemical treatments, to treat leachate prior to discharge and which would also reduce odor emissions from the lagoons. Implementation of the eventual selected control option would occur under any of the alternatives, so that the likelihood of odors generated from the leachate lagoons in the future should be reduced.

Although the odor mitigation described above is expected to be effective at limiting odor impacts, odor should continue to be monitored at the landfill to assure effectiveness of the mitigation. The current monitoring program involving periodic odor sampling should be expanded as necessary and strengthened with the development and implementation of verifiable metrics that allow accurate determination of actual odors at source and receptor locations.

With implementation or continued operation of the controls described above; no additional mitigation measures are necessary.

4.4 Significant Unavoidable Adverse Impacts

With implementation of ongoing and future mitigation as described above, no significant unavoidable adverse air quality or odor impacts would occur under any of the alternatives.

5.0 SURFACE WATER

This chapter describes how implementation of any of the action alternatives, including the facility relocation options, could affect surface water quality in the vicinity of the CHRLF and the Renton site, compared with the No Action Alternative. The discussion includes a description of the systems for surface water and stormwater management at the CHRLF and the Renton site. The leachate collection and pretreatment system for CHRLF is also discussed.

This environmental review determined that there would be no significant unavoidable adverse impacts to stormwater or surface water quality at CHRLF or the Renton site during construction or operation of any of the alternatives, including the facility relocation options. The review also determined that changes in leachate generation and collection at CHRLF from construction or operation of any of the alternatives would not produce significant unavoidable adverse impacts.

5.1 Affected Environment

The affected environment includes the regional drainage basins in the vicinity of the CHRLF and the Renton site, as well as the onsite drainage system discharges. Precipitation that falls on each site either infiltrates or produces runoff that is then collected and removed from the sites (stormwater) or enters a natural feature such as a creek or wetland (surface water). For the purposes of this EIS, precipitation that falls on the sites and infiltrates or is collected and removed from the site is considered stormwater. Surface water is what precipitation and stormwater become when they enter a natural feature.

5.1.1 Regional Drainage Basins

Regional drainage basins are geographic areas that contain and drain to a stream or river named and noted on common maps, such as the Cedar River, or a geographic area that drains to a non-flowing water body named and noted on common maps, such as Queen City Lake or Gravel Pit Lake.

Sub-basin means a geographic area that 1) drains to a stream or waterbody named and noted on common maps and 2) is contained within the basin of the stream or water body.

5.1.1.1 Cedar Hills

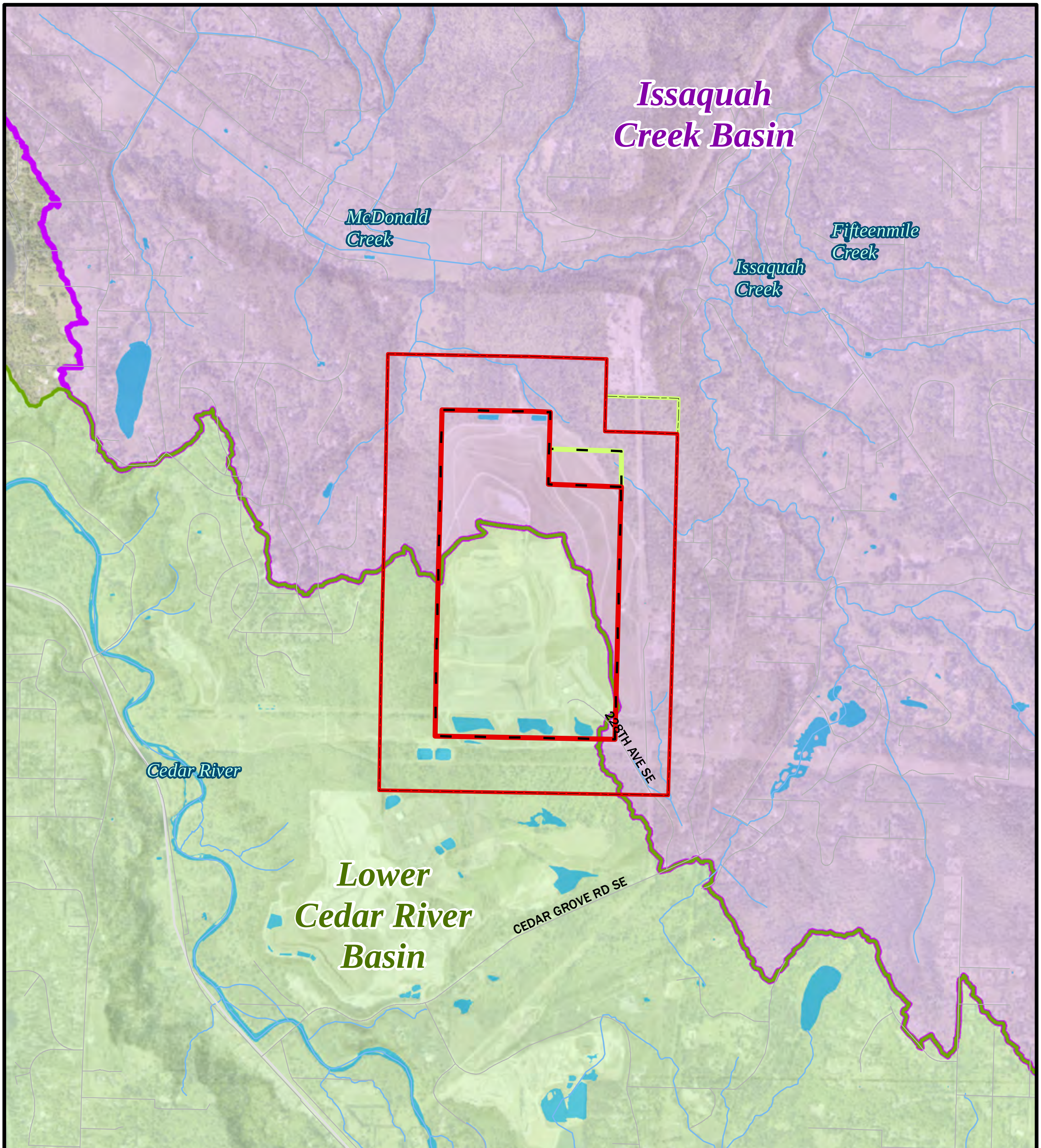
The CHRLF lies within the Issaquah Creek and Lower Cedar River drainage basins (see Figure 5-1). McDonald Creek flows in a west–east direction approximately 0.5 mile north of the landfill and is a tributary to Issaquah Creek. Stormwater runoff from the northern portion of the landfill drains to McDonald Creek. Issaquah Creek flows approximately one-quarter mile northeast of the landfill. Stormwater runoff from the eastern portion of the landfill buffer drains to Issaquah Creek. Figure 5-1 shows existing creeks, streams and waterbodies in the area.

The Cedar River flows approximately one mile southwest of the landfill. Three sub-basins at CHRLF are within the Cedar River watershed: the southwest sub-basin, south sub-basin and the southeast sub-basin. The southwest sub-basin is entirely located outside of the existing 1,000 foot buffer. Stormwater runoff from the southeastern corner of the landfill ultimately infiltrates into the ground along 228th Avenue SE before reaching the Cedar River. The majority of stormwater runoff from the south sub-basin of the landfill drains into Queen City Lake in the Lower Cedar River Basin and any overflow flows south into Gravel Pit Lake, which is located approximately half a mile south of the landfill. Currently, no observable surface outlet exists from Gravel Pit Lake.

Gravel Pit Lake is located on Queen City Farms property, and the owner has initiated plans for the filling of Gravel Pit Lake. As part of the project, overflow from Queen City Lake would be routed via a storm drainage conveyance system to a proposed pond just north of Cedar Grove Road SE and infiltrated. An overflow spillway on the pond would route flows into an existing ditch that runs parallel to Cedar Grove Road SE and flows towards the west. Infiltration would also occur along Cedar Grove to the east (i.e., towards the intersection of 228th and Cedar Grove road).

5.1.1.2 Renton Site

The Renton site lies within the Cedar River drainage basin (see Figure 5-2) and stormwater runoff from the site ultimately discharges into the Cedar River. The Cedar River is located approximately two-thirds of a mile south of the site and flows in a northwest direction before discharging into Lake Washington. Figure 5-2 shows existing creeks, streams and waterbodies in the area.



Legend

- Existing Landfill Property Line
- Existing 1000ft Buffer
- Proposed Landfill Property Line (ALT. 3)
- Proposed 1000ft Buffer (ALT 3.)
- Stream
- Issaquah Creek Drainage Basin
- Lower Cedar River Drainage Basin
- Waterbody

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 5-1. Regional Drainage in the Vicinity of the Cedar Hills Regional Landfill.

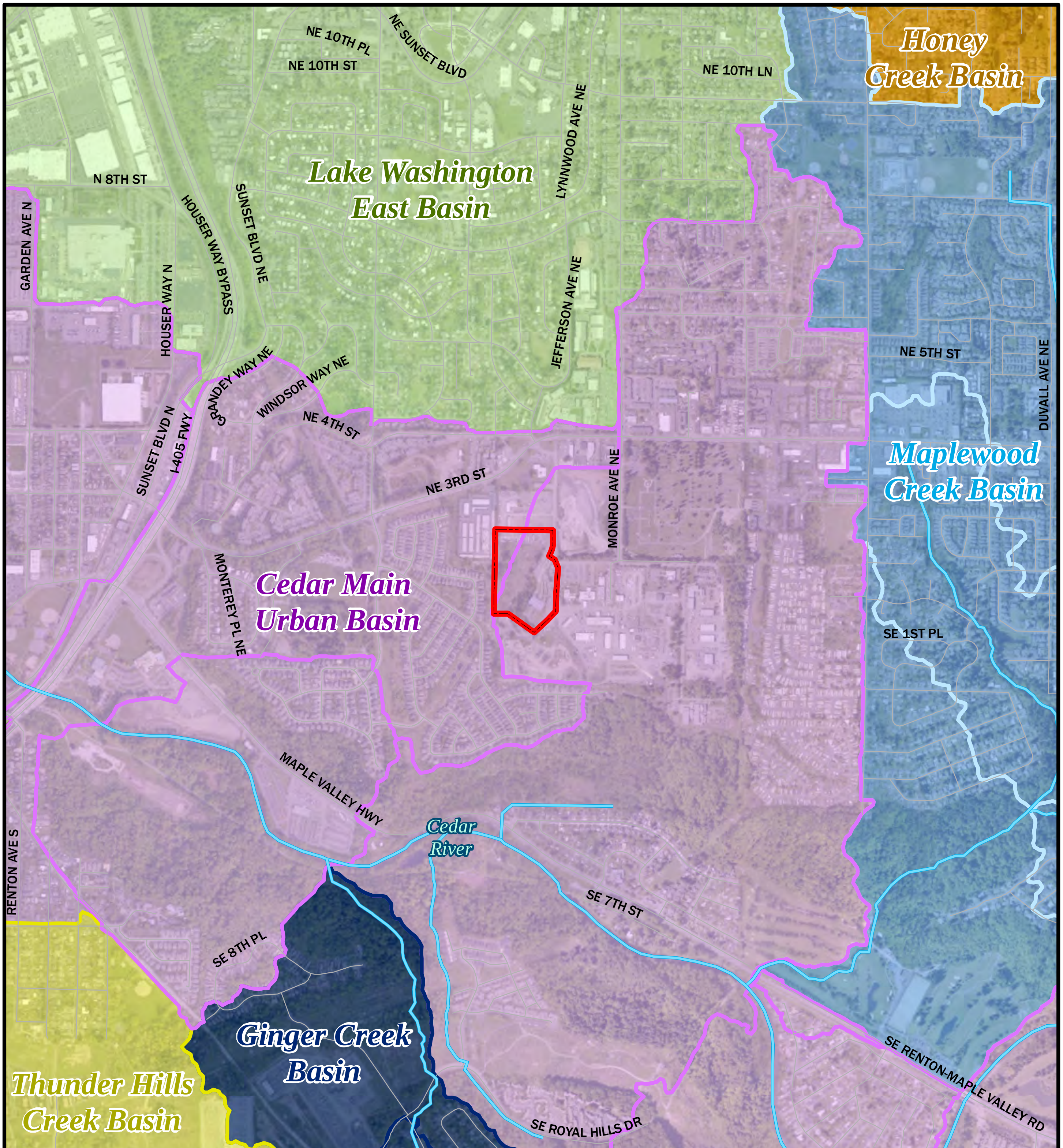
N

0 1,250 2,500 5,000 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 5\Figure5_1_Drainage.mxd



Legend

Renton Site Boundary

Stream

Sub-basin Boundary

- Cedar Main Urban
- Ginger Creek
- Honey Creek
- Lake Washington East
- Maplewood Creek
- Thunder Hills Creek

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 5-2. Drainage Basins in the Vicinity of the Renton Site.

N

0 750 1,500 3,000 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 5\Figure5_2_Renton_Drainage.mxd (8/10/2020)

5.1.2 On-Site Drainage Sub-basins

5.1.2.1 Cedar Hills

As shown in Figure 5-3, stormwater runoff from the landfill flows to one of five onsite drainage sub-basins: northeast, southwest, north, south, and southeast.

The northeast sub-basin primarily drains forested land within the northeastern buffer area. Stormwater runoff in this basin is not exposed to waste and discharges from the property toward Issaquah Creek in the regional Middle Issaquah Creek Sub-basin (Figure 5-1).

Stormwater runoff from the southwest sub-basin originates almost entirely in the undisturbed forested buffer areas in the southwestern corner of the landfill and infiltrates before reaching the Cedar River. Stormwater runoff in this basin is not exposed to waste.

The north sub-basin, which drains to McDonald Creek in the McDonald Sub-basin (Figure 5-1), contains the northwestern corner and north portions of the forested buffer area and the northern half of the landfill. This drainage sub-basin includes Areas 2/3 and 4, the northern half of the Main Hill Area, the Central Pit Area, the northern half of Area 5, and the northern half of the main asphalt access road on the west side of the landfill. The northern portion of CHRLF is not currently active, and an impermeable membrane, soil cap, and grass cover the waste in this area. Stormwater runoff from the covered areas of the north sub-basin drains through the North Siltation Pond or the North Stormwater Lagoon. A series of culverts and open ditch channels conveys the flow to stormwater monitoring point SW-N4. Flows discharge from monitoring point SW-N1, then flow to McDonald Creek, and ultimately to Issaquah Creek.

The south sub-basin is the largest drainage area in the landfill, encompassing a majority of the southern half of the landfill site. Area 6, the closed portions of Area 7, the Area 8 soil stockpile, the south forested buffer area, and the southern half of Area 5 all contribute stormwater runoff in the sub-basin. Stormwater from the south sub-basin drains through the southwest stormwater pond all contribute stormwater runoff in the sub-basin.

The unclosed portions of Area 7, the active Area 8, leachate lagoons, and the CSW lagoon are also located in the south sub-basin. These areas comprise the CSW basin. Stormwater runoff from these areas may come into contact with waste and thus is considered CSW. Berms around the unclosed portions of Area 7 and perimeter of Area 8 separate stormwater runoff and direct the CSW to the CSW lagoon, which ultimately discharges to the leachate lagoon and KCWTD POTW. Additional information on CSW management is included in Section 5.1.5.

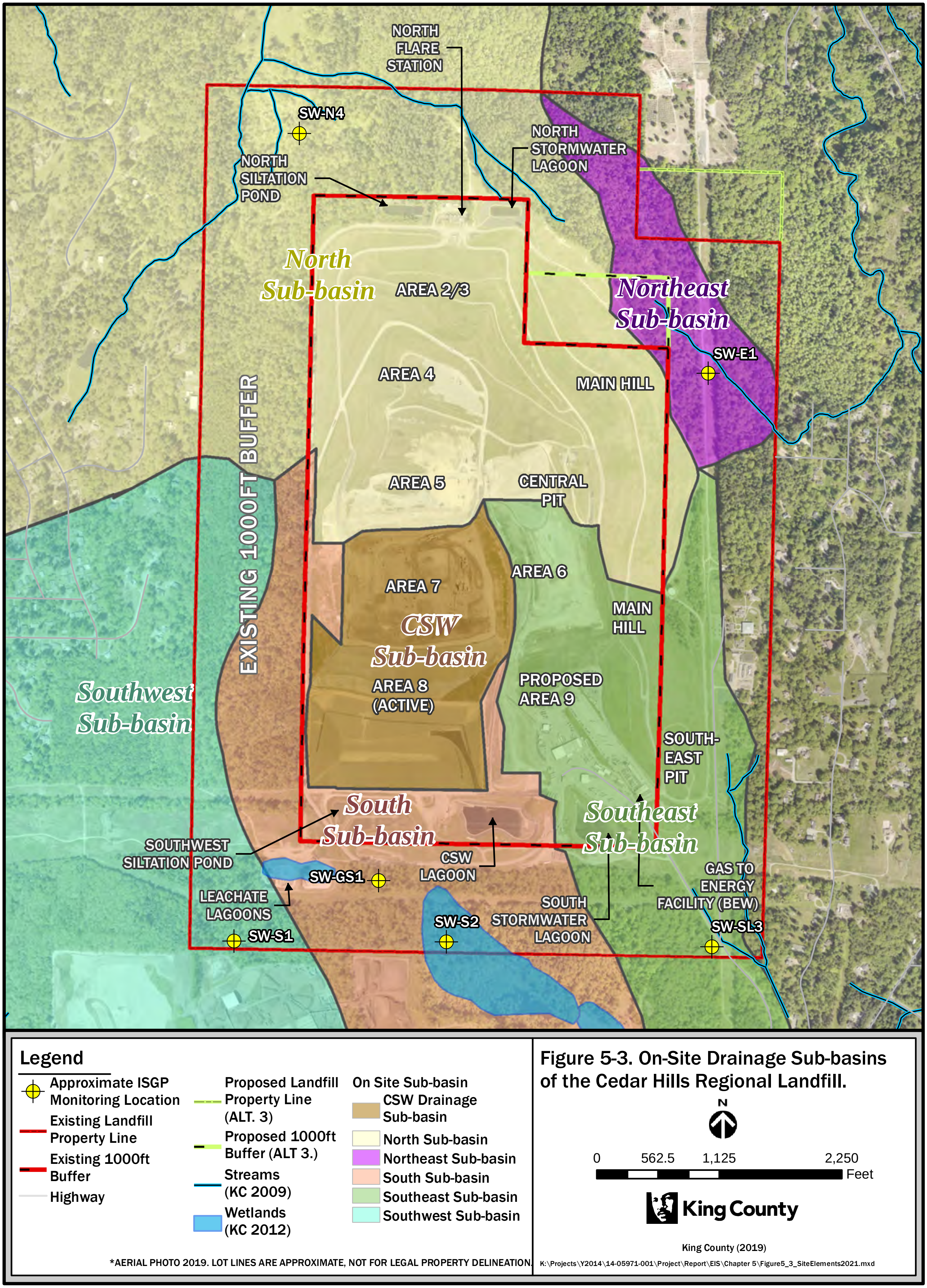


Figure 5-3. On-Site Drainage Sub-basins of the Cedar Hills Regional Landfill.

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 5\Figure5_3_SiteElements2021.mxd

The southeast sub-basin conveys drainage from ditches along the eastern main access road, the southern main hill, and the SE Pit Area into the South Stormwater Lagoon. The maintenance and administrative facilities cover a paved area of approximately 3.5 acres within the sub-basin. A sewer system routes runoff that is potentially contaminated into the leachate lagoons for pretreatment before conveyance to the KCWTD POTW for treatment. Ditches and berms route the uncontaminated runoff from the maintenance and administrative facilities to the South Stormwater Lagoon. An existing oil-water separator separates out oil from stormwater flows. Stormwater flowing out of the South Stormwater Lagoon flows through a bioswale to discharge point SW-SL3, at the southeast property line. Downstream of SW-SL3, stormwater flows through a series of pipes and catch basins along the west side of 228th Avenue SE, before daylighting and infiltrating in a roadside ditch along the north side of Cedar Grove Road SE, which provides a path to the Cedar River. The water infiltrates beneath the ditch before reaching the Cedar River.

The Southwest Siltation Pond was completed in 2016 (replacing the stormwater pond displaced by Area 8) and receives stormwater from approximately 155.1 acres of the 920-acre landfill. The pond provides pre-settling and detention with a pond outlet orifice that controls the discharge rate to historical (forested) standards. As stormwater leaves the pond, it flows into a sand filter and then is conveyed via a pipe underneath the south perimeter haul road to monitoring point SW-GS1 at the wetlands located on site approximately 300 yards from the southern property line. From this point, stormwater enters the wetlands and leaves the site as sheet flow at monitoring point SW-S2, where it enters Queen City Lake with overflow into a 145-acre-foot Gravel Pit Lake.

The majority of stormwater runoff generated in the southern-most part of the landfill (formerly the South Solid Waste Area) flows to the Southwest Siltation Pond. The pond releases at a controlled rate into the channels downstream of the pond outlet that flow to monitoring point SW-GS1.

5.1.2.2 Renton Site

The site is comprised of two separate King County tax parcels, one on the west part of the site and one on the east. A ravine is located in the south-central part of the site and straddles the parcels. The west parcel is comprised of two sub-basins, with one draining towards the southwest and one draining towards the southeast into the ravine. The east parcel is comprised of one sub-basin. The topography and an existing curb along the east edge of the parcel direct stormwater runoff primarily to the west and then to the south into the ravine.

5.1.3 On-Site Surface Water and Stormwater Management

5.1.3.1 Cedar Hills

CHRLF has an extensive system for managing precipitation that falls within its property limits. Stormwater at the landfill is managed via several systems depending on the path and required treatment before release from the site. This is based on whether the stormwater has come into contact with waste (i.e., CSW), and is then captured and conveyed to the leachate lagoons for pre-treatment and discharge to KCWTD POTW; or if the run-off is clean stormwater that can be discharged to natural channels. Surface water that enters or leaves the site in natural channels is managed in accordance with the most current version of the KCSWDM. These standards ensure that adequate flow control and water quality measures are installed relative to the scale of development.

Within the landfill area, much of the site is developed with impervious or low-permeability surfaces; thus, there is minimal infiltration into site soils with the majority of precipitation becoming run-off as CSW or clean stormwater.

5.1.3.2 Renton Site

As with CHRLF, precipitation that falls onto the site at Renton becomes stormwater runoff or surface water. Much of the Renton site is currently undeveloped and there do not appear to be any stormwater conveyance improvements on the southern part of the east parcel, with all runoff infiltrating via sheet flow into the onsite soils. The topography and an existing curb along the east edge of the parcel direct stormwater runoff primarily to the west and then to the south into the ravine.

Precipitation that falls on currently paved or impermeable surfaces, such as the northern portion of the east parcel, or the existing Renton Recycling and Transfer Station (west parcel), becomes stormwater runoff and is managed through existing stormwater collection systems. Through a combination of private and public storm drainage infrastructure, this runoff discharges into the Cedar River, which flows from east to west, south of the Renton site. Some areas of the Renton Recycling and Transfer Station also collect stormwater from areas of transfer truck travel and discharge to the King County wastewater treatment system. There are no surface water natural features on the site.

5.1.4 Leachate Collection

Leachate is produced when water percolates through the waste or is generated from the waste itself. At CHRLF leachate is collected in pipes within the landfill and diverted to two leachate lagoons located in the southwest corner of the site before ultimately being discharged to the KCWTD sanitary sewer conveyance system and then treated at the KCWTD POTW in Renton. At the Renton site, there is no production of leachate as no waste is present at the site. Additional detail on leachate collection is included in Section 1.3.4.

5.1.4.1 Cedar Hills

The leachate collection system is a drainage layer that lines the bottom of the refuse areas and collects the water that infiltrates through and is produced by waste. The leachate collection system conveys leachate through a network of pipes and pumps within landfill cells and diverts flow to two leachate lagoons located in the southwest corner of the site. The leachate lagoons pretreat the leachate with aeration before discharging to the KCWTD sanitary sewer system and POTW. Figure 5-4 shows the overall site-wide collection system for leachate flows.

Landfill operations to help minimize leachate and CSW production include placement of daily, interim, and final cover over existing waste-in-place. Placement of interim cover provides more effective separation of clean stormwater and CSW than daily cover, and interim cover minimizes leachate production and seeps. Placement of final covers restricts infiltration and provides drainage control. Stormwater runoff from areas of the landfill with interim or final cover does not come into contact with refuse and is collected and treated in the clean stormwater facilities. KCSWD landfill closure design for final and interim covers meets the low permeability requirement of 10^{-5} cm/sec (per Area 7 Staged Closures Basis of Design Report, King County, 2012). See Section 2.3.1.1 for more information on cover systems.

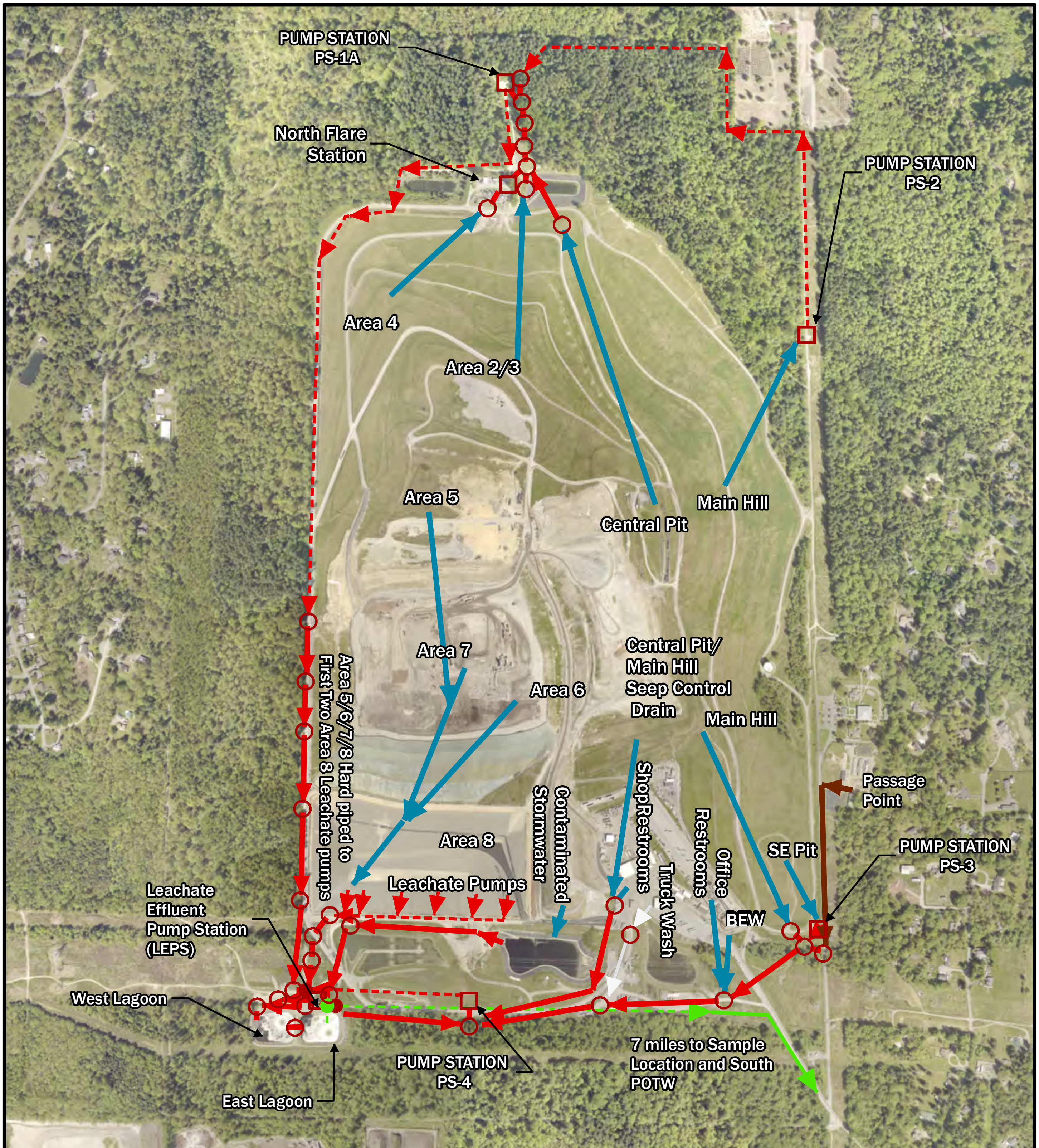
The leachate system was originally designed with sufficient capacity for all leachate generated through the development of Area 7 during the 100-year storm. During Area 8 design, an evaluation was done of the storage capacity of the existing lagoons with the revised leachate generation yield coefficients, the addition of Area 8, and the actual pump capacities of LEPS. This analysis used site specific design storm events of a 25-year, 24-hour event of 3.7 inches and a 100-year, 24-hour event of 4.4 inches. The storage analysis indicated that with the existing capacity of the CSW and leachate lagoons and current maximum pumping rates at LEPS that there was sufficient capacity to manage the increased peak flows associated with the development of Area 8. However, improvements to the leachate lagoon piping were required to convey the flow between the leachate lagoons and LEPS. (HDR 2017). During peak storm events, CSW can be detained in the CSW lagoon and released into the leachate system when the storm subsides and storage capacity in the leachate lagoons becomes available. Leachate can also be stored in the CSW lagoon in an emergency.

Landfill leachate discharged to the KCWTD sanitary sewer system and POTW must meet effluent limits and self-monitoring requirements specified in Wastewater Discharge Permit No. 7842-03 for CHRLF administered by the King County Industrial Waste (KCIW) Discharge Program (See Appendix E). Self-monitoring is conducted at the LEPS, which is located downstream of the leachate aeration lagoons (see Figure 5-4). Treated effluent samples from the leachate lagoons are collected from the effluent pump station every month for characterization. A weekly permit sample is also taken for a limited set of total metals and monitoring is conducted for soluble sulfide as a field parameter. A composite sampler is used at LEPS to collect 32 grab samples at 15-minute intervals over an 8-hour period. Analytical parameters required by the Wastewater Discharge Permit and frequency of monitoring for the LEPS wet well are included in Table 5-1. Discharge volume is also monitored, as well as inflow to the leachate lagoons.

In addition to the above self-monitoring location, leachate and wastewater is also monitored at several other locations for characterization purposes. Sampling done at the inlet to the leachate lagoons provides data on the untreated influent to the lagoons and is sampled from an influent vault on a monthly basis for characterization. A composite sampler is used to collect 48 grab samples at 30-minute intervals over a 24-hour period.

Table 5-1. Cedar Hills LEPS Wet Well Discharge Permit Monitoring Parameters.

Parameter	Sampling Frequency	Sample Type
Arsenic (As)	NA	NA
Cadmium (Cd)	Once a month	Composite
Chromium (Cr)	Once a month	Composite
Copper (Cu)	Once a month	Composite
Lead (Pb)	Once a month	Composite
Mercury (Hg)	NA	NA
Nickel (Ni)	Once a month	Composite
Silver (Ag)	NA	NA
Zinc (Zn)	Once a month	Composite
Cyanide Amenable (CN)	NA	NA
Total Soluble Sulfides (ppm)	Once a month	Grab
pH (s.u.)	Once a month	Grab
Daily Maximum Discharge Volume (gpd)	Continuous	Meter



Legend

- LEPS Effluent Sample Location
- LIF Influent Sample Location
- Leachate Manhole
- Pump Station
- Effluent Leachate in Forced Main
- Effluent Leachate in Gravity Line
- Influent Leachate in Forced Main
- Influent Leachate in Gravity Line
- Leachate Source
- Sewer Gravity Line
- Truck Wash Gravity Line

Figure 5-4. Leachate Influent and Effluent Schematic Cedar Hills Regional Landfill.

N

0 500 1,000 2,000 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 5\Figure5_4_Leachate_Schematic.mxd

The primary permit conditions are specified in the Wastewater Discharge Permit No. 7842- 03. This includes a maximum daily discharge volume of 2,700,000 gallons per day from the LEPS (Sample Site No. A90021). The average annual daily discharge volume measured at LEPS in 2019 was 450,000 gallons per day. Environmental monitoring results for contaminated stormwater and leachate are included in the Cedar Hills Regional Landfill Quarterly Environmental Monitoring Reports, which are available on KCSWD's website (King County 2019).

Under the Wastewater Discharge Permit, the KCIW Discharge Program must be notified within 24 hours of any exceedance of the standard(s). Exceedances are discussed in the paragraph below. When monitoring of CSW and/or leachate indicates a violation of the Wastewater Discharge Permit, the following actions must be completed:

- Take immediate action to stop the violation and notify KCIW within 24 hours of learning about the violation;
- Collect an additional sample and submit it to KCIW within 14 days of learning about the violation; and
- Submit a written report to KCIW explaining the cause of the response and the corrective actions taken to respond to the violation and ensure ongoing compliance.

Characterization sampling of leachate effluent has recently shown some exceedances of the arsenic loading limit specified in Wastewater Discharge Permit No. 7842- 03. Spent sulfur removal media (which were historically disposed at CHRLF until early 2020 but are no longer accepted) are a potential source of arsenic in leachate. KCSWD is currently examining methods and technologies to upgrade the performance of the leachate lagoons with respect to discharge pretreatment requirements and to implement source control measures within the landfill system as practicable. KCSWD and its consultants have prepared a Revised Draft Engineering Report (RDER) as part of a comprehensive engineering evaluation of source control opportunities and potential benefits of segregating wastewater streams (Wood 2020). The RDER included an engineering evaluation of the existing pretreatment system, assessment of the existing leachate lagoons in accordance with Washington state regulations, basis of design for lagoon improvements, engineering alternatives for improvements, modifications, and/or expansion of the existing pretreatment system, and a preferred alternative for achieving discharge permit compliance. Additionally, interim treatment measures to remove arsenic from the waste stream from BEW are currently being developed at a pilot scale to test the efficacy of removal that is achievable and measure the overall effect on reducing arsenic loading at LEPS. For reference, the discharge permit loading limit set by KCIW for arsenic is in place to ensure biosolids produced by KCWTD's Renton POTW are in compliance with all relevant standards and meet the requirements for Class B biosolids.

The CHRLF Plan of Operation includes information on the operation of the collection, conveyance, storage and treatment of leachate at CHRLF (KCSWD 2019c). Normal lagoon operating procedures and management of high leachate flows associated with extreme precipitation scenarios are described in the *Leachate Lagoon Modified Operating Procedures and Contingency Plan for Peak Flow Events or*

Emergency Conditions, which is included as Appendix A of the Cedar Hills Regional Landfill Area 8 Plan of Operations (HDR, et al. 2018).

In case of an emergency such as a leachate line breach or spill, public notification protocols exist for notification of neighbors in the case that any contamination or contaminants are found to have migrated offsite.

5.1.4.2 Renton Site

The existing Renton site does not produce leachate.

5.1.5 Contaminated Stormwater Management

CSW is generated when stormwater runoff contacts waste. Further detail on CSW management is included in Section 1.3.3. Stormwater runoff that does not contact waste is considered clean stormwater and is discussed in Section 5.1.6.

5.1.5.1 Cedar Hills

The majority of CSW generated at the landfill originates in the area of active waste placement. At the CHRLF, CSW is collected separately from leachate and uncontaminated (clean) stormwater runoff. The CSW conveyance system consists of berms, culverts, pipes, and asphalt-lined ditches that direct the CSW to the lined CSW lagoon located southeast of Area 8. The CSW lagoon stores the CSW and helps pre-settling of solids before the CSW is discharged to the leachate lagoons. In the leachate lagoons, CSW mixes with leachate and is aerated before discharging to the KCWTD Renton POTW system for treatment. Figure 5-4 shows the current overall sitewide collection system for CSW flows.

The existing CSW lagoon was constructed in 2016 as part of the CHRLF Southwest Siltation Pond and CSW Ponds project. The CSW lagoon occupies approximately 4.7 acres in the southcentral part of the landfill with a storage capacity of 37.0 acre-feet. The lagoon was sized to contain flows from approximately 96 acres of the landfill resulting from the 100-year, 24-hour storm as per the 2016 version of the KCSWDM.

In addition to the landfill areas, additional CSW at the site is collected from the maintenance shop areas where equipment that operates on the active landfill area is serviced, and from the loaded trailer parking area. The CSW collected from the maintenance and loaded trailer parking areas is currently piped directly to the leachate lagoons for aeration, without going through the CSW lagoon. CSW discharged to the KCWTD system, via the leachate lagoons, must meet effluent limitations and self-monitoring requirements specified in the Wastewater Discharge Permit for CHRLF. Monitoring of effluent from the leachate lagoons is as indicated in Section 5.1.4.1.

5.1.5.2 Renton Site

The undeveloped portion of the existing Renton site does not produce contaminated stormwater. The portion of the Renton site occupied by the Renton Recycling and Transfer Station maintains a roof over waste handling areas and uses BMPs to avoid stormwater from contacting waste handling areas. However, as a precaution, all areas where waste refuse trucks travel or are parked drain to a collection system that discharges to the Renton sanitary sewer system and is conveyed to the KCWTD POTW for treatment. It is estimated that approximately 3.8 million gallons per year are conveyed to the KCWTD system from the Renton Recycling and Transfer Station, including flows from restrooms, transfer station operations, washdowns, and stormwater runoff from waste refuse truck parking areas and the access roads.

5.1.6 Stormwater Runoff

Stormwater runoff is precipitation that falls on the site that doesn't infiltrate. At CHRLF, clean stormwater is diverted to detention or siltation ponds to control flow and remove sediment and is then discharged to wetlands and streams on the perimeter of the property. Further detail on stormwater management is included in Section 1.3.2.

5.1.6.1 Cedar Hills

The remainder of stormwater that leaves the landfill is uncontaminated runoff, including stormwater runoff from the inactive (closed) areas of the landfill and the buffer. In general, clean stormwater from the north half of the site flows north, into either the North Siltation Pond or the North Stormwater Lagoon. Clean stormwater generated on the southeast portion of the site flows to the South Stormwater Lagoon and clean stormwater from the southwest portion of the site flows to the Southwest Siltation Pond and through the connected water quality sand filter. Stormwater ponds provide detention and sediment removal before discharge to wetlands and streams on the perimeter of the property.

Stormwater ponds and onsite facilities are designed to meet the requirements of the most current KCSWDM. During design of the stormwater facilities, stormwater modeling is conducted to determine the size and components of the facility required to handle stormwater flows on site. Design input and assumptions are typically as follows:

- Flow control facilities are designed to match historical flow durations for 50 percent of the 2-year peak flow through the 50-year peak flow and match historical 2- and 10-year peak flows. Historic site conditions for CHRLF are forested conditions.
- New conveyance system elements are analyzed, designed, and constructed to meet the conveyance requirements for new systems.
- Pipe systems are designed to convey and contain (at a minimum) the 25-year flow from the developed conditions. The 100-year flow rates are evaluated to ensure compliance with the KCSWDM.
- New culverts are designed with sufficient capacity to meet the headwater requirements and convey (at a minimum) the 25-year peak flow from developed conditions. The 100-year flow rates are evaluated to ensure compliance with the KCSWDM.

- Open channel systems are designed to convey and contain (at a minimum) the 25-year flow from developed conditions. The 100-year flow rates are evaluated to ensure compliance with the KCSWDM.

Stormwater leaves CHRLF at three distinct discharge points (numbered below and shown on Figure 5-3) downstream of the stormwater ponds:

- SW-N4 discharges treated stormwater from the North Siltation Pond and North Stormwater Lagoon into an unnamed stream that traverses the northwest corner of the site before flowing into McDonald Creek, and ultimately to Issaquah Creek.
- SW-GS1 discharges treated stormwater from the Southwest Siltation Pond and adjoining water quality sand filter into wetlands located on site near the southern property line.
- Stormwater flowing out of the South Stormwater Lagoon flows through a bioswale to discharge point SW-SL3, at the southeast property line. Downstream of SW-SL3, stormwater flows through a series of pipes and catch basins along the west side of 228th Avenue SE, before daylighting and infiltrating in a roadside ditch along the north side of Cedar Grove Road SE, which provides a path to the Cedar River. The water infiltrates beneath the ditch before reaching the Cedar River.

5.1.6.2 Renton Site

Much of the Renton site is currently undeveloped and all runoff from the southern part of the east parcel is via sheet flow and infiltrates into site soils. The topography and an existing curb along the east edge of the parcel directs stormwater runoff primarily to the west and then to the south into the ravine. Stormwater runoff from the northern portion of the east parcel, or the existing Renton Recycling and Transfer Station (west parcel), becomes stormwater runoff and is managed through stormwater collection systems, except from areas where waste refuse trucks travel or are parked, which stormwater is separately conveyed to the Renton sanitary sewer system (see Section 5.1.5.2). The clean stormwater runoff then discharges into the Cedar River through a combination of private and public storm drainage infrastructure that flows from east to west, south of the Renton site.

5.1.7 Stormwater Runoff Quality

5.1.7.1 Cedar Hills

KCSWD routinely monitors the quality of stormwater runoff from the landfill in accordance with its Municipal Solid Waste Landfill Permit (see Appendix B), WAC 173-351-200, KCSWDM, SWMMWW, the Ecology CSWGP, and the Ecology ISGP for the landfill. Quarterly and annual reports filed with Public Health and Ecology provide a summary of the data (KCSWD 2020).

KCSWD staff members collect stormwater grab samples (which are collected at one location at one point in time) for analysis at quarterly intervals from the following key locations around the landfill to meet ISGP requirements (Figure 5-3):

- SW-N4, which drains the north sub-basin on its northern property line
- SW-GS1, which drains the south sub-basin on its southern property line
- SW-SL3, at the exit of the bioswale from the South Stormwater Lagoon

All surface water is monitored and managed in accordance with the applicable permits. KCSWD transmits data to Ecology in quarterly discharge monitoring reports (DMRs). The monitoring reports for the past several years indicate that parameter concentrations in stormwater samples from the landfill typically fall well below their respective benchmark values, or effluent limits (see reports at: <https://kingcounty.gov/depts/dnrp/solid-waste/facilities/documents.aspx#cedar_reports>).

Table 5-2 includes analytical parameters that KC tests for and the frequency of monitoring.

Table 5-2. Cedar Hills LEPS Wet Well Discharge Permit Monitoring Parameters.

Parameter	Sampling Frequency	Sample Type
pH	Quarterly	Grab
Turbidity (NTU)	Quarterly	Grab
Oil and Grease	Quarterly	Visual (Yes/No)
Copper (Cu)	Quarterly	Grab
Zinc (Zn)	Quarterly	Grab
Total BOD5	Quarterly	Grab
TSS	Quarterly	Grab
Ammonia	Quarterly	Grab
Alpha Terpineol	Quarterly	Grab
Benzoic Acid	Quarterly	Grab
4-Methylphenol	Quarterly	Grab
Phenol	Quarterly	Grab

While exceedances of benchmark values have occurred, they do not occur regularly. Effluent exceedances are reported in the CHRLF Quarterly and Annual Reports, and discharge monitoring reports and exceedance reports are included in appendices to the Annual Report (KCSWD 2020). Sampling results included in the ISGP Annual Reports show that there have been few benchmark exceedances in the past four years. There were exceedances in 2020 due to severe storm events and in 2016 due to erosion from construction activities and a vehicle rollover and subsequent diesel release; corrective actions were taken in all cases. When a benchmark value is exceeded, KCSWD investigates to determine the cause and takes actions to improve the BMPs in the area of the cause or to address the cause in another manner, in compliance with the ISGP. Based on these data, stormwater runoff from the landfill is not adversely affecting the quality of water in creeks and rivers in the area.

Beginning in 2017, a CSWGP was issued for CHRLF for the Area 8 construction activities (Ecology permit number WAR305034). A separate SWPPP was also created for this CSWGP permit. Four (4) discharge locations were monitored weekly for compliance with the CSWGP in accordance with the SWPPP by the contractor during the active phase of the project. Area 8 was substantially completed during the second quarter of 2019, and construction stormwater monitoring by the contractor discontinued at the time of completion. The permit however remains active, with monitoring continued by KCSWD staff monthly.

KCSWD continues to implement BMPs identified in the SWPPP to trap sediments and minimize erosion from the landfill. In addition to quarterly monitoring at compliance points required by the ISGP, KCSWD performs monitoring at SW-E1, located on the northeast side of the landfill property (shown in Figure 5-3). Refer to the 2013 Sampling and Analysis Plan (SAP) for additional information (KCSWD 2013).

5.1.7.2 Renton Site

Stormwater quality is not current monitored at the Renton site. A Clean Water Act Section 401 Water Quality Certification would be required as part of relocating CHRLF infrastructure to the Renton site. KCSWD would routinely monitor the quality of stormwater runoff from the site in accordance with the ISGP from Ecology for the site.

5.2 Environmental Impacts

5.2.1 Direct and Indirect Impacts

5.2.1.1 No Action Alternative

Under the No Action Alternative, the landfill would continue to operate as currently permitted, support facilities would remain in their current locations as-is or would be refurbished or re-built in place and would be temporarily located at interim facilities. Once closed, areas of the landfill that drain to the CSW system will be minimized or eliminated and areas that drain to surface water will cover most or all of the site. As part of landfill closure planning and design, stormwater modeling and design of system upgrades is done for the most conservative land cover closure type. For post-closure activities that include installation of a surface that will result in increased runoff, the stormwater system will be resized and upgraded as necessary to accommodate increased flows. No impacts to the stormwater system, leachate system, or CSW system would be anticipated and impacts on surface water quality would likely remain low.

5.2.1.2 Impacts Common to All Action Alternatives

The evaluation of impacts to surface water and stormwater assumes that well-proven engineering methods and techniques would be implemented to design and construct each of the action alternatives. Some potential impacts that would be common to all the alternatives are:

- When support facilities are relocated or rebuilt there may be an increase in impervious areas, which could result in increased surface water runoff. The surface water runoff volume from the site is expected to increase under all the action alternatives because the proposed development will create additional impervious surfaces.

- Stormwater falling on waste trailer parking areas could come in contact with waste and would be considered CSW. CSW from these areas would be routed to the CSW system at the landfill site, or to the KCWTD sanitary sewer system and POTW at the Renton site.
  - At the Renton site, the volume of stormwater from waste trailer parking areas that will be required to go to sanitary sewer is expected to be in the range of approximately 7 million gallons per year. This includes runoff from areas for waste refuse truck parking and the access roads. KCSWD would determine specific areas and conveyance needs during facility design and coordinate with City of Renton and KCWTD to ensure the required capacity exists in the existing sanitary sewer system or that new infrastructure is installed.
  - At CHRLF, the volume of stormwater from waste trailer parking areas that will be required to go to CSW (or sanitary sewer) is expected to be approximately 11 million gallons per year for the North Facility Option and 17 million gallons per year for the South Facility Option.
- If additional landfilling occurs under any of the action alternatives, additional capacity and/or infrastructure may be required in the existing stormwater, CSW, and/or leachate conveyance systems.
- If construction continues at CHRLF, there may be temporary construction impacts from potential spills, erosion from ground disturbance, and surface water runoff.

CHRLF currently implements a variety of structural design and operational BMPs, including construction BMPs, to minimize potential impacts and prevent them from becoming significant. These BMPs are described below.

Design BMPs

New stormwater facilities for treatment of runoff from parking areas, driveways, and rooftops will be required and will be designed and constructed in accordance with SWMMWW, the KCSWDM, the City of Maple Valley's Stormwater Management Program (City of Maple Valley 2020) for CHRLF, and the City of Renton's 2017 Surface Water Design Manual for any new facilities in Renton (City of Renton 2017). These standards ensure that adequate flow control and water quality measures are installed relative to the scale of development. In particular, the design and construction would need to consider the following:

- Construction scheduling.
- Size and location of stormwater facilities. Landfilll planning and design include stormwater modeling and system upgrades. If landfill development will result in increased runoff, the stormwater system will be resized and upgraded to accommodate increased flows. The North Siltation Pond, North Stormwater Lagoon, Southwest Siltation Pond, CSW Lagoon, and/or

Leachate Lagoons may be modified to handle additional flows, or additional ponds or facilities may be added to the stormwater system.

- Design of the new conveyance system to flow routing to existing infrastructure. Runoff generated from increased impervious areas would be routed through the stormwater system to the North Siltation Pond, North Stormwater Lagoon, Southwest Siltation Pond, after any needed modifications for capacity, or new pond(s) constructed as part of the facilities relocation.
- Separation and routing of clean stormwater, leachate, and CSW. Waste trailer parking areas would be required to route stormwater to the CSW system at the landfill site, or to the KCWTD sanitary sewer system and POTW at the Renton site. Flows to the sewer will be calculated and designed as part of future design phases. Stormwater modeling and design will follow the most current version of the KCSWDM, as well as the most current version of the City of Renton's Surface Water Design Manual (City of Renton 2017).
  - Flows from areas where stormwater comes into contact with waste will be routed via the Renton sanitary sewer system if possible. If there is not sufficient capacity in the Renton conveyance system, KCSWD will add sufficient conveyance capacity to the Renton system or add a connection directly to the KCWTD main.
  - Where feasible, waste trailer parking areas would be covered to minimize stormwater contact with waste and reduce flows to the CSW system (for Options 1 and 2) or the City of Renton sanitary sewer system (for Option 3), and in general to the KCWTD sanitary sewer system.
- Maintenance of existing drainage patterns so that stormwater would flow into the same drainage basin or sub-basin.
- Use of Low Impact Development (LID) techniques that increase infiltration and minimize runoff in new support facility areas.
- Amount and routing of stormwater flows: As noted above, development of new landfill disposal areas or landfill support facilities on the CHRLF property will adhere to the current KCSWDM. The current adopted KCSWDM is the 2021 version, which requires that the result in peak flow rates from any development through the 50-year design storm will match historical forested conditions. For the southern half of the landfill, future design phases will determine where the clean stormwater runoff will flow, either to the south or southeast discharge channels. If needed, additional stormwater management capacity, storage and treatment will be incorporated into the final design and constructed.

In addition to runoff treatment facilities, additional source-control BMPs would be implemented to reduce the amount of pollutants on the ground surface and prevent accidental spills of fuel or other toxic materials that could enter the storm drainage system. Hazardous materials control features would be incorporated into facility design for facility operation, including secondary containment for tanks and piping, leak detection equipment, and use of recycled/reused wash water equipment.

Modifications and design of the landfill CSW system and leachate systems would be done in accordance with WAC 173-351-200 and 300. Design and operation of any of the action alternatives would follow applicable regulations and would use well-proven engineering methods during design, construction, and operation.

Operational BMPs

KCSWD will continue to implement operational BMPs, such as those identified below, to minimize impacts to surface water and stormwater quality.

- Minimize the active area at all times.
- Apply daily, interim, and final cover.
- Regularly monitor and maintain cover systems per the design specification and maintenance plan.
- Earthwork activities will not take place during periods of heavy precipitation.
- Inspect and maintain erosion and sedimentation control measures on a regular basis.
- Implement additional measures for wet-season construction; these include covering stockpiled soil during winter, hydroseeding, and runoff management.

Construction BMPs

Temporary construction impacts will be minimized by implementing temporary erosion and sedimentation control plans in accordance with SWMMWW, spill prevention control and countermeasure (SPCC) plans, SWPPPs, and BMPs in accordance with the KCSWDM, including but not limited to the following:

- Develop and implement a temporary erosion and sediment control (TESC) plan.
- Control erosion at the source, when possible.
- Intercept and convey surface water from disturbed areas to sediment ponds.
- Properly identify clearing limits before clearing.
- Provide perimeter protection (e.g., silt fence) downslope of areas to be disturbed before construction.
- Provide stabilized construction entrances to limit the tracking of sediment off the construction area.

5.2.1.3 Action Alternative 1

Impacts to surface water under Action Alternative 1 include the specific impacts listed below, as well as those that are common to all action alternatives as indicated in Section 5.2.1.2.

Landfill Development

Impacts to surface water under Action Alternative 1 include those that are common to all action alternatives as indicated in Section 5.2.1.2. As with landfill planning and design, when evaluating landfill closure, stormwater modeling and design of system upgrades is done for the most conservative land cover closure type. If post-closure activities include installation of a surface that will result in increased runoff, the stormwater system will be resized and upgraded as necessary to accommodate increased flows. With implementation of the design, operational, and construction BMPs listed in Section 5.2.1.2, impacts to surface water or stormwater quality as a result of Action Alternative 1 would not be significant.

Support Facility Options

South

The option for locating the support facilities at the south end of the site would increase the paved area in the south basin and southeast basin by 10 to 15 acres. Impacts to the leachate system and the CSW system will be as indicated in the Impacts Common to All Action Alternatives, Section 5.2.1.2, above.

North

The option for locating the support facilities at the north end of the site would increase the paved area in the north basin by 11 to 16 acres. The North Siltation Pond would be modified and relocated or rebuilt into a covered vault in its existing location. Impacts to the leachate system and the CSW system would be as indicated in the Impacts Common to All Action Alternatives, Section 5.2.1.2, above.

Renton Site

The option for locating the support facilities at the Renton site would increase the paved area at the Renton site by 9 to 14 acres. Impacts to stormwater system and the sanitary sewer system and POTW would be as indicated in the Impacts Common to All Action Alternatives section, Section 5.2.1.2, above.

Stormwater runoff on the Renton site would be managed using ditches, pipes, culverts, swales, berms, and/or underground storage vaults. New stormwater infrastructure would be designed in accordance with the most current version of the KCSWDM.

5.2.1.4 Action Alternative 2

Impacts to surface water for Action Alternative 2 include the specific impacts listed below, as well as those that are common to all action alternatives as indicated in Section 5.2.1.2.

Landfill Development

Impacts to surface water under Action Alternative 2 include those that are common to all action alternatives as indicated in Section 5.2.1.2. With implementation of the design, operational, and construction BMPs listed in Section 5.2.1.2, impacts to surface water or surface water quality as a result of Action Alternative 2 would not be significant.

Support Facility Options

South

The option for locating the support facilities at the south end of the site would increase the paved area in the south basin and southeast basin by 10 to 15 acres. Impacts to the leachate system and the CSW system would be as indicated in the Impacts Common to All Action Alternatives, Section 5.2.1.2, above.

North

The option for locating the support facilities at the north end of the site would increase the paved area in the north basin by 11 to 16 acres. The North Siltation Pond would be modified and relocated or vaulted. Impacts to the leachate system and the CSW system would be as indicated in the Impacts Common to All Action Alternatives, Section 5.2.1.2 above.

Renton Site

The option for locating the support facilities at the Renton site would increase the paved area at the Renton site by 9 to 14 acres. Impacts to the stormwater system and the sanitary sewer system and POTW would be as indicated in the Impacts Common to All Action Alternatives section, Section 5.2.1.2, above.

5.2.1.5 Action Alternative 3

Impacts to surface water for Action Alternative 3 include the specific impacts listed below, as well as those that are common to all action alternatives as indicated in Section 5.2.1.2.

Landfill Development

Impacts to surface water under Action Alternative 3 include those that are common to all action alternatives as indicated in Section 5.2.1.2. With implementation of the design, operational, and construction BMPs listed in Section 5.2.1.2, impacts to surface water or surface water quality as a result of Action Alternative 3 would not be significant.

Support Facility Options

South

The option for locating the support facilities at the south end of the site would increase the paved area in the south basin and southeast basin by 10 to 15 acres. Impacts to the leachate system and the CSW system would be as indicated in the Impacts Common to All Action Alternatives , Section 5.2.1.2, above.

North

The option for locating the support facilities at the north end of the site would increase the paved area in the north basin by 11 to 16 acres. The North Siltation Pond would be modified and relocated or rebuilt into a covered vault in its existing location. Impacts to the leachate system and the CSW system would be as indicated in the Impacts Common to All Action Alternatives , Section 5.2.1.2, above.

Renton Site

The option for locating the support facilities at the Renton site would increase the paved area at the Renton site by 9 to 14 acres. Impacts to the stormwater system and the sanitary sewer system and POTW would be as indicated in the Impacts Common to All Action Alternatives, Section 5.2.1.2, above.

5.2.1.6 Indirect Impacts

The limited surface water impacts from the landfill are unlikely to lead to additional projects or actions that would result in indirect surface water or stormwater impacts.

As discussed in Section 1.7, in order to compare the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046–the estimated year of capacity for Action Alternative 3. The impacts that would occur during these intervening years would not occur but for the proposed action selected and are therefore indirect effects.

For the No Action Alternative between 2028 and 2046, waste disposal could involve either waste export to a regional landfill or disposal at a WTE facility, which could be the CHRLF site or another site. A regional landfill accepting waste from the County is likely to be an existing facility with onsite surface and stormwater management measures, leachate control systems, and contaminated stormwater management systems. These systems would control surface water impacts, so significant surface water-related indirect impacts associated with that landfill are unlikely to result from the County's waste export. Waste export may require development of an intermodal facility that could have surface water impacts, although waste handled at such a facility would be enclosed within shipping containers and the facility is likely to be located in an industrial area with surface water and stormwater management systems in place.

For Alternatives 1 and 2, potential surface water and stormwater impacts that could occur after closure in 2038 and 2039, respectively, would be similar to those that could occur under the No Action Alternative. A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the 2019 King County Comprehensive Solid Waste Management Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

For facility relocation options, including Options 1 and 2 at the CHRLF and Option 3 at the Renton site, implementation of required stormwater conveyance and treatment systems would minimize the potential for indirect impacts associated with construction and operation of the relocated facilities. It is unlikely that implementing the facility relocation options would alter patterns of land use, population density or growth rate in the vicinity of CHRLF or the Renton site and therefore no indirect impacts associated with facility relocation options are anticipated for the CHRLF or Renton site with regards to surface water.

5.2.2 Cumulative Impacts

For CHRLF, the adjacent Queen City Farms property has initiated plans for the filling of Gravel Pit Lake to the south of CHRLF. Currently, the majority of stormwater runoff from the south-central half of the landfill drains to Queen City Lake, which either infiltrates or overflows to Gravel Pit Lake. KCSWD has an obligation to appropriately manage stormwater generated on site and is evaluating options to lessen the flow to Queen City Farms, including mimicking pre-development conditions through infiltration. Proposed landfill development, landfill activities, facility relocation activities, and operations would contribute incrementally to the cumulative overall past, present, and likely future impacts on surface water in the region, including the Gravel Pit Lake project.

The planned or proposed improvements identified in the vicinity of the Renton site include expansion of the Renton Technical College. For facility relocation Option 3, this and all future development in the vicinity of the Renton site would be required to implement required stormwater conveyance and treatment systems appropriate to the scale and density of development and the regulations in effect at the time of permitting. Improvements associated with these developments would likely minimize water quality impacts and the potential for downstream flooding. The proposed facility relocation option at the Renton site would contribute to the general cumulative increase in impacts on surface water in vicinity of the Renton site over the time the facility remains open, but impacts are not likely to be significant.

5.3 Mitigation Measures

To avoid potential surface water impacts and to control offsite flows from landfill operations, KCSWD has been implementing best management and engineering practices during design, operation, construction, and maintenance of environmental control systems, including stormwater and surface water systems. With these controls in place, no additional mitigation measures are necessary.

5.4 Significant Unavoidable Adverse Impacts

With the mitigation cited, there would be no significant unavoidable adverse impacts to surface water or stormwater as a result of implementing any of the alternatives.

6.0 GROUNDWATER

This chapter describes the hydrogeologic setting in the vicinity of CHRLF and the Renton site, groundwater quality and beneficial use, critical aquifer recharge areas, the groundwater monitoring system at CHRLF, and how implementation of any of the action alternatives, including the facility relocation options, could affect groundwater quality in the vicinity of the CHRLF and the Renton site, compared to the No Action Alternative.

This environmental review determined that there would be no significant unavoidable adverse impacts to groundwater at CHRLF or the Renton site during construction or operation of any of the alternatives, including the facility relocation options.

6.1 Affected Environment

The affected environment includes the shallow groundwater and the regional aquifer below and in the vicinity of the CHRLF and the Renton site.

6.1.1 Hydrogeologic Setting

6.1.1.1 Cedar Hills

At CHRLF, groundwater occurs within site soils as local, discontinuous “perched” saturated zones and as a regional aquifer (CH2M Hill 1999; KCSWD 2003; KCSWD, 2004; KCSWD 2007; HDR 2008; KCSWD, 2013; HDR 2014; KCSWD 2020). The perched saturated zones are separated from the regional aquifer by underlying aquitards (i.e., soils with a hydraulic conductivity sufficiently lower than that of soils in the saturated zone that groundwater flow directions or rates are expected to be significantly affected by the presence of the aquitards) and, in most areas, by unsaturated soils.

Local perched saturated zones are present beneath most undeveloped areas of the site and beneath some areas where waste has been placed (CH2M Hill 1999; KCSWD 2003; KCSWD 2007; HDR 2008; HDR 2014; KCSWD 2020). Perched groundwater occurs in alluvial soils; in Vashon glacial deposits including recessional outwash, till, and ice contact deposits; and in underlying soils. The perched saturated zones identified beneath CHRLF are not laterally or vertically extensive. Perched saturated zones generally occur within single drainage basins and, because of variations in soils, more than one entirely separate and distinct perched saturated zone may occur within a single drainage basin. Most perched zones identified beneath undeveloped portions of the site are recharged by the infiltration of seasonal precipitation, and some perched zones are only seasonally saturated. In some cases, onsite perched saturated zones are hydraulically continuous with surface water and either receive recharge from losing streams or discharge to gaining streams. Groundwater flow direction and velocity cannot be determined due to the discontinuous nature of these perched groundwater zones.

The regional aquifer is the first continuous saturated zone encountered beneath the landfill footprint and extends beneath the entire site (CH2M Hill 1999; KCSWD 2003; KCSWD 2007; HDR 2008; HDR 2014;

KCSWD 2020). The regional aquifer occurs in Vashon stage advance outwash deposits and in earlier glacial and interglacial deposits. The regional aquifer water table is generally more than 120 feet below the base of landfilled waste.

A local recharge area is present immediately south of the CHRLF site in the area of the Queen City Farms site, Queen City Lake, and Gravel Pit Lake (Landau Associates 1990; Landau Associates 1991a, Landau Associates 1991b; Landau Associates 1992; EPA 1992; EPA 1994; EPA 2018). These lakes receive recharge from precipitation and several small streams; neither lake has an outlet. Surface water in Queen City Lake and Gravel Pit Lake and associated wetlands, and groundwater in the local recharge zone discharge by downward infiltration through highly permeable soils to the regional aquifer (Figure 6-1). Surface water ponded in Gravel Pit Lake is effectively coincident with the regional aquifer water table in this area and the vertical gradient in this area is consistently downwards (EPA 2018).

North of the local recharge area located on the Queen City Farms site the regional aquifer flows northward beneath the CHRLF site and does not flow towards the Cedar River. Numerous studies have confirmed that the regional aquifer beneath the CHRLF site does not extend above or discharge to the Cedar River or the Cedar Valley aquifer (KCSWD 2003; KCSWD 2004; HDR and SLR 2008; KCSWD 2010; Aspect 2011; Aspect 2013; HDR 2014; KCSWD 2019). Additional recharge from areas east and west of the CHRLF site are inferred by flow path analysis (Aspect 2011). All of the regional aquifer flow paths that pass beneath the CHRLF site eventually merge with groundwater derived from recharge beneath the East Renton Highlands that discharges towards McDonald Creek (Aspect 2011). This merged groundwater flow discharges northeast of the CHRLF site through the Issaquah Creek drainage in the gap between Tiger Mountain and Squak Mountain. There are no significant seasonal variations in horizontal flow paths; however, horizontal gradients are affected by seasonal precipitation infiltrating through the local recharge area near Gravel Pit Lake. The mean horizontal regional aquifer flow velocities beneath the CHRLF site vary and were reported as about 0.09 feet per day (ft/day) near the southern site boundary (and local recharge area), to 2.3 ft/day beneath the central portion of the site and 1.76 ft/day beneath the northern portion of the site (KCSWD 2020).

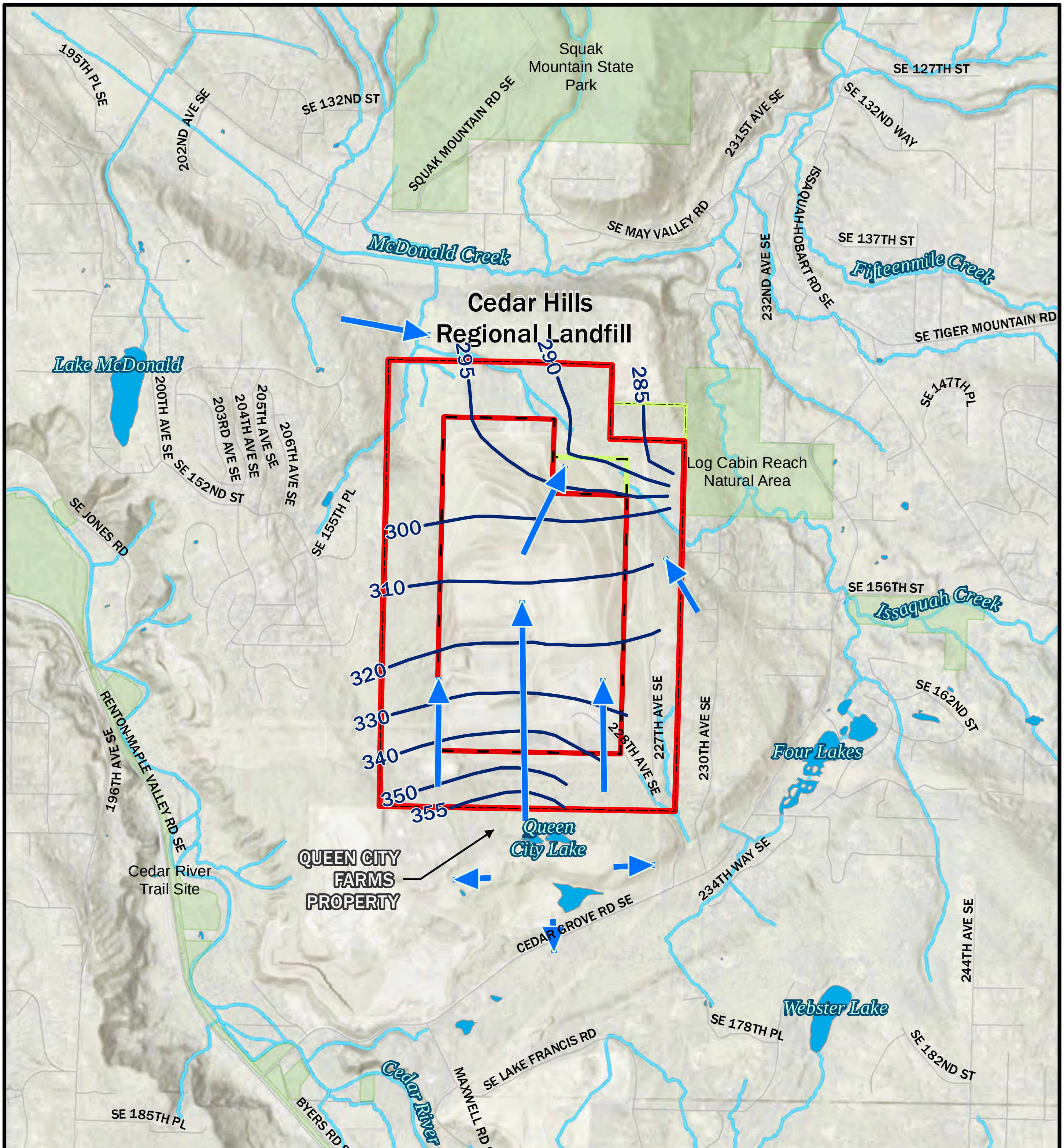
There are no critical aquifer recharge areas on or immediately adjacent to the landfill; the CHRLF site is not within the 1-, 5-, or 10-year time of travel of any wellhead protection areas; and the CHRLF site is not located above a sole-source aquifer (King County 2020).

6.1.1.2 Renton Site

The Renton site is located in an upland area above the Cedar River Valley and is located with the City of Renton's Aquifer Protection Area under which certain site activities and uses are restricted (Renton Municipal Code Title IV, Chapter 3, Section 4-3-050, Critical Areas Regulations). Although it is not located within the limits of the Cedar Valley Sole Source Aquifer or within the 1-year travel time for any wellhead protection area, the Renton site is located above the inferred 5- and 10-year travel time areas for at least some public water supply wells, including wells within the Cedar Valley Aquifer (King County iMap 2020; CH2M Hill 1988). The City of Renton has mapped this location as being within Aquifer Protection Area 2, which is “[t]he land area situated between the three hundred sixty five (365) day groundwater travel time contour and the boundary of the zone of potential capture for a well or well field owned or operated by the City.” (Reference: Renton Municipal Code 4-3-050 G [Development Standards]: Subsection 8 [Wellhead Protection Areas]).

Groundwater conditions beneath the Renton site have been evaluated using three monitoring wells installed in 1991 at REN-MW-34, located about 100 yards southwest of the existing transfer station (Figure 6-2). This installation consists of three monitoring wells (MW-34S, MW-34M, and MW-34D) installed within a single borehole (RH2 and PGG 1993). Well MW-34S was installed to evaluate a relatively shallow perched saturated zone. Perched groundwater occurs in relatively permeable “silt and sand” that overlie “silt bound sand and gravel”. The contact between these soil units was identified at 30 feet below grade. The depth to water in well MW-34S was reported as 44.29 feet below grade (about 14 feet below the contact) on September 30, 1992. Wells MW-34M and MW-34D are screened in relatively permeable sand units within soils logged as “silt and sand”. The final borehole depth is reported as 544 feet below grade with bedrock encountered at 543 feet below grade; however, well log shows the basal geologic unit as “gravel”. The regional aquifer elevation at this location reported for September 30, 1992 was 183.95 feet below grade in well MW-34M and 191.12 feet below grade in MW-34D, indicating a downward vertical gradient in the regional aquifer at that time.

Saturated soils monitored using wells MW-34M and MW-34D are interpreted as hydraulically continuous with the Maplewood Production Aquifer which at this location is interpreted as having a southwestward hydraulic gradient (RH2 and PGG, 1993; see Figure 6-2). The Maplewood Production Aquifer is a laterally-extensive sand and gravel deposit originally defined by testing performed using wells located at the Maplewood Golf Course (RH2 and PGG 1993). The Maplewood Production Aquifer underlies the Cedar Valley aquifer, extends north of the Renton site, and is likely bounded by bedrock to the south.



Legend

- Generalized Regional Aquifer Flow Direction
- Regional Aquifer Elevation (feet)
- Proposed Landfill Property Line (ALT. 3)
- Proposed 1000ft Buffer (ALT 3.)
- Existing Landfill Property Line
- Existing 1000ft Buffer
- Road
- Stream
- Waterbody
- Park

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 6-1.
Regional Groundwater Flow of the Cedar Hills Regional Landfill.

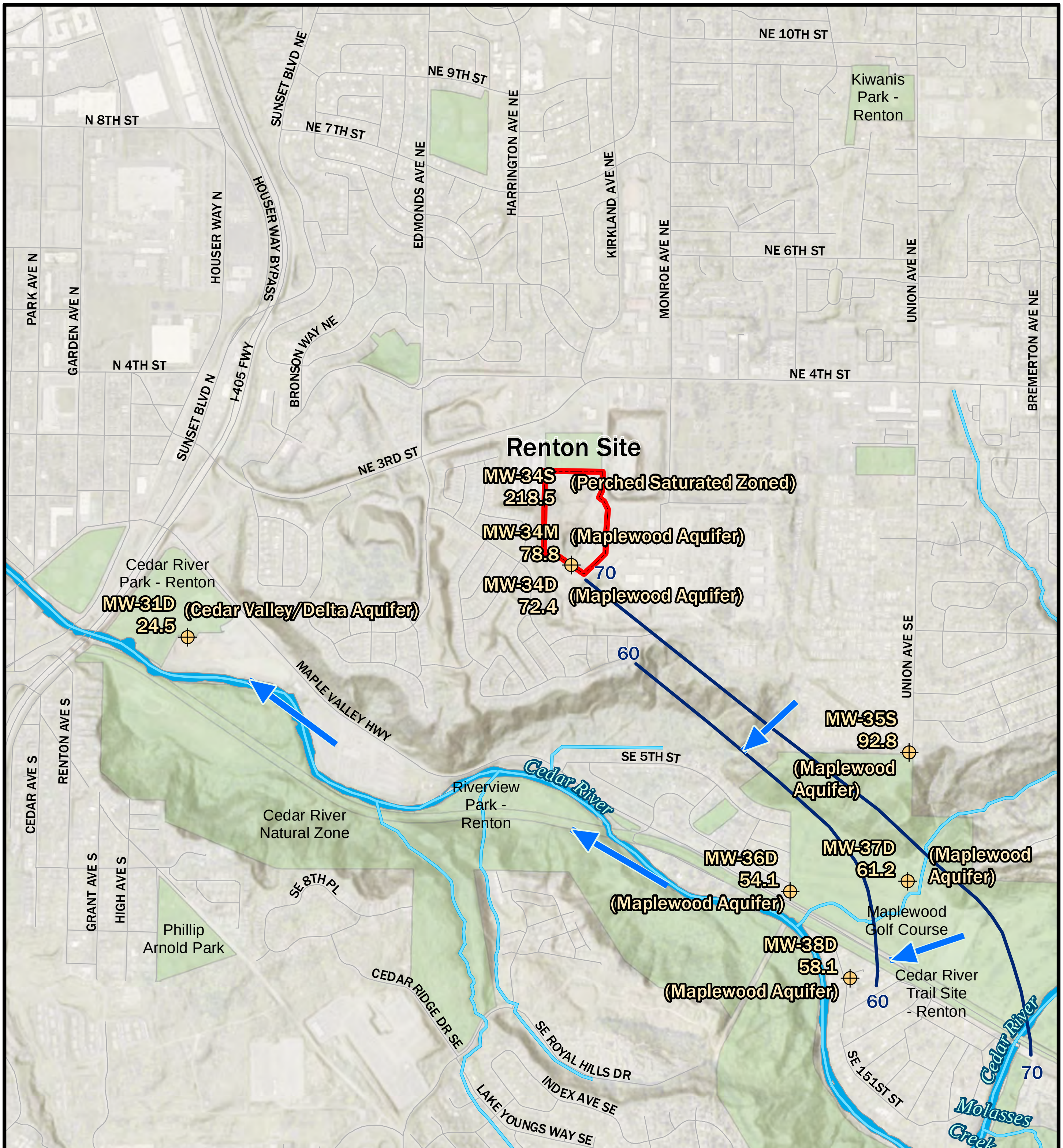
N

0 1,250 2,500 5,000 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 6\Figure6_1_CHRL_RegionalGroundFlow.mxd (8/12/2020)



Legend

- Well Name and Groundwater Elevation
- Renton Site Boundary
- Waterbody
- Park
- Generalized Regional Aquifer Flow Direction
- Estimated Regional Aquifer Elevation Near Renton Site
- Stream
- Road

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.
DATA SOURCE RH2 and PGG,1993.

Figure 6-2. General Regional Groundwater Flow in the Vicinity of the Renton Site.

N

0 750 1,500 3,000 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 6\Figure6_2_RegionalGWaterFlow_Renton.mxd (8/12/2020)

6.1.2 Surrounding Conditions Known to Impact Groundwater

6.1.2.1 Cedar Hills

Groundwater quality in the regional aquifer in the vicinity of the CHRLF has been and is affected by land uses at the adjacent privately-owned Queen City Farms property. This property was listed on the EPA National Priorities List in 1984, and remedial actions have been implemented to address soil and groundwater contamination caused by hazardous waste disposal (EPA 1992; EPA 1994; EPA 2018). The Queen City Farms site occupies approximately 340 acres directly south of the landfill. Over the last 50 years, the Queen City Farms site uses have included a pig farming operation that used MSW as feed, an animal rendering plant, unlined pits for disposal of liquid hazardous waste, unlined areas for disposal of solid waste including drummed waste, a general aviation airport, a solvent recovery operation, and gravel mining (EPA 1992; KCSWD 2004; EPA 2018). A commercial composting facility (Cedar Grove Composting) currently operates compost piles immediately south of the CHRLF property line. In the regional aquifer, groundwater flows north from the Queen City Farms site beneath the CHRLF property (see Figure 6-1).

6.1.2.2 Renton Site

Groundwater quality samples in the Renton area, including wells MW-34S and MW-34D, were collected during September 1992. The report summarized findings as “The water quality data indicates no detection of any pesticides, PCB chemicals, or volatile organic chemicals. The various inorganics and metals measured in each monitoring well sample were below established primary or secondary maximum contaminant levels with some exceptions.” (RH2 and PGG 1993).

No reports of contaminant releases to groundwater beneath or within a 0.5-mile radius of the Renton site have been identified. An estimated 80,000-gallon petroleum hydrocarbon release from the Olympic Pipe Line was identified in 1986, impacting the Cedar Valley Aquifer about 3,000 feet southeast of the Renton site. In 2015 Ecology agreed that no further remedial actions were needed at the site (Ecology 2015).

6.1.3 Controls to Protect Groundwater

6.1.3.1 Cedar Hills

Groundwater beneath the CHRLF is protected by natural and engineered controls. Natural controls include more than 120 feet of unsaturated soils beneath waste areas, including soil layers with low permeability that retard downward migration of leachate or gases derived from landfilled waste. All landfill disposal areas constructed after 1985 (and promulgation of WAC 173-304, which required landfill liners) include an impermeable landfill liner composed of high-density polyethylene (HDPE). A study of the chemical half-life characteristics of HDPE landfill liners predicted that the effective lifetime of an HDPE liner subjected to a temperature of 68°F would be 449 years, on average (Koerner 2005). The additional landfilling identified under all proposed alternatives would include placing waste over engineered liners.

The leachate management system consists of leachate extraction, conveyance, and pre-treatment facilities including leachate extraction drains and wells within waste; HDPE piping; epoxy-line concrete piping, manholes, and pump stations; and HDPE-lined pre-treatment lagoons.

The landfill gas management system consists of landfill gas extraction, conveyance, and treatment facilities including but not limited to probes, vents, and extraction wells in waste; probes and extraction wells within soils; HDPE piping; flares, and a gas-to-energy conversion facility.

Soil vapor is monitored manually using a network of probes (KCSWD 2020). Landfill gas in soils can impact groundwater quality by affecting groundwater concentrations of carbon dioxide and oxygen, and by conveying contaminants. Landfill gases (predominantly comprised of methane, nitrogen, and carbon dioxide) within the vadose zone can dissolve into groundwater. Changes in groundwater carbon dioxide and oxygen concentrations affect the solubility of numerous analytes, including metals that would naturally be present as solid particles or coatings on particles. Soil vapor is managed to protect groundwater and human health and the environment using a network of landfill gas extraction wells installed in waste and soils. (KCSWD 2020).

6.1.3.2 Renton

Groundwater beneath the Renton site is protected by natural and engineered controls. Natural controls include more than 40 feet of unsaturated soils beneath developed area, including soil layers with low permeability that retard downward migration of infiltrating stormwater. Engineered controls include hazardous waste management protocols required per the Renton Municipal Code (specifically, secondary containment is required for hazardous materials stored on site, if any).

6.1.4 Groundwater Monitoring System

6.1.4.1 Cedar Hills

Washington State requires groundwater monitoring at operating municipal solid waste landfills (Chapter 173-351-400 through 173-351-450 WAC). Groundwater monitoring is also specifically required under the Municipal Solid Waste Landfill Permit issued by Public Health (see Appendix B).

Groundwater has been monitored at the landfill since 1983. The current groundwater monitoring system is designed to meet the requirements of Chapter 173-351-405 WAC. Groundwater monitoring is performed under an Environmental Monitoring Sampling and Analysis Plan for the Cedar Hills Landfill (SAP; Aspect 2013), which is approved by Public Health and Ecology and periodically updated. The current Groundwater Detection Monitoring Program requires monitoring groundwater elevations and sampling groundwater quality in 32 regional aquifer monitoring wells; groundwater elevations are monitored in an additional 11 regional aquifer wells. The Groundwater Detection Monitoring Program also requires monitoring groundwater elevations and sampling groundwater quality in 16 monitoring wells installed in perched saturated zones; groundwater elevations are monitored in an additional 9 wells completed in perched saturated zones (KCSWD 2020). All modifications to the groundwater monitoring program or network are managed under Chapter 173-351-400 WAC.

Groundwater monitoring and sampling are conducted quarterly and, for selected wells, semi-annually during the second and fourth quarters. All groundwater monitoring and sampling data are evaluated using accepted statistical methods, and groundwater quality data are compared with relevant criteria including federal drinking water standards (Maximum Contaminant Levels) and the Washington State Groundwater Criteria (Chapter 173-200-040 WAC). Groundwater monitoring and sampling data are reported quarterly and annually in compliance with Chapter 173-351-415 WAC.

6.1.5 Groundwater Quality

6.1.5.1 Cedar Hills

KCSWD has been monitoring groundwater quality in the perched zones and the regional aquifer since the mid-1980s. Quarterly and annual reports filed with Public Health and Ecology provide a summary of the data. An overview is provided below.

Water Quality in Perched Groundwater Zones

Groundwater monitoring and site investigations indicate that groundwater quality in two localized perched groundwater zones (the East Main Hill Perched Zone and South Solid Waste Area Perched Zone) has been impacted by past landfilling practices (Aspect 2010a; Aspect 2010b). Investigations of the impacted perched saturated zones and regional aquifer have not identified any saturated flow path which connects any of these zones to the underlying regional aquifer. Because these perched zones are of limited extent and cannot provide sufficient water quantities for area uses, they pose no risk to water supplies in the vicinity of the CHRLF. Groundwater quality impacts within the East Main Hill Perched Zone are being managed under the Model Toxics Control Act (KCSWD 2016c).

Site improvements and engineered facilities have generally resulted in stable or decreasing contaminant concentrations in perched saturated zone groundwater (KCSWD 2020).

Upgradient Water Quality in the Regional Aquifer

Groundwater in the regional aquifer beneath the QCF site upgradient of CHRLF remains impacted by chlorinated solvents, and groundwater impacted by the QCF site contaminants has flowed north beneath the CHRLF site (EPA 2018). Chlorinated solvents and their derivatives are routinely detected in groundwater samples collected from wells installed to monitor water quality in the regional aquifer upgradient of CHRLF and downgradient of the Queen City Farms site. In addition, increasing concentrations of several water quality indicator parameters happened at the same time as, and were potentially related to, major clearing and grading activities initiated on the Queen City Farms property during 2011; these trends have continued through the current period of record (KCSWD 2020).

Downgradient Water Quality in the Regional Aquifer

Overall, onsite regional aquifer groundwater quality in the northeastern (downgradient) area of the CHRLF site has been affected by the upgradient QCF site operations and by landfill operations. Downgradient groundwater quality has exceeded primary standards for total arsenic and secondary standards for dissolved iron and manganese in 2019 (KCSWD 2020); however, there are currently no detections of chlorinated volatile organic compounds in groundwater samples collected from regional aquifer monitoring wells installed north (downgradient) of CHRLF refuse areas. These data indicate that CHRLF acts as an attenuation zone for impacts derived from the upgradient Queen City Farms site.

Downgradient groundwater quality is influenced by the presence of landfill gas in unsaturated soils along the flow path beneath refuse areas. In addition, chloride concentrations in regional aquifer groundwater samples north of the refuse areas are greater than elsewhere on site; this increase may related to infrastructure north of the landfilled area. Groundwater quality in the regional aquifer in 2019 was generally consistent with historical water quality, and all groundwater samples collected from regional aquifer monitoring wells downgradient of refuse areas met primary drinking water quality standards (KCSWD 2020).

6.1.6 Beneficial Use of Groundwater

6.1.6.1 Cedar Hills

Groundwater in the regional aquifer that extends beneath CHRLF has been used beneficially over many years. A comprehensive inventory of water supply wells in the vicinity of CHRLF was performed in conjunction with a site-wide hydrogeological evaluation (KCSWD 2004); this review included identifying and reporting Ecology’s water well records for the area within 2,000 feet south and west and 3,000 feet north and east of existing and proposed waste disposal areas at the CHRLF. This review identified wells classified by the Washington State Department of Health as Group A systems that provide service to 25 or more residents; Group B systems that provide service to less than 25 residents; and domestic wells that provide service to a single household. In addition, the CHRLF has three non-potable water wells that are permitted to provide water for onsite industrial use and fire suppression (potable water service is provided by King County Water District 90).

A review of King County iMaps (King County 2020) indicates the only additional well to those identified during the 2004 review within this general area is a Group B water supply well (Cedar Grove Composting water system) located about 600 feet south of CHRLF property line. The locations of water supply wells identified by the 2004 inventory and the additional Cedar Grove Composting water system well are shown in Figure 6-3.

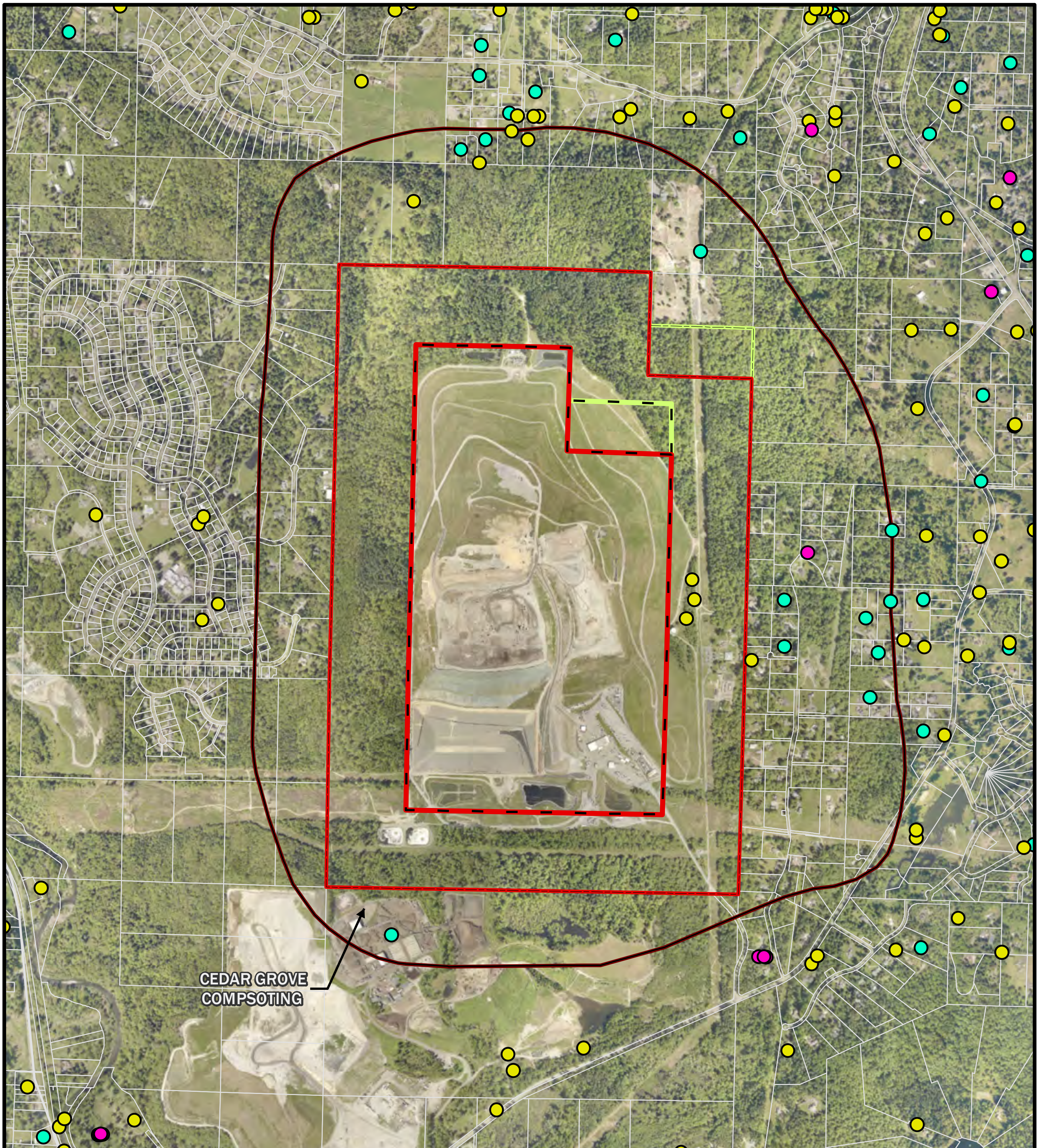
Operation of the three onsite non-potable water supply wells is permitted at a maximum rate of 400 gallons per minute (gpm) and a maximum withdrawal of 30 acre-feet per year. Operation of these wells does not affect groundwater availability for nearby water supply wells. Operation of the CHRLF has not affected the ability of surrounding landowners to rely upon the regional aquifer as a potable water resource.

6.1.6.2 Renton Site

The only supply well potentially located within 2,000 feet of the Renton site is a well installed in 1933 at the Greenwood Cemetery (now Greenwood Memorial Park and Funeral Home; Figure 6-4). The operational status of this well is not known. The area is served by the City of Renton water supply system and it is unclear which aquifer is the source for this 133-foot deep well.

City of Renton water supply is primarily dependent on groundwater sourced from water supply wells, and the city manages these under a wellhead protection program. The City of Renton owns and operates a multi-source water supply system. The primary source of the city water supply is groundwater pumped from the Delta Aquifer, which receives recharge from the Cedar Valley Aquifer (a federally-designated sole source aquifer). The primary sources of the city water supply are five wells (RW-1, RW-2, RW-3, PW-8, and PW-9) located at Liberty and Cedar River Parks, about 1 mile west of the Renton site. The Renton location is mapped by the City of Renton as being within Aquifer Protection Zone 2 (within the potential capture zone, with more than a 365-day travel time) relative to this wellfield. A well designated for emergency back-up use, EW-3, is also located at Liberty Park.

The City of Renton has also installed and tested three water supply wells (PW-11, PW-12, and PW-17) in the Maplewood Aquifer. The city has applied for the right to beneficially use water from these wells as additional municipal water supply; however, water right certificates for this wellfield had not been perfected as of 2012 (City of Renton 2012). The city's Maplewood wellfield is located about 1 mile southeast of the Renton site at the Maplewood Golf Course. Several additional water supply wells are located at the Maplewood Golf Course and in the surrounding area; all are at greater distance from the Renton site than the city wellfield. Groundwater in the Maplewood Aquifer beneath the Maplewood Golf Course has a slight upward gradient, suggesting that groundwater from the Maplewood Aquifer may discharge to the Cedar Valley Aquifer (RH2 and PGG 1993).



Legend

- Group A Wells
- Group B Wells
- Private Wells
- Inventory Boundary
- Existing Landfill Property Line
- Existing 1000ft Buffer
- Proposed Landfill Property Line (ALT. 3)
- Proposed 1000ft Buffer (ALT 3.)
- Tax Parcel

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 6-3. Water Supply Well Inventory in the Vicinity of Cedar Hills Regional Landfill.

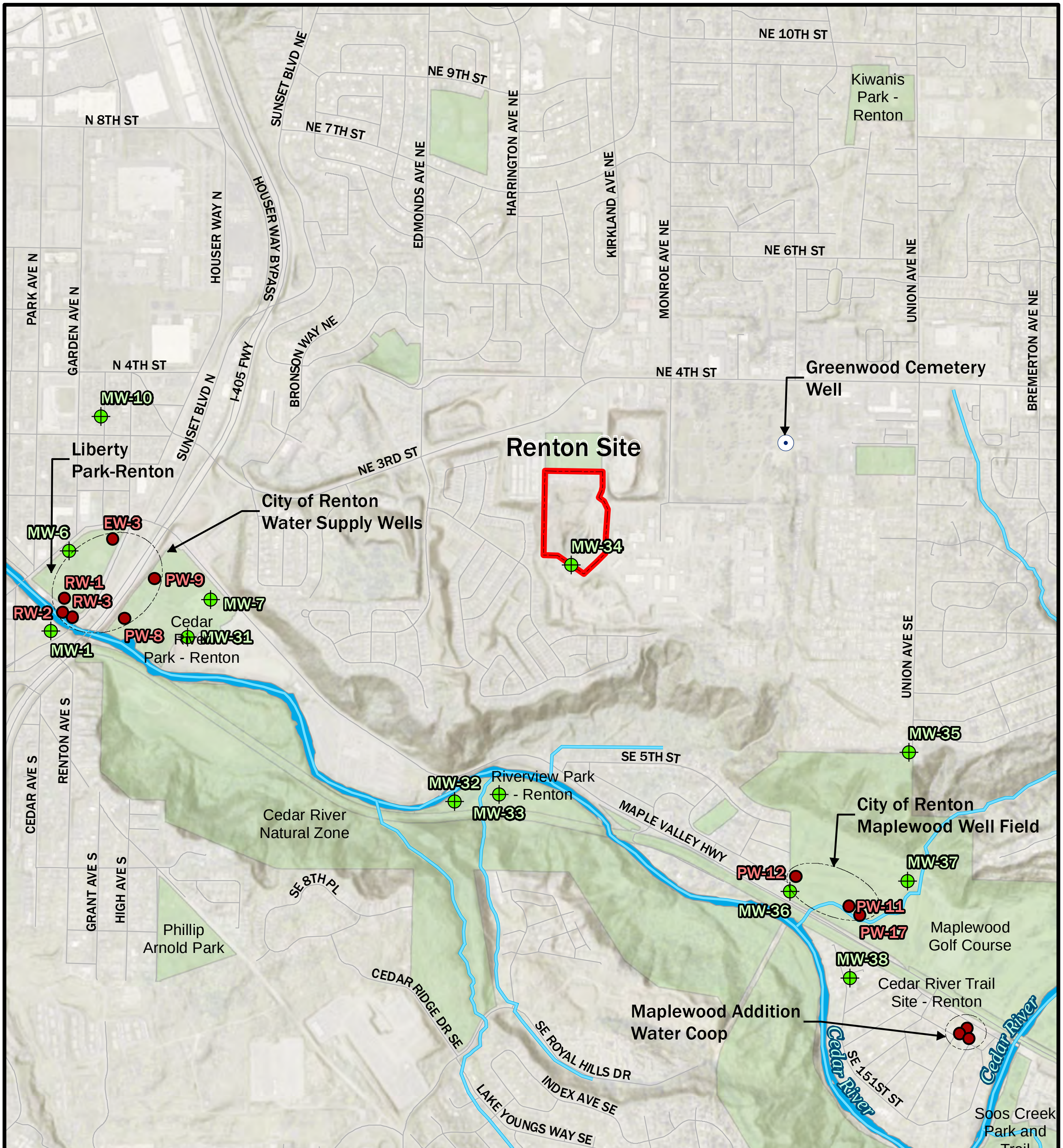
N

0 875 1,750 3,500 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 6\Figure6_3_CHRL_WaterWells_.mxd



Legend

- RW-1 Class A Water Supply Well
- Other Well Within 2000 feet of Renton Site
- Regional Aquifer Monitoring Well (RH2 and PGG, 1993)
- Renton Site Boundary
- Waterbody
- Park
- Stream
- Road

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.
WELLS ARE INSTALLED IN THE MAPLEWOOD, CEDAR VALLEY, AND DELTA AQUIFERS. THE EXACT HYDRAULIC RELATIONSHIPS BETWEEN THE AQUIFERS IS UNCLEAR.
DATA SOURCE RH2 AND PGG, 1993.

Figure 6-4. Water Supply and Regional Aquifer Monitoring Well Inventory in the Vicinity of the Renton Site.

N

0 750 1,500 3,000 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 6\Figure6_4_WaterWell_Renton.mxd (8/11/2020)

6.2 Environmental Impacts

KCSWD does and would under all action alternatives, including facility relocation options, adhere to rigorous design, construction, operations, and maintenance practices to minimize or avoid impacts to groundwater during construction and operation of landfill disposal areas and support facilities at CHRLF and at the Renton site. Engineering and management practices required and implemented by KCSWD at CHRLF, or as applicable at the Renton site, include:

Preparing detailed design drawings and specifications for new cell bottom liners, leachate collection systems, and a landfill gas collection system that explicitly describe the materials, installation, and quality control testing of these systems

Providing appropriate construction observation and field testing to document use of proper materials and installation methods

Monitoring surface water and groundwater at agreed monitoring points and using agreed practices to confirm the performance of the leachate management and pre-treatment system

Monitoring surface water and groundwater at agreed monitoring points and using agreed practices to confirm the performance of the containment systems of the new cells

Separately monitoring facilities related to fleet management, including fuel islands, truck washes, and maintenance areas

Reporting annually to provide a complete and transparent public record of site groundwater conditions

Providing secondary containment for hazardous materials used and/or stored on site at the Renton facility (if any).

6.2.1 Direct and Indirect Impacts

No direct impacts to groundwater during either construction or operation would be anticipated as a result of implementing any of the alternatives.

6.2.1.1 Indirect Impacts

The limited groundwater impacts from the landfill development and facility relocation construction and operation at CHRLF and the facility relocation construction and operation at the Renton site are unlikely to lead to additional projects or actions that would result in indirect impacts to groundwater.

As discussed in Section 1.7, in order to compare the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046–the estimated year of capacity for Action Alternative 3. The impacts that would occur during these intervening years would not occur but for the proposed action selected and are therefore indirect effects.

For the No Action Alternative between 2028 and 2046, waste disposal could involve either waste export to a regional landfill or disposal at a WTE facility, which could be at the CHRLF site or another site. A regional landfill accepting waste from the County is likely to be an existing facility with measures in place to control groundwater impacts, so significant groundwater-related indirect impacts associated with that landfill are unlikely to result from the County's waste export. Waste export may require development of an intermodal facility that could have groundwater impacts, although waste handled at such a facility would be enclosed within shipping containers and the facility is likely to be located in an industrial area with water groundwater protection systems in place.

For Alternatives 1 and 2, potential groundwater impacts that could occur after closure in 2038 and 2039, respectively, would be similar to those that could occur under the No Action Alternative. A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the Solid Waste Comp Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

6.2.2 Cumulative Impacts

Activities associated with landfill development and facilities relocation, including those at the CHRLF and the Renton site, would not be expected to contribute to the cumulative overall past, present, and likely future impacts on groundwater in the region due to other ongoing development.

6.3 Mitigation Measures

With implementation of BMPs, there are no anticipated impacts to groundwater as a result of implementing any of the alternatives; therefore, no mitigation measures would be necessary.

6.4 Significant Unavoidable Adverse Impacts

There would be no significant unavoidable adverse impacts to groundwater as a result of implementing any of the alternatives.

7.0 PLANTS AND ANIMALS

This chapter describes plants and animals in the vicinity of the CHRLF and the vicinity of the Renton site, and how implementation of any of the action alternatives, including the facility relocation options, could affect vegetation, wetlands, and wildlife at the CHRLF and the Renton site, compared to the No Action Alternative.

This environmental review determined that if mitigation measures are implemented there would be no significant unavoidable adverse impacts, , to upland vegetation, wetlands, and wildlife at CHRLF or the Renton site during construction or operation of any of the alternatives, including the facility relocation options.

7.1 Affected Environment

The affected environment includes the CHRLF property and 1,000-foot buffers, including the proposed property incorporation in the northeast corner, and all areas within one half mile of the property line to capture potential project effects on wildlife. Materials reviewed to obtain information about plants and animals at CHRLF included previous evaluations completed at the CHRLF and data received from the US Fish and Wildlife Service (USFWS), Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS), King County critical areas maps, and Washington State Department of Natural Resources (WDNR).

7.1.1 Vegetation

7.1.1.1 Cedar Hills

Upland vegetation communities in the 1,000-foot buffer of the landfill include deciduous forest, mixed coniferous and deciduous forest, and shrubs and grass (see Figure 7-1). There are no threatened or endangered plants or critical habitats on the site (USFWS 2019b) and no rare plants or rare plant communities are known to occur on the site (WDNR 2019).

Deciduous forest in the western and southern buffers consists primarily of red alder (*Alnus rubra*) and salmonberry (*Rubus spectabilis*) with a scattering of big leaf maple (*Acer macrophyllum*). Mixed coniferous and deciduous forest in the remaining buffer consists of Douglas-fir (*Pseudotsuga menziesii*), scattered western hemlock (*Tsuga heterophylla*), and red alder in the canopy, with an understory of Oregon grape (*Mahonia nervosa*), salal (*Gaultheria shallon*), sword fern (*Polystichum munitum*), and Robert geranium (*Geranium robertianum*). The shrub and herb community in the utility easement portions of the western and eastern buffers includes salmonberry, evergreen blackberry (*Rubus ursinus*), Himalayan blackberry (*Rubus armeniacus*), snowberry (*Symphoricarpos albus*), red elderberry (*Sambucus racemosa*), salal, Oregon grape, Robert geranium, sword fern, bracken fern (*Pteridium aquilinum*), and grasses. The shrub and herb community in the southern portion of the western buffer, within the Bonneville Power Administration transmission line corridor, includes Scotch broom (*Cytisus scoparius*), salmonberry, Himalayan blackberry, evergreen blackberry, common tansy (*Tanacetum vulgare*), salal, Oregon grape, bracken fern, and grasses (King County 2010).

7.1.1.2 Renton Site

Vegetation at the Renton site where the proposed facilities would be located under Option 3 consists mostly of mixed grasses, shrubs, and trees typical of disturbed sites. The north end of the site is paved with asphalt. The WDFW database (WDFW 2019a) and King County iMap (King County 2019a) do not show any priority habitats where the proposed facilities would be located and no rare plants or rare plant communities are known to occur on the site (WDNR 2019).

7.1.2 Noxious Weeds

7.1.2.1 Cedar Hills

King County assigns priorities for management of noxious weeds based on Washington State priorities modified for specific conditions in the County. Weeds that have been identified at the landfill are classified as Class B weeds. These are non-native species presently limited to portions of Washington where they are not yet widespread. Preventing new infestations in these areas is a high priority. Control is required for these species in King County (King County 2019b).Weeds present at the landfill include:

- Common reed (*Phragmites australis*)
- Tansy ragwort (*Jacobea vulgaris*)
- Spotted knapweed (*Centaurea stoebe*)
- Yellow starthistle (*Centaurea solstitialis*)
- Japanese knotweed (*Polygonum cuspidatum*),
- In addition, Scotch broom (*Cytisus scoparius*), butterfly bush (*Buddleia davidii*) and creeping buttercup (*Ranunculus repens*) are prevalent in the landfill buffer and surrounding area. Scotch broom and butterfly bush are state listed Class B noxious weeds; however, in King County control is not required but is recommended.

Figure 7-2 presents the most recent King County mapping of weed populations; the locations and species vary by year. In the past, weeds were much more prevalent and about 10 years ago CHRLF personnel, working with the King County Weed Board, began a weed control initiative. They currently manage weeds by requiring use of weed-free straw and weed-free seeds for prevention of new infestations. Cutting, hand pulling, and spot spraying are the primary method of control. Populations of Japanese knotweed (*Polygonum cuspidatum*), spotted knapweed (*Centaurea stoebe*) and common reed (*Phragmites australis*) found in the past were eliminated through early detection and treatment by the King County Weed Board.

Weed control occurs on an ongoing basis, with hand pulling and cutting occurring where feasible, and spot spraying for larger infestations when weather conditions allow. The only herbicide used at the landfill is

Tricloypyr (trade name Element 3A). This formulation uses the ester form of the active ingredient. The landfill uses 5 to 7 gallons of this herbicide annually.

7.1.2.2 Renton Site

Noxious weeds at the Renton site include:

- Spotted knapweed
- Tansy ragwort
- Orange hawkweed (*Hieracium aurantiacum*)
- Dalmation toadflax (*Linaria dalmatica*)

7.1.3 Wetlands and Waters of the U.S.

7.1.3.1 Cedar Hills

Naturally occurring and human-caused wetlands and streams are present in and around CHRLF (see Figure 7-3). Wetlands and streams mapped by King County (King County 2009; King County 2012) include:

- Excavated leachate lagoons in the south buffer. These lagoons were classified as palustrine unconsolidated bottom, artificially flooded excavated wetlands (sewage treatment ponds) during color infrared photo interpretation from 1981. They are not naturally occurring wetlands and have minimal habitat value.
- Forested, shrub, and herbaceous wetlands south and east of the landfill property.
- Streams in the east and northwest buffers.

The streams in the east buffer drain to Issaquah Creek and the streams in the northwest buffer drain to McDonald Creek, both of which are perennial fish-bearing streams (WDNR 2020b).

A wetland delineation conducted in 2001 by biologists in the Ecological Services Unit of the King County Department of Natural Resources and Parks, Water and Land Resources Division found additional wetlands within the northwest landfill buffers (KCSWD 2005 as cited in King County 2010), however no wetlands are currently mapped within the northwest landfill buffers and no recent wetland mapping has been conducted at the landfill. The County intends to avoid or minimize impacts to wetlands and streams and their buffers. Prior to final design and depending on the alternative selected, a wetland delineation could be conducted in the northwest buffer zone if needed, and project limits would be refined based on the new delineations.

7.1.3.2 Renton Site

There are no wetlands identified on the Renton site (USFWS 2019a, City of Renton 2019).

Legend

- Existing Landfill Property Line
- Existing 1000ft Buffer
- Proposed Landfill Property Line (ALT. 3)
- Proposed 1000ft Buffer (ALT 3.)
- BPA Easement
- Northwest Pipeline Easement
- Deciduous Forest
- Mixed Coniferous and Deciduous Forest
- Shrub and Grass

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 7-1. Upland Vegetation Communities at the Cedar Hills Regional Landfill.

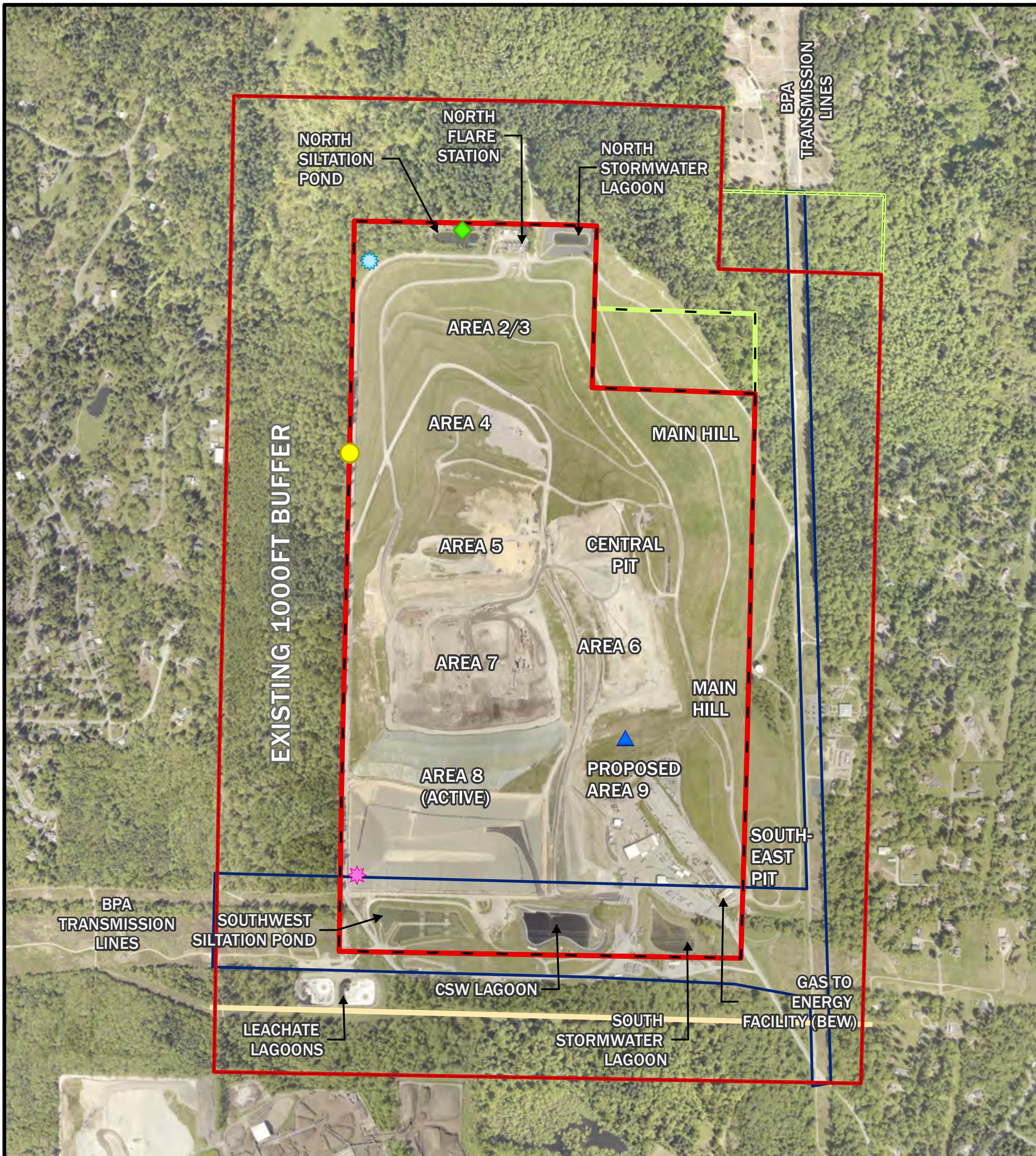
N

0 562.5 1,125 2,250 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 7\Figure7_1_UplandVegetation.mxd



Legend

- Existing Landfill Property Line
- Existing 1000ft Buffer
- Proposed Landfill Property Line (ALT. 3)
- Proposed 1000ft Buffer (ALT 3.)
- BPA Easement
- Northwest Pipeline Easement

Noxious Weeds

- Common Reed
- Rush Skeletonweed
- Spotted Knapweed
- Tansy Ragwort
- Yellow Starthistle

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 7-2. Noxious Weeds at the Cedar Hills Regional Landfill.

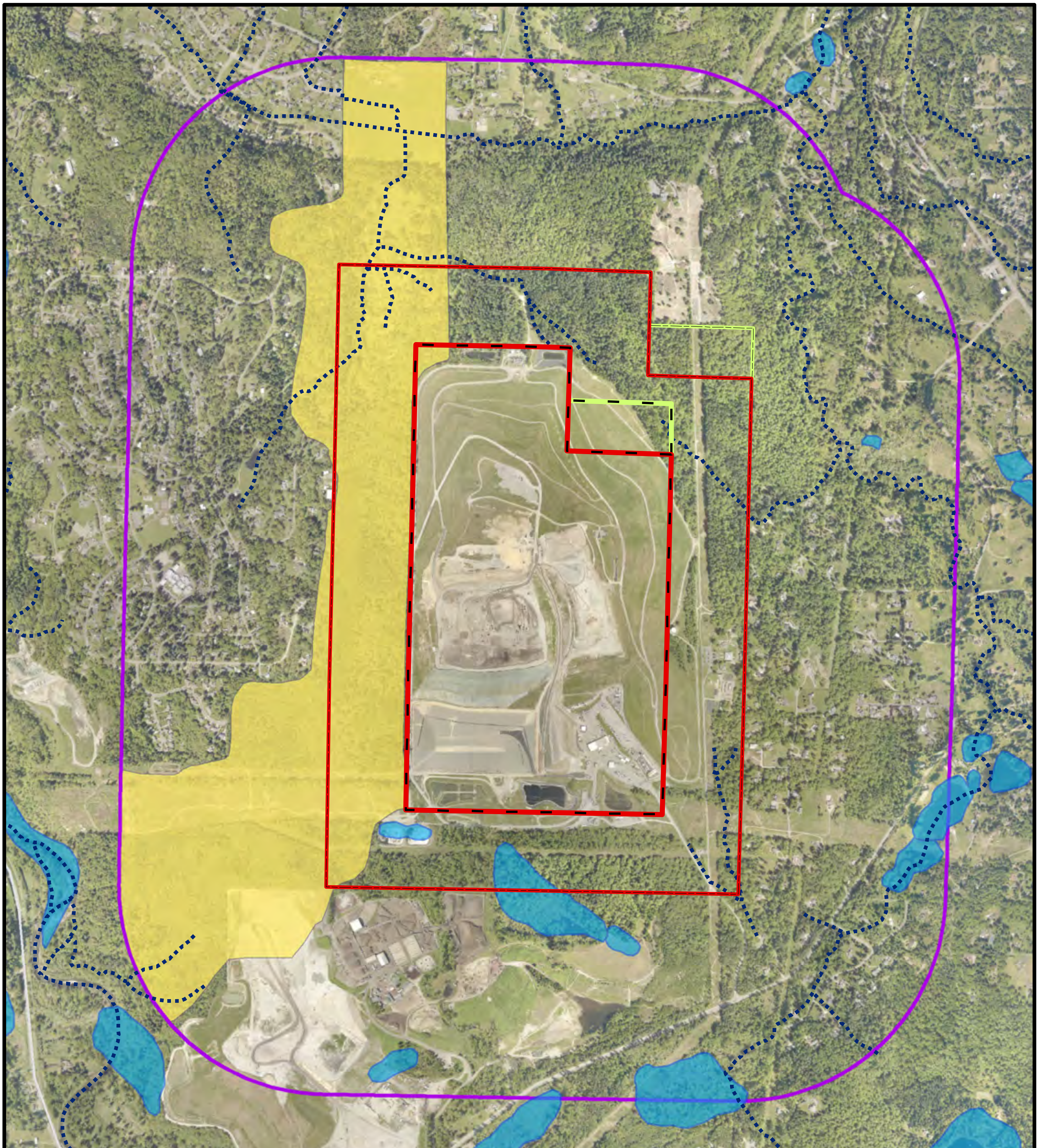
N

0 562.5 1,125 2,250 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 7\Figure7_2_NoxiousWeeds.mxd



Legend

- Existing Landfill Property Line
- Existing 1000ft Buffer
- Proposed Landfill Property Line (ALT. 3)
- Proposed 1000ft Buffer (ALT 3.)
- Streams (KC 2009)
- Wetlands (KC 2012)
- 0.5 Mile Distance from the Exisiting Landfill Property Line
- PHS Biodiversity Corridor

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 7-3. Wetlands and Priority Habitats in the Vicinity of Cedar Hills Regional Landfill.

N

0 875 1,750 3,500 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 7\Figure7_3_WetlandsCHRL_20191008.mxd

7.1.4 Wildlife

7.1.4.1 Cedar Hills

Environmental documents for CHRLF and data received from online databases (USFWS 2019b; WDFW 2019a, WDFW 2019b) were reviewed to determine the presence of threatened, endangered, candidate wildlife species, or species of concern in the project area.

USFWS identifies several wildlife species potentially occurring in the project vicinity that are listed as threatened or endangered under the Endangered Species Act including gray wolf (*Canis lupus*), North American wolverine (*Gulo luscus*), marbled murrelet (*Brachyramphus marmoratus*), streaked horned lark (*Eremophila alpestris strigata*), and yellow-billed cuckoo (*Coccyzus americanus*) (USFWS 2019b). However, none of these species are documented within CHRLF properties, likely due to a lack of available suitable habitat for these species at the landfill.

Coho (*Oncorhynchus kisutch*) rear in a tributary to McDonald Creek, northwest of the site. Fall chinook (*O. tshawytscha*), winter steelhead (*O. mykiss*), sockeye (*O. nerka*) and coho spawn in Issaquah creek, northeast of the site. (WDFW 2019b). Salmonids were documented in 2003 in a fish passage culvert conveying an unnamed tributary that drains to McDonald Creek in the northwest corner of the landfill. Repairs had been recently undertaken to remove sediment that had built up in the culvert to improve drainage.

Figure 7-4. Salmonids Observed in the Fish Passage Culvert in the Northwest Corner of the Landfill

This culvert is fish-accessible only during peak flows and is dry during normal conditions. There is no formal fish monitoring at the landfill, but landfill personnel regularly inspect culverts for stormwater conveyance. No salmonids have been seen since 2003 during routine inspections.

The WDFW priority habitats and species database indicates a biodiversity corridor along the west edge of the landfill (WDFW 2019a) (see Figure 7-3). Corridors are areas of relatively undisturbed or unbroken vegetation that connect fish and wildlife conservation areas, priority habitats, and areas identified as biologically diverse. The corridor connects the Cedar River biodiversity area to the Squak Mountain biodiversity area. It contains a variety of habitats that meet the needs of a wide range of native wildlife generally including elk, deer, cougar, bear, salmonids, woodpeckers, owls, hawks, and herons (WDFW 2019a).

Figure 7-5. Example of Elk Regularly Seen in Closed Areas of the Landfill.

.Figure 7-6. Example of Deer Regularly Seen Browsing in Grassy Areas at the Edge of the Landfill.

Wildlife using the landfill buffer areas currently coexist with noise and human activity associated with landfill operations. Except for some birds and occasionally deer, wildlife use of the active landfill area is minimal during active landfill operations. Closed landfill areas are planted with grass, which provides habitat for browsing ungulates (e.g., deer or elk). Elk, deer and other herbivores depend on grasses as a primary food source; thus, the landfill provides an important habitat for these animals.

About 200 adult and juvenile bald eagles frequent the landfill. Bald eagles are a federally protected species under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act (MBTA), and bald eagle numbers in western Washington have been increasing due to these protections.. Eagles observed at the site may be from nests in the general vicinity of the landfill or may be from elsewhere in the region flying over the landfill. There are no documented eagle nests within one half mile of the landfill (WDFW 2019c). Bald eagles use the site for resting during inclement weather due to the slightly warmer conditions than surrounding areas created by decomposing refuse, and the fact that, the area is surrounded by conifer trees and is relatively free of human activity (King County 2019c).

Other bird species observed at the landfill include Brewer's blackbirds (*Euphagus cyanocephalus*), American crows (*Corvus brachyrhynchos*), California gulls (*Larus californicus*), glaucous-winged gulls (*L. glaucescens*), pigeons (rock dove)(*Columba livia*), common raven (*C. corax*), house sparrow (*Passer domesticus*), and European starling (*Sturnus vulgaris*) (King County 2019c). The MBTA protects all migratory avian species except European starlings, non-native pigeons, Eurasian collared dove, and house sparrows (USFWS. 2021).

Bird Management

There are substantial concerns regarding bird populations at CHRLF that may negatively impact the health and safety of landfill employees, users, and neighbors. These concerns, which are typical of landfills, include:

- Human health and safety concerns with birds removing waste, including biomedical waste, from the landfill property and depositing it on neighboring properties. As discussed in Section 9.1.5, CHRLF only accepts biomedical waste that has undergone treatment in accordance with Title 10 of the Code of the King County Board of Health, is no longer capable of transmitting disease, and is accompanied by a Waste Clearance Decision.
- Human health and safety concerns with large numbers of flocking birds defecating on personnel, users of the landfill, neighboring property owners, leachate equalization pond systems, stormwater ponds, etc.
- Corrosion damage to structures, autos, and machinery caused by fecal accumulation from large numbers of flocking and roosting birds; and destruction of valve covers for landfill gas extraction and testing systems.
- Damage to buildings and structures caused by nesting birds, including clogged drains and vents with nesting material and aggressive nest behaviors.

- Potential threat to electrical power due to roosting in large numbers on power lines, primarily among European starlings and pigeons (King County 2019c).

Daily Cover

To prevent birds and other wildlife from feeding, removing, or breeding in waste, and to help control odors and blowing debris, exposed waste in active landfill areas is covered with six inches of compacted soil placed at the end of each day. Alternatively, at the end of each working day, landfill personnel use a semi-automated tarping system (Tarpomatic system) to cover as much of the leading face of the landfill as possible. The top and side of the daily cell and any portion of the leading face not covered by the tarp are covered with a compacted 6-inch soil layer.

State regulations allow for use of cover material other than six inches of soil with approval from the jurisdictional health department [WAC 173-351-200(2)]. The Tarpomatic system is approved by Public Health thus it is allowed under the landfill's 10-year (2019 – 2029) Municipal Solid Waste Landfill Permit. The operating permit also includes a requirement that all intermediate cover placed over each landfill lift must prevent any waste from being exposed or visible (Public Health permit number PR0015736).

Staff at the landfill recently conducted performance testing and cost analysis of daily cover options for control of odor and gas emissions, vectors, and loose garbage. Daily cover options included tarps, soil, Cedar Grove (CG) "Overs," (compost contaminated with plastic), Posi-Shell (clay-based material), and hog fuel. In addition to testing, they analyzed the daily, yearly, and capital costs of the materials and the impact on operations. Using these data, and informed by worker experience and observation, staff then ranked the materials by the following criteria:

- Control—of odor, methane, vectors, and loose garbage
- Operational Ease—ease to move, store, and place the material, as well as worker safety
- Cost—for labor, material, equipment, air space, material availability, and capital cost

Tarps received the highest ranking of all materials, followed by soil, hog fuel, CG Overs, and Posi-Shell.

Bird Control

King County has operated a bird control program at CHRLF for many years. The bird control program has historically relied on a variety of methods to deter and harass birds. King County recently produced an updated bird management plan, the Cedar Hills Regional Landfill Wildlife Management Plan (King County 2019c) and hired a contractor to employ a variety of bird management techniques that meet or exceed standard industry practices. The contractor is a qualified, licensed Wildlife Biologist with professional knowledge and experience, including experience with bird take (removal) using firearms if authorized by permit.

The wildlife management plan contains the following recommendations, which are currently being implemented:

Wildlife Deterrence by Minimizing Attractants:

- Landfill personnel mow the grass regularly to deter birds and keep the risk of fire hazards down in the summer months.
- Truck drivers are required to clean their vehicles prior to departing CHRLF, which reduces the spread of refuse that could attract birds.
- KCSWD purchased and installed dedicated tipping (dumping) stations to reduce the size of the overall daily active face where refuse is available to birds. These increase the rate of refuse removal from each container and restrict it to a smaller area than when waste transfer trucks were allowed to back into the general area and dump their contents.
- Landfill personnel conduct frequent trash sweeps in the areas surrounding the active face.

Harassment Techniques and Wildlife Management

- Harassment and lethal enforcement from stationary compactors and tippers when not in use.
- Exclusion netting at entrance and exit of the cat shack to exclude birds from roosting.
- Truck wash exclusion netting and bird spikes to exclude European starlings from roosting and loafing.
- Filling gaps in retaining walls to prevent European starlings from nesting.
- Decoy traps targeting juvenile European starlings to reduce the population that uses the landfill as a food source.
- Human silhouettes to deter birds from the active landfill face. To make this effective, the silhouette must be moved frequently and the technique reinforced with harassment and lethal control.
- Pyrotechnics to harass birds. Pyrotechnics are noise-making devices that are shot out of a pistol launcher or 12-gauge shotgun. This must be done in compliance with all federal, state, and local laws regarding the possession and use of a firearm, and outside of the nesting season.

Although there is heavy bird activity at the landfill year-round, the most intense period is July through February. The landfill operates under a permit from USFWS which allows the wildlife management contractor to deter eagles with the same types of techniques it uses on other birds (King County 2019c).

Monitoring

Bird populations are monitored by conducting point surveys at five permanent locations at the landfill. One pre-noon and one afternoon survey is done each week. Data from the surveys is used to assess the efficacy of the bird management plan and allow further adaptation and improvement of the plan. It also provides a basis for determining if bird use of the area changes through time. In addition, the wildlife contractor surveys the area surrounding the landfill for eagle nests each year beginning in December or January.

7.1.4.2 Renton Site

The WDFW database (WDFW 2019a) and King County iMap (King County 2019a) do not show any wildlife occurrences or priority habitats where the proposed facilities would be located.

7.2 Environmental Impacts

7.2.1 Direct and Indirect Impacts

7.2.1.1 No Action Alternative

Under the No Action Alternative, the landfill would continue to operate as currently permitted. Main landfill support facilities would remain in their current location, including removal, refurbishment or replacement of some facilities at the end of their useful life, and may include temporary use of interim offsite facilities.

Areas 5 and 6 currently have interim cover in place, while a temporary soil cover has been placed on the top of Area 7. Under the No Action Alternative, the interim covers on Areas 5 and 6 would be removed, waste placed to final grade, and final covers placed at an elevation not to exceed 788 feet (Area 7 has previously reached 788 feet and is scheduled for final closure in Summer 2022). Resuming active landfilling in areas with interim or temporary covers would impact the wildlife that currently use these areas and would attract scavengers. The CHRLF staff sets the area open to active landfilling (the operating face) each week. Typically, this area is about 200 feet by 200 feet. Nuisance birds would be controlled with active use of measures prescribed by the Cedar Hills Regional Landfill Wildlife Management Plan (King County 2019c). KCSWD would use the deterrence and harassment techniques summarized above and described in the plan to prevent birds and other wildlife from feeding or breeding in refuse, removing waste from the operating face, and to help control odors and blowing debris. Continuous monitoring will be used to determine program effectiveness and will adapt as needed. Weed management would continue under the current program in cooperation with King County. Herbicide use could affect fish if used near the small tributaries northwest of the site where salmonids have been documented.

Impacts on the health of eagles and other scavenging birds from the landfill include potential poisoning due to consuming solid waste, or animals that have been euthanized, poisoned, or killed using lead shot, as well as chemical or industrial waste that is improperly disposed. Measures to minimize these risks include mandatory use of non-toxic shot for wildlife management at the landfill and Seattle Animal Control safe disposal practices for euthanized animals (incineration). The CHRLF does not accept, and takes active steps to preclude, dangerous wastes as defined by Chapter 173-303 WAC, Dangerous Waste Regulations.

Noise and vibration from heavy equipment such as bulldozers (large and small), loaded trucks, and from operation of flares, could induce stress in wildlife. Vibration plays a role in communication between animals and is important in predator–prey interactions, mother and young relationships, mate choice, and recruitment of food. (Norton et al. 2011; Ortega 2012).

If support facilities are rebuilt in their current location, noise and vibration from construction could disturb nearby wildlife when construction commences and could cause individuals to move away or abandon the area however, effects would be temporary and minor because wildlife at the landfill are adapted to noise and human disturbance. There would be no long-term impacts on plants and animals from operation of the rebuilt support facilities because those operations would be the same as current operations. If interim offsite facilities are used, they would be in areas that support similar industrial and trucking uses and would be unlikely to affect plant and animal species of concern.

No impacts to upland vegetation or wetlands would be anticipated under the no-action alternative and impacts on wildlife would likely remain low until the landfill closes.

7.2.1.2 Impacts Common to All Action Alternatives

All action alternatives would increase capacity of CHRLF; therefore, vegetation communities in this area and any wildlife using the area could be affected over the range of time capacity is extended. Wildlife using the landfill and buffers currently coexist with noise and human activity associated with landfill operations. When operations cease, and the last remaining disturbed areas are revegetated with grass species (revegetation will be phased), wildlife use of the site may increase.

As described above, Areas 5 and 6 currently have interim cover in place and a temporary synthetic and soil cover has been placed over the top of Area 7 prior to final closure in Summer 2022. The impacts and practices described above under the No Action Alternative related to re-activating currently closed areas or areas with interim or temporary covers, would also apply to all action alternatives. Differences in proposed heights of the landfill cells would not cause additional effects on wildlife, but resuming active landfilling in currently closed areas or areas with interim or temporary covers would impact the wildlife that currently use these areas and would attract scavengers. Under all action alternatives, the area open for active landfilling during any week would be the same as under existing conditions (about 200 by 200 feet); only the location of the active face would change. Impacts on wildlife health from scavenging would be the same as described for the No Action Alternative. Under all action alternatives, proposed Area 9 would be developed for landfill expansion. The existing buildings and parking areas would be removed, and the area would be prepared for landfilling. Before any landfilling, the area would be prepared with a liner system and other environmental controls as described in Section 2.3.1.1. During construction, birds and small mammals may disperse to and use adjacent habitats in or near the landfill. This area currently contains minimal wildlife habitat value because most of the area is currently occupied by the support facility buildings and parking, therefore no impacts to upland vegetation or wildlife would be anticipated from operation of proposed Area 9.

Under all action alternatives leachate and stormwater will be managed to protect salmonid habitat and prevent impacts to fish downstream of CHRLF. Leachate and CSW are never discharged to local receiving waters. As described in Section 5.1.4, additional leachate and CSW created by the expansion would flow by gravity or be pumped from the collection system through subsurface piping to the existing leachate aeration lagoons in the southwest corner of the landfill, or the CSW Lagoon, respectively. Following pre-treatment in the leachate lagoons by aeration, the leachate would be discharged to the King County KCWTD sanitary sewer system and POTW. CSW is detained and settled in the CSW Lagoon and then discharged to the leachate lagoons.

Pipes carrying leachate are designed and specified to withstand the anticipated load of waste, accounting for overfilling. CHRLF has a comprehensive system designed to collect and manage leachate and CSW. In case of an emergency such as leachate line breach or spill, the leachate flow would be blocked in the upstream manhole and, if required, pumped to the downstream manhole until the failed section is inspected and repaired, as described in the Plan of Operation (KCSWD 2019c). This would prevent impacts from leachate line leaks or breakage on downstream aquatic habitats.

Runoff from areas of the landfill with interim or final cover is considered clean stormwater that has not come into contact with waste. This stormwater would be collected in ditches or subsurface piping in and around the landfill cells and transported to storage/treatment facilities, such as the Southwest Siltation Pond or the South Stormwater Lagoon, as described in Section 5.1.3.

Aerial dispersion of leachate from the CSW lagoon could affect aquatic habitat in the Southwest Siltation Pond or the South Stormwater Lagoon. KCSWD staff members collect stormwater grab samples (which are collected at one location at one point in time) for analysis at quarterly intervals. One of the sampling locations is at the exit of the bioswale from the South Stormwater Lagoon. This testing would identify if any contamination from aerial dispersion of leachate in the nearby CSW lagoon is reaching the stormwater pond. Testing for the past several years has bound that contamination is typically well below allowable limits. If contamination beyond allowable limits is found KCSWD investigates to determine the cause and takes actions to improve the BMPs in the area of the cause or to address the cause in another manner. Stormwater sampling is described in Section 5.1.7.1, and a link to monitoring reports is provided. In addition, KCSWD is assessing the feasibility of installing additional treatment to the leachate lagoons, which could include covers that would reduce aerial dispersal of leachate. These measures would prevent impacts on aquatic habitats in clean stormwater ponds or other aquatic habitats.

Stormwater that comes into contact with solid waste is considered CSW and is separated from the clean stormwater via a series of berms and ditches. Under all action alternatives, contaminated stormwater would be collected and conveyed to the existing CSW lagoon as described in Section 5.1.5.These controls would ensure that no untreated stormwater runoff would enter fish-bearing streams. As a result, no impacts to fish are expected.

Under all action alternatives there would be increased noise during construction of the support facilities. During operation there would be increased noise in the NW, SW, and north portions of the landfill if support facilities are built in the north. If support facilities are built in the south noise levels would be similar to existing conditions. Initiating new activity in previously closed landfill areas would not be a significant increase above what would occur under the No Action Alternative therefore the impacts of noise and vibration on wildlife during operation would be similar to existing conditions. However, the length of time that those impacts would occur would differ with each alternative, as shown in the discussions for each alternative. Alternative 1 is projected to extend the life of the landfill to 2037, Alternative 2 extends the projected life to 2038, and Alternative 3 extends the projected life to 2046. Mitigation for noise impacts is discussed in Section 10.3.Under all action alternatives there are potential impacts on wildlife due to disturbing soil that could be contaminated with volatile organic carbon or hydrocarbons from past operations at Queen City Farms. Potential sources of contaminants include overs disposal, truck traffic, airborne deposition or burning of chemical pits at QCF. However, any soil contamination from these sources would have been created decades ago and may or may not be on the CHRLF site and distinguishable from other sources of potential contamination such as traffic exhaust, etc. Any excavation of the Area 9 footprint would include soil testing to identify and separate reusable soils from soils requiring disposal at sites permitted for contaminated soil, minimizing the potential for wildlife to be exposed to contaminated soils.

7.2.1.3 Action Alternative 1

Landfill Development

Under Alternative 1, no additional landfilling would occur in in the Main Hill, Southeast Pit, Central Pit, and Area 7. Wildlife that are adapted to landfill operations would continue to use these areas. Areas 5, 6, and 8 would be filled with additional refuse, and a new refuse area would be added in proposed Area 9. Impacts of these actions on vegetation and wildlife are discussed under Impacts Common to All Alternatives.

Support Facility Options

Under Option 1 (facilities relocated primarily to the south), a Special Use Permit would be pursued to place the main landfill support facilities in the south buffer. Approximately 10 to 15 acres of vegetation, primarily deciduous forest, would be cleared. Wildlife would be affected during construction temporarily due to noise and dust from equipment operation. Operation of the facilities would cause permanent wildlife impacts with the loss of these habitats. Any wildlife using this area currently coexist with noise and human activity and would likely relocate to other habitats in or near the landfill during construction and return to the remaining buffer areas once construction activity is complete. The overall percentage of vegetation removed would be minor compared to the areas of existing vegetation in the buffers surrounding the landfill. There are no known wetlands or waters of the US that would be affected by the proposed south facility footprint. The landfill will comply with USFWS permit conditions regarding vegetation clearing to avoid impacts on migratory birds and bald eagles.

Under Option 2 (facilities relocated primarily in the north), a Special Use Permit would be pursued to place the main landfill support facilities in the north buffer. Approximately nine acres of mixed deciduous and coniferous upland forest would be cleared. As with Option 1, wildlife would be affected during construction and subsequent operation of the facilities with the permanent loss of these habitats. During construction, birds and small mammals may disperse to adjacent habitats in or near the landfill. Wildlife likely would continue to use adjacent forest or shrub and grass habitats after construction is complete. A stream mapped to the north and east of the proposed relocated facility area (Figure 7-3) would not likely be impacted by the construction or operation of these facilities, but its buffer may be impacted. During final design, wetlands and waters of the US would be delineated and their buffer widths determined. The site design would be modified to avoid impacts to these jurisdictional features to the extent possible. If impacts are unavoidable, mitigation may be required to comply with critical areas code (King County Code 21A.24).

Under Option 3 (main facilities relocated primarily in Renton), approximately three acres of degraded deciduous and shrub vegetation would be removed at a site adjacent to the Renton Transfer Station. Any wildlife using this area currently coexist with noise and human activity from dense industrial and residential uses surrounding the site and would likely relocate to other similar urban habitats. Wildlife populations that could potentially be affected by stormwater at the Renton site are those using, or coming into contact with, stormwater in the areas where trucks and trailers are parked. Surface water at the proposed site would require treatment before being released from the site or would be discharged to existing sanitary sewer system.

7.2.1.4 Action Alternative 2

Landfill Development

Under Alternative 2, Areas 5, 6, and 8 would be filled with additional refuse, and a new refuse area would be added in proposed Area 9. Impacts of these actions on vegetation and wildlife are discussed under Impacts Common to All Alternatives. The Main Hill, Southeast Pit, and Area 7 would not receive any additional waste, but portions of Areas 2/3, 4, and Central Pit would receive additional waste. These areas are currently closed, with final grass cover in place, providing habitat for deer, elk and other wildlife. Opening these areas up to active landfilling would attract birds, but otherwise discourage the existing wildlife use. As described above, CHRLF staff sets the area open to active landfilling (the operating face) each week. Birds attracted to the operating face would be managed under the existing system of daily cover and practices described in the wildlife management plan.

Support Facility Options

Alternative 2 includes the same three options for the relocation of landfill support facilities described above. Impacts on plants and animals for each option would be the same as discussed under Alternative 1.

7.2.1.5 Action Alternative 3

Landfill Development

Under Alternative 3, Areas 5, 6, and 8 would be filled with additional refuse, and a new refuse area would be added in proposed Area 9. Impacts of these actions on vegetation and wildlife are discussed under Impacts Common to All Alternatives. The Southeast Pit and Area 7 would not receive any additional waste, but portions of Areas 2/3, 4, Main Hill, and Central Pit would. These areas are currently closed, with final grass cover in place, providing habitat for deer, elk and other wildlife. Opening these areas up to active landfilling would attract birds, but otherwise discourage wildlife use. As described under common impacts, only an area of about 200 feet by 200 feet would be under active landfilling at any one time. Birds attracted to the operating face would be managed under the existing system of daily cover and practices described in the wildlife management plan.

Under Alternative 3 the landfill property line would be revised to incorporate King County-owned property at the northeast corner of the site. The property to be incorporated includes a portion of the BPA easement containing mixed coniferous and deciduous forest, and a vacant rural area-zoned property. During construction, wildlife using this area would disperse to and use adjacent habitats in or near the landfill. During operation, most wildlife would likely avoid the area of active landfilling. Birds would be managed under the existing system of daily cover and practices described in the wildlife management plan, as described above.

A soil berm would be constructed along the northeast corner of the proposed refuse area. A stream (Figure 7-3) is mapped near the proposed footprint of the Alternative 3 landfill area (King County 2012). Depending on the alternative selected, if necessary during final design, streams, wetlands and waters of the US could be delineated and the design would be modified to avoid impacts to the extent possible. If impacts are unavoidable mitigation may be required to comply with critical areas code (King County Code 21A.24).

Fish have not been documented to occur in these streams, but downstream populations of fish could be impacted by construction activities near wetlands and streams. BMPs would be employed during construction to trap sediments and minimize erosion, During operation King County would continue to monitor and manage stormwater runoff, groundwater and leachate to minimize potential harm to fish in downstream waters, as described in Section 5.1.

Support Facility Options

Alternative 3 includes the same three options for the relocation of landfill support facilities described above. Impacts on plants and animals for each option would be the same as discussed under Alternative 1.

7.2.1.6 Indirect Impacts

Indirect impacts on wetlands, streams, and their buffers could occur if any of the proposed actions cause impacts such as influx of sediments, changes in wetland hydrology, or changes in local drainage patterns at the CHRLF or at the Renton site. If indirect impacts are unavoidable, mitigation may be required as stated above.

As discussed in Section 1.7, in order to compare the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046–the estimated year of capacity for Action Alternative 3. The impacts that would occur during these intervening years would not occur but for the proposed action selected and are therefore indirect effects.

For the No Action Alternative between 2028 and 2046, waste disposal could involve either waste export to a regional landfill or disposal at a WTE facility, which could be at the CHRLF site or another site. A regional landfill accepting waste from the County is likely to be an existing facility with impacts to plants and animals already managed and mitigated, so significant plants and animal-related indirect impacts associated with that landfill are unlikely to result from the County's waste export. Waste export may require development of an intermodal facility that could have impacts on vegetation if it is a previously undeveloped site.

For Alternatives 1 and 2, potential impacts to plants and animals that could occur after closure in 2038 and 2039, respectively, would be similar to those that could occur under the No Action Alternative, although they would occur after nine or 10 years of additional operation. A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the 2019 King County Solid Waste Comp Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

7.2.2 Cumulative Impacts

The loss of vegetation and wildlife habitat from landfill support facilities development at the CHRLF or the Renton site under any of the action alternatives would be limited and relatively minor, but would incrementally add to the cumulative overall past, present, and likely future loss of vegetation and habitat in the region.

Rapid, sustained population growth since the end of World War II has resulted in substantial losses of fish and wildlife habitat in urbanizing areas of the state, particularly in the Puget Sound region. Water quality has been identified as one of the major influences that have the greatest impact on fish and wildlife (WDFW 2005). Other major influencers of habitat quality are related to urban development and include habitat loss, fragmentation, and invasive species. Impacts to threatened and endangered salmon and orca populations continue to occur in Puget Sound due to region-wide factors such as conversion of forests, and stormwater from transportation and land use.

Water quality impacts from the landfill have contributed to these impacts, although measures to monitor and control water quality impacts have been in place for the life of the landfill and will continue in the future, as described in Section 5.0. As stated above in Section 2.3.1.1, interim and final cover systems are installed during closure of each refuse area. Final cover systems typically include three 12-inch soil layers; a vegetative soil layer, a sand drain layer, and a select fill layer. Strip drains, an HDPE geomembrane, and a geosynthetic clay layer (GCL) are placed between the drain sand and select fill. Gas collectors are installed in collection trenches near the top of refuse. These measures ensure that the landfill will provide quality habitat for wildlife and aquatic ecosystems.

In the long term, after closure, the landfill will continue to provide valuable wildlife habitat. Urban Growth Boundary policies and regional grown strategies that direct growth away from rural and agricultural areas will preserve the habitat value of the landfill and surrounding areas. Central Puget Sound's Vision 2050 (PSRC 2020) outlines the region's growth strategy, focused on attracting 65 percent of the population increase in designated urban growth areas and high-capacity transit station areas and limiting development in natural resource and rural areas. The Regional Growth Strategy encourages use of tools to reduce the amount of development in rural and resource lands to ensure that proposed levels of development are consistent with the character of rural and agriculture, forest, and mineral areas.

7.3 Mitigation Measures

KCSWD continues to implement best management practices and bird management measures such as those identified above. Additional measures to minimize impacts to upland vegetation, wetlands, and wildlife include:

- Preserve as many trees as possible by integrating them into the footprint of any relocated facility. Prioritize protection of mature trees.
- Plant additional trees in buffer areas surrounding the landfill.
- Revegetate areas temporarily cleared for construction activities, but not permanently removed (e.g., within the footprint of the relocated facilities), with native vegetation appropriate to the landfill.
- Control known populations of noxious weeds before ground-disturbing activities to avoid spread.
- Plant pollinator species in closed landfill areas to enhance habitat for insects.
- During project design critical areas including streams, wetlands, wildlife corridors, and bird nests would be identified and mapped, and effort would be made to avoid impacts on those resources using methods such as timing restrictions, design modifications, and operational controls. If necessary, additional mitigation measures would be identified during permitting and plans would be developed to mitigate or compensate for impacts through actions such as restoration of temporarily disturbed areas, enhancement of undisturbed areas, or creation of suitable offsite habitats.
- Weed management near water would use mechanical control, or the least toxic herbicide that is labeled for use in and near aquatic sites.
- Stormwater impacts of conversion of forest land to impervious surface for construction and operation of the support facilities would be mitigated by the addition of stormwater controls as described in Section 7.2.1.2. Loss of trees could be minimized by preserving mature trees where possible, and planting trees in any areas within the support facility footprint that are not over old waste.

Additional bird control measures could be employed at CHRLF in addition to the current practices. Landfills in Oregon have had success using falconry and lasers (Waste Today 2021). Falcons used for bird control are trained to circle the area and deter the birds, although they will occasionally make a kill. A major benefit of falconry is that undesirable birds don’t habituate to the birds of prey in the way they habituate to other forms of abatement. Automated laser systems that use high-intensity beams could also be employed, although they work best in flat terrain and might not be feasible for CHRLF.

Impacts on wildlife of waste export to a regional landfill or disposal at a WTE facility could be mitigated through phased revegetation of the site with species of value to native wildlife; developing a wildlife management plan; or purchasing land for wildlife habitat protection. Although the extent of these impacts would be highly dependent on the specific facility location and design, the County's siting process to determine a location for such major facilities would favor sites where these impacts would be minimized.

7.4 Significant Unavoidable Adverse Impacts

- The loss of forested vegetation and conversion for construction and operation of the north and south facility options would be a significant unavoidable adverse impact to wildlife that use this habitat. Efforts would be made during project design to preserve existing vegetation where possible.
- During long-term management of the landfill no trees will be allowed to grow that could compromise the cover system, so covered areas would remain as grassland habitat in perpetuity. These areas would continue to provide habitat for deer, elk, and other browsing animals.
- Environmental controls including the stormwater and leachate collection systems will be maintained until monitoring supports that the CHRLF has met thresholds set by Ecology.

8.0 GREENHOUSE GAS EMISSIONS

This chapter describes how implementation of any of the action alternatives, including the facility relocation options, could affect greenhouse gas (GHG) emissions in the vicinity of the CHRLF and the Renton site, compared with the No Action Alternative.

As mentioned in Section 1.7, King County has not yet selected the long-term disposal option that will be used once the CHRLF reaches its capacity under the alternative selected as the result of this EIS process. The Solid Waste Comp Plan indicates it would be either waste export by rail to a regional landfill or a WTE facility located somewhere in King County. In order to compare equally the potential GHG emissions impacts from the action alternatives and the No Action Alternative over the same period into the future, this section considers potential direct impacts, as well as potential indirect impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046–the estimated year of capacity for Action Alternative 3 and the closure year that is furthest into the future.

Additional detail concerning methods, assumptions, and GHG analysis results can be found in the *Comparative Greenhouse Gas Analysis*, Appendix K.

This environmental review determined that given the similar level of GHG emissions from the action alternatives compared with the No Action Alternative, no significant unavoidable adverse GHG-related impacts would be expected to result from any of the action alternatives, including the facility relocation options. However, substantial GHG emission increases are inevitable with all of the alternatives, and additional mitigation is necessary to help meet GHG reduction goals set by the *King County Strategic Climate Action Plan* (SCAP) and to reduce the cumulative impact on global climate change.

8.1 Affected Environment

8.1.1 Greenhouse Gas Background

The principal GHGs of concern are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), sulfur hexafluoride (SF6), perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs). Each of the principal GHGs has a long atmospheric lifetime (one year to several thousand years). In addition, the potential heat-trapping ability of each of these gases varies significantly. CH4 is 28 times as potent as CO2 at trapping heat, while SF6 is 23,900 times more potent than CO2. Conventionally, GHGs have been reported as CO2 equivalents (CO2e). CO2e considers the relative potency of non- CO2 GHGs and converts their quantities to an equivalent amount of CO2 so that all emissions can be reported as a single quantity.

Ecology estimated that in 2018, Washington produced about 99.6 million gross metric tons (MMT CO2e; about 109.7 million US tons) of CO2e (Ecology 2021). Ecology found that transportation is the largest source, generating 45 percent of the state’s GHG emissions; followed by residential, commercial, and industrial (RCI) energy use at 23 percent, and electricity generation (in-state and purchased from out-of-state) at 16 percent. The sources of the remaining 16 percent of emissions are fossil fuel and industrial processes, agriculture, and waste management.

8.1.2 Regulatory Environment

Currently, no final state or federal guidance exists for determining the significance of GHG emissions. There is no standard significance threshold for GHG emissions in the Washington SEPA rules (Washington Administrative Code [WAC] 197-11-330). However, in 2020, Ecology was directed by the governor to develop regulations to guide greenhouse gas assessments for major projects in Washington, including new public or private facilities, or changes to an existing facility, that require review under SEPA. The purpose of this rulemaking is to create a new rule, Chapter 173-445 WAC, Greenhouse Gas Assessment for Projects, also known as the GAP rule. Those regulations are in the public comment process and have yet to undergo final rulemaking.

8.1.2.1 US EPA

The US EPA regulates emission of GHGs from the largest stationary sources (buildings, structures, facilities, installations, or waste facilities) by the Prevention of Significant Deterioration (PSD) and Title V Operating Permit Programs under the Clean Air Act (40 CFR 52.21(b)(3)).

8.1.2.2 Washington State

Washington has adopted a variety of regulations, programs, and initiatives designed to reduce greenhouse gas emissions.

Chapter 173-441 WAC—Reporting of Emissions of Greenhouse Gas, as adopted by Ecology, requires some facilities, including CHRLF, and transportation fuel suppliers to annually report their greenhouse gas emissions. The program uses the same emission calculation methods as EPA's greenhouse gas reporting program, and includes:

- Facilities that emit at least 10,000 metric tons of CO2e per year in Washington (CHRLF is in this category).
- Suppliers of liquid motor vehicle fuel, special fuel, or aircraft fuel that provide products equivalent to at least 10,000 metric tons of carbon dioxide per year in Washington.

In 2020, the Washington Legislature set new greenhouse gas emission limits (RCW 70A.45.020) in order to combat climate change. Under the law, the state is required to reduce emissions levels:

- 2020 – reduce to 1990 levels.
- 2030 – 45 percent below 1990 levels.
- 2040 – 70 percent below 1990 levels.
- 2050 – 95 percent below 1990 levels and achieve net zero emissions.

The 2021 Climate Commitment Act establishes a "cap and invest" program that sets a limit on the amount of greenhouse gases that may be emitted in Washington (the cap) and then auctions off allowances for companies and facilities that emit greenhouse gases until that cap is reached. Over time, the cap will be reduced, allowing total emissions to fall to match the greenhouse gas emission limits set in state law. Rulemaking began in 2021, and the program's first compliance period will begin in 2023.

8.1.2.3 King County Climate Change Policies

The 2020 King County SCAP was developed by the County Executive, with oversight by the King County Council. Ongoing implementation guidance for the SCAP is provided by the interdepartmental Climate Leadership Team representing leadership from different King County departments and agencies. The SCAP sets a goal of reducing countywide sources of GHG emissions by at least 50 percent by 2030, and 80 percent by 2050, compared with a 2007 baseline. These targets are also reflected in the King County-Cities Climate Collaboration (K4C) Joint Climate Action Commitments.

8.1.3 Sources of GHG

The analysis considers GHG emissions from four sources:

- Waste-decomposition of the waste after placement in a landfill or combustion in a WTE facility
- Operation of the landfill gas control system, including combustion of collected landfill gas in flares
- Operation of diesel- and gasoline-powered landfill equipment (dozers, compactors, construction equipment, etc.)
- Operation of diesel-powered waste transfer trucks

Each of these sources of GHG emissions was considered and evaluated, as applicable, for the No Action Alternative and each action alternative, including the options to relocate support facilities to other locations at CHRLF or the Renton site. Insignificant sources such as small fuel-burning heaters were not evaluated.

8.1.3.1 Cedar Hills

Waste Disposal and Decomposition

The disposal and anaerobic decomposition of municipal solid waste generates GHG emissions, contained in landfill gas. Landfill gas consists primarily of the GHGs methane and CO2. At CHRLF, an active state-of-the-art landfill gas collection and processing system is operated, consistent with King County's SCAP (King County 2015). This system creates a vacuum within the solid waste, withdraws landfill gas, and directs it in one of two ways:

1. To the BEW facility for conversion into natural gas pipeline-quality gas. The majority of the gas is injected into a pipeline, and the remainder is combusted in high-temperature flares or reciprocating engines at BEW to generate energy for the facility;

2. To high-temperature flares that burn the methane and almost all the trace non-methane organic compounds (NMOC), producing CO_2 and other products of combustion.

Some landfill gas is not collected during active waste placement and prior to placement of daily, interim, or final cover systems. This gas, called fugitive emissions, is emitted to the atmosphere. In compliance with 40 CFR Part 98, Mandatory Greenhouse Gas Reporting, King County reports GHG emissions into US EPA's electronic greenhouse gas reporting tool (e-GGRT) using calculations defined in Subpart HH § 98.343 for municipal solid waste landfills and using calculations defined in Subpart C § 98.30 for general stationary fuel combustion sources. Using the amount of landfill gas captured in the landfill supervisory control and data acquisition (SCADA) system, the HH-6 formula of the e-GGRT is used to calculate how much gas is produced, using estimated cover efficiencies. Using this method, King County has determined that of the landfill gas produced at CHRLF annually, approximately 5 percent is fugitive and 95 percent is captured in the LFG control system. Of the landfill gas that is captured approximately 80 percent is directed to BEW and approximately 15 percent is flared at CHRLF. However, this reported efficiency rate is above industry averages and the methods used to calculate facility emissions for compliance with 40 CFR Part 98 are meant to measure one year of emissions and are not appropriate for estimating GHG emissions over the lifecycle of the proposed project and the varying scenarios inherent in the alternatives under consideration. The Comparative Greenhouse Gas Emissions Analysis (see Appendix K) uses an assumption of 75 percent "capture rate" to conservatively estimate total emissions from waste disposal and decomposition, including fugitive emissions.

Daily Operations and Construction

Operation of the CHRLF (waste placement, compaction, daily cover) includes the use of diesel- and gasoline-powered equipment, including but not limited to dozers, compactors, dump trucks, excavators, and graders as mobile sources. Greenhouse gases from diesel and gasoline mobile combustion include CO_2 and nitrous oxide (N_2O). These emissions are accounted for in the Comparative Greenhouse Gas Emissions Analysis results, located in Appendix K.

The GHG emissions that are associated with all the alternatives landfill construction (i.e., cell development and soil import/export, liner construction, etc.) or facilities relocation construction include the use of diesel- and gasoline-powered equipment, including but not limited to dozers, compactors, dump trucks, excavators, or graders. Greenhouse gases from diesel and gasoline combustion include both CO_2 and N_2O.

Similar emissions from construction equipment are created from the construction of regional landfill disposal areas or WTE facilities. The Comparative Greenhouse Gas Emissions Analysis (see Appendix K) recognizes that while similar, the type and sequencing of construction, the location of the construction, and the type and configuration of buildings associated with the landfill disposal area construction and WTE facilities construction will cause some variation in the GHGs emitted. These variations are accounted for in the analysis, but generally are a small percentage of total emissions over the lifecycle of the alternatives. (WARM 2015).

Waste Transport

Transport of waste from recycling and transfer stations to CHRLF produces GHG emissions associated with use of diesel fuel, including CO2 and N2O. The solid waste collected at the transfer stations is trucked to the CHRLF under all alternatives through at least 2028. The action alternatives have closure years ranging from 2037 to 2046. For those alternatives with an earlier closure date, waste that would otherwise be disposed of at the CHRLF would be transported to an alternative landfill site and waste would be trucked from the rail unloading facility to the alternate landfill; or waste would be transported to a WTE facility somewhere in King County. A WTE facility or intermodal yard was assumed to be a distance from King County recycling and transfer stations comparable to CHRLF and thus transport of waste would be comparable.

Rail transport from an intermodal yard to disposal at a regional landfill as an option for long-term disposal introduces the potential indirect effect of GHG emissions unique to that option, discussed in Section 8.2.1. Additional information about GHG emissions from train transport can be found in the Final EIS for the Solid Waste Comp Plan incorporated here by reference.

Any out-of-county regional landfill was assumed to have comparable environmental protection systems and operations as those described for CHRLF and to meet applicable federal and state requirements. As with CHRLF, an assumption of 75 percent “capture rate” was used in the Comparative Greenhouse Gas Emissions Analysis (see Appendix K) for an out-of-county regional landfill to conservatively estimate total emissions from waste disposal and decomposition, including fugitive emissions.

WTE Facility

Combustion of waste in a WTE facility introduces the potential indirect effects of GHG emissions that are unique to that long-term option and are discussed in Section 8.2.1. For context, additional information about GHG emissions from WTE facilities can be found in the Final EIS for the Solid Waste Comp Plan, though none of those results are used in the Comparative Greenhouse Gas Emissions Analysis for this EIS. Both the Final EIS for the Solid Waste Comp Plan and the 2019 *King County Waste-To-Energy and Waste Export by Rail Feasibility Study*, are incorporated here by reference. A portion of the CO2 contained in the WTE exhaust is classified as biogenic and is not included in the GHG emissions accounting. Appendix K provides additional detail about how biogenic emissions are treated in GHG model estimates.

8.1.3.2 Renton Site

No GHG emissions are currently produced by project activities at the Renton site. Existing operations at the Renton Recycling and Transfer Station and the Roads Division maintenance yard produce GHG emissions related to use of diesel- and gasoline-powered equipment. These activities would take place similarly under all alternatives and are not included in this analysis.

Facilities relocation and construction at the Renton site would include the use of diesel and gasoline powered equipment, including but not limited to dozers, compactors, dump trucks, excavators, and graders. Greenhouse gasses from diesel and gasoline combustion include CO2 and N2O.

8.2 Environmental Impacts

8.2.1 Direct and Indirect Impacts

The analysis period used for comparing emissions is over a 100-year period starting in 2020 for waste placed between 2020 and 2046. The analysis also includes any ongoing and future emissions between 2020 and 2105 from waste placed at CHRLF between 1960 and 2020. The GHG emissions analysis considered the following inputs:

- Solid waste tonnage history and forecasts for King County
- Additional landfill capacity (years of life) from each alternative
- Distances from King County (waste producer) to an out-of-county disposal facility or a WTE facility

There is some dispute in the scientific community as to how GHG from waste management scenarios should be considered. Given the various sources of data and modeling techniques currently in use to evaluate GHG emissions from landfills and other waste management facilities, and in order to conservatively estimate the potential range of emissions, King County used a combination of the most widely accepted industry models to estimate the total GHG emissions (biogenic and anthropogenic sources) from the alternatives under consideration.

Net GHG emissions in metric tons of carbon dioxide equivalents (MTCO2e) are estimated using the Waste Reduction Model (WARM) excel version 15, Municipal Solid Waste Decision Support Tool (MSW-DST) version 2, Landfill Gas Emission Model (LandGEM) version 3.03, and the Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) tool 2020 all of which are the latest versions of those models and incorporate the latest improvements to their individual methodologies. While these models have inherent differences in default model assumptions, inputs and calculations, King County chose to model the alternatives under consideration using assumptions and inputs as similar as possible in order to accurately compare results.

For comparison purposes in this analysis, it was assumed that all of the forecast solid waste tonnage shown in Table 1-4 would be disposed at the CHRLF through each of the closure years for each alternative. The CO2 contained in the landfill gas and the CO2 created by the combustion of methane in the flares or engines is considered biogenic (i.e., part of the natural carbon cycle) and was not included in the direct GHG emissions accounting. The uncaptured methane produced from anaerobic decomposition of waste is counted in all scenario models (WARM and MSWDST) as an anthropogenic GHG because degradation would not result in methane emissions if not for placement in the landfill. Non-combusted methane in flare emissions is also counted in all scenario models.

In addition, the GHG accounting identifies separately the carbon sequestration associated with the long-term burial of non-decomposed organic material contained in the landfilled waste. For the years between closure and 2046 for each alternative (No Action, between 2028 and 2046; Action Alternative 1 between 2037 and 2046; Action Alternative 2 between 2038 and 2046), it was assumed all tonnage would be disposed at an out-of-county regional landfill, or at a WTE facility; these are the sources of potential indirect impacts. For all alternatives, additional indirect impacts occur when landfill gas is captured, sent to BEW for refining, distributed via pipeline to businesses and residences, and combusted. For Action Alternative 3 it was assumed all tonnage would be disposed at CHRLF through 2046.

Additional detail concerning methods, assumptions, and GHG analysis results can be found in the *Comparative Greenhouse Gas Analysis*, Appendix K.

8.2.1.1 No Action Alternative

Under the No Action Alternative, the landfill would continue to operate as currently permitted. Support facilities would remain in their current locations as-is or would be refurbished or rebuilt in place and could be temporarily located at interim facilities. Impacts from GHG emissions would be anticipated to continue from all sources associated with construction, operation, and maintenance of CHRLF and the landfill support facilities, including from waste decomposition, landfill gas control system operation, operation of heavy equipment, and waste transfer.

For purposes of this analysis, it was assumed that all new refuse areas would be constructed to meet the requirements of WAC 173-351, or future standards as relevant. As a result, the GHG emissions resulting from decomposition of the waste are assumed to be the same for all alternatives through 2028. After 2028, waste under the No Action Alternative would need to be transported by rail to an existing private landfill that could accept exported waste from King County (and would have similar systems to control landfill gas) or to a WTE facility somewhere in King County through 2046.

Landfill Development

WARM Results

A 2019 King County study comparing the feasibility of waste-to-energy and waste export by rail evaluated GHG emissions in metric tons of carbon dioxide equivalents per ton of waste (MTCO2e/ton) disposed by (a) landfilling at an out-of-county landfill using waste export by rail and (b) by combustion in a WTE facility, using the latest version of the EPA's Waste Reduction Model (WARM) (King County 2019e). This report provided the basis for assumptions used in the WARM modeling for this analysis, with some additional changes that reflect a more conservative assumption for landfill gas capture rate at 75 percent, and a correction from the WARM documentation source material.

Table 8-1 shows the net GHG emissions of MTCO2e/ton disposed for WTE and waste export by rail used in this analysis.

Table 8-1. Estimated Net GHG Emissions for WTE and Waste Export by Rail[1].

Description	WTE (MTCO2e/ton)	Waste Export by Rail (MTCO2e/ton)
Facility sources	0.42	0.405
Landfill equipment sources	0.0015	0.02
Transportation sources	0.018	0.038
Total Net GHG emissions excluding credits	0.4395	0.463
Utility credits	-0.26	-0.06
Other credits	-0.22	-0.21
Total Net GHG emissions including credits	-0.0405	0.193

Source: King County 2019e; WARM Documentation

MTCO2e/ton – metric tons of CO2 equivalent per ton.

Notes:

1 WARM Method 2 from King County 2019e, which adjusted a number of WARM defaults to County-specific values; plus, additional adjustments to LFG capture rate assumption and transportation refinements.

According to the 2019 King County study, these estimates for GHG emissions are highly dependent on the assumptions behind the analysis, and in particular the total net GHG emissions on the application of utility and other credits. As noted by the study, utility credits for WTE and waste export are associated with credits for emissions avoided from utility electricity generation. Other credits for WTE are associated with increased offsets for Advanced Material Processing (AMP) and ash reuse, and credits for waste export by rail are associated with carbon sequestration of non-anaerobically biodegradable, biogenic wastes. It is notable that these credits, along with other factors like waste composition, can affect results significantly, and the 2019 study presented information showing a significant reduction in MTCO2e/ton for WTE compared with waste export by rail with application of the credits. In order to provide the full context of the uncertainty associated with the applicability and longevity of the utility and other credits, and consistent with the principles of Intergovernmental Panel on Climate Change (IPCC) guidance, results include GHG emissions estimates with and without the inclusion of credits..

Table 8-2 shows total direct and indirect GHG emissions for WTE and Waste Export by Rail for the No Action Alternative based on the 2019 King County study WARM emission factors and other adjustments described (with and without credits) for waste disposed between 2020 and 2046. These estimates include emissions from waste decomposition and landfill gas control system operation at an out-of-county landfill, WTE, operation of heavy equipment, waste transfer, and combustion of recovered LFG. They do not include construction activities.

Table 8-2. Comparison of Estimated Operational GHG Emissions for the No Action Alternative, with WTE and Waste Export by Rail (WEBR)–WARM[1].

Description	WTE (MTCO2e)	WEBR (MTCO2e)
Facility Sources		
Fugitive emissions; operation of LFG recovery system	13,282,081	21,715,801
MSW combustion	8,746,080	
Operation of BEW processing system	included above	included above
BEW pipeline gas	included above	included above
Landfill Equipment Operation	205,156	590,400
Transportation Sources		
Rail transport of MSW to out-of-county regional landfill		624,720
Rail transport of ash from intermodal facility to landfill	208,240	
Truck transport between transfer station and CHRLF, WTE facility, and intermodal facility	236,160	236,160
Total Net GHG Emissions Excluding Credits	22,677,717 (226,777 per year for 100 years)	23,167,081 (231,678 per year for 100 years)
Avoided utilities–Pacific Region	(7,646,906)	(3,482,106)
Avoided emissions–metal recycling and ash reuse (WTE); landfill carbon sequestration (WEBR)	(6,407,440)	(6,199,200)
Total Net GHG Emissions Including Credits	8,623,371	13,485,775

MTCO2e – metric tons of CO2 equivalent.

Notes:

1 Modeling uses a combination of WARM and LandGEM to estimate GHG emissions (see Appendix K).

As shown in Table 8-2, waste disposed between 2020 and 2028 at CHRLF and after closure of the CHRLF in 2028 until 2046 under the No Action Alternative would produce a large quantity of GHG emissions with either long-term option: about 227,000 MTCO2e per year average for WTE and about 232,000 MTCO2e per year average for waste export over 100 years, or about 90,000 tons more MTCO2e average per year between 2028 and 2046 using waste export by rail than with WTE.

MSWDST Results

King County also evaluated GHG emissions in metric tons of carbon dioxide equivalents (MTCO2e) disposed of by (a) landfilling at an out-of-county landfill, using waste export by rail and (b) by combustion in a WTE facility, using the latest version of the EPA-funded Municipal Solid Waste Decision Support Tool (MSWDST). As stated earlier, while MSWDST and WARM have inherent differences in default model assumptions, inputs and calculations, King County chose to model the alternatives under consideration using assumptions and inputs as similar as possible in order to accurately compare results. The modeling assumptions used are described in more detail below in Appendix K.

Table 8-3 shows total direct and indirect GHG emissions for WTE and waste export by rail for the No Action Alternative based on the MSWDST and LandGEM models (with and without credits) for waste disposed of between 2020 and 2046. These estimates include emissions from waste decomposition and landfill gas control system operation at an out-of-county landfill, WTE, operation of heavy equipment, waste transfer, and combustion of recovered LFG. They do not include construction activities.

Table 8-3. Comparison of Estimated Operational GHG Emissions for the No Action Alternative, with WTE and WEBR–MSWDST[1].

Description	WTE (MTCO2e)	WEBR (MTCO2e)
Facility Sources		
Fugitive emissions; operation of LFG recovery system	15,522,187	23,380,272
MSW combustion	7,886,668	
Operation of BEW processing system	included above	included above
BEW pipeline gas	included above	included above
Landfill Equipment Operation	included above	included above
Transportation Sources		
Rail transport of MSW to out-of-county regional landfill		Included below
Rail transport of ash from intermodal facility to landfill	175	
Truck transport between transfer station and CHRLF, WTE facility, and intermodal facility	847,771	2,123,301
Total Net GHG Emissions Excluding Credits	24,256,801 (242,568 per year for 100 years)	25,503,573 (255,035 per year for 100 years)
Avoided utilities–Pacific Region	(11,032,461)	(3,208,346)
Avoided emissions–metal recycling and ash reuse (WTE); landfill carbon sequestration (WEBR)	(5,092,269)	(10,017,293)
Total Net GHG Emissions Including Credits	8,132,070	12,277,934

MTCO2e – metric tons of CO2 equivalent.

Notes:

1 Modeling uses a combination of MSWDST and LandGEM to estimate GHG emissions (see Appendix K).

As shown in Table 8-3, while the total emission estimates differ from the WARM model, however MSWDST results are consistent with the order of magnitude of estimations produced by the WARM model.

Under any of the alternatives, the GHG emissions associated with closure of CHRLF disposal areas, and construction of a new landfill disposal area at an alternate disposal site or WTE facility as long-term

disposal options would occur after closure of the CHRLF. Emissions from construction of long-term disposal options are considered indirect impacts. These emissions were quantified using AFLEET to account for on-road and off-road heavy equipment used during construction of the landfill components, and King County's SEPA GHG Emissions Worksheet to account for building and paving components..
Table 8-4 shows total direct and indirect GHG emissions for WTE and waste export by rail for the No Action Alternative based on the AFLEET model.

Table 8-4. Comparison of Estimated Construction GHG Emissions for No Action Alternative, with WTE and WEBR.

Description	WTE (MTCO2e)	WEBR (MTCO2e)
Construction Sources		
Landfill cell closure/construction[1]	11,122	29,501
WTE or WEBR facilities construction[2]	18,268	1,530
Total Construction GHG Emissions	29,390	31,031
WTE or WEBR facilities (lifecycle)[2,3]	913,421	76,488

MTCO2e – metric tons of CO2 equivalent.

Notes:

[1] Modeling uses AFLEET to estimate GHG emissions (see Appendix K).

[2] Modeling uses King County's SEPA GHG Emissions Worksheet to estimate lifecycle GHG emissions for WTE or WEBR facilities (see Appendix K). Lifecycle emissions include the embodied energy in building and paving materials, energy emissions, and transportation emissions associated with on- and off-road construction equipment and employee commutes.

[3] Conceptual building size information used for modeling both WTE and WEBR buildings is from King County 2019e (see Appendix K).

Support Facilities Options

Refurbishment or replacement of landfill support facilities at the end of their useful life would create GHG emissions related to use of construction equipment. The following table provides a summary of the estimated emissions that might be produced as a result of the replacement of support facilities currently on the CHRLF site. GHG emissions have been estimated by the AFLEET model using data from the EPA MOVES2014b model. Table 8-5 shows estimated GHG emissions associated with construction of replacement landfill support facilities.

Table 8-5. Comparison of Estimated Landfill Support Facilities Construction GHG Emissions for No Action Alternative, with WTE and WEBR.		
Description	WTE (MTCO2e)	WEBR (MTCO2e)
Construction Sources		
Landfill support facilities construction1, 2	2,758	2,758
Landfill support facilities (lifecycle) 1, 2	137,886	137,886

MTCO2e – metric tons of CO2 equivalent.

Notes:

[1] Modeling uses King County's SEPA GHG Emissions Worksheet to estimate lifecycle GHG emissions for CHRLF Support Facilities (see Appendix K). Lifecycle emissions include the embodied energy in building and paving materials, energy emissions, and transportation emissions associated with on- and off-road construction equipment and employee commutes.

[2] Conceptual building size information used for modeling CHRLF Landfill Support Facilities is from KCSWD. 2019b (see Appendix K).

Using the EPA data and the estimates above, construction of the support facilities would result in emissions of approximately 2,800 MTCO2e of GHGs to the atmosphere during construction and a total of approximately 138,000 MTCO2e over the lifecycle of the buildings (about 40 years).

Given the uncertainty of the impact of project-level emissions on global climate change, significant GHG-related impacts cannot be estimated from these construction activities. However, production of these GHGs, when combined with other global sources, would be anticipated to contribute to climate change.

Use of temporary interim offsite facilities would produce GHG emissions related to staff travel and trucking operations, but these emissions are assumed to be approximately the same as all other action alternatives, where similar staff travel and trucking operations in the region will be conducted either to and from CHRLF or the Renton site, and thus are not included in the overall analysis.

8.2.1.2 Impacts Common to All Action Alternatives

The evaluation of impacts from GHG emissions assumes that well-proven engineering methods and techniques would be implemented to design and construct each of the action alternatives. Some potential direct and indirect impacts that would be common to all the action alternatives are:

- GHG emissions from operation of diesel- and gasoline-powered equipment for disposal operations (e.g., waste placement, waste compaction, cover soil activities, etc.) would occur across all action alternatives and the No Action Alternative through 2028. Thereafter, once CHRLF closes under each action alternative, GHG emissions from operation of diesel- and gasoline-powered equipment for disposal operations would occur for the intervening years at CHRLF or an out-of-county landfill between year of closure and 2046. GHG emissions from use of equipment and buildings for operations would occur for the intervening years at a WTE facility between year of closure and 2046. Emissions would differ for each alternative based on date of CHRLF closure and are included in all modeling scenarios for the action alternatives.

- When support facilities are relocated, there would be a short-term increase in GHG emissions associated with construction equipment. The GHG emissions are expected to increase under all the action alternatives at a similar level as for the No Action Alternative.
- GHG emissions from waste decomposition would be the same for all action alternatives and the No Action Alternative through 2028. Thereafter, once CHRLF closes under each action alternative, GHG emissions from waste decomposition and LFG control system operation (including fugitive emissions) would occur for the intervening years at CHRLF or an out-of-county landfill between year of closure and 2046. Emissions would differ for each alternative based on the date of CHRLF closure and the location and method of long-term disposal, and these differences are included in all modeling scenarios for the action alternatives.
- GHG emissions from staff travel and trucking operations would occur similarly for all action alternatives and the No Action Alternative through 2028. Thereafter, once CHRLF closes under each action alternative, emissions would differ slightly for each alternative based on the date of CHRLF closure and the facilities option chosen. These differences in emissions are included in all modeling scenarios for the action alternatives.

8.2.1.3 Action Alternatives

Landfill Development

GHG emissions are generated by combustion of diesel- and/or gasoline-powered trucks when waste is collected and transported to King County recycling and transfer stations. The collection of solid waste and subsequent transport to transfer stations were assumed approximately the same regardless of where and when collected waste is disposed under all the alternatives.

Emissions from waste decomposition and landfill gas control system operation, operation of heavy equipment, and waste transfer are dependent on the length of time each action alternative is active and the long-term disposal option chosen after CHRLF closes. After 2028, each of the alternatives has a closure date between 2037 and 2046. For Alternatives 1 and 2 with an earlier closure date, waste that would otherwise be disposed of at CHRLF would need to be transported to another landfill for disposal or to a WTE facility somewhere in King County.

A number of factors affect GHG emissions from landfills, including CHRLF or an out-of-county landfill. A full discussion of methods, assumptions, and GHG analysis results can be found in the *Comparative Greenhouse Gas Analysis*, Appendix K, but major factors include:

- Waste composition and waste in-place. Waste composition affects the amount of degradable carbon in a landfill because each biodegradable waste component has different decay characteristics, which in turn impacts the amount of methane that is produced from anaerobic decomposition of the waste. Wastes that contain relatively large amounts of organics such as food waste produce a relatively large amount of methane compared with other wastes. To a lesser extent than food, other organic wastes such as paper and yard waste can decompose anaerobically and produce methane (King County 2019e). All alternatives would receive the same waste composition and therefore potential GHG impacts would be the same.

In addition, decomposition of waste does not occur all at once, but over many years. Waste placed in CHRLF in 1980 may still be producing methane, but generally much less than waste placed in 2010 (depending on other factors listed here such as location/moisture levels and waste composition). Certain materials degrade quickly, producing large amounts of methane within the first few years of placement in a landfill. Other materials degrade more slowly, producing gas steadily over a long period of time. (WARM 2009). The greater the waste in-place, the more landfill gas that could be generated in that location.

- Landfill location/moisture levels. Generally speaking, all types of biodegradable waste degrade more rapidly the wetter the landfill conditions. The CHRLF is in an area that receives greater than 50 inches of rain per year, while the potential out-of-county landfills (see the Solid Waste Comp Plan) are in areas that are mostly arid and receive less than 20 inches of rainfall per year. Moisture levels do not affect the total volume of GHG emissions, only the timing.
- Landfill cover systems and timing. Landfill gas is controlled by covering the active areas with daily cover as well as placing interim or final cover systems on areas that have reached final grades. Generally, daily cover (currently in use are tarps and/or soil) provides the least amount of gas control (the greatest amount of fugitive emissions), which is the primary reason the active waste disposal area is kept small (about one acre). Interim cover systems are designed to reduce infiltration of stormwater, minimize contamination of surface water runoff, provide physical containment of the waste, prevent contact with the waste by wildlife, and allow basic landfill gas collection until the final cover system is constructed. The interim cover is not intended to replace the final cover, but rather it is an enhanced control system to minimize environmental impacts to the extent practicable during operations before final closure. Final covers are designed as permanent containment of waste and allow full installation of LFG control and collection systems. LOURAs (see Section 2.3.1.1) installed as bottom liner in some areas (Alternative 3) would include LFG collection systems beneath or along the perimeter of the liner, causing it to act as an additional cover system for waste below it and enhancing gas collection. The WARM documentation describes a “typical” landfill as collecting only a small percentage (or none) of the gas produced soon after waste burial (years 0-1); about 50 percent collected in years 2 to 4; 75 percent in years 5 to 14; 82.5 percent in year 15 to one year before final cover; and almost all of the gas produced (90 percent) collected once a final cover is installed (WARM 2015).
- Landfill gas control system and capture efficiency. The largest factor that will affect GHG emissions at a landfill is the efficiency of the landfill gas recovery system. Greater landfill gas recovery efficiency will reduce GHG emissions. Research at other landfill sites shows methane capture percentages between 32 percent and 86 percent in mature, capped cells with gas collection. All

modeling for this analysis assumed an overall 75 percent landfill gas recovery, which is considered the higher end of the capture range. (King County 2019e)

- Energy recovery. Collecting landfill gas and combusting it for electricity (as is done at most of the out-of-county landfills) or distributing it as natural gas for combustion later in commercial and residential uses (as is done at CHRLF) reduces GHG emissions. This is because the byproducts of burning methane/natural gas are mostly CO2 and water vapor, with much of the CO2 from sources that are biogenic (i.e., part of the natural carbon cycle), and do not contribute to anthropogenic climate change. Likewise, combusting MSW in a WTE facility helps to avoid methane production and itself also produces CO2 from sources that are biogenic. All of these energy recovery approaches also help displace GHGs produced by other energy sources.

All of these unique conditions are reflected in the emissions modeling for all action alternative scenarios.

Table 8-6 shows the added capacity of each alternative and number of years that solid waste would be transported to an alternative disposal option, through 2046.

Table 8-6. Approximate Years of Long-Term Disposal Option Use (through 2046) Required Under Action Alternatives.

Alternative	Estimated Additional Capacity at CHRLF (million tons)	Estimated Capacity for Long-Term Option through 2046 (million tons)	Years of Disposal after closure of CHRLF under Long-Term Option through 2046
Action Alternative 1	9.1	11.7	9
Action Alternative 2	10.1	10.7	8
Action Alternative 3	20.8	0	0

It was assumed for all GHG emission modeling that for the varying number of years it would be in operation for each alternative (see above), an in-county WTE facility or intermodal yard for waste transfer to rail for export would be a distance from King County recycling and transfer stations comparable to CHRLF.

WARM Results

Table 8-7 shows net GHG emissions for landfill development under each action alternative with WTE and Waste Export by Rail compared with the No Action Alternative. The analysis includes GHG emissions associated with facility sources (including fugitive emissions), landfill equipment operations, and transportation sources. In addition, GHG emissions are shown both excluding and including credits for avoided emissions from energy recovery, metal recycling, ash reuse, and landfill carbon sequestration. The GHG emissions shown are total net emissions that reflect assumptions about the variables affecting LFG emissions discussed in the previous section (see Appendix K) that may conservatively overestimate actual emissions. Emissions are modeled over a 100-year period but do not account for the timing or duration of individual sources.

Table 8-7. Comparison of Estimated Operational GHG Emissions for Action Alternatives Compared with the No Action Alternative, with WTE and WEBR–WARM[1].

Description	WTE (MTCO2e)	WEBR (MTCO2e)
Total Net GHG Emissions Excluding Credits		
No Action Alternative	22,677,717	23,167,081
Action Alternative 1	22,618,281	22,892,761
Action Alternative 2	22,611,729	22,862,521
Action Alternative 3[2]	22,542,361	22,542,361
Total Net GHG Emissions Including Credits		
No Action Alternative	8,623,371	13,485,775
Action Alternative 1	10,484,175	13,211,455
Action Alternative 2	10,689,303	13,181,215
Action Alternative 3[2]	12,861,055	12,861,055

MTCO2e – metric tons of CO2 equivalent.

Notes:

1 Does not include construction of WTE and WEBR facilities.

2 Modeling uses a combination of WARM and LandGEM to estimate GHG emissions (see Appendix K);

3 Figures under WTE and WEBR for Alternative 3 are the same because they include only emissions from landfilling at CHRLF through 2046.

As shown in Table 8-7, when considering waste export by rail as the long-term disposal option, slightly lower GHG emissions occur under all action alternatives (both excluding and including credits) when compared with the No Action Alternative, with fewer GHG emissions the longer CHRLF remains open. Similar results are shown for WTE as the long-term disposal option when excluding credits, although when credits are included, higher GHG emissions occur under all action alternatives when compared with the No Action Alternative, with greater emissions the longer CHRLF remains open. As described above with the No Action Alternative, these estimates for GHG emissions are highly dependent on the assumptions behind the analysis, and on whether the utility and other credits are applied.

MSWDST Results

Table 8-8 shows net GHG emissions for landfill development under each action alternative with WTE and Waste Export by Rail compared with the No Action Alternative. As with WARM modeling, the analysis includes the full range of GHG emissions and both excluding and including credits. Similar conservative assumptions about the variables affecting LFG emissions are reflected in the MSWDST results (see Appendix K), and also reflect the same assumptions about emissions duration and timing.

Table 8-8. Comparison of Estimated Operational GHG Emissions for Action Alternatives Compared with the No Action Alternative, WTE and with WEBR–MSWDST[1].

Description	WTE (MTCO2e)	WEBR (MTCO2e)
Total Net GHG Emissions Excluding Credits		
No Action Alternative	24,256,801	25,503,573
Action Alternative 1	24,806,534	25,527,403
Action Alternative 2	24,863,558	25,526,454
Action Alternative 32	25,434,844	25,434,844
Total Net GHG Emissions Including Credits		
No Action Alternative	8,132,070	12,277,934
Action Alternative 1	9,956,712	12,303,662
Action Alternative 2	10,154,276	12,302,920
Action Alternative 32	12,213,491	12,213,491

MTCO2e – metric tons of CO2 equivalent.

Notes:

1 Modeling uses a combination of MSWDST and LandGEM to estimate GHG emissions (see Appendix K);

2 Figures under WTE and WEBR for Alternative 3 are the same because they include only emissions from landfilling at CHRLF through 2046.

As shown in Table 8-8, when considering waste export by rail as the long-term disposal option, very slightly higher GHG emissions occur under Action Alternatives 1 and 2 (both excluding and including credits) when compared with the No Action Alternative, but very slightly lower GHG emissions occur under Action Alternative 3 (both excluding and including credits) when compared with the No Action Alternative. Results for WTE as the long-term disposal option show higher GHG emissions occur under all action alternatives (both excluding and including credits) when compared with the No Action Alternative, with greater emissions occurring the longer CHRLF remains open. As described above with the No Action Alternative, these estimates for GHG emissions are highly dependent on the assumptions behind the analysis, and on whether the utility and other credits are applied.

Detailed results showing GHG emissions by source categories are included in Appendix K for both models used in this analysis. A comparison of the results between the WARM and MSWDST models largely shows overall alignment on order-of-magnitude emissions in total net MTCO2e. However, WARM and MSWDST generated conflicting answers to the question of which action alternative scenario would result in fewer GHG emissions. Both model results indicate that all landfill development alternatives unavoidably generate GHG emissions in largely similar amounts. Differences in individual sources exist between the two models due to inherent differences in the variations in key assumptions (that cannot be changed by the user) and calculation methodologies.

The GHG emissions associated with construction of the action alternatives are dependent primarily on the number of new refuse areas to be developed and the soil import or export transport trips necessary to accommodate that development. As described in Chapter 2, Section 2.3, soil needed for daily cover operations is stockpiled in various locations on the landfill property. Under all action alternatives, soil stockpiled at CHRLF or resulting from excavation for new refuse areas would need to be moved off site. Table 8-9 shows total offsite construction trips for all alternatives. Staff, contractor, and construction material deliveries are considered insignificant by comparison.

Table 8-9. Estimated Total Off-site Construction Trips–All Alternatives.

Alternative	Off-site Loads(one-way)	Total Construction Trips	Years of Construction
No Action	11,499	22,998	2029
Alternative 1	121,291	242,582	2025–2038
Alternative 2	122,219	244,438	2026–2039
Alternative 3	191,788	383,576	2026–2047

Source: Transportation Discipline Report. See Appendix J.

The following table summarizes the estimated emissions produced from construction of landfill capacity at the CHRLF site and an out-of-county landfill for the WEBR long-term disposal option, using estimates of the amount of fuel consumed by equipment to construct the landfill capacity associated with each alternative, and to import or export soil over the life of the alternative. (See Chapter 13 for a more detailed description of construction trip timing for each action alternative). GHG emissions have been estimated by using the AFLEET model and data from the EPA MOVES2014b model (see Appendix K). Table 8-10 shows estimated GHG emissions associated with landfill development construction.

Table 8-10. Comparison of Estimated Landfill Cell Closure and Construction GHG Emissions for Action Alternatives Compared with the No Action Alternative, WTE, and WEBR.

Description	WTE (MTCO2e)	WEBR (MTCO2e)
No Action	11,122	29,501
Alternative 1	44,789	56,391
Alternative 2	45,689	57,346
Alternative 3	65,988	65,988

MTCO2e – metric tons of CO2 equivalent.

Notes:

1 Modeling uses AFLEET to estimate GHG emissions (see Appendix K).

All action alternatives produce more construction GHG emissions than the No Action Alternative for both long-term disposal options. The differences in GHG emissions between the capacity constructed at CHRLF and a similar capacity constructed at a regional landfill are due to the efficiencies in staging, constructing, and closing capacity in larger increments at the out-of-county facility, and the elimination of offsite construction trips associated with construction at CHRLF. Construction impacts for relocation of landfill support facilities at the CHRLF would be similar to the No Action Alternative.

Estimated emissions produced from construction of facilities for WTE and WEBR long-term disposal options are considered indirect emissions and are the same for all alternatives. Using estimates of the amount of fuel consumed by equipment to construct the facilities, estimated GHG emissions using the AFLEET model and data from the EPA MOVES2014b model (see Appendix K) show approximately 18,268 MTCO2e for construction of the WTE facilities and 1,530 MTCO2e for the WEBR intermodal facilities. Additional minor GHG emissions may result from changes to other KCSWD facilities (e.g., recycling and transfer stations) to accommodate WTE- and WEBR-specific waste handling equipment.

Support Facility Options

Refurbishment or replacement of landfill support facilities at the end of their useful life would create GHG emissions related to use of construction equipment. The following table provides a summary of the estimated emissions that might be produced as a result of the replacement of support facilities currently on the CHRLF site. GHG emissions have been estimated by the AFLEET model using data from the EPA MOVES2014b model. Table 8-5 shows estimated GHG emissions associated with construction of replacement landfill support facilities.

When support facilities are refurbished or replaced, there would be a short-term increase in GHG emissions associated with construction equipment. While new facilities may be marginally different depending on the site and future programming, facility construction would use similar materials and methods for all action alternatives and facility relocation options, and result in similar GHG emissions as for the No Action Alternative (see Table 8-5).

Relocation of the main landfill support facilities to the Renton site would change the traffic levels at both the CHRLF and the Renton sites. The GHG emissions associated with these changes are assumed to be negligible and not quantified for the following reasons:

- Relocation of the landfill support facilities would not impact the waste transfer trucks delivering waste to the CHRLF or the number of waste truck deliveries to the CHRLF.
- The majority of employee and staff vehicles would go to the Renton site rather than to CHLRF. However, these vehicles would come from various locations around the Seattle metropolitan area and it is assumed that the aggregate distance traveled to the Renton site would be similar to the aggregate distance traveled to the CHRLF (see KCSWD 2019b).
- A portion of the KCSWD waste transfer trucks that typically are stored overnight at the CHRLF or brought for maintenance would instead go to the Renton site for those purposes. The Renton site is closer to the centroid of the KCSWD service area. Therefore, the shift of trucks from the CHRLF to the Renton site is not expected to cause a significant change in distance traveled because the trucks currently kept at the CHRLF would either travel back to the transfer stations located in the

metro area or to the Renton site and then to the transfer stations. Either way, the transfer trucks are traveling a similar distance.

As a result, no significant GHG emission impacts are expected from placing landfill support facilities at the Renton site.

Overall, according to WARM modeling, implementation of any of the action alternatives under a WTE or WEBR long-term disposal option would produce slightly lower GHG emission than the No Action Alternative with those options. According to MSWDST modeling, implementation of any of the action alternatives under a WTE long-term disposal option would produce slightly higher GHG emission than the No Action Alternative with that option. Implementation of Action Alternatives 1 and 2 under a waste export by rail long-term disposal option would produce slightly higher GHG emissions than the No Action Alternative with that option, and Action Alternative 3 would produce slightly lower GHG emissions than the No Action Alternative with that option.

As with the No Action Alternative, WARM and MSWDST generated conflicting answers to the question of which action alternative scenario overall would result in fewer GHG emissions. However, a comparison of the results between the WARM and MSWDST models largely shows overall alignment on order-of-magnitude emissions in total net MTCO2e. All action alternatives would produce levels of GHG emissions over 100 years at rates ranging from approximately 6,000 MTCO2e less to 12,000 MTCO2e more per year (excluding credits) relative to the No Action Alternative, depending on the model and scenario used. Including credits, all action alternatives would produce levels of GHG emissions over 100 years at rates ranging from approximately 6,000 MTCO2e less to 42,000 MTCO2e more per year relative to the No Action Alternative, depending on the model and scenario used.

While there are no standard significance thresholds for GHG emissions in the SEPA rules (WAC 197-11-330) and the GAP rule has yet to undergo final rulemaking, the federal Greenhouse Gas Reporting Program has a 25,000 MTCO2e per year applicability threshold, the state GHG Reporting Rule has a 10,00 MTCO2e per year statutory threshold, and the applicability level for the GAP rule is proposed to be the same at 10,000 MTCO2e. Further, the King County SCAP calls for a reduction of countywide sources of GHG emissions by at least 80 percent by 2050, compared with a 2007 baseline. At the same time, a PSD applicability test for a Title V Air Operating permit, requires Best Achievable Control Technology (BACT) to be applied only if there is more than 75,000 tons/year increase in CO2e.

Given the range of anticipated changes in GHG emissions relative to the No Action Alternative, and the variation in the regulatory context for the significance of project-level GHG emissions, it appears that the proposed project action alternatives by themselves have the potential for significant adverse impacts when compared with the most restrictive regulatory threshold and King County's overall greenhouse gas reduction goals, but may result in less-than-significant adverse impact if compared with other applicable standards.

Detailed results showing GHG emissions by source categories are included in Appendix K for both models used in this analysis.

8.2.2 Cumulative Impacts

The potential impact of GHG emissions is on a global scale. The breadth of past, present, and reasonably foreseeable future actions in the Puget Sound region alone that could contribute to project-level GHG emissions or a reduction in GHG emissions from existing sources makes it infeasible to identify a specific list of reasonably foreseeable projects that might increase or reduce GHG emissions. As a result, GHG cumulative impacts are considered on a qualitative rather than a quantitative basis, relying primarily on anticipated growth projected by the Puget Sound Regional Council (PSRC).

The cumulative GHG emissions driving climate change from other past and existing regional and global projects is already significant. In addition, the PSRC Vision 2050 report anticipates an increase in population in the Puget Sound Region of 1.8 million people and 830,000 households, and an increase in employment of 1.2 million jobs (PSRC 2020). This growth will induce additional GHG emissions from the resulting land use changes, deforestation, fossil fuels combustion, industrial processes, and agricultural activities anticipated to occur in response, in addition to those associated with waste generation modeled here. Existing development and this anticipated growth in the Puget Sound region could all generate GHGs that could lead to an increase in overall emissions and contribute to a cumulative impact on climate change.

GHG emissions from the proposed project alternatives would contribute incrementally to climate change. Ecology estimated that in 2018, Washington produced about 99.6 million MTCO2e (Ecology 2021). The King County SCAP estimated that geographic sources of GHG emissions in the County in 2017 totaled 20.3 million MTCO2e and that consumption-based sources of GHG emissions in the County in 2017 totaled 58.2 million MTCO2e (King County 2020). The approximately 250,000 MTCO2e per year average of GHGs from the action alternatives would represent an approximately 1.2 percent increase from the King County 2017 geographic total and an approximately 0.4 percent increase from the 2017 consumption total.

However, increased GHG emission increases are inevitable with all of the alternatives over the course of the project lifecycle, including the facility relocation options. Together with other past, present, and reasonably foreseeable future global sources and anticipated growth in the Puget Sound region, all alternatives have the potential to increase GHG emissions and contribute to an incremental cumulative effect on global climate change.

This is considered a cumulative significant unavoidable impact.

As noted above, Washington State and King County have established aggressive GHG emission-reduction goals, which may cause GHG emissions to decrease even as growth occurs. Mitigation to help meet GHG reduction goals set by the *King County Strategic Climate Action Plan* (SCAP) and to reduce the cumulative impact on global climate change are identified in Section 8.3.

8.3 Mitigation Measures

KCSWD reduces the potential production of GHG from CHRLF operations through various mitigation measures, including the installation and operation of state-of-the-art landfill gas management systems, consistent with King County's Strategic Climate Action Plan (King County 2015), and installation of interim and final covers with geomembrane liner material. KCSWD would continue these measures under all action alternatives and also could seek further reductions in GHG emissions by:

- Maximizing landfill gas capture and conversion to pipeline quality renewable natural gas at BEW, through:
  - Installation of dual-phase extraction wells in closed areas of the landfill at sufficient density for enhanced gas extraction, as part of LFG system upgrades.
  - Increased density of horizonal LFG collection pipes.
  - Use of daily cover materials and techniques that prevent fugitive emissions
  - Placement of interim and final covers as quickly as practicable after disposal areas are filled.
  - Enhanced LFG monitoring, reporting, and response.
- Maximizing efforts to achieve zero waste of resources consistent with King County SCAP, including elimination of organic waste from disposal. Efforts could include:
  - Implementing a regional organics plan that prioritizes food waste reduction strategies, wood waste reduction strategies, pet waste diversion, organics composting, and food rescue.
- Replacing diesel-fueled solid waste transfer trucks, maintenance vehicles, and landfill equipment with all-electric or hybrid electric vehicles and equipment.
- Planting significant landscaping and trees for additional carbon sequestration, to enhance all landfill buffer areas, with an emphasis on evergreen trees that could also provide aesthetic screening.
- Purchasing carbon neutral offsets for all GHG emissions associated with replacement or upgrades of existing facilities.

Federal and state regulations set strict operational criteria for landfill gas control systems and require systematic monitoring to assure that criteria are met. If those criteria are not met, changes must be made to the landfill gas control system on a specified schedule until the criteria are met (40 CFR Part 60, Subpart XXX; WAC 173-351).

8.4 Significant Unavoidable Adverse Impacts

None of the alternatives or long-term disposal options have any bearing on the continued production of waste in King County. Waste disposal will continue under some combination of the alternatives under consideration and the long-term disposal option selected by King County. While all alternatives produce GHG emissions that may or may not be significant in and of themselves, and although they are a small fraction of emissions from the region, state, country, and planet, when combined with other global emissions, they would be anticipated to contribute to global climate change. This is considered a significant unavoidable adverse cumulative impact.

9.0 HUMAN HEALTH

This chapter describes how implementation of any of the action alternatives, including the facility relocation options, could affect the health of local receptors, including onsite workers, visitors, and nearby residents in the vicinity of the CHRLF and the Renton site, compared to the No Action Alternative. The chapter is primarily based on analyses contained in Appendix L *Health Risk Assessment*, which address potential health risks associated with exposure to contaminants in ground or surface water, exposure to air toxics or odoriferous compounds, exposure to pests or other disease vectors, or exposure to noise or vibration. These risks are discussed in this chapter grouped by the location of the proposed development, at the CHRLF site and at the Renton site. Management of special wastes at the CHRLF is also discussed.

The studies in Appendix L *Health Risk Assessment* concluded that there would be no significant unavoidable adverse impacts to human health at CHRLF during construction or operation of any of the alternatives, including the facility relocation options at CHRLF or Renton. Because the direct, indirect, and cumulative human health impacts from relocating the administrative and maintenance facilities are expected to be insignificant, they are discussed briefly in this chapter.

9.1 Affected Environment

For a human health risk to exist, two components must be present: 1) hazard or toxicity (the potential for and degree of harm that a chemical, pathogen, or physical effect may inflict) and 2) an exposure or pathway (the degree to and manner in which humans come into contact with and absorb a chemical or pathogen, or comes into contact with and is affected by a physical effect [e.g., noise or vibration]). Risk defines the likelihood of experiencing harm from a chemical, pathogen, or physical effect. A description of the affected environment for human health risks requires identification of potential exposure pathways to potentially exposed populations. The primary potential exposure pathways relevant to CHRLF and the Renton site are pests and disease vectors (animals capable of transmitting disease to humans), water (surface and groundwater), air toxics and odor, and noise and vibration.

The other chapters in this FEIS discuss the affected environment for elements of the environment that are relevant to this discussion of human health risks. Chapter 4, Air and Odor describes the affected environment related to the potential air pathways; Chapter 5, Surface Water of describes the affected environment related to potential surface water and leachate pathways; Chapter 6, Groundwater describes the affected environment related to potential groundwater pathways; Chapter 7, Plants and Animals describes the affected environment related to potential pest and disease vectors; and Chapter 10, Noise and Vibration describes the affected environment related to potential noise and vibration effects. Each of the pathways, and potentially exposed populations, are discussed below.

While those chapters go on to discuss how the proposed alternatives may affect the environment, this chapter discusses how the proposed alternatives may affect human health by focusing on the potential impacts related to Alternative 3, the maximum proposed expansion of CHRLF.

9.1.1 Surface and Ground Water Pathways

Potential impacts of surface and stormwater runoff would be related to potential landfill contamination entering receiving waters without proper pretreatment or collection protocols. Potential impacts on humans could include: heavy metals contamination; toxic organics contamination; oil and grease (petroleum hydrocarbon) contamination; and introduction of pathogens. Potential impacts of groundwater would be related to potential landfill contamination entering groundwater used for drinking water. Potential impacts on humans could include exposure to heavy metals contamination, toxic organics contamination, oil and grease (petroleum hydrocarbon) contamination, and introduction of pathogens.

9.1.1.1 Cedar Hills

Populations that could potentially be affected by water from the CHRLF are those using, or coming into contact with, surface water downstream or groundwater downgradient (northeast) of the landfill. Surface water at the landfill is managed by several systems, depending on the water's path at the landfill and its required treatment before release from the site. Surface water that runs off the active face of the landfill is handled as CSW and is collected in a separate conveyance system and routed through the leachate treatment system and to the wastewater treatment system. All other surface water that runs off the site in the form of clean stormwater is routed through ditches, culverts, berms, and other BMPs constructed to meet stormwater effluent criteria per all relevant regulations, before discharge to wetlands and streams on the perimeter of the property. With this system of surface water controls that prevent exposure to waste, there is no exposure pathway via surface water.

Groundwater at the CHRLF flows generally from the southern portion of the landfill property to the north, and exits the landfill property beneath the northeast corner of the site. Groundwater can be contaminated primarily by either a leachate release, or by LFG migration. LFG can contain trace amounts of toxic compounds that may be harmful to human health at high enough concentrations and exposures. Regulatory requirements for groundwater protection and monitoring, a description of the monitoring program, and groundwater quality (currently and under each action alternative) are addressed in Chapter 6.

There is no indication of contamination in the regional aquifer where it leaves the CHRLF site (KCSWD 2020). As described in Chapter 6, Groundwater, chlorinated solvents and their derivatives are routinely detected in groundwater samples collected from wells installed to monitor water quality in the regional aquifer upgradient of CHRLF and downgradient of the Queen City Farms site, indicating that the source of this contamination does not originate from the landfill. Groundwater in the regional aquifer flows to the north and east beneath the CHRLF. Contaminants that enter the aquifer from the south are attenuated through naturally occurring processes before groundwater leaves the CHRLF site and reaches any water supply wells off site (as indicated by data from downgradient monitoring wells). The presence of water supply wells in the vicinity of CHRLF is discussed in Chapter 6, Groundwater. Features such as the dense (impermeable) glacial till and landfill liner systems (the oldest refuse areas at the landfill – Main Hill Refuse Area, and Southeast Pit Refuse Area – do not have bottom liner systems) underlying the CHRLF serve to minimize or avoid impacts to groundwater during construction and operation activities. All measures in place to protect groundwater would be continued and/or expanded during the implementation of any alternatives for the CHRLF. The combination of the CHRLF site hydrogeology, impermeable landfill liners, leachate management system, LFG management system, and groundwater monitoring system would serve to largely eliminate or mitigate exposure pathways via groundwater.

Leachate, which is stormwater that infiltrates through the refuse and is collected for treatment, is contaminated with various biological and chemical contaminants that are either contained in the solid waste or formed during solid waste decomposition. Leachate is captured through a system of pipes and pumps, conveyed to leachate aeration lagoons, and then conveyed to the KCWTD POTW for treatment and eventual discharge. In this human health risk context, leachate has no exposure pathways for most populations.

9.1.1.2 Renton Site

Populations that could potentially be affected by surface water from the Renton site are those using, or coming into contact with, surface water in the areas where trucks and trailers are parked. Surface water at the site would be managed by either stormwater or sanitary sewer systems requiring treatment before release from the site. All paved areas that underlie waste transfer trucks and trailer parking would collect stormwater and discharge to the KCWTD sanitary sewer. Populations that could potentially be affected by groundwater beneath the Renton site are those using public water supply wells, including wells within the Cedar Valley Aquifer, within the inferred 5- and 10-year travel time areas from the Renton site. The Renton site is not located within the limits of the Cedar Valley Sole Source Aquifer or within the 1-year travel time for any wellhead protection area.

9.1.2 Air Toxics and Odor

Air quality is potentially impacted by operations at CHRLF. As discussed in Chapter 4, CHRLF operations could impact air quality through toxic or odorous compounds contained in landfill gas, or from landfill operations such as aeration of leachate lagoons. Populations potentially affected by air contamination are onsite workers, visitors, and nearby residents.

With sufficient exposure, health effects from air toxics "…can include damage to the immune system, as well as neurological, reproductive (e.g., reduced fertility), developmental, respiratory and other health problems" (EPA 1999).

In general, odor is not indicative of toxicity; however, unpleasant odors may be perceived as an indication of potential health risks from chemicals causing unpleasant odors. Persistent odors can have physiological effects including eye and respiratory irritation or breathing problems. Similar to air toxics described above, with sufficient exposure, odorous chemicals also have the potential to cause adverse health effects.

9.1.2.1 Cedar Hills

As discussed in Chapter 4, Air and Odor, CHRLF operations could impact air quality through toxic or odorous compounds contained in LFG, or from landfill operations such as aeration of the leachate lagoons. Populations potentially affected by air contamination are onsite workers, visitors, and nearby residents.

Air Toxics

WAC 173-460 addresses the control of 389 chemicals that are referred to as toxic air pollutants (TAPs). This regulation defines an acceptable source impact level (ASIL), provided as a concentration, for each TAP. An ASIL is defined in WAC 173-460 as “a screening concentration of a toxic air pollutant in the ambient air.” Also defined in WAC 173-460 for each of the 389 TAPs is a small quantity emission rate (SQER), provided as a weight per specified time period and defined as “a level of emissions below which dispersion modeling is not required to demonstrate compliance with acceptable source impact levels.”

Odor

As described in Chapter 4, Air and Odor, humans vary tremendously in their ability to perceive odor and in their physical and psychological reaction to odor. Although there are no ambient air quality standards for odorous compounds, odor thresholds have been defined as described in Chapter 4, Air and Odor.

9.1.2.2 Renton Site

Air Toxics

As described in Chapter 4, Air and Odor, the primary potential air toxics impact if the Renton site is selected for support facilities is the emission of diesel engine emissions, particulate (DEEP) from empty waste delivery trucks travelling to and from the site. However, dispersion modeling referenced in that chapter indicates that truck emissions would be less than the DEEP small quantity emission rate (SQER), so that health impacts due to TAP are unlikely to occur.

Odor

As discussed in Chapter 4, Air and Odor, significant odor impacts are unlikely to occur at the Renton site; therefore, health impacts associated with odiferous compounds are unlikely to occur.

9.1.3 Pest and Disease Vector Pathways

Potential impacts of pest and disease vectors (living organisms that can transmit infectious pathogens between humans, or from animals to humans) at CHRLF or the Renton site would be related to potential exposure of onsite workers, site visitors, or neighbors to pest species and/or animals such as rodents, insects (e.g., flies and mosquitoes), birds, and other animals or organisms that are controlled to protect human health and the environment.

9.1.3.1 Cedar Hills

As a putrescible material (i.e., a material that contains organics and is liable to decay), MSW can attract animals, including insects, rodents, and birds that are potential disease vectors. Populations that could potentially be affected by these pathways are onsite workers, visitors, and nearby residents.

Federal regulations (40 CFR 258.22) and State regulations in WAC 173-351-200(3) that are based on 40 CFR 258.22 address disease vector control for municipal solid waste landfills. These regulations state:

> "Disease vector control.
>
> a. Owners or operators of all MSWLF units must prevent or control onsite populations of disease vectors using techniques appropriate for the protection of human health and the environment.
>
> b. For purposes of this section, disease vectors means any rodents, flies, mosquitoes, or other animals, including insects, capable of transmitting disease to humans."

In addition, the Municipal Solid Waste Landfill Permit issued for the CHRLF by Public Health (see Appendix B), requires that vectors such as rodents, flies, and mosquitoes be controlled at the CHRLF to protect human health and the environment. Daily compaction and covering of the MSW eliminate most refuge for rodents and reduce fly propagation (breeding). KCSWD performs visual inspections of the landfill for areas of standing water that could provide a breeding ground for mosquitoes. When an area of standing water is identified on the landfill, KCSWD removes the standing water, typically by re-grading the area. Catch basins and other structures containing standing water are regularly sampled for mosquito larvae during mosquito breeding season. If larvae are found, the water is treated with bacteria that specifically target mosquito larvae. Mosquitoes avoid the leachate aeration lagoons because they prefer stagnant water for breeding. To date, there has been no significant rodent, fly, or mosquito problem at the CHRLF. Best management practices currently employed to control vectors would continue during implementation of any alternatives for the CHRLF.

There are substantial concerns regarding bird populations at CHRLF that may negatively impact the health and safety of landfill employees, users, and neighbors. Bird activity is cited as a health threat in the Cedar Hills Regional Landfill Wildlife Management Plan (King County 2019c). These concerns, which are typical of landfills, include:

Human health and safety concerns with birds removing waste, including biomedical waste, from the landfill property and depositing it on neighboring properties. As discussed in Section 9.1.5, CHRLF only accepts biomedical waste that has undergone treatment in accordance with Title 10 of the Code of the King County Board of Health, is no longer capable of transmitting disease, and is accompanied by a Waste Clearance Decision.

Human health and safety concerns with large numbers of flocking birds defecating on personnel, users of the landfill, neighboring property owners, leachate equalization pond systems, stormwater ponds, etc.

The potential for birds to act as a vector pathway and bird control measures are also discussed in Section 7.1.4.

9.1.3.2 Renton Site

The Renton site currently is vacant and is not a significant source or attractant for vectors such as rodents and insects. The Renton site is located adjacent to the Renton Recycling and Transfer Station where MSW is handled and a limited number of trailers are parked. The activities at the transfer station could be an attractant to vectors although controls are currently in place at the transfer station to minimize vector issues. Waste handling measures are employed to control odor and wash-water and stormwater runoff, and stored trailers are not left open.

9.1.4 Noise and Vibration

Potential impacts of noise and vibration at CHRLF or the Renton site would be related to potential exposure of onsite workers, site visitors, or neighbors to noise levels associated with health effects supported by federal noise guidelines and peer-reviewed literature. The most common physiological effects caused by persistent exposure to environmental noise in humans consist of:

hearing loss

- sleep disturbance or difficulty falling asleep
- increased blood pressure or heart rate
- headaches
- fatigue
- stomach ulcers
- vertigo

Psychological effects that can be induced or exacerbated by exposure to noise can include the following (EPA 1974 & 1978; Suter 1991; Berglund 1999; Seligman 2001; WHO 2002, 2009):

speech interference

- irritation
- anxiety

Exposure to ground-borne vibrations is not associated with specific human health effects but can result in strong irritation and annoyance, and potentially sleep disruption, to exposed receptors such as nearby residents.

9.1.4.1 Cedar Hills

The primary sources of noise at the CHRLF are waste transfer vehicles and the BEW facility. Back-up safety alarms on vehicles and machinery may be heard at times off site. Landfilling operations at the working active face, when they occur near the edge of the landfill, can be audible off site. Sources of vibration at CHRLF are typical landfill operations occurring primarily in the active working area: tipping of trailers and bulldozing and compacting waste and soil. Of the equipment used in these operations, the vibratory roller is the strongest source of vibrations.

Noise

As described in Chapter 10, King County Code (KCC 12.86) establishes limits on the levels and durations of noise crossing property boundaries. Allowable maximum sound levels depend on the land-use zoning designations of both the noise source and the receiving property.

Vibration

No specific regulatory standards for vibration apply to the CHRLF. However, the Federal Transit Administration has established guidelines for vibration impact criteria based on a building's use and the frequency with which events causing vibration occur.

9.1.4.2 Renton Site

The primary source of noise at the Renton site would be truck traffic to and from the site. No significant sources of vibration would occur at this site.

Noise

As described in Chapter 10, City of Renton Municipal Code (Title VIII, Chapter 7) specifies maximum permissible environmental noise levels by defining an environmental designation for noise abatement (EDNA) for both noise sources and receiving properties.

9.1.5 Special Wastes

Potential impacts of special wastes at CHRLF or the Renton site would be related to potential exposure of humans to wastes such as asbestos-containing waste; untreated biomedical waste; sludge and catch-basin waste; and Washington State special waste such as sludges with low levels of metals and polycyclic aromatic hydrocarbons.

9.1.5.1 Cedar Hills

The CHRLF does not accept, and takes active steps to preclude, dangerous wastes as defined by Chapter 173-303 WAC, Dangerous Waste Regulations. However, some wastes that are accepted at the landfill require increased protection to be safely managed. In addition to federal, state, and local regulations and permit conditions, KCSWD implements specific policies for handling these special wastes. The CHRLF is not open to the public, and any materials arriving at the landfill in vehicles other than KCSWD or approved private hauler vehicles need a Waste Clearance Decision from KCSWD to be allowed access to the site. Waste types that could have human health impacts, if handled improperly are: asbestos-containing waste; biomedical waste; sludge and catch-basin waste; and Washington State special waste such as sludges with low levels of metals and polycyclic aromatic hydrocarbons. When these waste types are inadvertently brought to the landfill, they are segregated and disposed of as prescribed by the CHRLF Operations Plan or by Federal or State law.

Asbestos-containing Waste

Asbestos disposal is regulated at the federal, state, and local levels by several agencies including the US EPA, US Occupational Safety and Health Administration (OSHA), Washington Department of Labor and Industries (L&I), Public Health, and PSCAA. KCSWD has designated an “asbestos corridor” in the working area of the landfill for the placement of asbestos wastes. The asbestos corridor is mapped so that it will not be disturbed by excavation activities. There are no gas or water lines that might require excavation of waste for repair or replacement in the asbestos corridor.

Biomedical Waste

Biomedical waste is waste material from health practitioners, clinics, and hospitals that could contain pathogenic microorganisms infectious to humans. The King County Waste Acceptance Rule requires that only treated biomedical waste and containerized sharps are approved to go to CHRLF. Most biomedical waste, when it has undergone treatment in accordance with Title 10 of the Code of the King County Board of Health and is no longer capable of transmitting disease, is considered solid waste and may be disposed into the general solid waste stream, although must be accompanied by a Waste Clearance Decision. Methods of treatment include steam sterilization, incineration, interment, or other method(s) approved by the health officer. An exception to this is sharps waste (needles, scalpels, syringes with needles attached, etc.), which is required to be placed in leak-proof, rigid, puncture and break-resistant containers for storage, handling, and transport. If these containers are disposed in the general waste stream, the rigid containers can easily be broken by solid waste collection, transfer, or landfill equipment, releasing the sharps. Loose sharps can puncture tires or shoes or become lodged in equipment where they are a safety hazard to maintenance workers. Needle-stick injuries can transmit infectious diseases, especially blood-borne pathogens. KCSWD requires sharps waste from health care providers to be segregated and transported directly to the landfill where it is buried in the same corridor as asbestos-containing waste. It is conceivable that untreated biomedical waste is disposed at CHRLF illegally, despite the Waste Acceptance Rule and posted notifications and guidance.

Other residential medical waste is also accepted at CHRLF, incidental to other household waste, including materials and products such as used gauze, gloves, bandages, sanitary products, and other home care items used regularly by residents to maintain health and address household injuries. These items are not considered Biomedical Waste under Title 10, but may have blood, excrement, or other bodily fluids present; they are acceptable under Title 10 and the Waste Acceptance Rule when absorbed by materials such as bandages, sanitary napkins or commercial absorbents so that the fluid will not be released from the material and/or become airborne during normal solid waste handling practices.

Birds potentially remove residential medical waste or biomedical waste from the landfill property and deposit it on neighboring properties. However, CHRLF only accepts biomedical waste when it has undergone treatment in accordance with Title 10 of the Code of the King County Board of Health and is no longer capable of transmitting disease, or residential medical waste, so that this vector pathway is unlikely.

Sludge and Catch-Basin Waste

Although they are generally recycled, grit and bio-solids from wastewater treatment facilities may be accepted at CHRLF with a Waste Clearance Decision during maintenance activities, such as when there are wastewater treatment equipment breakdowns. Acceptance of biosolids requires the approval of Public Health and they must be dewatered. While they are accepted directly at the landfill, they are not allowed at transfer facilities.. These materials could contain microorganisms infectious to humans.

State Special Waste

State special wastes are specific wastes defined by the state in Chapter 173-303 WAC, Dangerous Waste Regulations. These wastes include asbestos-containing materials, industrial wastes, contaminated soil, over-sized materials, treated biomedical wastes, treatment plant grit and vactor wastes, and other miscellaneous materials. The state has determined that special wastes pose a relatively low hazard to human health and the environment and can be safely managed with an intermediate level of protection between dangerous and municipal waste. Special wastes go through Waste Characterization by Public Health before being considered for Waste Clearance and are required to be disposed directly at CHRLF without passing through any transfer station or other intermediate handling facility. KCSWD trains workers in the safe handling of special wastes and keeps records of these wastes as required by Chapter 173-303 WAC.

9.1.5.2 Renton Site

Special wastes would not be handled at the Renton site.

9.2 Environmental Impacts

9.2.1 Direct and Indirect Impacts

9.2.1.1 No Action Alternative

Under the No Action Alternative, the landfill would continue to operate as currently permitted, support facilities would remain in their current locations, and no land uses would be modified. No additional impacts to human health would be anticipated at or in the vicinity of the landfill site. Under the No Action Alternative, support facilities may be moved to occupy existing buildings at an interim offsite location. At this time, an interim location has been identified at an industrial location in Renton. Empty trailers could be stored at the offsite location, but no solid waste would be handled and human health impacts are unlikely to occur.

9.2.1.2 Impacts Common to All Action Alternatives

The following discussions apply to the action alternatives and the No Action Alternative. The factors that vary from alternative to alternative are the duration of the impact and the location of the active solid waste work area relative to the potential receptor. More detail regarding the conclusions provided below can be found in Appendix L *Health Risk Assessment*.

9.2.2 Landfill Development

9.2.2.1 Surface and Ground Water Pathways

Proposed landfill areas would not drain to any surface water body used as a water supply. With the proposed stormwater controls, no significant adverse impact to offsite surface water quality would be anticipated. Due to the lack of both exposure and toxicity, there would be no reason to expect any human health risk related to potential contamination of surface water from landfill operations under any of the alternatives.

Despite the lack of engineered bottom liners in the oldest areas of the landfill, routine monitoring shows that downgradient groundwater quality complies with primary drinking water standards (KCSWD 2020) in the regional aquifer. Through the Safe Drinking Water Act (SDWA), EPA and Washington State set legal limits on over ninety contaminants in drinking water. The legal limit for a contaminant reflects the level that protects human health and that water systems can achieve using the best available technology. Based on this continued compliance, the potential for leachate or landfill gas from current or future developed lined areas to affect the regional aquifer is considered minimal, in particular due to the hydrogeology of the site (see Chapter 3, Earth and Chapter 6, Groundwater). Due to the assessed low potential for groundwater quality impacts to the regional aquifer from current landfilling operations, there would be no reason to expect a health risk for users of the aquifer under any of the alternatives.

9.2.3 Air and Odor Pathways

9.2.3.1 Toxic Air Pollutants

Of the 118 chemicals whose expected concentrations were modeled at locations on and surrounding the landfill, none, with one exception, exceeded their toxicity values in any of the modeled community locations. The exception was 1,2-dibromo-3-chloropropane (DBCP) that was elevated in all modeling results, including the reference site. However, DBCP was not detectable in any source, although for modeling, DBCP was assumed to occur. Several of the 118 chemicals were estimated to be slightly elevated over their toxicity values in modeled locations on CHRLF property. These are categorized as low potential risk and are unlikely to cause any adverse health effects in the surrounding neighborhoods.

There were potential risks from individual chemical exposures at several locations on CHRLF property, most notably at the leachate lagoons source site. These exposures are compared to toxicity values based on repeated, daily exposure over decades (lifetime) and are unlikely to occur for visitors to the property. These same chemicals were not elevated at non-source sites or in the surrounding neighborhoods.

The analysis in in Appendix L *Health Risk Assessment* also evaluated the cumulative risk from simultaneous exposure to all 118 chemicals. Hazard Indices (HIs), values that total these risks, were developed for each sampling location by summing each chemical's Hazard Quotient (HQ), which is the ratio of exposure concentration and its toxicity value. The results indicated HIs that were low potential risk for all community modeled locations. All modeled fence line locations on CHRLF property were also low potential risk with the exception of moderate potential risk identified at the west fence line on CHRLF property (location S1 in Appendix L), which is not accessible to the public. Two of the source locations (the west edge of Area 8, S12 in Appendix L; and the top deck intersection of areas 5, 6, and 7, S13 in Appendix L) also had moderate potential risk. The leachate lagoons (location S11 in Appendix L is estimated to have high potential risk. These source locations are not accessible to the public. These HI values are based on chronic health effects and visitors would not be expected to have long-term chronic exposure to these locations, thus reducing the overall potential for risk. Although the values at these source locations are above their toxicity guideline, the actual exposures are of lower potential risk to health due to shorter exposure durations of site visitors and limited access to the sites. Based on both the onsite sampling data and numerical modeling results, these cumulative exposures are unlikely to cause any adverse health effects to residents in the surrounding neighborhood or site visitors.

An event such as a pipeline break within the gas management system, could result in a pulsed release of landfill gas. Although such a release could lead to a temporary increase in odorous compounds that have the potential for health effects, control systems in place would limit the duration of such a release and while short-term nuisance response symptoms could occur, adverse health impacts would be unlikely to occur.

Overall, based on the results of the Health Risk Assessment in Appendix L, the health effects due to CHRLF air toxics, whether estimated or measured, are unlikely to cause adverse health effects to site visitors or to populations in the surrounding community.

9.2.3.2 Odor

As discussed in Chapter 4, Air and Odor, odors are expected to be periodically evident in the community surrounding the landfill. Although unpleasant odors can be perceived to cause toxicity, the detection of odor is not a reliable indicator of toxicity and identifiable adverse health effects. Air sampling at 14 locations on and off the landfill detected 25 volatile organic compounds, three – ethanol, ethylbenzene, and hydrogen sulfide – were detected at concentrations above their odor threshold. However, all three were detected at concentrations that would be insufficient to cause any adverse health effect, and significant adverse health impacts from odor under any of the alternatives would be unlikely to occur.

9.2.4 Pest and Disease Vector Pathways

To date, there have been no significant rodent, fly, or mosquito problems at CHRLF due to control measures, such as daily cover and compaction of solid waste, and monitoring for and elimination or treatment of standing water. Impacts associated with birds as disease vector pathways include possible exposure to waste when it is removed from the active landfill refuse area. According to the World Health Organization, exposure to hazardous health-care waste can result in disease or injury, although those risks are generally limited to waste facility workers, and individuals who scavenge on waste disposal sites (WHO 1999), a practice that is prohibited at CHRLF. Bird control and mitigation of potential impacts from birds are discussed in Section 7.3. These updated control measures would continue under all alternatives. The analysis of health risks from pest and disease vectors that is contained within Appendix L *Health Risk Assessment* concludes that the BMPs employed at the CHRLF effectively control and manage bird and other pests at the facility and does so in a manner that reduces or eliminates human risk or exposure. A concise review of scientific literature worldwide disclosed no reported cases of birds or other organisms transporting biomedical waste and vectoring disease. Therefore, significant adverse health risk from these vector pathways are unlikely under any of the alternatives.

9.2.5 Noise and Vibration

Under any of the alternatives, significant adverse health effects from noise to the neighboring communities of the CHRLF would be avoided by implementation of recommended noise mitigation measures, as discussed in Chapter 10 and the consequent operation of the CHRLF within King County maximum permissible noise levels. An exception to this conclusion is associated with BEW's nighttime noise, which could cause exceedance of the County's nighttime noise limits within residential properties near the southeast portion of the landfill property. Additional mitigation by BEW would be necessary to bring BEW's nighttime noise within the County's regulatory standard. While noise levels above 39 dBA during nighttime hours could exceed the King County noise ordinance, annual exposure to these noise levels still fall within the WHO and EPA recommended average annual outdoor noise level (40–45 dBA). These levels are set to avoid moderate to severe irritation and protect public health and welfare with an adequate margin of safety. Therefore, no significant health impacts are expected as a result of these nighttime noise levels under any of the alternatives.

The analysis described in Chapter 10 concluded that vibrations caused by machinery operating on CHRLF are not likely to be noticeable to nearby residents living outside of the boundary. Therefore, vibrations generated by CHRLF machinery or processes would be unlikely to result in a significant risk to human health under any of the alternatives.

9.2.6 Special Wastes

It is anticipated that special wastes would continue to be handled in the same manner as they are at present. Therefore, no significant impacts to human health would be anticipated.

9.2.7 Support Facility Options

Activities occurring during construction or operation of support facilities located at CHRLF or the Renton site would generate minimal human health impacts.

9.2.8 Indirect Impacts

With mitigation described below, human health impacts are not anticipated to be significant and should not result in other actions leading to indirect impacts.

As discussed in Section 1.7, in order to compare the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046–the estimated year of capacity for Action Alternative 3. The impacts that would occur during these intervening years would not occur but for the proposed action selected and are therefore indirect effects.

For the No Action Alternative between 2028 and 2046, waste disposal could involve either waste export to a regional landfill or disposal at a WTE facility, which could be at the CHRLF site or another site. A regional landfill accepting waste from the County is likely to be an existing facility with measures in place to control human health impacts, so significant human health-related indirect impacts associated with that landfill are unlikely to result from the County's waste export. Waste export may require development of an intermodal facility that could have human health impacts, although waste handled at such a facility would be enclosed within shipping containers and the facility would have human health protection systems in place.

For Alternatives 1 and 2, potential human health impacts that could occur after closure in 2038 and 2039, respectively, would be similar to those that could occur under the No Action Alternative. A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the 2019 Solid Waste Comp Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

9.2.9 Cumulative Impacts

The history of odor complaints in the Cedar Hills area indicates that the Cedar Grove Composting Facility historically has been a major source of odors in the surrounding community. Occasional odor from the CHRLF has added to the cumulative odor impacts experienced by the surrounding community. As discussed above, the detection of odor is not a reliable indicator of toxicity and identifiable adverse health effects. Odor control programs in place and under evaluation as described below and in Chapter 4, Air and Odor should limit the frequency of odor events at the CHRLF so that the landfill's contribution to cumulative odor impacts in the Cedar Hills area under any of the alternative should be minimal.

9.2.10 Mitigation Measures

To avoid potential health impacts from landfill operations, KCSWD has been implementing best management and engineering practices in designing, operating, and maintaining environmental control systems, including disease vector control and the LFG, leachate, stormwater, and surface water systems. This EIS discusses these and other potential mitigation measures to limit impacts and avoid potential health impacts. See the Mitigation Measures section of each chapter for specific measures identified.

With these controls in place, no additional mitigation measures are necessary.

9.3 Significant Unavoidable Adverse Impacts

None of the alternatives would result in significant unavoidable adverse impacts to human health.

10.0 NOISE AND VIBRATION

This chapter describes how implementation of any of the action alternatives, including the facility relocation options, could affect noise and vibration in the vicinity of the CHRLF and the Renton site, compared to the No Action Alternative.

The chapter discussion pertains to noise and vibration studies that were performed for this EIS (Appendix F and Appendix G, respectively). These studies included measurements of existing noise and vibration levels at locations around the perimeter of and on the landfill property and the Renton site, and projection of future noise and vibration levels for the action alternatives and the No Action Alternative.

This environmental review determined that, with implementation of the proposed mitigation, the noise from the proposed alternatives would not create adverse noise impacts to the CHRLF and Renton communities, and no significant unavoidable noise impacts would occur during construction or operation of any of the alternatives, including the facility relocation options. Under worst-case conditions and for typical equipment operations, the noise study concluded that noise levels experienced at properties adjacent to the CHRLF could exceed the limits set in the King County noise regulations (King County Code Chapter 12.86); and that properties adjacent to the Renton site could exceed the nighttime limits set in the Renton municipal code (RMC Title VIII, Chapter 7). The study described mitigation that would reduce CHRLF and Renton site noise to within limits prescribed in KCC 12.86 and RMC Title VIII, Chapter 7, respectively.

The vibration study concluded that projected vibration levels at the CHRLF and Renton site property lines would remain below the threshold for noticeability for all action alternatives. Because they would not be noticeable, there would be no change compared to the No Action Alternative, and no significant unavoidable vibration impacts would occur during construction or operation of any of the alternatives, including the facility relocation options.

10.1 Affected Environment

The affected environment and community who could be impacted by noise and vibration due to implementation of the alternatives would be residents of the neighborhoods surrounding the CHRLF and Renton sites, and CHRLF visitors and staff working at each potential location. The sources of potential noise and vibration would be landfill construction, operational equipment and vehicles (including those used by BEW), and the North Flare Station.

10.1.1 Characteristics of Noise

Sound waves are received by the human ear as variations in pressure over time. The loudest sounds typically encountered by humans are a million times greater in pressure than faint sounds at the threshold of hearing. Because of this large scale, sound pressure levels are commonly specified in decibels (dB) which use a logarithmic scale to compress the range of pressure fluctuations to a more usable noise metric.

Because of their logarithmic nature, decibels do not arithmetically add. For example, if two sound levels are of equal strength, the sum of the two sound levels is 3 dB greater than either individual sound level. If two sound levels are added with one sound level being 10 dB louder than the other, the combined sound level is only 0.4 dB more than the louder sound level.

The sensitivity of humans to sound varies by pitch (frequency). For example, a 70 dB tone at a frequency of 2000 Hertz (Hz) will seem louder to most people than a 70 dB tone at 80 Hz. The A-weighting scale (dBA) is an attempt to compensate for this human perception of sound intensity. The A-scale deemphasizes low frequency noise, slightly emphasizes mid-high frequency noise, and slightly de-emphasizes high frequency noise.

Table 10-1. Typical A-Weighted Noise Levels and Human Response.

Example	dBA	Qualitative Evaluation	Times as loud (re 70 dBA)
	140	Deafening	
Threshold of Pain	135		
	130		
Jet Engine 200 feet	125		
	120		32
Rock Band	115		
Accelerating Motorcycle a few feet away	110		16
	105		
Noisy Urban Street/Heavy City Traffic	100	Very Loud	8
Jack Hammer at 50 feet	95		
	90		4
Heavy Truck at 50 feet	85		
	80	Moderately Loud	2
Vacuum Cleaner at 10 feet	75		
Near freeway auto traffic	70		1
	65		
Business Office	60	Quiet	½
	55		
	50		¼
	45		
Quiet urban nighttime	40	Faint	⅛
	35		
Soft whisper at 5 feet	30		
	25		
Motion picture studio	20	Very Faint	
	15		
Human breathing	10		
	5		
Threshold of human hearing	0		

People generally perceive a 10 dBA increase as a doubling of loudness. For example, a 70 dBA sound will be perceived by an average person as twice as loud as a 60 dBA sound. People generally cannot detect differences of 1 dBA to 2 dBA between noise sources, but under ideal listening conditions, differences of 2 dBA or 3 dBA can be detected by some. A 5 dBA change would probably be perceived by most people under normal listening conditions.

When distance is the only factor considered, sound levels from isolated point sources of noise typically decrease by about 6 dBA for every doubling of distance from the noise source. When the noise source is a continuous line (for example, vehicle traffic on a highway), noise levels decrease by about 3 dBA for every doubling of distance away from the source. Noise levels at receptor locations can also be affected by factors other than the distance from the noise source. For example, topographic features and structural barriers can increase or decrease noise levels by absorbing, reflecting, or scattering sound waves. Atmospheric conditions (wind speed and direction, humidity levels, and temperatures) can affect the degree to which sound is attenuated over distance. Temperature inversions and wind conditions can also bend and focus a sound wave to a location at considerable distance from the noise source. The degree of impact also depends on the individual sensitivity of people listening and on ambient sound levels. For example, where background noise levels are high, introducing a new noise source tends to have less impact than in an environment where background noise levels are low.

10.1.2 Noise Regulations and Criteria

10.1.2.1 King County

The King County Code (KCC 12.86) establishes limits on the levels and durations of noise crossing property boundaries. L_{EQ} and L_{MAX} are the noise metrics specified in the county noise limits, KCC 12.86. L_{MAX} is simply the loudest A-weighted sound level observed during a measurement/evaluation period. L_{EQ} is the Energy Equivalent Sound Level, meaning that over a measurement period it is the sound level that would have the same sound energy as a fluctuating sound level over the same time period. In this sense, L_{EQ} is similar to an average sound level but with more weighting being given to louder sound levels due to the logarithmic nature of the decibel.

Allowable maximum sound levels depend on the land-use zoning designations of both the noise source and the receiving property. The King County noise limits, which are based on the L_{EQ} during the measurement interval, are shown in Table 10-2.

Table 10-2. King County Maximum Permissible Sound Levels (dBA).

	District of Receiving Property			
District of Noise Source	Rural Day/Night	Residential Day/Night	Commercial	Industrial
Rural	49/39	52/42	55	57
Residential	52/42	55/45	57	60
Commercial	55/45	57/47	60	65
Industrial	57/47	60/50	65	70

The landfill is zoned RA-10. The noise limit at the RA-5 zoned properties adjacent to the landfill on the north, east, and west sides, is therefore 49 dBA during daytime hours (7 a.m. to 10 p.m. weekdays and 9 a.m. to 10 p.m. weekends) and 39 dBA during nighttime hours (10 p.m. to 7 a.m. weekdays and 10 p.m. to 9 a.m. weekends). Under KCC 12.86.110.B, the limit on maximum levels, L_{MAX}, is 15 dBA higher for all land uses; for rural areas, 64 dBA during daytime hours and 54 dBA during nighttime hours. At properties directly to the south of the CHRLF, and the other properties with Mineral zoning (an industrial zoning district) on the southwest corner, the L_{EQ} noise limits are 57 dBA and the L_{MAX} limit is 72 dBA during daytime hours.

According to the King County Code, Chapter 12.86.520, "[n]ormal and usual sounds created by construction" are exempt from the limits set forth in Chapter 12.86, except that construction noise is restricted to certain hours. For example, KCC 12.86.520(A)(1) states: "For heavy equipment used on construction sites, including crawlers, tractors, bulldozers, rotary drills and augers, loaders, power shovels, cranes, derricks, graders, off-highway trucks, ditchers, trenchers, compactors, compressors and other similar equipment, operating hours are between 7:00 a.m. and 7:00 p.m. weekdays and between 9:00 a.m. and 7:00 p.m. weekends."

10.1.2.2 Renton

The Renton municipal code specifies the following maximum permissible environmental noise levels. The environmental designation for noise abatement, or EDNA, is an area or zone (environment) within which maximum permissible noise levels are established.

Table 10-3. City of Renton Noise Limitations.

EDNA of Noise Source	EDNA of Receiving Property		
	Class A	Class B	Class C
Class A	55 dBA	57 dBA	60 dBA
Class B	57 dBA	60 dBA	65 dBA
Class C	60 dBA	65 dBA	70 dBA

EDNA – environmental designation for noise abatement
Class A – Lands where human beings reside and sleep
Class B – Lands involving uses requiring protection against noise interference with speech
Class C – Lands involving economic activities of such a nature that higher noise levels than experienced in other areas is normally to be anticipated

Additional requirements include:

- Between the hours of 10 p.m. and 7 a.m. the noise limitations of the foregoing table shall be reduced by 10 dBA for receiving property within Class A EDNAs.
- At any hour of the day or night the applicable noise limitations in Table 10-3 and the preceding bullet may be exceeded for any receiving property by no more than:
    - 5 dBA for a total of 15 minutes in any one-hour period; or
    - 10 dBA for a total of 5 minutes in any one-hour period; or

- o 15 dBA for a total of 1.5 minutes in any one-hour period.

10.1.3 Characteristics of Vibration

Vibration is an oscillatory, back and forth motion which results in zero net displacement (over time) of a medium (gas, liquid, or solid). Human and structural responses to vibration are most closely aligned with vibration velocity and acceleration and most documentation specifies human response criteria and damage criteria in terms of vibration velocity. Because vibration velocities can vary over a wide range, vibration velocity (L_V) is usually expressed using decibels (similar to noise). To avoid confusion with noise decibels, the notation VdB is used throughout for vibration decibels.

Figure 10-1 shows typical levels of vibration for a range of sources and subjective responses to those typical vibration levels.

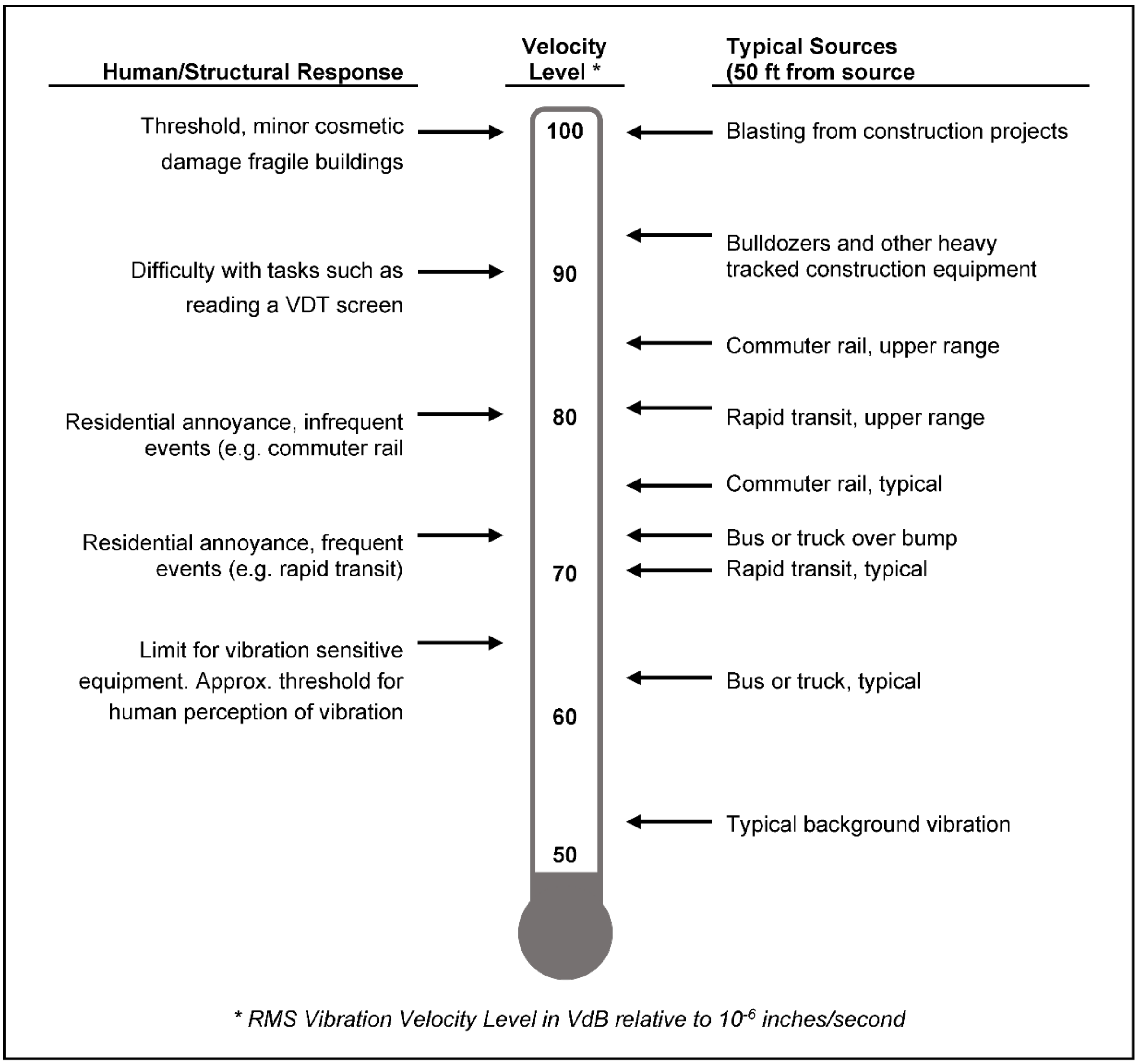


Figure 10-1. Human and Structural Response to Vibration Levels.

There is no governing standard for acceptable vibration levels. The Federal Transit Administration (FTA) report, *Transit Noise and Vibration Impact Assessment* (FTA 2006) presents criteria that have been developed based on human response to frequent or infrequent vibrations from rail traffic. Because the landfill vibration sources are generally in continuous operation, vibration levels associated with the landfill are compared against the FTA criteria for frequent vibration-causing events.

The FTA guidelines for vibration impact criteria based on a building's use and the frequency with which vibration causing events occur are shown in Table 10-4.

Table 10-4. Vibration Impact Criteria: Ground-Borne Vibration Impact Criteria for General Assessment.

Land Use Category	Frequent Events	Occasional Events	Infrequent Events
Category 1: Buildings where vibration would interfere with interior operations	65 VdB	65 VdB	65 VdB
Category 2: Residences and buildings where people normally sleep	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use	75 VdB	78 VdB	83 VdB

VdB – vibration decibels.
Frequent Events–more than 70 vibration events of the same source per day
Occasional Events–between 30 and 70 vibration events per day
Infrequent Events–fewer than 30 vibration events of the same kind per day

Since there are no high sensitivity-use buildings in the vicinity, the Category 2 land use category (for residences) is the most applicable vibration criterion for analysis of the CHRLF alternatives. Landfill operations are generally continuous throughout the day and the "frequent event" impact criterion is the most appropriate. For Category 2 frequent events, the criterion for vibration impacts is 72 VdB.

FTA guidelines for threshold vibration levels that can cause structural damage to various categories of buildings are presented in Table 10-5.

Table 10-5. Vibration Damage Criteria.

Building Category	Approximate VdB
Reinforced-concrete, steel, or timber (no plaster)	102
Engineered concrete and masonry (no plaster)	98
Non-engineered timber and masonry	94
Buildings extremely susceptible to vibration damage	90

VdB – vibration decibels

10.1.4 Existing Noise Levels

10.1.4.1 Cedar Hills

The ambient noise in the vicinity of CHRLF is highly variable. Aircraft and vehicular traffic are the most significant non-natural, external noise sources in the area on a widescale basis. Wind also influences the environmental noise level --for locations near trees, the rustling of leaves due to wind is an additional noise source. However, there are many smaller scale noise sources that can make significant contributions to the sound level observed locally. These include birds, dogs, insects, and human generated noise such as chainsaws, home repairs, lawn mowers, and leaf blowers.

In addition, noise from CHRLF may also be heard at some locations in the community at certain times of the day. Waste transfer vehicles (tractor-trailers and semi-trucks) and the BEW facility are currently the primary landfill noise sources that can be heard near the southeast and southwest corners of the property. Backup safety alarms may also be heard in these areas. When the active receiving and compacting of waste occurs near the edge of the landfill butte, sounds associated with those activities are likely audible in the surrounding community. When the active receiving and compacting activities are located away from the edge, they are less noticeable or possibly not noticeable.

During the filling of Area 7 and the currently active filling in Area 8, very little landfill noise is audible in the northeast (NE) and northwest (NW) corners of the property. During the noise study of the North Flare Station conducted in 2013/2014 (King County 2014), the operation of the station’s large flares created low frequency sound that was visible on a spectrum analyzer, but it was not readily noticeable to study personnel who were on site. Use of these flares has diminished since 2014.

To determine existing noise conditions in the community adjacent to the landfill, the noise study compiled noise levels measured at 18 locations around the perimeter of the landfill and at neighborhood residences. The results are shown in Table 10-6 below.

Table 10-6. Measurements of Existing Noise Levels (dBA).

Label	Location	Daytime LEQ	Nighttime LEQ
NM1	On landfill property, approximately 300 feet west of east boundary	47.1	44.0
NM2	Along east boundary of landfill property	40.3	34.9
NM3	Along west boundary of landfill property under SW powerlines	44.7	43.8
NM4	Along west boundary of landfill property	43.0	38.2
NM5	Along west boundary of landfill property	42.9	40.0
NM6	23323 SE 169th (southeast of landfill property)	46.6	39.8
NM7	23327 SE 156th (east of landfill property)	44.6	37.0
NM8	16214 230th Ave SE (east of landfill property)	50.2	37.5
NM9	22917 SE 159th (east of landfill property)	41.4	33.5
NM10	20725 SE 162nd Way (west of landfill)	48.0	41.9

Table 10-6 (continued). Measurements of Existing Noise Levels (dBA).

Label	Location	Daytime LEQ	Nighttime LEQ
NM11	15809 209th Ave SE (west of landfill)	45.5	38.6
NM12	Approximately 1,400 north of landfill property	38.7	35.0
NM13	Approximately 1,400 feet west of landfill property	44.7	36.9
NM14	Approximately 1,300 feet west of landfill property	39.7	34.1
NM15	Along west boundary of landfill property	42.0	41.1
NM16	Along north boundary of landfill property	40.0	36.6
NM17	Along east boundary of landfill property	39.0	35.0
NM18	On landfill property, approximately 400 feet south of north boundary	38.2	34.5

L_{EQ}–Energy Equivalent Sound Level
Note: During monitoring periods where rain was a factor, the periods with rain were excluded from the Leq calculation.

Existing noise levels measured at several locations at or outside the landfill property boundary (highlighted in gray in the table above) exceeded King County standards, and nighttime noise levels at two locations within the buffer area on the landfill property exceeded the standard for receiving properties, indicating that non-landfill properties adjacent to those measurement locations may have experienced noise levels exceeding County standards during the measurement period.

10.1.4.2 Renton Site

The Renton site and properties adjacent to the east and north are zoned industrial (EDNA C) and adjacent properties to the west within Liberty Ridge are zoned residential (EDNA A).

The community noise levels near the Renton site tend to be most heavily influenced by traffic noise, either from local traffic in the Liberty Ridge residential development located immediately west of the site, or from other traffic along NE 3rd-NE 4th Street, which is a main east-west arterial between downtown Renton, I-5, and the Renton Highlands area. Aircraft, both jet and propeller driven, were also observed in the area.

In the southeast corner of the Liberty Ridge development, the noise from the King County Road Services Maintenance Division yard is also a factor and raised the existing community noise above the NE 3rd-NE 4th Street noise levels.

Noise from the King County Renton Recycling and Transfer Station activities was not observed to be a significant daytime factor during site visits. The transfer station is not open overnight and does not contribute to the nighttime noise levels.

Existing early morning (nighttime) and daytime noise levels (L_{EQ}) in the Liberty Ridge community adjoining the west boundary of the site range between approximately 45 and 50 dBA at the properties nearest the site.

10.1.5 Existing Vibration Levels

There are no known uses within a reasonable distance of the landfill or the Renton site that would be specifically sensitive to vibration such as vibration-sensitive manufacturing and research, university research labs, or vibration-sensitive research at hospitals.

Vibration sources expected to be operating at the landfill are bulldozers (large and small), loaded trucks, and, potentially, vibratory rollers that may be used in road construction near the edges of the buffer zone. The wheeled trash compactors used at the site do not employ vibration to pack refuse. When moving, excavators on site would create maximum vibration levels similar to those generated by the large or small bulldozer. Table 10-7 shows approximate vibration levels for typical equipment.

No pile-driving is anticipated for any of the alternatives at either the landfill or Renton site.

Table 10-7. Vibration Source Levels for Construction Equipment.

Equipment	Approximate Lv in VdB at 25 feet
Large bulldozer	87
Small bulldozer	58
Vibratory roller	94
Loaded truck	86

Lv – vibration velocity
VdB – vibration decibels

10.2 Environmental Impacts

10.2.1 Direct and Indirect Impacts

For noise, a typical standard is that an increase of 10dB or greater compared to existing conditions is considered a significant impact. In the noise analysis, predicted noise levels are also compared with regulatory standards because, regardless of the extent of increase, if predicted noise levels would be above permissible levels, mitigation would be required to lower noise levels to meet standards.

Noise was evaluated for day and night operations at CHRLF. Daytime and early morning (considered nighttime under regulations) noise was evaluated for typical landfilling and facilities operations for the No Action and Action Alternatives (additional detail regarding the conditions evaluated is found in Appendix F – Noise Technical Memo and Addendum to Noise Technical Report).

BEW operates under its own Conditional Use Permit and EIS and is responsible for its nighttime noise emissions. However, BEW nighttime noise is included in the noise evaluation to provide a comprehensive assessment of nighttime noise impacts at the landfill (see Appendix F).

The noise study used traffic volumes for the month of June, which has the highest average daily volumes of any month. Preliminary data for the traffic analysis indicated that the maximum hour for waste volume occurs between 10:00 a.m. and -11:00 a.m. This was used for the daytime noise analysis. Similarly, the

6:00 a.m. to 7:00 a.m. period had the most trips in the early morning period, and was used for the nighttime noise analysis.

The study evaluated truck noise by treating trucks (or other mobile sources) as point sources spread along the applicable route.

Projected noise levels were calculated using atmospheric conditions that are favorable to noise propagation and thus lead to higher than typical noise levels. Temperature inversions and downwind noise propagation paths lead to downward bending noise paths leading to higher noise levels. Noise attenuation provided by trees and vegetation was calculated per the International Standards Organization ISO-9613-2 (ISO 1996).

For the No Action Alternative, noise levels were evaluated using the highest "normal" condition that would be expected – that is, the final few feet of elevation gained building the sloped top deck of the landfill is not considered. Further, a flattened section in the southeast corner of the landfill area was used when modeling noise in that quadrant. The terrain elevation used for noise evaluation in Areas 4, 5, and 6 was 770 feet above mean sea level.

For Action Alternatives 1 through 3, the noise study contained in Appendix F evaluated noise generated from seven locations when activity occurred in each. The study also analyzed four additional locations in the northern portion of the landfill where filling would occur under Alternative 3. The supplementary study conducted for the addendum (Appendix F) evaluated noise levels when activity would be occurring on the completed fill plateau over the Area 4/Main Hill under Alternative 3, which would be the very highest elevations at which landfill operations would occur.

Two studies (Noise Model Comparison and Sound Attenuation of Trees attachments to the supplementary noise study, Appendix F) were conducted to assess the accuracy of the models used to project future noise levels. One study compared modeled existing noise levels at two locations with actual noise measurements at those locations, and the second study compared modeled existing noise levels at a location on the property boundary with actual noise measurements at that location specifically to assess the accuracy of the algorithm used in the model to compute noise attenuation by trees. Both studies concluded that the noise model used to predict future noise levels is slightly conservative, that is, the model predicts slightly higher noise levels than the measured noise levels. With respect to attenuation by trees, the study indicates that the noise model slightly overpredicts noise levels both with and without leaves present in the tree canopy.

10.2.1.1 No Action Alternative

During daytime operations, the projected worst-case sound levels for the No Action Alternative exceed the King County limit (49 dBA) by about 1 dB outside the southeast (SE) property line. For early morning operations where the nighttime noise limit is still in effect, the projected noise from landfill activities is about 5 dB above the noise limit, also in the southeast corner of the landfill. The nighttime L_{MAX} is also more than the 59 dBA nighttime limit and the daytime L_{MAX} is also above the 64 dBA limit in the far SE corner.

The morning exceedances are primarily due to KCSWD waste transfer trucks idling and then leaving the site and, to a lesser degree, commercial waste operators bringing material onto the site.

10.2.1.2 Action Alternatives

Landfill Development

The noise analysis contained in Appendix F concluded that for all Action Alternatives and options there are sections of land where the projected noise levels exceed the noise limits.

In the SE corner, the high impact areas are generally the same as for the No Action Alternative. The noise analysis contained in Appendix F concluded that under any of the action alternatives, land adjacent to the SE corner of the landfill would exceed both daytime noise limits and, prior to 7:00 a.m., the nighttime noise limits, primarily due to truck traffic entering and leaving the landfill.

For all action alternatives that include support facilities in the north, nighttime noise limits are exceeded on land adjacent to the NW, SW, and north portions of the landfill.

Initiating new activity in the East Main Hill, Areas 2/3, and 4 under Alternative 3 would increase sounds to the NE and NW of the landfill beyond what is currently observed or planned under the other alternatives, but sound levels due to landfilling in those areas would not be a significant increase above what would occur under the No Action Alternative. This conclusion is unchanged as a result of the supplementary analysis contained in Appendix F.

The supplementary analysis also evaluated changes in impacts that would result if KCSWD adopted a five-day work week at the landfill in place of the existing seven-day work week. The increase in haul truck traffic and related activity with a five-day work week would result in slight noise increases at several locations.

More detail on expected noise impacts is in Appendix F, which contain noise contour maps showing the results of modeling noise impact at receptors near the landfill during both daytime and nighttime (immediately prior to 7:00 a.m.); with south, north, and Renton facility options; and when landfilling operations, including waste disposal and trucking activities, occur at various locations.

Vibration Impacts

Worst-case vibration levels were calculated by using the highest vibration-causing source, the vibratory roller, and by assuming that the roller was operating on the landfill buffer line or at the extents of the proposed facilities developments, whichever was closer to the property boundary. Table 10-8 shows projected vibration levels of typical equipment at two likely distances. Additional detail is provided in Appendix G.

Table 10-8. Projected Vibration Levels of Equipment.		
	Projected Vibration Levels (VdB)	
Equipment	Receiver Distance = 1,000 feet	Receiver Distance = 500 feet
Vibratory roller	45.9	55.0
Large bulldozer	38.9	48.0
Small bulldozer	9.9	19.0
Loaded truck	37.9	47.0

VdB – vibration decibels

The analysis presented in Appendix G was expanded with an addendum. The additional analysis included vibration measurements of the landfill's vibratory roller and included vibration measurements with the vibratory roller operating in Area 5 or Area 8. Measurements at the western property line were below 50 VdB (the typical human detection limit is approximately 65 vdB). The analysis concludes that although measured vibration levels associated with the landfill's vibratory roller are slightly higher than the levels predicted by FTA guidance, vibration levels outside the landfill boundary would be below the typical threshold for human detection.

In summary, the analyses of expected vibration impact conclude that for each type of equipment analyzed, the projected vibration level is:

- Below the threshold for Category III building damage
- Below the 72 VdB threshold for human annoyance
- Below the 65 VdB threshold for human perception

A 2014 study describes the results of a noise and vibration study performed for the CHRLF North Flare Station (King County 2014). The results of the study are still applicable because the same basic equipment is still in use. The results indicate that the vibration levels near the flare station with a single flare lit were well below the FTA criteria for human annoyance. With three flares lit (full capacity) the vibration levels would be a maximum of about 9.5 VdB greater, but levels would still be well below the FTA criteria. At property line locations, there was no significant difference between the measured vibration levels with the three flares on or off. The study concludes that at the landfill property lines the vibration level had diminished to the point that it was not distinguishable from the background level.

Projected vibration levels at the property line would remain below the threshold for noticeability for all action alternatives. Because they would not be noticeable, there would be no change compared to the No Action Alternative.

Support Facility Options

Expected noise impacts with south, north, and Renton facility options is included in the discussion under Landfill Development. Appendices F and the addendum to G contain noise contour maps showing the results of modeling noise impact at receptors near the landfill during both daytime and nighttime (immediately prior to 7 a.m.) with south, north, and Renton facility options. The analysis in the addendum to Appendix G includes the assumption that the existing gravel mine property to the northeast of the Renton site would be filled to bring its surface elevation up to the surrounding grade because the property is expected to be developed residentially in the future. This assumption results in higher expected noise levels on that property, with nighttime noise levels from facilities operations exceeding Renton's 50 dBA standard at the south edge of the property. Mitigation that would bring this projected impact below the threshold of significance is described in Section 10.3 below. Daytime noise levels on that property from facilities operations would not exceed the Renton 60 dBA standard.

If KCSWD implements a five-day work week, daily truck volumes would increase by 40 percent, which would require increased mitigation for noise for the CHRLF north and south support facility options as discussed below in Section 10.3.1.

For the Renton site, the applicable Renton nighttime noise limit for industrial to residential properties is 50 dBA. The projected 50 dBA noise contour extends well outside the SWD property lines and into the surrounding community. At some locations within Liberty Ridge, the early morning projected sound level would exceed the nighttime limit by over 10 dBA. Unmitigated, this projected 10 dBA noise increase would be a significant adverse impact. Mitigation that would bring this projected impact below the threshold of significance is described in Section 10.3 below. Projected daytime noise levels would be within noise limits. The projected 60 dBA (the daytime noise limit) noise contour is at the boundary with Liberty Ridge to the west and the boundary with residentially zoned property to the east.

The analysis in the addendum to Appendix G included analysis of traffic noise along NE 3rd Street and the contribution of landfill-related truck traffic to that noise. Based on measurements of noise along NE 3rd, expected increases from landfill-related traffic along that road would be about 3.3 dB in the 7:00 a.m. to 8:00 a.m. hour and about 4.9 dB in the 6:00 a.m. to 7:00 a.m. hour. The analysis in the addendum to G concludes that neither increase would be significant, and, further, that as baseline traffic volumes increase in the future, the relative contribution of landfill-related traffic to noise levels along NE 3rd would decrease. During other hours of the day, landfill-related traffic would be a smaller increment of total traffic and total traffic noise.

Vibration Impacts

Based on the type of activities that would take place at the Renton site, primarily trucking and vehicle activity, significant vibration impacts are not expected to occur.

Details regarding the analysis and results are contained in Appendix F and G.

10.2.1.3 Indirect Impacts

With implementation of mitigation described below, noise and vibration impacts under all action alternatives, including the facility relocation options, would be limited and unlikely to lead to additional projects or actions that would result in indirect noise and vibration impacts in the vicinity of CHRLF or the Renton site.

As discussed in Section 1.7, in order to compare the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Alternatives 1 and 2, and 2046, the estimated year of capacity for Alternative 3. The impacts that would occur during these intervening years would not occur but for the proposed action selected and are therefore indirect effects.

For the No Action Alternative between 2028 and 2046, waste disposal could involve either waste export to a regional landfill or disposal at a WTE facility (which could be the CHRLF site or another site). A regional landfill accepting waste from the County is likely to be an existing facility in a rural location, probably in eastern Washington, eastern Oregon, or Idaho, where noise and vibration would affect few sensitive receptors, so significant noise and vibration impacts associated with that landfill are unlikely to result from the County's waste export. Waste export may require development of an intermodal facility that would generate noise and vibration from truck to train transfer operations, but such a facility would likely be located in an industrial area where sensitive receptors are unlikely to be nearby. A WTE facility located at a site in the county has the potential to result in some noise and possibly vibration impacts. The potential extent of these impacts would be highly dependent on the specific facility location and design, but the implementation of available noise and vibration mitigation and regulatory requirements that require limiting noise levels at sensitive receptors minimize the likelihood of significant noise and vibration impacts. Also, the County's siting process to determine a location for a major facility such as an intermodal facility or a WTE would favor sites where sensitive receptors are unlikely to be adversely affected.

For Alternatives 1 and 2, potential noise and vibration impacts that could occur after closure in 2038 and 2039, respectively, would be similar to those that would occur under the No Action Alternative. A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the Solid Waste Comp Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

10.2.2 Cumulative Impacts

Landfill activities contribute incrementally to the cumulative overall past and present impacts on noise in the region. Analysis presented in the addendum to Appendix G–Addendum to Noise Technical Report concludes that nighttime noise exceeding the County's 39 dBA rural district nighttime standard would occur outside of the southeast, southwest, and south landfill boundaries under any alternative. This exceedance is due to a combination of BEW operations and landfill activities (primarily trucks in the 6 am to 7 am period). Analysis indicates that, even with implementation of adequate mitigation for landfill-related noise, a reduction of about 6 dBA in noise from BEW would be needed to reduce projected noise levels below the 39 dBA nighttime standard. Whether this level of BEW noise reduction is achievable is uncertain.

The area surrounding the landfill is unlikely to experience substantial additional future development leading to cumulative noise or vibration impacts within the area affected by landfill noise and vibration, so an increase in future cumulative noise and vibration impacts from additional development outside of the landfill is unlikely.

10.3 Mitigation Measures

10.3.1 Cedar Hills

As described in Section 10.2.1 above, the noise model used to predict future noise impacts levels produces slightly conservative results (i.e., noise levels that are slightly higher than what would be measured). Mitigation described below is based on the model results and is therefore expected to also be conservative (i.e., result in noise levels that are compliant with/below required standards).

Mitigation should include the following measures to bring noise levels within regulatory requirements:

- Installation of a barrier along the entrance road that is nominally 16 feet tall, with a height of 22 feet toward the northern end. The necessary height may vary according to its actual placement relative to the roadway. Because of the roadway split of 227th Avenue S.E., a wing of the barrier needs to extend up 227th to reduce the impact of the gap in the wall for the roadway.
- Installation of portable noise screens or berms around the screening equipment or the entire screening operation if the onsite gravel screen is operated half-time or more and noise measurements indicate that consequent noise levels at the property line are exceeded.
- To limit the potential impact of back-up alarms, installation and use of the quietest alarm that meets OSHA standards; use of alarms that automatically adjust for ambient noise levels; use of alarms that employ broadband or white noise rather than tonal noise.
- To limit noise from truck tailgates swinging shut, if possible:
    - Establish truck cleanout staging areas
    - Use rubber gaskets
    - Decrease speed of tailgate closure
    - Use bottom dump trucks
- To limit BEW-related noise, appropriate mitigation should be evaluated if modeled noise exceedances occur.
- Mitigation specific to the South Support Facilities option:
    - Orient the cat shack such that the open end of the building faces away from the closest homes. Cat shack operations should be limited to daytime hours.

  - Limit total HVAC noise on the Administrative Building to a combined sound power of 90.1 dB or less and install screens that provide at least 5 dB of extra attenuation to residences towards the east. An HVAC system meeting or exceeding this standard (i.e., having a lower sound power) could be installed or systems with higher sound power could be installed if offset by increased attenuation from screens.
  - Locate pressure washing on the east end of the maintenance building and on the approximate centerline of the building such that the noise levels to the east are attenuated by 10 dBA or more. Pressure washing should be limited to daytime hours only.
  - Install noise screens to attenuate noise from idling trucks at the residences to the east. Truck stalls should be oriented north-south instead of east-west with truck cabs facing northwards. Placement of stalls near either the Administrative or Maintenance building may reduce the number of stalls that need the barrier/baffle. The walls should be absorptive on both sides and have NRC ratings of 0.9 or higher in the 125 Hz third-octave band.
  - Idling trucks should not be located north of the end of the barrier, and when possible, the number and duration of trucks idling should be limited.
- Mitigation specific to the North Support Facilities option:
  - Limit the maximum speed along the main haul route to 20 mph until 7:00 a.m., when the daytime noise limits start.
  - Keep doors on north side of the maintenance building shut until daytime noise limits start. This should result in about a 10 dB reduction in noise to the north.
  - Limit pressure washing to daytime hours and locate washing on the east end of the maintenance building. The pressure washer pump should be electric-powered and located in a dedicated enclosure within the maintenance building or a fully enclosed addition on the exterior. The pressure washer could be located outside but would need to have a barrier or partial enclosure that results in a 10 dBA noise reduction to the north, east, and west sides.
  - Install a noise wall 750 feet in length and up to 19 feet in height above ground level along the northwest corner of the main haul route. This noise wall would need to be extended by about 222 feet and warmup idle time for trucks would need to be reduced from 10 minutes to five minutes to achieve a sufficient reduction in noise levels if KCSWD implements a five-day work week.
  - Install barriers/baffles between truck parking stalls with a nominal height of 18 feet. The barriers are intended to shield some currently uninhabited areas to the north/northeast. Use of the maintenance building as a shield could possibly reduce the number of parking stalls requiring the noise wall. The walls should be absorptive on both sides and have NRC ratings of 0.9 or higher in the 125 Hz third-octave band.

- Orient truck parking stalls so that the homes to the west would receive slightly lower noise levels with engine fans pointing away from residences.

Vibration impacts would not be significant, therefore no mitigation measures for vibration are necessary.

10.3.2 Renton Site

If the support facilities are located at the Renton site, to comply with City noise regulations most of the site would need tall, absorptive sound walls around the perimeter, on intermediate walls, and some along the street. The proposed barrier surface needs to be acoustically absorptive to prevent sound from reflecting off the noise barriers and back into the community. Under this mitigation, the ingress/egress route shown in conceptual site plans would need to move further to the south with a noise wall extending from the northeast corner down to the access point.

To provide sufficient mitigation, the wall height above the site grade would need to be up to 25 feet along portions of the north, west, and south property boundaries and up to 27 feet along a portion of the east side of the property. Assuming filling of the property to the northeast, mitigation would include a 12-foot noise wall along a portion of that property's west boundary as well as along the entire southern boundary of that property. If KCSWD implements a five-day work week, the noise wall on the perimeter of the property to the northeast would need to be increased to 14 feet for offsite noise levels to meet the City's requirements.

Noise walls at the recommended heights may result in adverse aesthetic impacts and may not comply with City of Renton zoning requirements, although excavation of the site could reduce wall heights relative to grades on property surrounding the Renton site. Nonetheless, whether adequate noise mitigation can be achieved at the Renton site in an aesthetically appropriate manner and in compliance with the City's zoning requirements is uncertain.

Pressure washing activities should be located in the upper lot and should be located away from the bluff overlooking the Liberty Ridge development to minimize noise impacts on the residential community.

Appendices F and the addendum to G provide additional detail regarding this recommended mitigation and notes that the mitigation described in detail may require refinement once facility design is finalized.

10.4 Significant Unavoidable Adverse Impacts

With implementation of mitigation measures described above, the communities surrounding the landfill or the Renton site would experience landfill-related noise for a longer period in the future under any of the action alternatives. However, no significant unavoidable adverse noise impacts should occur.

11.0 LAND AND SHORELINE USE

This chapter describes the compatibility of each of the action alternatives for the CHRLF with land uses in the vicinity of the CHRLF and Renton site, compared to the No Action Alternative. The consistency of proposed future development of the CHRLF with applicable land use policies and regulations is also discussed. This chapter also briefly addresses potential impacts to housing, recreation, and historic and cultural resources. Existing interlocal agreements are discussed in Chapter 15, Public Services and Utilities.

This environmental review determined that there would be no significant unavoidable adverse impacts to land and shoreline use in the vicinity of the CHRLF or the Renton site during construction or operation of any of the alternatives, including the facility relocation options.

11.1 Affected Environment

11.1.1 Land Uses

11.1.1.1 Cedar Hills

The CHRLF is located on a 920-acre site outside the urban growth boundary in eastern unincorporated King County. The site is located at 16645 228th Avenue SE, Maple Valley, about three miles north of Maple Valley, six miles east of Renton, and four miles south of Issaquah. In addition to the 920-acre parcel that constitutes the landfill property, the County owns an adjacent 20-acre parcel northeast of the landfill property line (shown on Figure 1-2).

Land Uses on the Landfill Site

The CHRLF site includes the municipal sanitary waste landfill operation and a 1,000-foot-wide buffer around the perimeter of the facility (Figure 1-3). The buffer, which is predominantly undeveloped forested land, separates the area of landfill activities from surrounding properties. Over the years, additional uses have been allowed in the buffer: for example, the Cedar Hills Alcohol Treatment Center, which was built in 1966 and closed in 2003. The treatment center site was redeveloped by YWCA Seattle | King | Snohomish for operation of its Passage Point facility, which provides transitional housing and support to parents reuniting with their children and returning to the community after a period of incarceration. King County, rather than KCSWD, owns and manages the area of the buffer zone on which the Passage Point facility is located (see Sections 1.5.1 and 2.1.4). Since 1997, the King County Parks Division has operated a native plant nursery on approximately six acres of the former treatment center site. Additional activities and uses within the buffer include an unpaved perimeter road just inside the fence along the property line, a non-potable water storage tank in the eastern buffer, and two leachate lagoons that are approximately 600 feet from the south and west property lines in the southwest corner of the site. Additional facilities are located adjacent to, but not within, the buffer. These include a siltation pond, a CSW lagoon, and a clean stormwater lagoon in the southern area of the site, and a siltation pond, a stormwater pond, and the north flare station in the northern area of the site. Aerial photographs taken in the 1970s and 1980s indicate that some landfilling occurred in the eastern and southern buffers (see Figure 1-3); however, since that time all landfilling of refuse has occurred at least 1,000 feet from the site boundaries. Additionally, the waste that had been previously placed in the southern buffer (i.e., the South Solid Waste Area) was excavated in 2015 to allow for development of the new stormwater and siltation ponds, and the CSW lagoon.

In addition to the activities and uses described above, several utility easements cross the CHRLF site. A 700-foot-wide BPA easement containing five electrical transmission lines crosses the southern portion of the site from east to west. Another electrical transmission line easement crosses north to south through the eastern buffer. A 75-foot-wide natural gas pipeline easement also parallels the BPA easement within the landfill's southern buffer.

Aside from the transitional housing provided by the Passage Point facility, no other housing exists on the landfill site.

Surrounding Land Uses

In the area immediately surrounding the landfill site, current land use is predominantly single-family residential, except for land uses abutting the southern and southwestern sides of the landfill. Nonresidential land uses south and southwest of the CHRLF include the Queen City Farms hazardous waste remediation site, currently on the National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the Cedar Grove composting facility, and the surface mining operations of both Stoneway Rock & Recycling and Quality Rock Products. All of these four land uses are under private ownership.

Within a one-mile radius of the landfill site, most developed properties support residential land uses, with more than 1,200 residences within one mile of the proposed landfill property line (Figure 11-1). In addition to the nonresidential uses listed in the preceding paragraph, low-intensity businesses or services and an elementary school are interspersed with the residential properties (Figure 11-2). None of those low-intensity businesses/services or the school has a direct relationship with the activities at CHRLF.

Recreation on and Surrounding the Landfill Site

No formal or informal recreation facilities or activities occur on the landfill site.

Maple Hills Park, a community-owned recreation facility, is located about 2,000 feet west of the western landfill property line (Figure 11-2). The park includes swimming and wading pools, tennis and basketball courts, ballfields, a picnic area, and playground. Throughout the year, the park is the location for various community gatherings and events.

The 118-acre Log Cabin Reach Natural Area abuts the northeast portion of the landfill site. This minimally developed area provides opportunities for walking and nature observation. Approximately 0.75 mile east of the landfill site, on the east side of Cedar Grove Road SE, is the 41-acre Middle Issaquah Creek Natural Area. King County is undertaking a habitat mitigation project on the property that will continue with monitoring expected through 2030. Passive recreation activities such as nature observation have occurred on the site and will continue to be available.

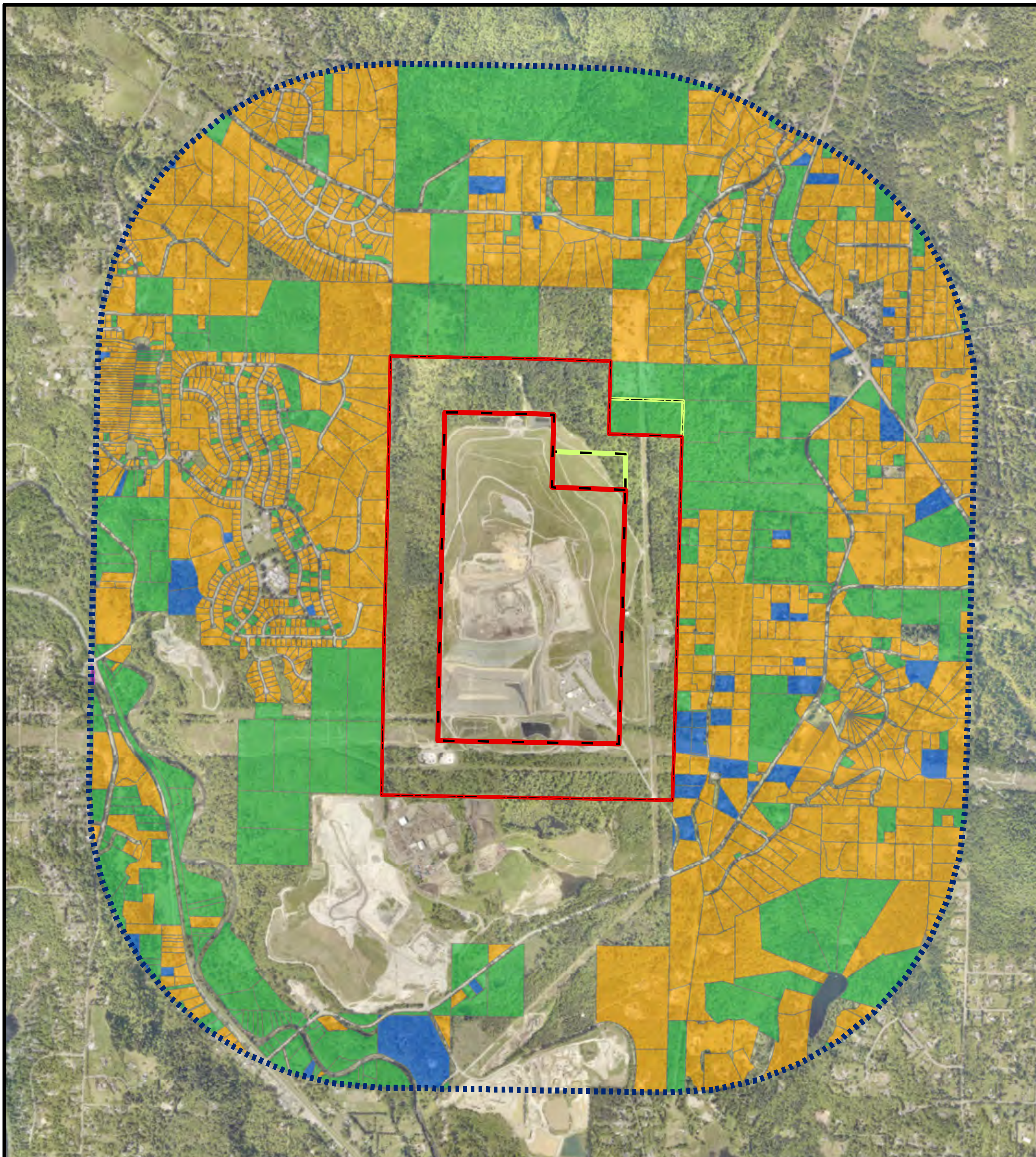
Several small natural areas are located along the Cedar River west and southwest of the landfill site. These areas, including the Cedar Grove, Larry Phillips (Rainbow Bend), Lower Lions Reach, and Belmondo Reach natural areas, provide some informal opportunities for walking and nature observation.

The Squak Mountain State Park lies about one mile north of the landfill site. This state park is part of an extensive area of interconnected public land that includes King County's Cougar Mountain Regional Wildland Park, two to three miles northwest of the landfill site and the state's West Tiger Mountain Natural Resources Conservation Area, located two to three miles northeast of the landfill site. The combined area of these public lands exceeds 11,000 acres and includes an extensive network of trails and roads used for walking, biking, and similar recreational activities.

Historic and Cultural Resources on and Surrounding the Landfill Site

A Cultural Resources review of the CHRLF site by King County Historic Preservation Program in January 2020 (KCHPP 2020) indicated that the landfill site, including the 1,000-foot-wide buffer, has a moderate probability of containing archaeological sites based on environmental and other factors. CHRLF has a low probability of containing intact archaeological sites because 1) it is on stable glacial landforms that have been subject to limited natural sedimentary deposition, so archaeological materials should be very close to the ground surface, and 2) it has been previously disturbed by logging, grading, and construction, which would have disturbed near-surface archaeological materials. In addition, archaeological surveys in and adjacent to the southern portion of CHRLF did not identify any archaeological resources. The review also found that several buildings within CHRLF are old enough to be considered historic, but all have been altered to an extent that they are no longer eligible for listing locally or nationally (KCHPP 2020).

As described in the Final EIS for the Cedar Hills Regional Landfill 2010 Site Development Plan (King County 2010), the results of an archival and literature review conducted for the 2010 EIS indicated that there had been 23 cultural resource surveys conducted within two miles of the landfill. Based on these surveys, the nearest recorded site was 0.9 mile west of the landfill – the Cedar Mountain Bridge and Ramp. Archaeologists also identified a fluted projectile point of a type associated with hunting camps as old as 11,000 years in a peat bog two miles west of CHRLF.



Legend

Existing Landfill Property Line

Existing 1000ft Buffer

Proposed Landfill Property Line (ALT. 3)

Proposed 1000ft Buffer (ALT 3.)

1 Mile Distance from Proposed Property Line

Single Residency

- Mobile Home- 46
- Single Family(C/I)- 1
- Single Family(Res Use)- 1308
- Vacant Single family- 371

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 11-1.
Number and Locations of Single-Family Houses within 1 mile of the Cedar Hills Regional Landfill.

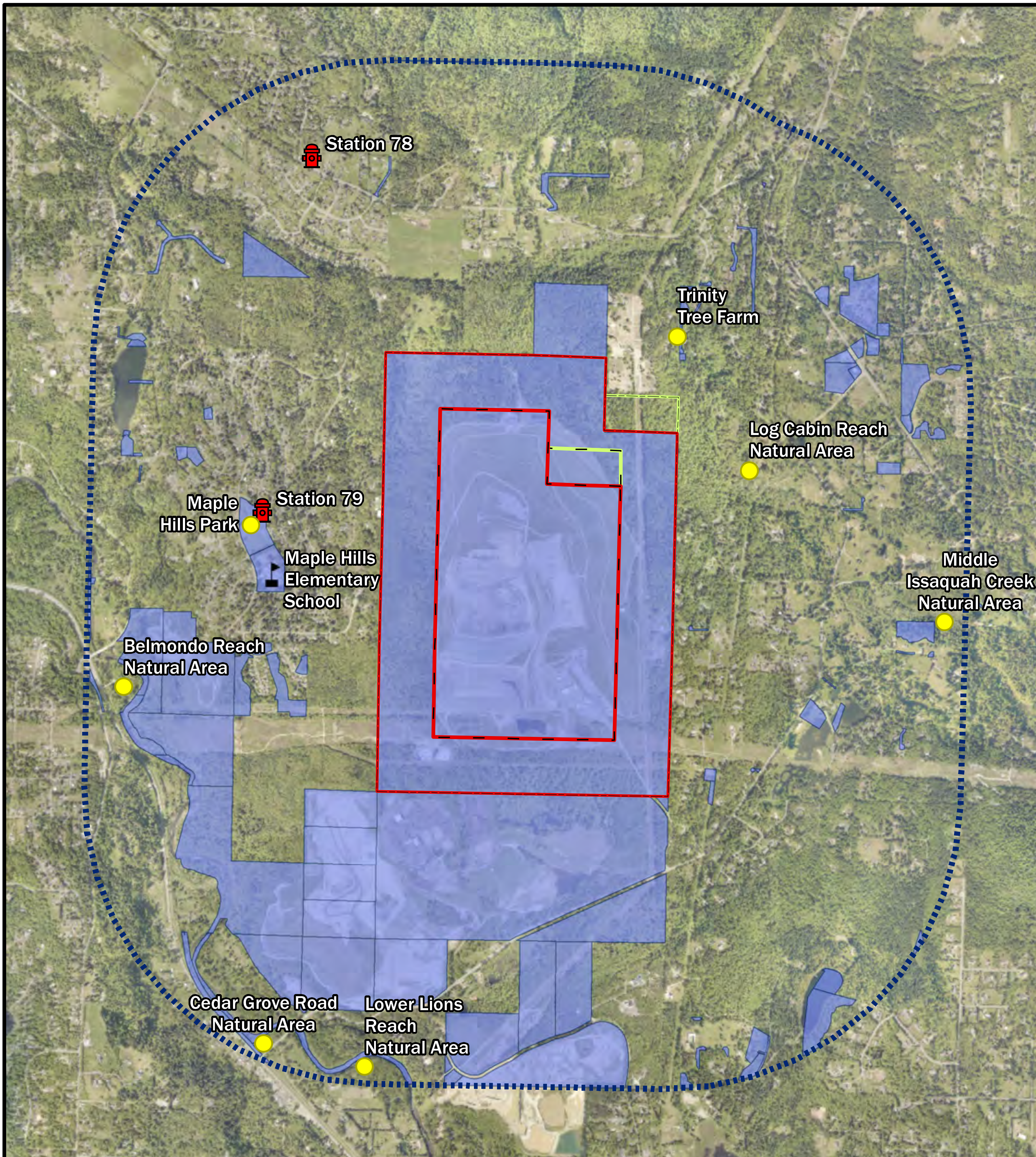
N

0 1,250 2,500 5,000 Feet

King County

King County (2017)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 11\Figure11_1_familyresidences_nolabels.mxd



Legend

- Fire Station
- School
- Natural area
- Existing Landfill Property Line
- Existing 1000ft Buffer
- Proposed Landfill Property Line (ALT. 3)
- Proposed 1000ft Buffer (ALT 3.)
- 1 Mile Distance from the Proposed Property Line
- Non-Residential Land Use

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 11-2.
Non-residential Land Uses within 1 mile of the Cedar Hills Regional Landfill.

N

0 1,250 2,500 5,000 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 11\Figure11_2_nonsingleresidences_nolabels.mxd

11.1.1.2 Renton Site

The Renton site is approximately eight acres comprised of two separate King County tax parcels—parcel 1434000020 (west part of the site) and parcel 1623059133 (east part of the site)—and is currently undeveloped land. It is next to King County's Renton Recycling and Transfer Station and is part of the King County Roads Division complex east and south of the transfer station. The Renton site option is further described in Chapter 2.

Residences are located west and southwest of the site and industrial and commercial development occurs south, north, east, and northeast of the site. The Greenwood Cemetery, which includes the Jimi Hendrix Memorial, is located along NE 4th Street northeast of the site.

The nearest recreation facility is the City's Heather Downs Heritage Park, an approximately 4.5-acre facility that includes play structures, climbing boulders, a picnic shelter, sports facilities, and paved and forested walking paths.

Based on the past intense urban development in the area, the January 2020 Cultural Resources review found there to be a low probability for containing intact archaeological sites or traditional cultural properties at the Renton site. No historic buildings were identified (KCHPP 2020).

11.1.2 Land Use Plans, Policies, and Regulations

11.1.2.1 Cedar Hills

The CHRLF site and surrounding lands are in unincorporated King County, outside the urban growth boundary. The site and its surroundings are under King County jurisdiction and subject to the policies of the King County Comprehensive Plan and regulations in the King County Zoning Code (King County Code Title 21A).

King County Comprehensive Plan Designations

To manage population growth in Washington state, the State Legislature passed the Washington State Growth Management Act (GMA) in 1990. The GMA directed the state's most populous and fastest-growing counties and their cities to prepare, and periodically update, comprehensive land use plans that anticipate growth over a 20-year horizon and direct development to designated urban areas and away from rural areas. The King County Land Use Comprehensive Plan (KC Comp Plan) provides a legal framework for making decisions about land use in unincorporated King County. The KC Comp Plan establishes boundaries for urban growth within the County, and the CHRLF and adjacent properties are outside the urban growth area.

In the current comprehensive plan, the CHRLF site and most of the surrounding area is designated Rural Area. The Log Cabin Reach Natural Area, which borders part of the CHRLF on the east, is designated King County Open Space System. Properties immediately south of CHRLF, with the Mineral zoning designation, are designated Mining on the comprehensive plan land use map.

King County Comprehensive Plan Policies

This section discusses the portions of the KC Comp Plan (King County 2018) that address land use policies pertinent to extending the useful life of CHRLF.

Essential Public Facilities

Under the definition of essential public facilities within the GMA and consistent with Policy F-229 (below) in the KC Comp Plan, the CHRLF is an essential public facility.

The GMA addresses what are termed "essential public facilities" in RCW 36.70A.200, which states in subsection (1): "The comprehensive plan of each county and city that is planning under RCW 36.70A.040 shall include a process for identifying and siting essential public facilities. Essential public facilities include those facilities that are typically difficult to site, such as airports, state education facilities and state or regional transportation facilities as defined in RCW 47.06.140, regional transit authority facilities as defined in RCW 81.112.020, state and local correctional facilities, solid waste handling facilities, and inpatient facilities including substance abuse facilities, mental health facilities, group homes, and secure community transition facilities as defined in RCW 71.09.020."

Consistent with RCW 36.70A.200, Chapter 9, Section II, Subsection G of the KC Comp Plan addresses essential public facilities. It states, "The region will work cooperatively to site essential public facilities in an equitable manner. Essential public facilities are defined in the Growth Management Act and include large, usually difficult to site facilities such as prisons, solid waste facilities, wastewater facilities, and airports." Subsection G includes the following policies:

> *"F-226 Proposed new or expansions to existing essential public facilities should be sited consistent with the King County Comprehensive Plan. Listed existing essential public facilities should be preserved and maintained until alternatives or replacements for such facilities can be provided.*
>
> *F-227 King County and neighboring counties, if advantageous to both, should share essential public facilities to increase efficiency of operation. Efficiency of operation should take into account the overall value of the essential public facility to the region and the county and the extent to which, if properly mitigated, expansion of an existing essential public facility located in the county might be more economical and environmentally sound.*
>
> *F-228 King County should strive to site essential public facilities equitably so that no racial, cultural, or socio-economic group is unduly impacted by essential public facility siting or expansion decisions. No single community should absorb an inequitable share of these facilities and their impacts. An assessment of existing facilities should be conducted when siting new facilities. Siting will consider equity, environmental justice and environmental, economic, technical and service area factors. Communities with a disproportionate share of existing facilities should be actively engaged in the planning and siting process for new facilities. The net impact of siting new essential public facilities should be weighed against the net impact of expansion of existing essential public facilities, with*

appropriate buffering and mitigation. Essential public facilities that directly serve the public beyond their general vicinity shall be discouraged from locating in the Rural Area and Natural Resource Lands.

F-229 A facility shall be determined to be an essential public facility if it has one or more of the following characteristics:

a. The facility meets the Growth Management Act definition of an essential public facility;

b. The facility is on a state, county or local community list of essential public facilities;

c. The facility serves a significant portion of the county or metropolitan region or is part of a countywide service system; or

d. The facility is the sole existing facility in the county for providing that essential public service.

F-230 Siting analysis for proposed new or expansions to existing essential public facilities shall consist of the following:

a. An inventory of similar existing essential public facilities in King County and neighboring counties, including their locations and capacities;

b. A forecast of the future needs for the essential public facility;

c. An analysis of the potential social and economic impacts and benefits to jurisdictions and local communities receiving or surrounding the facilities;

d. An analysis of the proposal's consistency with policies F-226 through F-229;

e. An analysis of alternatives to the facility, including decentralization, conservation, demand management and other strategies;

f. An analysis of economic and environmental impacts, including mitigation, of any existing essential public facility, as well as of any new site(s) under consideration as an alternative to expansion of an existing facility;

g. Extensive public involvement which strives to effectively engage a wide range of racial, ethnic, cultural, and socio-economic group, including communities that are the most impacted;

h. Consideration of any applicable prior review conducted by a public agency, local government, or stakeholder group; and

i. To the extent allowable under the Growth Management Act, the locational criteria in policies R-326 and R-327.

F-231 King County supports coordination of regional water supply planning, sales of excess water supplies among municipalities in the region, water quality programs and water conservation, reuse and recycled water programs. This regional planning should support King County's goals of focusing growth in the Urban Growth Area and ensuring water availability for resource lands."

Management of Solid Waste

Chapter 9, Section II, Subsection J of the KC Comp Plan addresses management of solid waste. It states: "King County's Comprehensive Solid Waste Management Plan, prepared by the Solid Waste Division of the Department of Natural Resources and Parks, guides the management of solid waste in the unincorporated county and for cities with which the county has interlocal agreements. The Comprehensive Solid Waste Management Plan presents policies, recommendations and goals for the following elements of solid waste management: system planning, waste prevention, recovery and recycling, solid waste collection and processing, the transfer system, landfill management and solid waste disposal, and system financing." Subsection J includes the following policies:

> *"F-265 Regional solid waste planning should integrate the principles of environmental stewardship and sustainable development into all aspects of solid waste management.*
>
> *F-266 Solid waste should be collected, handled, processed, and disposed in ways that reduce waste, conserve resources, and protect public health and the environment.*
>
> *F-267 King County should achieve Zero Waste of Resources by 2030 by targeting areas of the waste stream that have the greatest potential for diversion and recovery.*
>
> *F-268 Solid waste management should be planned, and transfer and disposal capacity provided, on a regional basis.*
>
> *F-269 King County shall operate a transfer system that is dispersed throughout the county to ensure access to safe, reliable, efficient, and affordable solid waste services, and improves recycling opportunities for residents and businesses. King County should continue to provide facilities for self-haulers.*
>
> *F-269a King County should consider demand management strategies that maximize the efficiency of the transfer system and encourage use of solid waste curbside collection services.*
>
> *F-269b In order to support achieving a 70 percent recycling goals, King County should work with partners and jurisdictions to encourage implementation of frequency and separation policies for curbside collection of garbage, recyclables, and organics throughout the county, including in unincorporated areas.*
>
> *F-270 King County should maximize the capacity and lifespan of the Cedar Hills Regional Landfill, subject to environmental constraints, relative costs to operate, stakeholder interests and overall solid waste system optimization.*
>
> *F-271 King County shall encourage sustainable development and development of markets for recyclable materials, and provide consumer education in the public and private sectors regarding green building practices, product stewardship, recycling, purchasing, and consumption in order to reduce the amount of waste disposed.*

> *F-271a King County should consider whether opportunities to increase energy recovery from select solid waste materials including organics, mixed plastics, and the non-recyclable portion of the waste stream are beneficial in terms of cost, the natural environment, greenhouse gas emissions and community impacts, as well as whether any such energy recovery facilities might be more appropriately located outside King County.*
>
> *F-271b Results from the King County Equity Impact Review Tool will be used as an important consideration to identify and assess the impacts of proposed service changes, and the county's Equity and Social Justice principles should be used to improve residents' access to the determinants of equity."*

Rural Areas and Natural Resource Lands

Chapter 3 of the KC Comp Plan addresses rural areas and natural resource lands. The Rural Area designation and associated policies in King County reflect the multi-use nature of rural lands. Policies from Section III (Rural Densities and Development), and IV (Rural Public Facilities and Services) of Chapter 3 pertain to the CHRLF, which is sited within the designated Rural Area of the County.

Section III, Subsection D, Nonresidential Uses, states: "*Although low-density residential development, farming and forestry are the primary uses in the Rural Area, some compatible public and private uses are appropriate and contribute to rural character. Compatible uses might include small, neighborhood churches, feed and grain stores, produce stands, forest product sales and home occupations such as woodcrafters, small day care facilities or veterinary services. In addition, it may be necessary to locate some public facilities in the Rural Area, such as utility installations that serve rural homes. Any allowed nonresidential uses should be designed to blend with rural residential development and resource uses.*"

Within Subsection D, the following policy is relevant to the CHRLF:

> *"R-324 Nonresidential uses in the Rural Area shall be limited to those that:*
>
> *a. Provide convenient local products and services for nearby residents;*
>
> *b. Require location in a Rural Area;*
>
> *c. Support natural resource-based industries;*
>
> *d. Provide adaptive reuse of significant historic resources; or*
>
> *e. Provide recreational and tourism opportunities that are compatible with the surrounding Rural Area.*
>
> *These uses shall be sited, sized and landscaped to complement rural character as defined in policy R-101 and R-201, prevent impacts to the environment and function with rural services including onsite wastewater disposal."*

Policies R-101 and R-201, referred to in Policy R-324, read as follows:

> *"R-101 King County will continue to preserve and sustain its rural legacy and communities through programs and partnerships that support, preserve, and sustain its historic, cultural, ecological,*

agricultural, forestry, and mining heritage through collaboration with local and regional preservation and heritage programs, community groups, rural residents and business owners including forest and farm owners, rural communities, towns, and cities, and other interested stakeholders."

"R-201 It is a fundamental objective of the King County Comprehensive Plan to maintain the character of its designated Rural Area. The Growth Management Act specifies the rural element of comprehensive plans include measures that apply to rural development and protect the rural character of the area (Revised Code of Washington 36.70A.070 (5)). The Growth Management Act defines rural character as it relates to land use and development patterns (Revised Code of Washington 36.70A.030 (15)). This definition can be found in the Glossary of this Plan. Rural development can consist of a variety of uses that are consistent with the preservation of rural character and the requirements of the rural element. In order to implement Growth Management Act, it is necessary to define the development patterns that are considered rural, historical or traditional and do not encourage urban growth or create pressure for urban facilities and service.

Therefore, King County's land use regulations and development standards shall protect and enhance the following attributes associated with rural character and the Rural Area:

a. The natural environment, particularly as evidenced by the health of wildlife and fisheries (especially salmon and trout), aquifers used for potable water, surface water bodies including Puget Sound and natural drainage systems and their riparian corridors;

b. Commercial and noncommercial farming, forestry, fisheries, mining, home-occupations and home industries;

c. Historic resources, historical character and continuity important to local communities, as well as archaeological and cultural sites important to tribes;

d. Community small-town atmosphere, safety, and locally owned small businesses;

e. Economically and fiscally healthy Rural Towns and Rural Neighborhood Commercial Centers with clearly defined identities compatible with adjacent rural, agricultural, forestry and mining uses;

f. Regionally significant parks, trails and open space;

g. A variety of low-density housing choices compatible with adjacent farming, forestry and mining and not needing urban facilities and services;

h. Traditional rural land uses of a size and scale that blend with historic rural development; and

i. Rural uses that do not include primarily urban-serving facilities."

Section IV, Rural Public Facilities and Services, sets forth King County's general approach to providing services and setting facility standards for the Rural Area and provides guidance for siting facilities that require Rural Area locations. Section IV policies include:

"R-401 King County shall work with cities and other agencies providing services to the Rural Area and Natural Resource Lands to adopt standards for facilities and services in the Rural Area and Natural

Resource Lands that protect basic public health and safety and the environment, but are financially supportable at appropriate densities and do not encourage urban development."

"R-402 Public spending priorities for facilities and services within the Rural Area and Natural Resource Lands should be as follows:

a. First, to maintain existing facilities and services that protect public health and safety;

b. Second, to upgrade facilities and services when needed to correct level of service deficiencies without unnecessarily creating additional capacity for new growth; and

c. Third, to support sustainable economic development that is sized and scaled at levels appropriate for Rural Areas and Natural Resource Lands and does not foster urbanization."

"R-403 In the Rural Area and Natural Resource Lands, standards and plans for utility service should be consistent with long-term, low-density development and resource industries. Utility facilities that serve the Urban Growth Area but must be located in the Rural Area or on Natural Resource Lands (for example, a pipeline from a municipal watershed) should be designed and scaled to serve primarily the Urban Growth Area. Sewers needed to serve previously established urban "islands," Cities in the Rural Area, Rural Towns, or new or existing schools pursuant to R-327 and F-264 shall be tight-lined and have access restrictions precluding service to other lands in the Rural Area and Natural Resource Lands."

King County Shoreline Master Program

The CHRLF site does not include any area within the jurisdiction of the County's shoreline master program. The closest waterbody under shoreline jurisdiction, Issaquah Creek, is over 1,000 feet from the landfill.

11.1.2.2 Renton Site

The site, and land immediately north of, east of the southern two-thirds of, and south of the site, is designated Employment Area in the city's comprehensive plan. Land immediately east of the northern third of the site, northeast of the site, and farther to the west and south is designated Residential High Density in the City's comprehensive plan. Properties along NE 3rd and NE 4th streets, north of the site, are designated Commercial Mixed Use in the City's comprehensive plan. Property south of the site, along the Cedar River and SR 169, is designated Residential Low Density in the City's comprehensive plan (See Figure 11-4). The Renton site is not within the City's shoreline master program jurisdiction.

11.1.3 Zoning

This section discusses zoning regulations applicable to Cedar Hills and the Renton site.

11.1.3.1 Cedar Hills

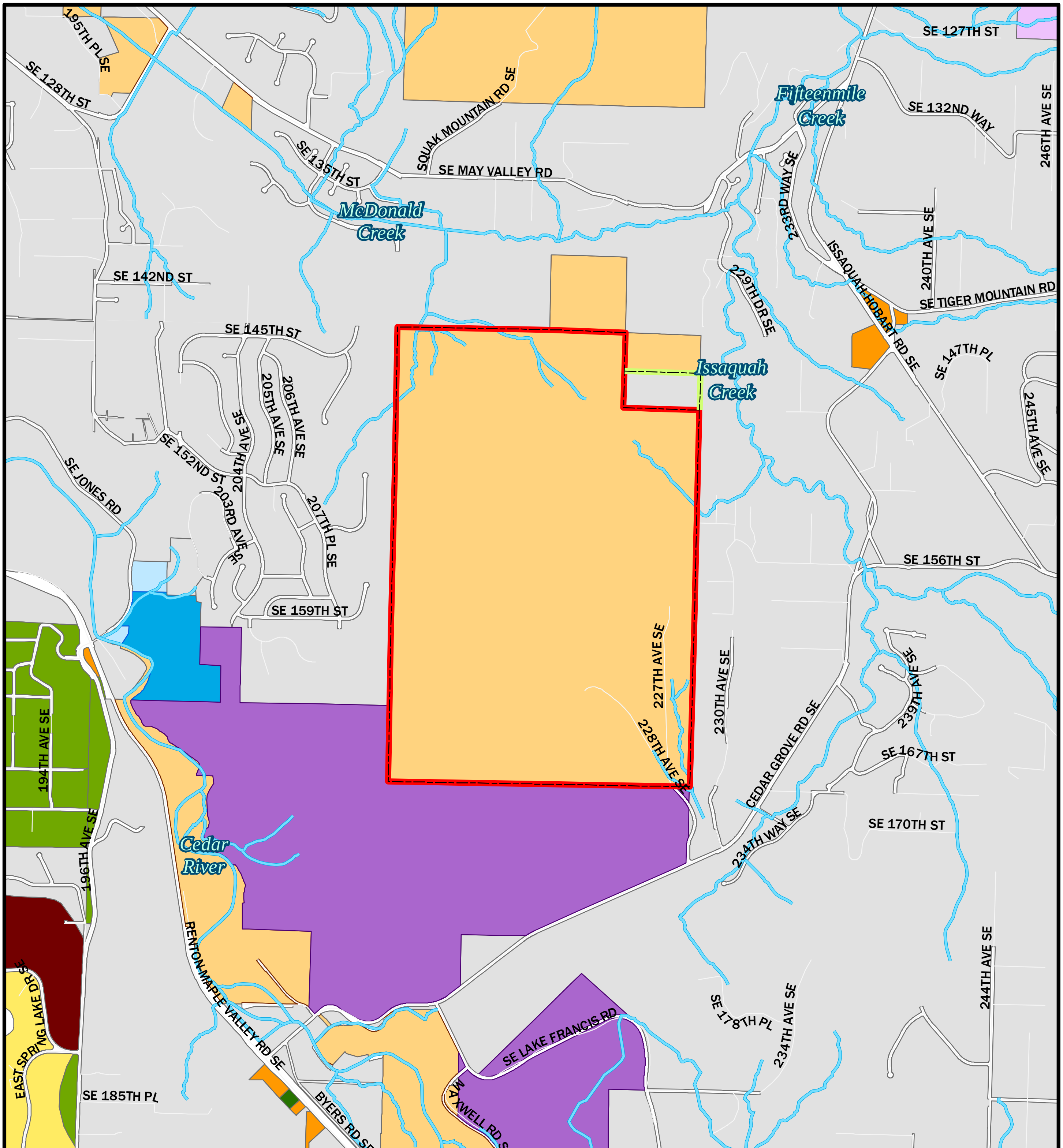
King County Zoning

The general purposes of King County zoning (KCC 21A.02.030) are:

> *"A. To encourage land use decision making in accordance with the public interest and applicable laws of the State of Washington.*
>
> *B. To protect the general public health, safety, and welfare;*
>
> *C. To implement the King County Comprehensive Plan's policies and objectives through land use regulations;*
>
> *D. To provide for the economic, social, and aesthetic advantages of orderly development through harmonious groupings of compatible and complementary land uses and the application of appropriate development standards;*
>
> *E. To provide for adequate public facilities and services in conjunction with development; and*
>
> *F. To promote general public safety by regulating development of lands containing physical hazards and to minimize the adverse environmental impacts of development."*

All current zoning designations in the vicinity of the landfill are shown in Figure 11-3. The CHRLF site is zoned RA-10 (Rural Area, minimum lot size of 10 acres). A landfill is a regional land use and is a special use in the RA-10 zone, and all other zones in King County except the Agricultural zone.

Properties immediately south of CHRLF, including the QCF and CG composting sites, are zoned M, mineral, which allows mining, other resource extraction, and similar uses. King County has zoned much of the remainder of the area surrounding the landfill as residential, with densities of either 1 unit per 5 acres or 1 unit per 10 acres. Small areas of commercial zoning are located at the junction of Issaquah–Hobart Road and Cedar Grove Road, and along the Maple Valley Highway (State Route 169) near its junction with Cedar Grove Road.



Legend

- Proposed Landfill Property Line (ALT. 3)
- Existing Landfill Property Line
- Stream

Zone

- Forest
- Neighborhood Business
- Mineral
- Industrial- Parcel specific condition
- Mineral - Parcel specific condition
- Rural Area - one DU per 5 acres (RA-5)
- Rural Area - one DU per 5 acres (RA-2.5)
- Rural Area - one DU per 5 acres special district overlay
- Rural Area - one DU per 5 acres parcel specific condition
- Rural Area - one DU per 5 acres special district overlay
- Rural Area - one DU per 10 acres

*LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

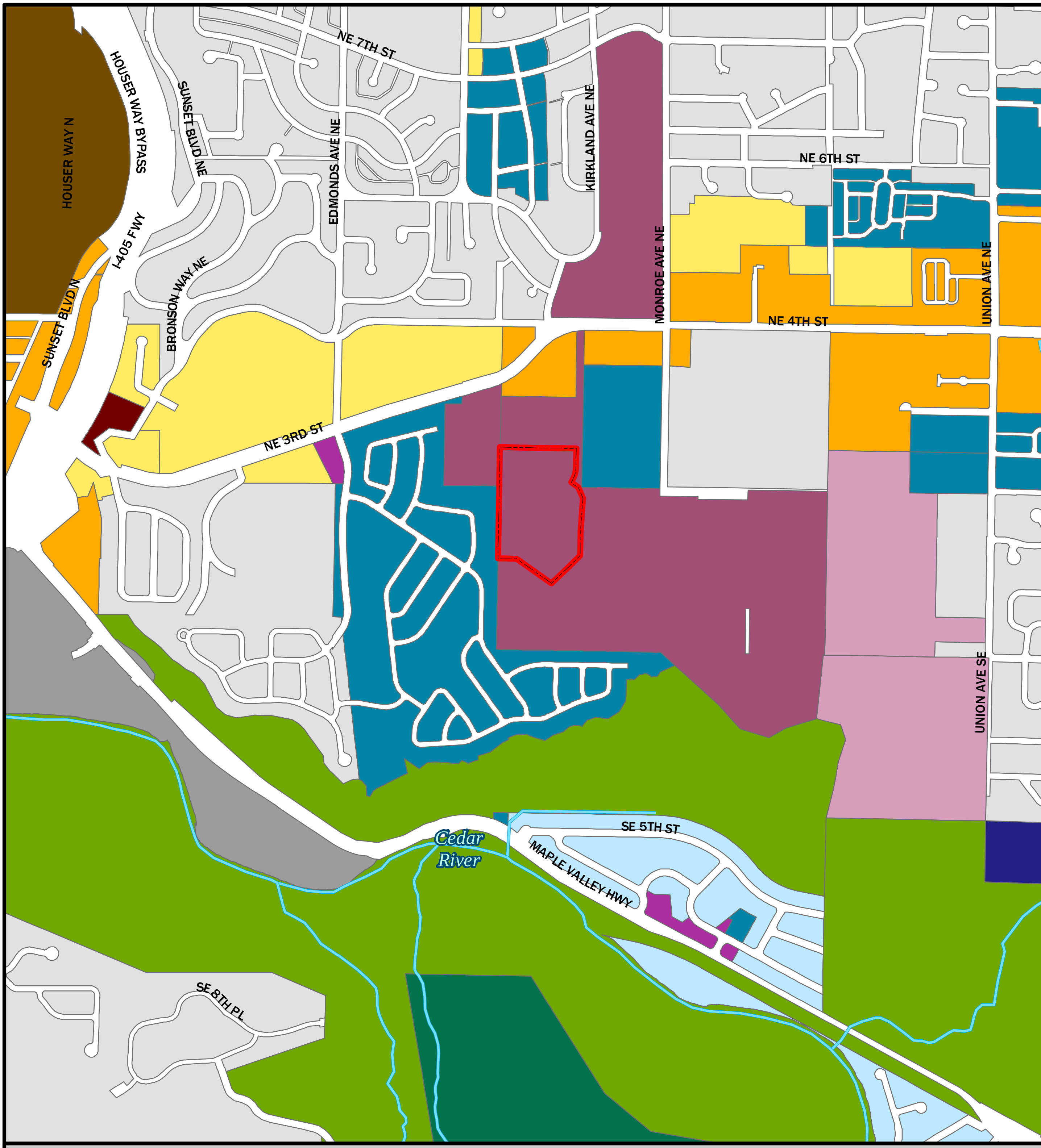
Figure 11-3.
Zoning Designations in Areas Surrounding the Cedar Hills Regional Landfill.

N

0 1,225 2,450 4,900 Feet

King County

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 11\Figure11_3_ZoningCHRL.mxd (8/6/2020)



Legend

- Renton Site Boundary
- Stream

Zoning

- Commercial Arterial
- Commercial Neighborhood
- Commercial Office
- Commercial/Office /Residential
- Heavy Industrial
- Industrial Light
- Residential - 10du/ac
- Residential - 14du/ac
- Residential - 4du/ac
- Residential - 8du/ac
- Residential - Multi-Family
- Residential Manufactured Home Park
- Residential - one DU per acre
- Resource Conservation

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 11-4. Zoning Designations in Areas Surrounding the Renton Site.

N

0 562.5 1,125 2,250 Feet

King County

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter 11\Figure11_4_ZoningRenton.mxd (8/10/2020)

Land Use Permitting

The CHRLF operates under a Special Permit issued by King County on September 12, 1960. The permit has no specified expiration date. The approval of the 1960 Special Permit allowed development and operation of a "sanitary landfill" on the present landfill property, subject to four conditions:

> "1. A 1,000-foot buffer strip surrounding the entire site will be left in its natural state for the protection of the surrounding properties. There will be no sanitary operations in this strip other than access.
>
> 2. Access will be from Cedar Grove Road over a new right of way entering the property from approximately the Southeast corner.
>
> 3. The operation is to be a true sanitary landfill. Not an open garbage dump.
>
> 4. There will be no burning of garbage."

An alternative that would require addition of property to the landfill site, sanitary operations within the 1,000-foot buffer designated in the 1960 permit, or "burning of garbage" (potentially including a waste-to- energy facility), would necessitate either an amendment to the existing Special Permit or approval of a new Special Use Permit.

The decision criteria associated with a Special Use Permit are contained in King County Code Section 21A.44.050:

> *"A special use permit shall be granted by the county, only if the applicant demonstrates that:*
>
> *A. The characteristics of the special use will not be unreasonably incompatible with the types of uses permitted in surrounding areas;*
>
> *B. The special use will not materially endanger the health, safety and welfare of the community;*
>
> *C. The special use is such that pedestrian and vehicular traffic associated with the use will not be hazardous or conflict with existing and anticipated traffic in the neighborhood;*
>
> *D. The special use will be supported by adequate public facilities or services and will not adversely affect public services to the surrounding area or conditions can be established to mitigate adverse impacts;*
>
> *E. The location, size and height of buildings, structures, walls and fences, and screening vegetation for the special use shall not hinder or discourage the appropriate development or use of neighboring properties; and*
>
> *F. The special use is not in conflict with the policies of the Comprehensive Plan or the basic purposes of this title. (Ord. 10870 § 626, 1993)."*

11.1.3.2 Renton Site

Renton Zoning

The site, and land immediately north, east of the southern two-thirds, west of the northern third, and south of the site, is zoned Light Industrial. Land immediately to the east of the northern third of the site, northeast of the site, and west of the southern two-thirds of the site is zoned R-10, a residential zone that allows 10 units per acre. Land farther to the west is zoned R-8, a residential zone that allows 8 units per acre. Properties along NE 3rd and NE 4th streets north of the site are zoned Commercial Arterial. Property south of the site, along the Cedar River and SR 169, is zoned Resource Conservation (See Figure 11-4).

Land Use Permitting

Landfill support facilities would be classified as “Other government offices and facilities” under the Renton zoning code (Renton Municipal Code, Title IV Section 4-2-060 Zoning Use Table). The land use category of “other government offices and facilities” is a Hearing Examiner Conditional Use in all zones.

The following decision criteria would apply to Hearing Examiner consideration of a proposed Conditional Use Permit for support facilities at the Renton site (Renton Municipal Code, Title IV Section 4-9-030 Conditional Use Permits):

> *“1. Consistency with Plans and Regulations: The proposed use shall be compatible with the general goals, objectives, policies and standards of the Comprehensive Plan, the zoning regulations and any other plans, programs, maps or ordinances of the City of Renton.*
>
> *2. Appropriate Location: The proposed location shall not result in the detrimental overconcentration of a particular use within the City or within the immediate area of the proposed use. The proposed location shall be suited for the proposed use.*
>
> *3. Effect on Adjacent Properties: The proposed use at the proposed location shall not result in substantial or undue adverse effects on adjacent property.*
>
> *4. Compatibility: The proposed use shall be compatible with the scale and character of the neighborhood.*
>
> *5. Parking: Adequate parking is, or will be made, available.*
>
> *6. Traffic: The use shall ensure safe movement for vehicles and pedestrians and shall mitigate potential effects on the surrounding area.*
>
> *7. Noise, Light and Glare: Potential noise, light and glare impacts from the proposed use shall be evaluated and mitigated.*
>
> *8. Landscaping: Landscaping shall be provided in all areas not occupied by buildings, paving, or critical areas. Additional landscaping may be required to buffer adjacent properties from potentially adverse effects of the proposed use.”*

11.2 Environmental Impacts

This and subsequent sections in this chapter discuss impacts related to land use and consistency with land use policies and regulations, concluding that all of the alternatives would be reasonably compatible with adjacent land uses and would be consistent with applicable land use policies and regulations. The following sections also conclude that none of the alternatives are likely to have adverse impacts on housing, recreation, or historic and cultural resources.

11.2.1 Direct and Indirect Impacts

The following section discusses direct and indirect impacts of the alternatives. Indirect impacts are impacts from other actions that would not occur but for the proposal.

11.2.1.1 No Action Alternative

In general, the No Action Alternative, which was evaluated in the 2010 EIS (King County 2010) would not result in significant land use, housing, recreation, or cultural resource impacts associated with landfill development. Under the No Action Alternative, support facilities may be moved temporarily to occupy existing buildings at an interim offsite location. The interim location would be an industrial site, but as existing buildings would be occupied at this site, adverse land use impacts would not occur.

11.2.1.2 Action Alternatives

Landfill Development

On-site and Surrounding Land Uses

None of the action alternatives would require a change in land use on the landfill site or on surrounding properties. None of the action alternatives would directly result in the loss of existing housing. Implementation of any of the action alternatives with recommended mitigation would result in limited proximity impacts (noise, air quality, odor) to recreation and would be unlikely to result in impacts to historic and cultural resources.

Consistency with Land Use Plans, Policies, and Regulations

<u>King County Land Use Comprehensive Plan</u>

The CHRLF is the only essential public facility in its vicinity, and it does not directly serve the public beyond its general vicinity, as no general self-haul or other services for individual residents or non-solid waste businesses are provided at the landfill (Policy F-228), with the limited exception that individuals are able to dispose of select special waste with specific waste clearance authorization. The landfill does serve the general public in King County by providing waste disposal services but does not directly serve individuals of the public. The guidelines contained in Policy F-230 regarding siting analysis for expansions of essential public facilities were addressed through the preparation and adoption of the 2019 update to Solid Waste Comp Plan.

In general, consistency of King County's solid waste management activities with Policies F-265 through F-271b of the KC Comp Plan has been assured through the development and implementation of the Solid Waste Comp Plan. The King County Council approved the 2019 update to the Solid Waste Comp Plan on April 24, 2019. The 2019 Solid Waste Comp Plan recommends maximizing disposal capacity at CHRLF, as does Policy F-270 in the KC Comp Plan. All action alternatives expand capacity at the landfill, with Alternative 3 maximizing capacity.

King County Comprehensive Plan policies relating to Rural Areas focus on preserving the character of rural areas by discouraging the development of urban infrastructure and urban types and levels of development in rural areas. At the same time, the KC Comp Plan acknowledges that some non-residential uses require location in the Rural Area (Policy R-324), either because they directly serve rural residents or because of their intrinsic nature. The CHRLF, because it is intrinsically a land-extensive use, requires location in the Rural Area designation of King County. Sufficiently large parcels of land are not available in non-rural areas of the County.

King County Zoning

All the action alternatives include placing support facilities either within the 1,000-foot buffer on the north or south side of the landfill or to a site in Renton (impacts discussed below). Placing support facilities within the landfill buffer may require a Special Use Permit from the King County Department of Local Services, Permitting Division and approval from the King County Council that would replace the existing 1960 Special Permit under which the landfill has been operating. Under Alternative 3, land adjacent to the current northeast corner of the landfill would be added to the landfill property. The addition of property would require either a modification to the legal description of the landfill property in the 1960 Special Permit or a new Special Use Permit to replace the existing 1960 Special Permit.

As described previously in this chapter, Special Use Permits can only be approved if specific criteria are met. The discussion below addresses the alternatives and their level of consistency with the Special Use Permit decision criteria.

The characteristics of the special use will not be unreasonably incompatible with the types of uses permitted in surrounding areas.

Compatibility of the CHRLF with surrounding, primarily residential, areas is determined by the nature and extent of impacts from the CHRLF. Impacts associated with noise, air and odor, surface and ground water, visual quality, and traffic have the potential for creating incompatibility. This EIS addresses these potential impacts and concludes that if the County designs, constructs, and operates the CHRLF as proposed and incorporates recommended mitigation, potential impacts associated with noise, air and odor, surface and ground water, visual quality, and traffic would not be significant. Based on this, the characteristics of the CHRLF under any of the alternatives would not be unreasonably incompatible with uses in areas surrounding the landfill.

The special use will not materially endanger the health, safety and welfare of the community.

As discussed under the previous criterion, with implementation of recommended mitigation, impacts associated with noise, air and odor, surface and ground water, visual quality, and traffic would not be significant. In addition, the discussion of potential human health impacts in this EIS concludes that significant health impacts would not occur. Based on this, further development of the CHRLF under any of the alternatives would not materially endanger the surrounding community's health, safety, and welfare.

The special use is such that pedestrian and vehicular traffic associated with the use will not be hazardous or conflict with existing and anticipated traffic in the neighborhood.

As discussed under criteria above, this EIS addresses impacts associated with vehicular traffic (there would be minimal pedestrian traffic associated with the CHRLF) generated by landfill construction and operations, and it concludes that safety and congestion impacts would be minimal or could be mitigated to make impacts not significant under any of the alternatives. Based on this, pedestrian and vehicular traffic associated with the CHRLF under any of the alternatives would not be hazardous or conflict with existing or anticipated traffic in areas surrounding the landfill.

The special use will be supported by adequate public facilities or services and will not adversely affect public services to the surrounding area or conditions can be established to mitigate adverse impacts.

The CHRLF is supported by public wastewater, solid waste, fire, emergency, and police services, and water, electrical, and telecommunication utilities. Leachate generated by waste decomposition is collected, given preliminary treatment, and conveyed to the King County wastewater system for final treatment and discharge. The wastewater system has adequate capacity to handle the landfill's leachate under any of the alternatives. The CHRLF's demand for solid waste, fire, emergency, and police services is minimal, and these services would not be adversely affected by the proposed alternatives.

The location, size and height of buildings, structures, walls and fences, and screening vegetation for the special use shall not hinder or discourage the appropriate development or use of neighboring properties.

Since the landfill began operation more than 50 years ago, residential communities have developed in surrounding areas, and the size and height of the landfill has not hindered development or use of neighboring properties in the past. The visual quality assessment conducted for this EIS concludes that visual impacts of expanding the landfilled area vertically and constructing associated structures would not be significant. Therefore, the size and height of structures and screening vegetation should not hinder further development or use of neighboring properties.

The special use is not in conflict with the policies of the Comprehensive Plan or the basic purposes of this title.

The consistency of the proposal with King County's comprehensive plan is discussed earlier in this chapter. That discussion concludes that all alternatives are consistent with relevant comprehensive plan policies.

The purposes of the King County zoning code (KCC 21A) are described previously in this chapter. In general, the purposes are to encourage land use decisions that are in the public interest and in accord with state laws, to protect the public health, safety, and welfare, to assure compatibility among land uses, to implement the County's comprehensive plan, and to provide adequate public facilities and services. These purposes are mostly addressed under the other Special Use Permit criteria above. In addition, the proposed design and operation of the CHRLF is consistent with relevant state laws described in Chapter 1.

Support Facility Options

South and North Options

Land use, housing, recreation, and cultural resource impacts for these options at CHRLF are included in the discussion of impacts associated with the landfill development alternatives above.

Renton Site Option

The proposed support facilities would be consistent with zoning on the Renton site and could meet the decision criteria for conditional use permits contained in the Renton Municipal Code.

Locating landfill support facilities at the Renton site would not displace any existing housing units. Due to the lack of recreation facilities and activities in the vicinity of the site, locating landfill support facilities at the Renton site would have minimal recreation impacts. Due to the low probability of the presence of archaeological resources or traditional cultural properties, locating landfill support facilities at the Renton site is unlikely to impact historic and cultural resources.

11.2.1.3 Indirect Impacts

Development of the CHRLF would not result in changes in land use at the site and is unlikely to result in changes in land use or land use patterns in the surrounding area. Locating support facilities at the Renton site would not result in a change in land use patterns at the site or in the surrounding area.

As discussed in Section 1.7, in order to compare the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046–the estimated year of capacity for Action Alternative 3. The impacts that would occur during these intervening years would not occur but for the proposed action selected and are therefore indirect effects.

For the No Action Alternative between 2028 and 2046, waste disposal could involve either waste export to a regional landfill or disposal at a waste-to-energy (WTE) facility (which could be at the CHRLF site or another site). A regional landfill accepting waste from the County is likely to be an existing facility, so any land use impacts associated with that landfill would not result from the County's waste export. Waste export may require development of an intermodal facility that could have land use impacts, although such a facility is likely to be located in an industrial area where land use compatibility impacts are unlikely and where the facility would be consistent with applicable land use policies and regulations. A WTE facility, located at a site in the county, could result in land use impacts, with the extent of impacts highly dependent on the specific facility location and design. The County's siting process to determine a location for a major facility such as an intermodal facility or a WTE would favor land use compatibility and consistency with applicable land use policies and regulations.

For Alternatives 1 and 2, potential indirect land use impacts that could occur after closure in 2038 and 2039, respectively, would be similar to those described for the No Action Alternative. A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the Solid Waste Comp Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

Based on the above, indirect impacts relating to land use are unlikely.

11.2.2 Cumulative Impacts

Other foreseeable actions in the area of the landfill, such as additional residential development, would be expected to be compatible with surrounding land uses and consistent with applicable land use policies and regulations. Foreseeable actions in the vicinity of the Renton site, such as additional institutional, commercial, industrial, or residential development, would be expected to be compatible with surrounding land uses and consistent with applicable land use policies and regulations. Under any of the alternatives, cumulative land use impacts are unlikely.

11.3 Mitigation Measures

No measures are necessary to address potential CHRLF impacts on land use compatibility or land use policy and regulatory consistency other than those described in other chapters for potential impacts related to traffic, noise, air quality and odor, surface and ground water, and visual quality and light and glare. Impacts at the CHRLF site on housing, recreation, and historic and cultural resources are unlikely, and no mitigation measures are needed.

Although the likelihood of impacting cultural resources is low at the Renton site, if that site is selected for support facilities, an onsite cultural resources investigation would be conducted before any ground disturbance in conjunction with appropriate coordination with state and local cultural resource agencies. If artifacts or other cultural resources are encountered during construction, onsite work would be stopped, and appropriate state and local cultural resource agencies contacted to determine proper handling of the resource before construction is resumed. Similar investigation and coordination would occur prior to any construction at the CHLRF that would take place in areas not previously disturbed by grading or construction.

11.4 Significant Unavoidable Adverse Impacts

With implementation of mitigation for potential impacts related to traffic, noise, air quality and odor, surface and ground water, and visual quality and light and glare, further development of the CHRLF under any of the alternatives would be consistent with King County land use policies and zoning regulations. All of the alternatives are unlikely to result in significant unavoidable adverse impacts to land use or cultural resources.

12.0 AESTHETICS, LIGHT AND GLARE

This chapter describes how implementation of any of the action alternatives, including the facility relocation options, could affect aesthetics, light and glare in the vicinity of the CHRLF and the Renton site, compared to the No Action Alternative. This discussion is based on two reports: Scenic Resources, Aesthetics, Light and Glare Technical Memorandum (KCSWD 2017c) and Visual Quality and Aesthetics Supplemental Technical Memorandum (KCSWD 2020b). These reports are Appendix H and Appendix I, respectively, and can be consulted by the reader for more detail regarding aesthetics, light and glare effects.

This environmental review determined that with continuation of mitigation described below, significant unavoidable adverse impacts to aesthetics, light and glare are unlikely in the vicinity of CHRLF or the Renton site during construction or operation of any of the alternatives, including the facility relocation options.

12.1 Affected Environment

The analyses described within the two technical reports included the following steps:

- Define study area.
- Determine viewshed.
- Identify and evaluate potentially sensitive viewers and viewpoints.
- Prepare visual simulations to describe visual changes introduced by landfill construction and operation.
- Assess visual impacts from potentially sensitive viewpoints.
- Recommend mitigation measures.

The study area defined in the two reports is the area within a three-mile distance of the center of the landfill.

The 14 key viewpoints used in evaluating visual impacts for the 2010 Cedar Hills EIS (King County 2010a) were assessed and found to be appropriate to analyze visual impacts resulting from the currently proposed alternatives. Those viewpoints were selected by the following methods:

- Identifying residences and roads that may provide a view of the landfill.
- Determining whether:
    - the view is typical of the project area,
    - is a public location with sensitive viewers nearby and,
    - can be seen by major viewer groups.
- Determining whether the view represents moderate to high changes to visual quality or character of scenic views.
- Determining that a substantial portion of the CHRLF is visible from the viewpoint.

Of the original 14 viewpoints, Viewpoint #9 was eliminated from the current analysis because it is located close to and is very similar to Viewpoint #8. Figure 10 in Appendix H maps the 13 viewpoints selected for analysis.

In gauging the magnitude of impacts, the analyses described in Appendix H and Appendix I used the following standards:

- A significant aesthetic impact is one that diminishes the public enjoyment and appreciation of a significant visual resource (or that impairs the character or quality of such a place).
- Mere visibility or detectability is not an adverse impact.

Tools and terminology used in the analysis are described in Appendix H.

12.1.1 Cedar Hills

The CHRLF is located in the foothills of the Cascade Mountain Range. The complex and diverse topography of the area includes deep valleys, steep-sided peaks, plateaus, and rolling hills. Major topographic features in the vicinity include Squak Mountain to the north, Tiger Mountain to the northeast, and the Cedar River Valley to the south. Much of the area is covered with mature second-growth conifer forest.

A variety of land uses are found in the vicinity of the landfill. Industrial facilities, including gravel mining and organic waste composting, operate south of the site. Residential development generally surrounds the landfill on the west, north, and east, including single-family subdivisions, large lot properties, and small farms. The character of the residential subdivisions generally falls into one of three categories: 1) subdivisions in open, formerly agricultural valleys, such as in May Valley; 2) subdivisions in forested areas such as Mirrormont to the east of the CHRLF and Maple Hills to the west, where the tree cover has been either maintained or re-established, and 3) subdivisions on slopes where trees have been removed to open views to Mount Rainier or other scenic features.

While there are a few neighborhood businesses and convenience stores in the vicinity, there are no large commercial or retail developments.

CHRLF is visible from surrounding areas; however, most potential views of the landfill are obscured by topography, existing offsite vegetation, and the vegetated 1,000-foot-wide buffer surrounding the landfill. A large portion of the landfill can be clearly seen from two locations: 1) from a residential area approximately one mile to the east, and 2) from an industrial area to the south. Other views of the landfill are partial or screened views through vegetation or views in which the landfill summit appears in the distance as a grass-covered ridge line rising just above the trees, or where active landfill operations are occurring, views may also include earthmoving equipment and soil. Some individual residents may have clearer views of the landfill from their properties. Many residences are on higher ground than the CHRLF, but views from hillside homes tend to be screened by the tree canopy from late spring to late fall when the deciduous trees are fully leafed-out.

The following two tables provide information about the specific viewpoints analyzed in the visual reports contained in Appendices H and I

Table 12-1. Viewpoints Surrounding the Landfill.

Viewpoint	Location	Distance and direction from landfill center in miles	Elevation in feet
#1	207th Ave SE	2.5 NNW of landfill center	1,166
#2	SE 127th St and 202 Pl SE	1.9 NW of landfill center	579
#3	250th Pl SE and SE Mirrormont Pl	2.0 E of landfill center	803
#4	Issaquah-Hobart Rd SE and Cedar Grove Rd SE	1.3 ENE of landfill center	358
#5	SE Lake Francis Rd	1.6 S of landfill center	454
#6	SE 159th St between 205th and 209th Aves SE	0.8 W of landfill center	571
#7	209th Ave SE	0.7 WNW of landfill center	593
#8	SE 152nd St and 204th Ave SE	0.9 W of landfill center	664
#10	SE May Valley Rd between 218th and 208th Aves SE	1.3 NW of landfill center	357
#11	195th Pl SE, N of SE 176th St	1.7 SW of landfill center	602
#12	SE 174th Way and 187th Pl SE	2.2 WSW of landfill center	642
#13	SE 147th Pl	1.5 ENE of landfill center	526
#14	SE 147th Pl	1.5 ENE of landfill center	602

Table 12-2. Visual Characteristics of Viewpoints Surrounding the Landfill.

Viewpoint	Primary Viewer Group	Viewer Sensitivity	Visual Characteristics of View
#1	Residents	Low	Average Vividness, Unity, and Intactness
#2	Residents, Motorists	Low	Average Vividness, Unity, and Intactness
#3	Residents	Low	Low Vividness; Average Unity and Intactness
#4	Motorists	Low	Low Vividness and Unity; Average Intactness
#5	Motorists	Low	Low Vividness, Unity, and Intactness
#6	Residents	Low	Average Vividness, Unity, and Intactness
#7	Residents, Motorists	Low	Average Vividness, Unity, and Intactness
#8	Residents, Motorists	Low	Low Vividness; Average Unity and Intactness
#10	Residents, Motorists	Low	Average Vividness, Unity, and Intactness
#11	Residents, Motorists	Low	Low Vividness, Unity, and Intactness
#12	Residents, Motorists	High	Average Vividness, Unity, and Intactness
#13	Motorists	Low	Average Vividness and Intactness; Low Unity
#14	Residents	High	Average Vividness, Unity, and Intactness

Note: More detail regarding terms described below can be found in Appendix H.

Vividness: The degree of memorability or distinctiveness of the landscape components.

Intactness: The presence of or freedom from encroaching elements that disrupt a natural or otherwise cohesive condition.

Unity: The degree of visual coherence and compositional harmony of the landscape view considered as a whole.

Viewer groups with views of the landfill and that are therefore potentially impacted by visual changes under the proposal include residents, people engaged in recreation or visiting the area, employees and clients of businesses, cyclists, pedestrians, and motorists. Residents are among the most sensitive viewers to visual quality change. This is because of the large amount of time they spend at the viewpoint, their familiarity with the view, and their sense of ownership. People travelling on area roads can have varying degrees of sensitivity. Motorists who frequently and/or regularly travel the roads around the landfill can become desensitized to their surroundings because of their familiarity. Occupants of motor vehicles. especially drivers, typically have only a fleeting awareness of their surroundings. These factors combine to result in an overall lower visual sensitivity for motorists. Visual sensitivity is generally higher, however, for people who are travelling for pleasure, such as tourists or people traveling to recreation areas.

12.1.2 Renton Site

The Renton site is located at the interface between a high-density single-family residential area to the west of the site and an industrial/commercial area to the north, east, and south of the site. All views toward the site from offsite locations are dominated by human-made structural forms ranging in size from single-family houses and accessory structures to larger non-residential structures. The area currently has a comparatively high level of light and glare.

Three viewpoints in the vicinity of the Renton site were evaluated:

RR Viewpoint #1. This viewpoint is approximately one-quarter mile southwest of the Renton site and is located on a two-lane road with sidewalk. This viewpoint is approximately 50 feet below the elevation of the proposed site and the homes within the Liberty Ridge development are approximately 85 feet below the site in elevation. The self-storage buildings immediately adjacent to the proposed project site are approximately the same mass and size as the proposed buildings.

RR Viewpoint #2. This viewpoint is located on NE 3rd Street between Downtown Renton, I-405, and the East Renton Highlands. This busy arterial is a major transportation route for commuters, commercial traffic, and students attending the neighboring Renton Technical College. The average daily traffic at this viewpoint is approximately 33,000 vehicles.

RR Viewpoint #3. This viewpoint is situated on Jefferson Avenue NE. This road serves the King County Renton Recycling and Transfer Station, King County Roads Maintenance Facilities, City of Renton Public Works Department, and a borrow pit. It is approximately 680 feet from the proposed Administration Building site and there is no appreciable elevation difference between the viewpoint and the site. The primary viewers are commuters, haulers, and transfer station customers.

12.2 Environmental Impacts

12.2.1 Direct and Indirect Impacts

12.2.1.1 No Action Alternative

Under the No Action Alternative, landfill development would continue through Area 8, and the maximum elevation of the landfill would be 788 feet. Support facilities may be removed, refurbished, or replaced. The landfill would increase in bulk primarily at the south end where development of Area 8 will occur, but, as described in the 2010 FEIS, visual and light and glare impacts would not be significant.

Under the No Action Alternative, support facilities may be moved to occupy existing buildings at an interim offsite location. An interim location has been identified in the City of Renton at an industrial location, but as existing buildings would be occupied at this offsite location, visual effects would be minimal and aesthetic and light and glare impacts would be unlikely to occur.

12.2.1.2 Action Alternatives

Landfill Development

Under any of the action alternatives, views from offsite locations having views of the landfill would change due to an increase in the bulk and height of portions of the landfill. The extent of visual change would generally be least in Alternative 1, under which visual change would occur primarily in the southern end of the landfill where Area 9 would be developed and Area 8 and Area 9 would extend up to 800 feet. Visual change would be greatest under Alternative 3, under which Areas 8, 9, portions of 2/3 and 4, and portions of the Main Hill and Central Pit would all extend up to 830 feet.

The visual analyses contained in Appendices H and I assessed visual effects at specific viewpoints. Appendices H and I contain figures showing visual simulations at the various viewpoints and also contain detailed discussion of visual impacts that would be experienced under the action alternatives. Table 12.3 below summarizes those visual impacts.

Table 12-3. Visual Effects at Viewpoints Surrounding Landfill by Alternative.

Viewpoint	Visual Effects
#1	The visual changes would be limited to the visible northwestern face and summit of the landfill. The proposed additional vertical fill in Area 4 in Alternatives 1 and 2 and in Area 2/3 in Alternative 3 would be slightly more obvious when compared with surrounding landforms because of the flat-topped, manufactured shape of the landfill. The proposed additional vertical fill may block some of the distant horizon. This is considered a less than significant impact due to the relatively minor decrease in the available viewshed, which is already obstructed by existing vegetation and the current landfill. The existing view of Mount Rainier, 50 miles to the south, will be unobstructed by the proposed vertical addition to the landfill. The North Landfill Support Facilities in Option 2 would not be visible from this viewpoint and it is unlikely that the support facilities would be visible to other residents on the southwest side of Squak Mountain due to obstruction by existing vegetation in the intervening 2.5 miles.
#2	Distant views of landfill operations from Viewpoint #2 are generally obscured by existing landforms and vegetation. Residents and motorists have a partial view of the landfill's northwestern face and summit. Viewers may see some soil surcharging activity and an increase in landfill bulk in Areas 2/3, 4, and 5 under Alternatives 2 and 3. The proposed additional vertical fill in these alternatives would be obvious because of the flat-topped, manufactured shape of the landfill. The proposed additional vertical fill may block some of the distant horizon. This is considered a less than significant impact due to the relatively minor decrease in the available viewshed, which is already obstructed by existing vegetation and the current landfill. The existing view of Mount Rainier, 50 miles to the south, will be unobstructed by the proposed vertical addition to the landfill. The North Landfill Support Facilities in Option 2 would not be visible from this viewpoint.
#3	When the landfill is visible from individual residences in the Mirrormont community, they may be able to see landfill operations in portions of the landfill where the projected elevation would rise to 830 feet in Alternatives 2 and 3. At 2.0 miles away, these visual changes would be softened by distance and atmospheric conditions. The access roads and active landfill areas would be less prominent, and equipment would be difficult to discern.
#4	There will be no changes in views of the landfill under Alternative 1. Under Alternative 2 the top of the southern end of the landfill would rise from its current elevation to a projected elevation of 830 feet. Under Alternative 3, the ridgeline would rise from its current elevation of 765 feet to a projected elevation of 830 feet. From this viewpoint, this would appear as a barely visible grass-covered ridgeline and would still be largely camouflaged by the perimeter buffer. Existing vegetation in the foreground and landforms in the middle ground would continue to obstruct views of the landfill from this viewpoint.
#5	Landfilling operations and earth-moving equipment would be visible in Area 6, where proposed elevations would reach 788' under the action alternatives. None of the alternatives would substantially degrade the existing visual character and the impact is less than significant due to the relatively minor decrease in the available viewshed, which is already obstructed by existing vegetation and the current landfill. While the landfill operations and earth-moving equipment would be visible, they would be softened by distance and atmospheric conditions. Upon completion of the landfill operations, a grass vegetative cover would dominate the view. In Option 1 under each alternative, the buffer would allow new landfill facilities. Existing vegetation and landforms in the middle ground completely obscure views of the South Landfill Facilities.
#6	The perimeter buffer existing vegetation in the foreground effectively obstructs most views to the landfill, although visibility of the landfill increases during the winter months when leaves are off the trees. None of the action alternatives would substantially degrade the existing visual character.
#7	The perimeter buffer existing vegetation in the foreground effectively obstructs most views to the landfill, although visibility of the landfill increases during the winter months when leaves are off the trees. None of the action alternatives would substantially degrade the existing visual character.
#8	The perimeter buffer vegetation in the foreground effectively obstructs most views to the landfill, although visibility of the landfill increases during the winter months when leaves are off the trees. None of the action alternatives would substantially degrade the visual character.

Table 12-3 (continued). Visual Effects at Viewpoints Surrounding Landfill by Alternative.

Viewpoint	Visual Effects
#10	Filling activity and possible increase in landfill bulk in Areas 2/3 and 4 in Alternative 3 may be apparent along May Valley Road. Because of the middle ground vegetation, the landfill would continue to appear as a grass-vegetated ridgeline in the distance. The increase in height would largely be obscured by the perimeter buffer. The proposed North Landfill Support Facilities in Option 2 would not be visible from this viewpoint.
#11	Unless the roadside vegetation is removed along 195th Place SE, motorists would likely be unaware of any visual changes at the landfill under any of the alternatives. None of the alternatives would substantially degrade the existing visual character.
#12	Residents are the primary viewers and while the view to the landfill would be dominated by landfill operations, including visible earth-moving equipment, it would not be substantially different from what is currently viewed. The appearance of these activities is softened by distance (greater than 2 miles) and atmospheric conditions. Because the landfill is an existing facility, it has become an established part of the landscape. None of the alternatives would substantially degrade the existing visual character and the impact is less than significant due to the relatively minor decrease in the available viewshed, which is already obstructed by topographic effects, neighborhood features, and the current landfill.
#13	Under Alternative 3, landfill development in the extreme northeast corner would both encroach on the existing perimeter buffer and increase the apparent bulk of the landfill. Under Alternative 3, the grass-covered ridgeline would be more visible above the visual tree line comprising the perimeter buffer. During landfill operations, construction of the increased landfill capacity in the Northeast corner, soil surcharging activity, soil-covered ridgeline, and earth-moving equipment would be visible. Their appearance would be temporary and softened by distance and atmospheric conditions. The fill area contrasts with the surrounding area because of the current soil cover and grass vegetative cover. It is also identifiable by the horizontal line of the flat top of the landfill. The proposed vertical and horizontal expansion would encroach on the horizon line; however, this is considered a less than significant impact due to the relatively minor decrease in the available viewshed, which is already obstructed by the vegetation and the current landfill.
#14	The visual effects from this viewpoint are the same as described for Viewpoint #13, with the exception that the cone of vision along the sightline is broader and affords a more expansive view of the landfill from north to south.

Support Facilities Options

South and North Options

Overall, visual impacts and light and glare impacts under any of the action alternatives with support facilities either in the north or south would not be significant. Visual impacts from many viewpoints are not significant because of either distance and/or the elevation of the viewpoint precluding either regional views that might be disrupted and/or precluding views of the landfill itself.

However, the overall conclusion of a lack of significant visual impacts under the three action alternatives, whether support facilities are in the north or south, depends on the County maintaining the integrity of the perimeter buffer's visual screening and employing other visual mitigation measures. The mitigation section below lists specific steps that the County could take to maintain and enhance the buffer's effectiveness at visually screening the landfill and its operations from adjacent properties and other measures that the County should continue to implement.

Renton Site Option

RR Viewpoint #1. The construction of the Administration and Maintenance Buildings would add two more rooflines among the myriad of rooflines surrounding the site. The profile of the Administration Building would be approximately 26 feet above the site elevation. There may be intermittent views of the Administration Building from Edmonds Avenue, but from the viewpoint, the line of sight to the Administration building would be obscured by the buildings in the Self-Storage complex. Views of the Maintenance Building, also 26 feet above site elevation, would be less visible from RR VP #1 because of its proposed siting 100 feet east of the west property line. The visible noise walls from this viewpoint would also be about 25 feet above the site elevation.

Multiple walls would be constructed to reduce the impacts associated with noise and for retaining soil. The final design, including heights, materials, and type of barrier would be determined during the final design and when the locations of noise sources relative to impacted residences are finalized. To minimize visual impacts, aesthetic considerations would include constructing with material that would soften the verticality of the wall face by providing visual texture and reducing the amount of smooth surface that can reflect light. Earth-toned colors for the wall surface would be less distracting to viewers and would help the wall blend with planted vegetation as it matures. In general, very light buff/tan, brown, or gray colors stand out more than darker colors such as deep browns, deep red-browns, and deep warm grays. These darker colors would complement the surrounding vegetation. A landscaped buffer consisting of evergreen and deciduous trees along the site perimeter and immediately adjacent to the walls would partially obscure their presence. Views into the site would diminish as plantings in the landscaped buffer mature.

The introduction of nighttime lighting on the site where all such lighting is currently absent will blend with the smattering of lights from commercial signs, streetlights, and passing vehicles. Onsite lighting would largely be obstructed by topography, existing structures, and vegetation. Any nighttime lighting would be directed down and away from any potentially sensitive receptors such as residences.

Shadows and shading would not affect offsite properties on the north, west, and south sides of the project site due to topographic relief. Afternoon shadows may shade the entrance/exit road to the existing transfer station and is not considered an impact.

Construction impacts: The presence of construction equipment would result in temporary construction impacts by altering the composition of the view available from and to the project site. Residents would have construction occurring in close proximity to them; however, residents would not have views of the construction activities because nearby homes are significantly downslope from the project site. During construction, the contractor would minimize project-related light and glare to the maximum extent feasible given safety considerations. Portable lights would be operated at the lowest allowable wattage and at a height no greater than 20 feet. All lights would be screened and directed downward toward work activities and away from the night sky.

RR Viewpoint #2. The visual effects from Viewpoint #2 are essentially the same as described for Viewpoint #1 above.

RR Viewpoint #3. This viewpoint is about 680 feet from the proposed Administration Building site and there is no appreciable elevation difference between the viewpoint and the site. The absence of mature native vegetation would be apparent at the building site. Visible from this viewpoint would be: the Administration Building, which would sit approximately 26 feet above the current elevation; a parking lot for privately-owned vehicles along the north side of the site; and the proposed noise wall, located approximately 200 feet south of the north property line. Proposed landscaping consisting of evergreen and deciduous trees along the entire north perimeter of the site will eventually create a visual buffer between the viewpoint and the site. As previously discussed with regard to Viewpoint #1, aesthetic considerations would include designing and constructing the buildings and walls with materials and textures that introduce horizontal patterns and would soften the verticality of the structures. Color and texture would also be selected to eliminate reflective surfaces, and thereby reduce glare. New plantings would improve aesthetics of the proposed project and provide visual screening. As these plantings continue to mature, they would increasingly obstruct views into the site. Nighttime lighting and construction effects are as previously discussed.

In summary, support facilities at the Renton site would be similar in bulk and character to existing development in the area. No significant regional views would be blocked or substantially altered. Overall, changes to the visual character of the area and increases to light and glare would be minimal, and aesthetic impacts would be insignificant.

12.2.1.3 Indirect Impacts

The limited aesthetic, light and glare impacts from the landfill development and facility relocation construction and operation at CHRLF and the facility relocation construction and operation at the Renton site are unlikely to lead to additional projects or actions that would result in indirect aesthetic, light and glare impacts.

As discussed in Section 1.7, in order to compare the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046–the estimated year of capacity for Action Alternative 3. The impacts that would occur during these intervening years would not occur without implementation of the proposed action selected and are therefore indirect effects. Direct impacts of the action alternatives are discussed above in Section 12.2.1. For the No Action Alternative between 2028 and 2046, waste disposal could involve either waste export to a regional landfill or disposal at a WTE facility (which could be at the CHRLF site or another site). A regional landfill accepting waste from the County is likely to be an existing facility, so additional aesthetic impacts from that landfill would be unlikely to result from the County’s waste export. Waste export could require development of an intermodal facility that could have aesthetic impacts, although such a facility is likely to be located in an industrial area where any aesthetic impacts would probably be minor. A WTE facility located at a site in the county could result in aesthetic impacts that would be highly dependent on the specific facility location and design.

For Alternative 1, potential indirect aesthetic impacts described for the No Action Alternative could also occur after CHRLF closure in 2038. Similarly, for Alternative 2, potential indirect aesthetic impacts described for the No Action Alternative could also occur after CHRLF closure in 2039. A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the 2019 Solid Waste Comp Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

12.2.2 Cumulative Impacts

The area surrounding the landfill is occupied predominantly by low- to moderate-density residential land uses. Aesthetic and light and glare impacts from that existing development are limited, and aesthetic and light and glare impacts from future development in that surrounding area are likely to be minimal. These impacts, coupled with the proposal's impacts described above, would not result in significant cumulative aesthetic or light and glare impacts.

Support facilities development at the Renton site would be similar in bulk and character to existing development in the area, and aesthetic and light and glare impacts from future development in that surrounding area are likely to be minimal. These impacts, coupled with the proposal's impacts described above, would not result in significant cumulative aesthetic or light and glare impacts.

12.3 Mitigation Measures

Landfill Development. While no specific, significant visual impacts are anticipated as a result of the action alternatives, it is important to maintain mitigation efforts currently in place to preclude unforeseen compromises in visual quality. Mitigation efforts should include:

- Screening.
  - Vegetation in the perimeter buffer should be maintained to the extent possible, particularly along the roadways immediately adjacent to the landfill property.
  - Where practical, existing vegetation should be infilled with young trees and shrubs to ensure continuity of screening over time as some of the older vegetation begins to decline.
  - Where uses in the buffer occur, infilling with young trees and shrubs should occur, especially concentrated in the buffer closest to those uses, to provide enhanced screening.
  - The buffer along the west edge of the landfill, which is largely comprised of deciduous trees, is currently planned by SWD to be infilled in 2022-2023 with evergreen trees to strengthen visual screening during winter months.
  - Where practical, plant native, fast-growing evergreen trees along the interface of the buffer and the landfill to maximize the benefit derived from vegetative screening over the longer term.
- Use motion- and/or user-controlled light systems to minimize the amount of nighttime artificial lighting where practicable and safe.

- Use neutral colors for non-safety-related structures and equipment to reduce the visual impact of bright colors.
- Use non-reflecting materials and finishes to reduce glare where practical.
- Continue to use typical landfill covers such as seeding or alternative covers compliant with WAC 173-351-100.
- Continue to use uniform design grades, colors, and heights across the landfill site. At the conclusion of operations, consider manipulating design grades to conform with surrounding natural terrain.
- Do not place any advertising structures on the landfill.
- If solar panels are proposed for placement at the landfill, the panels should be configured to not rotate toward nearby residential areas east or west of the landfill. Panels, which would primarily face south, would be tilted at an angle (minimum 20 degrees up from horizontal) that would avoid glare impacts on residential properties that are located in that direction.

Renton Site Option. While no specific significant visual impacts resulting from the proposed development under Option 3a at the Renton site have been identified, it is important to institute mitigation efforts to preclude unforeseen compromises in visual quality. These mitigation measures would include:

- Incorporate Best Management Practices to avoid or minimize environmental impacts during construction and operations.
- Establish landscaping comprised of evergreen and deciduous trees and shrubs around the perimeter of the site. The minimum width of the perimeter landscaping would be five feet. To maximize the visual impact of the landscape in the narrow-width planting beds, a variety of tree species, shrubs, and vines would be planted in clusters to begin to simulate a more naturalistic landscape instead of a hedgerow of trees. At initial planting, trees would also be specified with variable sizes and seasonal color would be considered.
- Install wire grid panels randomly along walls. Planted vines on these wire grids would eventually climb and disrupt the visual continuity along the wall.
- Utilize materials and textures on vertical surfaces to soften the verticality of wall faces and reduce the amount of smooth surface that can reflect light and cause glare.
- Use earth-toned colors to complement the general surrounding area.
- Direct nighttime lighting down and away from any potentially sensitive receptors.
- Minimize fugitive light and glare during construction. Screen lights and direct lighting toward work activities to the maximum extent possible.

12.4 Significant Unavoidable Adverse Impacts

With continuation of the mitigation described above, all of the alternatives are unlikely to result in significant unavoidable adverse impacts to aesthetics and light and glare.

13.0 TRANSPORTATION

This chapter describes how the implementation of any of the action alternatives could affect traffic in the vicinity of the CHRLF and the Renton site, compared to the No Action Alternative.

The analysis focuses on traffic conditions during the weekday AM, Midday, and PM peak hours at four horizon years for each alternative:

- Existing – Representing the current 2020 affected environment
- Opening Year – Representing an approximate year 2025 when the landfill capacity expansion would begin, and the support facilities would be relocated
- Design Year – Representing 2040 consistent with the surrounding jurisdictions' long-term planning horizon
- Capacity Year – Representing the year each action alternative reaches capacity

Additional detail concerning methods, assumptions, and traffic impact analysis results can be found in the Transportation Discipline Report, Cedar Hills Regional Landfill 2020 Site Development Plan, Appendix J.

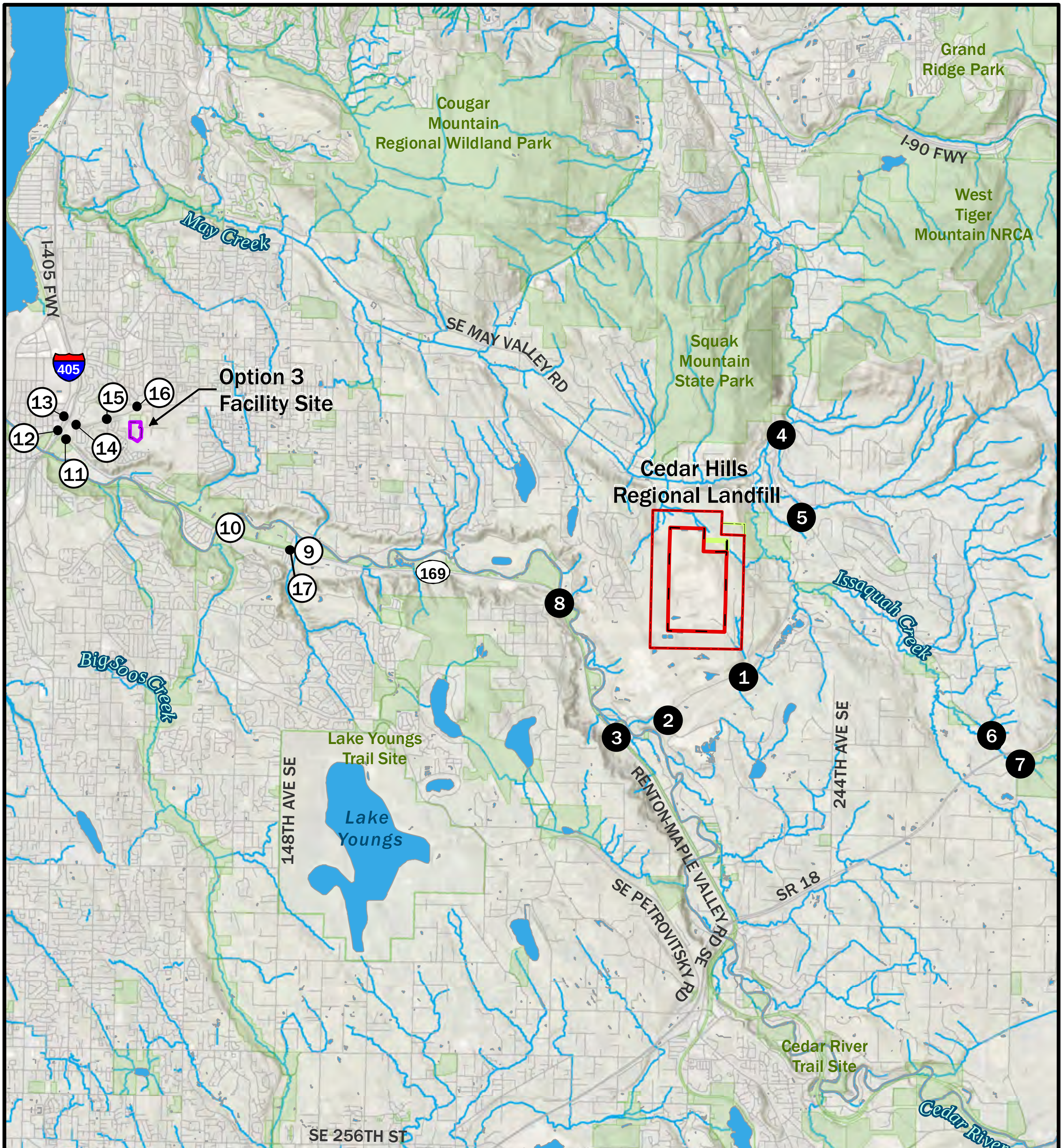
The environmental review determined that with the mitigation identified, no significant unavoidable adverse impacts to traffic in the vicinity of CHRLF or the Renton site are anticipated to result from construction or operation of any of the alternatives, including the facility relocation options.

13.1 Affected Environment

This section describes existing conditions for the street system, traffic volumes, traffic operations, and traffic safety within the CHRLF site and Renton site study areas, including:

- Cedar Hills –The area surrounding the existing CHRLF evaluated for all alternatives and options.
- Renton site –The area surrounding the proposed Option 3 main support facilities relocation site at 3005 NE 4th Street near the Renton Recycling and Transfer Station.

The Cedar Hills and Renton site study areas are shown on Figure 13-1 including the key roads and intersections along the access routes to CHRLF and the Renton site. The analysis intersections are shown in Table 13-1.



Legend

- Renton Site Study Intersections
- Cedar Hills Study Intersections
- Renton Site Boundary
- Existing Landfill Property Line
- Existing 1000ft Buffer
- Proposed Landfill Property Line (ALT. 3)
- Proposed 1000ft Buffer (ALT 3.)
- Stream
- Road
- Waterbody
- Park

*AERIAL PHOTO 2019. LOT LINES ARE APPROXIMATE, NOT FOR LEGAL PROPERTY DELINEATION.

Figure 13-1. Study Areas and Study Intersections of Cedar Hills Regional Landfill and Renton Site.

N

0 3,750 7,500 15,000 Feet

King County

King County (2019)

K:\Projects\Y2014\14-05971-001\Project\Report\EIS\Chapter13\Figure13_1_StudyAreas_Intersect.mxd (2/14/2022)

Table 13-1. Summary of Study Area Intersections.

Cedar Hills		Renton Site[1]	
Study Intersection	Jurisdiction	Study Intersection	Jurisdiction
1. Cedar Grove Rd SE/228th Ave SE	King County	9. 154th Pl SE/SR 169/SE Renton MVH	Renton
2. Cedar Grove Rd SE/SE Lake Francis Rd	King County	10. 140th Way SE/SR 169/SE Renton MVH	Renton
3. SR 169/SE Renton Maple Valley Road/Cedar Grove Rd SE	WSDOT	11. I-405 NB Ramps/SR 169/SE Renton MVH	Renton
4. Issaquah Hobart Rd SE/SE May Valley Rd	King County	12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	Renton
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	King County	13. Sunset Blvd N/NE 3rd St	Renton
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	WSDOT	14. Monterey Dr NE/NE 3rd St	Renton
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	WSDOT	15. Edmonds Ave SE/NE 3rd St	Renton
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	WSDOT	16. Jefferson Ave NE/NE 3rd St/NE 4th St	Renton
		17. 149th Ave SE/SR 169/SE Renton MVH	Renton

Notes: WSDOT=Washington State Department of Transportation, NB = Northbound and SB = Southbound, MVH = Maple Valley Highway

[1] The Renton site study area intersections are not evaluated under facility relocation Options 1 and 2 because the Renton site is not impacted.

13.1.1 Street System Inventory

This section describes the street system in the Cedar Hills and Renton site vicinities, including the transit and non-motorized facilities. The design of the street system is reflective of the primary mode of travel in the study areas, which is by car or truck.

13.1.1.1 Cedar Hills

The roadway network that serves CHRLF includes county, local, and arterial roadways, and State Route 169/ Maple Valley Highway, which provides the main connection to the regional freeway system at Interstate 405 (I-405). State Route (SR) 169 from I-405 is the primary truck route for hauling waste from the transfer stations throughout King County to CHRLF. A secondary truck route for waste trucks is SR 169 from the south. All KCSWD trucks hauling solid waste travel to the landfill along Cedar Grove Road from SR 169.

Characteristics of the existing street system in the study area are shown in Table 3-1 of Appendix J. The Cedar Hills study area is rural, and no sidewalks or bicycle facilities are provided along the roadways; however, shoulders of approximately 6 feet or greater are provided along Cedar Grove Road SE between SR 169 and 228th Avenue SE and limited shoulders are provided along 228th Avenue SE. There are signalized pedestrian crossings on two legs of the SR-169/Cedar Grove Road SE intersection as well as across all legs of the Cedar Grove Road and SE May Valley Road intersections along Issaquah Hobart Road SE. In addition, the Cedar River trail is south of the CHRLF along SR-169 and provides over 15 miles of multi-use path from Renton to Maple Valley.

There are no funded transportation projects identified in the CHRLF study area that change the roadway system evaluated as part of the traffic operations analysis.

King County Metro Transit operates two routes in the study area. The nearest bus stop to the project is along SR 169 at Cedar Grove Road, approximately two miles southwest of the CHRLF.

13.1.1.2 Renton Site

Characteristics of the existing street system in the study area are shown in Table 3-3 of Appendix J. Sidewalks are provided along all arterials, collectors, and local roadways in the Renton study area. There are signalized crossings on at least one leg of all the study intersections. The Cedar River trail is approximately 1/3 of a mile south of the Bronson Way N/Sunset Boulevard N intersection and provides a multi-use path from Renton to Maple Valley, with over 15 miles of trail. Bicycle facilities in the study area are limited to on-street bicycle lanes along 140th Way SE.

The Renton Technical College (RTC) is located in the northeastern area of the Renton study area and generates pedestrian activity in the area, especially where students and employees access transit. Signalized crossings are provided across all legs of the Monroe Avenue NE/NE 4th Street intersection as well across the western and southern legs of the Jefferson Avenue NE/NE 4th Street intersection (the study intersection). A person at RTC walking between the campus north of NE 4th Street to the south side of NE 4th Street would need to cross one crosswalk if crossing at Monroe Avenue and four crosswalks if crossing at Jefferson Avenue. Due to the reduced number of crossings required, pedestrians traveling across NE 4th Street would likely choose to cross at Monroe Avenue rather than Jefferson Avenue. Monroe Avenue is also closer to the transit stops and the businesses on the south side of NE 4th Street near RTC and further from the Renton Transfer Station.

The study area is served by King County Metro Transit Route 105. The nearest bus stops to the potential Renton facilities site are approximately 1/2-mile northeast, at the NE 4th Street/Monroe Avenue NE intersection and just over a 1/2-mile west of the site along NE 3rd Street at Edmonds Avenue SE. Metro Transit Route 111 also stops at NE 4th Street/Monroe Avenue and at additional stops further east and northeast from the site.

The planned improvements identified in the vicinity of the Renton site (see Appendix J) include transit, non-motorized, freeway and roadway/intersection improvements. However, the roadway and intersection improvements identified along SR 169 between 152nd Avenue SE and I-405 and along NE 3rd Street/NE 4th Street between Sunset Boulevard N east to the Renton city limits are not fully funded.

13.1.2 Traffic Volumes

Traffic volumes represent the number and turning movements of vehicles using the roadways in the vicinity of CHRLF and the Renton site and include background traffic and trips generated by CHRLF operations (trip generation). Trips represent one-way travel, with each vehicle's arrival at a location counting as one trip and its departure as one trip. A vehicle passing through an intersection counts as one trip.

Existing traffic volumes and movements at the Cedar Hills and Renton Site study intersections and at the CHRLF are based on weekday AM (7 to 9 a.m.), midday (11 a.m. to 1 p.m.), and PM (4 to 6 p.m.) peak period traffic counts conducted at the study intersections. The weekday AM and PM peak periods studied were based on a review of hourly traffic counts at five locations within the study area. The review showed that the AM and PM periods selected for this study are representative of the peak hours where the traffic volumes are either the same or greater than the adjacent hours. The summary of the hourly traffic volume review is included in Appendix C of Appendix J.

Existing traffic volumes for the Renton site intersections are based on traffic counts collected between 2010 and 2019 and were provided by the City of Renton and WSDOT.

13.1.2.1 Cedar Hills

Weekday peak hour conditions are based on traffic counts conducted in January 2020 at the CHRLF access point as well as a traffic study conducted in 2017 for analysis of CHRLF development alternatives (King County 2017). The January 2020 counts were hourly traffic counts conducted at the CHRLF site access from January 5 to 11, 2020 and included traffic classifications to determine the types of vehicles (i.e., trucks versus passenger cars/vehicles).

Current trip generation at CHRLF is based on the existing CHRLF operations and KCSWD scale data for a 3-year period (2017-2019) and hourly traffic counts collected at the site access in January 2020. The existing trip generation at CHRLF includes:

- KCSWD waste transfer vehicles (to/from KCSWD recycling and transfer stations)
- Commercial direct haul to CHRLF which includes hauls of full waste trailers made by commercial haulers such as Waste Management, Republic, Waste Connections, and Recology.
- Other haul trips directly to CHRLF include all other trips not related to the commercial haulers. The other users are limited and may or may not have commercial accounts with King County. These include multiple vehicle types such as sedans, pick-up trucks, truck/trailer combinations, and commercial users such as landscape companies.
- Staff, including KCSWD employees, BEW staff, vendors, contractors, and other visitors.

Although none are included in the existing trip generation, operational trips include offsite soil import and export truck trips associated with operations and are included in Opening and Design Year forecasts (see Section 13.2.1.1).

CHRLF operates seven days a week from approximately 5 a.m. to 8 p.m., although there are staff on site at all times. The facility is generally closed to the public and waste collected from the public is delivered to the King County recycling and transfer station facilities. Tables 13-2 and 13-3 provide a summary of the existing daily and peak hour trip generation.

Table 13-2. Existing CHRLF Daily Trip Generation.				
User	Average Haul Trips Inbound[1]	Staff Trips		Total Trips
		Employees	Other	
Average Weekday				
KCSWD waste transfer trucks	126	-	-	*252*
Commercial direct haul	14	-	-	*28*
Other haul	5	-	-	*10*
Operational	0	*0*	*0*	*0*
Staff[2]	-	*193*	*68*	*522*
Total Trips	145	193	68	812
Existing Weekday Counts[3]				*800*
Saturday				
KCSWD waste transfer trucks	71	-	-	*142*
Commercial direct haul	0	-	-	*0*
Other haul	0	-	-	*0*
Operational	*0*	*0*	*0*	*0*
Staff	-	*36*	*13*	*98*
Total Trips	71	36	13	240
Existing Saturday Counts[3]				*312*
Sunday				
KCSWD Waste Transfer Trucks	54	-	-	*108*
Commercial Direct Haul	0	-	-	*0*
Other Haul	0	-	-	*0*
Operational	*0*	*0*	*0*	*0*
Staff	-	*36*	*13*	*98*
Total Trips	54	36	13	206
Existing Sunday Counts3				204
Weekly Total Trips				4,506
Existing Weekly Counts3				4,366

Notes:

1 Daily transactions based on 2017-2019 scale data for the CHRLF representing the one-way inbound trips.

2 Employee/visitor trips based on data provided by KCSWD.

3 January 2020 traffic counts (see Appendix C in the Transportation Discipline Report, Appendix J) are used to validate the calculated average trip generation based on the larger data set.

As shown in Table 13-2, there are approximately 800 weekday daily trips and less than 300 trips on Saturdays and Sundays. Weekday conditions are the focus of the traffic analysis because that is when CHRLF and the transportation system traffic volumes are highest.

Table 13-3. Existing CHRLF Weekday Peak Hour Trip Generation.

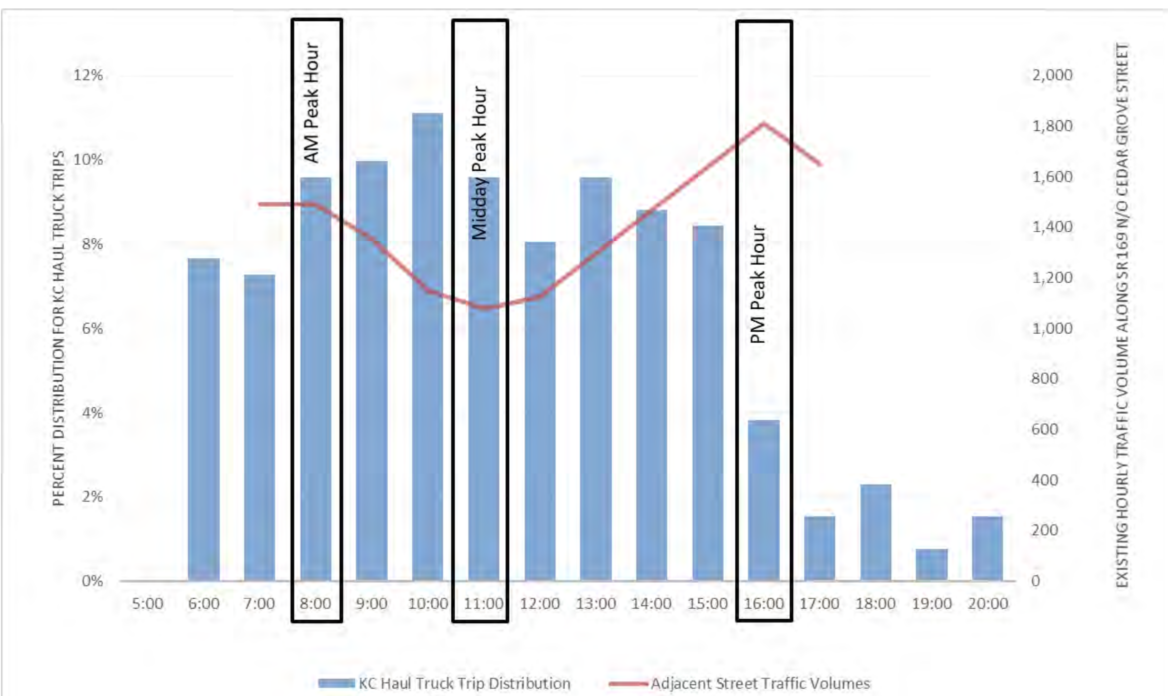
User	AM Peak Hour	Midday Peak Hour	PM Peak Hour
KCSWD waste transfer trucks[1]	24	24	10
Commercial direct haul[1]	2	5	0
Other haul[2]	1	1	0
Operational	0	0	0
Staff[2]	15	28	72
Total Trips	42	58	82

Notes:

[1] Time of day based on transaction scale data (2017-2019) for the CHRLF.

[2] January 2020 traffic counts (see Appendix C in the Transportation Discipline Report, Appendix J) in conjunction with the Cedar Hills scale data and review of vehicle classifications used to find time of day for staff trips.

The scale data for all haul-related transactions for a three-year period (2017-2019) indicate that trucks arrive after 8 a.m. or before 4 p.m. Figure 13-2 shows the weekday time of day distribution of KCSWD waste transfer vehicle trips arriving and leaving CHRLF, also plotted with the hourly volumes along SR 169 to provide a comparison of the low KCSWD truck volumes during the peak volume of the adjacent road. The peak hours for the analysis are also shown. On weekends, haul truck traffic is normally less than half of weekday traffic, with an average of one truck arriving before 7 a.m. or after 6 p.m.



N/O =North of

Figure 13-2. Weekday Time of Day Distribution of KCSWD Waste Transfer Vehicles Arriving at CHRLF with SR 169 Peak Volumes.

13.1.2.2 Renton Site

Existing weekday AM, Midday, and PM peak hour volumes are summarized on Figure 3-1, Figure 3-2, and Figure 3-3, respectively, in Appendix J.

For facility relocation Option 3, construction trips would occur for construction of facilities and parking areas sometime between 2023 and 2028. Construction traffic is related to import and export of material and construction soils, as well as bringing construction equipment to and from the site; for the evaluation of alternatives, it is accounted for separately and not as part of the base trip generation.

13.1.3 Traffic Operations

The operational characteristics of an intersection are based on a grading system called Level of Service (LOS). All LOS evaluations consider background traffic plus trip generation related to CHRLF operations projected to the horizon year being evaluated and distributed to study area intersections. Construction traffic impact on intersections is evaluated separately.

At signalized intersections, LOS is measured in average delay per vehicle and is typically reported using the intersection delay. At unsignalized side-street, stop-controlled intersections, LOS is measured by the average delay on the worst movement of the intersection. Traffic operations and average vehicle delay for an intersection can be described qualitatively with a range of levels of service (LOS A through F), with LOS A indicating free-flowing traffic and LOS F indicating extreme congestion and long vehicle delays.

The LOS analysis is based on procedures identified in the *Highway Capacity Manual* (HCM) using *Synchro 10*. The most recent version of HCM 6th Edition is used to evaluate the intersections. *Where it is not possible to evaluate conditions at an intersection using the 6th Edition HCM method, it is evaluated using the HCM 2000 methods (see Appendix J).*

13.1.3.1 Cedar Hills

The three key intersections included in the CHRLF study area are described in Table 13-1. These intersections are representative of the main travel path to and from the CHRLF and where CHRLF traffic volumes would be highest.

The existing weekday peak hour LOS is summarized in Table 13-4 for the Cedar Hills study area.

As shown in Table 13-4, all study intersections in the Cedar Hills study area operate at LOS C or better and meet the LOS standards during the weekday AM, Midday, and PM peak hours, with the exception of the Issaquah Hobart Road SE/SR 18 Westbound Ramps intersection. The westbound through left turn stop controlled movement at the Issaquah Hobart Road SE/SR 18 Westbound Ramps intersection is forecast to operate at LOS acceptably midday but operate below standard at LOS D and F during the weekday AM and PM peak hours, respectively. Poor operations at this intersection are a known issue.

Table 13-4. Existing Weekday Peak Hour LOS Summary—Cedar Hills.				
Intersection	LOS Standard	LOS[1]	Delay[2]	WM[3]
Weekday AM Peak Hour				
1. Cedar Grove Rd SE/228th Ave SE	E	B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	E	B	12	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	C	31	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	E	C	23	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	E	C	33	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	C	D	27	WBTL
7. Issaquah Hobart Rd SE/SR 18 EB Ramps	C	C	22	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	C	31	-
Weekday Midday Peak Hour				
1. Cedar Grove Rd SE/228th Ave SE	E	B	10	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	E	B	15	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	B	19	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	E	A	9	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	E	A	9	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	C	B	12	WBTL
7. Issaquah Hobart Rd SE/SR 18 EB Ramps	C	A	9	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	B	16	-
Weekday PM Peak Hour				
1. Cedar Grove Rd SE/228th Ave SE	E	B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	E	B	14	SB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	C	21	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	E	D	47	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	E	B	20	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	C	F	58	WBTL
7. Issaquah Hobart Rd SE/SR 18 EB Ramps	C	A	9	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	C	25	-

Notes: MVH = Maple Valley Highway. Shading indicates intersection operating below LOS standard.

[1] Level of Service (A–F) as defined by the Highway Capacity Manual (TRB, 6th Edition).

[2] Average delay per vehicle in seconds rounded to the whole second.

[3] WM–Worst movement or approach reported for side-street, stop-controlled intersections. All other intersections are signalized.

13.1.3.2 Renton Site

The six key intersections included in the Renton site study area are described in Table 13-1. The existing weekday peak hour LOS is summarized in Table 13-5 for the Renton site study area.

Table 13-5. Existing Weekday Peak Hour LOS Summary—Renton Site.

Intersection	LOS Standard	LOS[1]	Delay[2]
Weekday AM Peak Hour			
9. 154th Pl SE/SR 169/SE Renton MVH	D	E	63
10. 140th Way SE/SR 169/SE Renton MVH	D	D	46
11. I-405 NB Ramps/SR 169/SE Renton MVH	D	C	35
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	E	F	87
13. Sunset Blvd N/NE 3rd St	E	D	54
14. Monterey Dr NE/NE 3rd St	D	B	13
15. Edmonds Ave SE/NE 3rd St	D	B	15
16. Jefferson Ave NE/NE 3rd St/NE 4th St	D	A	7
17. 149th Ave SE/SR 169/SE Renton MVH	D	A	7
Weekday Midday Peak Hour			
9. 154th Pl SE/SR 169/SE Renton MVH	D	C	33
10. 140th Way SE/SR 169/SE Renton MVH	D	D	37
11. I-405 NB Ramps/SR 169/SE Renton MVH	D	C	22
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	E	C	33
13. Sunset Blvd N/NE 3rd St	E	D	41
14. Monterey Dr NE/NE 3rd St	D	A	9
15. Edmonds Ave SE/NE 3rd St	D	C	34
16. Jefferson Ave NE/NE 3rd St/NE 4th St	D	A	8
17. 149th Ave SE/SR 169/SE Renton MVH	D	A	7
Weekday PM Peak Hour			
9. 154th Pl SE/SR 169/SE Renton MVH	D	E	68
10. 140th Way SE/SR 169/SE Renton MVH	D	D	43
11. I-405 NB Ramps/SR 169/SE Renton MVH	D	B	15
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	E	E	61
13. Sunset Blvd N/NE 3rd St	E	D	53
14. Monterey Dr NE/NE 3rd St	D	A	9
15. Edmonds Ave SE/NE 3rd St	D	C	32
16. Jefferson Ave NE/NE 3rd St/NE 4th St	D	A	8
17. 149th Ave SE/SR 169/SE Renton MVH	D	B	10

Note: MVH = Maple Valley Highway. Shading indicates intersection operating below LOS standard.

1 Level of Service (A – F) as defined by the Highway Capacity Manual (TRB, 6th Edition).

2 Average delay per vehicle in seconds rounded to the whole second.

3 Evaluated using HCM 2000 ; HCM 6th Edition does not evaluate the specific phasing of the intersection.

Table 13-5 shows that the Renton site study intersections generally meet LOS standards with the exception of the I-405 Southbound On-Ramp intersection during the weekday AM peak hour and the 154th Place SE/SR 169/SE Renton Maple Valley Highway intersection during the weekday AM and PM peak hours. The I-405 Southbound On-Ramp/SR 169/ SE Renton Maple Valley Hwy/Sunset Blvd N intersection has a LOS E standard but operates at LOS F during the weekday AM peak hour. Poor operations are a known issue at this intersection because of overall high volumes and the need to provide separate traffic signal phases for each leg of the intersection. 154th Place SE/SR 169/SE Renton Maple Valley Highway intersection has a LOS D standard but operates at LOS E during the weekday AM and PM peak hour. Poor operations are a known issue at this intersection because of high directional conflicting volumes both along MVH as well as to/from MVH and 154th Place SE.

13.1.4 Traffic Safety

Collision records for the most recent complete five-year period were reviewed for the study area. Historical collision data are from WSDOT for the period of January 1, 2015 to December 31, 2019. The analysis does not include 2020 collision data. A review of 2020 data showed fewer collisions compared to the annual average number of collisions in the five-year period between 2014 and 2019; therefore, the analysis is based on 2014-2019 since 2020 could be influenced by the COVID-19 pandemic. A review of collision history is provided to identify potential safety issues. and is summarized below for the Cedar Hills and Renton site study areas. Intersections with observed crash rates (collisions per million entering vehicles) greater than the critical crash rate are identified for further review and consideration. The critical crash rate is based on the average crash rate at similar intersections, intersection traffic volumes and a statistical constant for the confidence level (*Highway Safety Manual*, AASHTO, 2010). Additional detail on analysis methodology is contained in Appendix J.

13.1.4.1 Cedar Hills

A summary of the total and average annual number of reported collisions as well as the observed and critical crash rates at each study intersection is provided in Table 13-6.

Table 13-6. Collision History—Cedar Hills.

Intersection	Number of Reported Collisions					Total	Annual Average	Observed Crash Rate[1]	Critical Crash Rate[2]
	2015	2016	2017	2018	2019				
1. Cedar Grove Rd SE/228th Ave SE	0	0	0	0	0	0	0.0	0.00	1.66
2. Cedar Grove Rd SE/ SE Lake Francis Rd	0	1	2	2	2	7	1.4	0.80	1.52
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	5	6	9	5	2	27	5.4	0.79	0.91
4. Issaquah Hobart Rd SE/ SE May Valley Rd	5	1	5	2	7	20	4.0	0.55	0.89

Table 13-6 (continued). Collision History—Cedar Hills.									
Intersection	Number of Reported Collisions					Total	Annual Average	Observed Crash Rate[1]	Critical Crash Rate[2]
	2015	2016	2017	2018	2019				
5. Issaquah Hobart Rd SE/ Cedar Grove Rd SE	0	4	4	3	2	13	2.6	0.40	0.92
6. Issaquah Hobart Rd SE/ SR 18 WB Ramps	0	0	1	1	1	3	0.6	0.11	0.96
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	0	0	0	1	1	2	0.4	0.11	1.13
8. SE Jones Rd/196th Ave SE/ SR 169/SE Renton MVH	3	2	3	3	3	14	2.8	0.37	0.88

Notes: Source: WSDOT, 2020; MVH = Maple Valley Highway.

[1] Observed Crash Rate = Reported collisions per million entering vehicles (MEV).

[2] Calculated per Equation 4-11 in the Highway Safety Manual, 2010.

[3] Note the 2015-2019 review period was maintained due to non-typical conditions of 2020.

As shown in the table, the observed crash rates for the intersections are less than their critical crash rates, indicating there are no existing safety issues requiring further review. There were no reported collisions at the Cedar Grove Road SE/228th Avenue SE intersection, which provides access to the CHRLF. Most of the collisions at the remaining study intersections were rear-end collisions and generally resulted in property damage only. There are no reported fatalities or pedestrian collisions within the study area. There is one reported bicyclist collision in the study area, which occurred at the Cedar Grove Road SE/SR 169 intersection and resulted in a possible injury. The analysis indicates there are no existing safety issues warranting further review in the study area.

13.1.4.2 Renton Site

A summary of the total and average annual number of reported collisions as well as the collision rate at each study intersection is provided in Table 13-7 in the Renton site study area.

Table 13-7. Collision History—Renton Site.									
Intersection	Number of Reported Collisions					Total	Annual Average	Observed Crash Rate[1]	Critical Crash Rate[2]
	2015	2016	2017	2018	2019				
9. 154th Pl SE/SR 169/SE Renton MVH	9	7	5	5	6	32	6.4	0.49	1.07
10. 140th Way SE/SR 169/SE Renton MVH	11	13	7	5	2	38	7.6	0.49	1.03
11. I-405 NB Ramps/SR 169/SE Renton MVH	12	15	18	9	9	63	12.6	0.89	1.05

Table 13-7 (continued). Collision History—Renton Site.

Intersection	Number of Reported Collisions					Total	Annual Average	Observed Crash Rate[1]	Critical Crash Rate[2]
	2015	2016	2017	2018	2019				
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	19	19	15	14	10	77	15.4	0.82	0.99
13. Sunset Blvd N/NE 3rd St	17	26	19	20	14	96	19.2	0.94	0.98
14. Monterey Dr NE/NE 3rd St	5	8	3	7	4	27	5.4	0.48	1.10
15. Edmonds Ave SE/NE 3rd St	7	7	4	5	7	30	6.0	0.56	1.11
16. Jefferson Ave NE/NE 3rd St/NE 4th St	1	4	2	2	3	12	2.4	0.24	1.13
17. 149th Ave SE/SR 169/SE Renton MVH	2	0	0	1	3	6	1.2	0.12	1.12

Source: WSDOT, 2020; MVH = Maple Valley Highway

[1] Observed Crash Rate = Reported collisions per million entering vehicles (MEV).

[2] Calculated per Equation 4-11 in the Highway Safety Manual, 2010.

[3] Note the 2015-2019 review period was maintained due to non-typical conditions of 2020.

As shown in the table, the observed crash rates for the intersections are less than their critical crash rates, indicating there are no existing safety issues requiring further review. Most of the collisions at the study intersections are rear-end collisions and generally resulted in property damage only. Two fatalities were reported during the review period at the 154th Place SE and 140th Way SE intersections along SR 169/SE Renton MVH and were the result of either inattention or speeding. The SR 169 corridor between 152nd Avenue SE/154th Place SE to I-405 (inclusive of both study intersections with fatalities) is identified for widening from four to six lanes with pedestrian and bicycle improvements per the 2040 Puget Sound Regional Council (PSRC) Regional Transportation Plan 2018 (see Section **Error! Reference source not found.**). There are five reported pedestrian collisions and three reported bicyclist collisions in the study area, which occurred at the two I-405/SR 169 study intersections as well as at the Sunset Boulevard and Edmonds Avenue NE intersections at NE 3rd Street. Based on the safety analysis, no patterns at intersections were identified that would indicate safety issues warranting further review in the study area.

To distinguish from collision risks, potential safety issues due to vehicles speeding along NE 3rd Street in the vicinity of the grade west of the Renton Site were examined. A week of traffic volumes, speeds, and vehicle classification data was collected along NE 3rd Street in the vicinity of Blaine Avenue NE (i.e., capturing the impacts of the grade along NE 3rd Street). The posted speed limit along NE 3rd Street is 35 mph. The data shows that along NE 3rd Street for the downgrade section vehicles speeds were an average of 42 mph with an 85th percentile speed of 47 mph, indicating there is a speeding issue on the downhill portion of NE 3rd Street. A review of speeds by vehicle class shows the truck average speed along the same section of NE 3rd Street is 41 mph with an 85th percentile speed of 45 mph, indicating that trucks are going slightly slower but still over the speed limit. An additional review of collisions at the study intersections along the NE 3rd Street corridor was performed to determine potential safety issues related to heavy vehicles speeding. During the five-year study period, a total of 10 collisions were reported along NE 3rd Street west of the Renton Site involving trucks, with eight of the 10 collisions occurring at the Sunset Boulevard/NE 3rd Street intersection and the remaining two collisions occurring at the Edmonds Avenue NE/NE 3rd Street intersection. All reported collisions resulted in property damage only and were primarily sideswipe or approach turn collisions. None of the reported collisions were due to excessive speed or disregard for the traffic signal. The collision history review includes the existing Renton Transfer Station, which has similar types of trucks to the CHRLF. The review shows there is a speeding issue along NE 3rd Street for both general vehicles and trucks, related to the downhill grade. Consideration could be given to speed radar signs or other structural measures to help slow traffic along NE 3rd Street.

13.1.5 Construction

Construction traffic occurs periodically on the roadway network in the CHRLF study area through the period of each refuse cell development, mostly occurring in the summer between July and October. Construction traffic is related to import and export of material and construction soils, as well as bringing construction equipment to and from the site, and for the alternatives evaluation is accounted for separately from the base trip generation.

13.2 Environmental Impacts

This section describes the future conditions for the transportation systems within the study areas under the No Action Alternative and the action alternatives. The future transportation system conditions are based on forecasts consistent with regional planning, including King County, WSDOT, and the cities of Renton and Maple Valley.

From a transportation standpoint, the major differences among the alternatives are the length of time the CHRLF would remain open and the location of landfill support facilities at the CHRLF site or at the Renton site. This EIS evaluates the effects of the CHRLF in 2025, 2040 and at the Capacity Year for each action alternative because those years are consistent with local and regional planning, coincide with the potential timing of relocation of the landfill support facilities, and have the highest forecast operational landfill traffic volumes. Temporary increases in construction traffic are assessed separately and take into consideration the timing and number of landfill areas to be developed.

13.2.1 Direct and Indirect Impacts

Direct transportation impacts are the impacts of traffic generated by each alternative. The No Action Alternative is the baseline condition against which the action alternatives are compared. Transportation impacts of all action alternatives and the No Action Alternative are evaluated for only the offsite transportation system and include the combined effects of the landfill development and the support facilities relocation.

13.2.1.1 No Action Alternative

The No Action Alternative is expected to provide disposal capacity at the landfill to approximately 2028, as currently permitted, and support facilities would remain in place or be placed at interim offsite facilities. Up to the time landfill capacity is reached, there would continue to be trips from all types of traffic associated with the landfill (see Section 13.1.2.1), with waste transfer trips growing in proportion to the tonnage of waste disposed (see Section 1.6). After the landfill reaches capacity in approximately 2028, waste transfer tractors and trailers would continue to be based at CHRLF, and there would be staff and contractor trips related to trucking and maintenance of the environmental control systems, but no waste transfer trips related to landfilling. When the landfill closes after it reaches capacity, disposal and associated waste transfer trips would be shifted to either waste export by rail or to a WTE facility somewhere in King County.

Traffic Volumes

Future Opening Year (2025) background traffic forecasts for weekday AM, Midday, and PM peak hour conditions were developed by applying an average annual growth rate to existing traffic volumes of one percent per year and then adding traffic from “pipeline” projects) in the study area (i.e., upcoming planned development projects that have been approved or are in the approval process but have yet to be constructed). The annual growth rate and pipeline projects are based on coordination with King County Roads Division, City of Renton, and WSDOT staff. The pipeline projects identified in the study area include Renton Shop, Cedar River Apartments, and Elk Heights Pit.

Future Design Year (2040) background traffic forecasts were developed using the travel demand models for the study areas. The Cedar Hills study area background traffic forecasts are based on the recently updated Maple Valley Travel Demand Model and the Renton site study area forecasts are based on the PSRC Travel Demand Model, both of which forecast weekday PM peak hour conditions. Weekday AM and Midday peak hour background traffic volumes are developed through their relationship with the existing weekday PM peak hour traffic counts.

Operational trips by year for the life of the landfill for each alternative are based on soil stockpiles, soil use, and a soil balance analysis, and are included in Opening Year and Design Year forecasts.

Table 13-8 summarizes the Existing, Opening Year, Capacity Year, and Design Years weekday daily and hourly trips for the No Action Alternative at the CHRLF. Detailed trip generation is included in Appendix J.

Table 13-8. No Action Alternative Estimated Weekday Trip Generation—Cedar Hills.

	Opening Year (2025)	Capacity Year (2028)	Design Year[1](2040)
No Action Alternative Daily Trips	884	936	340
Existing Daily Trips	*812*	*812*	*812*
Net New Daily Trips	+72	+124	-472

Table 13-8 (continued). No Action Alternative Estimated Weekday Trip Generation—Cedar Hills.			
	Opening Year (2025)	Capacity Year (2028)	Design Year[1](2040)
Net New Peak Hour No Action Alternative Trips[2]			
AM Peak Hour	3	9	-32
Midday Peak Hour	6	12	-40
PM Peak Hour	8	8	-12

Notes:

1 The Design Year trip generation reflects the remaining trucking and trucking/maintenance staff related trips because the facility would reach capacity before the horizon year of 2040.

2 Net new peak hour trips are relative to existing weekday peak hour trips.

In the Capacity Year, the No Action Alternative would result in an increase of 124 daily trips and an increase of up to 12 peak hour trips relative to existing conditions. The increase in trips generated by the No Action Alternative is related to incremental growth in solid waste handled by CHRLF that is already permitted. In the Design Year, the No Action Alternative would result in a reduction of 472 daily trips and a reduction of up to 40 peak hour trips relative to existing conditions because the CHRLF would be closed to landfilling. As described previously, the No Action Alternative would continue to generate trips when it reaches capacity for trucking operations and for staff performing trucking and maintenance of the environmental control systems.

Traffic Operations

Trip distribution patterns are based on existing travel patterns for each of the users, KCSWD waste transfer routes to/from the recycling and transfer stations, US Census Bureau's *OnTheMap* tool and the 2017 CHRLF Traffic Study. Detailed discussion of trip distribution assumptions, and net new trips by intersection for horizon years are included in Appendix J. The trip distribution assumptions guide how net new trips for the horizon years are assigned to study area intersections.

Table 13-9 summarizes No Action Alternative intersection LOS for the weekday AM, Midday, and PM peak hours in the Cedar Hills study area.

Table 13-9. Existing and No Action Alternative Weekday Peak Hour LOS—Cedar Hills.											
	Existing				No Action Opening Year (2025)				No Action Design Year (2040)		
Intersection	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM		LOS	Delay	WM
Weekday AM Peak Hour											
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	12	NB		B	13	NB		B	13	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	31	-		D	47	-		D	44	-

Table 13-9 (continued). Existing and No Action Alternative Weekday Peak Hour LOS—Cedar Hills.

Intersection	Existing				No Action Opening Year (2025)				No Action Design Year (2040)		
	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM		LOS	Delay	WM
Weekday AM Peak Hour (continued)											
4. Issaquah Hobart Rd SE/SE May Valley Rd	C	23	-		C	34	-		C	34	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	C	33	-		D	36	-		D	40	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	D	27	WBTL		D	29	WBTL		D	31	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	C	22	-		C	26	-		C	31	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	C	31	-		D	40	-		D	49	-
Weekday Midday Peak Hour											
1. Cedar Grove Rd SE/228th Ave SE	A	10	SB		B	10	SB		B	10	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	15	NB		C	16	NB		B	15	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	B	19	-		C	23	-		C	21	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	A	9	-		A	9	-		A	9	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	A	9	-		A	9	-		A	9	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	B	12	WBTL		B	12	WBTL		B	13	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	A	9	-		A	9	-		A	9	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	B	16	-		B	17	-		B	17	-
Weekday PM Peak Hour											
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	14	SB		B	14	NB		C	15	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	21	-		C	26	-		C	31	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	D	47	-		E	57	-		E	63	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	B	20	-		C	23	-		D	38	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	F	58	WBTL		F	78	WBTL		F	177	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	A	9	-		A	10	-		B	10	-

Table 13-9 (continued). Existing and No Action Alternative Weekday Peak Hour LOS—Cedar Hills.

Intersection	Existing				No Action Opening Year (2025)				No Action Design Year (2040)		
	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM		LOS	Delay	WM
Weekday PM Peak Hour (continued)											
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	C	25	-		D	35	-		D	51	-

Note: Shading indicates intersection operating below LOS standard. MVH = Maple Valley Highway.

1 Level of Service (A – F) as defined by the Highway Capacity Manual (TRB, 6th Edition)

2 Average delay per vehicle in seconds rounded to the whole second.

3 Worst movement or approach reported for side-street, stop-controlled intersections. All other intersections are signalized. SB = southbound, NB = northbound, WBTL = westbound through/left turn movement.

As shown in Table 13-9, the study intersections are forecast to continue to meet their respective operational standards during the peak hours under both Opening and Design Year No Action Alternative conditions with the exception of the SR 169/Cedar Grove Road SE and Issaquah Hobart Road SE/SR 18 Westbound Ramp intersections which are discussed below.

The signalized SR 169/Cedar Grove Road SE intersection would operate at LOS C under the Opening and Design Year No Action conditions during the weekday Midday and PM peak hours but would degrade to LOS D during the weekday AM peak hour. The LOS standard at the SR 169/Cedar Grove Road SE intersection is LOS C. The LOS D in the weekday AM peak hours is because of the high SR 169 northbound direction volume with only a single shared through/right turn-lane along SR 169. The No Action Alternative Capacity Year (2028) conditions would be close to the Opening Year conditions.

The westbound left turn stop controlled movement at the Issaquah Hobart Road SE/SR 18 Westbound Ramp intersection under both the Opening Year and Design Year No Action condition is forecast to operate consistent with existing conditions. During the midday peak hour, the intersection currently operates and is forecast to continue to operate acceptably at LOS B. During the AM peak hour, the westbound left turn is forecast to continue to operate at LOS D with two to four seconds of added delay during Opening Year and Design Year conditions. During the PM peak hour, the westbound left turn is forecast to continue to operate at LOS F. As noted above, WSDOT has identified poor operations at this location and plans to change the traffic control from a stop-controlled intersection to a roundabout. With this improvement, delay would be significantly reduced. This improvement was not assumed in the primary analysis as the funds to construct the roundabout have not yet been identified.

At the Renton site and consistent with existing conditions, all study intersections would meet LOS standards under the No Action Alternative condition in Opening and Design Years with the exception of the two intersections discussed below. At the study intersections projected to meet LOS standards, increases in delay with the No Action Alternative compared with existing conditions are the result of five to 20 years of growth in background traffic volumes. A small reduction in delay is projected at the I-405 Northbound

Ramps/SR 169 intersection during the weekday AM peak hour under the No Action Alternative Design Year compared to the Opening Year condition because of the decrease in traffic volumes with the CHRLF reaching capacity and the planned improvements along I-405.

The I-405 Southbound On-Ramp/SR 169 intersection would operate at LOS F under Opening and Design Year No Action Alternative conditions during the weekday AM peak hour. During the weekday midday and PM peak hours, the intersection would operate acceptably at LOS D and E, respectively, under Opening and Design Year No Action Alternative conditions.

The 154th Place SE/SR 169/SE Renton Maple Valley Highway intersection under Opening Year and Design Year No Action conditions is forecast to operate consistent with existing conditions, operating acceptably during the midday peak hour and at LOS E during the weekday AM and PM peak hours. Increases in delay during all peak hours is anticipated to be eight seconds or less with the future No Action conditions relative to existing conditions.

Detailed LOS worksheets and traffic operations methods and intersection parameters are provided in Appendix J.

Traffic Safety

Increases in traffic generated by the No Action Alternative will result in a proportional increase in the probability of collisions. With growth in traffic in the study area, it would likely become progressively more challenging for side-street traffic at unsignalized intersections to enter the traffic stream.

Future increases in pedestrian and bicycle volumes along the NE 3rd Street/NE 4th Street corridor near the Renton site option are anticipated with planned bicycle facilities and expansion of Renton Technical College (RTC) could result in additional conflicts. As noted in the Affected Environment, there is a speeding issue along NE 3rd Street due to the downhill grade. Although issues such as speeding could continue, no safety issue related to truck collisions has been identified. A speed radar sign could be provided along NE 3rd Street to make drivers aware and help slow vehicles. In addition, the RTC master plan notes that pedestrian improvements would be needed as part of planned college expansion projects to connect potential development on the southwest corner of NE 3rd Street/NE 4th Street/Jefferson Avenue NE intersection to the main campus.

Construction

Some of the support facilities are at the end of their useful life and would be refurbished or replaced in their current location under the No Action Alternative. Off-site traffic impacts related to the facilities construction could include:

- Arrival, departure, and parking of construction worker vehicles
- Delivery of construction materials
- Removal of debris

- Delivery of construction vehicles and machinery
- Delivery or removal of material with fill or excavation
- Potential impacts to onsite bicycle and pedestrian traffic

Before construction began, a construction management plan describing procedures for construction activity such as truck routes and hours of operation would be developed and approved by KCSWD (see Section 13.3).

13.2.1.2 Impacts Common to All Alternatives

The following conditions and impacts are common to all alternatives, including the No Action Alternative.

- Traffic Safety. Traffic generated by the action alternatives results in a proportional increase in the probability of collisions. It is unlikely that the project traffic would significantly change safety issues in the study area. With growth in traffic in the study area, it would likely become progressively more challenging for side-street traffic at unsignalized intersections to enter the traffic stream.

  Future increases in pedestrian and bicycle volumes along the NE 3rd Street/NE 4th Street corridor in Renton are anticipated with planned bicycle facilities and expansion of RTC, which could result in additional vehicle conflicts. The RTC master plan notes that pedestrian improvements would be needed as part of planned college expansion projects. As noted in the Affected Environment, there is a speeding issue along NE 3rd Street. The review of existing collision data showed no specific safety issue related to existing truck traffic. As described in the affected environment, although there would be some increase in truck traffic with the alternatives the percent of trucks relative to general traffic is anticipated to be the same in the future with the alternatives. In addition, growth in truck traffic from the alternatives is anticipated to be before or after the peak commute periods and during the hours when there is less overall travel along the street system. Although observed issues such as speeding could continue, no safety issue related to truck collisions has been identified. A speed radar sign could be provided along NE 3rd Street to make drivers aware and help slow vehicles.

- CHRLF User Trips (Trip Generation). Trip generation for the alternatives is based on future waste tonnage growth projections provided by KCSWD. The existing daily waste transfer, commercial direct-haul, and other user trips grow based on the yearly KCSWD tonnage forecasts. The annual tonnage of solid waste generated is assumed to be the same under all the alternatives (including the No Action Alternative).

- Future Background Traffic. Opening Year (2025), Capacity Year, and Design Year (2040) background traffic forecasts were developed consistently for all alternatives, with models appropriate to the study area under consideration. See Appendix J for detailed discussion of methodology.

- Heavy Vehicles. Existing heavy vehicle percentages were reviewed at the study intersections and analysis was done to determine if there would be a change in heavy vehicle percentages with growth in background conditions and increases in truck traffic with the alternatives. The review shows that under the typical landfill operations, both in the Cedar Hills and Renton areas, the heavy vehicle percentages would be unchanged or less than current conditions. In addition, specifically under Option 3 conditions, the shift in truck trips to the Renton site would occur outside of the peak hours as shown in Figure 13-4 and thus would not result in an increase to the heavy vehicle percentages for the analysis. The heavy vehicle percentages are increased in the analysis of temporary construction impacts because of the concentrated increase in truck traffic. See Appendix J for detailed discussion of methodology.

13.2.1.3 Action Alternative 1

Under Action Alternative 1, landfill development would extend the capacity of the CHRLF to approximately 2037, and the main support facilities would be based at CHRLF (Options 1 and 2) or the Renton site (Option 3). Prior to reaching capacity, for Options 1 and 2 at CHRLF, there would continue to be trips from all types of traffic associated with the landfill (see Section 13.1.2.1), with waste transfer trips growing in proportion to the tonnage of waste disposed (see Section 1.6). For Option 3 at CHRLF, there would be waste transfer trips and trips related to maintenance of the environmental control systems. For Option 3 at the Renton site, there would be trips related to trucking from the waste transfer tractors and trailers based there, and trucking and maintenance staff trips.

When the landfill reaches capacity in approximately 2037, for Options 1 and 2 waste transfer tractors and trailers would continue to be based at CHRLF and there would continue to be trips related to trucking, and staff and contractor trips related to trucking and maintenance of the environmental control systems, but no waste transfer trips related to landfilling. For Option 3 at CHRLF, there would be trips related to maintenance of the environmental control systems, but no waste transfer trips related to landfilling. For Option 3 at the Renton site, there would be trips related to trucking from the waste transfer tractors and trailers based there, and trucking and maintenance staff trips. When the landfill closes after it reaches capacity, disposal and associated waste transfer trips would be shifted to either waste export by rail or to a WTE facility somewhere in King County.

Transportation impacts under the action alternatives change based on the amount of landfill development and whether the support facilities are located on site at CHRLF or at the Renton site. Impacts do not differ between the support facilities south or north options at CHRLF (Options 1 and 2), so impacts are described in terms of Landfill Development with South and North Options and Landfill Development with Renton site Option (Option 3).

Landfill Development with South and North Options

Traffic volumes, operations, and construction impacts for Action Alternative 1 Options 1 and 2 are described below. Transportation impacts are evaluated for the Cedar Hills study area. Under Options 1 and 2, Renton site study area transportation impacts would be limited, with less than five trips or two percent volume increase at the study intersections, and mainly related to access to and from I-405. Both Options 1 and 2 have the same transportation impacts at CHRLF because the location of the support facilities on site does not change the traffic generated by the action alternatives.

Traffic Volumes

Action Alternative 1 net new trip generation considers the traffic generated by the No Action Alternative, which permits CHRLF operations until approximately 2028. The estimated year the CHRLF reaches capacity with Action Alternative 1 is approximately 2037, before the Design Year of 2040. A summary of the weekday daily and peak hour trips for Alternative 1, Options 1 and 2, is shown in Table 13-10. Detailed trip generation forecasts are included in Appendix J.

Table 13-10. Alternative 1 Options 1 and 2 Estimated Weekday Trip Generation—CHRLF.

	Existing	Opening Year (2025)	Capacity Year (2037)	Design Year[1] (2040)
Alternative 1 Options 1 and 2 Daily Trips[2]	812	926	1,000	340
No Action Alternative Daily Trips	812	884	340	340
Net New Daily Trips	0	+42	+660	0
Net New Peak Hour Alternative 1 Options 1 and 2 Trips[3]				
AM Peak Hour	0	5	49	0
Midday Peak Hour	0	5	58	0
PM Peak Hour	0	0	44	0

Notes:

1 The design year trip generation for No Action and Alternative 1 reflects only the remaining trucking and trucking/maintenance staffing because the CHRLF reaches capacity before the horizon year of 2040.

2 Options 1 and 2 include the support facility on site at the CHRLF.

3 Net new peak hour trips are relative to the No Action Alternative weekday peak hour trips.

As shown in Table 13-10, 42 net new daily trips are estimated for Alternative 1 Options 1 and 2 Opening Year conditions compared to the No Action Alternative. The 1,000 total trips in 2037 under Action Alternative 1 Options 1 and 2 are about 190 trips more than the existing daily trips in 2020. For the Design Year, there would be no new trips with Alternative 1 because both the No Action Alternative and Alternative 1 reach capacity before 2040. The peak hour net new trips are low with Alternative 1 Options 1 and 2 with up to five new trips during the weekday AM and Midday peak hours in the Opening Year, up to 58 new trips during the peak hours in the Capacity Year, and no new trips during the peak hours during the Design Year.

The overall peak hour net new trips for Alternative 1 is the same for Options 1, 2, and 3; however, with Options 1 and 2 all travel patterns focus on the CHRLF Site.

A comparison of the action alternatives shows that Alternative 1 Options 1 and 2 net new trips in 2037 would be less than 10 trips greater than Alternative 2 Options 1 and 2 in 2038 (or the Alternative 2 Capacity Year) and approximately 30 trips less than Alternative 3 Options 1 and 2 in 2040 (or the Design Year). Transportation-related impacts of Alternative 1 Options 1 and 2 when CHRLF reaches capacity (2037) are the same as or less than identified for Alternative 3 Options 1 and 2 in the Design Year (see Section 13.2.1.5 for details).

Traffic Operations

The weekday AM and Midday peak hour traffic operations for the Alternative 1 Options 1 and 2 Opening Year conditions are summarized in Table 13-11 and compared to the No Action Alternative.

Table 13-11. Alternative 1 Options 1 and 2 Opening Year Weekday Peak Hour LOS Summary.

Intersection	No Action Alternative				Alternative 1		
	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM
Weekday AM Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	13	NB		B	13	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	D	47	-		D	47	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	C	34	-		C	34	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	D	36	-		D	36	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	D	29	WBTL		D	29	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	C	26	-		C	26	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	40	-		D	40	-
Weekday Midday Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	10	SB		B	10	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	C	16	NB		C	16	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	23	-		C	24	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	A	9	-		A	9	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	A	9	-		A	9	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	B	12	WBTL		B	12	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	A	9	-		A	9	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	B	17	-		B	17	-

Note: MVH = Maple Valley Highway. Shading indicates intersection operating below LOS standard. The weekday PM peak hour traffic operations are not included in the table because no new trips would be generated relative to the No Action Alternative during the Opening Year condition.

1 Level of Service (A–F) as defined by the Highway Capacity Manual (TRB, 6th Edition).

2 Average delay per vehicle in seconds rounded to the whole second.

3 Worst movement or approach reported for side-street stop-controlled intersections. All other intersections are signalized. SB = southbound, NB = northbound, WBTL = westbound through/left turn movement

As shown in Table 13-11, for Alternative 1 Opening Year Options 1 and 2 conditions, the study intersections would operate at the same LOS as the No Action Alternative during the weekday peak hours. All study intersections would meet the LOS standard during the weekday peak hours except the SR 169/Cedar Grove Road SE and Issaquah Hobart Rd SE/SR 18 WB Ramps intersections during the weekday AM peak hour. Both intersections are forecast to operate at LOS D under both No Action Alternative and Alternative 1 Options 1 and 2 Opening Year conditions and would not increase delay at the intersection compared to the No Action Alternative; so, there are no significant traffic operations impacts.

Design Year Options 1 and 2 conditions would be the same as No Action Design Year conditions, because CHRLF would be closed under both alternatives. However, Alternative 1 Options 1 and 2 Capacity Year conditions (2037) would generate less traffic than Alternative 3 Options 1 and 2 Design Year conditions (2040) and therefore have a lower impact at the study intersection. Table 13-19 in Section 13.2.1.5 shows that, consistent with the No Action Alternative, most of the study intersections would meet LOS standards under Alternative 3 Options 1 and 2 conditions with the exception of the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE and Issaquah Hobart Road SE/SR 18 WB Ramps intersections. The SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection would operate below the LOS C standard under the No Action Alternative (with or without the CHRLF traffic) because of the high traffic volumes along SR 169 during the weekday AM and PM peak hours and only a single through lane in each direction. The intersection would operate at LOS D during the weekday AM and PM peak hours under Alternative 1 Options 1 and 2, but the intersection delay increase would likely be less than Alternative 3 Options 1 and 2 given fewer anticipated trips. The Issaquah Hobart Road SE/SR 18 WB Ramps intersection would operate at LOS D and LOS F during the weekday AM and PM peak hours, respectively, under the No Action Alternative, but have no increase in delay with the Alternative 3 Options 1 and 2 forecast relative to No Action conditions, such that no significant traffic operations impact would occur as a result of Alternative 1 Options 1 and 2 given fewer anticipated trips.

Traffic associated with the continued operation of the landfill would cause no substantial difference in future traffic conditions under Alternative 1 Options 1 and 2. However, the continued operation of the landfill would generate more truck trips, and therefore could contribute to the physical deterioration of the roadway surfaces.

Based on these results, the additional traffic from Alternative 1 Options 1 and 2 would have an impact requiring mitigation at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE due to increase in delay in the weekday AM and PM peak hours, anticipated to occur in 2029. Section 13.3 discusses potential mitigation to reduce the impact of the action alternatives on that intersection, and the different timing that may be necessary for each action alternative.

Construction

There would be periodic construction that could result in offsite trips higher than typical conditions for up to four months in the summer with Alternative 1 Options 1 and 2. Construction activities would be import and export of material and soils as well as bringing construction equipment to and from the site. The most intense Alternative 1 Options 1 and 2 construction activity during the four -month period is estimated to occur in 2025 and 2026 as shown on Figure 13-3. Construction activity with offsite trips is temporary and does not occur each year during operations of CHRLF.

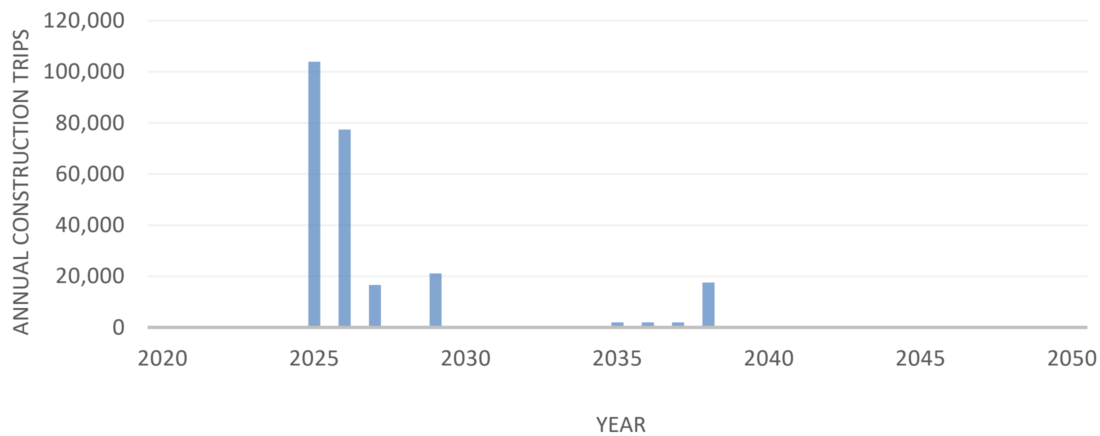


Figure 13-3. Estimated Alternative 1 Options 1 and 2 Annual Off-Site Construction Trips.

Figure 13-3 shows the annual construction trips would be highest in 2025; however, monthly projections for construction trips estimate the highest month would be in the summer of 2026. There is no construction activity in the Design Year because with Alternative 1 Options 1 and 2, CHRLF reaches capacity in 2037. Estimated annual, peak monthly, and hourly construction trips for Alternative 1 Options 1 and 2 in the Opening Year are summarized in Table 13-12. The table shows 2026 conditions because the peak month and peak hour trips would be highest during this period.

Table 13-12. Estimated Alternative 1 Options 1 and 2 Peak Construction Trips.

Total Annual Trips[1]	Peak Monthly Trips[2]	Peak Hourly Trips[3]
77,438	28,758	80

Notes:

[1] Annual construction trips occur for up to four months between June and September for 2026.

[2] The peak monthly trips occur in the fourth (or last) month of construction in 2026; this reflects the highest monthly construction trips for Alternative 1.

[3] The peak hourly trips are calculated based on the peak month of construction activity and assuming the construction trips occur for 12 hours a day and seven days a week and are evenly distributed.

Construction impacts would be temporary, and for all construction months KCSWD would develop a construction management plan describing procedures for construction activity that would minimize transportation impacts, similar to what is described under the No Action Alternative.

Landfill Development with Renton Site Option

Traffic volumes, operations, and construction impacts for Action Alternative 1 Option 3 are described below for both the CHRLF site and the Renton site.

Traffic Volumes

A summary of the weekday net new trips for Alternative 1 Option 3 is provided in Table 13-13 and shows the trips to/from CHRLF and the Renton site. Net new daily trips are in comparison to the No Action Alternative. Detailed trip generation estimates are included in Appendix J.

Table 13-13. Alternative 1 Option 3 Estimated Weekday Trip Generation.

	Existing	Opening Year (2025)			Capacity Year (2037)			Design Year[1] (2040)		
	CHRLF/Total	CHRLF	Renton Site	Total	CHRLF	Renton Site	Total	CHRLF	Renton Site	Total
Alternative 1 Option 3 Daily Trips	812	552	482	1,034	626	502	1,128	92	248	340
No Action Alternative Daily Trips	812	884	0	884	340	0	340	340	0	340
Net New Daily Trips	0	-332	+482	+150	+286	+502	+788	-248	+248	0
Net New Peak Hour Alternative 1 Option 3 Trips[2]										
AM Peak Hour	0	-6	+11	+5	+38	+11	+49	-7	+7	0
Midday Peak Hour	0	-15	+20	+5	+38	+20	+58	-13	+13	0
PM Peak Hour	0	-52	+52	0	-8	+52	+44	-34	+34	0

Notes:

[1] The Design Year trip generation for No Action and Alternative 1 reflects only the remaining trucking and trucking/maintenance staffing related trips because the CHRLF would have reached capacity before the horizon year of 2040.

[2] Net new peak hour trips are relative to the No Action Alternative weekday peak hour trips.

No new trips are generated with Alternative 1 Option 3 in the Design Year because CHRLF reaches capacity in 2037. All Alternative 1 Option 3 trip generation reflects the shift in trips from CHRLF to the Renton site. If Option 3 moves forward, the relocation to the Renton site would occur sometime between 2023 and 2028 and the analysis presented in this study captures the range of transportation impacts for whichever year the relocation occurs.

The overall peak hour net new trips for Alternative 1 is the same for Options 1, 2, and 3; however, with Option 3 there is a change in travel patterns with trucking and maintenance staff based at the Renton site. The change in travel patterns results in a reduction in trips at the CHRLF site compared to the No Action and an increase in trips to and from the Renton site.

Figure 13-4 below provides an understanding of the anticipated time of day for the trips to/from the proposed Renton facility. The truck trips are forecast to occur prior to the weekday AM commuter peak period and after the weekday PM peak hours as well as outside of typical school operating hours (such as Renton Technical College, discussed in greater detail below).. The timing of Alternative 1 truck trips is when general traffic volumes and non-motorized activity is generally low. The total number of trips would change depending on the analysis year, however, but the time-of-day distribution does not change and would be consistent for all action alternatives with Option 3.

The RTCCampus Master Plan identifies a new Allied Health building located south of NE 4th Street at the southwestern corner of the NE 3rd Street/NE 4th Street/Jefferson Avenue NE intersection. The Master Plan identifies the need for pedestrian improvements at the crossing. A review of the current RTC scheduled classes shows that the majority of classes on campus begin at 8 a.m. or later, while KCSWD haul truck volumes are forecast to be greatest prior to 7:00 a.m., As reflected in Figure 13-4, this minimizes the conflicts between students and KCSWD operations. The limited classes identified as beginning prior to 8:00 a.m. are automotive or culinary courses not likely to be located in the proposed new Allied Health Building. Figure 13-4 shows that any truck activity that would take place in the evening (after the weekday PM peak period) is anticipated to occur over three hours. Given the context of the street, which already serves the Renton Transfer Station, it is anticipated that the crossing improvements identified as part of the RTC project would address any anticipated safety concerns with trucks.

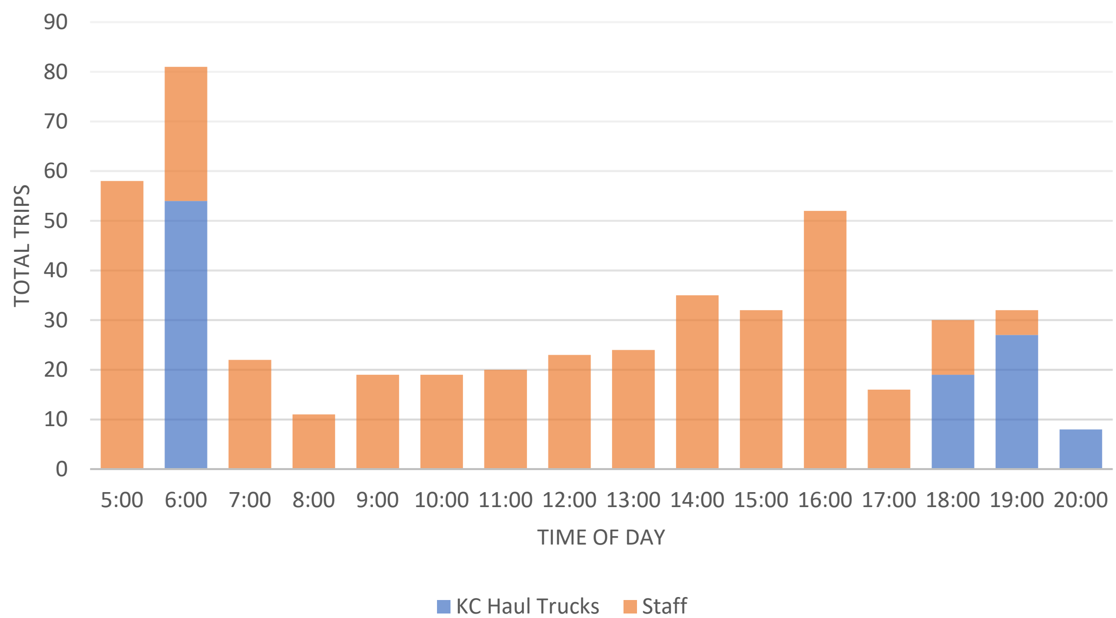


Figure 13-4. Opening Year Trips by Time of Day for Alternative 1 Option 3 at Renton Site.

The CHRLF is estimated to reach capacity in 2037 with Alternative 1 Option 3 resulting in a peak daily trip generation of 1,128 trips with 626 trips at CHRLF and 502 trips at the Renton site in the Capacity Year. Overall trip generation in the Capacity Year would be substantially the same as Alternative 2 Option 3 Capacity Year (2038) and slightly less than with Alternative 3 Option 3 Design Year (2040).

Traffic Operations

The weekday peak hour traffic operations for the Alternative 1 Option 3 Opening Year conditions are summarized below in Table 13-14.

Table 13-14. Alternative 1 Option 3 Opening Year Weekday Peak Hour LOS Summary.

Intersection	No Action Alternative				Alternative 1		
	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM
Weekday AM Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	13	NB		B	13	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	D	47	-		D	47	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	C	34	-		C	34	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	D	36	-		D	36	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	D	29	WBTL		D	29	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	C	26	-		C	26	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	40	-		D	40	-
9. 154th Pl SE/SR 169/SE Renton MVH	E	71	-		E	71	-
10. 140th Way SE/SR 169/SE Renton MVH	D	39	-		D	50	-
11. I-405 NB Ramps/SR 169/SE Renton MVH	D	44	-		D	45	-
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	F	93	-		F	93	-
13. Sunset Blvd N/NE 3rd St	E	59	-		E	59	-
14. Monterey Dr NE/NE 3rd St	B	14	-		B	14	-
15. Edmonds Ave SE/NE 3rd St	B	15	-		B	15	-
16. Jefferson Ave NE/NE 3rd St/NE 4th St	A	10	-		A	10	-
17. 149th Ave SE/SR 169/SE Renton Maple Valley Hwy	A	7	-		A	7	-
Weekday Midday Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	10	SB		B	10	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	C	16	NB		C	16	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	23	-		C	22	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	A	9	-		A	9	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	A	9	-		A	9	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	B	12	WBTL		B	12	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	A	9	-		A	9	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	B	17	-		B	17	-
9. 154th Pl SE/SR 169/SE Renton MVH	C	34	-		C	34	-
10. 140th Way SE/SR 169/SE Renton MVH	D	38	-		D	38	-
11. I-405 NB Ramps/SR 169/SE Renton MVH	C	26	-		C	27	-
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	D	43	-		D	44	-

Table 13-14 (continued). Alternative 1 Option 3 Opening Year Weekday Peak Hour LOS Summary.

Intersection	No Action Alternative				Alternative 1		
	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM
13. Sunset Blvd N/NE 3rd St	D	42	-		D	42	-
14. Monterey Dr NE/NE 3rd St	A	9	-		A	9	-
15. Edmonds Ave SE/NE 3rd St	D	38	-		D	38	-
16. Jefferson Ave NE/NE 3rd St/NE 4th St	A	8	-		A	8	-
17. 149th Ave SE/SR 169/SE Renton Maple Valley Hwy	A	7	-		A	7	-
Weekday PM Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	14	NB		B	14	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	26	-		C	20	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	E	57	-		E	61	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	C	23	-		C	23	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	F	78	WBTL		F	78	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	A	10	-		A	10	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	35	-		D	36	-
9. 154th Pl SE/SR 169/SE Renton MVH	E	76	-		E	76	-
10. 140th Way SE/SR 169/SE Renton MVH	D	42	-		D	42	-
11. I-405 NB Ramps/SR 169/SE Renton MVH	B	17	-		B	17	-
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	E	72	-		E	73	-
13. Sunset Blvd N/NE 3rd St	E	57	-		E	57	-
14. Monterey Dr NE/NE 3rd St	A	9	-		A	9	-
15. Edmonds Ave SE/NE 3rd St	C	35	-		C	35	-
16. Jefferson Ave NE/NE 3rd St/NE 4th St	B	13	-		B	16	-
17. 149th Ave SE/SR 169/SE Renton Maple Valley Hwy	B	11	-		B	11	-

Note: Shading indicates intersection operating below LOS standard. MVH = Maple Valley Highway

1 Level of Service (A – F) as defined by the Highway Capacity Manual (TRB, 6th Edition).

2 Average delay per vehicle in seconds rounded to the whole second.

3 Worst movement or approach reported for side-street stop-controlled intersections. All other intersections are signalized. SB = southbound, NB = northbound, WBTL = westbound through/left turn movement

4 Evaluated using HCM 2000; HCM 6th Edition does not evaluate the specific phasing of the intersection.

The study intersections under the Alternative 1 Option 3 Opening Year conditions would operate at the same LOS as the No Action Alternative with increases in delay of approximately three seconds or less. The study intersections meet the LOS standards during the weekday AM, Midday, and PM peak hours with the exceptions:

- Issaquah Hobart Rd SE/SR 18 WB Ramps during the AM and PM peak hours

- 154th Place SE/SR 169/SE Renton MVH during the AM and PM peak hours
- I-405 SB On-Ramp/SR 169/SE Renton Maple Valley Highway/Sunset Blvd N during the AM peak hour

Given that there is no change in delay at the intersections above during the peak hours compared with the No Action Alternative, no significant traffic operations impact would occur as a result of Alternative 1 Option 3 under Opening Year conditions.

The Alternative 1 Option 3 Design Year traffic volume impacts would be less than Alternative 3 Option 3 because trip generation for Alternative 1 is less. In addition, the Alternative 1 Option 3 Design Year traffic volume impacts would occur mostly in the Renton site study area because the CHRLF would be closed before the Design Year. Table 4-24 in Appendix J summarizes the percent increase of traffic volumes at the study intersections attributable to Alternative 3 Option 3 during the weekday peak hours for the Design Year conditions. This table shows that the traffic volume impacts in the Renton site study area are 1 percent or less for Alternative 3 Option 3; thus, the Alternative 1 Option 3 Design Year traffic volume impacts would be small given that trip generation of Alternative 1 is less than Alternative 3.

Based on these results, the additional traffic from Alternative 1 Option 3 would have an impact requiring mitigation at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE due to increased delay in the weekday AM and PM peak hours, anticipated to occur in 2029. Section 13.3 discusses potential mitigation to reduce the impact of the action alternatives on that intersection, and the different timing that may be necessary for each action alternative.

Construction

Alternative 1 Option 3 construction impacts at the CHRLF and within the Cedar Hills study area are the same as those described for Alternative 1 Options 1 and 2. Alternative 1 Option 3 also generates temporary construction impacts at the Renton site from construction of the main support facilities. The traffic generated by construction includes both trucks hauling material and equipment as well as workers. Construction impacts for Alternative 1 Option 3 generally include:

- Arrival, departure, and parking of construction worker vehicles
- Delivery of construction materials
- Removal of debris
- Delivery of construction vehicles and machinery
- Delivery or removal of material during filling or excavation
- Potential impacts to onsite bicycle and pedestrian traffic

These impacts are expected to be temporary and to not have a significant impact on the surrounding transportation network. A construction management plan (CMP) similar to what is described under the No

Action Alternative but specific to the Renton site would be developed and approved by the City of Renton before construction begins at the Renton site.

13.2.1.4 Action Alternative 2

Under Action Alternative 2, landfill development would extend the capacity of the CHRLF to approximately 2038, and the main support facilities would be based at CHRLF (Options 1 and 2) or Renton (Option 3). Prior to and after reaching capacity, both the CHRLF study area and the Renton study area would experience the same types of trips as for Action Alternative 1 for all support facilities options, although the timing, intensity, and duration would change. As with the No Action Alternative and Action Alternative 1, when the landfill closes after it reaches capacity, disposal and associated waste transfer trips would be shifted to either waste export by rail or to a WTE facility somewhere in King County.

Landfill Development with South and North Options

A summary of the weekday daily and peak hour trips for Alternative 2 Options 1 and 2 is shown in Table 13-15. Detailed trip generation forecasts are included in Appendix J.

Table 13-15. Alternative 2 Options 1 and 2 Estimated Weekday Trip Generation—CHRLF.

	Existing	Opening Year (2025)	Capacity Year (2038)	Design Year[1] (2040)
Alternative 2 Options 1 and 2 Daily Trips[2]	812	884	994	340
No Action Alternative Daily Trips	812	884	340	340
Net New Daily Trips	+0	+0	+654	+0
Net New Peak Hour Alternative 2 Options 1 and 2 Trips[3]				
AM Peak Hour	0	5	48	0
Midday Peak Hour	0	5	57	0
PM Peak Hour	0	0	45	0

Notes:

1 The design year trip generation for No Action and Alternative 2 reflects only the remaining trucking and trucking/maintenance staffing because the CHRLF reaches capacity before the horizon year of 2040.

2 Options 1 and 2 include the support facility onsite at the CHRLF.

3 Net new peak hour trips are relative to the No Action Alternative weekday peak hour trips.

As shown in Table 13-15, traffic volume and traffic operation impacts for Alternative 2 Options 1 and 2 would be the same as the No Action Alternative under Opening Year and Design Year conditions since there are no new trips. For the Capacity Year, Alternative 1 Options 1 and 2 is estimated to generate 654 net new trips compared to the No Action Alternative, because CHRLF would be closed in 2028 under the No Action Alternative. The 994 total trips in 2038 under Action Alternative 2 Options 1 and 2 is estimated to be about 180 trips more than the existing daily trips in 2020. The peak hour net new trips are low with Alternative 2 Options 1 and 2 and substantially similar to those for Alternative 1 Options 1 and 2.

Alternative 2 Options 1 and 2 would generate about 150 fewer trips than Option 3 at the Opening Year; about 130 fewer trips than Option 3 at the Capacity Year; about the same as Option 3 at the Design Year. For all options, the overall peak hour net new trips for Alternative 2 is the same, although Options 1 and 2 focus all travel patterns on the CHRLF Site. Detailed trip generation is provided in Appendix J.

Trip generation, traffic volume, and traffic operation impacts for Alternative 2 Options 1 and 2 would be the same as those discussed for the No Action Alternative under Opening Year and Design Year conditions; similar but slightly less than those discussed for Alternative 1 Options 1 and 2 at Opening Year conditions; and substantially similar to those discussed for Alternative 1 Options 1 and 2 under Capacity Year conditions. Traffic volume and traffic operation impacts of Alternative 2 Options 1 and 2 under Capacity Year conditions are similar but slightly less than those discussed for Alternative 3 Options 1 and 2 under Design Year and Capacity Year conditions.

Based on these results, the additional traffic from Alternative 2 Options 1 and 2 would have an impact on the transportation network similar to Alternative 1 Options 1 and 2. Section 13.3 discusses potential mitigation to further reduce the impact of the action alternatives.

The most intense Alternative 2 Options 1 and 2 construction activity would occur for up to four months during the summer in 2027. There is no construction activity in the Design Year because CHRLF reaches capacity in approximately 2038 and would be closed. Construction related trips in 2027 are estimated to be greatest during the fourth month of construction based on the plan for import and export of soils and equipment. Estimated annual, peak monthly, and hourly construction trips for Alternative 2 Option 1 and 2 in 2027 are summarized in Table 13-16.

Table 13-16. Estimated Alternative 2 Options 1 and 2 Peak Construction Trips.

Total Annual Trips[1]	Peak Monthly Trips[2]	Peak Hourly Trips[3]
88,572	29,785	83

Notes:

[1] Annual construction trips occur for up to four months between June and September with a peak in 2027 with Alternative 2.

[2] The peak monthly trips occur in the fourth month of construction.

[3] The peak hourly trips are calculated based on the peak month of construction activity and assuming the construction trips occur for 12 hours a day for seven days a week and are evenly distributed.

Construction impacts would be temporary and would not have a significant impact on the surrounding transportation network. For all construction months, KCSWD would develop a CMP describing procedures for construction activity such as truck routes and hours of operation.

Landfill Development with Renton Site Option

Overall traffic volume and traffic operation impacts for Alternative 2 Option 3 at all horizon years are substantially the same as those for Action Alternative 1 Option 3 compared with the No Action Alternative (see Section 13.2.1.3 and Appendix J). As with Alternative 1 Option 3, Alternative 2 Option 3 would have an impact on the transportation network requiring mitigation. Section 13.3 discusses potential mitigation to reduce the impact of the action alternatives.

Alternative 2 Option 3 construction impacts at the CHRLF are the same as those described for Alternative 2 Options 1 and 2. Alternative 2 Option 3 also generates temporary construction impacts at the Renton site related to construction of the support facility consistent with the temporary construction impacts described at the Renton site for Alternative 1 Option 3.

As with the other action alternatives, these impacts are expected to be temporary and to not have a significant impact on the surrounding transportation network. A CMP would be developed and approved by the City of Renton before construction begins at the Renton site.

13.2.1.5 Action Alternative 3

Under Action Alternative 3, landfill development would extend the capacity of the CHRLF to about late 2046, and the main support facilities would be based at CHRLF (Options 1 and 2) or Renton (Option 3). Prior to and after reaching capacity, the CHRLF study area and the Renton study area would experience the same types of trips as for Action Alternatives 1 and 2 for all support facilities options, although the timing, intensity, and duration would change. As with all other alternatives, when the landfill closes after it reaches capacity, disposal and associated waste transfer trips would be shifted to either waste export by rail or to a WTE facility somewhere in King County.

Landfill Development with South and North Options

Traffic Volumes

A summary of the weekday daily and peak hour trips for Alternative 3 Options 1 and 2 is provided in Table 13-17. Detailed trip generation estimates are included in Appendix J.

Table 13-17. Alternative 3 Options 1 and 2 Estimated Weekday Trip Generation—CHRLF.

	Existing	Opening Year (2025)	Design Year[1] (2040)	Capacity Year (2046)
Alternative 3 Options 1 and 2 Daily Trips[2]	812	884	1,028	1,058
No Action Alternative Daily Trips	812	884	340[2]	340
Net New Daily Trips	0	0	+688	+718
Net New Peak Hour Alternative 3 Options 1 and 2 Trips[3]				
AM Peak Hour	0	0	51	55
Midday Peak Hour	0	0	61	64
PM Peak Hour	0	0	45	46

Notes:

[1] Options 1 and 2 include the support facilities onsite at the CHRLF.

[2] The design year trip generation for No Action Alternative reflects only the remaining trucking and trucking/maintenance staffing because the CHRLF reaches capacity before the horizon year of 2040 with this Alternative.

[3] Net new peak hour trips are relative to the No Action Alternative weekday peak hour trips.

As shown in Table 13-17, Alternative 3 Options 1 and 2 Opening Year condition trip generation is the same as the No Action Alternative and there would be no impacts beyond what is already permitted with the No Action Alternative. The net new trip generation for Alternative 3 Options 1 and 2 in the Design Year is estimated to be 688 daily trips with 51 new trips during the weekday AM peak hour, 61 new trips during the weekday Midday peak hour and 45 new trips during the weekday PM peak hour. Alternative 3 Options 1 and 2 Design Year net new trips are higher than during the Opening Year because with the No Action Alternative the CHRLF would be closed. Alternative 3 Options 1 and 2 is estimated to reach capacity in 2046 with a net new trip generation of 718 daily trips with 55 new trips occurring during the weekday AM peak hour, 64 new trips in the weekday Midday peak hour and 46 new trips in the weekday PM peak hour compared to the No Action Alternative in 2046.

The overall total net new trips are less for Alternative 3 Options 1 and 2 than for Option 3 in all horizon years, although the overall peak hour net new trips for Alternative 3 are the same for Options 1, 2, and 3. Options 1 and 2 travel patterns focus on the CHRLF Site.

A comparison of the action alternatives shows that Alternative 3 Options 1 and 2 net new trips in the Design Year, 2040, would be only approximately 30 trips greater than Alternative 1 Options 1 and 2 net new trips in 2037 (or Alt. 2 Capacity Year), and 35 net new trips greater than Alternative 2 Options 1 and 2 in 2038 (or Alt. 3 Capacity Year). As a result, transportation-related impacts of Alternative 3 Options 1 and 2 in the Design Year are very slightly greater than those identified for Alternative 1 Options 1 and 2 at the Capacity Year (2037).

Traffic Operations

Table 13-18 summarizes the percent increase of traffic volumes at the study intersections attributable to Alternative 3 Options 1 and 2 during the weekday peak hours for the Capacity Year conditions, which represents the worst-case projection, and a comparison with the Design Year conditions.

Table 13-18. Alternative 3 Options 1 and 2 Capacity Year (2046) Traffic Volume Impact.

	Peak Hour Total Entering Vehicles (2046)				Alternative 3 Percent Share Design Year (2040)
Study Intersections	No Action	Net New Trips	Alternative 3 Total Traffic	Percent Share	
Weekday AM Peak Hour					
1. Cedar Grove Rd SE/228th Ave SE	508	55	563	10%	9%
2. Cedar Grove Rd SE/SE Lake Francis Rd	613	53	666	8%	8%
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	1,718	52	1,770	3%	3%
4. Issaquah Hobart Rd SE/SE May Valley Rd	1,740	2	1,742	<1%	<1%
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	1,700	2	1,702	<1%	<1%
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	1,180	0	1,180	0%	0%
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	1,190	0	1,190	0%	0%
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	1,819	37	1,856	2%	2%

Table 13-18 (continued). Alternative 3 Options 1 and 2 Capacity Year (2046) Traffic Volume Impact.					
	Peak Hour Total Entering Vehicles (2046)				Alternative 3 Percent Share Design Year (2040)
Study Intersections	No Action	Net New Trips	Alternative 3 Total Traffic	Percent Share	
Weekday Midday Peak Hour					
1. Cedar Grove Rd SE/228th Ave SE	260	65	325	20%	19%
2. Cedar Grove Rd SE/SE Lake Francis Rd	446	61	507	12%	12%
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	1,306	62	1,368	5%	4%
4. Issaquah Hobart Rd SE/SE May Valley Rd	1,139	4	1,143	<1%	<1%
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	1,009	4	1,013	<1%	<1%
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	570	0	570	0%	0%
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	455	0	455	0%	0%
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	1,390	41	1,431	3%	3%
Weekday PM Peak Hour					
1. Cedar Grove Rd SE/228th Ave SE	438	47	485	10%	10%
2. Cedar Grove Rd SE/SE Lake Francis Rd	589	43	632	7%	7%
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	2,209	43	2,252	2%	2%
4. Issaquah Hobart Rd SE/SE May Valley Rd	2,169	4	2,173	<1%	<1%
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	2,094	4	2,098	<1%	<1%
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	1,885	0	1,885	0%	0%
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	1,175	0	1,175	0%	0%
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	2,579	22	2,601	1%	1%

Note: MVH = Maple Valley Highway

As shown in Table 13-18, generally the Alternative 3 Options 1 and 2 traffic volume impact at the study intersections is the same for both the Design Year and 2046 conditions. The only study intersections where the traffic volume impact is different are along Cedar Grove Road SE. During the AM peak hour at the Cedar Grove Road SE/228th Avenue SE intersection, the 2046 Alternative 3 Options 1 and 2 traffic volume impact would be 1 percent greater than in the Design Year. During the midday peak hour at the Cedar Grove Rd SE/228th Ave SE and the SR 169/SE Renton MVH/Cedar Grove Rd SE intersections, the 2046 Alternative 3 Options 1 and 2 traffic volume impact also would be 1 percent greater than in the Design Year. Traffic volume impacts at the SR 169/SE Renton Maple Valley Hwy/Cedar Grove Rd SE, which has the highest traffic volume in the study area, are projected to be approximately three to five percent during the weekday peak hours for Alternative 3 Options 1 and 2 Design and Capacity Year conditions.

The higher traffic volume impact at the study intersections in the Design and Capacity Years is because the CHRLF reaches capacity by 2028 with the No Action Alternative, resulting in more net new trips for Alternative 3 Options 1 and 2.

The traffic operations for the Design Year Alternative 3 Options 1 and 2 are summarized in Table 13-19.

Table 13-19. Alternative 3 Options 1 and 2 Design Year Weekday Peak Hour LOS Summary.

Intersection	No Action Alternative				Alternative 3		
	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM
Weekday AM Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	13	NB		B	14	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	D	44	-		D	52	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	C	34	-		C	34	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	D	40	-		D	40	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	D	31	WBTL		D	31	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	C	31	-		C	31	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	49	-		D	51	-
Weekday Midday Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	10	SB		B	10	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	15	NB		C	17	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	21	-		C	26	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	A	9	-		A	9	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	A	9	-		A	9	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	B	13	WBTL		B	13	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	A	9	-		A	9	-
Weekday PM Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	C	15	NB		C	16	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	31	-		D	35	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	E	63	-		E	63	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	D	38	-		D	39	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	F	177	WBTL		F	177	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	B	10	-		B	10	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	51	-		D	52	-

Note: Shading indicates intersection operating below LOS standard. MVH = Maple Valley Highway.

1 Level of Service (A – F) as defined by the Highway Capacity Manual (TRB, 6th Edition).

2 Average delay per vehicle in seconds rounded to the whole second.

3 Worst movement or approach reported for side-street, stop-controlled intersections. All other intersections are signalized. SB = southbound, NB = northbound, WBTL = westbound through/left turn movement

As shown in Table 13-19, consistent with the No Action Alternative, most of the study intersections would meet LOS standards under Alternative 3 Options 1 and 2 conditions. The Cedar Grove Road SE/228th Avenue SE intersection and the 228th Avenue SE and SR 169 intersection in the identified peak hours would have good operations in the future with LOS C or better conditions. Background and CHRLF growth with Alternative 3 Options 1 and 2 in 2046 would not result in impacts beyond those identified in the Design Year. The SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection would operate at LOS D during the weekday AM and PM peak hours with an intersection delay increase of four to eight seconds with Alternative 3 Options 1 and 2. This study intersection operates below the LOS C standard because of the high traffic volumes along SR 169 during the weekday AM and PM peak hours and only a single through-lane in each direction. This impact is similar for all Action Alternatives Options 1 and 2, although Alternative 3 intersection delay increases are greater. Mitigation related to this impact is discussed in Section 13.3. The Issaquah Hobart Road SE/SR 18 WB Ramps intersection would operate at LOS D and LOS F during the weekday AM and PM peak hours, respectively; however, no increase in delay with the Alternative 3 Options 1 and 2 is forecast relative to No Action conditions, such that no significant traffic operations impact would occur as a result of Alternative 3 Options 1 and 2.

Construction

As described for Alternative 1, there would be periodic construction with Alternative 3 Options 1 and 2 resulting in offsite trips higher than typical day-to-day operations. The most intense Alternative 3 Options 1 and 2 construction activity would occur for up to four months during the summer in 2026 as shown on Figure 13-5. Offsite construction activity is temporary and would not occur every year during operations of CHRLF.

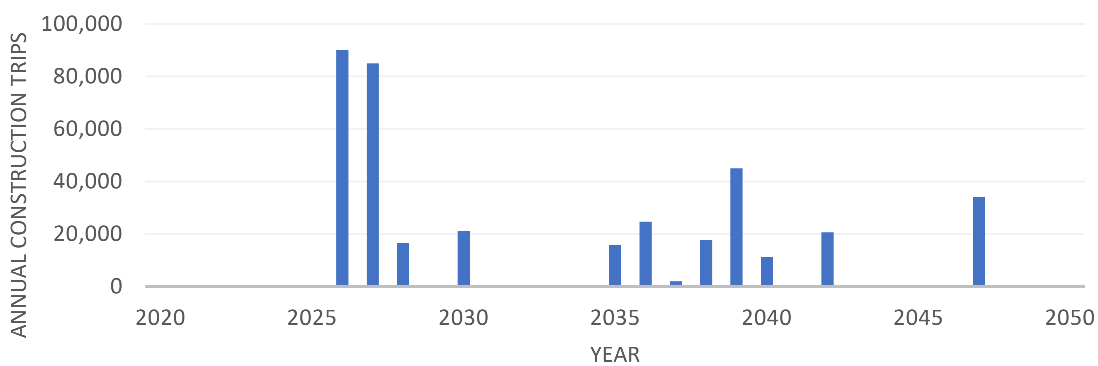


Figure 13-5. Estimated Annual Construction Trips at CHRLF—Alternative 3.

Construction-related trips are estimated to be greatest during the fourth month of construction based on the plan for import and export of soils and equipment. Although 2026 would have the highest annual estimated construction trips, it is anticipated that 2027 would have greater peak hour trips. In addition, 2039 is anticipated to have the highest construction-related traffic within the longer-term horizon. Estimated annual, peak monthly, and hourly construction trips for Alternative 3 Options 1 and 2 are summarized in Table 13-20 for 2026, 2027 and 2039.

Table 13-20. Estimated Alternative 3 Options 1 and 2 Peak Construction Trips.

Year	Total Annual Trips[1]	Peak Monthly Trips[2]	Peak Hourly Trips[3]
2026	90,083	25,079	70
2027	84,945	26,157	73
2039	44,971	14,990	42

Notes:

[1] Annual construction trips occur for up to four months between June and September.

[2] The peak monthly trips occur in the fourth month of construction.

[3] The peak hourly trips are calculated based on the peak month of construction activity and assuming the construction trips occur for 12 hours a day for seven days a week and are evenly distributed.

The table shows the highest hourly construction trips for Alternative 3 Options 1 and 2 occur in 2027 with 73 peak hourly trips. The Alternative 2 constructions trips are slightly higher than Alternative 3 for the near-term or Opening Year horizon. Construction impacts with Alternative 3 would be consistent with those described for Alternatives 1 and 2 including those related to construction of the main support facility. Construction impacts would be temporary, and a CMP would be implemented during all time periods with offsite construction activity.

The Alternative 3 Options 1 and 2 peak hourly construction trips are estimated to be 42 trips in 2039. This represents the highest estimated construction trips of the action alternatives, which generally coincides with the long-term horizon year, Design Year 2040. It should be noted that construction would occur in the summer when the surrounding network traffic volumes are typically lower; however, the traffic volume forecast is based on spring counts and is therefore a more conservative estimate of impact (i.e., an over estimation) when compared to actual expected impacts.

Table 13-21 shows the impacts of construction in the Cedar Hills study area for the Alternative 3 Options 1 and 2 Design Year conditions during the weekday peak hours to understand potential temporary impacts with construction. For context, the Alternative 3 Options 1 and 2 without construction conditions are shown.

Table 13-21. Design Year Weekday Peak Hour With and Without Construction LOS Summary.

Intersection	No Action Alternative				Alternative 3 without Construction				Alternative 3 with Construction		
	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM		LOS	Delay	WM
Weekday AM Peak Hour											
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	13	NB		B	14	NB		B	15	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	D	44	-		D	52	-		E	59	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	C	34	-		C	34	-		C	34	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	D	40	-		D	40	-		D	40	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	D	31	WBTL		D	31	WBTL		D	31	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	C	31	-		C	31	-		C	31	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	49	-		D	51	-		D	54	-
Weekday Midday Peak Hour											
1. Cedar Grove Rd SE/228th Ave SE	B	10	SB		B	10	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	15	NB		C	17	NB		C	18	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	21	-		C	26	-		C	29	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	A	9	-		A	9	-		A	9	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	A	9	-		A	9	-		A	9	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	B	13	WBTL		B	13	WBTL		B	13	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	A	9	-		A	9	-		A	9	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	B	17	-		B	17	-		B	17	-

Table 13-21 (continued). Design Year Weekday Peak Hour With and Without Construction LOS Summary.

Intersection	No Action Alternative				Alternative 3 without Construction				Alternative 3 with Construction		
	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM		LOS	Delay	WM
Weekday PM Peak Hour											
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB		B	12	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	C	15	NB		C	16	NB		C	17	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	31	-		D	35	-		D	38	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	E	63	-		E	63	-		E	63	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	D	38	-		D	39	-		D	42	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	F	177	WBTL		F	177	WBTL		F	180	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	B	10	-		B	10	-		B	10	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	51	-		D	52	-		D	55	-

Note: Shading indicates intersection operating below LOS standard.

1 Level of Service (A–F) as defined by the Highway Capacity Manual (TRB, 6th Edition)

2 Average delay per vehicle in seconds rounded to the whole second.

3 Worst movement or approach reported for side-street stop-controlled intersections. All other intersections are signalized. SB = southbound, NB = northbound, WBTL = westbound through/left turn movement

As shown in the table, all of the study intersections would operate at the same LOS with and without construction except the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE and Issaquah Hobart Rd SE/SR 18 WB Ramps intersections. The SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection would be reduced to LOS E with construction during the weekday AM peak hour conditions. As described previously, offsite construction impacts would be temporary, lasting approximately four months, and would not occur during all phases of the project. Section 13.3, Mitigation Measures describes the CMP that would be implemented during all periods with offsite construction activity.

At the Issaquah Hobart Rd SE/SR 18 WB Ramps intersection, three additional seconds of delay are estimated to occur with construction during the weekday PM peak hour relative to non-construction conditions and the No Action condition. As noted previously, WSDOT has identified a needed change in traffic control at this intersection from stop controlled to a roundabout, significantly improving operations and reducing the delay from LOS F to LOS D at this location during the weekday PM peak hour both under No Action conditions and the future Alternative 3 with-construction conditions. The construction of the roundabout is not yet funded and therefore was not reflected in the operational analysis. The impacts of construction are temporary and potential mitigation measures are identified in in Section 13.3.

Landfill Development with Renton Site Option

Alternatives 1 and 2 Option 3 trip generation when the landfill reaches capacity (2037) would be less than Alternative 3 Option 3 in the Design Year (2040). Alternative 3 Option 3 is estimated to generate 1,167 daily trips with 654 at CHRLF and 513 at the Renton site in the Design Year. As a result, transportation-related impacts of Alternative 3 Option 3 would be the same or slightly more than those identified for Alternatives 1 and 2 Option 3 in 2037 (see section 4.1.5.2 in Appendix J for more detail).

Traffic Volumes

Overall, the increase of traffic volumes at the study intersections attributable to Alternative 3 Option 3 during the weekday peak hours for the Design Year conditions in the Renton site study area is one percent or less (see Table 4-24 in Appendix J).

Table 13-22 summarizes the percent increase of traffic volumes at the study intersections attributable to Alternative 3 Option 3 during the weekday peak hours for the Capacity Year conditions, which represents the worst-case projection.

Table 13-22. Alternative 3 Option 3 Capacity Year (2046) Traffic Volume Impact.

Study Intersections	Peak Hour Total Entering Vehicles				Alternative 3 Percent Share Design Year[1]
	No Action	Net New Trips	Alternative 3 Option 3 Total Traffic	Percent Share[1]	
AM Peak Hour					
1. Cedar Grove Rd SE/228th Ave SE	508	44	552	8%	7%
2. Cedar Grove Rd SE/SE Lake Francis Rd	613	42	655	6%	6%
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	1,718	43	1,761	2%	2%
4. Issaquah Hobart Rd SE/SE May Valley Rd	1,740	2	1,742	<1%	<1%
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	1,700	2	1,702	<1%	<1%
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	1,180	0	1,180	0%	0%
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	1,190	0	1,190	0%	0%
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	1,819	34	1,853	2%	2%
9. 154th Pl SE/SR 169/SE Renton MVH	3,179	34	3,213	1%	1%
10. 140th Way SE/SR 169/SE Renton MVH	3,614	36	3,650	1%	1%
11. I-405 NB Ramps/SR 169/SE Renton MVH	3,995	38	4,033	1%	1%
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	5,079	27	5,106	1%	1%
13. Sunset Blvd N/NE 3rd St	5,584	21	5,605	<1%	<1%

Table 13-22 (continued). Alternative 3 Option 3 Capacity Year (2046) Traffic Volume Impact.

Study Intersections	Peak Hour Total Entering Vehicles				Alternative 3 Percent Share Design Year¹
	No Action	Net New Trips	Alternative 3 Option 3 Total Traffic	Percent Share¹	
AM Peak Hour (continued)					
14. Monterey Dr NE/NE 3rd St	2,933	14	2,947	<1%	1%
15. Edmonds Ave SE/NE 3rd St	2,868	14	2,882	<1%	1%
16. Jefferson Ave NE/NE 3rd St/NE 4th St	2,803	16	2,819	1%	1%
17. 149th Ave SE/SR 169/SE Renton Maple Valley Hwy	2,409	34	2,443	1%	1%
Midday Peak Hour					
1. Cedar Grove Rd SE/228th Ave SE	260	43	303	14%	13%
2. Cedar Grove Rd SE/SE Lake Francis Rd	446	42	488	9%	9%
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	1,306	46	1,352	3%	3%
4. Issaquah Hobart Rd SE/SE May Valley Rd	1,139	1	1,140	<1%	<1%
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	1,009	1	1,010	<1%	<1%
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	570	0	570	0%	0%
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	455	0	455	0%	0%
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	1,390	36	1,426	2%	2%
9. 154th Pl SE/SR 169/SE Renton MVH	2,325	36	2,361	1%	1%
10. 140th Way SE/SR 169/SE Renton MVH	2,861	37	2,898	1%	1%
11. I-405 NB Ramps/SR 169/SE Renton MVH	3,413	44	3,457	1%	1%
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	4,244	35	4,279	1%	1%
13. Sunset Blvd N/NE 3rd St	4,204	31	4,235	1%	1%
14. Monterey Dr NE/NE 3rd St	2,353	22	2,375	1%	1%
15. Edmonds Ave SE/NE 3rd St	2,263	22	2,285	1%	1%
16. Jefferson Ave NE/NE 3rd St/NE 4th St	2,203	24	2,227	1%	1%
17. 149th Ave SE/SR 169/SE Renton Maple Valley Hwy	1,991	35	2,026	2%	2%
PM Peak Hour					
1. Cedar Grove Rd SE/228th Ave SE	438	-7	431	-2%	-2%
2. Cedar Grove Rd SE/SE Lake Francis Rd	589	-5	584	-1%	-1%
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	2,209	3	2,212	<1%	<1%
4. Issaquah Hobart Rd SE/SE May Valley Rd	2,169	-2	2,167	-<1%	-<1%
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	2,094	-2	2,092	-<1%	-<1%
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	1,885	0	1,885	0%	0%
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	1,175	0	1,175	0%	0%
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	2,579	10	2,589	<1%	<1%
9. 154th Pl SE/SR 169/SE Renton MVH	3,869	10	3,879	<1%	<1%
10. 140th Way SE/SR 169/SE Renton MVH	4,585	15	4,600	<1%	<1%

Table 13-22 (continued). Alternative 3 Option 3 Capacity Year (2046) Traffic Volume Impact.					
	Peak Hour Total Entering Vehicles				Alternative 3 Percent Share Design Year[1]
Study Intersections	No Action	Net New Trips	Alternative 3 Option 3 Total Traffic	Percent Share[1]	
PM Peak Hour (continued)					
11. I-405 NB Ramps/SR 169/SE Renton MVH	4,366	18	4,384	<1%	<1%
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	5,818	42	5,860	1%	1%
13. Sunset Blvd N/NE 3rd St	6,339	50	6,389	1%	1%
14. Monterey Dr NE/NE 3rd St	3,440	47	3,487	1%	1%
15. Edmonds Ave SE/NE 3rd St	3,295	47	3,342	1%	2%
16. Jefferson Ave NE/NE 3rd St/NE 4th St	3,185	52	3,237	2%	2%
17. 149th Ave SE/SR 169/SE Renton Maple Valley Hwy	3,075	9	3,084	<1%	<1%

Notes: MVH = Maple Valley Highway

1 Represent the percent impact of Alternative 3 Option 3 relative to the No Action Alternative.

Generally, the Alternative 3 Option 3 traffic volume impact at the study intersections is the same for both the Design Year and 2046 conditions (see Appendix J). The only study intersections where the traffic volume impact is different is at the 228th Avenue SE/Cedar Grove Road SE intersection during the weekday AM and Midday peak hours. The Alternative 3 Option 3 2046 traffic volume impact would be up to one percent greater than in the Design Year due to the three to four additional new trips during the weekday AM and Midday peak hours. The background and CHRLF growth with Alternative 3 Option 3 in 2046 would not result in impacts beyond those identified in the Design Year.

Traffic Operations

The traffic operations for Alternative 3 Option 3 in the Design Year are summarized in Table 13-23.

Table 13-23. Alternative 3 Option 3 Design Year Weekday Peak Hour LOS Summary.							
	No Action Alternative				Alternative 3		
Intersection	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM
Weekday AM Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	13	NB		B	14	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	D	44	-		D	50	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	C	34	-		C	34	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	D	40	-		D	40	-

Table 13-23 (continued). Alternative 3 Option 3 Design Year Weekday Peak Hour LOS Summary.

Intersection	No Action Alternative				Alternative 3		
	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM
Weekday AM Peak Hour (continued)							
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	D	31	WBTL		D	31	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	C	31	-		C	31	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	49	-		D	51	-
9. 154th Pl SE/SR 169/SE Renton MVH	E	71	-		E	71	-
10. 140th Way SE/SR 169/SE Renton MVH	D	50	-		D	50	-
11. I-405 NB Ramps/SR 169/SE Renton MVH	D	42	-		D	43	-
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	F	93	-		F	93	-
13. Sunset Blvd N/NE 3rd St	E	60	-		E	58	-
14. Monterey Dr NE/NE 3rd St	B	14	-		B	14	-
15. Edmonds Ave SE/NE 3rd St	B	16	-		B	16	-
16. Jefferson Ave NE/NE 3rd St/NE 4th St	A	10	-		B	10	-
17. 149th Ave SE/SR 169/SE Renton Maple Valley Hwy	A	7	-		A	7	-
Weekday Midday Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	10	SB		B	10	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	B	15	NB		C	16	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	21	-		C	24	-
4. Issaquah Hobart Rd SE/SE May Valley Rd	A	9	-		A	9	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	A	9	-		A	9	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	B	13	WBTL		B	13	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	A	9	-		A	9	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	B	17	-		B	17	-
9. 154th Pl SE/SR 169/SE Renton MVH	C	34	-		C	34	-
10. 140th Way SE/SR 169/SE Renton MVH	D	39	-		D	39	-
11. I-405 NB Ramps/SR 169/SE Renton MVH	C	27	-		C	27	-
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	D	44	-		D	45	-
13. Sunset Blvd N/NE 3rd St	D	42	-		D	42	-
14. Monterey Dr NE/NE 3rd St	A	10	-		A	10	-
15. Edmonds Ave SE/NE 3rd St	D	39	-		D	39	-
16. Jefferson Ave NE/NE 3rd St/NE 4th St	A	8	-		A	8	-
17. 149th Ave SE/SR 169/SE Renton Maple Valley Hwy	A	8	-		A	8	-
Weekday PM Peak Hour							
1. Cedar Grove Rd SE/228th Ave SE	B	11	SB		B	11	SB
2. Cedar Grove Rd SE/SE Lake Francis Rd	C	15	NB		B	15	NB
3. SR 169/SE Renton MVH/Cedar Grove Rd SE	C	31	-		C	30	-

Table 13-23 (continued). Alternative 3 Option 3 Design Year Weekday Peak Hour LOS Summary.

Intersection	No Action Alternative				Alternative 3		
	LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM
Weekday PM Peak Hour							
4. Issaquah Hobart Rd SE/SE May Valley Rd	E	63	-		E	63	-
5. Issaquah Hobart Rd SE/Cedar Grove Rd SE	D	38	-		D	38	-
6. Issaquah Hobart Rd SE/SR 18 WB Ramps	F	177	WBTL		F	177	WBTL
7. Issaquah Hobart Rd SE/ SR 18 EB Ramps	B	10	-		B	10	-
8. SE Jones Rd/196th Ave SE/SR 169/SE Renton MVH	D	51	-		D	53	-
9. 154th Pl SE/SR 169/SE Renton MVH	E	78	-		E	78	-
10. 140th Way SE/SR 169/SE Renton MVH	D	43	-		D	43	-
11. I-405 NB Ramps/SR 169/SE Renton MVH	B	17	-		B	17	-
12. I-405 SB On-Ramp/SR 169/SE Renton MVH/Sunset Blvd N	E	80	-		E	78	-
13. Sunset Blvd N/NE 3rd St	E	59	-		E	60	-
14. Monterey Dr NE/NE 3rd St	A	10	-		A	10	-
15. Edmonds Ave SE/NE 3rd St	D	36	-		D	37	-
16. Jefferson Ave NE/NE 3rd St/NE 4th St	B	14	-		B	17	-
17. 149th Ave SE/SR 169/SE Renton Maple Valley Hwy	B	11	-		B	11	-

Note: Shading indicates intersection operating below LOS standard. MVH = Maple Valley Highway.

1 Level of Service (A – F) as defined by the Highway Capacity Manual (TRB, 6th Edition)

2 Average delay per vehicle in seconds rounded to the whole second.

3 Worst movement or approach reported for side-street stop-controlled intersections.

4 Evaluated using HCM 2000; HCM 6th Edition does not evaluate the specific phasing of the intersection.

Table 13-23 shows that the study intersections under the Design Year Alternative 3 Option 3 would operate at the same LOS as the No Action Alternative with increases in delay of approximately five seconds or less. The study intersections meet the LOS standards during the weekday AM, Midday, and PM peak hours with the exception of the following intersections.

- Issaquah Hobart Rd SE/SR 18 WB Ramps during the AM and PM peak hours
- 154th Place SE/SR 169/SE Renton MVH during the AM and PM peak hours
- I-405 SB On-Ramp/SR 169/SE Renton Maple Valley Highway/Sunset Blvd N during the AM peak hour
- SR 169/SE Renton Maple Valley Highway/Cedar Grove Rd SE during the AM peak hour –During the weekday AM peak hour, the SR 169/SE Renton Maple Valley Highway/Cedar Grove Rd SE intersection would not meet the LOS standards, operating at LOS D under both the No Action Alternative and Alternative 3 Option 3 for the Design Year, although it would not meet the standard

in the future with or without Alternative 3. The intersection is forecast to have an increase in delay of approximately seven seconds with Alternative 3 Option 3 relative to No Action conditions. Mitigation related to this impact is discussed in Section 13.3.

With the exception of SR 169/SE Renton Maple Valley Highway/Cedar Grove Rd SE, discussed above, the remaining three intersections have no change in delay during the identified peak hours relative to the No Action Alternative, such that no significant traffic operations impact would occur as a result of Alternative 3 Option 3.

As shown in the Table, the 228th Avenue SE/Cedar Grove Road SE intersection would have good operations in the future, with LOS B conditions during the weekday peak hours.

Construction

Alternative 3 Option 3 construction impacts at the CHRLF are the same as those described for Alternative 3 Options 1 and 2. Alternative 3 Option 3 also generates temporary construction impacts at the Renton site related to construction of the support facility consistent with the temporary construction impacts described at the Renton site for Alternatives 1 and 2 Option 3.

As with the other action alternatives, these impacts are expected to be temporary and to not have a significant impact on the surrounding transportation network. A CMP would be developed and approved by the City of Renton before construction began at the Renton site.

13.2.1.6 Indirect Impacts

Indirect impacts on the transportation system, including the combined effects of traffic being generated by increases in capacity of the CHRLF and construction and operations activities in the vicinity of CHRLF and the Renton site, are included in the analysis of direct impacts, including consideration of vehicular and non-motorized travel. The primary analysis considers increases in all modes of travel including pedestrians associated with the RTC expansion and growth in the Renton area and potential conflicts with the action alternative Option 3. It is noted that the KCSWD trucking associated with hauling/mobilizing occurs during the off-peak periods when pedestrian volumes are anticipated to be lower (see Figure 4-15 in Appendix J).

CHRLF Operations

King County waste haul operations currently take place seven days a week and is the assumption used in the analysis described in the previous sections. There is a potential that future operations could be reduced to five days per week. That change is not part of the Cedar Hills Regional Landfill 2020 Site Development Plan and could occur with or without the CHRLF project. A sensitivity analysis was conducted to evaluate potential changes in impacts if operations of the waste haul trucks were change to five days a week (weekdays only). The key assumptions for a review of five-day operations include:

- All Alternatives–If implemented, five-day operations could occur under all alternatives (both No Action and Action) since it would occur regardless of the Cedar Hills Regional Landfill 2020 Site Development Plan.
- Weekly King County Waste Haul Trips – The total forecast weekly King County Waste Haul trips would remain unchanged (no change in forecast tonnage); however, to transfer the same tonnage, more trips would take place on the weekdays. KCSWD has indicated that slightly more trips would occur at the beginning of the week (Monday and Tuesday) compared with end of the week (Thursday and Friday). The distribution of CHRLF trips over the week is illustrated on Figure 13-6 including a comparison of five- and seven-day operations.
- Staffing –The staffing totals would also be reduced on the weekends, consistent with the totals seen after the facility has reached capacity. Weekend staff and contractors would be associated with construction trucking and maintenance of the environmental control systems at the CHRLF.

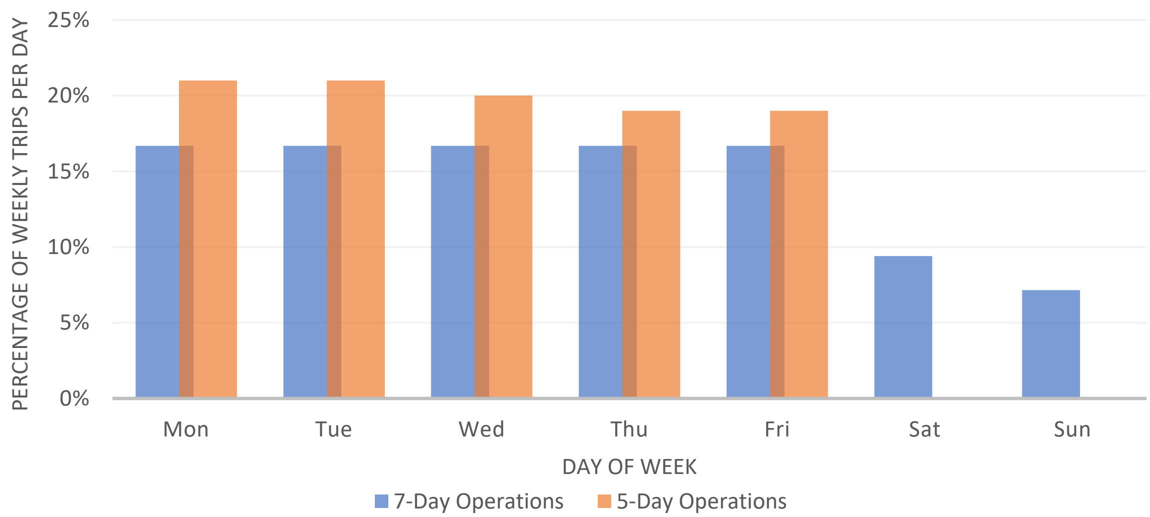


Figure 13-6. Weekly Distribution of King County Waste Haul Truck Trips.

Based on the assumptions noted above for the five-day operations, a comparison of trip generation between the five- and seven-day operations is summarized in Table 13-24. The trip generation for the five-day operations is based on the peak weekday trips, which as shown on Figure 13-6, occurs at the beginning of the week on Monday and Tuesday.

Table 13-24. Estimated Weekday Trip Generation for 5-Day Operations.

	Opening Year				Design Year		
	No Action	Alternative 1[2]	Net New (Alt 1 compared with NA)		No Action[1]	Alternative 3[2]	Net New (Alt 3 compared with NA)
Daily Trips							
7-Day Operations	884	926	+ 42		340	1,028	688
5-Day Operations	954	996	+ 42		340	1,118	778
Difference	+ 70	+ 70	-		-	+ 90	+ 90
AM Peak Hour							
7-Day Operations	48	53	+5		10	61	+51
5-Day Operations	52	57	+5		10	69	+59
Difference	+4	+4	-		-	+8	+8
Midday Peak Hour							
7-Day Operations	64	69	+5		18	79	+61
5-Day Operations	70	75	+5		18	89	+71
Difference	+6	+6	-		-	+10	+10
PM Peak Hour							
7-Day Operations	89	89	0		47	92	+45
5-Day Operations	92	92	0		47	96	+49
Difference	+3	+3	-		-	+4	+4

[1] The Design Year trip generation for No Action reflects the remaining trucking and trucking/maintenance staff-related trips because the facility would reach capacity before the horizon year of 2040.

[2] Alternatives 1 and 3 reflect Options 1 and 2 conditions.

As shown in the Table 13-24 trip generation summary, under the Opening Year condition, there would be up to six additional trips per peak hour or 70 trips on the peak weekday with the change from seven-day to five-day operations. Under the Design Year condition, there would be up to 10 trips per peak hour or 90 trips on the peak weekday with the change from seven-day to five-day operations.

Given the minimal increase in trips with the potential change to five-day operations, the impacts of the alternatives are anticipated to be similar to seven-day operations described in the previous sections. The analysis identified potential alternative impacts at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Rd SE intersection. An additional review was completed at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Rd SE intersection to verify potential impacts from the five-day operations. Table 13-25 summarizes the intersection operations analysis at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Rd SE intersection.

Table 13-25. Intersection LOS at SR 169/SE Renton Maple Valley Hwy/Cedar Grove Rd SE with 5-Day Operations.

SR 169/SE Renton Maple Valley Hwy/Cedar Grove Rd SE	No Action Alternative			Action Alternative Options 1 and 23	
	LOS1	Delay2		LOS	Delay
Opening Year					
Weekday AM Peak Hour	D	50		D	50
Weekday Midday Peak Hour	C	24		C	24
Weekday PM Peak Hour	C	26		C	26
Design Year					
Weekday AM Peak Hour	D	44		E	53
Weekday Midday Peak Hour	C	21		C	27
Weekday PM Peak Hour	C	31		D	35

Note: Shading indicates intersection operating below LOS standard.
Level of Service (A – F) as defined by the Highway Capacity Manual (TRB, 6th Edition)
Average delay per vehicle in seconds rounded to the whole second.
Opening Year = Alternative 1, Design Year = Alternative 3.

The forecast for the SR 169/SE Renton Maple Valley Hwy/Cedar Grove Rd SE with five-day operations are consistent with the seven-day operations presented previously, with the delay within one second of the seven-day operations. A change in delay of one second is not anticipated to result in different mitigation measures for the five- and seven-day operations. Mitigation for this impact is discussed in Section 13.3.

Long-Term Disposal Options

As discussed in Section 1.7, in order to compare the potential impacts of the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046, which is the estimated year of capacity for Action Alternative 3. The impacts that would occur during these intervening years would not occur but for the proposed action selected and are therefore indirect effects. Direct impacts of the action alternatives are discussed above in Section 13.2.1.

For the No Action Alternative between 2028 and 2046, waste transfer vehicle traffic that previously used the transportation network to and from CHRLF to dispose of waste at the landfill would instead travel to and from a WTE facility (which could be the at CHRLF or another site) to deposit waste; or waste transfer vehicle traffic would travel to and from a local intermodal site to transfer waste to rail for transport to a regional landfill. Because the long-term option has not been selected by King County, neither the location of a WTE facility nor an intermodal site are known at this time. Therefore, the indirect impacts on traffic of these changes in transportation pattern cannot be precisely quantified.

For Action Alternative 1, truck traffic would continue to use the transportation network to and from CHRLF or the Renton site until capacity is reached in approximately 2038, as discussed above. After the landfill reaches capacity, the indirect effects on traffic of Action Alternative 1 would be similar to those of the No Action Alternative, with waste transfer vehicle impacts centered on the transportation networks to and from CHRLF or another site in King County (for a WTE facility), or to and from a local intermodal facility and at the destination regional landfill. Traffic associated with trucking and maintenance/operations staff would continue at the selected location for landfill support facilities.

Traffic impacts from Action Alternative 2 would be similar to those for Action Alternative 1, but would extend to approximately 2039 as discussed above, and then indirect impacts from waste trucking would shift to the site(s) associated with the long-term disposal option selected. Traffic associated with trucking and maintenance/operations staff would continue at the selected location for landfill support facilities.

Traffic impacts from Action Alternative 3 would be similar to those of the other action alternatives, but would extend to approximately 2046 as discussed above, and then waste truck impacts would shift to the site(s) associated with the long-term disposal option selected, resulting in indirect effects on traffic. Traffic associated with trucking and maintenance/operations staff would continue at the selected location for landfill support facilities.

Indirect Impacts from Mitigation Measures

There may be indirect impacts related to construction of the northbound right-turn lane at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection as part of the proposed mitigation for the action alternatives (see Section 13.3). Providing the right-turn lane may require shifting the existing Cedar River Trail to accommodate the new turn lane at the intersection. In addition, based on current conditions and regulations, the intersection is in the FEMA 100-year preliminary floodplain and regulatory floodplain as well as within an area that supports fish passage. Mitigation may be required related to the floodplain and fish passage conditions.

A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the 2019 King County Comprehensive Solid Waste Management Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

13.2.2 Cumulative Impacts

Cumulative impacts, which are the combined effects of traffic being generated by increases in capacity of the CHRLF and its construction activities and the traffic generated from other sources, are included in the analysis above.

The future funded improvements within the study areas and their corresponding impacts on the transportation networks are applied to all alternatives consistently. King County Metro Connects Long Range Plan, 2017, identifies improved service and new express bus service between Maple Valley, Renton, Overlake, Issaquah, and Enumclaw by 2040. The transit improvements would not change travel to and from the CHRLF; however, background traffic could be reduced with improved service resulting in people using transit as an alternative to driving.

In addition, WSDOT had identified an improvement along SR 18 at the Issaquah Hobart Road ramps. The project would convert the existing stop controlled and signalized ramp intersections to roundabouts by 2024. The design of this project is funded; however, the construction is not funded and thus was not assumed.

The funded planned improvements identified in the vicinity of the Renton site include:

- Renton TC to Auburn Station–Construct a new RapidRide (I) line between Renton, Kent, and Auburn.
- I-405 Corridor Widening and Express Toll Lanes.
- Add a local bus route from Renton Highlands to Auburn, expected to be running in 2025.
- Sidewalk to be added to the east side of Edmonds Avenue NE.

The proposed action alternatives would contribute to the general cumulative increase in traffic in the CHRLF and Renton study areas over the time the landfill remains open under each action alternative.

13.3 Mitigation Measures

This section presents mitigation measures that would offset or reduce potential transportation impacts of the action alternatives. The impacts of the action alternatives described in Section 13.2, Environmental Impacts, are similar, which would result in similar mitigation measures for the action alternatives.

13.3.1 Intersection Improvement

The evaluation of the alternatives showed that the action alternatives would have a significant traffic operations impact at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection. No other significant impacts to traffic operations requiring mitigation are identified in the Cedar Hills and Renton site study areas.

13.3.1.1 Timing of Mitigation

The SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection would operate below the LOS C standard in the Opening Year for the No Action Alternative and the action alternatives for Options 1, 2 and 3 during the weekday AM peak hour. The action alternatives would not increase delay at this intersection in the Opening Year; so, there are no significant impacts that would require mitigation at this intersection in the short-term.

The long-term Design Year analysis shows that Alternative 3 Options 1, 2 and 3 would have a significant traffic operations impact at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection. The intersection would operate at LOS D during the weekday AM peak hour, which is below the LOS C standard, and Alternative 3 Options 1, 2, and 3 would increase delay relative to the No Action Alternative. In addition, with Alternative 3 Options 1 and 2 the intersection operations would be reduced from LOS C with the No Action Alternative to LOS D during the weekday PM peak hour.

KCSWD projects annual incremental increases in CHRLF traffic with the No Action Alternative and all the action alternatives. The evaluation of Opening and Design Year conditions bookends when transportation impacts are anticipated with the action alternatives. Trips associated with waste tonnage increases are consistent with all action alternatives and it is anticipated that sometime between 2025 and 2040, before CHRLF reaches capacity, the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection would be impacted by the action alternatives. The Design Year analysis of Alternatives 1 and 2 Options 1, 2 and 3 showed the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection would not be impacted in the Design Year because the CHRLF would reach capacity and close to landfilling before 2040; however, these alternatives would impact the intersection before reaching capacity.

A year-by-year evaluation of increases in action alternatives traffic was conducted to find the timing for significant traffic operations impact at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection. The analysis shows that the action alternatives would impact the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection by approximately 2029. This timing corresponds to when the CHRLF would reach capacity with the No Action Alternative.

13.3.1.2 Potential Improvements Due to Mitigation

The SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection is under WSDOT's jurisdiction. WSDOT requires an Intersection Control Evaluation (ICE) be prepared as part of the design for intersection improvements. Before planning, designing and constructing the mitigation for SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE, WSDOT would require the ICE to finalize the improvement. A review of intersection operations shows that provision of an approximately 100-foot northbound (or northwest-bound) right-turn lane along SR 169 would mitigate the potential traffic impact of the action alternatives. Installation of the right-turn lane is recommended with all the action alternatives (Alternatives 1, 2, 3 with Options 1, 2, and 3). Table 13-26 provides a summary of intersection operations with the proposed mitigation measure. Traffic operations are shown for Alternative 3 Options 1 and 2 in the Design Year, representing the highest traffic levels projected at this intersection.

Table 13-26. Design Year Intersection LOS with Right-Turn Lane Mitigation.

SR 169/SE Renton Maple Valley Hwy/Cedar Grove Rd SE	No Action Alternative			Alternative 3 Options 1 and 2 No Mitigation			Alternative 3 Options 1 and 2 with Mitigation	
	LOS1	Delay2		LOS	Delay		LOS	Delay
Weekday AM Peak Hour	D	44		D	52		C	26
Weekday Midday Peak Hour	C	21		C	26		B	19
Weekday PM Peak Hour	C	31		D	35		C	35

Note: Shading indicates intersection operating below LOS standard.

Level of Service (A–F) as defined by the Highway Capacity Manual (TRB, 6th Edition)

Average delay per vehicle in seconds rounded to the whole second. For the Weekday PM Peak Hour, Alternative 3 without mitigation results in an LOS D 35.1 and with mitigation results in an LOS C 34.8.

As shown in Table 13-26, construction of a right-turn lane at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection would mitigate the impacts of the action alternatives.

13.3.1.3 Traffic Monitoring

The intersection mitigation measure is intended to offset the potential transportation impact of the action alternatives that would occur beginning in approximately 2029. The increase in capacity of the landfill with the action alternatives will extend traffic associated with CHRLF operations for between 16 and 25 years from today, depending on the action alternative. The transportation mitigation should be implemented at the time the impact would occur. KCSWD is coordinating with WSDOT on an agreement for a traffic monitoring program to ensure the appropriate mitigation is in place in a timely manner.

13.3.1.4 Construction Management Plan

For all construction months, KCSWD would develop a CMP describing procedures for construction activity such as truck routes and hours of operation. The following would be considered in the CMP to mitigate potential impacts of construction activity:

- Construction activities would be scheduled so that the most intensive activities in terms of construction traffic are spread out over time and to minimize the intensity during peak periods of traffic congestion, where possible.
- Truck routes would be identified, and consideration would be given to not routing all traffic via SR 169 to reduce the impact at the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection. Not all construction trips are routed to/from SR 169 for the primary analysis. The primary analysis shows there is capacity at the Issaquah Hobart Road SE intersections with SE May Valley Road and Cedar Grove Road SE to accommodate the temporary trips related to construction.
- Manual traffic control (flaggers) could be provided at the CHRLF access and SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection, as appropriate.

In addition, the intersection improvement discussed in Section 13.3.1.2 describes the potential right-turn lane to mitigate long-term impacts of the action alternatives. If this mitigation is implemented, construction impacts would be less than described in Section 13.2. **Error! Reference source not found.** in Appendix J shows the traffic operations of the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection during construction with implementation of the right-turn lane. Operations of the SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection during construction for the weekday AM and Midday peak hours would improve with construction of the intersection improvement; however, the improvement would not fully mitigate the impacts of construction during the weekday PM peak hour. The CMP would be implemented to mitigate the temporary impacts during construction.

13.4 Significant Unavoidable Adverse Impacts

The action alternatives would increase the capacity of the CHRLF, allowing it to remain open for an additional nine to 18 years beyond what would occur with the No Action Alternative. KCSWD anticipates that the tonnage of waste going to the CHRLF would grow annually, which would result in additional trips to and from the CHRLF.

The I-405 Southbound on-Ramp/SR 169/SE Renton Maple Valley Highway/Sunset Boulevard North, Issaquah Hobart Road SE/SR 18 Westbound Ramps and 154th Place SE/SR 169/SE Renton Maple Valley Highway intersections operate at LOS E or F during the weekday AM and PM peak hours. These intersections would also have poor operations with the No Action Alternative and action alternatives in both the Opening and Design Year conditions. The action alternatives would not increase delay at these intersections. Impacts to the I-405 Southbound On-Ramp/SR 169/SE Renton Maple Valley Highway/Sunset Boulevard North, Issaquah Hobart Road SE/SR 18 Westbound Ramps, and 154th Place SE/SR 169/SE Renton Maple Valley Highway intersections are considered cumulative, significant, and unavoidable adverse impacts that would occur with or without the action alternatives. It has been noted that WSDOT has an unfunded planned improvement at Issaquah Hobart Road SE/SR 18 Westbound Ramps to provide a roundabout. An analysis with the roundabout shows that the Issaquah Hobart Road SE/SR 18 Westbound Ramps intersection may continue to operate at LOS D for the Design Year condition under the No Action and alternative action conditions. WSDOT currently has a LOS C standard at the Issaquah Hobart Road SE/SR 18 Westbound Ramps intersection.

With implementation of the proposed intersection mitigation (SR 169/SE Renton Maple Valley Highway/Cedar Grove Road SE intersection), there would be no significant and unavoidable impacts to traffic related solely to the increase in capacity of the CHRLF or relocation of the main landfill support facilities.

14.0 PUBLIC SERVICES AND UTILITIES

This chapter describes how implementation of any of the action alternatives, including the facility relocation options, could affect public services and utilities in the vicinity of the CHRLF and the Renton site, compared to the No Action Alternative. This discussion includes potential impact on water and sewer, natural gas, electricity, solid waste services, police, fire and emergency services, communications, and maintenance at CHRLF and the Renton site.

The environmental review determined there would be no significant unavoidable adverse impacts to public services and utilities in the vicinity of CHRLF or the Renton site during construction or operation of any of the alternatives, including the facility relocation options.

14.1 Affected Environment

14.1.1 Water and Sewer

14.1.1.1 Cedar Hills

Potable water is supplied to the CHRLF by King County Water District 90 at a connection along SE 159th Street and conveyed to the site through a 10-inch-diameter pipeline that runs along the south side of the Southwest Siltation Pond and CSW Lagoon. The CHRLF system provides potable water to CHRLF operations and maintenance facilities, BEW facilities and operations, and neighboring Parks and Passage Point facilities. The CHRLF facilities connected to the potable water system include the LEPS control/generator building, maintenance building, lunchroom, engineering offices, conference room office building, and site laboratory. BEW is also connected to the potable water system and metered separately.

The non-potable water system is an onsite network of water mains serving nine onsite fire hydrants, a booster pump fire system for Passage Point, and a water truck fill station. The non-potable water is supplied from regional groundwater and pumped into a reservoir that supplies the support facilities area with water for fire suppression and equipment washing purposes, dust control for landfilling operations, and Passage Point with fire suppression. The system is served by three onsite groundwater wells. The wells pump water to a 14-inch line connected to a 1.73-million-gallon steel tank reservoir located northwest of the Passage Point facility, within the east buffer zone. The water from the tank flows by gravity to the Passage Point facility and to the fire hydrants in the support facilities area. Based on the existing water right, the wells can supply a maximum of 400 gallons per minute, and up to a total of 9.7 million gallons of water annually.

The sanitary sewer system serving the CHRLF administration and support facilities discharges to a KCWTD sanitary sewer pipeline. The system is comprised of primarily 6-inch-diameter gravity pipe collecting flows from the shop facilities, truck wash restrooms, and portions of the upper parking lot, and restrooms within the office, break rooms, and administrative offices. BEW also connects to the CHRLF sanitary sewer system with flow from their onsite system.

Precipitation that has come into contact with municipal solid waste, either through percolation (leachate) or direct runoff (CSW), is pre-treated through both detention at the CSW pond (for run-off), and through aeration/biological processes at the leachate lagoons (for both leachate and CSW). A discharge permit allows for 2.7 million gallons per day of treated effluent to be discharged to a KCWTD sanitary sewer pipeline.

Stormwater is discussed in Chapter 5, Surface Water.

14.1.1.2 Renton Site

Access to the Renton site is from Jefferson Avenue NE on the east side, the same road currently used to access KCSWD's Renton Transfer Station, on adjacent property. Currently, no utilities are extended into the site. Utilities are located just outside the site on Jefferson Avenue NE and would be extended into the site under the personal vehicle entrance. Potable water would be provided by City of Renton, which relies on four sources: 1) six downtown wells located in Liberty and Cedar River Parks, which draw water from the Cedar Valley Aquifer; 2) Springbrook Springs, a small spring located in south Renton; 3) the Maplewood wellfield located at the Maplewood Golf Course; and 4) Seattle Public Utilities, which gets its supply from the Cedar and Tolt rivers.

Sanitary sewer services would be provided by the City of Renton Wastewater Utility for conveyance facilities, and by KCWTD's South POTW for treatment.

Stormwater is discussed in Chapter 5, Surface Water.

14.1.2 Natural Gas

14.1.2.1 Cedar Hills

As previously stated in Section 1.3.5, KCSWD leases 2 acres in the southeast area of CHRLF to BEW for a facility to convert landfill gas produced at the landfill into pipeline-quality renewable natural gas for use in the region. Once processed, the methane gas is pumped into a natural gas pipeline owned by the Northwest Pipeline Corporation (Northwest).

The Northwest natural gas pipeline is located along the south side of the property, south of the BPA easement and the leachate lagoons and in the south buffer area. A 20-foot-wide easement was acquired by Northwest when the pipeline was installed (Williams 2005); KCSWD is not allowed to build within this easement. A north–south natural gas line is also located along the eastern edge of the CHRLF site. Puget Sound Energy (has a 40-foot pipeline easement connecting the BEW facility to a metering station at the Northwest pipeline along 228th Ave SE in the southeast corner of the property. No external connection to offsite natural gas supplies exists for CHRLF.

14.1.2.2 Renton Site

PSE would supply natural gas to the Renton site as no current utility is available.

14.1.3 Electrical Facilities

14.1.3.1 Cedar Hills

Electricity is supplied to the CHRLF site by 3-phase power lines owned by PSE. For the most part, power is supplied to the CHRLF facilities and shop area by way of aerial wires, except for underground power from the shop area to the truck wash and fuel island. In addition to PSE-supplied power, the site has nine generators. With the exception of the North Flare Station portable generator, the generators are run regularly to ensure proper operation.. The North Flare Station generator runs only in the event of a local power failure.

High-voltage electrical transmission lines operated by BPA cross the CHRLF site at two locations. A north–south BPA transmission line easement is located along the eastern edge of the CHRLF site. Five east–west transmission lines owned by BPA are located on the southern portion of the CHRLF site. There are limitations on land uses and activities that can occur within the BPA easements (see Section 2.1.5).

14.1.3.2 Renton Site

PSE would supply electricity to the Renton site as no current utility is available.

14.1.4 Solid Waste Services

14.1.4.1 Cedar Hills

KCSWD provides a full range of solid waste services in the region, of which disposal at the CHRLF is an integral part. All municipalities in King County except the cities of Seattle and Milton are served by the County system. Since July 1988, cities have entered into ILAs with the County that establish KCSWD as the lead planning agency. In 2013, the County worked with the cities to amend the original ILAs. The Amended and Restated Solid Waste Interlocal Agreements extend the original ILAs by 12.5 years, from June 2028 through December 2040.

King County's solid waste disposal system is a public-sector operation that is funded almost entirely by fees collected from its customers. The fees charged at County facilities (called "tipping fees") pay for the construction, operation, and maintenance of CHRLF facilities and equipment, and administrative operating expenses and overhead.

A portion of KCSWD's revenue is transferred from the Solid Waste Operating Fund to reserve funds. These funds were established to ensure that the division can meet future obligations, or expenses, some of which are mandated by law. Contributions to reserve funds are routinely evaluated to ensure they are adequate to meet short- and long-term needs. Paying into reserve funds stabilizes the impact on rates for certain expenses by spreading the costs over a longer time period and ensures that customers who use the system pay the entire cost of disposal.

One such fund is the Landfill Reserve Fund, codified in KCC 4.08.045, which covers the costs of four major accounts maintained for the CHRLF, shown below. The cell closure and post-closure maintenance accounts are mandated by federal and state law.

- New area development account: Covers the costs for planning, designing, permitting, and building new refuse cells.
- Facility improvements account: Covers a wide range of capital investments required to sustain the infrastructure and operations at the landfill, such as enhancements to the landfill gas and wastewater systems.
- Cell closures account: Covers the cost of closing refuse cells within the landfill that have reached capacity. These contributions help the division prepare incrementally for the cost of final closure of the entire landfill.
- Post-closure maintenance account: Accumulates funds to pay for post-closure maintenance of the Cedar Hills landfill for at least 30 years.

King County has adopted a goal of “Zero Waste of Resources” by 2030 as a principle designed to eliminate the disposal of materials with economic value. Improvements in waste reduction; recycling in the unincorporated areas, within cities, and at transfer stations; and continued improvement in recycling of organics (yard and food waste) could substantially reduce the volumes of material that enter the CHRLF.

With permitted capacity at CHRLF predicted to be used by about 2028, new long-term disposal options are required. When the landfill reaches capacity and closes, the County will no longer own or operate a disposal facility. King County Ordinance 14236 prohibits the County from developing a replacement landfill either in King County or elsewhere. King County has not yet selected the long-term disposal option that will be used once the CHRLF reaches its capacity under the alternative selected as the result of this EIS process, but the Solid Waste Comp Plan indicates it would be either waste export by rail to a regional landfill or a WTE facility located somewhere in King County.

14.1.4.2 Renton Site

Municipal solid waste disposal service is mandatory per City of Renton code. All properties are required to have adequate service levels to prevent overflow of materials. Waste disposal service at the Renton site would be provided by the City of Renton contractor for solid waste collection services, currently Republic Services. Recycling and organics collection would also be provided by the City’s contractor.

14.1.5 Police, Fire, and Emergency Medical Services

14.1.5.1 Cedar Hills

Eastside Fire & Rescue, part of King County Fire District 10, serves the landfill. Fire District 10 provides technical rescue, hazardous material, and wild land services for deployment at CHRLF (KCFD 2019). The closest facility to the CHRLF is Fire Station 78 located at 20720 SE May Valley Road in Issaquah, about

5.6 miles (driving distance) from the landfill. Precinct 3 of the King County Sheriff's department supplies police service to the landfill, and Bellevue Medic One/EMS Services provides advanced life support services in the area including the CHRLF.

Water for fire control is obtained on site by means of three non-potable water wells located northwest of the Passage Point facility, within the east buffer zone. The three wells pump groundwater into a 1.7-million-gallon water tank located at the eastern portion of the site. The water from the tank flows by gravity to the Passage Point facility and to six fire hydrants in the support facilities area (KCSWD 2019c).

14.1.5.2 Renton Site

The Renton Police Department would serve the Renton site and with the nearest station approximately 2.5 miles from the site. The Renton Regional Fire Authority services the City of Renton for fire response and maintains a base within two miles of the site. Bellevue Medic One/EMS Services provides advanced life support services in the area including the Renton site.

14.1.6 Schools

14.1.6.1 Cedar Hills

The CHRLF is entirely within the Issaquah School District #411. The closest school to the landfill is the Maple Hills Elementary School, approximately 0.33 miles to the west of the CHRLF property boundary. Several other schools are located between 2.5 and three miles away, including Briarwood Elementary, Lincoln Senior High School, and Maywood Middle School to the west and northwest (Issaquah School District); Ridgewood Elementary and Northwood Middle School to the southwest (Kent School District); and Tahoma Elementary, Shadow Lake Elementary, and Cedar River Elementary to the south (Tahoma School District).

14.1.6.2 Renton Site

The Renton site is entirely within the Renton School District. The closest school to the site is the Highlands Elementary School, approximately 0.59 mile to the north of the site property boundary. Other nearby schools include Honey Dew Elementary, approximately one mile to the northeast; Maplewood Heights Elementary School, approximately 1.4 miles to the east; Sartori Elementary, approximately one mile to the west; Renton Senior High School, approximately 1.4 miles to the west; and Tiffany Park Elementary School, approximately 1.3 miles to the south.

14.1.7 Parks or Other Recreational Facilities

Parks and other recreational facilities are discussed in Chapter 11, Land and Shoreline Use.

14.1.8 Communications

Communications infrastructure in the vicinity of CHRLF and the Renton facility site is provided by the following: landline telephone by Century Link; cable by Xfinity; internet by Century Link, and mobile wireless by AT&T, T Mobile, and Verizon.

14.1.9 Maintenance

Maintenance of CHRLF facilities and any facilities at the Renton site would be undertaken by KCSWD.

14.2 Environmental Impacts

14.2.1 Direct and Indirect Impacts

14.2.1.1 No Action Alternative

No new utilities are proposed as part of the No Action Alternative. Relocation of various portions of the sewer, water, communications, and PSE electrical facilities would be required for some refurbishment or replacement of facilities at CHRLF that are at the end of their useful life, but no additional services would be required. Use of temporary interim facilities will be in an industrial area where public services and utilities are scaled to meet the types of industrial uses KCSWD would locate there, although service and utility providers would likely change over time. Impacts would be minimal.

14.2.1.2 Action Alternatives

Landfill Development

No new utilities are proposed as part of any of the action alternatives. Relocation of various portions of the sewer, water, communications, and PSE electrical facilities would be required for all action alternatives at CHRLF. Brief, temporary interruptions to these services could occur on the CHRLF site during the relocations; however, no impacts to these services off of the CHRLF site would be anticipated. With the infrastructure improvements anticipated as part of the action alternatives, the capacity of the sewer utility and the permitted discharge volumes at CHRLF would not be exceeded for any of the action alternatives. According to King County Water District 90, potable water supplies may be inadequate for planned upgrades under the action alternatives. KCSWD would coordinate with Water District 90 to design and provide adequate capacity for all action alternatives. KCSWD will also work with Water District 90 and maintain on site fire suppression water supplies in the existing 1.7-million-gallon water tank, to ensure that adequate water supply and pressure for firefighting is available at all times, and to minimize the likelihood of temporary disruption of service to Passage Point. As discussed above and in Section 10.2.1.2, there would be no impacts to the existing natural gas pipelines or BPA transmission lines under any of the action alternatives.

Under all action alternatives, the CHRLF would maintain active disposal operations farther into the future than the No Action Alternative and represent an ongoing need for fire or emergency medical services due to potential additional accidents or health incidents on site. For this additional amount of time, emergencies requiring deployment would expose first responders to health and safety risks similar to those that would be encountered currently. Construction of refuse areas under all action alternatives would lead to an increased need over a longer period of time for fire or emergency medical services due to potential additional accidents or health incidents on site. However, police, fire, and emergency medical services serving the CHRLF have adequate capacity to handle any emergency services resulting from the action alternatives. KCSWD would work with police, fire, and emergency medical services during final design and construction, and over the longer period of operation under all the alternatives, to ensure that reliable emergency access is maintained and to inform them of construction schedules and any potential road delays.

None of the alternatives would lead to a measurable increase in the need for public transit, health care, or schools although employees and users of those services may be affected by any of the impacts discussed throughout this EIS that occur within the study area under the action alternatives.

Selection of the No Action Alternative would result in CHRLF reaching capacity sooner than any of the action alternatives. Modifications to the CHRLF infrastructure to extend the life and location of support facilities would result in costs for capital improvements and changes in the cost of system operation and maintenance, all of which could affect the rates paid by the system's customers. However, the action alternatives would likely result in lower solid waste disposal rates for King County ratepayers when compared to the period after the No Action Alternative.

Modifications to CHRLF and associated support facilities would be unlikely to result in significant adverse impacts on public services and utilities, including fire and police services, schools, maintenance, communications, water and stormwater, and sanitary sewer services. The potential for impacts on parks and other recreational facilities in the vicinity of CHRLF from the action alternatives is discussed in Chapter 11, Land and Shoreline Use.

Support Facility Options

Construction of landfill support facilities at CHRLF under all action alternatives would lead to an increased need over a longer period of time for fire or emergency medical services due to potential additional accidents or health incidents on site. However, police, fire, and emergency medical services serving the CHRLF and the Renton site have adequate capacity to handle any emergency services resulting from the action alternatives. KCSWD would work with police, fire, and emergency medical services during final design and construction, and over the longer period of operation under all the alternatives, to ensure that reliable emergency access is maintained and to inform them of construction schedules and any potential road delays. Water and sewer services for newly constructed landfill support facilities would access existing water and sanitary sewer connections, with no increase in demand, but for a longer period than under the No Action Alternative.

Development of the Renton site to provide necessary landfill support functions under Option 3 would require services from PSE (electricity), City of Renton (water, sewer, stormwater), the City of Renton's solid waste contractor, CenturyLink (telephone), and one of the broadband internet providers. Connections from these utilities are all available. Services to the site would incrementally increase the demand for public services and utilities, including fire, police, and emergency medical services; water, stormwater, and sewer services; communications services; and solid waste services. All the public service and utility providers identified have adequate capacity to handle any services required at or resulting from the development and use of the Renton site. The project would not lead to a measurable increase in the need for public transit, health care, recreation, or schools. The potential for impacts on parks and other recreational facilities in the vicinity of the Renton site from the action alternatives is discussed in Chapter 11, Land and Shoreline Use.

Construction activities on the Renton site or in the immediate vicinity include but are not limited to the installation of primary electrical service; onsite light poles and foundations; street lights; communications and power connections between new buildings; power panels and power meters; fire mains, hydrants, and fire department points of connection; storm drains and bioswales; communication conduits and cabling, sanitary sewer and side sewer lines, manholes, and connections; new backflow preventers and meters for fire and domestic water; and utility vaults and pads.

KCSWD would work with the utility providers during final design, construction, and operation of the proposed facilities to ensure that reliable emergency access is maintained and to inform them of construction schedules and any potential disruptions. KCSWD would coordinate with the City of Renton to ensure that adequate water supply and pressure for firefighting is available at new facilities and would also coordinate with all other public service utilities to ensure that adequate capacity is available for all facilities.

14.2.2 Indirect Impacts

The limited impacts on public services and utilities from the landfill development and facility relocation construction and operation at CHRLF and the facility relocation construction and operation at the Renton site are unlikely to lead to additional projects or actions that would result in indirect public services and utilities impacts.

As discussed in Section 1.7, in order to compare the potential impacts from the action alternatives and the No Action Alternative over the same period into the future, this EIS must consider potential impacts in the intervening years between the estimated year of capacity for the No Action Alternative and Action Alternatives 1 and 2, and 2046–the estimated year of capacity for Action Alternative 3. The impacts that would occur during these intervening years would not occur but for the proposed action selected and are therefore indirect effects. Direct impacts of the action alternatives are discussed above in Section 14.2.1. For the No Action Alternative between 2028 and 2046, waste disposal could involve either waste export to a regional landfill or disposal at a WTE facility. A regional landfill accepting waste from the County is likely to be an existing facility, so any public services and utilities impacts from that landfill would not result from the County's waste export. Waste export could require development of an intermodal facility that could have impacts, although such a facility is likely to be located in an area where any impacts associated with provision of public services and utilities would probably be minor. A WTE facility, located at a site in the county, could result in public services and utilities impacts that would be highly dependent on the specific facility location and design.

A more detailed description of potential impacts associated with the long-term disposal options can be found in the Final EIS for the Solid Waste Comp Plan <https://your.kingcounty.gov/dnrp/library/solid-waste/about/planning/2019-comp-plan-final-EIS.pdf>.

14.2.3 Cumulative Impacts

The proposed action alternatives, including the activities associated with landfill development and facilities relocation at the CHRLF and the Renton site, would contribute to the general cumulative increase in demand for public services and utilities in the CHRLF and Renton study areas over the time the landfill and support facilities remain open under each action alternative.

14.3 Mitigation Measures

Although mitigation strategies are not required due to a lack of significant adverse impact findings, to address the potential for less-than significant impacts to essential services in the vicinity of the CHRLF, KCSWD could consider adopting the following measures:

- Provide fire and emergency service workers with a full set of updated Safety Data Sheets (SDSs) (formerly MSDSs or Material Safety Data Sheets) for hazardous chemicals used on site.
- Provide Maple Hills Elementary School with input on its emergency response plan to cover potentially hazardous situations arising from CHRLF operations.
- Install air and odor monitoring equipment at Maple Hills Elementary School that alerts Issaquah School District Staff and KCSWD in case of regulatory exceedances.
- Identify and evaluate future service system needs through collaborative planning between KCSWD and PSE.
- Install photovoltaic and other local energy generating technologies to reduce the demand on the public generating and distribution facilities.
- For facilities relocation, construction and operation of LEED compliant (or similar ranking system) buildings would reduce the power and water requirements for the facilities (e.g., incorporation of passive systems and modern power saving units could reduce the use of power in building heating and cooling).

14.4 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on public services and utilities would occur under any of the alternatives.

15.0 REFERENCES AND INFORMATION SOURCES

Aspect. 2010a. Results of Groundwater Sampling and Fate and Transport Analysis, South Solid Waste Area Perched Zone Assessment. Prepared for KCSWD. April 5.

Aspect. 2010b. East Main Hill Perched Zones Technical Memorandum, Cedar Hills Regional Landfill, October 22.

Aspect. 2011. Regional Aquifer Technical Memorandum, Cedar Hills Regional Landfill. Prepared for KCSWD. March 24.

Aspect. 2013. Environmental Monitoring Sampling and Analysis Plan for Cedar Hills Regional Landfill. Prepared for KCSWD. December 31.

Blakely, R.J., R.E. Wells, C.S. Weaver, and S.Y. Johnson. 2002. Location, Structure, and Seismicity of the Seattle Fault Zone, Washington: Evidence from Aeromagnetic Anomalies, Geologic Mapping, and Seismic-Reflection Data. Geological Society of America Bulletin, 114(2), pp. 169–177.

CH2M HILL. 1999. Cedar Hills Regional Landfill Hydrogeologic Report. March.

CH2M HILL 1988. Sole-Source Aquifer Petition for the Cedar River Aquifer, Renton, Washington. November 1988.

CH2M HILL and Udaloy Environmental Services (UES). 2004. Cedar Hills Regional Landfill Site-Wide Hydrogeologic Report. Prepared for the King County Solid Waste Division (KCSWD). May.

City of Renton. 2012. Water System Plan Update: A Comprehensive Water System Plan. Prepared by City of Renton with the assistance of Carollo Engineers. December 2012.

City of Renton. 2017. City of Renton Surface Water Design Manual. December 12, 2016

City of Renton. 2019. Critical Areas Map. <http://rp.rentonwa.gov/HTML5Public/Index.HTML?viewer=CORMaps>.

Ecology. 2015. Letter to Bryan Taylor, Antea Group, from Dale Myers, Ecology Site Manager, RE: No Further Action. February 18.

Ecology. 2019 Stormwater Management Manual for Western Washington, Washington Department of Ecology. Ecology Publication No. 19-10-021).

Ecology. 2020. Health Impact Review of Toxic Air Pollution. Accessed June 12, 2020. <https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Air-Quality-permits/Notice-of-Construction-permit/Health-impact-assessments-of-toxic-air-pollutants>.

EMCON. 1996. Final Report Hydrogeologic Characteristics of the Lower Cedar River Basin. Prepared by EMCON and Hong West Associates for King County Surface Water Management December 30.

EPA. 1992. Record of Decision Declaration, Decision Summary, and Responsiveness Summary for Final Remedial Action, Queen City Farms Superfund Site, Maple Valley, King County, Washington. December.

EPA. 1994. USEPA Region 10 Administrative Order for Remedial Design and Remedial Action in the Matter of: Queen City Farms, Inc., Respondent CERCLA Docket No. 1094-03-09-06. March 28.

EPA. 1995. Prepared by Richardson, G.N., E. Kauazanjian, and N. Matasovic. RCRA Subtitle D(258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities, EPA/600/R-95/051, US Environmental Protection Agency. Washington, D.C.

EPA. 2018. Fifth Five-Year Review Report for Queen City Farms Superfund Site Maple Valley, Washington. Prepared by US Environmental Protection Agency Region 10. Seattle, Washington. September 17.

EPA. 2018. Inventory of US Greenhouse Gas Emissions and Sinks, 1990–2018. US Environmental Protection Agency. EPA 430-R-20-002. April 2020.

FTA. 2006. Federal Transit Administration Report FTA-VA-90-1003-06, Transit Noise and Vibration Impact Assessment. May 2006.

Galster, R.W., and W.T. Laprade. 1991. Geology of Seattle, Washington, United States of America: Bulletin of the Association of Engineering Geologists, v. 28, no. 3, p. 235–302.

Golder. 2008. CHRLF Area 7 Stability Analysis, memo from Frank Shuri (Golder Associates, Inc.) to Tim Raibley (HDR Engineering, Inc.). December 3.

Golder. 2015. Technical Memorandum—Draft Cedar Hills Regional Landfill Expansion Stability Analyses 5 and 9. Golder Associates, October 27.

HDR. 2008. Technical Memorandum on Impact Assessment of Select Fill Material Stockpiling in Area 5, Cedar Hills Regional Landfill Area 7 Development. May.

HDR. 2014. Area 8 Development and Facility Relocation, Hydrogeologic Report. Prepared for the King County Department of Natural Resources and Parks Solid Waste Division. October.

HDR. 2017. Area 8 Development Agency Submittal Engineering Report. Prepared for the King County Department of Natural Resources and Parks Solid Waste Division. August.

HDR, BHC, and Herrera Environmental Consultants. 2018. Cedar Hills Area 8 Plan of Operations. December.

HDR Engineering and SLR International Corporation. 2008. Cedar Hills Regional Landfill Area 7 Hydrogeologic Report. Prepared for KCSWD. February 14.

ISO. 1996. International Standards Organization ISO-9613-2, Acoustics – General Method of Sound Propagation Outdoors.

KCHPP. 2020. Cedar Hills Regional Landfill Site Development & Facilities Relocation EIS Cultural Resources Review. Prepared by King County Historic Preservation Program. January 22.

KCSWD. 2003. Cedar Hills Regional Landfill Hydrogeologic Investigation Report, Area 6 Development Project. Prepared by HDR and Aspect. 2003. April 10.

KCSWD. 2004. Cedar Hills Regional Landfill Site-Wide Hydrogeological Report. Prepared by CH2M Hill and UES, May.

KCSWD. 2005. Cedar Hills Regional Landfill Stormwater Management Facility Assessment and Buffer Enhancement Report. King County Department of Natural Resources and Parks, Solid Waste Division. February 24.

KCSWD. 2006. Solid Waste Transfer and Waste Management Plan Prepared for Prepared by King County Department of Natural Resources and Parks, Solid Waste Division. September.

KCSWD. 2007. Technical Memorandum, Phase I Investigations, Groundwater Monitoring System Enhancements, Cedar Hills Regional Landfill. October 12.

KCSWD. 2013. Environmental Monitoring Sampling and Analysis Plan for Cedar Hills Regional Landfill Sampling and Analysis Plan Prepared for King County Department of Natural Resources and Parks, Solid Waste Division by Aspect Consulting. December 2016.

KCSWD. 2016. Area 8 Development and Facility Relocation Contaminated Surface Water Design Report Prepared for King County Department of Natural Resources and Parks by Herrera Environmental Consultants, Inc. Seattle, Washington.

KCSWD. 2016b. Cedar Hills Regional Landfill Southwest Siltation Pond Relocation Final Drainage Report Prepared for King County Department of Natural Resources and Parks by Herrera Environmental Consultants, Inc. Seattle, Washington.

KCSWD 2016c. Draft East Perched Zones Remedial Investigation and Feasibility Study Prepared by Aspect Consulting, LLC. December.

KCSWD. 2017. Cedar Hills Regional Landfill King County Cedar Hills Regional Landfill Area 8 Engineering Report Prepared for King County Department of Natural Resources and Parks by HDR. August.

KCSWD. 2017b. Site Development Alternatives for Cedar Hills Regional Landfill—Final Report Prepared for King County Department of Natural Resources and Parks by Herrera Environmental Consultants, Inc. Seattle, Washington. September.

KCSWD. 2017c. Scenic Resources, Aesthetics, Light and Glare Technical Memorandum. Prepared for King County Solid Waste Division by Osborn Pacific, Inc. June 2017.

KCSWD. 2019b. Cedar Hills Regional Landfill Support Facilities Evaluation—Phase 2 Report. Prepared for King County Department of Natural Resources and Parks by CH2M Hill (Jacobs Engineering). January.

KCSWD. 2019c. Cedar Hills Regional Landfill Plan of Operation Prepared for King County Department of Natural Resources and Parks by Herrera Environmental Consultants, Inc. Seattle, Washington.

KCSWD. 2020. Cedar Hills Regional Landfill 2019 Annual Report. Prepared by Facility Engineering & Science Section, KCSWD. May 1.

KCSWD. 2020b. Visual Quality and Aesthetics Supplemental Technical Memorandum. Prepared for King County Solid Waste Division by Osborn Pacific, Inc. July.

KCSWD 2020c. Solid Waste Division 2019 Analysis of Odor Complaints.

King County. 2009. Rivers and Streams in King County. Vector digital data published on June 18, 2009. King County, Washington.

King County. 2010. Final Environmental Impact Statement Cedar Hills Regional Landfill 2010 Site Development Plan. King County Department of Natural Resources and Parks, Solid Waste Division. July.

King County. 2010b. Cedar Hills Regional Landfill 2010 Site Development Plan – Project Program Plan. King County Department of Natural Resources and Parks, Solid Waste Division. July.

King County. 2012. Sensitive Area Ordinance Wetlands (from all wetland composite)/wetland_all_area. Vector digital data published on August 9, 2012. King County, Washington.

King County. 2014. JR 336, Noise and Vibration Study of Cedar Hills Regional Landfill North Flare Station, prepared for King County Solid Waste Division by JR Engineering, May.

King County. 2016. King County Surface Water Design Manual.

King County. 2017. Land Use 2016, King County Comprehensive Plan, 2016, Chapter One, Regional Growth Management Planning. King County GIS Center. September 22.

King County. 2019. Cedar Hills Regional Landfill Quarterly Environmental Monitoring Report, Second Quarter. August.
<https://kingcounty.gov/depts/dnrp/solid-waste/facilities/documents.aspx#monitoring>.

King County. 2019a. Environmentally Sensitive Areas accessed September 20, 2019, via King County iMap Interactive Mapping Tool at <https://gismaps.kingcounty.gov/iMap/>.

King County. 2019b. King County Noxious Weed List: <https://www.kingcounty.gov/services/environment/animals-and-plants/noxious-weeds/laws/list.aspx>.

King County. 2019c. Cedar Hills Regional Landfill Wildlife Management Plan. Prepared by Justin Dayton for King County Department of Natural Resources and Parks Solid Waste Division.

King County. 2019d. King County Comprehensive Solid Waste Management Plan. Prepared by King County Department of Natural Resources and Parks Solid Waste Division. April 17.

King County, 2019e. King County Waste-To-Energy and Waste Export by Rail Feasibility Study, prepared for King County Solid Waste Division by Arcadis, September.

King County. 2020. Environmentally Sensitive Areas. Accessed 2020, via King County iMap Interactive Mapping Tool at <https://gismaps.kingcounty.gov/iMap/>.

Koerner, R.M., Y.G. Hsuan, and G.R. Koerner. 2005. Geomembrane Lifetime Prediction: Unexposed and Exposed Conditions. GRI White Paper #6. Folsom, Pennsylvania. June 7.

Landau Associates. 1990. Remedial Investigation Report, Queen City Farms, King County, Washington. Volumes I and II. April 20.

Landau Associates. 1991a. Interim Data Report, Supplemental Remedial Investigation, Queen City Farms, King County, Washington. September.

Landau Associates. 1991b. Supplemental Remedial Investigation Report, Queen City Farms, King County, Washington. December 16.

Landau Associates. 1992. Supplemental Remedial Investigation Report, Queen City Farms, King County, Washington. Volumes I and II. July 31.

Liberty, L.M., and T.L. Pratt. 2008. Structure of the Eastern Seattle fault zone, Washington State: New Insights from Seismic Reflection Data. Bulletin of the Seismological Society of America, 98(4), pp. 1681–1695.

Luzier, J.E. 1969. Geology and Groundwater Resources of Southwestern King County, Washington. Washington Division of Water Resources Water Supply Bulletin 28. Olympia, Washington.

Mullineaux. D.R., et al. 1970. Geology of the Renton, Auburn, and Black Diamond Quadrangles, King County, Washington. Geological Survey Professional paper 672.

Nelson, A.R., et al. 2003. Late Holocene Earthquakes on the Toe Jam Hill fault, Seattle Fault Zone, Bainbridge Island, Washington, Geological Society of America Bulletin, 115, 1388–1403.

Palmer et al. 1994. Liquefaction Susceptibility for the Des Moines and Renton 7.5-minute Quadrangles, Washington. Washington Division of Geology and Earth Resources, Geologic Map GM-41, December.

Renton Municipal Code Title IV, Chapter 3, Section 4-3-050 Critical Areas Regulations.

RH2 Engineering P.S. and Pacific Groundwater Group. 1993. Monitoring Well Installation Report. Prepared for City of Renton, August.

Rogers, G.C. 1988. An Assessment of the Megathrust Earthquake Potential of the Cascadia Subduction Zone. Canadian Journal of Earth Sciences, 25(6), pp. 844–852.

Rosengreen, T.E. 1965. Surficial Geology of the Maple Valley and Hobart Quadrangles, Washington (M.S. thesis). University of Washington, Seattle, Washington.

Seattle Times. 2019. King County Council Wants Plan to Keep Eagles Out of Dump. Published April 1. <https://www.seattletimes.com/seattle-news/environment/king-county-council-wants-plan-to-keep-eagles-out-of-dump/>.

Seed, R.B. and R. Bonaparte. 1992. Seismic Analysis and Design of Lined Waste Fills: Current Practice. pp. 1521–1545 in: Proceedings, Stability and Performance of Slopes and Embankments II. Vol. 2, ASCE Geotechnical Special Publication No. 31, Berkeley, California (as cited by CHRM Hill 1995).

ten Brink, U.S., et al. 2006. Rupture Models for the A.D. 900–930 Seattle Fault Earthquake from Uplifted Shorelines, Geology, v. 34, p. 585–588.

USDA. 2019. Soils Data for the Renton Transfer Station Property Obtained from the United States Department of Agriculture's Natural Resource Conservation Service Web Soil Survey site.

USFWS. 2019a. National Wetland Inventory. <https://www.fws.gov/wetlands/data/mapper.html>.

USFWS. 2019b. Official Species List for Cedar Hills Regional Landfill. US Fish and Wildlife Service, Washington Fish and Wildlife Office. Lacey, Washington. June 25.

USGS. 2014. National Seismic Hazard Model. US Geological Survey.

USGS. 2020. M 9.3 Scenario Earthquake—Cascadia Megathrust Shake Map. Accessed May 4, 2020 at US Geological Society website: <https://earthquake.usgs.gov/scenarios/eventpage/bssc2014cascadia_sub0_m9p34_se/shakemap/intensity>.

Vine, J.D. 1969. Geology and Coal Resources of the Cumberland, Hobart, and Maple Valley Quadrangles, King County, Washington. Geological Survey Professional Paper No. 624. US Geological Survey.

Walsh. 1984. Geology and Coal Resources of Central King County, Washington. Prepared by Timothy J. Walsh for the State of Washington Department of Natural Resources, Olympia, Washington. July.

Washington State Department of Ecology. 1990. Water Quality Standards for Groundwaters of the State of Washington. WAC 173-200. Filed October 31. Effective 12/1/90.

WDFW. 2019a. Priority Habitats and Species Online Mapper. Washington Department of Fish and Wildlife. <http://apps.wdfw.wa.gov/phsontheweb/>.

WDFW. 2019b. Salmonscape Online Mapper. <http://wdfw.wa.gov/mapping/salmonscape>.

WDFW. 2019c. Priority Habitats and Species database retrieval. Accessed on July 19, 2019. Washington Department of Fish and Wildlife.

WDNR. 2002. Geologic Map of Washington—Northwest Quadrangle. Washington Division of Geology and Earth Resources Geologic Map GM-50. Published by the Washington State Department of Natural Resources.

WDNR. 2019. Sections that Contain Natural Heritage Features. Data Current as of November 18, 2019. Washington Department of Natural Resources. <https://www.dnr.wa.gov/publications/amp_nh_trs.pdf?9cnlcl>.

WDNR. 2020a. Information Regarding Geologic Faults and Folds, Liquefaction, Seismic Risk, Landslides, and Coal Mines. Accessed June 2020 on Washington Department of Natural Resources Washington Geologic Information Portal. <https://geologyportal.dnr.wa.gov/>.

WDNR. 2020b. Forest Practice Application Mapping Tool. Washington Department of Natural Resources. <https://fpamt.dnr.wa.gov/default.aspx#>.

WGCEP (Working Group on California Earthquake Probabilities). 2003. Earthquake Probabilities in the San Francisco Bay Region: 2002–2031. US Geological Survey Open-File Report 03-214.

WHO. 1999. Safe Management of Wastes from Health-Care Activities, 2nd edition. Edited by Chartier, Yves, et al. 329 pp. World Health Organization, Geneva, Switzerland.

16.0 DISTRIBUTION LIST

Federal Agencies

National Oceanic and Atmospheric Administration (NOAA) Fisheries

US Army Corps of Engineers

US Fish and Wildlife Service

US Environmental Protection Agency

Tribes

Muckleshoot Indian Tribe

Puyallup Tribe of Indians

Snoqualmie Indian Tribe

Suquamish Tribe

Tulalip Tribes of Washington

State of Washington

Department of Agriculture

Department of Ecology

Department of Transportation, Northwest

Region

Washington Utilities and Transportation Commission

Regional Agencies

Puget Sound Clean Air Agency

Puget Sound Regional Council

King County

Dow Constantine, Executive

County Council

Rod Dembowski, District 1

Girmay Zahilay, District 2

Kathy Lambert, District 3

Jeanne Kohl-Welles, District 4

Dave Upthegrove, District 5

Claudia Balducci, District 6

Pete von Reichbauer, District 7

Joe McDermott, District 8

Reagan Dunn, District 9

King County Council Auditors Office

Department of Community and Human Services

Department of Executive Services

Department of Natural Resources and Parks

Department of Permitting and Environmental Review

Department of Transportation

Public Health—Seattle and King County

Local Jurisdictions

City of Algona

City of Auburn

City of Bellevue

Town of Beaux Arts Village

City of Black Diamond

City of Bothell

City of Burien

City of Carnation

City of Clyde Hill

City of Covington

City of Des Moines

City of Duvall

City of Enumclaw:

City of Federal Way

Town of Hunts Point

City of Issaquah

City of Kenmore

City of Kent

City of Kirkland

City of Lake Forest Park

City of Maple Valley

City of Medina

City of Mercer Island

City of Newcastle

City of Normandy Park

City of North Bend

City of Pacific

City of Redmond

City of Renton

City of Sammamish

City of SeaTac

City of Seattle

City of Shoreline

City of Skykomish

City of Snoqualmie

City of Tukwila

City of Woodinville

City of Yarrow Point

Pierce County

Snohomish County

Advisory Committees

Metropolitan Solid Waste Management Advisory Committee

Solid Waste Advisory Committee

Community Groups

Community Service Areas

Sound Cities Association

Haulers

Recology

Republic Services, Inc.

Waste Connections, Inc.

Waste Management, Inc.

Local Libraries

King County Library System

DEIS Commentors

See Appendix M

17.0 GLOSSARY

acre-foot – unit of volume commonly used in reference to large-scale water bodies, equal to the volume of one acre of surface area to a depth of one foot.

active area – the cell that is currently accepting refuse.

active face – the area within a cell where refuse is being placed.

aeration – a leachate treatment system consisting of circulating air through, mixing with, or dissolving air in the leachate to promote biological oxidation.

alternative daily cover – cover material other than earthen material which is placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter, and scavenging.

biogas – biogas is produced through the process of anaerobic decomposition. It is produced naturally by anaerobic bacteria in municipal-solid-waste landfills and is also called landfill gas.

biosolids – refers to treated sewage sludge that meets the Environmental Protection Agency pollutant and pathogen requirements for land application and surface disposal.

compost – the product resulting from the controlled biological decomposition of organic waste, including yard waste, food scraps, and food-soiled paper, which is beneficial to plant growth when used as a soil amendment.

culvert – A culvert is a structure that allows water to flow under a road, railroad, trail, or similar obstruction from one side to the other.

daily cover – see alternative daily cover.

disposal area – a discrete area of the landfill for placement of waste, identified by the extent of its liners. See Refuse Area.

diversion – any legal practice or program that diverts solid waste from disposal in the landfill.

easement – an interest in land owned by another that entitles its holder to a specific limited use or enjoyment.

geomembrane – The HDPE or LLDPE manufactured component for either a lining system or cover system. Geomembrane represents the primary protection element for either system as required by the WAC.

hydrogeology – a branch of geology concerned with the occurrence, use, and functions of surface water and groundwater.

interim cover – Placed seasonally in areas that will not have refuse placed in them between successive lift sequences, typically consisting of between 6 and 12 inches of compacted soil and hydroseeded (or approved equivalent consistent with the Stormwater Pollution Prevention Plan) to control erosion. Interim

Cover is placed to aid in the control of leachate seeps and LFG emissions and will form the foundation for the Interim Final Cover or Final Cover systems.

landfill cell – area of filling within a landfill that adjoins other cells, typically separated by a berm and with a protective liner to prevent contamination.

landfill gas condensate – Landfill gas (LFG) condensate is a liquid produced in landfill gas collection systems through natural or artificial cooling of the gas or through physical processes such as volume expansion.

leachate – Water or other liquid has been contaminated by dissolved or suspended materials due to contact with solid waste or gases.

lift – the full depth of each layer of waste and cover placed in a given refuse area.

liner – a clay and/or synthetic protective layer that is placed on both the bottom and top of a landfill.

refuse area – a discrete area of the landfill for placement of waste, identified by the extent of its liners. See Disposal Area.

self-hauler – anyone who brings garbage, recyclables, and/or yard waste to division transfer facilities except a commercial collection company.

social justice – encompasses all aspects of justice, including legal, political, and economic; it demands fair distribution of public goods, institutional resources, and life opportunities.

soil surcharging – Process of placing soil in stockpiles over areas with previously placed waste to increase the rate, and total, settlement of the waste. After a sufficient amount of time, the soil surcharge is removed and additional waste is then placed in the area.

solid waste – all materials discarded including garbage, recyclables, and organics.

special waste – wastes that have special handling needs or have specific waste properties that require waste clearance before disposal. These wastes include contaminated soil, asbestos-containing materials, wastewater treatment plant grit, industrial wastes, and other wastes.

sub-basin – a geographic area that (1) drains to a stream or waterbody named and noted on common maps and (2) is contained within the basin of the stream or water body.

top deck – final and highest portion of the landfill, which is finished with a gradual slope to aid surface water run off following cover placement.

tipper – large pieces of equipment that allow garbage trailers to be backed onto the tipping surface, and then tilt the trailer, allowing the garbage to slide out of the back and into the refuse area.

vector – is an organism that does not cause disease itself but which spreads infection by conveying pathogens from one host to another, such as a mosquito or rat.

waste prevention – the practice of creating less waste, which saves the resources needed to recycle or dispose of it such as choosing to purchase items with less or no packaging.

waste-to-energy technologies – recover energy from municipal solid waste and include both waste conversion technologies and incineration with energy recovery, such as mass burn waste-to-energy, refuse derived fuel, and advanced thermal recycling.

zero waste of resources or zero waste – a planning principle designed to eliminate the disposal of materials with economic value. Zero waste does not mean that no waste will be disposed; it proposes that maximum feasible and cost-effective efforts be made to prevent, reuse, and recycle waste.

18.0 AUTHORS AND PRINCIPAL CONTRIBUTORS

KCSWD authored the Final EIS with technical support from the following principal contributors.

Name	Discipline	Education	Years of Experience
King County Solid Waste Division			
Kinyan Lui, PE, PMP	Project Manager	EMPA, Public Administration BS, Civil Engineering	29
Laura Belt, PE	Landfill Operations and Environmental Control Systems	BS, Civil/Environmental Engineering	30
Kris McArthur	Landfill Operations and Environmental Control Systems	BS, Civil/Environmental Engineering MS, Civil/Environmental Engineering	12
Herrera Environmental Consultants, Inc.			
Philip Coughlan	EIS Manager Greenhouse Gas Emissions Public Services and Utilities	MPA, Environmental Policy and Management BS, Business Administration	35
Michael Spillane, PE	Project Manager Landfill Operations and Environmental Control Systems	BS, Civil/Environmental Engineering	30
Art Campbell	Air and Odor; Noise and Vibration; Human Health; Land and Shoreline Use	MS, Geological Sciences BS, Environmental Studies BSE, Biomedical Engineering	44
Lindsey Amtmann	Land and Shoreline Use, Background Information	MS, Resource Policy and Behavior BA, Dramatic Literature	23
Heidi Houck, PE	Surface Water	BS, Civil Engineering with Environmental Engineering Specialty	19
Ondrej Sklenar, PE	Surface Water	MS, Sustainable Urban Management BS, Engineering Science	13
George Iftner, LG	Earth	BS, Natural Resources-Soil Science	24
Sue Wall, PWS	Plants and Animals	MS, Forestry BS, Botany	34
Makie Matsumoto-Hervol	GIS Resources	BA, Geography – People and Wildlife Landscapes Emphasis BA, Environmental Studies	6
Michelle Fox	Publications	BA, Social Sciences	7
Greta Presley	Plants and Animals	BS, Biology	23

Name	Discipline	Education	Years of Experience
Jennifer Schmidt	GIS Resources	MAS, Spatial Analysis for Public Health BA, Geography – GIS Emphasis	18
Rayna Gleason	Plants and Animals; Graphics	BLA, Landscape Architecture (Horticulture emphasis)	15
Tyson Wright, PE	Landfill Operations and Environmental Control Systems	BS, Civil Engineering	21
HDR Engineering, Inc.			
M. Kirk Dunbar	Air and Odor; Greenhouse Gas Emissions; Fugitive Dust	BS, Aeronautical/Astronautical Engineering	32
Ed Liebsch	Air and Odor	BA, Earth Science MS, Meteorology	41
Karam Singh, PE	Air and Odor	MS, Environmental Engineering BS, Civil Engineering	11
Ronalee Spellecacy	EIS Technical Review	MA, Political Science/Government BA, Anthropology BA, Biology	18
Golder Associates, Inc.			
Frank Shuri, PE, LG, LEG	Earth, Slope Stability Analysis	Graduate Studies, Civil Engineering BS, Geology	47
Alan Hull, Ph.D., PG (CA), CEG (CA)	Earth, Seismic Hazard Analysis	PhD, Geological and Earth Sciences/Geosciences	39
BHC Consultants, LLC			
Bard Horton, PE	Refuse fill sequencing and soil balance estimates	MS, Civil Engineering BS, Civil Engineering	33
Aaron Werner, PE	Refuse fill sequencing and soil balance estimates	BS, Civil Engineering	23
Darin Rogers, PE	Refuse fill sequencing and soil balance estimates	BS, Civil and Agricultural Engineering	17
Margarita Rodriquez	Refuse fill sequencing and soil balance estimates	BS, Environmental Engineering	5
Osborn Pacific Group, Inc.			
Linda Osborn	Aesthetics, Light, and Glare	BLA, Landscape Architecture BA, Botany	45
Quietly Superior, Inc.			
Greg Price	Noise and Vibration	BS, Aeronautical and Astronautical Engineering	25
John Alberti	Noise and Vibration	BS, Physics	56

Name	Discipline	Education	Years of Experience
Transpo Group, Inc.			
Stefanie Herzstein, PE, PTOE	Transportation	MS, Transportation Engineering BS, Civil Engineering	20
Kassi Leingang, PE	Transportation	MS, Civil Engineering BS, Civil Engineering	10
Udaloy Environmental Consulting			
Anne Udaloy, LHG	Groundwater; Hydrogeology	MS, Geology BA, Geology	33
Chartrand Environmental, LLC/Intertox, Inc.			
Allan Chartrand, DABT	Health Risk	BS, Entomology MS, Environmental Toxicology	35
Kelli Hackney	Health Risk	BS, Environmental Sciences	2
Richard Pleus, Ph.D.	Health Risk	BS, Physiology MS, Environmental Health PhD, Environmental Toxicology	30
Lisa Corey, Ph.D., DABT	Health Risk	BS, Biology MS, Environmental Toxicology PhD, Environmental Toxicology with a Risk Assessment certificate	17
Anne Galyean, Ph.D.	Health Risk	MS Chemistry PhD, Nanochemistry	6
Heather Klintworth, Ph.D.	Health Risk	BS, Cell and Molecular Biology/Zoology MS, Environmental Toxicology PhD, Environmental Toxicology	12

Appendix A

Special Permit for Sanitary Landfill (Refuse Disposal) for King County

The contents of this appendix will be provided separately.

Appendix B

Municipal Solid Waste Landfill Permit—Cedar Hills Regional Landfill PR0015736

King County

The contents of this appendix will be provided separately.

Appendix C

Seismic Design Criteria Update Technical Memo

King County

The contents of this appendix will be provided separately.

Appendix D

Updated Air Quality and Odor Technical Memos

King County

The contents of this appendix will be provided separately.

Appendix E

Wastewater Discharge Permit for Cedar Hills Regional Landfill No. 7842-03

King County

The contents of this appendix will be provided separately.

Appendix F

Noise Technical Memo and Addendum

King County

The contents of this appendix will be provided separately.

Appendix G

Vibration Technical Memo and Addendum

King County

The contents of this appendix will be provided separately.

Appendix H

Scenic Resources, Aesthetics, Light and Glare Technical Memorandum (2017)

King County

The contents of this appendix will be provided separately.

Appendix I

Visual Quality and Aesthetics Supplemental Technical Memorandum (2020) and Addendum (2021)

King County

The contents of this appendix will be provided separately.

Appendix J

Final Transportation Discipline Report

King County

The contents of this appendix will be provided separately.

Appendix K

Comparative Greenhouse Gas Analysis

King County

The contents of this appendix will be provided separately.

Appendix L

Health Risk Assessment: Cedar Hills Regional Landfill Facility

King County

The contents of this appendix will be provided separately.

Appendix M

DEIS Comment Responses and Comments

King County

The contents of this appendix will be provided separately.