Port of Seattle

P.O. Box 1209
Seattle, WA 98111-1209
Tel: (206) 728-3000

www.portseattle.org

Addendum to the
Seattle-Tacoma International Airport (Sea-Tac Airport)
Flight Corridor Safety Program – Phase 1
Mitigated Determination of Non-Significance (MDNS)

Addendum to: Flight Corridor Safety Program – Phase 1 Mitigated Determination of Non-Significance (MDNS). The MDNS was issued by the Port of Seattle on August 26, 2016 following the provisions of the Washington State Environmental Policy Act (SEPA) under Revised Code of Washington (RCW) Chapter 43.21C, Washington Administrative Code (WAC) Chapter 197-11, and Port of Seattle Commission Resolution No. 3650 – SEPA Policies and Procedures. The Flight Corridor Safety Program – Phase 1 MDNS is available for review at the Port of Seattle office, Environment and Sustainability Department, Pier 69, 2711 Alaskan Way, Seattle, Washington, and Seattle-Tacoma International Airport, Airport Office Building reception, 17801 International Boulevard, Seattle, Washington (POS SEPA File No. 16-07).

Name of Project: Flight Corridor Safety Program – Phase 1

Project Applicant: Port of Seattle, Seattle-Tacoma International Airport (Sea-Tac Airport)

Project Background: The Port of Seattle issued a MDNS for this project on August 26, 2016 for public and agency comment pursuant to WAC 197-11-340. The MDNS proposed to remove obstructions, per Federal Aviation Administration requirements, primarily consisting of trees on and around Sea-Tac Airport. The MDNS issued by the Port of Seattle was for the removal of obstructions located on Port of Seattle property, i.e. Phase 1. Phases 2 and 3 would remove obstructions on commercial properties, public properties, and private properties located in the cities of SeaTac, Des Moines, and Burien and will undergo SEPA review as a phased approach for the Flight Corridor Safety Program (WAC 197-11-060(5)(b) and WAC 197-11-060(5)(e)).

As a condition of the FAA-issued Airport Operating Certificate, the Port of Seattle is required to ensure there are no obstacles or obstructions are present on or around Sea-Tac Airport that could affect aviation safety. Hazardous obstructions to air navigation are defined by the FAA as features that "affect the safe and efficient use of navigable airspace and the operation of planned or existing air navigation and communication facilities" (14 Code of Federal Regulations [CFR] Part 77). Additionally, FAA Airport Grant Assurance 20 requires that, "It [the airport] will take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to airport…will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards."

Phase 1 of the Flight Corridor Safety Program, will remove approximately 1,170 trees located on 27 acres of Port of Seattle property. After the removal of these obstructions, new trees and vegetation will be re-planted in accordance with federal and state requirements and Port of Seattle policy. Mitigation for Phase 1 impacts includes the re-planting of approximately 4,000 trees in addition to shrubs and hydro seeding to revegetate areas where ground vegetation or understory impacts occur. Mitigation has not been determined for Phases 2 and 3.

FLIGHT CORRIDOR SAFETY PROGRAM UPDATES

Project Proposal

The Port of Seattle is issuing an addendum to update and supplement existing information for the Flight Corridor Safety Program – Phase 1. This addendum is based on public comments and new information available since the issuance of the final MDNS on August 26, 2016. The addendum will also describe plans for Phases 2 and 3. There are no changes to the original project proposal – Flight Corridor Safety Program – Phase 1.

Potential Impacts, Mitigation Discussion, and Updated Information

This Addendum supplements and amends environmental evaluations presented in the original MDNS (POS SEPA No. 16-07) to provide additional information following the issuance of the final MDNS on August 26, 2016. The supplementary information does not change the original project scope or mitigation measures for Phase 1.

Location of Proposal

Obstructions are defined by the Federal Aviation Administration (FAA) and Seattle-Tacoma International Airport as an object that penetrates, or will penetrate within the next 5 years; imaginary surfaces surrounding airplane takeoff and landing areas (FAA Part 77 – Safe Efficient Use, and Preservation of the Navigable Airspace; FAA - Engineering Brief No. 91, Management of Vegetation in the Airport Environment). These imaginary surfaces are identical for all phases of the Flight Corridor Safety Program. The FAA defines the obstruction-free imaginary surfaces as:

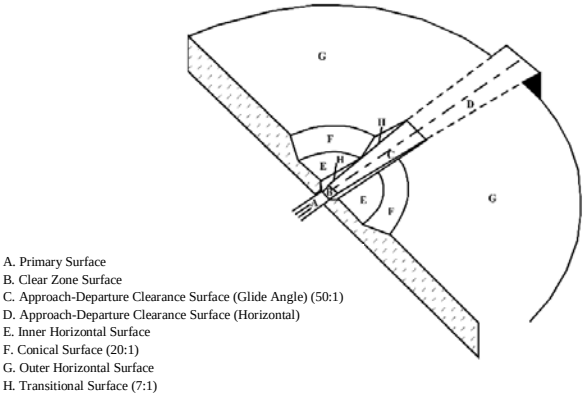


Figure 1 – Airport Imaginary Surfaces (FAA Order JO 7400.2H).

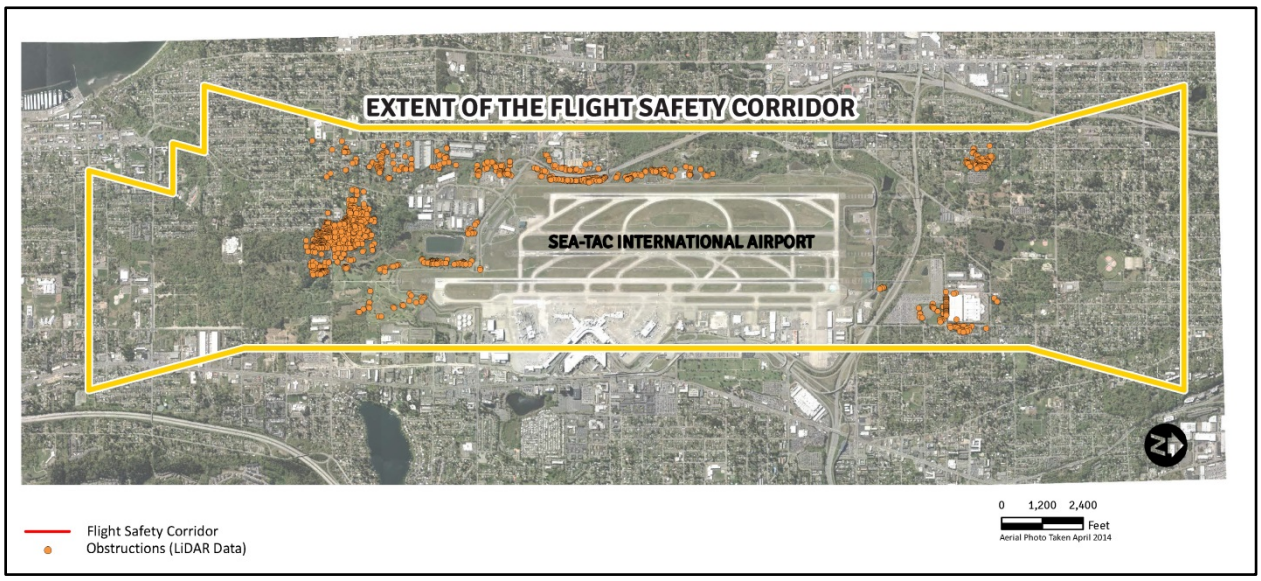


Figure 2 – Extent of the Flight Safety Corridor and Obstruction Identification (Port of Seattle, 2016)

Plants

Phase 1 will remove approximately 1,170 trees located on Port of Seattle property. After the removal of these obstructions, new trees and vegetation will be replanted in accordance with federal, state, and local requirements and Port of Seattle policy. Phase 1 includes the re-planting of approximately 4,000 trees.

In accordance with the Implementation Plan, proposed mitigation for the removal of trees was initially developed on a minimum of 1:1 in non-critical areas and a 2:1 tree replacement ratio in critical areas. In addition to the minimum tree replacement requirement, the Port established a

site revegetation objective to restore native forest or shrub communities. The designed tree density well exceeds minimum tree replacement ratio requirements in order to:

- Ensure dense native forest and shrub communities establish, including offsetting anticipated plant mortality,
- Increase site habitat structure and ecological function, and
- Prevent future obstructions[1].

As a result, the current design documents include a tree replacement ratio of approximately 4:1 (plant mortality is expected to be between 20 - 50%). Phase 1 replanting will occur on sites where trees are being removed. Phases 2 and 3 replanting locations have not been identified. Phase 2 and 3 replanting will be based on objectives similar to Phase 1. However, in addition to Phase 1 mitigation objectives, alternatives for environmental review for Phases 2 and 3 will be considered for offsite replanting, tree banks, easements, and will require coordination between the Port, local jurisdictions and private property owners where trees are being removed.

Appendix A, *Flight Corridor Safety Program – Phase 1 Tree Removal and Replanting Map by Area*, provides anticipated quantities of trees removed and replanted for each parcel in Phase 1. Similar information will be made available for environmental review for Phases 2 and 3.

The Conceptual Plan (Appendix B) and Implementation Report (provided in Flight Corridor Safety Program – Phase 1 SEPA Checklist, http://www.portseattle.org/Environmental/Environmental-Documents/SEPA-NEPA/Pages/default.aspx) recommend a menu of tree removal methods based on site characteristics, particularly the presence of critical areas including wetlands, stream and wetland buffers, and steep slopes. Tree removal in wetlands is limited to selective clearing by hand to avoid ground disturbance and stump treatment to avoid re-growth. Tree removal on steep slopes can use machinery, but stumps will be left in place to avoid ground disturbance and protect slope stability. Upland areas were originally intended for clearing and grubbing[2] or selective removal with grinding. However, further consideration of site stability and erosion control for such large clearing areas led the obstruction removal methods to be revised in most cases to selective clearing with machinery, which avoids the level of ground disturbance typical of grubbing.

Appendix B, *Conceptual Plan, Seattle-Tacoma International Airport, Flight Corridor Safety Obstruction Management Program*, provides obstruction removal alternatives considered for

[1] Densely planting sites will minimize the ability of invasive vegetation to establish and grow and other vegetation such as black cottonwood from becoming future obstructions.

[2] Clearing and grubbing describes stages of land development in which vegetation is removed (known as clearing), and then a root rake or similar device is used to remove the roots that remain in the dirt (the process known as grubbing).

Phase 1. Phases 2 and 3 will update the Conceptual Plan and include and consider additional removal methods as identified by FAA Grant Assurance 20.
Tree canopy impacts for Phase 1 were also considered. The existing tree canopy cover in the City of SeaTac was estimated using the National Land Cover Dataset (NLCD) 2011 United States Forest Service Tree Canopy (Homer 2015). Of the 6,580 acres of land within the City of SeaTac, the existing tree canopy is estimated at 1,118 acres (or 17% of the total city land cover). Phase 1 would reduce canopy cover in the city by 15 acres, or 1.3% of the existing canopy. Phase 2 and 3 would remove 45 acres, or 4.1% of the existing canopy. The total reduction in tree canopy for all phases within the City of SeaTac would be 60 acres, representing 5.4 percent of the existing canopy.

The existing tree canopy cover in the City of Des Moines is 1,125 acres (or 27% of the total city land cover) and would be reduced by 1 acre, or 0.09% of existing canopy, in Phase 2 and 3. The existing tree canopy cover in the City of Burien is 1,577 acres (or 25% of the total city land cover) and would be reduced by 3 acres or 0.2% of the existing canopy in Phase 2 and 3. (The tree canopy within the cities of Burien and Des Moines would not be affected in Phase 1). The lost canopy cover would recover to current levels within approximately 15 years on all tree removal sites.

Phase/ Jurisdiction	City Land Area (acres)	Existing Tree Canopy		Removed Tree Canopy		
		Area (acres)	Percent of City Land[a]	Area (acres)	Percent of City Land[b]	Percent of City Canopy[c]
Phase 1						
SeaTac	6,580	1,118	17	15	0.2	1.3
Subtotal	***6,580***	***1,118***	***17***	***15***	***0.2***	***1.3***
Phase 2 and 3						
SeaTac	6,580	1,103	17	45	0.7	4.1
Burien	6,432	1,577	25	3	0.04	0.2
Des Moines	4,220	1,125	27	1	0.02	0.09
Subtotal	***17,232***	***3,805***	***22***	***49***	***0.3***	***1.3***
Subtotal (SeaTac – All Phases)				**60**	**0.9**	**5.4**
Grand Total (All cities – All Phases)				**64**	**0.4**	**1.7**

[a] (Acres of Existing Tree Canopy / City Total Land Area) * 100.
[b] (Acres of Cleared Tree Canopy / City Total Land Ara) * 100.
[c] (Acres of Cleared Tree Canopy / Acres of Existing Tree Canopy) * 100.

Table 1 – Summary of Obstruction Removal and Temporary loss of Tree Canopy by Phase and Jurisdiction

Air

Tree removal in Phase 1 will occur over approximately 25 acres, which represents 3,025 metric tons of stored carbon. In Phase 2, tree removal will occur over approximately 116 acres, which represents 14,036 metric tons of stored carbon. Qualitatively, it is assumed that the loss of carbon storage would be replaced and likely exceeded through revegetation efforts, which are planned at a 4:1 tree replacement ratio.

Appendix C, *Department of Ecology Greenhouse Gas Calculator*, provides additional information on greenhouse gas emissions.

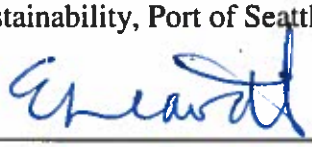
SEPA Review: The Port of Seattle has reviewed this proposal and determined that there is no change to Flight Corridor Safety Program - Phase 1 scope. However, the additional information described in this addendum will be included in the Phase 2 and 3 SEPA environmental evaluation. Phases 2 and 3 will be evaluated in one SEPA document together, and will include evaluation of cumulative impacts for all phases.

Date Addendum Issued: November 16, 2016

SEPA Lead Agency: Port of Seattle (SEPA No. 16-09)

Contact Person: Steve Rybolt, Environmental Program Manager, Port of Seattle, Environment and Sustainability, P.O. Box 68727, Seattle, WA 98168, Telephone: (206) 787-5527, Email: Rybolt.S@portseattle.org

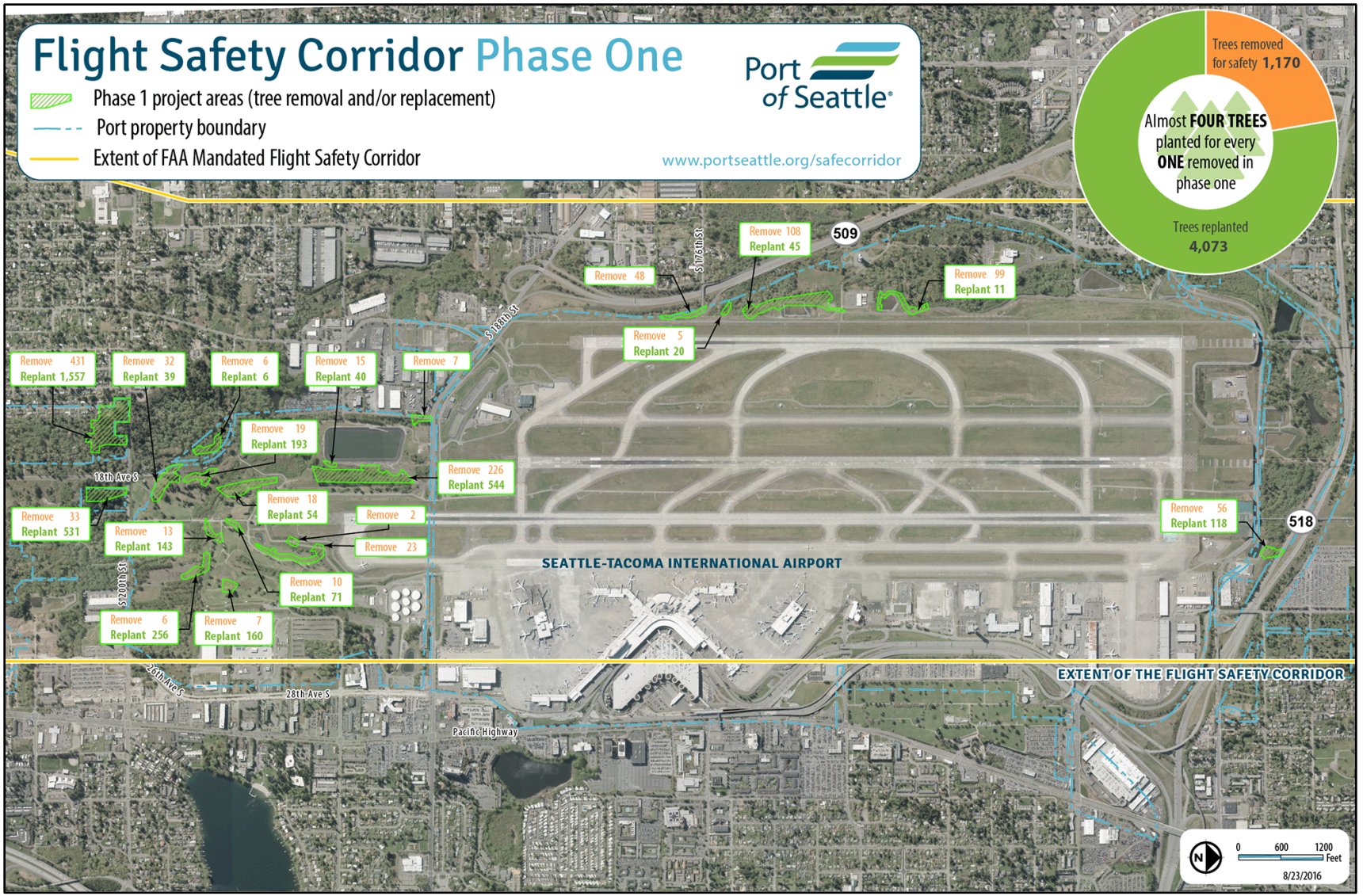
SEPA Responsible Official: Elizabeth Leavitt, Senior Director, Environment and Sustainability, Port of Seattle, Seattle, WA 98111, (206) 787-7203



Elizabeth Leavitt
Senior Director, Environment and Sustainability
November 16, 2016

APPENDIX A

Flight Corridor Safety Program – Phase 1 Tree Removal-Replacement Map by Area


Flight Safety Corridor Phase One
Phase 1 project areas (tree removal and/or replacement)
Port property boundary
Extent of FAA Mandated Flight Safety Corridor
www.portseattle.org/safecorridor
Port of Seattle
Trees removed for safety 1,170
Almost FOUR TREES planted for every ONE removed in phase one
Trees replanted 4,073
Remove 108 Replant 45
Remove 48
Remove 99 Replant 11
Remove 5 Replant 20
Remove 431 Replant 1,557
Remove 32 Replant 39
Remove 6 Replant 6
Remove 15 Replant 40
Remove 7
Remove 19 Replant 193
Remove 226 Replant 544
Remove 18 Replant 54
Remove 2
Remove 23
Remove 33 Replant 531
Remove 13 Replant 143
Remove 10 Replant 71
Remove 6 Replant 256
Remove 7 Replant 160
Remove 56 Replant 118
SEATTLE-TACOMA INTERNATIONAL AIRPORT
EXTENT OF THE FLIGHT SAFETY CORRIDOR
S 176th St
S 188th St
18th Ave S
S 200th St
26th Ave S
28th Ave S
Pacific Highway
509
518
0 600 1200 Feet
8/23/2016

APPENDIX B

Conceptual Plan
Seattle-Tacoma International Airport
Flight Corridor Safety Obstruction Management Program

This document is available on the website:

http://www.portseattle.org/Environmental/Environmental-Documents/SEPA-NEPA/Pages/default.aspx
Seattle – Tacoma International Airport - Fligth Corridor Safety Program

December 2015

PORT OF SEATTLE

Conceptual Plan
Seattle-Tacoma International Airport Flight Corridor Safety Obstruction Management Program

Prepared by
Anchor QEA
720 Olive Way, Suite 1900
Seattle, Washington 98101

CONCEPTUAL PLAN

SEATTLE-TACOMA INTERNATIONAL AIRPORT FLIGHT CORRIDOR SAFETY OBSTRUCTION MANAGEMENT PROGRAM

Prepared for

Port of Seattle

P.O. Box 68727

Seattle, Washington 98168

Prepared by

Anchor QEA, LLC

720 Olive Way, Suite 1900

Seattle, Washington 98101

Graphics prepared by Port of Seattle

December 2015

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LIST OF ACRONYMS AND ABBREVIATIONS

ACM	Airport Certification Manual
CFR	Code of Federal Regulations
FAA	Federal Aviation Administration
ILA	Interlocal Agreement
LiDAR	Light Detection and Ranging
Port	Port of Seattle
SR	State Route
STIA	Seattle-Tacoma International Airport
WSDOT	Washington State Department of Transportation

1 OBSTRUCTION MANAGEMENT PROGRAM OVERVIEW AND PURPOSE

As a condition of the Federal Aviation Administration (FAA)-issued Airport Operating Certificate, the Port of Seattle is required to ensure there are no obstacles or obstructions on or around the Seattle-Tacoma International Airport (STIA) that could affect aviation safety. Hazardous obstructions to air navigation are defined by the FAA as features that "affect the safe and efficient use of navigable airspace and the operation of planned or existing air navigation and communication facilities" (14 Code of Federal Regulations [CFR] Part 77).

In addition to the CFR Part 77 obstruction standards, the following regulations and guidance documents require the Port of Seattle (Port) to address the obstruction removal:

- STIA Airport Certification Manual (ACM), especially with respect to the Port's compliance with 14 CFR Part 139.331 – Certification of Airports: "each object in each area within its authority… is removed, marked, or lighted…"
- FAA Engineering Brief 91 – Management of Vegetation in the Airport Environment: "…it is recommended to protect terminal airspace by clearing bushes and trees that penetrate or have the potential to penetrate any applicable navigable surfaces."
- FAA Airport Grant Assurance 20: "It [the airport] will take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport (including established minimum flight altitudes) will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards."
- FAA Airport Grant Assurance 21: "It [the airport] will take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft."
- FAA Advisory Circular 150/5300.13A – Maintenance of obstacle clearance surfaces: "The airport operator has an ongoing obligation to review the surface(s) for obstructions…"
- Revised Code of Washington Section 14.12.020 – Airport hazards contrary to public interest

- STIA Strategic Goals and Objectives – Goal 1: "Ensuring safe and secure operations" (Port of Seattle 2015a)
- STIA Landscape Design Standards XII(3)c (page 29): "Trees shall be removed … when [they] exceed the maximum allowable height requirements imposed by the FAA". These 2006 landscape standards are part of the City of SeaTac and Port of Seattle Interlocal Agreement (ILA).

The purpose of this Conceptual Plan is to identify and compare alternatives for removing existing obstructions at STIA, both on and off Port-owned properties, and to recommend an approach to obstruction removal. This Conceptual Plan provides the background and guiding objectives for the flight corridor safety obstruction management program. It also summarizes the existing site conditions and how these conditions affect obstruction removal strategies. This Conceptual Plan provides the basis for communication with Port leadership and the FAA. It can also aid preliminary discussions with the community, regulators, and agency representatives concerning the planning, environmental review, and permitting that may be necessary during implementation.

2 BACKGROUND

In 2014, the Port conducted a comprehensive obstruction analysis that used Light Detection and Ranging (LiDAR) remote sensing and imaging technology to identify obstructions that extend into, or very near (within a 6-foot threshold of), navigable airspace. The imaging process identified more than 1,600 obstructions. These obstructions are primarily trees or stands of trees that are located on Port-owned properties, other public properties (owned by the Washington State Department of Transportation [WSDOT], the City of SeaTac, or the City of Burien), and commercial and private lands in the cities of Burien, SeaTac, and Des Moines. Figure 1 illustrates the project vicinity, including the airport properties and surrounding jurisdictions.

Following the LiDAR survey, the Port mapped the location of the obstructions, including 23 individual sites on Port-owned property (Figure 2). An estimated three-fourths of the mapped obstructions are on Port-owned properties and other public properties, and the remaining obstructions are on private and commercial properties. With this information, the Port is now evaluating options for removing the obstructions.

3 GUIDING OBJECTIVES

The objectives of the obstruction management program will be used to evaluate the suitability of obstruction removal alternatives. The objectives are as follows:

1. **Comply with FAA Operating Rules and Guidelines.** The Port will demonstrate to the FAA that obstruction standards, vegetation management, grant assurances, and wildlife hazard management requirements are being met. Failure to meet these requirements may result in changes to operations including higher approach category minima, loss of approaches, departure restrictions, (FAA 2014); failure to meet the intent of the STIA ACM and its associated Wildlife Hazard Management Plan; and potential forfeiture of FAA funds.

2. **Provide Consistency with Airport Policies.** The Port will follow airport policies in the planning and implementation of the obstruction management program. Certain airport rules and regulations relate (or may relate) to obstruction removal, including Environmental (Section 4) and Landscaping and Water Management (Section 5G), which define best management practices for work in critical areas, planting requirements, emergency removal of aviation hazards, and work within restricted areas, including mitigation sites (Port of Seattle 2015b). The STIA Century Agenda strategic objectives that may relate to the implementation details of this program include using the Port's influence to promote small business growth and workforce development, and being the greenest, most energy-efficient port in North America (Port of Seattle 2015c). The Environmental Strategy Plan for STIA includes a number of goals , under the Managing Natural Resources priority, that may relate to obstruction removal; these include: increasing the solid waste recycling rate (Goal 10), reducing land clearing and construction debris generated by the airport and its contractors (Goal 11), achieving and maintaining best management practices for water quality treatment and flow control (Goal 14), improving habitat and protection for native species not in conflict with aviation safety, and managing hazardous wildlife with biologically sound approaches (Goal 15; Port of Seattle 2009).

3. **Prioritize Port-owned Properties.** The Port will consider land ownership in prioritizing obstructions for removal. The process to remove obstructions on properties that are not Port-owned will likely take additional time for coordination with local jurisdictions and property owners (Appendix A).

4. **Comply with Federal, State, and Local Laws and Land Use Requirements.** Through the obstruction management program, the Port will avoid and minimize impacts to critical areas and will comply with federal laws, state laws, and local land use requirements. Where impacts to critical areas may be unavoidable, the Port will ensure consistency with development standards for tree and vegetation removal and revegetation.

5. **Provide Revegetation Benefits.** The Port recognizes that replacing obstructions with native vegetation provides a number of benefits, including the following:

   - Generation and retention of soil, as well as protection of slopes from erosion and land movement
   - Water quality improvements to slow stormwater movement and filter toxins
   - Aesthetic qualities
   - Control of non-native plant establishment

   Port Commissioners have requested no net loss of trees will occur through the obstruction management program (Port of Seattle 2015d); revegetation efforts to achieve this goal will comply with all Port policies.

6. **Minimize Costs for Removal and Long-term Monitoring**. The Port will seek to minimize costs for obstruction removal and ongoing maintenance. This will guide the removal techniques, revegetation, sequencing of construction, and identification of opportunities for material reuse. This effort may also include the proactive removal of vegetation that is nearing obstruction status and is in the vicinity of current obstructions.

4 EXISTING SITE CONDITIONS

4.1 Property Ownership

King County parcel data were overlaid with the preliminary obstruction points derived from the Port's 2014 LiDAR analysis. As shown in Figure 3 and Table 1 these obstructions are located in the cities of Burien, SeaTac, and Des Moines. The identified obstructions are found on Port-owned properties, other public properties, and commercial and private lands.

Table 1
Number of Obstructions by Jurisdiction

Jurisdiction	Obstruction Counts from LiDAR Survey
City of Burien	78
City of Des Moines	57
City of SeaTac	1301[1]

Notes:
1. This total includes 387 obstructions on Port-owned property.
LiDAR = Light Detection and Ranging

The obstructions found on public property include a City of Seattle reservoir parcel and WSDOT-managed rights-of-way. Some of the obstructions on WSDOT property occur within areas planned for the State Route (SR) 509 extension project.

Obstructions on airport property lie within the city of SeaTac; the Port and the City of SeaTac currently have an ILA in place that provides for complementary land use, landscaping, zoning, and surface water management provisions that were agreed upon by both parties (City of SeaTac and Port of Seattle 2006). Obstruction removal on Port-owned property will be consistent with the provisions of the ILA.

Implementation of the flight corridor safety obstruction management program on non-Port-owned property will require coordination between the Port, local jurisdictions, and property owners to ensure safe navigable airspace and compatible land uses.

4.2 Site Characteristics

While most of the obstructions have been identified as trees, the height, health, species, number of trees per obstruction, and associated land use vary by site. The following sections provide a general description of the known site conditions. Fieldwork is currently underway to fully characterize each obstruction and the site conditions. The Port-owned obstruction sites are shown in Figure 2. The locations of obstructions on non-Port-owned properties are shown in Figure 3.

4.2.1 Port-owned Properties

The Port-owned obstruction sites (numbered 1 through 23) are located around the north, west, and south sides of STIA.

Site 1 contains steep slopes with an adjacent wetland and regulatory buffer; it is located at the north end and is adjacent to a stormwater detention pond situated upslope of the site. The tree species in this area include large cottonwoods (*Populus balsamifera* ssp. *trichocarpa*) and moderately dense stands of alder (*Alnus rubra*). The groundcover within the interior sections of the site includes English ivy (*Hedera helix*), which has been controlled by Port maintenance and is found mostly on the ground rather than climbing up tree trunks.

Site 1 located north of STIA

Sites 2 through 10 are found near the Port's west-side office, to the west of the airport and to the east of SR 509 and Des Moines Memorial Drive. This area includes two stormwater ponds, one wetland complex, a number of steep slope areas, and is adjacent to restrictive covenant lands to the north. Sites 5 and 10, which are near the wetland area and steep slopes, mostly contain deciduous maple (*Acer macrophyllum*), alder, and cottonwood trees (though some conifer species are also present).

Site 5 looking north with nearby stormwater pond, Airport Operating Area in the background

The steep slope areas here have Himalayan blackberry (*Rubus armeniacus*) growing in dense brambles. The areas around the stormwater ponds (Sites 5C and 9) have mown turf groundcover, and the ponds are covered with nets to deter waterfowl. Sites 2, 3, and 4 include former residential parcels that were purchased by the Port as part of the third runway project. These areas contain a number of large conifer trees and remnant ornamental (possibly fruit-bearing) plantings from the historical residential uses that occurred here.

Sites 11 through 23 are south of the airport. Site 11 includes a windrow (single row of trees planted very closely together) of Lombardy poplars (*Populus nigra 'Italica'*). There are trees near this site that, given their proximity to the airport runways, will likely become obstructions in the next few years.

Looking west with Site 11 in the background and potential future obstructions in the foreground

Site 13 contains a relatively intact wetland and stream complex. This site contains alder stands and relatively diverse, native shrub and groundcover layers, including healthy stands of red-osier dogwood (*Cornus servicea*). The remaining obstructions in this area are within a former golf course.

Site 23 contains a large tract of forested land, which includes publicly accessible walking trails that are well used by the community. This site contains a number of non-native species (e.g., English ivy, holly [*Ilex aquifolium*]). The tree species on the site include native vegetation and ornamental landscaping, which indicates the historical residential use of the property. Site 24, located to the east of the prison access road, contains a similar mix of species, but is not accessible to the public.

Looking north at Site 23 (left) and obstructions on WSDOT property (right; Section 4.2.2)

4.2.2 WSDOT Properties

Sites that contain obstructions on WSDOT-owned land include the vegetated shoulder of SR 509, located to the west of STIA, and a large parcel south of the airport that is planned to be used in the SR 509 extension project. The existing SR 509 shoulders near the airport are elevated between 20 and 35 feet above the highway. While fieldwork has not been completed in this area, analyses of street view and aerial imagery suggest that the obstructions in this area are predominately deciduous trees, though some of the larger obstructions (e.g., 60 feet tall) are conifer, Douglas fir (*Pseudotsuga menziesii*) species. The WSDOT area south of the airport is located across South 200th Street from the Port-owned

Site 23. This parcel, similar to the Port-owned site, contains a large tract of forested land with a mix of native and non-native species.

4.2.3 Other Public Properties

Obstructions found on municipal land occur predominately within city rights-of-way. In addition, one vacant parcel within the city of SeaTac contains two obstructions per the LiDAR analysis. From analyses of street view imagery, these obstructions appear to be conifers. Seattle Public Utilities' water reservoir, located northeast of the airport, contains a number of obstructions. The parcel appears to be parkland, with obstructions that are a mix of deciduous and conifer trees. Finally, the City of Burien's Highline School District has two parcels containing obstructions. One site is located to the west of the airport along the western shoulder of SR 509; the obstructions are at the edge of a school bus parking lot. The second parcel is located to the south of the airport and northwest of the Port-owned Site 23. This parcel contains an old school building, which appears to be used as offices and storage space for the school district.

4.2.4 Private Properties

Obstructions on private land are found on parcels zoned for commercial, institutional and worship, and residential uses. Within the city of SeaTac, obstructions are found within a number of small residential parcels east of the Seattle Public Utilities' water tower (northeast of the airport), and also within isolated residential properties southwest of STIA. Other obstruction locations in SeaTac include two commercial car rental sites, a cemetery, isolated vacant parcels, and a church.

Private parcels with obstructions in the cities of Burien and Des Moines appear to consist entirely of residential uses. One of the larger sites in the city of Des Moines appears to be vacant, but is owned by a real estate developer.

4.3 Critical Areas

Several obstructions occur within or adjacent to a critical area, including wetlands, streams, and steep slopes, as well as their regulatory buffers. Data on obstructions within or near critical areas are currently available for obstruction sites on Port-owned properties and other properties

within the city of SeaTac. The obstruction counts presented are based on the LiDAR analysis. Because ground truthing fieldwork is not yet complete, these are estimated counts.

Approximately 25% of the identified obstructions on Port-owned properties and within the city of SeaTac are found within a critical area or adjacent areas as follows:

- Approximately 90 obstructions are located within wetlands or wetland buffers, and 30 more obstructions are within 50 feet of these areas.
- Approximately 2 obstructions are located within stream buffers, and 2 additional obstructions are within 50 feet of these areas.
- Approximately 40 obstructions are located on a steep slope area, and 240 more obstructions are within 50 feet of a steep slope area; however, many of the steep slope areas include engineered slopes, which are more stable than naturally occurring steep slopes and will therefore have less restrictions for obstruction removal.

The Port will obtain critical areas data for other obstruction within the cities of Des Moines and Burien in early December, and the forthcoming Implementation Plan will confirm and report the number of obstructions within critical areas for the entire program area. This critical areas data will be verified during upcoming (early 2016) field characterizations of obstructions and site conditions for private properties.

4.4 Site Access

The majority of the identified obstructions occur within easily accessible sites. The site characteristics that contribute to more difficult access by personnel and/or equipment include narrow access routes, vegetative brambles (i.e., Himalayan blackberry) that require clearing for site access, soft and/or saturated soils, and sites that have traffic hazards for access. Potential sites with access issues on Port-owned properties include Sites 5f and 5d, which are located, or partially located, on steep slopes and within a bramble-filled wetland buffer that may also contain soft soils. Traffic hazards may be an issue for access to obstruction sites along SR 509, particularly if access via the highway is the only option. Detailed plans for site access will be developed through the Implementation Plan. Clearing additional vegetation, and placing and removing access route materials (angular rock and base courses) may require further site restoration following obstruction removal.

5 OBSTRUCTION REMOVAL METHODS

This section presents methods for each step of completing the obstruction management program as follows:

1. Obstruction removal
2. Material processing and disposal
3. Site treatment (to minimize future obstructions and stabilize the site)
4. Monitoring

The various methods are identified in Tables 2 through 5, along with the suitability of these methods under certain site conditions and property ownership. The methods are also evaluated against the guiding principles of the flight corridor safety obstruction management program as they relate to FAA policies, Port policies, and overall cost. When the data collection for each site is complete, the Port will select a preferred removal plan for each site, which will be included in the Implementation Plan. A few examples showing how these approaches could be combined into a preferred removal plan are provided in Tables 1 through 4.

Table 2

Suitability and Comparison of Potential Methods for Obstruction Removal

Potential Method	Suitability		Other Considerations	
	Site Conditions	Property Ownership	Consistent with FAA and Port Policies	Cost per Obstruction
Clearing, tree removal in congested area (hand work)	Suitable where isolated obstructions occur particularly on congested sites; may also include cordoning off the removal area to protect the public	Suitable for all ownership types	All options are consistent with FAA rules and Port policies.	High. This option would likely be the most expensive for tree removal, however because the operation may have less unintentional vegetation removal and disturb less of the site overall, the material disposal and site treatment costs may be lower.
Clearing, tree removal without stump removal	Suitable where isolated or small groupings of obstructions occur and retaining stumps is used to protect steep slopes	May not be suitable for private owners and public entities who require or prefer stump removal		Moderate. Somewhat lower than selective clearing, grubbing, and grading
Selective clearing, grubbing, and grading	Suitable where isolated or small groupings of obstructions occur and retaining stumps is not needed to protect steep slopes	Suitable for all ownership types		Moderate. Somewhat higher than selective clearing and grubbing without stump removal
Clearing, grubbing, and grading	Suitable for areas with dense obstruction groupings where adjacent areas are not congested or major traffic corridors; sites without firm, level terrain would be more difficult to clear using standard equipment (e.g., 300-horsepower bulldozer)	May not be suitable for private owners and public entities who may require protection of non-obstruction features and vegetation		Low to Moderate. The cost of removal per unit obstruction would likely be the lowest of all methods. However, because many understory features would also be removed during clearing, the disposal cost per obstruction may be higher. Additionally, treatment for sites not slated for development would require a larger investment as the removal operation would likely cause more site disturbance.

Potential Method	Suitability		Other Considerations	
	Site Conditions	Property Ownership	Consistent with FAA and Port Policies	Cost per Obstruction
Topping trees	Topping is no longer regarded as a suitable pruning practice because it affects tree heath, potentially creating a hazard tree, and stimulates undesirable growth, triggering ongoing maintenance.	While topping could be possible on Port-owned property where regular maintenance could occur, it would require much more maintenance and re-topping over time. In addition, this approach is not consistent with Port policies related to wildlife management.	The airport's *Wildlife Hazard Management Plan* prohibits tree topping adjacent to the airport.	Moderate, though this option is not feasible. While the cost of the initial topping would be low, additional recurring costs would be required to maintain trees below the obstruction level

Table 3

Suitability and Comparison of Potential Methods for Material Disposal from Obstruction Removal Activities

	Suitability		Other Considerations	
Potential Method	**Site Conditions**	**Property Ownership**	**Consistent with FAA and Port Policies**	**Cost**
Leave material on site with little or no processing	Problematic except in open space areas; leaving obstructions where they lay may be interpreted as discharging fill within wetland or stream critical areas	May not be suitable for private owners and public entities who may require removal of materials	Consistent with policies, provided felled logs are monitored for resprouting to avoid future obstructions	Low.
Process material for use on site (wood chips, restoration features)	Suitable for sites that are large enough to contain these materials	May not be suitable for private owners and public entities who may require removal of materials	These options are acceptable. Reuse of materials contributes to the goals of the *Environmental Strategy Plan* (e.g., waste reduction) and are cost effective.	Moderate. Slightly higher cost than leaving material on site with little or no processing
Process material for Port use off site (wood chips, lumber, restoration features)	Suitable for all site conditions	Suitable for all ownership types		Moderate. Slightly higher cost than processing material for on-site use, as work includes trucking material off site; potential cost savings for receiving project by eliminating the need to purchase this material elsewhere
Salvage understory plant materials and replant following obstruction removal				Costs associated with salvaging plant material would be minimal given that this work would likely be provided by volunteers. This option would provide cost savings through lowering the costs associated with purchasing plants for site revegetation.

Potential Method	Suitability		Other Considerations	
	Site Conditions	Property Ownership	Consistent with FAA and Port Policies	Cost
Dispose off site(no reuse conditions)	Suitable for all site conditions	Suitable for all ownership types	This option is acceptable, though does not contribute to Port waste reduction goals.	High.
Engage materials exchange network for beneficial reuse by other parties			This option is acceptable.	Low, provided a receiving property or party is available to take materials immediately following removal

Table 4

Suitability and Comparison of Methods for Site Treatment (Minimizing Potential Future Obstructions, Stabilizing Site)

	Suitability		Other Considerations	
Potential Method	**Site Conditions**	**Property Ownership**	**Consistent with FAA and Port Policies**	**Cost**
Revegetate site with shrubs and groundcovers	Best suited for sites with the closest proximity to safe navigable airspace surface	Suitable for all ownership conditions	Consistent with policies, provided species selected are part of the Port's approved plant palette	Low to moderate for plant installation; however, compared to not revegetating disturbed areas, these methods would lower costs of King County noxious weed management and maintenance activities
Revegetate site using low-growing trees, shrubs, and groundcovers	Suitable for most site conditions	Suitable for all ownership conditions		
Develop site	Most feasible for sites outside of critical areas where the development proposal complies with airport safety land use requirements	Suitable for sites slated for development; if time frame for development is further out, temporary site treatment for erosion and sediment control would be required	Consistent with policies, provided development proposal complies with airport safety land use requirements	Low. This option includes the potential that the developing agency will cover the obstruction removal work from their development budget.
Implement tree removal and site treatment in adjacent areas with near-term obstruction potential	Best suited for sites where repeated disturbance through obstruction removal is ill-advised (critical areas, congested areas)	Best suited for private ownership conditions where repeat entry for obstruction removal will be time-consuming and/or difficult	Consistent with policies	High. Highest cost in the short term through additional obstruction removal; however, this is a cost-saving approach for overall obstruction management because this option eliminates future access planning, permitting, and crew and equipment mobilization to a site

Potential Method	Suitability		Other Considerations	
	Site Conditions	Property Ownership	Consistent with FAA and Port Policies	Cost
Erosion control best management practices (geotextiles, armoring slopes)	May be necessary for certain steep slope sites, particularly those where soft armoring through revegetation may not be feasible or be sufficient towards slope protection; may be required on private sites where grading following obstruction removal is required, but the space for grading requires retaining structures to meet grades while protecting nearby infrastructure	Suitable for all ownership conditions	Consistent with policies	Low to moderate. This cost depends on the methods required for erosion control.

Table 5

Suitability and Comparison of Methods for Monitoring

Potential Method	Suitability		Other Considerations	
	Site Conditions	Property Ownership	Consistent with FAA and Port Policies	Cost
Treat stumps to control resprouting[1] (applicable only in sites where stumps were left in place during obstruction removal)	To avoid future obstruction development, this approach would be required where stumps of fast-growing species are resprouting. Herbicide or fungicide treatment of stumps in or near aquatic areas would need to comply with water quality policies.	Not well suited for private ownership conditions where repeat entry for obstruction removal would be time-consuming and/or difficult	Consistent with policies	Moderate, however this method provides cost savings because it removes the future obstruction potential of a feature, and thus eliminates future access planning, permitting, and crew and equipment mobilization to a site
Monitor areas with high near-term obstruction potential	Suitable for sites where recurring obstruction removal (i.e., 5-year cycle) is possible	Suitable for all ownership conditions, though permission to enter private or public parcels may be required if obstructions cannot be monitored from rights-of-way or Port-owned property	Consistent with policies	Low.

Note:
1. Species of concern for stump resprouting include cottonwoods, maples, and willows

6 RECOMMENDED APPROACH TO OBSTRUCTION REMOVAL

Port staff have determined that the approach to obstruction management should proceed in the following general sequence: 1) Port-owned properties; 2) other public-owned properties and commercial properties; and 3) private properties. Within this sequence, the phasing of obstruction removal should prioritize those sites that pose the greatest safety risk. An evaluation examining the degree to which an obstruction is penetrating the approach and departure surface, as well as species-specific tree growth rates, will provide a better understanding of the priority for removal. The current field efforts that include ground truthing the LiDAR analysis through site surveys and GPS data collection will also provide the species details necessary to establish these growth rates. Further detail of this phasing will be provided through the Implementation Plan.

The Port has identified 24 specific sites within their ownership that are in need of clearing. Grouping these sites into logical bid packages through the Implementation Plan will streamline the complexity inherent with this number of sites. While combining Port-owned sites that are geographically near each other may make sense in some instances, the means and methods of obstruction removal, as well as specific site characteristics (e.g., critical areas, difficult site access, congested areas), are important factors in making sure the right crew and equipment are working on the right site.

Communication with WSDOT and local jurisdictions at the conceptual stage of the obstruction management program can provide an introduction to the project and early identification of coordination or permitting needs, including agency guidance and land use code requirements related to tree removal and revegatation. Further communications could include site visits with agency representatives to describe the program in more detail, the site conditions, and the safety issues guiding the program. In addition, this outreach can provide an opportunity for local jurisdictions to identify potential mitigation needs associated with tree removal.

Based on the existing information and range of alternatives, the following approach to obstruction removal is recommended.

6.1 Steps to Implementing the Obstruction Removal Plan

STEP 1: Confirm existing conditions at each obstruction removal site	Complete tree surveys to confirm tree numbers, size, and species. The site visits can also be used to confirm the presence of any critical areas and other important site conditions (e.g., access restrictions) that may affect obstruction removal. This work is ongoing.
STEP 2: Confirm degree of intrusion for each obstruction removal site	Use LiDAR information combined with tree species and site conditions to confirm existing degree of intrusion and predict risk of increased intrusion.
STEP 3: Identify preferred removal method for each site	Identify preferred removal method for each site based on the site conditions, species, height, and degree of intrusion.
STEP 4: Develop grouping of sites for bid packages	Prepare an obstruction management implementation plan that prioritizes removal in the following general sequence: 1) Port-owned properties; 2) other publicly owned properties and commercial properties; and 3) private properties. Within each element, adjustments can be made as necessary to remove high-priority obstructions that have greater degrees of intrusion.
STEP 5: Coordinate with local jurisdictions and regulatory agencies	Assimilate summaries of site information and obstruction removal plans for each reviewing agency and confirm which approvals are required. Prepare environmental review and permitting documents as necessary.
STEP 6: Complete obstruction removals	Remove obstructions and revegetate the site. Implement monitoring of sites for future obstructions as well as performance monitoring for revegetation as required by permit conditions.

7 REFERENCES

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FIGURES

H:\Projects\STIA\3850\2015\150417-2 Airport Tree Obstruction Data\Anchor QEA

Aerial Photo Taken Spring 2012

Figure 1: Project Vicinity

Flight Corridor Safety Obstruction Management Program Conceptual Plan

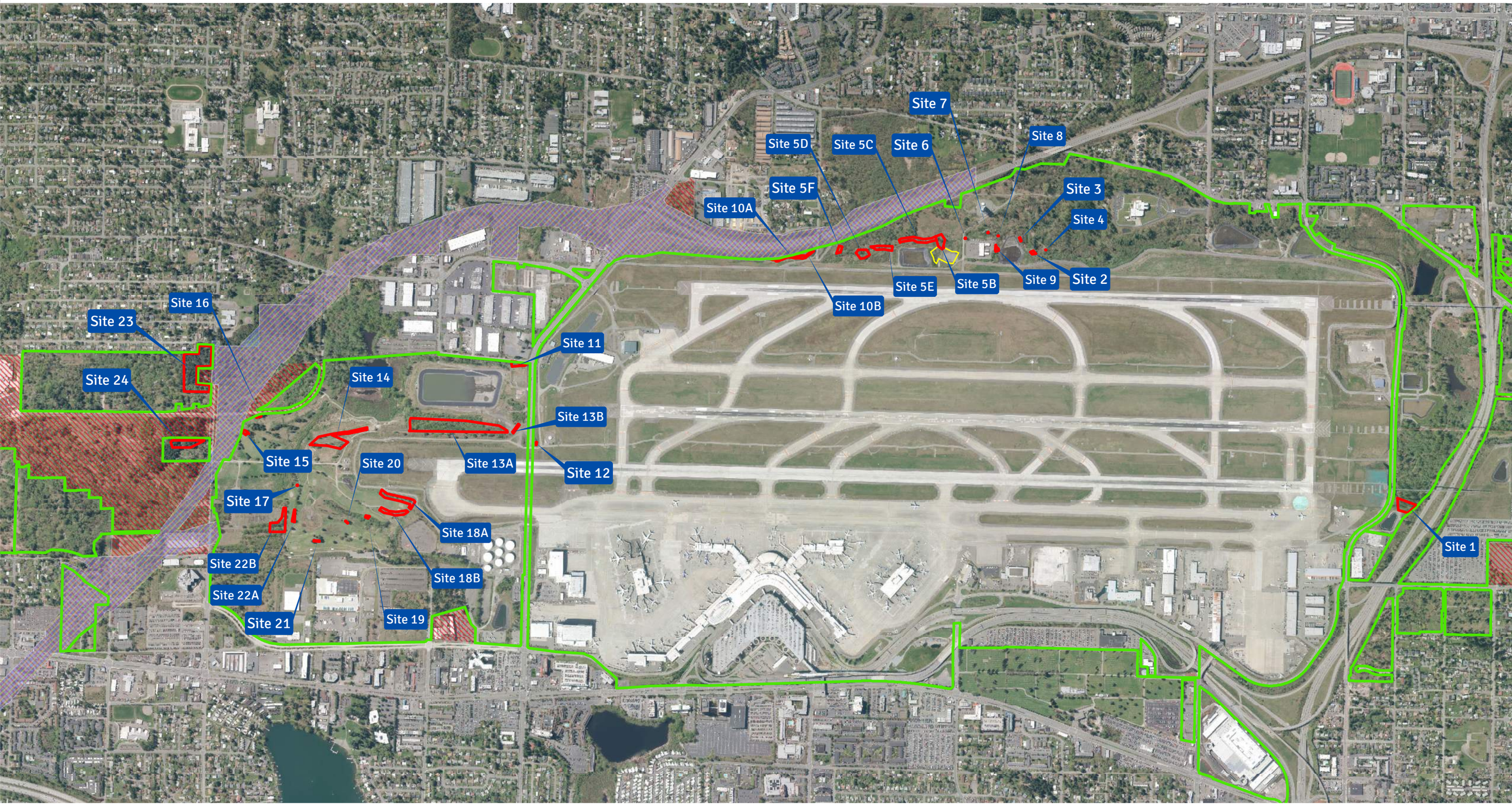
0 1,000 2,000 Feet

State (WSDOT) Property

Private Property

City Boundary

Port of Seattle Property



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Aerial Photo Taken Spring 2012

Figure 2: Port-Owned Site Locations

Flight Corridor Safety Obstruction Management Program

Conceptual Plan

0 1,000 2,000 Feet

State (WSDOT) Property

Private Property

Port of Seattle Property

Preliminary Site Extents

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Aerial Photo Taken Spring 2012

Figure 3: Obstructions Outside Port Property

Flight Corridor Safety Obstruction Management Program Conceptual Plan

0 1,000 2,000 Feet

City Boundary

Port of Seattle Property

On Public Property

- WSDOT
- City

On Private Property

- Commercial
- Residential
- Worship

APPENDIX A
POTENTIAL ENVIRONMENTAL APPROVALS AND PERMIT MATRIX

Permit/Approval	Agency	Trigger	Notes
Federal Jurisdiction: Permits			
CWA Section 404 (Section 404 permit)	USACE	Discharge of dredged or fill material into waters of the United States, including adjacent special aquatic sites such as wetlands	No new permits are anticipated at this time; however, obstruction removal on existing mitigation sites will require permit modifications per the provisions of restrictive covenants.
Migratory Bird Treaty Act	USFWS	Actions that results in the harming a migratory bird, its eggs, or nest	No permits are anticipated if the tree removal is done before March 1 and after July 15.
Rivers and Harbor Act Section 10 (Section 10 Permit)	USACE	Any proposed work in, over, or under navigable waters of the United States that affects navigable capacity	See Section 404 above.
Federal Jurisdiction: Associated Approvals			
NEPA Compliance	Lead federal agency	Projects with a federal nexus (e.g., led by a federal agency, receiving federal funding, located on federal lands, or requiring a federal permit)	Would apply to USACE permits, FAA decision and/or federal funding
ESA Section 7 Consultation	NMFS and USFWS	All projects with federal nexus are subject to Section 7 of the ESA, which requires federal agencies to ensure that projects they authorize, permit, or fund do not jeopardize the continued existence of any threatened or endangered species, or destroy or adversely modify critical habitat.	The federal nexus for the project would be associated with USACE permit and/or federal funding for project; a biological assessment will be prepared for the project to support the USACE permit process.
Magnuson-Stevens Fishery Conservation and Management Act EFH Consultation	NMFS	Consultation is required to ensure that federal actions adequately avoid, minimize, or mitigate any activity that may affect EFH	EFH consultation occurs concurrently with ESA consultation.

Permit/Approval	Agency	Trigger	Notes
NHPA Section 106 Consultation	Federal lead agency in coordination with the DAHP	Projects with a federal nexus are subject to Section 106 of NHPA, which evaluates actions that have the potential to affect cultural, archaeological, or historical properties	No effects to historic properties are anticipated at this time.
State Jurisdiction: Permits			
CWA Section 401 WQC	Ecology	Applying for a federal permit or license to conduct any activity that might result in a discharge of dredge or fill material into water or non-isolated wetlands or excavation in water or non-isolated wetlands	Not anticipated at this time
Coastal Zone Management Act Federal Consistency Determination	Ecology	Projects that contain a federal nexus proposed within any of Washington's 15 coastal counties	Not anticipated at this time
CWA Section 402 National Pollutant Discharge Elimination System Construction Stormwater General Permit	Ecology	Required for all soil-disturbing activities where 1 or more acres will be disturbed and have a discharge of stormwater to a receiving water or storm drains that discharge into a receiving water (i.e., wetland, creek, river, marine water, ditch, or estuary)	Not anticipated at this time
Hydraulic Project Approval	WDFW	Proposed activity that uses, diverts, obstructs, or changes the natural flow or bed of any of the saltwaters or freshwaters of the state	Not anticipated at this time
Class IV General Forest Practices Permit	DNR or authorized local jurisdiction	Required when more than 5,000 board feet of merchantable timber (approximately one logging truck) is harvested from an area or property	Would be processed as part of local agency critical areas review and/or clearing and grading permitting
Tree Removal Authorization	WSDOT	Tree or vegetation removal on WSDOT property	Includes requirements/ratios for revegetation

Permit/Approval	Agency	Trigger	Notes
Local Agencies			
SEPA Compliance	Local jurisdiction	Any proposal that requires a state or local agency decision to license, fund, or undertake a project; or the proposed adoption of a policy, plan, or program can trigger environmental review under SEPA	Propose SEPA review of obstruction removal plan for each jurisdiction
Substantial Shoreline Development Permit	Local jurisdiction	Proposed activities occurring within the Shoreline Management Act Jurisdiction (generally within 200 feet of mean higher high water)	Not anticipated at this time
Critical Area Review	Local jurisdiction	Triggered by proposed activities occurring within sensitive areas or their buffers (e.g., landslide-prone areas, steep slopes, wetlands)	
Other Local Permits and Approvals (e.g., Building, Fill/Grade, Land Use, Noise)	Local jurisdiction	Required for proposed activities within a city or county jurisdiction	

Notes:
This list of permits and approvals is based on Anchor QEA's experience of resource agency review time frames and is subject to change based on project complexity and locale.

CWA = Clean Water Act
DAHP = Department of Archeology and Historic Preservation
DNR = Washington Department of Natural Resources
Ecology = Washington State Department of Ecology
EFH = Essential Fish Habitat
ESA = Endangered Species Act
FAA = Federal Aviation Administration
NEPA = National Environmental Policy Act
NHPA = National Historic Preservation Act
NMFS = National Marine Fisheries Service
SEPA = State Environmental Policy Act
USACE = U.S. Army Corps of Engineers
USFWS = U.S. Fish and Wildlife Service
WDFW = Washington Department of Fish and Wildlife
WQC = Water Quality Certification
WSDOT = Washington Department of Transportation

APPENDIX C

Department of Ecology Greenhouse Gas Calculator

The greenhouse gas estimate below uses the Department of Ecology's Greenhouse Gas Emissions calculation tool, specifically the conversion of forest lands non-combustion emissions. Acreages for proposed removal were estimated using the figure data in the Implementation Plan.

Conversion of Forest Lands		
Acres Cleared	Location	GHG Emission (MT CO2e)
25.2	Western WA	3,049
116	Western WA	14,036
	Western WA	-
	(select option)	-
	(select option)	-
	(select option)	-

Washington Department of Ecology. Guidance for Ecology Including Greenhouse Gas Emissions in SEPA Reviews. http://www.ecy.wa.gov/programs/sea/sepa/climatechange/calculationsTool.xlsx