PCHB NO. 01-133
PORT OF SEATTLE'S MEMO OPPOSING
ACC'S MOTION FOR STAY

Declaration of James Kelley, Ph.D.
Volume 1 of 3

ORIGINAL

AR 008823

RECEIVED
OCT - 1 2001
ENVIRONMENTAL HEARINGS OFFICE

POLLUTION CONTROL HEARINGS BOARD
FOR THE STATE OF WASHINGTON

AIRPORT COMMUNITIES COALITION, Appellant, v. DEPARTMENT OF ECOLOGY and THE PORT OF SEATTLE, Respondents.	No. PCHB 01-133 DECLARATION OF JAMES C. KELLEY, PH.D.

JAMES C. KELLEY, Ph.D., declares as follows:

1. I am over 18 years of age, am competent to testify, and have personal knowledge of the facts stated herein.

2. I am a professional ecologist employed by Parametrix, Inc., an engineering and environmental consulting firm. Parametrix Inc. provides environmental planning, engineering design, and environmental permitting services to public and private sector clients. Many of our projects involve new or expanded transportation infrastructure. The natural resource group at Parametrix, Inc. includes fisheries biologists, wildlife ecologists, wetland biologists, and water quality specialists needed for the multidisciplinary analysis of large projects. I have been employed at Parametrix for over 13 years. My educational background includes a Doctoral of Science degree (1985) from the Fisheries and Wildlife Department at Michigan State University where my studies

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

focused on aquatic ecology. I have a Master of Science degree from the Department of Botany and Plant Pathology (1980) at Michigan State University where my studies focused on plant ecology and plant taxonomy. My Bachelor of Science is from the Botany Department (1978) at the University of Vermont. I have completed postdoctoral research at the University of Minnesota-Duluth (1985-1987), where I studied wetland and riparian processes.

3. In 1997, I served on the Riverine Assessment Team and Depressional Assessment Team to help develop *Methods for Assessing Wetland Function Volume I Riverine and Depressional Wetlands in the Lowlands of Western Washington* (Ecology Publication #99-115). I have professional training and practical experience in the planning, design, implementation, and maintenance of constructed wetlands for water quality treatment, and have completed treatability studies that evaluate the ability of constructed wetland systems to remove excess metals from surface water. I have developed and implemented wetland restoration plans as part of sediment remediation (including dredging, capping, and natural recovery) actions. I have prepared over a dozen presentations and publications on wetlands ecology and related topics, which are included with my resume attached to this declaration in **Attachment A.**

4. I serve as the principal consulting ecologist for the Master Plan Update (MPU) projects at Seattle-Tacoma International Airport. In that capacity, I have directed and managed the wetland and natural resource studies for the MPU, which includes the Third Runway Project, the runway safety area extensions, the South Aviation Safety Area, the development of on-site borrow areas, and related projects. I and others working under my direction have been primarily responsible for the identification of impacts to wetlands and other aquatic resources, the assessment of wetland functions, and the design of compensatory mitigation for the MPU projects. The scientific analysis and conclusions on which this declaration is based are provided in the *Wetland Delineation Report* **(Attachment K),** the *Wetland Functional Assessment and Impact Analysis Report* **(Attachment L),** and the *Natural Resource Mitigation Plan* **(Attachment M).**

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

5. The Master Plan Update Improvements at the Seattle-Tacoma International Airport result in the permanent filling of 18.37 acres of wetland. During construction, an additional 2.05 acres of wetland will be impacted and, pursuant to Ecology's direction in the 401 Certification, will be treated as permanent wetland impacts. A complete and comprehensive mitigation plan has been developed to replace the ecological functions these wetlands provide to the local area and to the Miller, Walker, and Des Moines Creek basins. Development of the plan has followed requirements to avoid and minimize impacts to wetlands. For impacts that cannot be avoided, compensatory mitigation is provided to prevent basin losses of wetland functions.

6. Logging and farming practices have historically modified the Miller, Walker, and Des Moines Creek basins. More recent urban development has also modified stream, wetland, and upland habitats. As a result, environmental conditions in the project area are far from pristine. Approximately 80 percent of the basins has been converted from their original forested condition to residential or commercial land uses. Increased impervious surfaces have resulted in increased stormwater runoff rates and volumes, which have contributed to erosion and down cutting in high-energy reaches and increased sedimentation and habitat degradation in low-gradient reaches. Runoff from residential, commercial, and agricultural areas located in wetlands and uplands has increased input of sediment, nutrients, and pollutants to the stream. Upland and wetland riparian areas adjacent to the stream have been altered from the original forest and/or shrub cover to impervious surfaces, agricultural fields, residential lawns, or ornamental landscaping. Native plant and animal habitats have been reduced in size and fragmented, resulting in a loss of species diversity.

7. All wetlands and streams affected by the project have been subjected to historic and on-going land use disturbances.[1] These disturbances include drainage and other hydrologic modifications, partial filling, land clearing and mowing, grazing, farming, domestic pets, urban runoff, and residential development. These disturbances have removed or altered many of the

[1] These impacts are described in a report *Cumulative Impacts to Wetlands and Streams* provided as Attachment N.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

features undisturbed wetlands may have that allow them to function at their highest levels. For example, the historic conversion of forested riparian wetlands to lawn and pasture (as has occurred in portions of Wetland 18, 37, and some wetlands on the Tyee Valley Golf Course) reduces habitat value, carbon cycling and carbon export capabilities. Their and riparian functions are also affected, as their ability to deliver woody debris and organic matter to creek ecosystems is severely diminished.

8. Even the supposedly higher quality Class II wetlands that occur in the basins and would be impacted by the project are functionally degraded wetlands. Class II wetlands that occur in the Vacca Farm area are degraded by farming and hydrologic alterations. The Class II Wetlands 18, and 37, are functionally degraded by alterations that residential development, ditching, land clearing and logging have caused. A component of the project mitigation (discussed later in this declaration) is to mitigate impacts to Category IV, III, and II wetlands by restoration enhancing the functions of degraded Category II wetlands.

9. Figure 2 in Paragraph 24 of the Azous declaration identifies that 45 percent of the area of wetlands rated Category II using the Ecology system will be eliminated from the Miller Creek Basin. In making this calculation, Ms. Azous apparently did not include Wetland 43 (about 33 acres) or the Tub Lake wetland (about 17 acres) in her calculations. These wetlands are discussed on page 1-9 of the *Wetland Functional Assessment and Impact Analysis Report* (**Attachment L**). When the Tub Lake wetland (a Class I wetland) and Wetland 43 (a Class II wetland) are included in the calculation, the loss of Class II or higher wetlands from the project area is 11 percent, significantly smaller than 45 percent reported by Azous. As discussed elsewhere in this declaration, the Port's mitigation plans will compensate for the functions lost by filling all wetlands, including the Class II wetlands.

10. The Ecology ratings are assigned independent of any specific evaluation of all the wetland functions that a functional assessment similar to that completed by the Port's would provide.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

While the rating approach helps identify a general ecological value that a wetland may provide, it cannot be used to infer what the specific functional performance of a wetland may be. Likewise, the ratings are assigned independent of the level of human disturbance or degradation that a wetland may have been subjected to.

11. The channel morphology of Miller Creek has been altered throughout the project area. Extensive areas of the channel have been armored with riprap or retaining walls, and dredged or straightened to protect property adjacent to the stream or to drain land for agricultural uses. For much of its length, dredging or straightening of the channel has occurred to increase conveyance. Ecologically valuable logs and other woody debris are nearly absent from the channel. These conditions have reduced aquatic habitat complexity, shading from riparian vegetation, and floodplain storage, and they have degraded water quality.

12. Similar land use histories have resulted in similar degradation of wetlands and streams in the Des Moines Creek basin.

13. Process to delineate and assess wetlands, and identify potential wetland impacts. The Port has used scientifically-accepted methods and standards to evaluate the presence of wetlands, the function of these wetlands, project impacts to these wetlands, and mitigation measures to avoid and compensate for wetland impacts.

14. The identification and delineation of wetlands are described in the *Wetland Delineation Report for Seattle-Tacoma International Airport Master Plan Update Improvements* (**Attachment K**). These studies were completed using the required methods outlined in the *Washington State Wetland Identification and Delineation Manual* and the U.S. Army Corps of Engineers *Wetland Delineation Manual.*

15. Based on these evaluations, areas that were determined to be wetland were flagged, surveyed and mapped. Data was collected in the wetlands and adjacent uplands to document the

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

dominant vegetation types, soil conditions, shallow groundwater conditions, and the general ecological condition of the area.

16. In addition to identifying vegetated wetlands, the studies identified streams and other drainage features that convey natural surface waters at least seasonally. These areas were also flagged and delineated. Where determined by the ACOE to be "waters of the U.S." they were surveyed, mapped, and included in further analysis.

17. The ACOE made site visits to confirm wetland identifications and boundary delineations between July 1998 and November 2000. The ACOE review of delineated wetland is documented in a *Memorandum for the Record (MFR): Field Review and Jurisdictional Summary* in February 2001. All modifications to delineated wetland boundaries that were requested by ACOE during those site visits have been made and are reflected in the wetland mapping and analysis for the project.

18. In addition to determining wetland areas affected and potentially affected by the project, impacts to wetland functions were also evaluated (**Attachment L**). Consistent with implementation of Clean Water Act Sections 404 and 401, this study focused on identifying the beneficial biological and physical (hydrologic and water quality) functions that wetlands provide to the local area and their larger basins.

19. Functional assessment methodologies for wetlands typically identify and evaluate a suite of physical and biological attributes of wetlands that are indicative of wetland functions. Several functional assessment methodologies were used for guidance in preparing the functional assessment[2]. There are no standard quantitative procedures for obtaining direct measurements of wetland functions for environmental assessments, nor are any required by the Department of

[2] These methods include locally developed *Wetland and Buffer Functions: Semi-Quantitative Assessment Methodology Draft Users Manual* (Cooke Scientific Services 1996), *Wetland and Buffer Functions: Semi-Quantitative Assessment Methodology Final Working Draft Users Manual* (Cooke Scientific Services 2000), *Wetland Evaluation Technique*, Department of the Army, U.S. Army Corps of Engineers (1987), and Indicator Value Approaches as described in Hruby, T., W. Cesanek, and K. Miller. 1995. *Estimating relative wetland values for regional planning.* Wetlands 15: 93-106.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

Ecology or the Army Corps of Engineers. Indeed, despite the significant amount of wetland research that has occurred over the past several decades, I am not aware of any wetland where the suite of ecological functions it provides has been quantitatively documented through direct measurements. The scientific literature, for most wetland functions, generally consists of a relatively small number of direct measurements of function at a relatively small number of wetlands. From this data, attempts are made to characterize various physical and ecological attributes that would indicate the functional performance of other wetlands, but there are no standard assessment methods that are applicable to the range of wetlands types found in Washington State or the project area. The Department of Ecology has recently developed a predictive model to estimate wetland functions in a variety of wetland types in western Washington[3]. However, these models were not available at the time the Port's studies were conducted and the models do not model functions of slope or non-riverine riparian wetland types (the most common and functionally important wetland types affected by the project). Due to the various limitations of the available functional analysis methods, careful observations and expert opinion are recognized as important elements in assessing wetland functions.

20. The commonly-recognized functions provided by wetlands in Puget Sound were evaluated in this function assessment study, and include:

- Supports resident and anadromous fish. Wetlands can provide direct habitat for fish, or provide indirect support to fish habitat by a number of processes.
- Provides habitat for songbirds. A variety of avian species use wetlands for foraging and nesting habitat.
- Provides waterfowl habitat. Wetlands frequently provide aquatic and semi-aquatic habitat used by waterfowl for nesting and foraging.
- Provides amphibian habitat. Wetlands with seasonal ponding may be breeding and rearing habitat for amphibians, which then disperse to adjacent upland areas.

[3] *Methods for Assessing Wetland Function. Volume I. Riverine and Depressional Wetlands in the Lowlands of Western Washington.* Washington Department of Ecology, publication #99-115. 1999.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

- Provides small mammal habitat. A variety of small mammals forage in and adjacent to wetlands. Some small mammals (American beaver [Castor canadensis] and muskrat [Ondatra zibenthicus]) live in certain types of wetlands.

- Exports organic matter. Organic matter produced in wetlands (live or dead plant material, aquatic or terrestrial insects, etc.) can be exported to downslope waters and may serve as food resources for other aquatic organisms. Carbon export can be in dissolved or particulate forms.

- Maintains groundwater exchange. Wetlands can be areas where groundwater is discharged and enters surface water drainage systems. Less frequently, they are areas where surface water collects and recharges groundwater aquifers.

- Provides flood-storage and runoff desynchronization. Wetlands in floodplains store floodwater and can reduce downstream flooding. Other wetlands slow surface water runoff rates, which can also reduce peak runoff rates in streams.

- Enhances nutrient retention and sediment trapping. Wetlands that reduce water velocities are areas where sedimentation occurs. Nutrients and pollutants are often attached to these sediments. Chemical and biochemical processes in wetlands can also remove nutrients and other chemical pollutants from surface water. These processes can improve the quality of surface water flowing through a wetland.

21. Biological and physical functions of wetlands were determined by evaluating a variety of wetland attributes that are correlated to wetland function. These attributes were identified from regional and national functional assessment methodologies and professional judgement. The attributes are interpreted to determine the quality of functions provided within the wetland, its buffer, and its associated basin. For biological functions, the attributes examined focused on structural complexity, hydrological connectivity to other aquatic habitat, hydrodynamics, habitat quality, and the degree of human disturbance. For physical functions, the attributes examined focused on hydrodynamics, hydrologic connectivity, and degree of disturbance, topographic conditions, as well as potential sediment transport. The presence, absence, and nature of these attributes helped determine the functions provided by the wetlands.

22. Five biological functions were examined. These functions determine the degree to which the wetland: (1) supports resident and anadromous fish, (2) provides passerine bird habitat, (3) provides waterfowl habitat, (4) provides amphibian habitat, and (5) provides small mammal

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

habitat. This assessment relied heavily on the factors incorporated into Ecology's wetland rating system as indicators of significant wildlife habitat (i.e., Category I and Category II wetlands).

23. Four physical functions provided by wetlands were also examined. These functions examined the wetlands' ability to: (1) export organic matter to downslope systems, (2) maintain groundwater exchange, (3) provide flood storage, and (4) enhance nutrient retention and sediment trapping. Wetlands with similar landscape positions, water sources, and hydrologic fluctuation (i.e., those within the same hydrogeomorphic class) were compared. Wetland groupings in the study area were determined to be:

- **Riparian.** Wetlands directly adjacent to Miller, Walker, or Des Moines Creeks.
- **Slope.** Wetlands that are generally free draining because they are on a hillside or slope.
- **Depression.** Wetlands that occur in topographic depressions, with or without restricted drainage outlets.

24. To help summarize project impacts on wetland functions, the wetlands were grouped according to their physical and biological similarities. The primary attributes that control the biological functions are the plant communities present, their vegetation structure, and the amount of habitat connectivity (particularly with other aquatic habitats). The primary attribute that accounts for physical (hydrologic and water quality) functions is whether the wetlands are riparian, slope, or depression (i.e., their hydrogeomorphic classification [HGM]). For these reasons, the U.S. Fish and Wildlife Service (USFWS) classification based on vegetation classes impacted (palustrine emergent, palustrine shrub, and palustrine forested) as well as their topographic occurrence in riparian, slope, or depression areas (i.e., its hydrogeomorphic position) were several of the primary characteristics considered when evaluating functions.

25. The functional performance of each wetland was determined based on evaluations of the physical and biological indicators of wetland function observed in each wetland, knowledge of

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

other wetland ecosystems in the Puget Sound region (urban and non-urban), and professional judgement. Functional performance ratings were assigned as follows:

- **High.** The wetland contains several important characteristics required to perform the function, and lacks attributes that limit or prohibit the function from occurring in the wetland.

- **Moderate.** The wetland contains one or more characteristics required to perform the function; however, several of these may be secondary indicators. The wetland may contain one or more characteristics that interfere with or prevent optimal performance of the function in question.

- **Low.** The wetland lacks significant attributes that the wetland could perform the function in question. One or more characteristics indicating the wetland does not perform the function are typically present.

26. **Attachment B** provides a summary of the functional assessment. For each wetland function, the total area of wetlands permanently affected by the project that provide at least a "low-medium"[4] level of function are totaled. **Attachment B** also lists the general conditions that were present in a wetland to receive at least a "low-medium" rating for each function.

27. Following wetland and stream identifications, the engineering designs for Master Plan projects were mapped on wetland and stream maps. Direct impacts were considered to occur in those areas where wetlands would be filled by project development. These areas were calculated using engineering design data and survey maps of delineated wetland boundaries that were incorporated into GIS map layers, from which fill impacts were calculated.

28. Permanent direct impacts occur where fill is permanently placed in wetlands. Temporary direct impacts occur where, on a temporary basis, fill or other activities occur in wetlands during a portion of the construction period. In these areas, following construction, and per the Council of Environmental Quality regulations (40CFR 1508.20), the impact is rectified by restoring the affected environment.

---

[4] The impacts to and ratings of each individual wetland and function are provided in Table 3-1 and Table 3-3, respectively, in the *Wetland Functional Assessment and Impact Analysis Report* (Attachment H).

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

29. Temporary impacts[5] result primarily from the need for temporary erosion and sediment control facilities (including sediment fencing, drainage swales, and stormwater management ponds) during the construction period. The duration of temporary impacts is variable, depending on project area and specific activity but can be several years.

30. Indirect wetland impacts to wetland functions were defined as potential wetland impacts (excluding filling) that could affect the existence and ecological function of wetlands located near areas developed as part of the Master Plan. The general methodology for evaluating these impacts was to consider the changes to wetland conditions or characteristics that could occur from the project, and evaluate what effect these changes could have on wetland functions.

31. Potential indirect impacts to wetland functions or areas may result from the long-term effects of construction and operation of the Master Plan Update improvements. The following activities could potentially result in indirect impacts, and they were thus evaluated in the study:

- Placement of fill near or adjacent to wetlands
- Placement of fill in portions of wetlands
- Stormwater management upslope of wetlands
- Disturbance of wildlife from aircraft noise
- Wildlife management activities
- Excavation for retaining wall footings
- Excavation for stormwater management ponds located upslope of wetlands
- Water quality impacts from potential stormwater discharges to wetlands at construction sites.

[5] The *Natural Resource Mitigation Plan* proposes wetland mitigation for all permanent and temporary wetland impacts. Because the duration of temporary impacts exceeds 1-year, mitigation for these temporary impacts includes restoration of the affected area (see the *Natural Resource Mitigation Plan*, Section 5.2.4, Parametrix 2000) and restoration of Wetland A17 (2.85 acres of wetland and 8.6 acres of upland) as required by condition D(4) of the amended Water Quality Certification.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

- Increased turbidity and sediment runoff above water quality standards.
- Degradation of water quality such as increases in temperature, chemical content, or reductions in dissolved oxygen.
- Changes to wetland vegetation that affect stream habitat conditions, including shade and export of organic matter.
- Changes to wetland hydrology that may affect the ability of a wetland to provide base flow to streams.
- Increased noise and human disturbance.
- Changes in hydrology that eliminate special habitat conditions (i.e., hydrologic changes eliminate standing water that might be used by certain bird species).
- Changes in hydrology that alter the dominant vegetation types in the wetlands.
- Alterations of flow patterns, riparian conditions, and vegetation types that could affect organic matter export to downstream ecosystems.
- Changes in runoff patterns and timing as a result of new impervious surfaces and the stormwater management system.

32. A key component of the indirect impact analysis was to consider the potential fragmentation of wetlands. Fragmentation impacts were evaluated by considering if, given the remaining fragment of wetland and the future project condition, the wetland would be capable of providing the suite of biological and physical functions it currently does. For habitat functions, where the remaining wetland would, as a result of mitigation, be incorporated into enhanced and protected buffers, it would remain functional because it will remain connected to other wetlands and riparian areas. If, however, a wetland fragment were to remain isolated from other more significant habitat, its functions would be impaired, and the indirect impact was considered significant. In these cases, the area of the wetland fragment was added to the amount of direct impacts. For physical

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

functions, the changes in hydrologic, runoff, disturbance, and other conditions were evaluated to determine if additional indirect impacts would reduce and fragment wetlands.[6]

33. A large number of hydrologic and engineering studies were completed to assure the accuracy of the wetland impact analysis. Key studies were included as appendices in the *Wetland Impact and Functional Assessment Report*, and are:

- *Third Runway Embankment Construction - Temporary Impacts to Wetlands and Erosion and Sedimentation Control*
- *Geotechnical Engineering Report for the Third Runway Embankment Construction*
- *Borrow Areas 1, 3, and 4 – Projected Impacts to Wetlands*
- *Preservation of Wetlands in Borrow Area 3*
- *Third Runway MSE Wall Subgrade Improvements*
- *Third Runway Embankment – Effects of Infiltration on Base Flow*
- *Low Streamflow Analysis for Miller, Walker, and Des Moines Creeks*
- *Analysis of Indirect Impacts to Wetlands from SR 509 Temporary Interchange*
- *Stormwater Detention Pond Designs for the Miller Creek Basin*
- *Feasibility of Stormwater Infiltration*
- *IWS Lagoon #3 Expansion Footprint*

34. <u>Avoidance and Mitigation of Wetland Impacts</u>. The primary strategy in addressing potential project impacts was avoidance and minimization of impacts to wetlands and streams. The key actions taken to avoid these impacts are listed in **Attachment C.** The result is the design of a "least damaging practical alternative" to avoid and minimize wetland and stream impacts. Where impacts to wetlands and streams were found to be unavoidable, compensatory mitigation is proposed such that there is no net loss of wetland functions or area.

---

[6] A detailed analysis of ACC claim regarding fragmentation impacts is provided in Response to Comments of Azous Environmental Sciences, February 16, 2001 response #15 – 17, attached to the Declaration of Steven Jones.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

Mitigation Summary

35. The compensatory wetland and stream mitigation projects and their area are summarized in **Attachment D.** This attachment shows that for the 18.37 acres of permanent and the 2.05 acres of temporary impact, over 167 acres of land will be permanently protected as mitigation. The 401 Certification requires the Port to execute and record restrictive covenants to protect the 167 acres of mitigation area. The forms of these restrictive covenants are included in the *Natural Resource Mitigation Plan* (**Attachment M**). The covenants require that the mitigation areas be preserved in a natural state, prohibiting future development activity. The geographic scope of the mitigation areas to be protected by the covenants is depicted on the drawings at **Attachment H.**[7] The ecological functions that are targeted in the design of these mitigation projects were based on the functions impacted by wetland loss (see **Attachment B**). For each mitigation site, I have listed in **Attachment E** the planned ecological functions to be provided at the mitigation site and the physical or ecological attributes that are included to assure the sites provide these functions. The attributes listed in **Attachment E** are the same or similar attributes that were used in the functional assessment report (see **Attachment L**, pages 2-3 through 2-5) to rate the functions of the impacted wetlands. These are the types of attributes that are generally recognized as indicators of wetland function.[8]

36. The mitigation plan proposes mitigation areas in excess of impact areas to account for the short term temporal losses of wetland functions (losses of function over the time period required for the mitigation sites to develop) and for potential uncertainty in mitigation success.[9] The recommended preference for selecting wetland mitigation sites in Washington is as follows: (1) on-

---

[7] These drawings do not include the two additional mitigation areas added by the 401 Certification decision – Wetland A-17 and the area adjacent to Borrow Area 3. Drawings for these two areas are currently being prepared.

[8] See *Methods for Assessing Wetland Functions. Volume I. Riverine and Depressional Wetlands in the Lowlands of Western Washington*. Washington Department of Ecology Publication 99-115. 1999.

[9] The uncertainty in the ultimate success of the mitigation projects is greatly reduced by careful design that is based on several years of observations of mitigation site conditions. Uncertainties are further reduced by requirements to a 15-year monitoring period, identification of enforceable performance standards, planning of contingency options, and an adaptive management approach to monitoring the projects.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

site and in-kind; (2) off-site, within the watershed, and in-kind; (3) off-site, out of the watershed, and in-kind; and (4) off-site, out of the watershed, and out-of-kind. The Port's proposed mitigation for wetland impacts has followed these recommendations. Therefore, most mitigation for impacts to wetland, stream, and floodplain functions are on-site and in-kind, occurring within the Miller and Des Moines Creek basins.

37. Mitigation for the Master Plan Update projects focuses on impacts to streams and wetlands by restoring and enhancing stream and wetland functions, especially to Class II wetlands. In the Miller Creek basin, the 401 Certification requires the Port to implement the following specific mitigation:

- Restore natural channel morphology, habitat complexity, and instream habitat along an approximately 1.4-mile reach of Miller Creek extending from south of Lora Lake to Des Moines Memorial Drive.
- Restore floodplain, floodplain wetlands, and riparian areas along the upper reaches of Miller Creek, and re-integrate floodplains and adjacent wetlands with the stream.
- Restore, replace, and enhance wetland and aquatic habitat functions to the currently degraded lacustrine, stream, floodplain, and riparian wetland system along the upper reaches of Miller Creek.
- Maintain wetland hydrology and base flow functions in wetlands adjacent to the embankment fill by providing surface water drainage features to convey groundwater and surface water runoff from the new embankment to downslope wetlands.
- Restore and enhance wetland and aquatic functions, and protect the long-term viability of these systems by establishing native forested buffers around wetlands and aquatic systems from Lora Lake to Des Moines Memorial Drive.
- Restore habitat connectivity in the upper reaches of the Miller Creek basin by providing a continuous forested wetland and riparian corridor connecting currently fragmented wetland, aquatic, and riparian habitats between Lora Lake and Des Moines Memorial Drive.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

38. To accomplish these objectives, mitigation projects will be concentrated in two areas along the upper reaches of Miller Creek: (1) Lora Lake and the Vacca Farm and (2) Miller Creek and its riparian zone between Lora Lake and Des Moines Memorial Drive.

39. In the Des Moines Creek basin, mitigation is designed to restore wetland and stream functions, and to mitigate for potential indirect effects to wetland hydrology. To replace functions impacted by Master Plan Update improvements and to restore and enhance aquatic and wetland habitat in the Des Moines basin, the 401 Certification requires the Port to implement the following specific mitigation:

- Enhance water quality and fish habitat, and restore stream conditions in Des Moines Creek by establishing a forested buffer along at least 1,200 linear feet of the west branch of Des Moines Creek

- Restore and enhance wetland and aquatic habitat by replacing the existing turf grass wetland with a native shrub wetland at the Tyee Valley Golf Course, adjacent to Des Moines Creek

- Avoid, minimize, and mitigate potential indirect hydrology impacts to wetlands adjacent to the borrow areas by directing groundwater seepage and/or surface water runoff to wetlands near the borrow areas

40. The Port will also establish basin trust funds to promote local stream restoration projects in the Miller and Des Moines Creek basins ($150,000 in each basin).

41. The Port has planned and designed the necessary stormwater conveyance, detention, and treatment facilities to manage runoff from both newly developed project areas and to retrofit existing developed airport areas. These facilities will not only mitigate potential stormwater runoff impacts from new construction impacts but they will also help to reduce existing peaks flows to further mitigate the impacts of airport stormwater discharges. Detention storage provided for Master Plan Update improvement projects will exceed that normally required by local regulations, and result in additional mitigation of stormwater impacts from project areas, including reduced peak stormwater runoff impacts on Miller, Walker, and Des Moines Creeks.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

42. The mean annual 2-year flow in Des Moines Creek, Miller Creek, and Walker Creek are currently less than 1 cubic foot per second. The Port has designed mitigation to prevent low flow impacts to the creeks. This includes infiltrating stormwater at certain stormwater detention facilities. Additional mitigation to prevent low stream flow impacts includes storage vaults which will collect stormwater during the winter months and release it during low flow periods. These mitigation actions will prevent impacts to aquatic habitat and fish movements.

43. The STIA Master Plan Update improvement projects are not expected to impact existing water quality. As described in greater detail in other declarations submitted by the Port, stormwater generated by Master Plan Update improvements will be collected and treated using water quality BMPs that are designed in compliance with the *Stormwater Management Manual for Puget Sound* (e.g., bioswales, filter strips, wet vaults, infiltration). Most urban development in the Miller, Walker, and Des Moines Creeks basins was constructed prior to requirements for stormwater treatment. The creeks receive pollutants that include: heavy metals, oils, and grease derived from nearby highways; fecal coliform from failing residential septic systems and adjacent farms; and suspended solids and litter carried in urban runoff. They also receive increased levels of phosphorus and nitrogen from fertilization of landscaping or cultivated areas. Sources of many of these pollutants will be removed as part of the Master Plan Update improvements. Because actions to mitigate water quality impacts are part of new development, the quality of future stormwater runoff will be equal to or better than current stormwater quality. A detailed discussion of water quality benefits and mitigation is included in the *Stormwater Management Plan.*

44. The Port's mitigation plan avoids creating new wetlands in the affected stream basins and it includes some off-site mitigation for reasons of aviation safety. Wetlands provide attractive habitat for waterfowls, flocking birds, and other wildlife that pose serious hazards to aircraft. In the United States, wildlife strikes annually result in over $300 million in direct damage and associated costs, and over 500,000 hours of aircraft down time. Since 1960, at least 78 civillian aircraft and

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

201 civilian lives have been lost worldwide to wildlife strikes. Since 1960, at least 250 military aircraft and 120 military personnel have been lost because of wildlife strikes.[10] FAA Advisory Circular 150/5200-33 provides that land uses that are wildlife attractants, such as wetlands, must be sited no closer than 10,000 feet from turbine aircraft movement areas. The FAA imposed this requirement as a condition of federal funding for the Third Runway project in its 1997 Record of Decision at p.26-27. The Animal Damage Control Office of the U.S. Department of Agriculture, in a letter to the U.S. Army Corps of Engineers dated April 15, 1998, describes the bird strike safety concerns at STIA and strongly recommends against the creation or enhancement of wetlands within 10,000 feet of the STIA runways.[11]

45. The Port searched for wetland mitigation sites in the Des Moines, Walker, and Miller Creek basins that could be used to provide replacement wildlife habitat; however, these basins are almost totally within the 10,000-ft exclusion area for wildlife habitat mitigation[12]. Areas within these basins that are more than 10,000 ft from existing runways were found not to be suitable for mitigation due to their small size, developed nature, forested condition, or the lack of hydrologic conditions necessary to support wetlands.

46. To mitigate for the loss of wildlife habitat due to the Master Plan Update improvements, the Port will construct wetland mitigation off-site on a 65-acre parcel in the City of Auburn. This mitigation will provide high-quality, diverse, forested, shrub, emergent, and open water wetland habitats and functions to a site where these functions are currently absent or degraded. This mitigation will provide greater habitat functions to a greater diversity of wildlife because it will provide a greater diversity of habitats, greater areas of habitats, and provide habitats that lack the

---

[10] See *Wildlife Hazard Management at Airports, USDA and FAA,* December 1999. Pages 1-2

[11] The FAA Advisory Circular and the U.S.D.A. letter are included in **Attachment I** to this declaration. See also, General Responses GR-1 and GR-2, dated April 2001, attached to the Declaration of Steven Jones, for a more complete discussion of bird strike hazards and reasons for not creating new wetlands at the airport.

[12] This issue was addressed in Section 7.2.3 of the *Natural Resource Mitigation Plan* (**Attachment M**) and in response to comments received during public comment periods (see General Response 1, page 16, Response to 404/401Comments, March 2000).

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

past and on-going disturbances that have reduced wetland habitat quality in the areas of wetland impact.

47. The off-site mitigation involves wetland restoration, wetland creation, and wetlands enhancement. The mitigation establishes 17.2 acres of forested wetland, 6.0 acres of shrub wetland, 6.2 acres of emergent wetland, 0.60 acres of open water, and 19.5 acres of emergent wetland habitat. These habitats will be protected with approximately 15.9 acres of forested upland buffers.

48. The mitigation planning and designs are based on scientifically-recognized methods to create, restore, and enhance wetlands and streams, and are sustainable over time. Planning for the sites has carefully evaluated site conditions (soil, hydrology, vegetation, and landscape conditions) to determine restoration approaches that will establish desired ecological functions in a sustainable manner, following agency guidelines[13]. The extensive review of these plans by the public and agency staff has resulted in the incorporation of numerous modifications to assure successful mitigation. For example, the applicable recommendations of recent King County assessments of mitigation projects have been included in the Port's plans[14] As planned, the mitigation also meets the Society of Wetland Scientists' definition of wetland restoration[15], as summarized in **Attachment F.** The mitigation planning also incorporates many other recommendations[16] regarding mitigation including: development of multiple functional goals; development of multiple performance-based monitoring standards for the key ecological elements to be established; and identification of contingency measures, including an adaptive management approach to monitoring and extension of the monitoring period to 15 years. The mitigation sites are assured long-term protection by restrictive covenants that legally protect them from other uses. These approaches are designed to

---

[13] The mitigation was planned and evaluated in accordance with the interagency publication *Guidelines for Developing Freshwater Mitigation Plans and Proposals*. Washington State Department of Ecology publication #93-74. 1993.
[14] See response to Comment 1 of State Senator Julia Patterson's letter of November 12, 1999 contained in *Response to Comments on Permit Reference No. 1996-4-02325,* Port of Seattle, March 2000.
[15] See *Position Paper on the Definition of Wetland Restoration,* Society of Wetland Scientists, August 6, 2000.
[16] See *Compensating for Wetland Losses Under the Clean Water Act, Advanced Copy*, National Research Council, Washington, D.C. 2000, pages 1-8.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

ensure that wetland functions are ultimately replaced and that the duration of temporal impacts are minimized.

49. The ACC [17] has questioned the effectiveness and sustainability of compensatory wetland mitigation projects. A study of 45 mitigation sites has been completed by Ecology. While many mitigation projects evaluated in that study have not yet met performance standards, it is important to note that none have been in place for longer than 7 years, and only 5 have been in place for 6 years or longer[18]. Evaluation of mitigation for the Auburn Downs racetrack and West Point Treatment plant (personal observations) demonstrate that wetland and buffer mitigation composed of native plants similar to those planned by the Port is effective and sustainable over time. Monitoring at the Auburn Downs Racetrack mitigation site indicates that in only 4 years, shrub communities average 46 percent cover and forest communities average 37 percent cover.[19] These results demonstrate that the rapid development of dense plant cover is achievable in wetland mitigation sites. Since many of the desired functions on mitigation sites are dependent on vegetation growth and structure (e.g. habitat, carbon export, nutrient cycling, water quality improvement), they would likewise be readily established on the mitigation sites. Other studies evaluating wetland mitigation have not concluded that mitigation be abandoned, but that they include increased design efforts, increased and clear performance standards tied to functional attributes, and longer monitoring periods. The Port's mitigation projects have incorporated many of these recommendations in its design and monitoring plan. Most significantly, each mitigation project includes numerous performance standards for hydrology, soils, vegetation, and other conditions. Monitoring of these variables and evaluating against the performance standards will form a basis for the Port to implement contingency and adaptive management actions if performance standards are not met. Given the fact that the Port's plan is responsive to recent recommendations designed by experts to

[17] See *Declaration of Amanda Azous*, paragraph 19, 11 September, 2001.
[18] Table 1 pages 58-59. *Washington State Wetland Mitigation Evaluation Study*. Phase 1: Compliance. Washington Department of Ecology. 2000.
[19] See *Auburn Racetrack Year Four Monitoring Report*. Northwest Racing Associates, Auburn, Washington.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

improve the performance of mitigation (see paragraph 47), and that the plans include elements that few other mitigation projects have fully addressed, ACCs assertions regarding the sustainability of the Port's Mitigation are unfounded.

50. *In-Basin Mitigation Will Replace Lost Wetland Functions.* Contrary to the ACC's allegations, the mitigation plan required by the 401 Certification will fully replace the wetland functions lost to wetland filling. In fact, the in-basin elements of the mitigation plan, alone and without considering the benefits of the Auburn mitigation project, will replace the wetland functions lost to filling (except for avian habitat). The amount of mitigation area that the mitigation plan provides for each wetland function is summarized in **Attachment E**, where the acres of impact are compared to the acres of mitigation, by function. In the following paragraphs, I describe how the mitigation plan replaces each function identified in the affected wetlands. The mitigation will result in stream and riparian wetland conditions that are at least as good, and possibly better, than they are at present.

51. The enhancement and restoration of wetlands and riparian buffers in the Miller and Des Moines Creek basins has been carefully planned to replace the functional attributes of the wetlands impacted by the project. The fact that other mitigation actions other than wetland creation can replace the wetland functions lost as a result of the MPU, is the basis for the recommended mitigation ratios present in wetland guidelines and standards.[20] Riparian buffers (wetland and upland) are recognized as providing shade, organic carbon water quality, and habitat functions that protect adjacent stream systems[21]. The restoration and enhancement actions proposed by the Port's mitigation plan are expected to be especially effective in replacing and restoring functions since, concomitant with the restoration and enhancement actions, land use practices that cause on-going degradation of wetlands and streams are being removed and replaced by the mitigation. These

[20] see Table 5 in *Water Quality Guidelines for Wetlands*, Washington Department of Ecology, Olympia Washington, 1996.

[21] Analysis of riparian buffer functions are provided in *Management Recommendations for Washington's Priority Habitat: Riparian.* K. Knutson and V. Leaf, Washington Department of Fish and Wildlife, Olympia. 1997.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

methods also take advantage of the naturally occurring soil and hydrologic conditions that promote the establishment of wetland and other native plant communities.

52. The information collected and evaluated during the wetland delineation, the assessment of wetland and stream functions, and the analysis of potential project impacts to these functions were used to develop the mitigation plan. This mitigation plan was prepared to meet mitigation requirements for "no net loss" of wetland function or area. The mitigation was designed, to the extent possible given concerns for aviation safety identified by FAA and the Port[22], to replace functions within the affected sub-basins. Contrary to the assertion of Ms. Azous, all mitigation is proposed in the same Water Resource Inventory Area (WRIA 9) where the impacts occur. For all functions except avian habitat, the functions are mitigated in the same sub-basin as where the impacts occur.

53. The ACC has identified functional losses and landscape changes associated with the filling of slope wetlands[23] , and this analysis is incorrect. For the wetlands in this project area, the primary functional differences between HGM classes are related to the wetland's hydrologic functions. The affected wetlands, across HGM classes, provide similar habitat functions that are dependent on the vegetation types present. In mitigating functions of various HGM classes, the following was considered:

- **Slope** wetlands that are located in areas where groundwater surfaces, provide groundwater recharge, water quality, and water conveyance functions. The ecological significance of this surface water is baseflow support to Miller Creek or other downslope wetlands.

- **Riparian** wetlands provide conveyance functions, floodplain storage, and water quality functions. Providing equivalent floodstorage and stormwater management facilities will replace these functions.

- **Depression** wetlands provide stormwater detention and water quality functions. Providing equivalent floodstorage and stormwater management facilities will replace these functions.

---

[22] See Section 7.2.3 of the *Natural Resource Mitigation Plan.*

[23] See *Declaration of Amanda Azous*, paragraph 19, September 11, 2001.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

54. The mitigation enhances and restores slope, depression, and riparian wetlands. However, most wetlands restored are those in riparian areas. The significant hydrologic functions of slope wetlands (groundwater discharge) are mitigated by the embankment design and low flow mitigation. The embankment design collects water that falls on non-paved surfaces and conveys it to Miller or Walker Creeks. The seasonal discharge of this water to the streams is impacted by the design, in that greater amounts of water are discharged during the late spring and summer months compared to pre-construction conditions. This impact is positive in that streamflow will be supplemented by discharge from the embankment during months when low streamflow are becoming ecologically significant. For these reasons, landscape changes and functional losses will not occur because impacts to the unique functions of slope wetlands are avoided.

55. The detention and water quality functions provided by the several small wetland depressions affected by the project are replaced through stormwater detention facilities, stormwater management BMPs, and through the removal of land uses in the mitigation areas that generate water pollutants. For these reasons, landscape changes and functional losses will not occur because impacts to the unique functions of depression wetlands are avoided.

56. In the following paragraphs, I discuss each of the commonly-recognized functions provided by wetlands in Puget Sound (that were assessed in the *Wetland Functional Assessment and Impact Analysis Report*, discussed above), and I describe how the mitigation plan replaces each of the functions that would be lost when the wetlands are filled.

57. *Resident/Anadromous Fish.* The new Miller Creek stream channel will provide improved fish and other aquatic habitat because it is designed with a number of beneficial features to cutthroat trout and other organisms that are lacking in the present stream. The primary characteristics provided by the design are large woody debris (LWD), woody riparian vegetation, and substrate variability. Each of these features will enhance fish and aquatic habitat. Increased amounts of woody riparian vegetation will result in increased shade, allochthonous inputs (food

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

sources in the form of coarse particulate organic matter [CPOM] and terrestrial invertebrates), and sources of woody debris. Increased LWD generally provides habitat complexity, including small plunge pools, fish cover, invertebrate substrates, variable water depths and velocities, etc. These conditions will provide nesting, resting, and forage habitat for fish and other aquatic life. Increased streambed variability in the form of gravel, wood, and CPOM will also increase the diversity of invertebrate habitat. The function of large woody debris and other organic matter in providing fish habitat and food resources for fish is well understood and documented (see Chapter 5 in *Streamside Management: Forestry and Fishery Interactions*, E. Salo and T Cundy eds, Institute of Forest Resources, University of Washington, Seattle; Chapter 12 of *Stream Ecology: Structure and Function of Running Waters,* J, Allen. 1995. Kluwer Academic Publisher, Boston).

58. The shallow water along the margin of Lora Lake will be improved aquatic habitat compared to existing conditions. The replacement of lawns and riprap with plantings of riparian tree and shrub vegetation will improve aquatic habitat by providing shade and organic matter input (woody debris, leaf matter, and insects) that will support fish and other aquatic life.

59. The more than 51 acres of mitigation in Miller Creek buffer areas occurs along over 1.4 miles of Miller Creek. It consists of riparian uplands and wetland, much of which was developed as residential lawns, pasture, or a small nursery. Over 1,800 linear feet of a small tributary channel will also be enhanced. Over 10.25 acres of riparian wetlands will be enhanced and restored in this area. In addition, throughout the stream reach, fish enhancement including woody debris, bank improvements, and substrate improvements will be added to enhance fish habitat. About 2 acres of wetlands subjected to temporary construction impacts will be restored following construction.

60. In 4 locations, instream enhancements to Miller Creek will improve habitat for fish and other aquatic organisms because of the new beneficial features that will be added to the stream that are currently lacking. The primary features provided are LWD, woody riparian vegetation, substrate variability, and removal of riprap. Each of these features will enhance fish and aquatic

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

habitat. Increased amounts of woody riparian vegetation will result in increased shade, allochthonous inputs (food sources in the form of CPOM and terrestrial invertebrates), and sources of woody debris. Increased LWD generally provides habitat complexity, including small plunge pools, fish cover, invertebrate substrates, variable water depths and velocities, etc. These conditions provide nesting, resting, and forage habitat for fish and other aquatic life. Increased streambed variability in the form of gravel, wood, and CPOM will also increase the diversity of invertebrate habitat. Removal of riprap will provide more natural channel banks that improve invertebrate habitat and forage areas for fish. Buffer enhancement will increase the types and amounts (terrestrial insects, plant detritus, etc.) of organic matter inputs to the stream, thus increasing forage resources for fish and invertebrates. Placement of LWD will trap other organic matter where it can be processed by aquatic organisms, support invertebrate populations, and increase food resources for fish (see page 152 of *Streamside Management: Forestry and Fishery Interactions*.

61. The Tyee Valley Golf Course Mitigation Area is over 6 acres in size and includes restoration of wetland and buffer functions to the golf course. The area includes over 700 linear feet of Des Moines Creek. Enhancement of floodplain wetlands and stream buffers will provide indirect improvements to fish and aquatic habitat. Increased amounts of woody riparian vegetation planted in the wetland and buffer will result in increased shade and organic matter inputs to the stream, including food sources and woody debris that improves habitat. These conditions improve the quality of the stream for nesting, resting, and forage habitat for fish and other aquatic life. Restoration of floodplain wetlands (converting golf course vegetation to shrub wetland) will increase carbon production, some of which will be exported to the stream during flood events, rainy periods, or through movement in groundwater (in the form of dissolved organic carbon).

62. The Auburn mitigation area is not designed to provide fish habitat. Some warmwater fish may use the open water and flooded emergent portion of the wetlands. Some indirect support to

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

downstream ditch systems (including Auburn Creek) could occur in the form of organic matter export during flood events or periods of groundwater discharge.

63. *Passerine Birds*. While not a specific goal of the mitigation, the increased amounts of woody and forest vegetation will provide additional and improved habitat for forest-dwelling bird species. Planting trees and shrubs around Lora Lake could increase forage opportunity for some birds such as kingfisher. Vegetation in the Miller Creek buffer mitigation area, and wetland and buffer plants at the Tyee Valley Golf Course mitigation site, will produce insects that a variety of passerine birds forage upon.

64. The Auburn mitigation site will provide multi-canopied forested, shrub, and emergent wetland communities. The complex vegetation structure and plant communities (containing vertical diversity, snags, debris structures, and food sources) will provide high quality habitat to a variety of forest and wetland bird species. These elements will provide resting, nesting, and foraging habitat for passerine birds. Because of the diversity of habitats at this site and the absence of the past and on-going disturbances to the impacted wetlands, the areas will provide increased habitat functions for birds, small mammals, and amphibians.

65. *Waterfowl.* The Miller and Des Moines Creek mitigation sites are not planned to provide waterfowl habitat functions, for reasons of aviation safety.

66. The Auburn mitigation site will provide waterfowl habitat in open water areas, submergent aquatic bed vegetation, and seasonally flooded emergent vegetation. These areas will provide a diversity of cover and food sources that will provide habitat for waterfowl, including feeding, resting, and nesting habitat.

67. *Amphibian habitat.* In Puget Sound, amphibian species using non-flooded wetland and riparian wetlands typically prefer habitats dominated by woody plant communities. In the Vacca Farm mitigation area, the conversion of farmland to shrub and forested wetlands and buffers will improve habitat conditions for amphibians. The restored floodplain wetlands will provide

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

habitat for adult amphibians and breeding habitat (logs and forest soils) for species that breed in non-aquatic habitat (e.g., red-backed salamander, ensatina). The removal of riprap from the margin of Lora Lake will provide breeding habitat for amphibians that require surface water for breeding. The mitigation site will also improve amphibian dispersal because of the new South 154th Street bridge that will span the floodplain of Miller Creek, and removal of the existing bridge, which prevents movement of amphibians through riparian areas. The mitigation will also improve connections to upstream, forested wetlands located north of the existing airfield.

68. The wetland and buffer enhancements that replace lawns and homes in the Miller Creek Wetland and Buffer Mitigation Area will improve conditions for amphibians by enhancing riparian wetlands. This enhancement will provide improved habitat for adult terrestrial amphibians. Improved habitat for terrestrial breeding amphibians (e.g., red-backed salamander, ensatina) will be provided by increased amounts of forest vegetation and woody debris in the Miller Creek buffer and riparian wetlands. The mitigation site will also improve amphibian dispersal because of improved connections to habitat at Vacca Farm, Lora Lake and other riparian wetlands.

69. The wetland and buffer enhancements in the Tyee Valley Golf Course Mitigation Area will replace golf course turf grass will improve conditions for amphibians by restoring floodplain wetlands that provide habitat for terrestrial adult amphibians. Improved habitat terrestrial breeding species (e.g., red-backed salamander, ensatina) will be provided by the increased amounts of shrub vegetation and woody debris. The mitigation site will also improve amphibian dispersal because of improved connections to other riparian areas and Wetland 28.

70. The wetland mitigation in Auburn will establish open water ponds with flooded emergent vegetation will provide breeding and rearing habitat for several amphibian species. The open water will provide habitat for the adult phases of aquatic species. Forested wetlands and upland buffers will provide habitat for terrestrial adult life phases. Mitigation includes placement of

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

logs and other woody debris, and topographic diversity that will provide habitat structure for amphibians.

71. *Small Mammals.* Small mammal habitat in the Vacca Farm mitigation area will improve as a result of the new vegetation to be planted in the riparian areas. Restoring wetlands will improve habitat for small mammals by creating a diversity of forage and cover habitat for them. Logs and woody vegetation added to the site will provide denning and forage. The new 154th Street bridge and demolition of the existing bridge will improve habitat connectivity for small mammal, because the new bridge will span the floodplain and allow unimpeded passage of small mammals. The restoration also improves habitat connectivity to Wetlands 1 through 9, which are located north and east of the site.

72. In the Miller Creek wetland and buffer mitigation area, the planting riparian vegetation in riparian areas and restoring wetlands will improve habitat for small mammals by creating a diversity of forage and cover habitat for them. Increased woody vegetation and debris will provide denning and forage areas. The new 154th Street bridge and demolition of the existing bridge will improve habitat connectivity for small mammals using the Miller Creek buffer.

73. Planting vegetation in riparian areas and restoring wetlands in the Tyee Valley Golf Course mitigation area will improve habitat for small mammals by creating a diversity of forage and cover habitat compared to the existing turf grass. Increased woody vegetation and debris will provide denning and forage areas. The mitigation site will also improve amphibian dispersal because of improved connections to other riparian wetlands and Wetland 28.

74. At the wetland mitigation in Auburn, the existing tall grasses on the site provide habitat for small mammals. However, conversion of the area to forest and shrub wetlands will improve habitat for forest and wetland-associated mammals. The increased vegetation structure will provide a greater variety of denning areas, a greater diversity of food sources, and greater cover than are on the site at present. The mitigation area will contain greater amounts and more diverse habitat

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

than is present in wetlands at the airport. This habitat will not be subjected to the historical and on-going disturbances found in the impact area, and thus will provide higher levels of function compared to them.

75. *Export Organic Matter.* There are relatively high levels of dissolved organic carbon (DOC) in Miller Creek (see pages 7-19 through 7-22 of the *Biological Assessment* for the project). The high levels of DOC are found upstream and downstream of wetlands to be filled by the project. The large areas of peat soil in the upper portion of the basins (at Tub Lake –about 15 acres; and at the Vacca Farm area and the wetlands located north of the existing airfield –39 acres) are a likely source of DOC to the creek. The planned mitigation does not result in the destruction of a peat system. In fact, the grading of the Vacca Farm area for mitigation purposes will result in a net removal of about 0.1 acres of peat soil.[24] The addition of productive wetland plant communities and lowering the land surface elevation would return peat forming processes by reducing the oxidation of organic carbon to carbon dioxide gas, and promote decay pathways that result in production of DOC and further accumulation of peat. For these reasons, there is no reason to believe that DOC concentrations in the creek would be altered. In the Des Moines Creek basin, restoration of shrub plant communities on mowed golf course wetlands that occurs on about 5.5 acres of peat wetland will enhance organic matter production and export to Des Moines Creek.

76. The ACC[25] cites literature regarding soil organic matter at mitigation sites in Portland, Oregon and incorrectly uses this information to claim that functions dependent on organic matter cannot be replaced by the Port's mitigation. The fallacy of the ACC argument is that the studies cited are from areas of palustrine open water habitats, which were created by excavating a pond in an existing wetland. The Port does not take this mitigation approach, and the results of the study examined by ACC are thus not applicable to the Port's project. It is not surprising open water

[24] There are 0.59 acres of peat soil that are filled by the project in the Vacca Farm area, as shown in Table 3-1 of the *Wetland Functional Assessment and Impact Analysis Report.*

[25] See paragraphs 10 and 29 of the Declaration of Amanda Azous, September 11, 2001.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

wetlands accumulate organic matter at slow rates because in these systems there is little production of vascular plant materials that decay relatively slowly in anaerobic environments, and thus little annual contribution of organic matter to the soil. In contrast, the Port proposes restoring a woody plant community on existing wetlands or riparian areas where such has been removed. In this situation, woody plant parts and leaf litter, which are much more resistant to decay than the algae or other plants expected in open water habitats, will accumulate on the soil surface. In addition, the root system of these plants will contribute organic matter to the deeper soil layers. In an anaerobic soil environment, this organic matter would contribute to accumulation in soils and anaeropbic nutrient cycling processes such as denitrification, methanogneisis, etc. The fact that the Port's mitigation sites at Vacca Farm and the Tyee Golf course currently have organic soils, yet lack the critical plant production component because the sites are now lawn or golf course further assures that more natural ecological systems can be readily established.

77. In the Vacca Farm and Miller Creek relocation area, the new creek channel is designed to have overbank flow during the 1-year and higher storm events. Smaller storms will flood portions of the floodplain through backwater flooding. As floodwaters recede, export of dissolved and particulate organic matter from the floodplain to the stream will occur at higher levels than would currently be expected because greater amounts and types of organic matter (leaves, twigs, branches, etc.) will be on site and available for export. Replacing of grass-dominated riparian plants adjacent to the stream and Lora Lake with native woody riparian vegetation will increase the amount and diversity of organic matter (i.e., readily decomposable leaves and woody debris that is slower to decompose) available to the stream and aquatic habitat of Lora Lake.

78. The high productivity expected in forest and shrub wetlands will result in accumulations of organic matter in the saturated soil of the restored wetland. Groundwater movement through the site and flooding will transport dissolved organic matter to Miller Creek. Placement of logs in Miller Creek and development of a natural riparian zone will help trap organic

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

debris in the stream channel, where it will be available for processing by aquatic invertebrates, thus benefiting the food chain. Suggestions by the ACC[26] that shrub wetlands are of low productivity and thus less valuable than emergent wetlands are wrong. The project mitigation, in basin and out of basin, replaces low quality turf grass, plowed fields, and abandoned lands dominated by introduced pasture grasses and reed canary grass. The plant productivity of these systems is nearly irrelevant, as the lack the vegetation structure and process that provide habitat and allow the sites fully support riparian systems are missing. For example, the mowed golf course and the plowed fields of Vacca Farm are unable to export organic matter to adjacent streams because they are mowed, plowed, and or harvested each year. There are few or no trees or shrubs present on these sites, and riparian contributions to instream processes are unsupported. Leaf and woody debris does not accumulate as peat, and as a result, it is very likely that an annual loss of peat from these systems, due to the oxidation of the existing soils occurs. As ecological benefits of the mitigation are explained in the documents Ms. Azous claims to have reviewed, her statements that the "*Vacca Farm purposefully lacks habitat for biological processes*" demonstrates her fundamental misunderstanding of the Port's proposals and the ecological conditions in the project area.

79. Further, in contrast to ACCs claim, the Vacca farm mitigation site will, following grading, have adequate hydrology to support wetland vegetation and biological functions. This is demonstrated by the hydrologic monitoring data presented in the *Natural Resource Mitigation Plan* (Table 5.1-10, page 5-32), other on-site observations, and that the development of peat soils at this site is the result of groundwater discharge (which is still present) and not surface flooding. The wetland is graded such that overbank and backwater flooding will occur during the mean annual flow, not the 100-year flow as reported by ACC[27]. Following flood events, floodwaters will gradually recede as the water elevation in the creek recedes without long-term ponding.

---

[26] See paragraphs 5 and 21 of the Declaration of Amanda Azous, September 11, 2001.

[27] See Response #19 to comment letter by Sheldon & Associates, February 15, 2001 in March 2001 Response to Comments.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

80. Removal of plowing and soil drainage systems will reduce the potential loss of peat soils through oxidation, which occurs in better drained soils. Restoring natural hydrology and natural plant communities will provide a carbon cycle where greater amounts of organic matter decomposes anaerobically with subsequent export from the site as dissolved organic carbon, and accumulation on-site as organic soil.

81. In the Miller Creek wetland and buffer mitigation area, replacing grass-dominated riparian areas with native woody riparian vegetation will increase the export of organic matter to the creek. In many places, lawn vegetation will be replaced with tree and shrub vegetation. The high productivity expected in the enhanced wetlands will increase the amount and diversity of organic matter (i.e., insects, leaves, branches, trees, etc.) reaching the stream. Accumulations of organic matter in the saturated soil and increased export to the stream as detritus and woody debris or as dissolved carbon are likely to occur. Where riparian vegetation consists of blackberry, its replacement with a multi-storied forest and shrub canopy will also increase the type and diversity of organic matter reaching the stream.

82. Placing LWD in the Miller Creek stream channel and removing residential land uses, as part of buffer mitigation will result in restoration of natural patterns of organic matter accumulation, storage and cycling in the stream channel. For example, under residential land use, many residents clear the riparian buffer of trees or shrubs, reducing delivery of organic matter to the stream channel. When trees or branches do fall into the creek, they are typically removed by the landowner. Removing these logs and branches prevents trapping of organic matter in the channel, and promotes its conveyance downstream. Placement of logs in the stream as mitigation will promote trapping and storage of organic matter in the mitigation site, where its ultimate decomposition will benefit aquatic organisms.

83. Groundwater movement through the riparian wetlands will transport dissolved organic matter to Miller Creek. Removing artificial bank armoring and placing in-channel woody

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

debris will improve overbank flow in some sections. This overbank flow, coupled with overhanging riparian vegetation, will provide additional sources of organic matter export into the stream channel. Where riparian wetland vegetation is currently pasture or blackberry, planting tree and shrub communities will increase the amount and diversity of organic matter available to the stream and wetlands.

84. At the Tyee Valley Golf Course mitigation area, organic matter export functions will increase because currently organic matter is cut and removed from the floodplain as part of golf course activities. After enhancement is in place, organic matter could be exported from the wetland and riparian buffer during flooding and rainy periods. New woody vegetation in the riparian zone will contribute leaf fall and insects directly to Des Moines Creek at levels higher than the current herbaceous vegetation provides.

85. Wetland mitigation in Auburn will promote organic matter export functions because, the wetland will be in the floodplain and also have a seasonal hydrologic connection to the Green River. As the flood and other surface waters drain, fine particulate organic matter (FPOM) and dissolved organic matter will be exported to downstream systems via the ditch systems. During periods of groundwater discharge, particulate and dissolved organic matter would be discharged from the site.

86. *Ground Water Exchange.* The ground water exchange functions of the impacted wetlands has been evaluated in detail by the Port (see Appendices B, C, D, E, F, G of the *Wetland Functional Assessment and Impact Analysis Report*, **Attachment L**). The project's impacts to this function has been avoided by project design and mitigated through low flow mitigation. As a result, the mitigation sites are not designed to provide this function.

87. *Flood Storage.* The Vacca Farm and Miller Creek relocation/mitigation site is designed to replace floodplain filled by the project (8,500 cubic yards) and provide a small net

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

increase (9,600 cubic yards). The overall significance of the wetlands and farmland in providing this function will not change.

88. No change to the flood storage functions at the Miller Creek wetland and buffer mitigation site, or at the Tyee Valley Golf Course mitigation site, will occur s a result of mitigation.

89. The Auburn mitigation site is hydrologically connected to the Green River floodplain via a series of ditches. The site is designed to store floodwater during 100-year flood events.

90. With regard to flood storage, the ACC[28] said "*slope and riparian wetlands lost have far superior water quality and water storage functions compared to the upland buffer the Port would restore as compensation*". It is generally recognized that wetlands on slopes provide little opportunity for water storage in a manner that moderates runoff rates and flood control. Wetlands on slopes lack the topographic conditions that allow significant water storage. For the wet season, when flood storage is important, the surface soils in these wetland soils remain saturated, and thus have little storage capacity compared to the non-saturated upland soils. With regard to water quality functions, upland soils are known to provide significant water quality functions, and in fact, infiltration of stormwater into upland soils is among the best BMP for water treatment of urban runoff. The statement the "*the enhancement of the Miller Creek riparian buffer and remaining wetlands could actually reduce those areas' effectiveness for water quality and storage functions because of disturbance to the soil*" is not supported by the cited reference which has no relevance to the mitigation planned by the Port. Further, the proposed buffer enhancements will add organic mulch to parts of the area. It will not remove or compact soils. There thus would be no reduction in infiltration rates, storage capacities, or sub-soil properties and thus the soil's ability to provide water quality functions would not be changed. Enhancement of other wetlands and the excavation of replacement floodplain replace the hydrologic functions of the small area of riparian wetlands affected (about 0.6 acres of Wetland R1 and A1).

[28] See paragraph 19 of the Declaration of Amanda Azous, September 11, 2001.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

91. *Nutrient/Sediment Trapping.* Although the water quality functions of the existing wetlands will be lost when these wetlands are filled, the overall project, including the planned mitigation, will fully replace these water quality functions and is likely to result in improved water quality in Miller, Walker, and Des Moines Creeks. This is true for several reasons.

92. First, a number of the existing wetlands that will be eliminated or impacted by Master Plan Update improvements do not provide optimal water quality treatment functions. The treatment function in some of these wetlands is sub-optimal due to a short residence time (as inferred by wetlands on slopes, small size, topography that limits ponding and storage of water, and channelized flow) and a lack of dense emergent vegetation. The above-mentioned factors are typically associated with wetlands with high function for water quality improvement.

93. Second, the proposed stormwater management facilities will include water quality treatment. This will primarily consist of biofiltration swales and filter strips, as well as wet vaults where biofiltration is not feasible. These water quality treatment facilities will be constructed to meet Ecology and NPDES requirements. These facilities will be at least partially effective in replacing the water quality functions of the wetlands to be filled.

94. It is noteworthy that existing wetlands (to be filled) receive untreated stormwater runoff from non-STIA areas. For example, existing wetlands downslope of 12th Avenue South receive untreated stormwater runoff from 12th Avenue South and provide treatment (at less than optimal rates) prior to discharge to Miller Creek. Treating stormwater likely degrades some of the biological functions also provided by the wetlands. Following construction of the embankment, runoff will be treated by water quality treatment BMPs, which should enhance the biological functions of the remaining wetlands.

95. Third, and perhaps most important, construction of Master Plan Update improvements and mitigation measures will improve the quality of water draining to the streams and

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

wetlands because existing land uses that contribute pollutants to the wetlands and Miller Creek will be replaced by natural vegetation.[29]

- For areas within development footprints, existing pollution-generating areas within the acquisition area (e.g., lawns, streets and driveways) that currently lack water quality treatment facilities will be removed. These areas will be replaced with embankment and other facilities with stormwater management BMPs.

- For areas to remain undeveloped, but not specified as mitigation, the removal of residential and commercial land-uses will eliminate pollutant sources, including failing septic tanks, fertilizer, runoff, and other potential pollutants (pesticides, pesticide residues). If redevelopment of these areas occurs, then stormwater management standards for water quality treatment and runoff rates must be met at the time of development. These standards would exceed the baseline condition (lacking any stormwater BMPs), and maintain water quality benefits compared to the current condition.

- For areas in the Vacca Farm mitigation area, the restoration of farmed areas in the Miller Creek floodplain with native wetland vegetation will reducing erosion, pollutant sources, and increase the area's water quality treatment capacity to remove nutrients and pollutants from Miller Creek and stormwater runoff from adjacent areas.

- For Miller Creek and Wetland A17 mitigation areas, the enhancement of wetlands and buffers will eliminate pollutant sources, including failing septic tanks, fertilizer, runoff, and other potential pollutants (pesticides, pesticide residues). Planting of these areas native upland and wetland vegetation will reduce erosion, pollutant sources, and increase the area's water quality treatment capacity to remove nutrients and pollutants from Miller Creek and stormwater runoff from adjacent areas.

- For mitigation along on the Tyee Valley Golf Course and along Des Moines Creek, removal of golf course uses would remove fertilizer and pesticide runoff to the creek. Planting of these areas native upland and wetland vegetation will reduce pollutant sources and increase the area's capacity to remove nutrients and pollutants from Des Moines Creek and stormwater runoff from adjacent areas.

96. The ACC[30] asserts that a loss in the wetlands role in reducing nitrogen export will occur and that this will alter the food web and increase the supply of nitrogen at the mouth of the

---

[29] The influence of land use on the water quality conditions of runoff water is well documented, and include studies in Washington (see *Fundamentals of Urban Runoff Management* R. Horner, J. Skupien, E. Livingston, and H. Shaver. 1994. page 38; as well as other regions (*Los Angeles County 1994-2000 Integrated Receiving Water Impact Report.* Los Angeles County Department of Public Works. 2000; *Sources of Pollutants in Wisconsin Stormwater.* Bannerman et al. 1999. Natural Science and Technology, 28:241-259).

[30] See *Declaration of Amanda Azous*, paragraph 25, September 11, 2001.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

creeks This argument is not logical because, as described above, the project will remove sources of pollutants to wetlands near Miller, Des Moines and Walker Creeks by removing land uses that contribute nitrogen to them. The replacement of lawns, golf courses, farmland, streets and driveways, and home sites with natural vegetation would restore a natural pattern of nitrogen cycling to the landscape which would not be detrimental because naturally vegetated wetlands and buffers do not contribute ecologically damaging levels of nitrogen in runoff waters.

97. The ACC (paragraph 25, 26, and 27 of the Azous Declaration) claims that *"enormous consequences"* to water quality and ecological conditions will result from the filling of wetlands and providing over 100 acres of in-basin mitigation. The facts are that the MPU improvements and STIA occupy only about 9 percent of the entire Miller Creek basin. Of that area, only a small percentage of urban runoff waters are routed through the wetlands that will be filled. Most runoff (including that generated by portions of the existing airfield, 12th Avenue South, 154th Street, 160th Street, and 170th Street) drains directly to the creek, or in the case of Water W, to channels that quickly convey water through wetlands to the creek. Therefore, the filling of wetlands will not cause increased amounts of urban runoff to go untreated to Miller Creek. The fundamental point is the project removes the sources of pollutants or provides water quality treatment facilities.

98. At the Vacca Farm and Miller Creek relocation site the new stream channel is designed to have overbank flow during the 1-year and higher storm events. Smaller storms will flood portions of the floodplain through backwater flooding. In each case, floodwater flows into shrub and forested riparian areas will promote sediment trapping and retention of nutrients in the restored wetland. In the riparian wetlands, planting woody vegetation will allow this function to occur at higher levels than currently exists on the farmland or lawn areas (adjacent to Lora Lake). The replacement of herbaceous vegetation with woody plant communities would promote storage of nutrients in organic matter (wood) which decomposes slower than herbaceous vegetation. Removal of farming and residential land use activities will remove activities that degrade water quality.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

99. Water quality functions in the Miller Creek Wetland and buffer mitigation area will improve for several reasons. Many impacts to the riparian wetlands and the stream will be removed as a result of the project and mitigation. For example, several dozen houses and buildings, lawns, driveways, etc. will be removed from the mitigation area, thus removing features and land uses that contribute to the degradation of water quality. Several septic systems will be removed from the mitigation area, as will one or more horse pastures, which also contribute to degradation of water quality. Outside of the mitigation area, removing streets and residential land uses will reduce the amount of pollutant loading to the wetland and stream system. Restoration of these disturbed areas will increase their capacity to provide water quality functions by establishing natural nutrient cycling pathways.

100. At the Tyee Valley Golf Course mitigation area, the removal of turf grass and turf grass management actions from the wetland and buffer areas will remove sources of nutrients and pesticides. Planting shrub and forest vegetation will provide natural pathways for nutrient uptake and cycling.

101. Wetland mitigation in Auburn consists of creating and enhancing depressional wetlands with channelized discharge. The large size of the wetland basins and relatively small amount of discharge water expected during most conditions will result in high retention rates for sediment and nutrients. The site will have a surface water connection to the Green River flood during flow events that exceed 8,500 cubic ft per second. At these flow levels, the wetland area will flood as a result of backwater conditions from the Green River. During flood events the wetland is expected to remove nutrients and sediments from floodwaters.

102. The requirement for increasing the size of the Miller Creek Wetland and Buffer enhancement area to include Wetland A17 and Water D (Condition D(4) of the 401 Certification) is a minor component of the overall mitigation planned for the project. This additional mitigation area is geographically adjacent to and hydrologically linked to the planned Miller Creek Wetland and

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

Buffer Enhancement mitigation site, for which detailed mitigation designs are provided. The addition of the Wetland A17 area is merely a geographic expansion of the Miller Creek Wetland and Buffer Enhancement Area, and it will be subject to the same mitigation plan that has been developed and reviewed by Ecology in detail. The design and implementation of this mitigation involves the same types of activities that are already described in the existing mitigation areas. These are the removal of houses, garages, and other structures from wetlands and buffers, the removal of invasive vegetation, and the planting of these and other areas with native wetland or upland trees and shrubs. Where two driveways cross Water D, culverts and driveway fill will be removed from the wetland. In another location where Water D is buried across a portion of a yard, it will be removed from a culvert. These actions represent improvements to the watercourse and are similar to other in-water work described in the mitigation plan.

103. On behalf of the ACC, Amanda Azous stated that it is important to consider the cumulative impacts of all projects in the watershed, and she alleged that there has been no cumulative impact assessment completed by the Port. Azous Decl. at Para. 30 (ACC declarant Tom Luster made a similar allegation. Luster Decl. at p. 16.). These declarants are correct that a consideration of cumulative impacts is important, but they are wrong that the Port conducted no cumulative impact assessment. The Port, and the regulatory agencies responsible for reviewing permits for the airport projects, have extensively considered the cumulative impacts. In its response to public comments, the Port reviewed all the other projects proceeding in the Miller, Walker, and Des Moines Creek basins. This includes the SR 509 and Regional Detention Facility projects mentioned by Mr. Luster, along with airport terminal projects, wastewater system expansion, Part 150 noise compatibility planning, and other projects and activities in the area. See General Response GR-19, dated April, 2001, attached to the Declaration of Steven G. Jones. The Port concluded that these other projects would not result in significant adverse impacts to the aquatic ecosystem of the basins because their impacts will be mitigated. Also, the FAA, as lead agency for environmental

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

review of the airport projects, fully considered the wetland and other environmental impacts of other projects in the basins. The FAA concluded that "none of these projects are expected to cause significant adverse impacts individually or in combination with the Master Plan Update projects." See, Federal Aviation Administration Record of Decision, *Environmental Reevaluation for Master Plan Update Development Actions, Sea-Tac International Airport*, August 8, 2001, p. A-1, attached to this declaration as **Attachment J**. Finally, the Port has also considered the historical changes to these stream basins, as documented in *Cumulative Impacts to Wetlands and Streams*, August 2001, attached to this declaration as **Attachment N**.

104. *Summary.* In my experience working as a professional wetland ecologist, I have had the opportunity to observe nearly all the wetland mitigation plans for major projects in the Puget Sound area that involve wetland impacts. In my opinion, the wetland mitigation required by this 401 Certification exceeds the mitigation requirements that have typically been imposed on other projects. The mitigation requirements of this 401 Certification are detailed and comprehensive, and they fully mitigate for the impacts of wetland filling. Substantial resources have been devoted to the planning, design, and regulatory review of the mitigation plan, to avoid and minimize direct and indirect impacts to wetlands and other aquatic resources. Avoidance of and mitigation for impacts has been exhaustively considered on a function by function basis, as explained in this declaration. The mitigation will result in one of the largest wetland mitigation sites in Puget Sound. I am unaware of any 1.4-mile reach of stream in Washington where adjacent residential land uses were removed and its riparian wetlands and buffers restored to natural conditions. The large ecological lift that will occur at the in-basin mitigation sites and at the site in Auburn will be protected in perpetuity by restrictive covenants. The temporal impacts of the mitigation will be positive and substantial in the long run. The benefits can be thought of as similar to compounding interest, where the ecological benefits gained by over 167 acres of functioning habitat will increase over time, far outweighing short-term risks that are mitigated by an extensive 15-year monitoring program. Since the planned

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

mitigation replaces all functions provided by the impacted wetlands and will result in water quality and other ecological benefits to the remaining wetlands and streams, beneficial uses will be protected, water quality will not be degraded, and state water quality standards will be met.

I declare under penalty of perjury under the laws of the state of Washington that the foregoing is true and correct.

Executed at Kirkland, Washington, this 29th day of September 2001.

James C Kelley

James C. Kelley, Ph.D.

FOSTER PEPPER & SHEFELMAN PLLC
1111 THIRD AVENUE, SUITE 3400
SEATTLE, WASHINGTON 98101-3299
206-447-4400

A

ATTACHMENT A

Resume of James C. Kelley, Ph.D.

James C. Kelley, Ph.D.

Ph.D., Aquatic Ecology, 1985, Michigan State University
Master of Science, Plant Ecology and Taxonomy, 1980, Michigan State University
Bachelor of Science, Botany, 1978, University of Vermont
Postdoctoral Research Associate, University of Minnesota-Duluth
Certified Wetland Specialist – Pierce County, Washington
Washington Department of Natural Resources Watershed Analysis Certified

Dr. Jim Kelley has 16 years of experience working as a professional wetland ecologist. Building on his education and research experience, which emphasized botany, aquatic ecology, and water quality, he has investigated aquatic, terrestrial, and stream riparian ecosystems to support project planning, natural resource impact assessment, permitting, and mitigation design.

Dr. Kelley has extensive experience in planning, permitting, and implementing wetland and terrestrial habitat mitigation and restoration plans for a variety of public and private sector projects. He routinely assists clients with technical and regulatory issues involving wetland resources. He conducts surveys to delineate wetlands and riparian areas, evaluates areas for rare plants, assesses wildlife habitat, determines project impacts to natural resources, completes Section 404 Clean Water Act permitting, and assists with National Environmental Policy Act compliance. Dr. Kelley has prepared biological assessments and coordinated Endangered Species Act compliance for a variety of terrestrial and aquatic plant and animal species. He also provides expert testimony on wetland and other ecological issues.

In addition to the above experience, Dr. Kelley has state-of-the-art training in the planning, design, implementation, and maintenance of constructed wetlands for water quality treatment, and is currently completing treatability studies that evaluate the ability of constructed wetland systems to remove excess metals from surface water. He also assists in designing wetland and biofiltration facilities for storm water treatment. He has developed and implemented wetland restoration plans as part of sediment remediation (including dredging, capping, and natural recovery) actions. He is experienced in conducting cost and feasibility analyses using interdisciplinary teams of engineers, biologists, and economists.

Roads and Highways

Hansard Avenue Infrastructure Improvements – City of Lebanon, OR
Dr. Kelley assisted with the permitting of road and utility improvements for the City of Lebanon. The project involved reconstruction and widening of U.S. Highway 34, extension and reconstruction of existing streets, and construction of a 1.7-mile beltway link. Portions of these improvements were to occur in wetlands. Parametrix wetland biologists completed a wetland delineation, a wetland impact analysis, and a wetland mitigation plan for the project. We coordinated with the Oregon Division of State Lands and the Corp of Engineers to obtain permit approval for the projects.

SR 509 East-West Corridor EIS Wetland Report – Washington State Department of Transportation, Tacoma, WA
As task manager, Dr. Kelley completed a wetland technical study and EIS section for a NEPA EIS addressing a proposed limited access road around the Port of Tacoma. The wetland report identified wetlands along the project corridor, documented the functional significance of the wetlands, and evaluated project impacts to wetlands. Dr. Kelley coordinated with the design team to minimize and mitigate for project impacts to wetlands. A conceptual wetland mitigation plan was prepared to assist with environmental review and permitting.

Wetland Delineation and Critical Areas Study – Snohomish County, WA
Parametrix is preparing a scope of work and cost estimate to delineate wetlands and prepare a Critical Area Study (CAS) for a road widening project located south of the City of Snohomish on the Lowell-Snohomish River Road.

Air Transportation

Master Plan Update: Natural Resource Mitigation – Port of Seattle, WA
Managed completion of the natural resource mitigation elements of the Port's Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport (this study evaluates construction of a third dependent runway). Work included planning and design for the relocation of about 2,000 linear feet of Miller and Des Moines creeks, and the design of approximately 30 acres of off-site wetland mitigation. In addition to mitigation design, Dr. Kelley led the permitting effort to obtain a Section 404 permit for filling wetlands and a Hydraulics Project Approval for work in streams. Reports completed for the project included mitigation design reports, project alternatives analyses, and permit documents.

Municipal Airport Wetland Studies – City of Colville, WA
A detailed study of wetlands on the 300-acre site of a proposed new airport was completed. The studies involved extensive coordination with the Corps of Engineers, Department of Ecology, and other resource agencies. Studies included evaluations of threatened and endangered species (Bald Eagle), economic and ecological evaluations of project alternatives, conceptual design and construction cost estimations for a wetland mitigation plan, preparation of a revised NEPA EA for the project, as well as coordination with state and federal agencies to gain permit approval. The City was granted permit approval by the Corps of Engineers and Fish and Wildlife Service for wetland and endangered species permits, respectively.

Aviation Support Facilities, Natural Resource Impacts and Mitigation Studies – Port of Seattle, WA
As task manager for natural resource issues, Dr. Kelley conducted technical studies evaluating wetland and stream environments in support of a NEPA/SEPA EIS for a proposed aircraft maintenance base. Following publication of the EIS, Dr. Kelley assisted with design of a stream restoration/relocation plan for Des Moines Creek. The plan focused on restoration of spawning and rearing habitat for salmonids. Dr. Kelley coordinated with Corps of Engineers and other state and federal agencies to obtain permit approval. The project would result in the filling of wetlands, and the relocation of about 3,000 feet of natural creek. An integrated approach to mitigation was taken where spill control facilities, storm water detention ponds, wetlands, and stream enhancements were designed to increase ecosystem functions for fish, waterfowl, and other wildlife.

Rail Transportation

Everett to Seattle Commuter Rail EIS and Mitigation Planning – Sound Transit, Seattle, WA
Dr. Kelley served as project manager and senior scientist investigating the potential impacts of adding commuter rail service to an existing freight rail line. The analysis evaluated the natural resource impacts of alternatives for new mainline tracks, new passing tracks, passenger stations, parking lots, and other required improvements. The proposed improvements could impact freshwater wetlands, endangered species habitats, streams, and freshwater wetlands. A natural resource report was prepared to document existing conditions and the potential project impacts on these resources. Coordination with Federal and State natural resource agencies was completed to further evaluate project impacts, potential permitting conditions, and mitigation requirements. Concurrent with analysis of natural resources, Dr. Kelley managed completion of water quality and hazardous material studies.

South/North Light Rail Corridor Draft Environmental Impact Statement – Portland Metro, Portland, OR
As senior technical advisor, Mr. Kelley is responsible for assuring the quality and timeliness of all deliverables associated with preparation of the draft EIS for biological resource issues. This study is being conducted to assess construction and operation impacts of a proposed 27-mile-long light rail transit project to biological resources in the Portland metropolitan area. Mr. Kelly is also involved in negotiations with resource agencies regarding Endangered Species Act and Clean Water Act Section 404 permitting.

Light Rail Transit Facilities, Natural Resource Impacts and Mitigation Studies – Portland, OR
Conducted ecological studies evaluating wetland and stream environments in support of a NEPA EIS for the proposed extension of Portland's Light Rail Transit System. As task manager, he coordinated natural resource studies and permitting efforts with the Corps of Engineers and other state and federal agencies staff. The project evaluated impacts resulting from improvements to an existing rail line, proposed stations, park-and-ride facilities, and road system improvements. A conceptual wetland and stream mitigation plan was prepared to compensate for wetland impacts and to restore degraded streams and wetlands near the project. All studies and analysis were completed according to Federal Transit Authority Standards.

Pacific Northwest Rail Corridor Plan and Environmental Impact Statement – Washington State Department of Transportation, OR, WA and BC
Conducted the environmental analysis for the rail plan between Eugene, Oregon and Vancouver, British Columbia. Identified environmental constraints and other issues that needed to be considered in the evaluation of options and rail alternatives for a higher speed rail program. Coordinated with several cities and counties to identify local programs and plans which needed to be considered in the development of the plan. During the development of the Environmental Impact Statement, Dr. Kelley worked on an interagency coordination plan and assisted WSDOT in implementing the coordination program with cities, counties, Ports and Regional Planning Organizations. He is also managing the evaluation and documentation of natural resource impacts and mitigation strategies in the preparation of the NEPA EIS.

LINK Light Rail EIS – Sound Transit, Seattle WA
Assisted with the natural resource studies. Developed on a very tight schedule, the EIS evaluates a new light rail system extending from north Seattle to Sea-Tac International Airport. Public and agency response to the Draft EIS generated over 3,600 separate comments, each of which must be addressed in the Final EIS.

Site Development

City of Myrtle Creek Golf Course Development, Myrtle Creek, OR
The City of Myrtle Creek has planned and constructed a new municipal golf course and incorporated reuse into the irrigation system. Dr. Kelley assisted with the wetland delineation of the project site, assisted in planning golf course features to minimize impacts to wetlands and streams, and planned conceptual mitigation for the site. The delineation and mitigation plans were coordinated with the Oregon Division of State Lands and the Corps of Engineers to obtain permit approval for the project.

Mission Ridge Biological Evaluation – Mission Ridge Mountain Corp., Wenatchee, WA
Dr. Kelley served as a senior biologist in support of a NEPA Environmental Assessment to address issues on threatened, endangered, sensitive, and management indicator species for a proposed ski area expansion located on Forest Service land. Parametrix biologists prepared a wildlife habitat map, using aerial photos to address the amount and type of habitats present. A plant survey determined the occurrence, location, and abundance of sensitive species on the site. Fish and wildlife studies evaluated on-site streams for salmonid habitat, and surveyed the site for spotted owls and other sensitive wildlife species.

Sensitive Areas Ordinance Review – Century Pacific L.P., Seattle, WA
Parametrix assisted a private development group with review of City of Kirkland's Sensitive Areas Ordinance and recommended changes to ordinance to the planning Commission.

Wetland Creation and Restoration – Simpson-Tacoma Kraft Mill, Tacoma, WA
As project manager and technical lead, Dr. Kelley developed a detailed wetland restoration plan for a 2.8-acre intertidal and estuarine wetland adjacent to the Puyallup River. This plan included documentation of wetland fill through aerial photographs, identification of design criteria for the restored wetland, preparation of construction and planting plans, developing a cost estimate for the project, and completing agency coordination. The restoration plan emphasized development of a tidal wetland providing waterfowl and fish habitat. Dr. Kelley monitored construction and planting of the saltmarsh and has monitored the project annually since construction.

Everett Homeport EIS – U.S. Navy, Everett, WA
Parametrix prepared environmental impact studies and supporting discipline reports for the dredging and disposal of over 1 million cubic yards of marine sediment and for construction of piers and wharfs for the homeporting of Navy vessels. Dr. Kelley evaluated proposed dredge disposal sites for the presence of wetlands, appropriate wetland buffers, and impacts to native vegetation and habitat. These studies were used to determine the feasibility of land disposal of dredge materials.

Simpson/Lowell Mill Site Wetland Study – Simpson Investment Company, Everett, WA
Identified wetlands on a 34-acre industrial site to support Corps of Engineers permitting requirements. In addition to delineations, Dr. Kelley used aerial photographs and historical maps to prepare a history of wetland formation and disturbances on the former mill site. He presented findings to the Corps of Engineers and designed conceptual mitigation plans for the relocation of about five acres of wetland.

Wetlands Study for Branch Campus Site Selection – University of Washington, Snohomish County, WA
As task manager, Dr. Kelley conducted field surveys of five alternative project sites for a proposed university campus. These sites, totaling approximately 750 acres, were surveyed to identify and delineate wetlands, document wetland functions, and meet Corps of Engineers and Snohomish County permit requirements. Dr. Kelley coordinated with resource agencies and prepared a technical report and EIS sections documenting wetlands, development impacts, and mitigation measures.

Cherry Point Wetland Assessment – Chevron, Whatcom County, WA
Managed an assessment of wetlands on 900 acres of undeveloped land (pasture and second-growth forest). The project included delineation and mapping of wetlands and coordination with Corps of Engineers. Wetlands throughout the site were farmed, which required careful assessment and documentation of soil and hydrologic conditions to verify as wetland. A report documented the delineations, wetland characteristics, and classification according to the DOE Four-Tier System. Completed a functional assessment of wetland values as a necessary precursor to determine potential mitigation for site development.

Wetlands Inventory – Fourth Corner Economic Development Council, Whatcom County, WA
Managed the completion of a wetland inventory on 5,000 acres of industrially zoned property. Wetlands were mapped using aerial photo interpretation and field studies. Field maps were transferred to a geographic information system (GIS) to evaluate methodology and potential errors. Comparisons between field delineation maps and air photo inventory maps were made. The report summarizing these findings and the GIS database will assist the County in making land use decisions on wetland protection and future land use development.

Lake Tapps County Park Wetland Report – Pierce County, WA
Project manager and technical lead for the survey of a 188-acre park site to identify wetlands and wildlife habitat, evaluate wetland functions, and determine federal, state, and county regulatory requirements. The study was required as part of the park's master development plan so that the wetlands and other sensitive areas in the park would be protected from proposed facility expansion.

Wetland Report – Chief Joseph State Park, WA
Conducted an analysis of a 298-acre proposed state park in eastern Washington to evaluate plant communities, wildlife and wildlife habitat, and identify wetlands on the site. The study was designed so that proposed park developments could be planned while meeting Corps of Engineers, county, and state permit requirements.

Wetland Studies – Benaroya Capital Company, Seattle, WA
Dr. Kelley assisted Benaroya Capital Company in evaluating wetland and stream conditions on several parcels of land in Bothell, Washington. The studies allowed Benaroya Capital to determine potential development footprints and the ultimate economic feasibility of development projects. Dr. Kelley delineated wetlands, reviewed regulatory requirements for protection/alteration of wetlands, streams, and associated buffers. He recommended development strategies to maximize potential development footprints and comply with local, state, and federal wetland requirements.

Sewage Treatment

Shoreline Habitat Enhancement Plan, West Point Sewage Treatment Plant Upgrade – Metro, Seattle, WA
As a member of a consultant team designing an 18-acre shoreline park and beach habitat, Dr. Kelley conducted studies of natural and artificial shorelines to identify plant communities and habitat features to be incorporated into the design of a park system within and adjacent to the West Point Treatment Plant. To assure the park would provide significant ecological functions, a detailed planting schedule using native plants and a long-term monitoring program was developed for the project. Park features also included conceptual and detailed wetland mitigation plans that were developed to meet the conditions of the Corps of Engineers' Section 404 permit. Dr. Kelley also assisted with cost estimating to evaluate project feasibility given Metro's fiscal constraints.

Wetland Permitting/Mitigation for Wastewater Treatment Facilities – LOTT Partnership, Thurston County, WA
Assisted Lacey, Olympia, Tumwater, and Thurston County (LOTT) with the permitting and mitigation of a 1.6-acre wetland fill on Port of Olympia property. The fill was required to implement the Port's Master Plan to construct a new sewage treatment plant outfall to Puget Sound.

Solid Waste Management

Wetland Evaluation Woodwaste Landfill – Simpson Timber Company, Shelton, WA
Conducted a field survey and regulatory assessment of wetlands on the site of a proposed woodwaste landfill. Probable impacts of landfill development to wetlands were determined and regulatory requirements including avoidance and mitigation were assessed.

Vegetation Evaluations – Solid Waste Transfer Stations for Various Clients
Conducted field surveys for vegetation and threatened and endangered plant species, made regulatory assessments, prepared reports and mitigation plans for several proposed solid waste transfer stations in King, Snohomish, Grays Harbor, and Klickitat counties. These studies evaluated vegetation, wetlands, and wildlife habitat on proposed transfer station sites, as well as reviewed regulatory requirements affecting site development.

Wetlands Study and Mitigation – Snohomish County Regional Landfill, Snohomish County, WA
Conducted a field survey of a 400-acre site to identify and delineate wetlands, document wetland functions, and meet Corps of Engineers and County permit requirements for the project. Dr. Kelley coordinated with resource agencies and prepared a report documenting wetlands, development impacts, and mitigation measures. He also provided testimony at public hearings. Dr. Kelley prepared a detailed wetland mitigation report that addressed the filling of on-site wetlands, and sought permit approval for the project. He assisted in the preparation of construction plans and contracts for the mitigation project, and he has completed monitoring reports documenting the success of the project.

Site Clean-up/Reclamation

Pinal Creek Superfund Site Feasibility – Wetland Treatment Studies, WA
Pinal Creek receives acid rock drainage from historic copper mines and contains high concentrations of manganese and other metals. Dr. Kelley is assisting chemical engineers and geochemists who are conducting laboratory and field experiments investigating the feasibility of using a passive wetland treatment system to treat runoff waters to water quality standards. To remove manganese, a variety of aerobic wetland treatment options are under evaluation. Laboratory studies indicate that complete removal of manganese is technically feasible. Bench- and pilot-scale studies are focusing on developing cost-effective techniques to implement wetland treatment options. These options include the integration of wetland treatment with chemical treatment technologies.

Middle Waterway NRDA Mitigation Design, Implementation, and Monitoring – Simpson Tacoma Kraft, Tacoma, WA
Dr. Kelley planned and designed a Natural Resources Damage Assessment (NRDA) riparian wetland mitigation project in the Middle Waterway for the Simpson Tacoma Kraft Mill. The project included negotiations with the NRDA trustees on sampling to assess the nature and extent of contaminated sediments, permitting, design, construction oversight, development of performance standards, and monitoring of the mitigation site. Dr. Kelley is responsible for monitoring the mitigation project, and preparing annual monitoring reports.

Strandley Environmental Services – Seattle City Light, Purdy, WA
Dr. Kelley assisted with scientific and engineering services for a Removal Action and restoration of the Strandley/Manning sites, which is a Superfund hazardous waste site adjacent to Burley Lagoon near Purdy, Washington. He assisted with wetland evaluations and plans for restoration of terrestrial and aquatic habitat.

Forest Management

Port Houghton Timber Sale EIS – Tongass National Forest, Chatham and Stikine Areas, AK
Served as Task Manager for Threatened and Endangered Plant Species, Floodplains, and Biodiversity Tasks for an NEPA EIS addressing a proposed timber sale on a 192,000-acre project area located in southeast Alaska. Dr. Kelley completed literature reviews and field surveys to identify unique habitats, determine the occurrences of unique and rare plant communities and species, identify wildlife habitat corridors, map wetlands, and recommend habitat conservation areas. He also completed GIS mapping and landscape level analysis of plant communities, and assessed changes in forest cover to wildlife and biodiversity conditions. He was responsible for preparation of resource reports describing the affected environments, project impacts, mitigation opportunities, and appropriate monitoring guidelines.

Wetland Delineation and Permitting – Port Blakely Tree Farms, WA
As project manager, Dr. Kelley supervised wetland studies on a 200 acre forest zoned as for industrial landuse. The project included a delineation and mapping of wetlands on the project site so areas of developable land could be determined. The wetland delineation was reviewed and approved by the U.S. Army Corps of Engineers. Completion of the study allows Port Blakely Tree Farms to accurately represent the development potential of the property, as affected by wetlands.

Regulatory Assistance

On-Call Wetland Services – City of Kirkland, WA
Served as Project Manager for delineation of wetlands, wetland impact analysis, and mitigation planning for City and private development projects affecting wetlands and stream resources. Parametrix provided on-call services to the City as needed, and identified wetlands and impacts to wetland function in several of the City's parks, proposed housing projects, and transportation improvements. Dr. Kelley has prepared and reviewed numerous wetland and stream restoration projects for several city and private development projects.

Wetland Inventories – Cities of Puyallup, Sumner, Redmond, WA
Served as Project Manager for completing three inventories of wetlands within the comprehensive planning area for the cities of Puyallup, Sumner, and Redmond, Washington. These inventories were partially funded by the Department of Ecology through a Coastal Zone Management grant. Project management and methodologies were required to meet Department of Ecology Standards. Inventory of the 15 to 30 square mile planning areas used aerial photo interpretation, ground verification, soil survey maps, and National Wetland Inventory maps. The inventories are used by planning departments and land owners to evaluate the impact of proposed wetland regulations on land development and to assist with site planning.

Wetland Inventory – City of Sumner, WA
Responsible as Project Manager for completing an inventory of wetlands within the 15 square mile Sumner Comprehensive Planning area. Wetlands were identified according to Washington Department of Ecology procedures. These included aerial photo interpretation, evaluation of soil and National Wetland Inventory maps, and 100% field verification. Wetlands were identified on aerial photos and mapped on a geographic information system (GIS). The inventory was designed to allow planning staff and development proponents to identify environmental issues in early planning stages, and to minimize project impacts to wetlands.

Sensitive Areas Ordinance – City of Redmond, WA
Managed a field inventory of regulated wetlands within a 28 square mile area. Dr. Kelley provided technical evaluations of proposed ordinance goals, performance standards, and implementation procedures. He also participated in the public involvement process.

Surface Water Management and Water Quality

Miller Creek Regional Detention Facility – King County, WA
Assisted Parametrix engineering staff with permitting issues associated with the development of a regional storm water detention pond that would periodically flood wetlands. Activities directed by Dr. Kelley included wetland delineation, wetland impact analysis, wetland mitigation design, and coordination with Corps of Engineers' staff for Section 404 permit approval. The studies showed that storm water detention would have minor impacts to existing wetland vegetation. A mitigation plan, including wetland creation, was designed to mitigate for fill of wetlands associated with construction of the control structure.

North Creek Regional Detention Facility – Snohomish County, WA
Managed environmental studies and permitting analysis on the site of a proposed regional storm water detention facility. The studies were conducted in support of SEPA analysis of project

impacts, and to support Section 404 Individual Permit, and HPA Permit applications. Specific studies included analysis of wetlands, fisheries and wildlife habitat, and the impact of storm water detention on these wetland functions. An important permitting strategy was to emphasize the degraded nature of the wetland and affected stream while identifying opportunities to enhance wetland and fisheries value through mitigation. These studies were coordinated with the engineering design team, County staff, and federal and state resource agencies. Dr. Kelley also presented deposition testimony to help settle property appraisal issues associated with property acquisition for the facilities.

Wetland Study – Swamp Creek Regional Detention Facility Design, Snohomish County, WA

As part of an on call drainage design contract, Dr. Kelley conducted an inventory of forest, bog, and emergent wetlands on a 70-acre site proposed for regional storm water detention. Dr. Kelley prepared a technical report that was included as an appendix to the County's environmental impact statement assessing the impact of storm water detention on wetland communities. The facility consists of an earth-filled dam and outlet structure designed for a 100-year storm event. Since wetland habitat impacts and fisheries were a major concern, Dr. Kelley completed an analysis of flooding on wetland plant communities. These studies showed that flooding due to storm water detention would not result in significant impacts to wetland plant communities or their habitat benefits.

Hydrologic Control of Nitrogen Cycling Processes (Post-Doctoral Research) – University of Minnesota

Conducted studies to examine how fluctuations in water levels and flooding of wetland communities (caused by beavers) affected wetland ecology and the nutrient status of riparian soils. The project included identification of wetlands from color infrared aerial photographs, studies of nutrients in stream runoff, beaver ponds, soil, and interstitial water. Successional changes in beaver-influenced riparian zones were also examined through aerial photographs and GIS mapping.

Effect of a Marsh on Water Quality (Dissertation Research) – Michigan State University

Designed and implemented a study examining the role of wetland plant communities in cycling nitrogen and phosphorus in a riverine marsh. The study included the identification of wetland plant communities from color infrared aerial photography, construction of hydrologic, nutrient, and sediment budgets for a wetland basin; evaluation of nutrient dynamics in emergent plant communities; and an analysis of wetland water quality. The response of wetland communities to periodic water level fluctuations was documented through field studies and photogrammetric analysis.

Utilities

Pipeline Expansion Wetland Studies – Pacific Gas Transmission, OR and WA

As project manager and technical lead, Dr. Kelley planned and supervised studies to identify, delineate, and document wetlands along a 400-mile natural gas pipeline through central Oregon and Washington. The study was conducted to support permit applications for the construction of a new parallel pipeline through an existing right-of-way. This study used false color infrared photography, true color aerial video of the pipeline corridor, and National Wetland Inventory maps to screen wetland from non-wetland areas for further detailed studies. Field studies included mapping and detailed documentation of soil, vegetation, and hydrologic conditions at all potential wetlands. In addition to the field studies, he assisted with permitting the project through the U.S. Corps of Engineers offices in Washington and Oregon, and State resource agencies.

Tansy Ragwort Biological Control – Seattle City Light, Darrington, WA

As part of an on-call services consultant contract with Seattle City Light Environmental Affairs, Dr. Kelley evaluated the feasibility of biological control of tansy ragwort, a noxious weed, in the utility's powerline right-of-way near Darrington in Snohomish County, Washington. Two insect species that feed on ragwort were released in the study area between 1986 and 1988. Insect populations and ragwort densities were monitored over a five-year period to evaluate the effectiveness of the biological control program in maintaining tansy ragwort at low densities.

Combustion Turbine EIS – Seattle City Light, Seattle, WA
Seattle City Light selected Parametrix to prepare an Environmental Impact Statement on the siting and construction of a combustion turbine. Dr. Kelley examined and reported on wetland and vegetation impacts to five sites. He identified possible mitigation measures for wetlands and terrestrial habitat, including substantial stream and wetland enhancement at the Duwamish River site.

Novelty Hill Substation and Transmission Lines Hill Natural Resource Assessment – Puget Sound Power and Light Company, King County, WA
As part of an indefinite quantity contract with Puget Sound Power & Light, Parametrix conducted environmental studies in support of new facility and transmission line development in the Puget Sound region. Dr. Kelley assisted with Wetlands Delineation and Characterization, Wildlife Inventories, and a Fishery Habitat Characterization and Stream Channel Stability Assessment

Additional Qualifications

Postdoctoral Associate
University of Minnesota, Natural Resources Research Institute (1985-1987). Dr. Kelley conducted studies to examine how flooding and drainage of wetland and riparian ecosystems by beavers affect the nutrient status and chemistry of riparian soils. Successional changes in beaver-influenced riparian zones were also examined through aerial photograph interpretation and GIS mapping. Dr. Kelley was responsible for designing environmental sampling programs for vegetation, soil, and water, as well as conducting analytical analyses for a variety of chemical constituents.

Effect of a Marsh on Water Quality
(Dissertation Research) Designed and implemented a study examining the role of wetland plant communities in cycling nitrogen and phosphorus in a riverine marsh. The study included the construction of hydrologic, nutrient, and sediment budgets for a wetland basin; evaluation of nutrient dynamics in emergent plant communities; and an analysis of wetland water quality.

Wetland Design for Hazardous Waste/Mining Operations
Dr. Kelley received professional, state-of-the-art training in the planning, design, implementation, and maintenance of wetland systems to treat waste water derived from industrial or other mining facilities.

Presentations and Publications

1988 Naiman, R.J., C.A. Johnson, and J.C. Kelley. Alteration of North American streams by beaver. BioScience 38:753-762.
1985 Kelley, J.C., T.M. Burton, and W.R. Enslin. The effects of natural water level fluctuations on N and P cycling in a Great Lakes marsh. Wetlands. 4:159-175.
1995 Kelley, J.C. and K.A. Lakey. An evaluation of wetlands and wetland functions in Southeast Alaska. Society of Wetland Scientists, Northwest Chapter, Annual Meeting, June 1995. Spokane, Washington
1995 Reak, A. and J. C. Kelley. Monitoring an eelgrass (Zostera marina L.) mitigation project for biological function and transplant success. Society of Wetland Scientists, Northwest Chapter, Annual Meeting, June 1995. Spokane, Washington

1994 Lakey, K.A., J.C. Kelley, and K. Ford. Recovery of functions in farmed Puget Trough wetlands following abandonment. Society of Wetland Scientists annual meeting, May 1994. Portland, Oregon.

1987 Kelley, J.C., C.A. Johnson and R.J. Naiman. Effect of beaver (Castor canadensis) on plant nutrient availability in stream riparian zones. Ecological Society of America Annual Meeting, August 1987, Columbus, Ohio.

1986 Kelley, J.C. Litter decomposition and nutrient dynamics in a freshwater marsh. American Society of Limnology and Oceanography Annual Meeting, June 1986, Kingston, Rhode Island.

1985 Kelley, J.C., and T.M. Burton. Nitrogen flux in a freshwater marsh and the significance of emergent plant production. American Society of Limnology and Oceanography Annual Meeting, June 1985, Minneapolis, Minnesota.

1984 Kelley, J.C., T.M. Burton, and W.R. Enslin. The effects of natural water level fluctuations on N and P cycling in a Great Lakes marsh. Presented at the Society of Wetland Scientists Annual Meeting, May 1984, San Francisco, California.

1984 Kelley, J.C., and T.M. Burton. Patterns of nutrient cycling in emergent plant communities. Great Lakes Coastal Wetland Colloquium, Michigan State University, November 1984, East Lansing, Michigan.

1983 Kelley, J.C., and T.M. Burton. Plant mediated nitrogen and phosphorus movements in a freshwater marsh. Ecological Society of America Annual Meeting, August 1983, Grand Forks, North Dakota.

1982 Kelley, J.C., and T.M. Burton. Nutrient flux and the role of emergent macrophytes in a rivermouth marsh. Ecological Society of America Annual Meeting, August 1982, State College, Pennsylvania.

B

ATTACHMENT B

Wetland acreage impacts by wetland function[31].

Wetland Function	Acres of Impact	Comments – *Rating Threshold*
Resident/ Anadromous Fish	8.6	Most wetlands rated for this function do not provide direct habitat for fish or aquatic organisms. These wetlands were rated at least low-moderate when at least indirect support of fish habitat through organic matter export, hydrologic functions, or other water quality functions would be expected.
Passerine Birds	14.9	Generally, areas providing nesting and foraging habitat for some birds were rated at least low-moderate. These ratings reflect the fact that even disturbed wetland areas in urban areas provide some habitat for birds when trees or shrubs are present in or near the wetlands.
Waterfowl	1.9	Wetlands that provide areas of forage (wetlands on the golf course and Vacca Farm) or emergent wetlands with nesting habitat were rated at least low-moderate.
Amphibians	9.8	When forest or shrub habitat occurred in wetlands or their buffers, they were rated at least low-moderate for this function.
Small Mammals	13.2	Generally, wetlands with shrub or forest cover provide some habitat to small mammals, and were rated at least low-moderate. These ratings reflect the fact that small disturbed wetland areas, even in urban environments are used by small mammal species.
Exports Organic Matter	10.9	Wetlands with surface water connections to streams or channels were generally rated at least low-moderate for this function.
Ground Water Exchange	13.0	Wetlands where groundwater discharges (perennial or seasonal) were observed were rated at least low-moderate for this function.
Flood Storage	4.6	Wetlands in floodplains or those formed in shallow depressions, were rated at least low to moderate for this function.
Nutrient/Sediment Trapping	16.3	Wetlands in floodplains, in shallow depressions, or on slopes where channelized inflow was absent, were rated at least low-moderate for this function.

[31] If functional assessment for a wetland was rated greater than low, the impact acreage is included in this table.

C

ATTACHMENT C

Summary of mitigation actions taken to avoid and minimize wetland impacts.

Mitigation Requirement	Proposed Mitigation Action
Avoid the impact by not taking a certain action or parts of an action.	Avoid fill in wetlands and Miller Creek by designing the runway to meet the minimum operational, engineering, safety, and maintenance standards. Locate, where feasible, permanent stormwater detention ponds in uplands. Avoid excavation within 50 ft of Category II and III wetlands in Borrow Area 3. Avoid wetlands in Borrow Area 1 where practical. Construct retaining walls at the northwest end of the runway to reduce impacts to Miller Creek and Category II wetlands (Wetlands 8, 9, and A1) located at the north end of the project. Install a retaining wall near the west-central portion of the embankment to reduce impacts to Category II Wetlands 18 and 37 and avoid relocating a second segment of Miller Creek.
Minimize the impact by limiting the degree or magnitude of the action.	Place a retaining wall near the southwest end of the runway to reduce impact to a Category II wetland (Wetland 44). Design Borrow Areas 1 and 3 with a 150- to 200-ft setback from Des Moines Creek to minimize potential impact to the stream and its buffers. Implement stormwater pollution prevention plans (SWPPPs) prior to any construction project. Maintain hydrology to wetlands by directing seepage water from the embankment to wetlands downslope of the embankment. Provide water quantity and water quality mitigation to protect aquatic habitat in Miller Creek from stormwater impacts during operation.
Avoid the impact by not taking a certain action or parts of an action.	Construct retaining walls to support relocated South 154th Street and avoid permanent fill in Wetlands 3 and 4.
Minimize the impact by limiting the degree or magnitude of the action.	Construct retaining walls to support relocated South 154th Street and reduce permanent fill and minimize temporary impacts in Wetland 5. Implement SWPPPs prior to any construction project. Provide water quantity and water quality mitigation to protect wetlands and other receiving waters from stormwater impacts during operation.
Avoid the impact by not taking a certain action or parts of an action.	Design the SASA footprint to avoid relocation of Des Moines Creek. Temporary impacts to Des Moines Creek and Wetland 52 are not anticipated.
Minimize the impact by limiting the degree or magnitude of the action.	Design the SASA to avoid direct impacts to forested wetland (Wetland 52) that provides groundwater discharge functions.

Mitigation Requirement	Proposed Mitigation Action
Reduce the impact over time by preservation and maintenance actions during the life of the action.	Design water quantity and water quality mitigation to protect wetlands from stormwater impacts.
On-site Borrow Source Areas	
Avoid the impact by not taking a certain action or parts of an action.	Do not propose excavation in Wetlands 3-6 and 10 located north of the existing runways. Redesign development areas within Borrow Areas 1 and 3 to avoid excavation of 12 wetlands (Wetlands B1, B4, B5, B6, B7, B9, B10, B15a, B15b, 29, 30, and 48).
Minimize the impact by limiting the degree or magnitude of the action.	Establish a 150- to 200-ft buffer between Borrow Area 1 and Des Moines Creek to avoid impacts to stream hydrology and riparian buffers. Follow a TESC Plan to eliminate siltation reaching wetlands or Des Moines Creek from excavation activities. Establish final surface grades in Borrow Area 1, and construct interceptor swale system in Borrow Area 3, to direct surface water runoff and groundwater seepage to wetlands near borrow areas, and minimize and avoid indirect hydrology impacts. Maintain BMPs throughout the operating period to ensure adjacent wetlands will be protected from adverse construction-related activities.

D

ATTACHMENT D

Summary of wetland mitigation credit for Seattle-Tacoma International Airport Master Plan Update improvements.

Mitigation	Mitigation (acres)	Area Mitigation Credit
In-Basin		
Wetland Restoration – Credit ratio 1:1		
Vacca Farm (prior converted cropland and other upland)	6.60	6.60
Wetland Enhancement – Credit ratio 1:2		
Vacca Farm (Farmed Wetland, Other Wetlands, Lora Lake)	5.70	2.85
Wetlands in Miller Creek Wetland and Riparian Buffer	10.25	5.12
Tyee Valley Golf Course	4.50	2.25
Wetland in Des Moines Creek Buffer	1.01	0.51
Subtotal	**28.06**	**17.33**
Buffer Enhancement- Credit ratio 1:5		
Miller Creek Buffer, South of Vacca Farm	40.86	8.17
Vacca Farm	4.58	0.92
Lora Lake	0.27	0.05
Tyee Valley Golf Course Mitigation Area Buffer	1.57	0.31
West Branch Des Moines Creek Buffer	3.38	0.68
Subtotal	**50.66**	**10.13**
Preservation – Credit Ratio 1:10		
Borrow Area 3 Wetland	2.35	0.24
Borrow Area 3 Buffer	21.20	2.10
Subtotal	**23.55**	**2.34**
Total In-Basin Mitigation[a, b]	**102.27**	**29.80**
Out-of-Basin		
Wetland Creation[c] - Credit ratio 1:1		
Forest (17.20 acres), shrub (6.0 acres), emergent (6.20 acres), and open water (0.60 acres)	29.98	29.98
Wetland Enhancement - Credit ratio 1:2	19.50	9.75
Buffer Enhancement - Credit ratio 1:5	15.90	3.18
Total Out-of-Basin Mitigation	**65.38**	**42.91**
Total Mitigation	**167.65**	**72.71**

a Mitigation credit has not been assigned for relocating a portion of Miller Creek channel, instream enhancement projects, drainage channel replacement, Des Moines Creek buffer enhancement, or a $300,000 trust fund for watershed restoration.

b Mitigation areas in the Des Moines and Miller Creek watersheds exceed 102 acres. In- basin mitigation area divided by wetland impact (18.37 acres permanent plus 2.05 acres temporary) provides a 5:1 aerial replacement ratio.

c Based on maps of hydric soils, mitigation can be also characterized as restoration.

E

ATTACHMENT E

Summary of compensatory mitigation (on and off site) for watershed, wetland, and stream impacts at Seattle-Tacoma International Airport.

Impact	Mitigation Action	Target Functions to Replace	Explanation and Key Attributes that Provide Target Functions
ON-SITE MITIGATION			
Permanent Impacts			
Approximately 980 linear ft of Miller Creek channel will be filled to accommodate third runway embankment and South 154th Street relocation.	Relocate approximately 1,080 ft of Miller Creek channel.	Fish and aquatic habitat Amphibian habitat Organic matter export	The channel design includes instream habitat features, including improved substrate conditions, LWD, channel diversity, and increased channel length. A buffer around the new channel will be vegetated with native trees and shrubs to provide shade and organic matter inputs to the stream.
Drainage channels will be filled near 12th Avenue South to accommodate the third runway embankment.	Create new permanent drainage channels.	Organic matter export functions Groundwater exchange functions	Approximately 1,290 ft of new permanent drainage channels will provide ecological functions by planting the channel margins with native vegetation to provide buffer functions. Functions include shade to control water temperatures and provide organic matter input. The channels will be designed to connect to the embankment drainage layer material to promote groundwater discharge. Connection to wetlands and Miller Creek will promote organic matter transport and export to the creek.
Approximately 8,500 cy of Miller Creek floodplain will be filled to accommodate third runway embankment and South 154th Street relocation.	Replace lost floodplain.	Flood storage	Approximately 9,600 cubic yards of soil will be excavated to suitable elevations that achieve storage of 5.94 acre-ft of floodwaters. Suitable grades and elevations will allow overbank and backwater flooding to occur in this floodplain.

Impact	Mitigation Action	Target Functions to Replace	Explanation and Key Attributes that Provide Target Functions
Approximately 18.37 acres of wetland will be filled during construction of the third runway embankment and other construction-related projects.	Restore about 9 acres of the Vacca Farm site to shrub-dominated wetlands.	Nutrient and sediment trapping functions Organic matter export Groundwater exchange Small mammal habitat Reduced waterfowl habitat	Plowed farmland will be stabilized with dense shrub and herbaceous plantings. Overbank and backwater flooding will occur to promote organic matter export. Subsurface drainage systems will be removed to promote natural groundwater discharge and flow patterns. Hummocks vegetated with dense native vegetation in wetlands and buffers will be provided as habitat for small mammals. This attribute will be augmented with LWD in wetlands and buffers. Large areas of emergent vegetation, open water, or long-term flooding that could promote waterfowl use will be avoided.
	Restore wetland buffer conditions (0.30 acre) around the north and west sides of Lora Lake.	Fish, amphibian, and aquatic habitat Organic matter export Reduce wildlife attractants	Converting lawn areas to riparian buffer communities will be established by planting with native wetland and upland shrub vegetation (refer to Table 5.1-1 in Section 5). Overhanging dense shrub vegetation will improve aquatic habitat, reduce waterfowl use of shoreline areas, and promote export of organic matter from shoreline to aquatic habitats. Removal of bulkhead along the Lora Lake shoreline will improve shoreline habitat for amphibians, fish, and aquatic insects.
	Enhance approximately 10.25 acres of wetlands along Miller Creek	Nutrient and sediment trapping Small mammal habitat	Removing structures and restoring native wetland vegetation (Table 4.1-3) will enhance riparian and other wetlands. Areas of non-native vegetation will be removed and native trees and shrubs planted in the wetland.

Impact	Mitigation Action	Target Functions to Replace	Explanation and Key Attributes that Provide Target Functions
	Restore wetlands on the Tyee Valley Golf Course.	Nutrient and sediment trapping Organic matter export Reduce waterfowl habitat Small mammal habitat	Dense native shrub vegetation will be planted in Des Moines Creek floodplain and riparian areas (see Table 4.1-3). The wetland and riparian vegetation will promote increased export of organic matter to Des Moines Creek compared to the existing turf vegetation.[a] Shrub communities will reduce waterfowl use and improve habitat for small mammals.
<u>Temporary Impacts</u>			
Construction of temporary stormwater management ponds and other projects may temporarily impact up to 2.05 acres of wetland.	Restore forest and shrub communities to Wetland A17. Restore wetland areas after construction is complete.	Nutrient and sediment trapping Organic matter export Groundwater exchange Small mammal habitat	Restoration of wetlands that will be temporarily filled or disturbed will restore functions that previously existed on these sites. Restoration will include establishing pre-disturbance topography and planting the area with native shrub or forest vegetation. Integration of these areas with the replacement drainage channel mitigation and the embankment drainage layer will promote restoration of pre-existing hydrologic and water quality functions.
<u>Indirect and Cumulative Impacts</u>			
Filled wetlands near Miller Creek will reduce aquatic habitat value of the stream.	Establish and enhance buffers along Miller Creek.	Nutrient and sediment trapping Organic matter export Small mammal habitat	Conversion of residential landuses to vegetated stream buffers will promote nutrient and sediment trapping functions and reduce pollutant loading. Greater densities of riparian vegetation will increase shade, instream habitat, and organic matter export to Miller Creek. Riparian buffer vegetation will contribute to bank stabilization, sediment, and nutrient removal. It will also provide small mammal habitat (see Table 4.1-3).

Impact	Mitigation Action	Target Functions to Replace	Explanation and Key Attributes that Provide Target Functions
Additional development in the basins could result in additional cumulative impacts.	Participate in developing and implementing Miller Creek and Des Moines Creek basin plans.	Aquatic habitat Stream and/or basin hydrology	These planning processes will identify effective, long-term solutions to restore additional fish habitat functions to Miller and Des Moines Creeks. Projects are anticipated to focus on restoring basin hydrology through increased regional stormwater detention facilities and improved fish habitat through habitat restoration projects. The Port will contribute staffing resources and funds to support these efforts. The Port will work with other cooperating jurisdictions to plan and implement appropriate basin restoration projects.
	Provide trust fund to basin restoration projects.	Cumulative impacts to aquatic habitat	The Port will establish a trust fund to help promote aquatic habitat and other basin restoration actions.
The runway fill or borrow area excavation may eliminate water sources that contribute to remaining wetlands downslope of the runway.	Design internal drainage and conveyance channels to promote and retain wetland hydrology and streamflow . Monitor wetlands adjacent to the third runway embankment and borrow areas to ensure wetland hydrology is maintained.	Groundwater exchange Organic matter export	Subsurface and surface replacement channels will continue to collect and distribute groundwater currently surfacing near 12th Avenue South to Miller Creek and associated wetlands. Surface drainage patterns and conveyance swales will be designed to collect and distribute groundwater seepage and surface runoff to wetlands downslope of the borrow areas.
OFF-SITE MITIGATION			
Permanent Impacts			
Approximately 18.37 acres of wetland wildlife (avian) habitat will be lost.	Replace high quality wetland and avian habitat functions off-site at an overall ratio of 2:1.	Passerine bird habitat Waterfowl habitat Small mammal habitat Flood storage	A variety of wetland classes and vegetation types on a large protected site will provide high quality habitat for a diverse array of birds and small mammals. Open water habitat (including vegetated aquatic beds) will support waterfowl and other bird species that require small ponds for forage or nesting.

Impact	Mitigation Action	Target Functions to Replace	Explanation and Key Attributes that Provide Target Functions
			Waterfowl and other marsh birds will use flooded persistent and non-persistent emergent plant communities for forage and nesting. These communities will produce organic matter and aquatic insects that provide forage in open water areas. Shrub wetland will fringe marsh communities and provide nesting and forage habitat for songbirds as well as export organic matter to emergent areas. Multi-storied forest communities will provide habitat to songbirds, raptors, and small mammals. A densely vegetated 100-ft-wide buffer will provide additional upland habitats and protect interior upland and wetland habitats from potential disturbances if off-site areas are developed. Microhabitat features-including LWD, vegetated hummocks, interspersion of vegetation types, and proximity to the Green River riparian corridor-will further enhance the area for wildlife. Excavation of portions of the site below an elevation of 45 ft and connection to the floodplain of the Green River by enhancing existing drainage channels will provide flood-storage functions.

F

ATTACHMENT F

Comparison of mitigation projects to the Society of Wetland Scientist's Definition of Wetland Restoration.

SWS Criteria	Vacca Farm	Miller Creek Buffer	Tyee Golf Course	Auburn Wetland Mitigation
Reinstatement of driving ecological processes	Plant production processes are restored to the site. This production will drive wetland functions such as peat accumulation, organic matter export, and nutrient cycling processes.	Plant production processes will be restored in uplands and wetlands (see Vacca Farm). Stream enhancements and riparian restoration will restore habitat conditions and promote the retention and processing of organic matter by the creek ecosystem.	Plant production processes will be restored in uplands and wetlands (see Vacca Farm). Restoration of riparian areas will restore habitat and promote the retention and processing of organic matter by the creek ecosystem.	For wetland enhancement areas, plant production processes will be restored in uplands and wetlands (see Vacca Farm). In wetland creation areas, wetland hydrology will be established to support a variety of forest, shrub, and emergent pant communities and habitat which will promote a diverse ecological system.
Restoration Integrated into the landscape.	The restoration project is located within a 1.4 mile riparian corridor, and promotes an ecological connection between the wetlands located north of the airfield and Miller Creek.	The restoration restores landscape (wetland and riparian corridor) functions to Miller Creek. Removal of development on over 50 acres of land.	The restoration restores landscape (wetland and riparian corridor) functions to Des Moines Creek. Removal of golf course development on over 6.5 acres of land. The restoration is integrated into the larger (35 acre) Wetland 28 ecosystem.	The restoration establishes 65-acres integrated into the floodplain of the Green River.
Restores a persistent resilient system	Wetland buffers, the landscape setting, and restrictive covenants will assure long term protection and functioning of the restoration.	Same.	Same.	Same.
Results in historic wetland conditions	The historic floodplain and riparian conditions are restored.	The historic forest and shrub riparian wetlands are restored.	The historic floodplain and riparian conditions are restored.	Historic depression and riparian floodplain wetlands, once common in the Green River Valley are restored.
Performance standards based on objectives that measure structural and functional characteristics	A wide variety of performance standards based on desired structural and functional characteristics will be monitored as part of a 15-year adaptive management program.	A wide variety of performance standards based on desired structural and functional characteristics will be monitored as part of a 15-year adaptive management program.	A wide variety of performance standards based on desired structural and functional characteristics will be monitored as part of a 15-year adaptive management program.	A wide variety of performance standards based on desired structural and functional characteristics will be monitored as part of a 15-year adaptive management program.

G

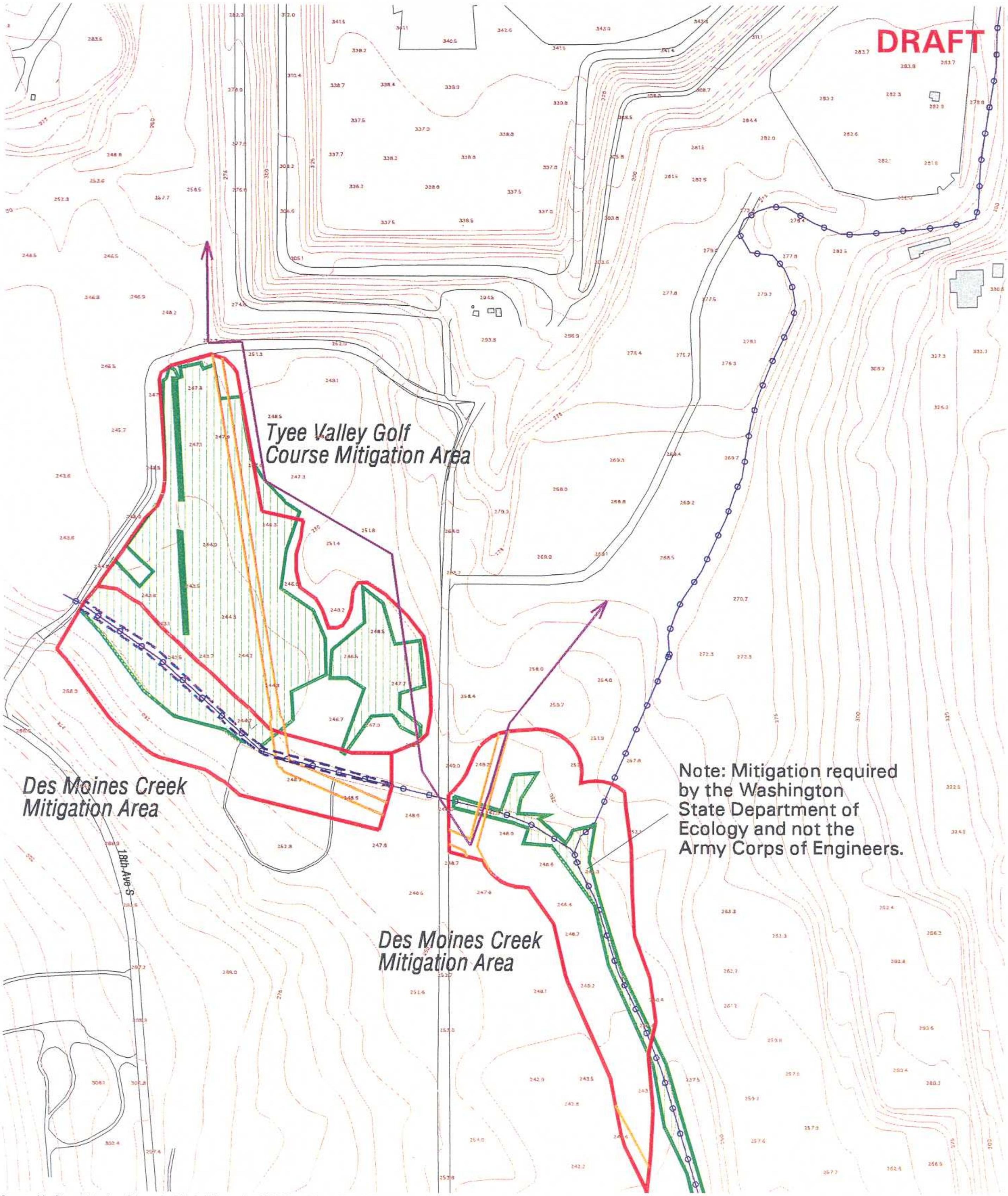
ATTACHMENT G

Wetland acreage impacts and mitigation by wetland function.

Wetland Function	Impact	In-basin*		Auburn		Comment
		Site	Credit	Site	Credit	
Resident/ Anadromous Fish	8.6	70.54	25.79	-	-	In basin mitigation includes mitigation for direct impacts to Miller Creek and indirect impacts that may occur through alteration of riparian and hydrologically connected wetlands. For the Miller Creek enhancement areas, buffer averaging areas greater than 100-feet from Miller Creek were excluded from providing this function.
Passerine Birds	14.9	-	-	65.38	42.91	In-basin mitigation credit is not sought for this function due to potential wildlife management actions.
Waterfowl	1.9	-	-	6.80	6.80	In-basin mitigation credit is not sought for this function due to potential wildlife management actions.
Amphibians	9.8	78.72	27.46	65.38	42.91	The Lora Lake shoreline restoration, removing human uses, and native plant communities provided by the on-site mitigation will provide habitat for several species.
Small Mammals	13.2	78.72	27.46	65.38	42.91	Eliminating human uses, and native plant communities provided by the on-site mitigation will provide habitat for several species.
Exports Organic Matter	10.9	78.72	27.46	-	-	In-basin mitigation includes increasing production and quality of organic matter in wetlands and riparian areas. Maintenance actions that remove organic matter from wetlands, streams, and buffers will also be removed.
Ground Water Exchange	-	-	-	-	-	Impacts to this function, provided by slope and riparian wetlands (13.6 acres), are avoided by project design and by low flow augmentation.
Flood Storage	4.6	4.6	4.6	25	25	This function is mitigated in-basin by new flood storage at Vacca Farm and by stormwater detention facilities that are designed to maintain or decrease peak stream flows during flood events.
Nutrient/Sediment Trapping	16.3	78.72	27.46	65.38	42.91	In basin mitigation for this function is also provided by changes in land use that convert pollution generating land uses in mitigation areas to native vegetation, and by retrofitting existing pollution generating surfaces with BMPs for water quality treatment.

* Preservation of 23.55 acres near Borrow Area 3 is excluded from this table.

H



Prepared by Parametrix, Inc. File: seatac2/p_8x11tyee_site_042001.aml Date: June 20, 2001

N

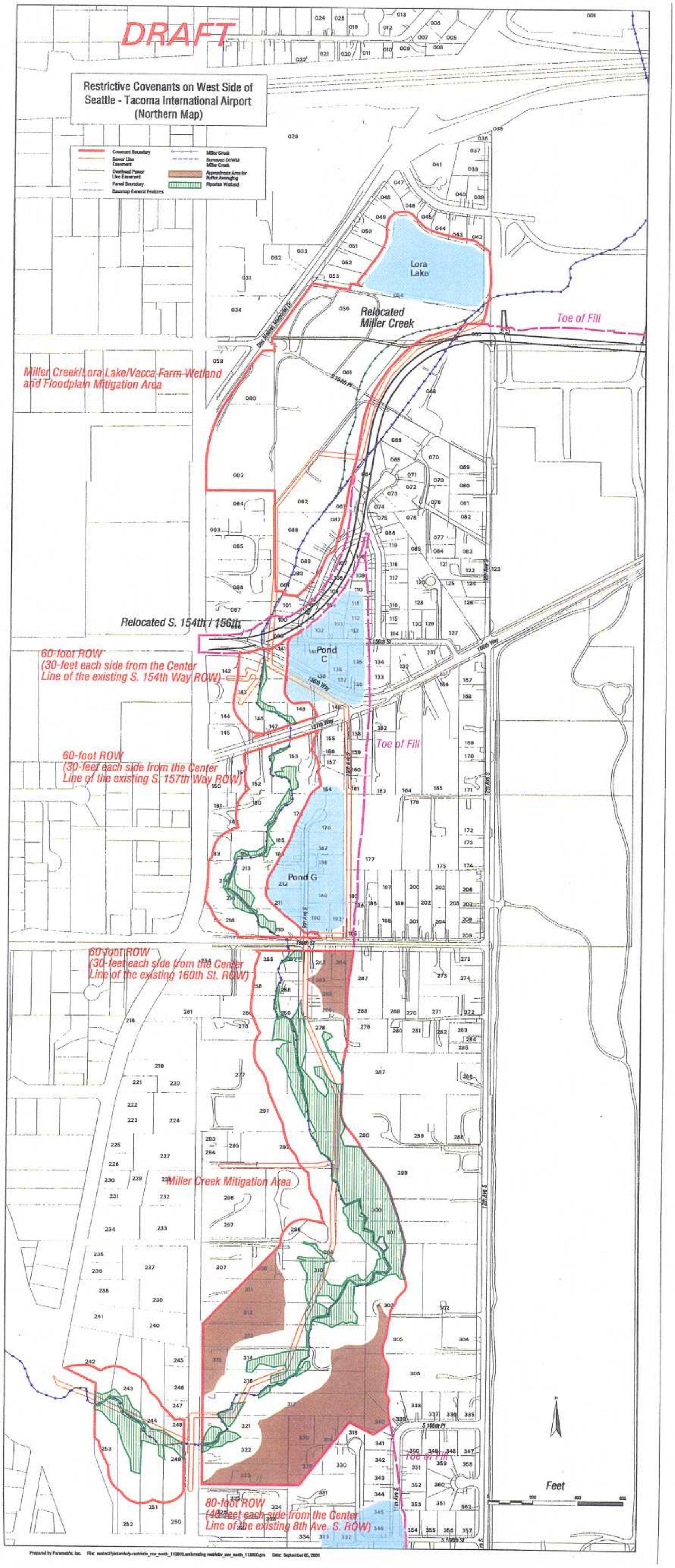
FEET
0 100 200 300 400

Scale 1:3600

Covenant Boundary
Sewer Line Easement
IWS Line
Des Moines Creek
Surveyed OHWM Des Moines Creek
Riparian Wetland

Restrictive Covenants on South End of Seattle - Tacoma International Airport

AR 008894


DRAFT
Restrictive Covenants on West Side of Seattle - Tacoma International Airport (Northern Map)
Lora Lake
Relocated Miller Creek
Toe of Fill
Miller Creek/Lora Lake/Vacca Farm Wetland and Floodplain Mitigation Area
Relocated S. 154th / 156th
60-foot ROW (30-feet each side from the Center Line of the existing S. 154th Way ROW)
Pond C
60-foot ROW (30-feet each side from the Center Line of the existing S. 157th Way ROW)
Pond G
60-foot ROW (30-feet each side from the Center Line of the existing 160th St. ROW)
Miller Creek Mitigation Area
80-foot ROW (40-feet each side from the Center Line of the existing 8th Ave. S. ROW)
Feet

AR 008895

U.S. Department of Transportation

Federal Aviation Administration

Advisory Circular

Subject: HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS

Date: 5/1/97

Initiated by: AAS-310 and APP-600

AC No: 150/5200-33

Change:

1. PURPOSE. This advisory circular (AC) provides guidance on locating certain land uses having the potential to attract hazardous wildlife to or in the vicinity of public-use airports. It also provides guidance concerning the placement of new airport development projects (including airport construction, expansion, and renovation) pertaining to aircraft movement in the vicinity of hazardous wildlife attractants. Appendix 1 provides definitions of terms used in this AC.

2. APPLICATION. The standards, practices, and suggestions contained in this AC are recommended by the Federal Aviation Administration (FAA) for use by the operators and sponsors of all public-use airports. In addition, the standards, practices, and suggestions contained in this AC are recommended by the FAA as guidance for land use planners, operators, and developers of projects, facilities, and activities on or near airports.

3. BACKGROUND. Populations of many species of wildlife have increased markedly in the last few years. Some of these species are able to adapt to human-made environments, such as exist on and around airports. The increase in wildlife populations, the use of larger turbine engines, the increased use of twin-engine aircraft, and the increase in air-traffic, all combine to increase the risk, frequency, and potential severity of wildlife-aircraft collisions.

Most public-use airports have large tracts of open, unimproved land that are desirable for added margins of safety and noise mitigation. These areas can present potential hazards to aviation because they often attract hazardous wildlife. During the past century, wildlife-aircraft strikes have resulted in the loss of hundreds of lives world-wide, as well as billions of dollars worth of aircraft damage. Hazardous wildlife attractants near airports could jeopardize future airport expansion because of safety considerations.

DAVID L. BENNETT
Director, Office of Airport Safety and Standards

SECTION 1. HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS.

1-1. TYPES OF HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AIRPORTS. Human-made or natural areas, such as poorly-drained areas, retention ponds, roosting habitats on buildings, landscaping, putrescible-waste disposal operations, wastewater treatment plants, agricultural or aquacultural activities, surface mining, or wetlands, may be used by wildlife for escape, feeding, loafing, or reproduction. Wildlife use of areas within an airport's approach or departure airspace, aircraft movement areas, loading ramps, or aircraft parking areas may cause conditions hazardous to aircraft safety.

All species of wildlife can pose a threat to aircraft safety. However, some species are more commonly involved in aircraft strikes than others. Table 1 lists the wildlife groups commonly reported as being involved in damaging strikes to U.S. aircraft from 1993 to 1995.

Table 1. Wildlife Groups Involved in Damaging Strikes to Civilian Aircraft, USA, 1993-1995.

Wildlife Groups	Percent involvement in reported damaging strikes
Gulls	28
Waterfowl	28
Raptors	11
Doves	6
Vultures	5
Blackbirds-Starlings	5
Corvids	3
Wading birds	3
Deer	11
Canids	1

1-2. LAND USE PRACTICES. Land use practices that attract or sustain hazardous wildlife populations on or near airports can significantly increase the potential for wildlife-aircraft collisions. FAA recommends against land use practices, within the siting criteria stated in 1-3, that attract or sustain populations of hazardous wildlife within the vicinity of airports or cause movement of hazardous wildlife onto, into, or across the approach or departure airspace, aircraft movement area, loading ramps, or aircraft parking area of airports.

Airport operators, sponsors, planners, and land use developers should consider whether proposed land uses, including new airport development projects, would increase the wildlife hazard. Caution should be exercised to ensure that land use practices on or near airports do not enhance the attractiveness of the area to hazardous wildlife.

1-3. SITING CRITERIA. FAA recommends separations when siting any of the wildlife attractants mentioned in Section 2 or when planning new airport development projects to accommodate aircraft movement. The distance between an airport's aircraft movement areas, loading ramps, or aircraft parking areas and the wildlife attractant should be as follows:

a. Airports serving piston-powered aircraft. A distance of 5,000 feet is recommended.

b. Airports serving turbine-powered aircraft. A distance of 10,000 feet is recommended.

c. Approach or Departure airspace. A distance of 5 statute miles is recommended, if the wildlife attractant may cause hazardous wildlife movement into or across the approach or departure airspace.

AR 008898

SECTION 2. LAND USES THAT ARE INCOMPATIBLE WITH SAFE AIRPORT OPERATIONS.

2-1. GENERAL. The wildlife species and the size of the populations attracted to the airport environment are highly variable and may depend on several factors, including land-use practices on or near the airport. It is important to identify those land use practices in the airport area that attract hazardous wildlife. This section discusses land use practices known to threaten aviation safety.

2-2. PUTRESCIBLE-WASTE DISPOSAL OPERATIONS. Putrescible-waste disposal operations are known to attract large numbers of wildlife that are hazardous to aircraft. Because of this, these operations, when located within the separations identified in the sitting criteria in 1-3 are considered incompatible with safe airport operations.

FAA recommends against locating putrescible-waste disposal operations inside the separations identified in the siting criteria mentioned above. FAA also recommends against new airport development projects that would increase the number of aircraft operations or that would accommodate larger or faster aircraft, near putrescible-waste disposal operations located within the separations identified in the siting criteria in 1-3.

2-3. WASTEWATER TREATMENT FACILITIES. Wastewater treatment facilities and associated settling ponds often attract large numbers of wildlife that can pose a threat to aircraft safety when they are located on or near an airport.

a. **New wastewater treatment facilities.** FAA recommends against the construction of new wastewater treatment facilities or associated settling ponds within the separations identified in the siting criteria in 1-3. During the siting analysis for wastewater treatment facilities, the potential to attract hazardous wildlife should be considered if an airport is in the vicinity of a proposed site. Airport operators should voice their opposition to such sitings. In addition, they should consider the existence of wastewater treatment facilities when evaluating proposed sites for new airport development projects and avoid such sites when practicable.

b. **Existing wastewater treatment facilities.** FAA recommends correcting any wildlife hazards arising from existing wastewater treatment facilities located on or near airports without delay, using appropriate wildlife hazard mitigation techniques. Accordingly, measures to minimize hazardous wildlife attraction should be developed in consultation with a wildlife damage management biologist. FAA recommends that wastewater treatment facility operators incorporate appropriate wildlife hazard mitigation techniques into their operating practices. Airport operators also should encourage those operators to incorporate these mitigation techniques in their operating practices.

c. **Artificial marshes.** Waste-water treatment facilities may create artificial marshes and use submergent and emergent aquatic vegetation as natural filters. These artificial marshes may be used by some species of flocking birds, such as blackbirds and waterfowl, for breeding or roosting activities. FAA recommends against establishing artificial marshes within the separations identified in the siting criteria stated in 1-3.

d. **Wastewater discharge and sludge disposal.** FAA recommends against the discharge of wastewater or sludge on airport property. Regular spraying of wastewater or sludge disposal on unpaved areas may improve soil moisture and quality. The resultant turf growth requires more frequent mowing, which in turn may mutilate or flush insects or small animals and produce straw. The maimed or flushed organisms and the straw can attract hazardous wildlife and jeopardize aviation safety. In addition, the improved turf may attract grazing wildlife such as deer and geese.

Problems may also occur when discharges saturate unpaved airport areas. The resultant soft, muddy conditions can severely restrict or prevent emergency vehicles from reaching accident sites in a timely manner.

e. **Underwater waste discharges.** The underwater discharge of any food waste, e.g., fish processing offal, that could attract scavenging wildlife is not recommended within the separations identified in the siting criteria in 1-3.

AR 008899

2-4. WETLANDS.

a. Wetlands on or near Airports.

(1) Existing Airports. Normally, wetlands are attractive to many wildlife species. Airport operators with wetlands located on or nearby airport property should be alert to any wildlife use or habitat changes in these areas that could affect safe aircraft operations.

(2) Airport Development. When practicable, the FAA recommends siting new airports using the separations identified in the siting criteria in 1-3. Where alternative sites are not practicable or when expanding existing airports in or near wetlands, the wildlife hazards should be evaluated and minimized through a wildlife management plan prepared by a wildlife damage management biologist, in consultation with the U.S. Fish and Wildlife Service (USFWS) and the U.S. Army Corps of Engineers (COE).

NOTE: If questions exist as to whether or not an area would qualify as a wetland, contact the U.S. Army COE, the Natural Resource Conservation Service, or a wetland consultant certified to delineate wetlands.

b. Wetland mitigation. Mitigation may be necessary when unavoidable wetland disturbances result from new airport development projects. Wetland mitigation should be designed so it does not create a wildlife hazard.

(1) FAA recommends that wetland mitigation projects that may attract hazardous wildlife be sited outside of the separations identified in the siting criteria in 1-3. Wetland mitigation banks meeting these siting criteria offer an ecologically sound approach to mitigation in these situations.

(2) Exceptions to locating mitigation activities outside the separations identified in the siting criteria in 1-3 may be considered if the affected wetlands provide unique ecological functions, such as critical habitat for threatened or endangered species or ground water recharge. Such mitigation must be compatible with safe airport operations. Enhancing such mitigation areas to attract hazardous wildlife should be avoided. On-site mitigation plans may be reviewed by the FAA to determine compatibility with safe airport operations.

(3) Wetland mitigation projects that are needed to protect unique wetland functions (see 2-4.b.(2)), and that must be located in the siting criteria in 1-3 should be identified and evaluated by a wildlife damage management biologist before implementing the mitigation. A wildlife damage management plan should be developed to reduce the wildlife hazards.

NOTE: AC 150/5000-3, *Address List for Regional Airports Division and Airports District/Field Offices*, provides information on the location of these offices.

2-5. DREDGE SPOIL CONTAINMENT AREAS.

FAA recommends against locating dredge spoil containment areas within the separations identified in the siting criteria in 1-3, if the spoil contains material that would attract hazardous wildlife.

AR 008900

SECTION 3. LAND USES THAT MAY BE COMPATIBLE WITH SAFE AIRPORT OPERATIONS.

3-1. GENERAL. Even though they may, under certain circumstances, attract hazardous wildlife, the land use practices discussed in this section have flexibility regarding their location or operation and may even be under the airport operator's or sponsor's control. In general, the FAA does not consider the activities discussed below as hazardous to aviation if there is no apparent attraction to hazardous wildlife, or wildlife hazard mitigation techniques are implemented to deal effectively with any wildlife hazard that may arise.

3-2. ENCLOSED WASTE FACILITIES. Enclosed trash transfer stations or enclosed waste handling facilities that receive garbage indoors; process it via compaction, incineration, or similar manner; and remove all residue by enclosed vehicles, generally would be compatible, from a wildlife perspective, with safe airport operations, provided they are not located on airport property or within the runway protection zone (RPZ). No putrescible-waste should be handled or stored outside at any time, for any reason, or in a partially enclosed structure accessible to hazardous wildlife.

Partially enclosed operations that accept putrescible-waste are considered to be incompatible with safe airport operations. FAA recommends these operations occur outside the separations identified in the siting criteria in 1-3.

3-3. RECYCLING CENTERS. Recycling centers that accept previously sorted, non-food items such as glass, newspaper, cardboard, or aluminum are, in most cases, not attractive to hazardous wildlife.

3-4. COMPOSTING OPERATIONS ON AIRPORTS. FAA recommends against locating composting operations on airports. However, when they are located on an airport, composting operations should not be located closer than the greater of the following distances: 1,200 feet from any aircraft movement area, loading ramp, or aircraft parking space; or the distance called for by airport design requirements. This spacing is intended to prevent material, personnel, or equipment from penetrating any Obstacle Free Area (OFA), Obstacle Free Zone (OFZ), Threshold Siting Surface (TSS), or Clearway (see AC 150/5300-13, *Airport Design*). On-airport disposal of compost by-products is not recommended for the reasons stated in 2-3.d.

a. Composition of material handled. Components of the compost should never include any municipal solid waste. Non-food waste such as leaves, lawn clippings, branches, and twigs generally are not considered a wildlife attractant. Sewage sludge, wood-chips, and similar material are not municipal solid wastes and may be used as compost bulking agents.

b. Monitoring on-airport composting operations. If composting operations are to be located on airport property, FAA recommends that the airport operator monitor composting operations to ensure that steam or thermal rise does not affect air traffic in any way. Discarded leaf disposal bags or other debris must not be allowed to blow onto any active airport area. Also, the airport operator should reserve the right to stop any operation that creates unsafe, undesirable, or incompatible conditions at the airport.

3-5. ASH DISPOSAL. Fly ash from resource recovery facilities that are fired by municipal solid waste, coal, or wood, is generally considered not to be a wildlife attractant because it contains no putrescible matter. FAA generally does not consider landfills accepting only fly ash to be wildlife attractants, if those landfills: are maintained in an orderly manner; admit no putrescible-waste of any kind; and are not co-located with other disposal operations.

Since varying degrees of waste consumption are associated with general incineration, FAA classifies the ash from general incinerators as a regular waste disposal by-product and, therefore, a hazardous wildlife attractant.

3-6. CONSTRUCTION AND DEMOLITION (C&D) DEBRIS LANDFILLS. C&D debris (Class IV) landfills have visual and operational characteristics similar to putrescible-waste disposal sites. When co-located with putrescible-waste disposal operations, the probability of hazardous wildlife attraction to C&D landfills increases because of the similarities between these disposal activities.

FAA generally does not consider C&D landfills to be hazardous wildlife attractants, if those landfills: are maintained in an orderly manner; admit no putrescible-waste of any kind; and are not co-located with other disposal operations.

3-7. WATER DETENTION OR RETENTION PONDS. The movement of storm water away from runways, taxiways, and aprons is a normal function on most airports and is necessary for safe aircraft operations. Detention ponds hold storm water for short periods, while retention ponds hold water indefinitely. Both types of ponds control runoff, protect water quality, and can attract hazardous wildlife. Retention ponds are more attractive to hazardous wildlife than detention ponds because they provide a more reliable water source.

To facilitate hazardous wildlife control, FAA recommends using steep-sided, narrow, linearly-shaped, rip-rap lined, water detention basins rather than retention basins. When possible, these ponds should be placed away from aircraft movement areas to minimize aircraft-wildlife interactions. All vegetation in or around detention or retention basins that provide food or cover for hazardous wildlife should be eliminated.

If soil conditions and other requirements allow, FAA encourages the use of underground storm water infiltration systems, such as French drains or buried rock fields, because they are less attractive to wildlife.

3-8. LANDSCAPING. Wildlife attraction to landscaping may vary by geographic location. FAA recommends that airport operators approach landscaping with caution and confine it to airport areas not associated with aircraft movements. All landscaping plans should be reviewed by a wildlife damage management biologist. Landscaped areas should be monitored on a continuing basis for the presence of hazardous wildlife. If hazardous wildlife is detected, corrective actions should be implemented immediately.

3-9. GOLF COURSES. Golf courses may be beneficial to airports because they provide open space that can be used for noise mitigation or by aircraft during an emergency. On-airport golf courses may also be a concurrent use that provides income to the airport.

Because of operational and monetary benefits, golf courses are often deemed compatible land uses on or near airports. However, waterfowl (especially Canada geese) and some species of gulls are attracted to the large, grassy areas and open water found on most golf courses. Because waterfowl and gulls occur throughout the U.S., FAA recommends that airport operators exercise caution and consult with a wildlife damage management biologist when considering proposals for golf course construction or expansion on or near airports. Golf courses should be monitored on a continuing basis for the presence of hazardous wildlife. If hazardous wildlife is detected, corrective actions should be implemented immediately.

3-10. AGRICULTURAL CROPS. As noted above, airport operators often promote revenue-generating activities to supplement an airport's financial viability. A common concurrent use is agricultural crop production. Such use may create potential hazards to aircraft by attracting wildlife. Any proposed on-airport agricultural operations should be reviewed by a wildlife damage management biologist. FAA generally does not object to agricultural crop production on airports when: wildlife hazards are not predicted; the guidelines for the airport areas specified in 3-10.a-f. are observed; and the agricultural operation is closely monitored by the airport operator or sponsor to ensure that hazardous wildlife are not attracted.

NOTE: If wildlife becomes a problem due to on-airport agricultural operations, FAA recommends undertaking the remedial actions described in 3-10.f.

a. Agricultural activities adjacent to runways. To ensure safe, efficient aircraft operations, FAA recommends that no agricultural activities be conducted in the Runway Safety Area (RSA), OFA, and the OFZ (see AC 150/5300-13).

b. Agricultural activities in areas requiring minimum object clearances. Restricting agricultural operations to areas outside the RSA, OFA, OFZ, and Runway Visibility Zone (RVZ) (see AC 150/5300-13) will normally provide the minimum object clearances required by FAA's airport design standards. FAA recommends that farming operations not be permitted within areas critical to the proper operation of localizers, glide slope indicators, or other visual or electronic navigational aids. Determinations of minimal areas that must be kept free of farming operations should be made on a case-by-case basis. If navigational aids are present, farm leases for on-airport agricultural activities should be coordinated with FAA's Airway Facilities Division, in accordance with FAA Order 6750.16, *Siting Criteria for Instrument Landing Systems*.

NOTE: Crop restriction lines conforming to the dimensions set forth in Table 2 will normally provide the minimum object clearance required by

FAA airport design standards. The presence of navigational aids may require expansion of the restricted area.

c. Agricultural activities within an airport's approach areas. The RSA, OFA, and OFZ all extend beyond the runway shoulder and into the approach area by varying distances. The OFA normally extends the farthest and is usually the controlling surface. However, for some runways, the TSS (see AC 150/5300-13, Appendix 2) may be more controlling than the OFA. The TSS may not be penetrated by any object. The minimum distances shown in Table 2 are intended to prevent penetration of the OFA, OFZ, or TSS by crops or farm machinery.

NOTE: Threshold Siting standards should not be confused with the approach areas described in Title 14, Code of Federal Regulations, Part 77, (14 CFR 77), *Objects Affecting Navigable Airspace.*

d. Agricultural activities between intersecting runways. FAA recommends that no agricultural activities be permitted within the RVZ. If the terrain is sufficiently below the runway elevation, some types of crops and equipment may be acceptable. Specific determinations of what is permissible in this area requires topographical data. For example, if the terrain within the RVZ is level with the runway ends, farm machinery or crops may interfere with a pilot's line-of-sight in the RVZ.

e. Agricultural activities in areas adjacent to taxiways and aprons. Farming activities should not be permitted within a taxiway's OFA. The outer portions of aprons are frequently used as a taxilane and farming operations should not be permitted within the OFA. Farming operations should not be permitted between runways and parallel taxiways.

f. Remedial actions for problematic agricultural activities. If a problem with hazardous wildlife develops, FAA recommends that a professional wildlife damage management biologist be contacted and an on-site inspection be conducted. The biologist should be requested to determine the source of the hazardous wildlife attraction and suggest remedial action. Regardless of the source of the attraction, prompt remedial actions to protect aviation safety are recommended. The remedial actions may range from choosing another crop or farming technique to complete termination of the agricultural operation.

Whenever on-airport agricultural operations are stopped due to wildlife hazards or annual harvest, FAA recommends plowing under all crop residue and harrowing the surface area smooth. This will reduce or eliminate the area's attractiveness to foraging wildlife. FAA recommends that this requirement be written into all on-airport farm use contracts and clearly understood by the lessee.

AR 008903

Table 2. Minimum Distances Between Certain Airport Features And Any On-Airport Agriculture Crops.

Aircraft Approach Category And Design Group [1]	Distance In Feet From Runway Centerline To Crop		Distance In Feet From Runway End To Crop		Distance In Feet From Centerline Of Taxiway To Crop	Distance In Feet From Edge Of Apron To Crop
	Visual & ≥ ¾ mile	< ¾ mile	Visual & ≥ ¾ mile	< ¾ mile		
Category A & B Aircraft						
Group I	200 [2]	400	300[3]	600	45	40
Group II	250	400	400[3]	600	66	58
Group III	400	400	600	800	93	81
Group IV	400	400	1,000	1,000	130	113
Category C, D & E Aircraft						
Group I	530[3]	575[3]	1,000	1,000	45	40
Group II	530[3]	575[3]	1,000	1,000	66	58
Group III	530[3]	575[3]	1,000	1,000	93	81
Group IV	530[3]	575[3]	1,000	1,000	130	113
Group V	530[3]	575[3]	1,000	1,000	160	138
Group VI	530[3]	575[3]	1,000	1,000	193	167

1. Design Groups are based on wing span, and Category depends on approach speed of the aircraft.

Group I: Wing span up to 49 ft.
Group II Wing span 49ft. up to 78 ft.
Group III: Wing span 79 ft. up to 117 ft.
Group IV: Wing span 118 ft. up to 170 ft.
Group V: Wing span 171 ft. up to 213 ft.
Group VI: Wing span 214 ft. up to 261 ft.

Category A: Speed less than 91 knots
Category B Speed 91 knots up to 120 knots
Category C Speed 121 knots up to 140 knots
Category D Speed 141 knots up to 165 knots
Category E Speed 166 knots or more

2. If the runway will only serve small airplanes (12,500 lb. And under) in Design Group I, this dimension may be reduced to 125 feet; however, this dimension should be increased where necessary to accommodate visual navigational aids that may be installed. For example farming operations should not be allowed within 25 feet of a Precision Approach Path Indicator (PAPI) light box.

3. These dimensions reflect the TSS as defined in AC 150/5300-13, Appendix 2. The TSS cannot be penetrated by any object. Under these conditions, the TSS is more restrictive than the OFA, and the dimensions shown here are to prevent penetration of the TSS by crops and farm machinery.

SECTION 4. NOTIFICATION OF FAA ABOUT HAZARDOUS WILDLIFE ATTRACTANTS ON OR NEAR AN AIRPORT.

4-1. GENERAL. Airport operators, land developers, and owners should notify the FAA in writing of known or reasonably foreseeable land use practices on or near airports that either attract or may attract hazardous wildlife. This section discusses those notification procedures.

4-2. NOTIFICATION REQUIREMENTS FOR WASTE DISPOSAL SITE OPERATIONS. The Environmental Protection Agency (EPA) requires any operator proposing a new or expanded waste disposal operation within 5 statute miles of a runway end to notify the appropriate FAA Regional Airports Division Office and the airport operator of the proposal (40 CFR 258, *Criteria for Municipal Solid Waste Landfills*, section 258.10, *Airport Safety*). The EPA also requires owners or operators of new municipal solid waste landfill (MSWLF) units, or lateral expansions of existing MSWLF units that are located within 10,000 feet of any airport runway end used by turbojet aircraft or within 5,000 feet of any airport runway end used only by piston-type aircraft, to demonstrate successfully that such units are not hazards to aircraft.

a. **Timing of Notification.** When new or expanded MSWLFs are being proposed near airports, MSWLF operators should notify the airport operator and the FAA of this as early as possible pursuant to 40 CFR Part 258. Airport operators should encourage the MSWLF operators to provide notification as early as possible.

NOTE: AC 150/5000-3 provides information on these FAA offices.

b. **Putrescible-Waste Facilities.** In their effort to satisfy the EPA requirement, some putrescible-waste facility proponents may offer to undertake experimental measures to demonstrate that their proposed facility will not be a hazard to aircraft. To date, the ability to sustain a reduction in the numbers of hazardous wildlife to levels that existed before a putrescible-waste landfill began operating has not been successfully demonstrated. For this reason, demonstrations of experimental wildlife control measures should not be conducted in active aircraft operations areas.

c. **Other Waste Facilities.** To claim successfully that a waste handling facility sited within the separations identified in the siting criteria in 1-3 does not attract hazardous wildlife and does not threaten aviation, the developer must establish convincingly that the facility will not handle putrescible material other than that as outlined in 3-2. FAA requests that waste site developers provide a copy of an official permit request verifying that the facility will not handle putrescible material other than that as outlined in 3-2. FAA will use this information to determine if the facility will be a hazard to aviation.

4-3. NOTIFYING FAA ABOUT OTHER WILDLIFE ATTRACTANTS. While U. S. EPA regulations require landfill owners to provide notification, no similar regulations require notifying FAA about changes in other land use practices that can create hazardous wildlife attractants. Although it is not required by regulation, FAA requests those proposing land use changes such as those discussed in 2-3, 2-4, and 2-5 to provide similar notice to the FAA as early in the development process as possible. Airport operators that become aware of such proposed development in the vicinity of their airports should also notify the FAA. The notification process gives the FAA an opportunity to evaluate the effect of a particular land use change on aviation safety.

The land use operator or project proponent may use FAA Form 7460-1, *Notice of Proposed Construction or Alteration*, or other suitable documents to notify the appropriate FAA Regional Airports Division Office.

It is helpful if the notification includes a 15-minute quadrangle map of the area identifying the location of the proposed activity. The land use operator or project proponent should also forward specific details of the proposed land use change or operational change or expansion. In the case of solid waste landfills, the information should include the type of waste to be handled, how the waste will be processed, and final disposal methods.

4-5. FAA REVIEW OF PROPOSED LAND USE CHANGES.

a. The FAA discourages the development of facilities discussed in section 2 that will be located within the 5,000/10,000-foot criteria in 1-3.

AR 008905

b. For projects which are located outside the 5,000/10,000-foot criteria, but within 5 statute miles of the airport's aircraft movement areas, loading ramps, or aircraft parking areas, FAA may review development plans, proposed land use changes, operational changes, or wetland mitigation plans to determine if such changes present potential wildlife hazards to aircraft operations. Sensitive airport areas will be identified as those that lie under or next to approach or departure airspace. This brief examination should be sufficient to determine if further investigation is warranted.

c. Where further study has been conducted by a wildlife damage management biologist to evaluate a site's compatibility with airport operations, the FAA will use the study results to make its determination.

d. FAA will discourage the development of any excepted sites (see Section 3) within the criteria specified in 1-3 if a study shows that the area supports hazardous wildlife species.

4-6. AIRPORT OPERATORS. Airport operators should be aware of proposed land use changes, or modification of existing land uses, that could create hazardous wildlife attractants within the separations identified in the siting criteria in 1-3. Particular attention should be given to proposed land uses involving creation or expansion of waste water treatment facilities, development of wetland mitigation sites, or development or expansion of dredge spoil containment areas.

a. **AIP-funded airports.** FAA recommends that operators of AIP-funded airports, to the extent practicable, oppose off-airport land use changes or practices (within the separations identified in the siting criteria in 1-3) that may attract hazardous wildlife. Failure to do so could place the airport operator or sponsor in noncompliance with applicable grant assurances. FAA recommends against the placement of airport development projects pertaining to aircraft movement in the vicinity of hazardous wildlife attractants. Airport operators, sponsors, and planners should identify wildlife attractants and any associated wildlife hazards during any planning process for new airport development projects.

b. **Additional coordination.** If, after the initial review by FAA, questions remain about the existence of a wildlife hazard near an airport, the airport operator or sponsor should consult a wildlife damage management biologist. Such questions may be triggered by a history of wildlife strikes at the airport or the proximity of the airport to a wildlife refuge, body of water, or similar feature known to attract wildlife.

c. **Specialized assistance.** If the services of a wildlife damage management biologist are required, FAA recommends that land use developers or the airport operator contact the appropriate state director of the United States Department of Agriculture/Animal Damage Control (USDA/ADC), or a consultant specializing in wildlife damage management. Telephone numbers for the respective USDA/ADC state offices may be obtained by contacting USDA/ADC's Operational Support Staff, 4700 River Road, Unit 87, Riverdale, MD, 20737-1234, Telephone (301) 734-7921, Fax (301) 734-5157. The ADC biologist or consultant should be requested to identify and quantify wildlife common to the area and evaluate the potential wildlife hazards.

d. **Notifying airmen.** If an existing land use practice creates a wildlife hazard, and the land use practice or wildlife hazard cannot be immediately eliminated, the airport operator should issue a Notice to Airmen (NOTAM) and encourage the land owner or manager to take steps to control the wildlife hazard and minimize further attraction.

APPENDIX 1. DEFINITIONS OF TERMS USED IN THIS ADVISORY CIRCULAR.

1. GENERAL. This appendix provides definitions of terms used throughout this AC.

a. **Aircraft movement area.** The runways, taxiways, and other areas of an airport which are used for taxiing or hover taxiing, air taxiing, takeoff, and landing of aircraft exclusive of loading ramps and aircraft parking areas.

b. **Airport operator.** The operator (private or public) or sponsor of a public use airport.

c. **Approach or departure airspace.** The airspace, within 5 statute miles of an airport, through which aircraft move during landing or takeoff.

d. **Concurrent use.** Aeronautical property used for compatible non-aviation purposes while at the same time serving the primary purpose for which it was acquired; and the use is clearly beneficial to the airport. The concurrent use should generate revenue to be used for airport purposes (see Order 5190.6A, *Airport Compliance Requirements*, sect. 5h).

e. **Fly ash.** The fine, sand-like residue resulting from the complete incineration of an organic fuel source. Fly ash typically results from the combustion of coal or waste used to operate a power generating plant.

f. **Hazardous wildlife.** Wildlife species that are commonly associated with wildlife-aircraft strike problems, are capable of causing structural damage to airport facilities, or act as attractants to other wildlife that pose a wildlife-aircraft strike hazard.

g. **Piston-use airport.** Any airport that would primarily serve FIXED-WING, piston-powered aircraft. Incidental use of the airport by turbine-powered, FIXED-WING aircraft would not affect this designation. However, such aircraft should not be based at the airport.

h. **Public-use airport.** Any publicly owned airport or a privately-owned airport used or intended to be used for public purposes.

i. **Putrescible material.** Rotting organic material.

j. **Putrescible-waste disposal operation.** Landfills, garbage dumps, underwater waste discharges, or similar facilities where activities include processing, burying, storing, or otherwise disposing of putrescible material, trash, and refuse.

k. **Runway protection zone (RPZ).** An area off the runway end to enhance the protection of people and property on the ground (see AC 150/5300-13). The dimensions of this zone vary with the design aircraft, type of operation, and visibility minimum.

l. **Sewage sludge.** The de-watered effluent resulting from secondary or tertiary treatment of municipal sewage and/or industrial wastes, including sewage sludge as referenced in U.S. EPA's *Effluent Guidelines and Standards*, 40 C.F.R. Part 401.

m. **Shoulder.** An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface, support for aircraft running off the pavement, enhanced drainage, and blast protection (see AC 150/5300-13).

n. **Turbine-powered aircraft.** Aircraft powered by turbine engines including turbojets and turboprops but excluding turbo-shaft rotary-wing aircraft.

o. **Turbine-use airport.** Any airport that ROUTINELY serves FIXED-WING turbine-powered aircraft.

p. **Wastewater treatment facility.** Any devices and/or systems used to store, treat, recycle, or reclaim municipal sewage or liquid industrial wastes, including Publicly Owned Treatment Works (POTW), as defined by Section 212 of the Federal Water Pollution Control Act (P.L. 92-500) as amended by the Clean Water Act of 1977 (P.L. 95-576) and the Water Quality Act of 1987 (P.L. 100-4). This definition includes any pretreatment involving the reduction of the amount of pollutants, the elimination of pollutants, or the alteration of the nature of pollutant properties in wastewater prior to or in lieu of discharging or otherwise introducing such pollutants into a POTW. (See 40 C.F.R. Section 403.3 (o), (p), & (q)).

AR 008907

q. **Wildlife.** Any wild animal, including without limitation any wild mammal, bird, reptile, fish, amphibian, mollusk, crustacean, arthropod, coelenterate, or other invertebrate, including any part, product, egg, or offspring there of (50 CFR 10.12, *Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants*). As used in this AC, WILDLIFE includes feral animals and domestic animals while out of the control of their owners (14 CFR 139.3, *Certification and Operations: Land Airports Serving CAB-Certificated Scheduled Air Carriers Operating Large Aircraft (Other Than Helicopters)*).

r. **Wildlife attractants.** Any human-made structure, land use practice, or human-made or natural geographic feature, that can attract or sustain hazardous wildlife within the landing or departure airspace, aircraft movement area, loading ramps, or aircraft parking areas of an airport. These attractants can include but are not limited to architectural features, landscaping, waste disposal sites, wastewater treatment facilities, agricultural or aquacultural activities, surface mining, or wetlands.

s. **Wildlife hazard.** A potential for a damaging aircraft collision with wildlife on or near an airport (14 CFR 139.3).

2. RESERVED.

AR 008908

United States Department of Agriculture

Animal and Plant Health Inspection Service

Animal Damage Control

720 O'Leary St., NW
Olympia, WA 98502
Tel: (360) 753-9884
Fax: (360) 753-9466

April 15, 1998

Jonathan Friedman
U.S. Army Corps of Engineers
Seattle District
Federal Office Building, Suite 200
909 First Avenue
Seattle WA 98104-1000

Dear Mr. Friedman:

We submitted a formal statement from our agency (see attached) at the public hearing on April 9, 1998 indicating our strong opposition to the establishment of any new wetlands within 10,000 feet of runways at SeaTac. I am writing this follow-up letter to address several issues and concerns that were raised during the hearing. Let me preface my statements by noting that we are neither for nor against the proposed runway expansion or the issuance of a Section 404 permit to fill existing wetlands. While we have not taken a formal position regarding the issuance of a Section 404 permit, it is our opinion that the existing wetlands attract wildlife in a manner that is detrimental to air safety, particularly Canada geese and dabbling ducks. We have been working with SeaTac to reduce wildlife hazards throughout the airfield and have provided them with assistance in the past to preclude waterfowl from utilizing existing wetlands. I want to reemphasize the serious nature of bird strikes - they are real and can result in more than just costly repairs, they can result in loss of human life. A tragic example of this was recently demonstrated in 1995 when a flock of Canada geese brought down an aircraft in Alaska, killing all 24 crew members on board. In situations where there is loss of human life or property, there may be severe legal ramifications and personal liability for personnel that fail to abate hazardous situations involving wildlife.

One recurring theme that was voiced throughout the hearing by supporters of on-site mitigation was that the 10,000-foot separation between airfields and hazardous wildlife attractions (as described in FAA Advisory Circular 150/5200-33) is only a recommendation and is not mandatory. Many of the same presenters also indicated that they did not feel wetlands attract wildlife, nor would they increase the potential for bird strikes at the airfield. This contention is inherently flawed because 1) if birds are not attracted to the wetlands, there would be no need to mitigate in the first place, and 2) it has been demonstrated at airports throughout the world that as the number of animals in the vicinity of an airport increases, the wildlife strike-rates (number of strikes per 10,000 aircraft movements) typically increase. While, this relationship between strike-rates and wildlife abundance may not be directly proportional due to the susceptibility of some species to collide with aircraft, it is a general rule. Waterfowl, which are considered one of the most hazardous forms of wildlife throughout the world because of their size, abundance, propensity to flock, and flight characteristics, would inevitably be attracted to new on-site wetlands.

There are many actions that can be taken to decrease wildlife hazards, depending on the species, time of year, why they are using the airfield, habitat characteristics on and around the airfield, and a host of other variables. It is therefore, a necessity to fully understand an animal's biology, particularly in relation to specific environmental characteristics, when establishing a wildlife control program. Because conditions surrounding airfields can vary so dramatically, the FAA intentionally drafted Advisory Circular 150/5200-33 in a manner that provides mangers with a degree of latitude and flexibility when dealing with wildlife hazards. For this reason, the Advisory Circular was not made into a regulatory mandate, but rather a series of guidelines developed through years of research and experience in dealing with wildlife-related hazards and their impacts on air safety. While there are circumstances that merit exemption from the 10,000-foot separation, and we do work closely with airports in these situations, we do not feel SeaTac is one of them.

Several presenters stated that despite the current existence of wetlands within 10,000 feet of SeaTac's airfield, there is not a wildlife hazard nor have there been any damaging incidents involving birds in the past. However, a review of historical bird strike records submitted to the FAA by pilots reveals this is not the case. Between March 1991 and September 1997, pilots reported 11 strikes involving waterfowl. This is probably a gross underestimate because pilots report only a small proportion (typically less then 15-20%) of the strikes that actually occur. Several of the waterfowl strikes involved multiple birds, and twice the aircraft was damaged and had to make a precautionary landing. Other species that were involved in strikes at SeaTac within the past 7 years include blackbirds, gulls, starlings, herons, hawks, and sparrows, all of which utilize wetland habitats to varying degrees. Fifty-one of the remaining 99 reported-bird strike incidents involved unidentified species, but it is probable some of these were waterfowl.

We understand many of the concerns raised by proponents of on-site mitigation, but like you, it is our professional responsibility to gather information and weigh all the facts before drawing conclusions, even if our decision is not popular. Our position is based on years of experience and training on issues related to wildlife hazards associated with airport environments, and more importantly, site-specific observations made while dealing with wildlife hazards at SeaTac Airport. While we strongly endorse the wildlife enhancement as a whole, we feel this practice is incompatible with safe aircraft operations and oppose its implementation in such close proximity to the airfield. Whatever your decision, we hope you will consider and incorporate the issue of wildlife hazards in the deliberation process. Thank you for your considering regarding our concerns.

Sincerely,

Roger Woodruff

for J. Gary Oldenburg
State Director, WA/AK/HI/Pacific Islands

Encl Letter submitted by USDA to the U.S. Army Corps of Engineers, April 9, 1998

cc: Harold Handke, Lead Cert. Safety Inspector, FAA
Michael Linnell, Wildlife Biologist, USDA-WA/AK

J

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

NORTHWEST MOUNTAIN REGION

RECORD OF DECISION

ENVIRONMENTAL REEVALUATION FOR MASTER PLAN UPDATE DEVELOPMENT ACTIONS SEA-TAC INTERNATIONAL AIRPORT

AUGUST 8, 2001

INTRODUCTION AND BACKGROUND

Four years ago, on July 3, 1997, I signed a Record of Decision (ROD) approving Federal Aviation Administration (FAA) actions providing support for various Master Plan Update (MPU) development actions proposed by the Port of Seattle (POS), including a controversial third runway project. The 1997 ROD relied upon a Final Environmental Impact Statement (FEIS) approved by the FAA on February 1, 1996, and a Supplemental EIS (SEIS) approved by the FAA on May 13, 1997. The instant year-2001 ROD makes the determination that it is not necessary to further supplement the 1996 and 1997 EIS documents at this time, to account for subsequent refinements to the MPU projects and new information relating to environmental impacts of these projects.

It is not uncommon during airport design and development, in the period between initial FAA approval of federal actions supporting airport projects and the completion of those projects, for new environmental information to come to the attention of the FAA. Likewise, it is not uncommon for an airport sponsor to propose and make design refinements to previously-approved projects as those projects proceed towards the construction phase. This is particularly true when the airport development plan involves multiple separate projects proposed to be completed in several stages over a lengthy period of time.

At 40 CFR Part 1500, the Council on Environmental Quality (CEQ) has promulgated regulations for implementing the procedural provisions of the National Environmental Policy Act. Section 1501.9(c)(1) provides that an agency shall prepare supplements to final environmental impact statements if:

> (i) The agency makes substantial changes to the proposed action that are relevant to environmental concerns; or
>
> (ii) There are significant new circumstances or information relevant to environmental concerns and bearing upon the proposed action or its impacts.

The FAA Northwest Mountain Region Airports Division has prepared and signed two environmental reevaluations[1]. The ROD Appendices A and B address the issue of whether the previous environmental analyses, pertinent to ongoing discretionary federal actions concerning the POS MPU projects, must now be supplemented based upon new information concerning these projects or recent modifications to these projects.

The Appendix A reevaluation examines the validity of the FSEIS in light of increased airport activity levels and MPU project refinements that have occurred in the 4 years since issuance of the 1997 FSEIS and ROD.

Appendix A discusses increased airport activity levels that have occurred and have been forecast since the 1997 FSEIS forecasts, noting that the environmental consequences of these activity levels have the potential to affect aircraft noise and land use, air quality, and surface traffic conditions. While reporting that since 1997 airport operations have been somewhat greater than forecast in the FSEIS, Appendix A concludes: 1) that the noise mitigation commitments in the ROD would fully mitigate any noise impacts exceeding those forecast in the FSEIS, 2) that the MPU projects will continue to comply with the de-minimus thresholds of the Clean Air Act conformity regulations, as stated in the FSEIS, and 3) that the increased passenger levels will not significantly degrade surface traffic conditions to an extent undisclosed in the FSEIS.

Appendix A also discusses various refinements to the MPU projects that have been identified over the last 4 years. When considering the overall context and intensity of these refinements, it is concluded that none of these modifications are expected to cause significant adverse impacts, either individually or in combination.

The Appendix B reevaluation discusses new biological information that has arisen in the 4 years since issuance of the 1997 FSEIS and ROD, including new information on wetlands, endangered and candidate species, commercially managed fish species, and migratory birds.

With regard to wetlands, Appendix B concludes that despite an increase in the acreage of wetlands now known to be

[1] Re-Evaluation of Airport Activity and Changes to the Master Plan Update at Seattle-Tacoma International Airport, dated July 2001, attached as Appendix "A"; and Re-Evaluation of Impacts to Biological Conditions from the Master Plan Update Improvements at Seattle-Tacoma International Airport, dated July 2001, attached as exhibit "B."

affected, the functions and values of the affected wetlands are the same as those analyzed and evaluated in the FEIS and FSEIS, with no additional or unrecognized biological functions identified.

With regard to the Endangered Species Act (ESA), Appendix B addresses the fact that on March 24, 1999, and November 1, 1999, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Services (USFWS), [the Services], respectively listed the Puget Sound Chinook salmon and the Puget Sound bull trout as threatened species under the ESA. Critical habitat for the Puget Sound Chinook salmon was designated in February 2000.

On May 22, 2001, following a year-long consultation process, the USFWS issued a biological opinion (BO) concluding that the MPU development actions are not likely to jeopardize the continued existence of the bull trout, bald eagle or marbled murrelet. On May 31, 2001, the NMFS issued a letter concurring with the BA conclusions that the MPU development actions are not likely to adversely affect the Puget Sound Chinook salmon or result in the destruction or adverse modification of its critical habitat. Under ESA Section 7, and its implementing regulations, the FAA's formal consultation with the Services was concluded at the issuance of these two documents.

Appendix B starts with the premise that these new listings of threatened fish species by the Services represent determinations of the species' legal status, and do not by themselves constitute significant new information requiring preparation of another SEIS. The written reevaluation notes that the 1996 and 1997 EIS and SEIS specifically considered the effects of the project upon fisheries and aquatic resources in the project vicinity, including anadromous fish. The reevaluation specifically relies upon the expertise of the Services, and, likewise, concludes that the MPU development actions are not likely to jeopardize the continued existence of newly ESA-protected fish species or result in the destruction or adverse modification of their designated critical habitat. The reevaluation documents the fact that the MPU projects' environmental effects resulting from the ESA listings are neither significant nor uncertain, as compared with the impacts evaluated in 1996 and 1997.

With regard to the bald eagle, the USFWS's BO and Appendix B agree with the FEIS and FSEIS assessment that the MPU projects are not expected to adversely affect this threatened species. For the Marbled Murrelet, the BO found insignificant effects, given the absence of nearby critical habitat, a conclusion similar to that reached in the FEIS and FSEIS, where it was found that the murrelet is not likely to occur in the project area.

With regard to coho salmon, an ESA-candidate species, Appendix B concludes that, while there may be temporary adverse affects on coho during MPU construction, long-term benefits to coho are expected as a result of in-basin mitigation efforts. Appendix B notes that these effects are consistent with the effects from potential construction and operational activities described in the FEIS and FSEIS for similar fish species.

With regard to commercially managed fish species and their essential fish habitat protected by the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act, Appendix B concludes that construction and operation of the MPU projects would have no effect upon Coastal Pelagic Fisheries or West Coast Groundfish, and that, even though these projects may adversely affect coho essential fish habitat over the short term, over the long term they would have an overall beneficial affect. These effects are likewise consistent with the effects from potential construction and operational activities described in the FEIS and FSEIS for other fish species.

With regard to species protected under the Migratory Bird Treaty Act, Appendix B notes that project impacts upon bird species were thoroughly discussed in the FEIS and FSEIS, and concludes that new information in this area is consistent with the FEIS and FSEIS findings that the MPU projects would not have a significant adverse effect upon migratory birds. Neither the legal status of these species under federal law nor their biological status has changed over the last 4 years.

DECISION AND ORDER

Given the project modifications and new information discussed in Appendices A and B, the decision choices available for the FAA are either to refrain from further FAA actions, pending preparation of a SEIS, or to continue with those actions without preparing another SEIS.

Having thoroughly reviewed the Appendix A and B reevaluation documents, along with pertinent portions of the documents they reference, I have concluded that the recent MPU project modifications and the new information concerning environmental impacts do not affect the quality of the human environment in a significant manner or to a significant extent not already considered. I have, therefore, concluded that there is no significant new information warranting preparation of new SEIS.

I have further determined that the certification prescribed by 49 U.S.C. § 44502(b), that the projects approved in the July 3, 1997, ROD are reasonably necessary for use in air commerce, along with the subsidiary orders and determinations therein, will neither be reconsidered, nor their effectiveness stayed, for further environmental review.

Therefore, under the authority delegated to me by the Administrator of the FAA, I find that the preparation of another SEIS is not warranted at this time, and I direct that the FAA continue to implement the agency actions/approvals specified in Section III of the 1997 ROD, without further NEPA documentation or supplementation.

L. Andriesen

Lawrence B. Andriesen
Regional Administrator
Northwest Mountain Region
Federal Aviation Administration

8-8-01
Date

RIGHT OF APPEAL

This decision constitutes the Federal approval for the actions identified above and any subsequent actions approving Federal funding for the Port of Seattle. Today's decision is made pursuant to 49 U.S.C. Subtitle VII, Parts A and B, and constitutes a Final Order of the Administrator, subject to review by the courts of appeals of the United States in accordance with the provisions of 49 U.S.C. § 46110.

AR 008917

APPENDIX A

RE-EVALUATION OF AIRPORT ACTIVITY AND CHANGES TO THE MASTER PLAN UPDATE

AT

SEATTLE-TACOMA INTERNATIONAL AIRPORT

July 20, 2001

RE-EVALUATION OF AIRPORT ACTIVITY AND

CHANGES TO THE MASTER PLAN UPDATE

AT SEATTLE-TACOMA INTERNATIONAL AIRPORT

TABLE OF CONTENTS

AR 008919

I. BACKGROUND AND NEED FOR RE-EVALUATION

On May 13, 1997, the FAA approved the *Final Supplemental Environmental Impact Statement (Final Supplemental EIS) for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport.* The SEIS supplemented the Final Environmental Impact Statement dated February 9, 1996 (FEIS). A Record of Decision (ROD) was subsequently signed on July 3, 1997, providing final approval for those FAA actions necessary to support the proposed Master Plan Update projects. The Master Plan environmental documents describe four needs at the Airport and the corresponding actions necessary to satisfy those needs: 1) a third runway (a new 8500-foot dependent air carrier runway), 2) a 600-foot southerly extension of existing Runway 16L/34R, 3) expanded runway safety areas for Runways 16R and 16L, and 4) certain terminal and landside improvements scheduled to be completed through the year 2010.

FAA Order 5050.4A Paragraph 102 establishes time limitations for environmental impact statements. Among other provisions, subparagraph 102b states with respect to Final EIS's:

> If major steps toward implementation of the proposed action (such as the start of construction, substantial acquisition, or relocation activities) have not commenced within 3 years from the date of approval of the final statement, a written reevaluation of the adequacy, accuracy and validity of the final statement shall be prepared. If there have been significant changes in the proposed action, the affected environment, anticipated impacts, or proposed mitigation measures, a new or supplemental environmental impact statement shall be prepared and circulated.

A Written Reevaluation is not required if "major steps toward implementation of the proposed action" have occurred. Steps considered "major" under Order 5050.4A "Airport Environmental Handbook" include start of construction, substantial acquisition, or relocation activities. The FAA has reviewed the actions taken by the Port of Seattle (Port), the owner and operator of the Airport, to implement the projects included within the approvals in the Final Supplemental EIS and the ROD. The following summarize those actions:

A. Steps Toward Implementation Since July 3, 1997.

Between July 3, 1997 and June 1, 2001, the Port has acquired about 240 acres of land to implement the Third Runway and associated projects (including Taxiway C, connecting taxiways, taxiway filets), at a total cost of $143 million; 319 residential units have been demolished and 34 moved off-site, and all occupants of 483 residences have been relocated to other dwellings. The cost of demolition and relocation for the runway since July 3, 1997 total $3.7 million. Approximately 95% of the property to be acquired for the project has been acquired and about 3 million cubic yards of earth fill material has been acquired and deposited at the Airport for the Third Runway embankment at a cost of $48 million. This fill constitutes approximately 20% of the total fill required for the runway. Of these amounts, approximately $46.7 million was funded by FAA grants.

Virtually all of these steps would be of little or no value to the Port, or to the national air transportation system, if the runway and associated projects are not completed and operational.

In addition, construction on the following elements of the terminal and landside projects have been initiated: the southern expansion of the main parking garage; expansion of the main terminal, improvements to the main garage and garage access, expansion of the A Concourse, completion of the new North Employee Parking Lot, completion of aircraft parking hardstands in the cargo area, infrastructure in anticipation of other planned improvements, etc. The cost of this construction between July 3, 1997 and the date of this document is approximately $365,000,000.

In total, the Port has expended about $498 million of the total $2.6 billion Master Plan Update projects. The Port has acquired almost all of the land required for the project at substantial cost, has cleared the land and relocated the residents. The Port has moved approximately 20% of the total fill needed for the runway and has already constructed elements of the airfield improvements that will serve the new runway. Such steps toward implementation are "major" and sufficient under Paragraph 102b to make a Written Reevaluation unnecessary.

B. Need for Written Reevaluation

Paragraph 103 of FAA Order 5050.4A states:

> "In addition to the requirement for a written reevaluation due to circumstances arising under paragraph 102, the responsible official should exercise judgment on when a written reevaluation is appropriate in other circumstances to evaluate the continued validity of an environmental document. The preparation of a new EIS, FONSI, or supplement is not necessary when it can be documented that: the proposed action conforms to plans or projects for which a prior EIS or FONSI has been filed; the data and analysis contained in the previous EIS or FONSI are still substantially valid; and that all pertinent conditions and requirements of the prior approval have been or will be met in the current action."

The FAA has continued to monitor the progress of the Port of Seattle development through regular interactions at levels ranging from monthly coordination meetings, site visits, and project specific coordination, to reviews of materials submitted by the Port of Seattle. The FAA has reviewed the data, analysis and conditions presented in the FEIS and FSEIS and found them to remain substantially valid. Further, changes in proposed development projects at Sea-Tac conform to the Master Plan Update, upon which the Final EIS and FSEIS were prepared. Further, the Port has continued to meet all pertinent conditions and requirements noted in the FAA's ROD.

The FAA concludes that under the standards of paragraph 103 of Order 5050.4A, a Written Reevaluation is not required.

Upon gaining access to acquired lands where previous requests for access had been denied, the Port identified additional wetlands that would be affected by the proposed project. While the number of wetlands affected has increased over that which was presented in the Final EIS and FSEIS, the conclusions regarding the impact of the project on wetland resources remains substantially valid. As is documented in the FAA's re-evaluation concerning biological issues, the wetland impact analysis presented in the Final EIS and FSEIS remain substantially valid.

Nevertheless, the FAA has prepared this Written Reevaluation. The FAA is aware that the Master Plan Update projects are highly controversial in some communities near the Airport. Although the City of SeaTac, in which the Airport is located, has accepted the Master Plan Update projects, certain other units of government near the Airport have not, and continue to oppose these projects. In light of this controversy, the FAA has elected to prepare this document.

* * *

It is important to note that the Council of Environmental Quality's (CEQ) "NEPA's Forty Most Asked Questions" response to question 32 contains further clarification on NEPA's intent relative to Supplements to old EISs:

> "As a rule of thumb, if the proposal has not yet been implemented, or if the EIS concerns an ongoing program, EISs that are more than 5 years old should be carefully reexamined to determine if the criteria in Section 1502.9 compel preparation of an EIS supplement.
>
> If an agency has made a substantial change in a proposed action that is relevant to environmental concerns, or if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts, a supplemental EIS must be prepared for an old EIS so that the agency has the best possible information to make any necessary substantive changes in its decisions regarding the proposal. Section 1502.9(c)."

This Written Reevaluation has been prepared because more than three years have elapsed since the Final Supplemental EIS was approved, per FAA Order 5050.4A, but not more than the five years noted by CEQ. This Reevaluation evaluates the current validity of the Final EIS and Final SEIS in light of subsequent events and current conditions, all as provided in Order 5050.4A.

II. <u>ISSUES RELATING TO CONTINUED VALIDITY OF FINAL SUPPLEMENTAL EIS</u>

The FAA has re-evaluated the adequacy, accuracy and validity of the FEIS/SEIS. The question in this document is whether any new information significantly affects the analysis of environmental impacts of the projects. With the passage of time, it is to be expected that some of the data in an EIS will not match subsequent actual experience exactly, and that new information will become available. That is true with respect to the FEIS/SEIS. However, the questions are whether the new information or changes in the project would significantly change the kind or extent of environmental impacts, and whether new or different mitigation of environmental impacts would be required. If the environmental impacts of the projects would not be significantly different in light of new information, there is no reason to undertake a supplemental EIS.

The FAA has re-evaluated the validity of the Final Supplemental EIS in light of the following events and circumstances that have occurred since the Final Supplemental EIS was issued in May 1997:

A. Variance between actual activity levels at the Airport and the levels forecast in the Final Supplemental EIS. In addition, the implications of the 2000 Terminal Area Forecast (TAF) were considered;

B. Modifications to the Master Plan Update projects; and

C. Information regarding cumulative impacts.

The FAA has reviewed each of these issues to determine whether it would require a new or supplemental EIS.

A. Activity Levels

A primary reason that the FAA prepared the 1997 Supplemental EIS was the rapid growth in air travel demand that had been experienced at Sea-Tac Airport during the 1990s. As a result, the FAA examined how actual activity at the Airport has occurred in comparison with the Master Plan Update forecasts, as well as more recent forecasts prepared by the agency.

1. Background and Current Situation

a) Master Plan Update Activity Levels

The Final Supplemental EIS used the following forecasts of future activity at the Airport for 2000, 2005, and 2010:

TABLE 1

COMPARISON OF FSEIS DO-NOTHING TO "WITH PROJECT" ACTIVITY LEVELS

Primary Forecast

	Total Passengers		Total Operations	
Year	Do Nothing	With Project	Do-Nothing	With Project
2000	27,400,000	27,400,000	409,000	409,000
2005	31,400,000	31,400,000	445,000	445,000
2010	35,800,000	35,800,000	460,000	474,000

Source: Final Supplemental EIS, Page 2-14

Contingency Forecasts (Final Supplemental EIS Appendix D)

	Total Passengers		Total Operations	
Year	Case 1	Case 3	Case 1	Case 3
2010	35,800,000	35,800,000	474,000	521,400
2020	44,600,000	49,060,000	532,000	585,200

Appendix D, Final Supplemental EIS, With Project activity.

The Final Supplemental EIS Appendix D also contained supplemental estimates of environmental impacts for purposes of considering the environmental consequences of a contingency forecast. That Appendix recited the difficulty of making reliable forecasts for future years, particularly for distant years. It is particularly difficult to assign a specific activity level to particular future years. Although an airport may be expected to reach particular forecast levels eventually, it is difficult to predict the precise year in which that will occur. As a result, FAA's guidance on performing forecasts (as will be noted in the following section) suggests that airport planning focus on future activity levels rather than particular future years.

In light of the fact that a Supplemental EIS was being prepared because activity had varied over earlier predictions, and that activity is difficult to accurately predict, the appendix was prepared to contain a "what if" the new forecasts were also less than actual. Three cases were examined. Case 1 reflected the Supplemental EIS forecasts, with a linear extrapolation through 2020. Case 2 reflected a 10% increase in each respective year over the Supplemental EIS forecasts. Case 3 was the same as Case 2, but in the case of the Do-Nothing, assumed that the terminal and landside facilities could not accommodate the passenger demand beyond 2010.

b) Recent Actual Levels and the FAA's Terminal Area Forecast (TAF)

Since the Final Supplemental EIS, the Airport has experienced operations that are somewhat greater than expected in the primary forecasts. For 2000, the Airport handled 446,066 operations, the operations total expected by the Final Supplemental EIS to initially occur in 2005. Passenger enplanements, however, have not grown as fast as operations. In 2000, the Airport accommodated 28.4 million passengers. The Final Supplemental EIS enplanements forecasts are generally consistent with the actual experience at the Airport in the intervening years, as the FSEIS evaluated 27.4 Million annual passengers (MAP) versus actual of 28.4 MAP. The difference between the growth rate for the number of passengers and aircraft operations appears as a result of how the airlines are responding to the growth in passenger demand – by providing more frequent service with smaller aircraft.

The FAA has continued to issue annual updates of its Terminal Area Forecasts (TAF), as was acknowledged in the Final EIS and Final Supplemental EIS. The TAF is prepared using different methods than the Master Plan Update forecasts, and the Final Supplemental EIS explains why the Master Plan Update forecasts were considered by the FAA to be more appropriate than the TAF for purposes of that environmental impact analysis. The Master Plan Update Final Supplemental EIS forecasts relied more heavily on actual local conditions, whereas the TAF relied more heavily on national trends, with the result that the Master Plan Update forecasts were somewhat lower than the TAF forecasts.

In preparing this evaluation, the FAA considered the most recent actual activity levels as well as the most recent (2000) Terminal Area Forecast. These are as follows:

Year	Total Passengers	Aircraft Operations
1999 Actual	27,700,000	434,425
2000 Actual	28,400,000	446,066
TAF 2005	33,805,000	485,740
TAF 2010	39,746,000	529,060
TAF 2015	45,687,000	572,400

Actual: Port of Seattle, TAF Downloaded from the Internet on 1-13-01

AR 008924

When considering the need to supplement the FSEIS, the FAA has compared the year 2000 TAF with the 1996 TAF that formed the basis for determining the need to prepare the FSEIS. This comparison shows:

Year	2000 TAF Total Passengers	2000 TAF Aircraft Operations	1996 TAF Total Passengers	1996 TAF Aircraft Operations
1999 Actual	27,700,000	434,425		
2000	28,400,000	446,066	27,840,000	433,474
TAF 2005	33,805,000	485,740	32,580,000	468,053
TAF 2010	39,746,000	529,060	37,900,000	528,205
TAF 2015	45,687,000	572,400	NA	NA

For the year 2010, the two TAFs are less than 0.2% different (855 operations) from an aircraft operations perspective and less than 5% from a total passenger perspective. In 2005, the passenger difference is less than in 2010, while the operations differ by 3.8%. These differences are very small, particularly in the most distant future (2010), the FAA finds that there is not a significant difference between the two TAF forecasts.

During the preparation of this re-evaluation document, the FAA began internal coordination of the 2001 TAF. As part of the initial review, the FAA Washington DC office distributed national information to its local offices and seeks feedback. The initial data set for Sea-Tac indicates that the 2001 TAF will likely use lower growth rates (2000 TAF used 1.8% whereas the 2001 TAF may use 1.58%) than were used in the 2000 TAF. As a result, the TAF projection of 572,400 annual operations in 2015 may be lowered to 562,500 in the 2001 TAF. The 2001 TAF would reflect the slower economic conditions now affecting the country.

The FAA has reviewed the Final Supplemental EIS explanations of the differences between its forecasts and the TAF and has concluded that the same conditions continue to exist. The TAF is a useful guide to projected airport activity, but is not adjusted to the specific conditions at the Airport. The FAA continues to consider the local forecasts more specifically applicable to the Airport for environmental impact analysis purposes.

Further, the 2000 TAF was prepared in mid 2000, based on conditions preceding that period. Since that time, national and local economic conditions have begun to slow. As a result, activity at Sea-Tac has also begun to slow such that growth in aircraft operations and passenger activity has declined and leveled-off. During the first five months of 2001, air travel activity has been less than 2000. Even accounting for the effect of the February 28, 2001 earthquake in Seattle, which for a short period severely affected the control tower and ability to process arriving and departing operations, total passengers and operations are less than the comparable periods in 2000.

As was noted in the FSEIS, the quantity of air travel demand is based on population, per capita income, and the cost of air travel. Both the cost of air travel and per capita income have been affected by recent economic conditions – the cost of fuel has increased substantially and the availability of discretionary income has decreased.

FAA believes that it is reasonable to use locally developed forecasts for purposes of environmental evaluations of specific local improvements. As has not been uncommon in the past, airport activity has been known to grow in a fashion that graphs as stairs – growing and then leveling off for a period before additional growth. Therefore, the FAA does not place any additional weight on the 2000 TAF in comparison to the 1996 FSEIS forecasts; particularly since the 1996 TAF (upon which the need to prepare the FSEIS is based) and 2000 TAF are very similar, as noted earlier. However, to aid in understanding the probable environmental consequences of these forecasts, this written re-evaluation discusses (in "2. Environmental Consequences") the probable impact of the 2000 TAF.

c) Other Issues

Table 2 contrasts the current (2000) TAF with the Master Plan forecast as well as the contingency analysis presented in Appendix D of the Final Supplemental EIS. While the FAA's terminal area forecast is greater than was considered in evaluating the Master Plan forecast, it is lower than the contingency analysis presented in Appendix D through 2005. Post 2005, the TAF is slightly greater than the contingency forecast.

As **Table 2** shows, the difference in aircraft operations between the 2000 TAF and the Master Plan Update forecast is less than the difference between the Appendix D comparison against the forecast; the TAF activity level is embraced generally by the Case 3 analysis.

After comparing the two activity level projections, several issues were considered:

- FAA Guidance on Forecast Comparisons
- Capability of the existing airfield
- Activity and Capacity with the Third Runway
- Forecasting beyond a 10 year period

TABLE 2
Comparison of TAF, Master Plan and Final Supplemental EIS Contingency Forecasts

Year	*2000 TAF*	*Master Plan Update Forecast*	*Contingency FSEIS Appendix D Case 1*	**TAF compared to Forecast (Case 1)**	*Contingency FSEIS Appendix D Case 3*	**TAF compared to Contingency Forecast (Case 3)**
2000	442,420	409,000	409,000	33,420	449,900	-7,480
2005	485,740	445,000	445,000	40,740	489,500	-3,760
2010	529,060	474,000	474,000	55,060	521,400	7,660
2015	572,400	NA	503,000	69,400	553,300	19,100
2020	NA	NA	532,000	NA	585,200	NA

The following briefly summarize these issues

FAA Guidance on Forecast Comparisons: The FAA has issued guidance concerning forecast comparisons in only two specific areas. For purpose of environmental analysis, the FAA requires revisions to some environmental analysis if actual or new forecast activity levels are more than a certain percentage different from those relied upon for the initial analysis. For instance, if an airport's forecast is 10% or more different than the TAF, documentation is required to reconcile the difference or a supplemental analysis is performed.[1/] The previous text documents the FAA's consideration of the 2000 TAF relative to activity evaluated in the FSEIS.

For Part 150 Noise Compatibility Planning purposes, the FAA uses a 15% difference in actual activity relative to modeled conditions to justify the need to perform an updated noise analysis. The FAA has chosen for noise purposes the 15% rule, as this level of activity ensures that any change in noise is less than the 1.5 DNL (Day-Night Average Sound Level) threshold of significance used by the FAA.[2/]

The 2000 TAF operations level is about 11% greater than the Case 1 forecast for 2010 (the level considered in Chapter 5 of the FSEIS) and 14% greater than the 2015 Case 1 extrapolation. The 2000 TAF is less than 4% greater than the condition evaluated in Appendix D (Case 3) for 2015. While the TAF projection is slightly greater than the 10% FAA guide, the FAA has considered the differences, as documented in this re-evaluation. First, the 2000 TAF for operations is 0.2% greater than the 1996 TAF that led to the development of the FSEIS. Second, actual condition in late 2000 and early 2001 are producing lower airport operations than occurred in 2000. As the 2000 TAF was prepared when national economic conditions were better than the current conditions producing less air travel demand, it is likely that the next TAF will reflect lower air travel projections that are more in line with the 1996 TAF and/or FSEIS forecast.[3/] Finally, the FSEIS considered a contingency forecast which is within the 10% FAA guidance range. For these reasons, the FAA believes that the difference between the 2000 TAF and the FSEIS forecasts does not warrant further environmental review.

Capacity of Existing Airfield: In preparing the forecasts for the Final Supplemental EIS, future demand was first identified. To consider the level of activity associated with the Do-Nothing (without the Third Runway), the operating capability of the existing airfield was assessed. The operating capability of the existing airfield was based on the 1992 Flight Plan Study EIS that found that the maximum *theoretical* capacity of the existing airfield is 460,000 operations, assuming that operations are extended into the late evening and early morning and that greater levels of delay would be experienced. Overlaying the delay curve relative to then current delay conditions, the Final Supplemental EIS re-validated the estimate of the existing airfield operating capability at 460,000 annual operations; it also noted that

> "To calculate an extreme capacity of the existing airfield at Sea-Tac, this hourly capacity could be multiplied by the number of hours in a day, and days in the year. Theoretically, 481,800 operations would be accommodated, reflecting that air travel demand is typically concentrated into a 16 hour period (6 am to 9 p.m.) based on today's fleet mix and passenger demand profile." Page II-9

1/ FAA Order 5100.38A Change1 provides guidance for approval of aviation forecasts. Paragraph 428(a) indicates that "FAA should review sponsor forecasts to ensure they are realistic and provide an adequate justification for the airport planning and development. The study should include data supporting the forecasts, including information that can be used as a basis to update the Terminal Area Forecast (TAF). When the forecast is different from the TAF (differences of 10 percent and more, or any difference that affects timing and/or cost of development in the NPIAS/ALP) differences must be resolved with APO-110 and/or the sponsor. If the variance does not result in such change, then the FAA may accept the forecast without further coordination."

2/ A 15% increase in activity relative to a base condition would produce less than 1.0 dBA change in noise. The 15% change is noted in the FAA Part 150 Checklist for Noise Exposure Maps (NEM III.B.). This change in sound is based on the mathematical equation 10*Log (new activity/old activity).

3/ Based on the lower growth rate expected to be included in the 2001 TAF, it is likely that the 2001 TAF for Sea-Tac will be within the 10% difference criteria used by the FAA.

AR 008927

When considering the consequences of not adding a Third Parallel runway, the FAA must consider how the air transportation system at Sea-Tac and in the region would evolve to accommodate the anticipated increases in air travel demand. If the Third Runway were not completed at Sea-Tac, it is reasonable to assume that the FAA would take actions (such as air traffic instrument procedures and possibly actions involving the locations of navigation aids), to enable more landings to occur during poor weather. While the only prudent alternative to addressing the total poor weather problem is the development of the Third Runway; other technological improvements, as documented in the Final EIS and FSEIS, could be implemented that would increase the poor weather capability in a limited extent. For purposes of this evaluation, only those actions that would occur without the Third Runway were considered.

The Third Runway would increase arrival processing capability, which during good weather (VFR1) is 60 arrivals an hour, by 20% during VFR2, 40% during IFR1, and 60% during IFR2/4 (Table I-3 FEIS). It is reasonable to assume that without the Third Runway, actions such as the Localizer Directional Aid (LDA) approach would be instituted. An LDA would improve the ability to land during VFR2 conditions at Sea-Tac but would not affect landings during IFR conditions; the net benefit would be an increase of about 6.5% on an annual basis from an LDA. In addition, other technological improvements may occur toward the forecast horizon of 2010 that would also incrementally increase the number of hourly landings during poor weather. Technologies that may be available in later years, coupled with LDA, could increase the overall operating capability of the existing two runway system at Sea-Tac from the 460,000 predicted in the FEIS/FSEIS to in excess of 500,000 operations. Together these actions would be expected to increase the operating capability of the two runway system. Precisely how much higher than 500,000 would depend on the aircraft fleet mix at the time, technology, and weather conditions in any respective year.[4/]

Activity and Capacity With the Third Runway: Because actual activity levels for 2000 will exceed the Final Supplemental EIS forecast activity levels for 2000, the FAA has considered whether forecast levels for 2010 are also too low. The FAA must determine whether such higher growth rates will continue through 2010 and require an adjustment of the 2010 "With Project" forecast. If so, the difference between the *with* and *without* levels could be larger than forecast in the Final Supplemental EIS with a resulting difference in some categories of environmental impacts.

The Master Plan Update forecast demand to reach 35.8 million annual passengers and 474,000 annual aircraft operations by 2010, the end of the planning horizon. Appendix D's contingency forecasts examined conditions beyond 2010 for three conditions. Case 1 examined a linear interpolation from 2010 conditions to predict

---

4/ In June 2001, the FAA issued "Airport Capacity Benchmark Report 2001" which characterized Sea-Tac's existing delay conditions as "while only about 1% of all flights at Seattle are delayed more than 15 minutes from their estimated flight plan arrival time, the airport operator emphasizes that almost a third of airline flights arrive more than 15 minutes later than scheduled." The reference to 1% of flights delayed more than 15 minutes is reference to the OpsNet data that quantifies the number of flights that are delayed more than 15 minutes during any one of four operating phases. FAA Washington DC has readily noted that the FAA does not maintain delay data in a way that clearly quantifies delay associated with specific conditions. As a result, existing operational capability is often assessed using OpsNet data, as well as the Airline Service Quality Performance (ASQP). ASQP data for Sea-Tac indicates that 33.3% of arrivals arrived more than 15 minutes late. When conducting planning for airport improvements, simulation data, such as that used by the Capacity Enhancement Plan are used. Simulation models enable the quantification of average delay per aircraft operation, and enable the identification of conditions that led to delay.

conditions in 2020. Case 2 and 3 then examined activity levels and environmental conditions, if activity were 10% greater than the Case 1 conditions.

The Final Supplemental EIS recites the difficulty of making long-range airport activity forecasts.[5] The factors that made precise forecasts for 2010 and 2020 difficult in the Final Supplemental EIS still affect forecasting. After review of the actual activity levels since 1997, the TAFs for the intervening years (including the 2000 TAF), and the factors affecting operations at the Airport, the FAA has concluded that a new forecasting effort would be unlikely to provide a new forecast that would materially change the environmental impact analysis of the Final Supplemental EIS. The environmental consequences of these differences are considered in a following section.

As is shown in **Table 2**, the Case 3 activity levels for 2010 is within 4% of the 2000 TAF (TAF is 529,060 operations versus Case 3 at 521,400). The TAF is 11% greater than the Master Plan forecast of 474,000. While the passenger levels are much more closely related, the annual aircraft operations differs primarily due to assumptions concerning commuter aircraft operations. Based on a review of the two activity projections, and difficulty in predicting how the commuter markets will evolve, the FAA has determined that the differences alone do not warrant conducting additional environmental review.

Support from Area Airports: The Final EIS, which preceded the Final Supplemental EIS and remains the basic environmental document analyzing the impacts of the projects, also recognized that other airports in the region might begin to serve commercial air travel demand. The FEIS states:

> It is recognized that commercial air service at an existing airport in the Region could be initiated at any time. It is likely that such air service would be by a charter or niche carrier (cargo, low-cost, etc.). However such activity would not materially affect the demand at Sea-Tac and the resulting facility needs. Low-cost operators have historically initiated new service at an airport with 30 or less aircraft operations. As such, this would represent less than 3 percent of Sea-Tac's current daily aircraft operations – and would likely amount to less than 1 million enplanements a year (10 percent of Sea-Tac's enplaned passengers). FEIS, Page II-9

The FAA is aware that carriers have from time to time investigated initiating commercial air carrier service from Boeing Field or Paine Field, and is also aware that on occasion certain operations have been relocated to Boeing Field to avoid restrictions at Sea-Tac Airport. It is therefore likely, as the Final EIS recognizes, that if the Third Runway is not built and demand for air travel in the region continues to grow, that not only would air traffic control instrument procedure actions be undertaken to satisfy demand, but some portion of that demand would be served by one or more other airports.

An examination of the Master Plan's for both Boeing Field and Paine Field indicate that both airports anticipate commercial passenger service in the future. The Master Plan underway for Boeing Field includes 9,000 passenger aircraft operations accommodating 77,000 passengers in 2010 and growing to 10,200 operations in 2015 with 89,300 passengers. The Paine Field forecasts examined several scenarios, ranging from 176,000 passengers in 2009 to 1,014,000 passengers. By 2014, Paine Field estimated a range of 192,000 passengers to 1,106,000 passengers. The forecast adopted for use in the Paine Field Master Plan was the low end of the range with

---

5/ See Final Supplemental EIS, p. D-1 – D-3

176,000 annual passengers and 10,100 annual operations in 2009 or 192,000 passengers and 11,000 operations in 2014. Thus, within the planning horizon, it is possible that as many as 19,100 annual passenger aircraft operations could be accommodated at existing airports within the region.

Based on the anticipated strong growth in air travel demand, Sea-Tac's role as the sole commercial passenger service airport, and a probable limitation in the operating capability of Sea-Tac, it is reasonable to assume that the airlines will continue to serve the passenger demand. Such service could realistically include continued evolution of the demand profile at Sea-Tac to accommodate greater levels of passenger and aircraft activity coupled with initiation of limited passenger service at one of the region's existing airports. The Final EIS and Final Supplemental EIS anticipated this probability as noted.

Forecasting Conditions Beyond a 10-year period Remains Uncertain: The Final Supplemental EIS contained a detailed description of the difficulties with preparing forecasts of aviation activity. Since the issuance of the Final Supplemental EIS, the FAA has issued its TAF each of the three years, and in each year the forecasts have been changed to reflect the most recent conditions affecting the aviation industry. Since the issuance of the 2000 TAF, aviation activity across the country increased initially, but began to flatten off as a result of several conditions, including a slowing of the national economy, increased congestion in the aviation system, and increases in fuel cost which caused an increase in the cost of air travel. Because these conditions began in the latter part of the second quarter of 2000, it is uncertain as to their effects on actual activity levels and on future TAFs.

* * *

The FAA has reviewed the new (2000) TAF and the actual activity at the Airport since 1997 to determine whether this new information is sufficient to require a new EIS or another supplemental EIS. The FAA has considered the statement in Order 5050.4A that "a supplement is not required if the only change is the development of additional data, provided such data are not in conflict with the environmental document." Paragraph 104b. A new or supplemental EIS will be required only if "the contents of the original document are no longer applicable, adequate, accurate or valid."

Therefore, the FAA's review focused on two issues: (i) whether the forecasts in the Final Supplemental EIS are still substantially valid, and (ii) whether the data and analyses of environmental impacts are still substantially valid. If the FAA determines that a new set of forecasts either would not produce substantially different numbers for either of the forecast years, or that any differences in forecasts would not substantially affect the analysis of environmental impacts, a new or supplemental EIS is not required.

2. Environmental Consequences

Because activity levels at Sea-Tac have increased faster than was considered in the Final Supplemental EIS, and because of the discussion in the preceding section, the FAA considered the environmental consequence of an additional scenario. In considering these issues, the FAA focused on the difference in activity levels that would be accommodated with the proposed projects versus the activity that would be accommodated without the projects.

As was noted in the preceding section, the only new forecast that has been prepared for Sea-Tac is the FAA's Terminal Area Forecast. Therefore, for purposes of this re-evaluation the 2000 TAF is being used to define the With Project condition.

TABLE 3

COMPARISON OF TAF-BASED DO-NOTHING TO "WITH PROJECT" ACTIVITY LEVELS

	Total Passengers		Total Operations	
Year	**Do Nothing**	**With Project (TAF)**	**Do-Nothing**	**With Project (TAF)**
2000	27,400,000	27,400,000	420,700	420,700
2005	33,805,000	33,805,000	485,740	485,740
2010	39,746,000	39,746,000	500,000	529,060

Source: FAA, based on issues documented in this re-evaluation
Note: The 2010 Do-Nothing condition assumes that demand is continued to be served in the region, with the significant portion being accommodated at Sea-Tac Airport in accord with the theory articulated by Dr. Richard DeNeufville as documented in the FEIS page II-10.

Comparing the data shown in **Table 3** for the With Project to the Do-Nothing, indicates that Sea-Tac (and possibly an existing airport in the region) would likely continue to accommodate the passenger demand. However, Sea-Tac Airport would likely not be able to accommodate the 2010 air traffic demand (operations). The Final Supplemental EIS noted that in 2010 Sea-Tac could not accommodate about 14,000 annual aircraft operations (474,000 operations with project and 460,000 without project) but could accommodate the entire passenger demand, through spreading the peak and increasing load factors/aircraft sizes.

Using the TAF data and current operating conditions, Sea-Tac would likely continue to not be capable of accommodating about 29,060 annual aircraft operations in 2010. Approximately 19,100 of these operations could occur within the region at airports such as King County International Airport or Snohomish County Airport (Boeing Field and Paine Field respectively), leaving about 9,940 operations not accommodated. Similar to the evaluation performed for the Final Supplemental EIS, it is reasonable to assume that the passenger demand could continue to be accommodated through increased load factors and spreading of the off-hour peaks.

This re-evaluation considered the environmental consequences of the TAF. Three primary environmental factors are affected by the level of activity at Sea-Tac Airport: a) aircraft noise and land use, b) air quality, and c) surface traffic conditions. The following briefly summarize how current activity levels would affect these factors.

a) <u>Noise and Land Use</u>

Noise impacts depend to a considerable degree on operations levels. The FAA has considered whether the potential differences in activity levels described above may produce significant difference in noise impacts of the Master Plan Update projects. The FAA has considered both whether the noise analysis in the Final Supplemental

EIS is still substantially valid, and whether the mitigation program required by the Final Supplemental EIS is sufficient to mitigate impacts of the projects even if the potential differences in activity levels occur.

As is noted earlier, the higher activity projections of the TAF are less than the 15% threshold used by FAR Part 150 to develop official noise exposure maps for an airport. Based on FAR Part 150 guidance, no additional noise exposure analysis would be required and the contours prepared for the FSEIS would remain valid. This 15% rule used by the FAA was established because a 15% change in activity would increase aircraft noise exposure by 1.0 DNL, which is less than the 1.5 significance threshold used by the FAA in its NEPA evaluations.

Further, the Final Supplemental EIS contains an analysis of noise impacts for operations levels considerably higher than those in the main text of the Final Supplemental EIS. Appendix D assumed a 10% greater growth rate than the main text, and calculated noise impacts for 521,400 operations in 2010. In 2010, the Final Supplemental EIS shows the following population affected by DNL 65 or greater noise:

2010 Without Project	11,940
2010 With Project	13,220
2010 Case 3 contingency w/ project	15,340 (Appendix D Table D-2)

The difference in impacted population between the two cases (main text and contingency case 3) is 2,120 people.

The Port has recently updated its noise exposure contours through the Part 150 Study process and found that noise has not decreased as rapidly as was anticipated in the FSEIS. The Part 150 Study showed, however, that substantial reductions are still anticipated, as noisier aircraft (MD80 and F-28) are transitioned out of the fleet at Sea-Tac. Therefore, while the exact magnitude of total people affected by aircraft noise today is greater, substantial decreases in the future are still anticipated. More importantly, the comparison of *With Project* to *Without Project* would remain the same and mitigation is required in the FSEIS/ROD.

The population and housing units affected by 521,400 operations are already covered by the Port's noise mitigation commitments to the FAA in the Final Supplemental EIS. The noise mitigation program was designed to cover noise impacts exceeding those projected in the Final Supplemental EIS, should they occur.

> Following commencement of operations on the new runway, but prior to the year 2010, the POS [Port] and the FAA will undertake a further supplemental evaluation of noise and land use impacts anticipated after the year 2010. . . . Following completion of that evaluation, if significant additional adverse environmental impacts are found, the Port of Seattle will be required to adopt further noise and land use mitigation measures designed to minimize any significant adverse affects [sic] found in that evaluation. ROD, 21

The FAA found that such additional mitigation is feasible. The FAA further determined that "even if the maximum additional adverse environmental effects estimated in Appendix D should occur, it would still make the decisions set forth in this ROD and would approve the projects, subject to the special condition with respect to additional mitigation." ROD, 22

AR 008932

The FAA considers the mitigation commitments of the Port sufficient, in light of the ROD, to mitigate all of the impacts of any such higher growth.

It is important to note that in response to the FSEIS and the PSRC Expert Panel review of noise conditions at Sea-Tac, the Port undertook an unprecedented Part 150 Study for the purpose of collecting data to improve the credibility of the noise modeling process. Airport operational data and noise measurements were taken over a 12-month period. Based on this data, improvements in the accuracy of the noise modeling process were identified and incorporated into the Part 150 Noise Study contours. While these changes in the noise exposure contour process change the characterization of noise conditions for each existing and future condition, it would not significantly change the comparison of the With Project and Do-Nothing condition. Based on the Part 150 noise contours, which are larger than the EIS contours, the mitigation would continue to be necessary upon commissioning the runway as was described and depicted in the FSEIS. It is likely that additional homes along the northwest corner of the existing noise remedy program boundary would require sound insulation; these properties are included in the ROD mitigation commitment for insulation.

It is also important to note that had the noise model calibration data been available at the time that the EIS was prepared, that data would have been reflected in the FEIS/FSEIS noise contours. FAA EIS guidance does not require the collection of such data, and at the time of the analysis neither the FAA nor the airport operator expected that actual annual data would differ from the default information imbedded in the noise model. See Attachment A, page A-4 for further discussion of the changes made during the Part 150 to the modeling data. However, in response to public input, the Port conducted the Part 150 (a study which as was expected by the EIS) to address these public concerns. The Port is in the process of updating the noise exposure maps to reflect this new information. The FEIS and FSEIS acknowledged that the Port would undertake an update of its Part 150. In addition, the FSEIS deferred refinement of the approach transition area acquisition to the Part 150 Study. Because of these issues, and the ROD requirement to update the contours upon commissioning the runway and to mitigate any now unforeseen impacts, the FAA believes that the Part 150 Study contours do not make the EIS contours invalid.

As noted earlier, the FAA is requiring the Port to develop a new noise analysis upon commissioning the runway and to identify mitigation based on actual operational characteristics. In light of this commitment, the FAA believes that developing additional noise contours at this time in response to the 2000 TAF is unwarranted and could be misleading, because of the changing conditions that can not be predicted at this time.

b) Air Quality

In preparing this Re-evaluation the FAA must consider whether the finding made under the conformity provision of the Clean Air Act remains substantially valid. The ROD concluded that the projects would not exceed the de-minimis thresholds for general conformity, and would conform to the Washington State Air Quality Implementation Plan. In evaluating emission in the FSEIS, emissions were categorized as operating, which included the operation of airport sources upon completion of projects, and construction, the emissions associated with the construction activity. As that analysis showed, the primary project-related emissions occur during construction. With the project changes discussed above, the project will not exceed de minimis thresholds or cause any significant air impacts that were not fully discussed in the SEIS.

Relative to the operating emissions, one of the primary considerations in evaluating air quality and conformity with the SIP is differences in the level of activity between the With Project and that of the Do-Nothing. In preparing the FSEIS, in 2010 the With Project was found to accommodate 14,000 annual aircraft operations more than the Do-Nothing (with the project 474,000 annual aircraft operations, and 460,000 operation under the Do-Nothing). Because the higher level of activity with project is accommodated in a much more efficient manner, air emissions (particularly for nitrogen oxides) are less with project than without. Therefore, when considering the TAF activity, the differences between the With Project and Do-Nothing from an activity and efficiency perspective must be considered.

For evaluation purposes, the 2000 TAF projections of 529,000 annual operations for 2010 would reflect the With Project, or regional air travel demand. Under this scenario, a Do-Nothing scenario must be postulated. The FAA believes that with a higher demand, several scenarios might exist: 1) all of the demand could be accommodated at Sea-Tac, with an associated extreme delay condition (about 64 minutes of average arrival delay versus 13 minutes with project); or 2) some portion of demand could be accommodated at Sea-Tac, with the remaining accommodated at other airports in the region. While slight differences in air emissions could occur with either scenario, the differences would be minor, approximately equal to that already addressed in the FSEIS. As was noted in an earlier section, while higher levels of activity are predicted by the TAF (in comparison to the FSEIS), it is likely that the region (through Sea-Tac or another airport) would accommodate a growing portion of that demand. For operating emissions, it is believed that emission benefits will continue to be achieved with the implementation of the proposed Master Plan Update projects relative to the Do-Nothing/No Build, as air travel demand will continue to be accommodated within the Puget Sound Region.

As was discussed in Appendix B of the FSEIS (Conformity evaluation), construction emissions represent the potential to exceed the de-minimis threshold. As is noted in the Port's response to comments in the Clean Water Act Section 404 process, the Port has continued to monitor its compliance with its de-minimis commitments in the FSEIS and ROD. The Port has evaluated its annual construction emissions and shown that the de-minimis thresholds will not be exceeded. To further confirm this compliance, the FAA has obtained a written commitment from the Port to prepare annual submittals demonstrating its de-minimis compliance, and thus, has no new information that would indicate that the Port or the proposed projects would not meet the Clean Air Act conformity requirements. The FAA will make this annual submittal a requirement of the Port's grant agreements. Therefore, relative to all direct and indirect emissions, conformity would continue to be met in the 2010 period.

Conformity analysis through 2010 was sufficient for purposes of the SEIS and was accepted by the US Court of Appeals. It remains the appropriate timeframe for this Reevaluation. The conformity requirement is not a general regulatory provision, but is limited to ensuring that federal activities do not interfere with the effectiveness of state implementation plans. The Seattle region currently is in attainment for ozone, and subject to a maintenance plan that regulates air quality through 2010. The regional clean air agency (Puget Sound Clean Air Agency) is currently revising its emissions inventory for the maintenance plan and the Port anticipates that the emissions for Sea-Tac Airport will reflect current regional growth, airport growth and anticipated airport development. The FAA has concluded that the de-minimis threshold would not be exceeded through the foreseeable future and this determination is sufficient to satisfy the requirements of the Clean Air Act.

For the period after 2010, the State of Washington must revise the maintenance plan. The maintenance plan itself provides for revision: "Such a revised SIP will provide for an additional ten years of maintenance." 61 FR 50441. Under this statutory mandate, the federal, state and regional air quality agencies will review current emissions data, which will include emissions estimates based on Airport activity at that future time, and updated forecasts of future Airport activity for the period after 2010. The revised plan will have to include whatever measures are deemed appropriate by the air quality agencies to ensure continued compliance with national air quality standards. Because the Airport, with the Master Plan Update projects, is already included in the Metropolitan Transportation Plan, all of its projected activity in the air and on the ground must be accommodated in the updated plan. USEPA must approve the revised plan. The updated plan will not require reliance on the Port's written commitment to the FAA.

c) **<u>Surface Traffic Conditions</u>**

In examining the effect of higher levels of airport passengers on surface traffic conditions, a comparison was made against the Master Plan traffic levels for the year 2000 with the levels evaluated for the base condition for 1999/2000 for the ongoing Joint Transportation Study (JTS -- the study funded by the City of SeaTac and Port of Seattle for purposes of examining traffic conditions in the airport vicinity).

A comparison of traffic levels along six roadways was conducted as shown in **Table 4**: International Boulevard (SR 99), North Airport Expressway, Air Cargo Road, South 160th Street, South 170th Street and South 188th Street. The Master Plan Update Final Supplemental EIS found intersections along many of these roadways to be heavily traveled, and in many circumstances with poor levels of service (LOS D or worse).

A comparison of the more recent JTS data shows that the Master Plan Update Final EIS and Final Supplemental EIS used very conservative (high traffic levels) when assessing surface traffic conditions in comparison to what has actually occurred on these roadways.

Actual traffic levels were less on all roadway segments, with the exception of four segments: a) North Airport Expressway from SR 518 to the terminal; b) Air Cargo Road from S. 160th to Airport Expressway; c) Air Cargo Road from North Expressway to S. 170th, and d) South 170th Street from Air Cargo Road to North Expressway. All of these segments are in the same general vicinity, and appear to reflect the greater number of passengers using the on-airport roadway system. Further, while slightly greater actual traffic has occurred on these roads, the FEIS and FSEIS noted that traffic conditions were and would continue to be relatively good, except at Air Cargo Road and S. 170th. At Air Cargo Road/S. 170th, the Port and City of SeaTac have proposed a signalized intersection (as was noted in the FSEIS), independent of the Master Plan to resolve low levels of service. Therefore the carrying capacity of these roads is capable of accommodating the slightly higher traffic levels. It is important to note that surface traffic on off-airport roadways is consistently less than was predicted.

Therefore, despite the higher levels of actual airport activity, surface traffic conditions on area roadways have not worsened in proportion to the increase. Rather, the increases in airport activity have not produced commensurate increases in surface traffic levels. Because the existing conditions for most roadways were over predicted in the FSEIS, it is reasonable to assume that conditions that might be associated with a TAF level of future activity have already been accounted for in the evaluation prepared for the FSEIS. For the few roadways/intersections where actual traffic is greater than evaluated in the FSEIS, the slight differences would not have a material effect on traffic flow given the carrying capacity of the existing roads. Thus, it is reasonable to assume that the traffic conditions evaluated in the Final Supplemental EIS, by virtue of being conservative/over-predictive, have identified adequately actual traffic conditions and conditions associated with the 2000 TAF. Based on the surface traffic conditions, no further analysis would be warranted, as the traffic analysis in the FSEIS is substantially valid.

Table 4

Comparison of Actual to Projected Surface Traffic
(Average Daily Traffic Levels)

Roadway From/To	Actual 1999/2000 JTS	FSEIS 2000 W/o project	FSEIS 2000 W/ Project
International Boulevard/SR 99			
State Route 518 to S. 160th Street	33,000	43,600	42,900
S 160th Street to S 170th Street	27,500	36,600	35,500
S. 170th Street to S 176th Street	35,000	39,800	38,300
S 176th Street to S 180th Street	32,500	47,700	45,800
S 180th Street to S 188th Street	39,500	62,100	59,900
S 188th Street to S 192nd Street	37,000	53,600	51,500
Northern Airport Expressway			
State Route 518 to Terminal	58,100	56,100	55,400
Air Cargo Road			
S 154th Street to S 160th Street	9,700	12,100	12,400
S 160th Street to North Airport Expy	12,400	9,600	9,600
North Airport Expy to S 170th Street	13,500	12,500	12,400
South 160th Street			
Air Cargo Road to International Blvd	8,300	10,900	10,700
South 170th Street			
Air Cargo Road to North Airport Expy	12,500	12,600	12,300
North Airport Expy to International Bl	14,400	16,100	15,800
South 188th Street			
28th Ave S to International Blvd	24,500	28,700	27,200
International Blvd to Military Road	31,700	36,900	34,500

Source: Port of Seattle

B. Modifications to the Master Plan Update Project

As with any airport development project, refinements are made in the plan as projects move from planning documents to design and construction. In the case of the long-range Master Plan Update improvements, a number of refinements were identified subsequent to the preparation of the Final Supplemental EIS. These include:

- Revisions to the Concourse A expansion to enable an additional gate and to provide a six story office complex – this project also was modified such that the existing Delta Hangar was demolished, with a new hangar to accommodate Northwest Airlines.
- Implementation of a Hydrant Fueling System for the existing terminal and future terminals
- The Construction Only Temporary Interchange from SR 509, Modifications to the Third Runway Embankment and Retaining Wall, and Other Matters
- Expansion and improvements to the Industrial Waste System (IWS)
- Expansion of the South Electrical Substation;
- Expansion of the Main Terminal (North Esplanade) and Satellite Transit System (STS)
- Development of an Air Cargo Plan, which reinforced the Master Plan recommendations and recommended the development of a secure bridge from the existing north cargo area to the warehouse area north of SR 518 (warehousing recommended by the Master Plan);
- Refinements to the Auburn Wetland Mitigation Program;
- Temporary aircraft overnight parking on taxiways recommended by the Master Plan;
- Development of landscaping design standards

All of these projects were processed under the Washington State Environmental Policy Act (SEPA) as either Determinations of Non-Significance, Mitigated Determinations of Non-Significance or addendums to the Master Plan Update EIS. As a result, their impacts are either minor or have been mitigated. The FAA has reviewed these project SEPA documents, as noted in Attachment A to this re-evaluation, and determined that these projects are either a) design changes that are not significant or do not produce significant new information or environmental consequences, b) categorically excluded under the National Environmental Policy Act (per FAA Order 5050.4A, paragraph 23), or c) were adequately addressed in the Final EIS/Final Supplemental EIS. The cumulative effect of these projects, in combination with the Master Plan Update projects, are discussed in the following section.

C. Cumulative Impacts of Project Modifications and Changes in the Surrounding Environs

As would be expected, since publication of the Final EIS and SEIS, more detailed information has become available on other projects in the vicinity of the Airport. In response to comments concerning cumulative impacts, the Port has prepared a detailed review of cumulative impacts as documented in their response to public comments on the Clean Water Act Section 404 permit (See General Response GLR19). The FAA has reviewed that response and much of the underlying non-airport documentation and generally concurs with the Port's review. That response is included by reference and shows that while a clearer definition of the non-airport projects have been prepared, no significant cumulative impacts are expected to occur.

III. CONCLUSION

Consistent with the requirements of 40 CFR 1508.7 and 40 CFR 1502.9, the FAA has taken a systematic "hard look" at the new environmental information and planned changes in elements of the Master Plan Update. FAA Order 5050.4A, Paragraphs 102b and 103 were considered. Relative to Paragraph 102b, the FAA has reviewed the status of the project. As is shown in this re-evaluation, the project is substantially underway. Relative to paragraph 103, three considerations were made: a) proposed action conforms to the plans for project upon which the FEIS/FSEIS was prepared, b) the data and analysis in the FEIS/FSEIS remain substantially valid, and c) all pertinent conditions and requirements of the prior approval have been or will be met.

As is shown in this re-evaluation, the project changes conform to the project upon which the FEIS/FSEIS is based. Further the re-evaluation shows that the data and analysis in the FEIS/FSEIS is substantially valid. Finally, the FAA has reviewed the Port's actions since issuance of the ROD. The Port has either implemented or has plans to implement all of the conditions and requirements of the ROD (such as Best Management Practices, air emissions evaluations, conduct of the Part 150, continued sound insulation, and implementation of acquisition and relocation processes). The FAA has considered the significance of the new information that has been developed for these projects and evaluated the information for potential cumulative impacts with those impacts identified in the Port's Master Plan Update Final EIS, Final Supplemental EIS and supporting environmental documentation. In each case, and collectively, the new information and the effects of the projects are either not significant or are not substantially greater than what had been reported previously.

The FAA has concluded that major steps toward implementation of the Project have occurred. A second supplemental EIS would not show significantly different impacts of the Project.

David A. Field

David Field
Manager, Planning, Programming and Capacity Branch
Responsible Official for the Seattle-Tacoma International
Airport Master Plan Re-Evaluation

ATTACHMENT A

NEPA CONSIDERATION OF OTHER PORT PROJECTS

Since publication of the FEIS and SEIS, the Port has conducted refinements to elements of the Master Plan Update and identified additional projects that are necessary. This appendix presents the FAA's examination of the impact of these projects relative to the National Environmental Policy Act. In all cases, except where noted, the Port has completed an environmental review of the project per the requirements of the Washington State Environmental Policy Act (SEPA). As this appendix shows, none of these projects are expected to cause significant adverse impacts individually or in combination with the Master Plan Update projects.

1. South SeaTac Electrical Substation Upgrade

This project will expand the capacity of the existing South SeaTac Substation by constructing a new substation next to the existing one and installing approximately 1.2 miles of 115kV high transmission lines on segments of South 188th Street and 28th Avenue South. The Port completed a SEPA checklist and made a Determination of Non-Significance (DNS) for this project.

The proposed substation project will not affect airport activity (either aircraft or surface transportation) upon completion of the project. As a result operation of the project will have no impact on noise, land use compatibility, social impacts, induced socio-economic impact, air quality, DOT 4(f) lands, historic/architectural/archaeological and cultural resources, endangered species of flora and fauna, floodplains, coastal zone management and/or coastal barriers, wild and scenic rivers, farmland, light emissions, and solid waste.

The project will have a slight effect on water quality, biotic communities (plants and animals), wetlands, and energy supply and natural resources, and will generate short-term construction impacts. However, these impacts are not expected to be significant and are expected to be concentrated on airport lands. As is described in the Port's SEPA checklist supporting its determination of non-significance, two shrub and forested wetlands are located 50 feet south and 50 feet east of the proposed substation site. The wetlands south of the site contain both forested and emergent wetland habitats. Groundwater seepage into the wetlands during the wet season maintains the area as a wetland. The wetlands lack any distinct surface water inlet or outlet features. The wetlands are small in size, have been subjected to recent disturbance, and have limited biological diversity. No structures will be constructed within 65 feet of the wetlands, and measures to minimize erosion, and off-site sediment transport will be implemented. The project will have a benefit to the electrical capability of the airport, by providing redundancy, but will not generate measurable additional electrical consumption.

2. South Terminal Expansion (Concourse A and related projects)

Much of this project was analyzed under the Master Plan Update FEIS and FSEIS, as Table 2-7 of the FSEIS notes "Expansion of Concourse A including expansion of Main Terminal at A". Changes to the terminal expansion proposal were discussed in the Port of Seattle's July 19, 1999 *South Terminal Expansion SEPA Checklist*, and considered in a Mitigated DNS dated July 19, 1999. The project will be constructed on a previously developed portion of airport property and is expected to include the following elements: Concourse A Extension, Office Tower Building, tenant supporting space, South Ground Transportation Lot, Remain Overnight Aircraft Parking, apron paving, demolition of existing Delta Airlines hanger and construction of a new Northwest Airlines hanger on the site, Northwest

AR 008939

Airlines flight kitchen, aircraft lavatory dump station replacement, and construction staging area. The project changes do not substantially alter the Master Plan EIS analysis of potential environmental impacts.

3. Expansion of the Main Terminal (North Esplanade) and Satellite Transit System (STS)

This proposal was analyzed in the May 13, 1997 Master Plan Final Supplemental EIS, as is noted in Table 2-7 as "Overhaul and/or replacement of the STS". The upgrade entails relocation of the existing north security checkpoint, construction of a new vertical circulation core, improvements to the satellite transit system, interior remodeling, and extension of the north end of the main terminal by approximately 75 feet. Project modifications are discussed in the August 23, 1999 SEPA Addendum. The modifications do not substantially alter the analysis of significant impacts described in the Master Plan FSEIS.

4. Upgrade and Expansion of Industrial Wastewater System (IWS) Lagoon #3

This proposal is to clean, line, expand and upgrade an existing wastewater system lagoon. The expanded lagoon will provide greater industrial wastewater storage capacity prior to treatment in the Port's Industrial Wastewater System Treatment Plant and allow for controlled discharge to the King County Metro Sewer line. The proposal received a SEPA Determination of Non-Significance on December 22, 1999. The Final EIS noted that the Port was preparing a Stormwater Management Plan for the airport, for which this was a recommendation of that study.

This project will occur adjacent to (but not in) the northern arms of Wetland 28 (the Northwest Ponds) and wetland IWSA/IWSB (north of the pond). Buffer impacts resulting from the project would be reviewed by the appropriate regulatory agencies and may require mitigation such as buffer averaging or replacement. Other than these impacts, the project would provide water quality benefits and, other than short-term construction impacts, would have no adverse impacts.

5. Aircraft Hydrant Fueling System (AHFS)

The AHFS proposal is to install a Jet A underground fuel line concurrent with the planned improvements to Concourse A. The AHFS would provide single source fuel delivery of Jet A fuel at the airport and a common infrastructure that would be used by all airlines. The AHFS would replace the current fueling operations (primarily truck deliveries) for most commercial passenger aircraft at the Airport. The Port issued a SEPA DNS for the project on October 6, 2000.

The Master Plan Update and FEIS/FSEIS noted that the Port was considering addressing the existing hydrant fueling system, but that no decision had been reached concerning that project. However, it noted that as new terminal facilities are built, such as Concourse A and the North Terminal, they would have hydrant fueling.

6. North Electrical Substation

The North Electrical Substation received a SEPA Determination of Non-Significance on June 2, 2000. This DNS was amended on March 6, 2001 to reflect minor project changes. As currently envisioned, the project involves upgrading and expanding the existing Bow Lake Substation, replacing the North SeaTac Substation with a smaller facility (the North Main Service Point) and installing an 1,800-foot, 12.5 kV underground cable system between the Bow Lake Substation and the new North Main Service Point.

The Bow Lake Substation will be rebuilt on property owned by Puget Sound Energy ("PSE"). The North Main Service Point will consist of switch-gear enclosed in a 25-foot by 60-foot building that is 15 feet tall. The building will be enclosed by a 50-foot by 100-foot fence. The North Main Service Point will be located just east of the south entrance to the Airport parking garage between the entrance booth and the northbound Airport circulation road. The proposed 12.5 kV cable system will extend along the north side of South 176th St., across International Boulevard and onto Airport property.

No wetlands or water bodies are impacted in the construction of this facility. Stormwater collected at the North Main Service Point will flow either into the Port's stormwater collection system or industrial waste system. Catch basins for both systems are located in the area.

7. Temporary Aircraft Parking-Taxiway Stubs

On October 25, 2000 the Port issued a SEPA Determination of Non-Significance to allow use of some existing Taxiways for aircraft parking until the taxiways are needed for the Third Runway. No maintenance or de-icing activities will occur to aircraft parked on the taxiways, and no impacts to aquatic resources are expected to occur from this activity. The development of the pavement to support the aircraft parking was considered in the Final EIS and FSEIS.

8. The Construction Only Temporary Interchange from SR 509, Modifications to the Third Runway Embankment and Retaining Wall, and Other Matters

In January 2000, the Port issued "*Addendum To Final Environmental Impact Statement and Final Supplemental Environmental Impact Statement For Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*" under SEPA. This Addendum addressed new information relating to: (a) wetlands and other aquatic resources that would be affected by the planned new runway and other improvements at Seattle-Tacoma International Airport; and (b) potential impacts of temporary construction-related interchanges on SR 518 and SR 509 to be used by trucks delivering fill material to the planned new runway site. This Addendum was prepared by the Port to report the Port's assessment of the new information and its determination that the existing environmental analyses under the Washington State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA) remain adequate. This conclusion was based on the Port's findings that the newly discovered areas of adverse impacts to wetlands and other aquatic resources, and the potential impacts of the temporary construction interchanges, either were not environmentally significant, in light of project changes and mitigation measures, or were adequately covered by the analyses of wetland impacts in the 1996 FEIS and 1997 FSEIS.

This Re-evaluation discusses the consequences of the project relative to wetland impacts and shows that based on the FEIS/FSEIS the FAA believes that there is not the need to supplement the FSEIS. As the temporary construction interchanges were addressed in the FSEIS, and slight changes occurred in the design of the project element that do not create adverse effects, the FAA finds that there is no need to supplement the EIS based on that project.

9. Refinements to the Auburn Mitigation Program

On May 5, 2000, the Port of Seattle issued a SEPA addendum to the FEIS/FSEIS and to the August 1998 SEPA checklist for the Auburn Wetland Mitigation Project. The purpose of the addendum was to analyze the consequences to the mitigation of wetlands for the Master Plan Update projects. The addendum accounted for an increase in the wetland mitigation size and advanced the design of the mitigation site from a conceptual plan to a 60% design. As noted in the Addendum, the project design and increase in mitigation size did not "substantially change the analysis of significant impacts described in" the FEIS/FSEIS. Based on the FAA's review of the Addendum relative to NEPA, the analysis of the Auburn Mitigation site in the FEIS/FSEIS remains valid.

10. Part 150 Noise Compatibility Plan

In late 2000, the Port of Seattle completed its commitment to update its Part 150 Noise Compatibility Plan as noted in the Final Supplemental EIS and ROD, and formally submitted the Plan to the FAA in mid 2001. The scope of this study was undertaken to respond to comments raised during the Puget Sound Regional Council (PSRC) Expert Panel on Noise as well as comments received during preparation of the FEIS/FSEIS concerning the use of computer driven noise exposure contours. As a result, the Port commissioned the Part 150 Study to collect 12 months of airport operational and associated noise measurements for use in improving the accuracy of the FAA's Integrated Noise Model at Sea-Tac Airport.

The Part 150 study resulted in the preparation of two primary products:

- **Noise Exposure Maps**: The Port updated its existing (2000), 2005 and 2010 noise exposure maps for Sea-Tac after completing an extensive measurement program to validate the model's accuracy. **Table 5** shows that the contours prepared for the Part 150 Study are larger than those prepared for the EIS. This difference is attributed to:
    - A full year of aircraft noise and aircraft operational performance data was collected and used to calibrate the noise model specific to Sea-Tac Airport. A comparison was made between the departure climb profiles actually used at Sea-Tac with that provided in INM Version 5.2. The comparison showed that Stage 3 narrow body aircraft (for their representative stage length) actually climb slower than the INM was predicting. To more accurately represent the departure climb performance, the Part 150 contours used profiles associated with heavier aircraft (aircraft operating to a longer stage length). The departure climb stage length adjustment is the primary reason that the noise exposure contours are larger than was predicted in the FSEIS;
    - A new version of the Integrated Noise Model (the computer model used to evaluate aircraft noise – Version 5.2a was used in the Part 150 Study, while Version 4.11 was used in the EIS) became available after the FAA issued the ROD; and
    - The EIS fleet mix assumed a different fleet mix (aircraft types) versus what is actually occurring, such as Alaska Airlines' planned discontinued use of F-28's.
- **Noise Compatibility Plan**: The Port has submitted to the FAA's its recommended Plan that expands upon the operational and land use recommendations reflected in the Final Supplemental EIS.

The Noise Compatibility Plan continues to reflect the Port's commitment to mitigate noise impacts within the designated noise contours, which is consistent with its commitment in the Final EIS.

Because the conduct of the study was recognized and directed, to some degree, by the FSEIS, the FAA believes that the conclusions do not warrant the preparation of an additional supplemental EIS. The ROD commitment to develop new noise exposure contours once the runway has been commissioned provides the maximum assurance that any project-related impacts will have been mitigated by 2010.

The Port issued a SEPA Determination of Non-Significance for the Part 150 Noise Compatibility Plan on October 20, 2000. The Plan is part of the Port's Noise Remedy program, the goal of which is to reduce aircraft and ground noise at the Airport, reduce noise impacts on the greater Seattle area, and encourage land uses that are compatible with anticipated aircraft noise exposure. The Plan recommends conducting additional studies including a siting study for the Ground Run-up Enclosure, a siting study for noise walls, recommended changes to runway use and flight tracks, acquisition of mobile home parks, sound insulation of schools, and compatible land use planning by local communities.

Table 5
Comparison of Noise Impacts
Final Supplemental EIS versus the Part 150 (population)

	65-70 DNL	70-75 DNL	75+ DNL	65+ DNL
Final Supplemental EIS				
Existing (1996)	26,230	5,570	0	31,800
2000	10,330	950	30	11,310
2005	9,640	700	100	10,440
2010	11,960	1,070	190	13,220
2000 Part 150				
Existing (1998)	30,600	7,100	0	37,700
2005	10,140	2,560	0	11,700
2010	14,960	360	0	15,320

11. Development of Landscaping Standards

Section IV.24 "Aesthetics and Urban Design" of the FEIS contains a discussion of the conceptual landscaping envisioned in the Master Plan Update for the airport. Subsequent to the Master Plan Update, the Port prepared landscape design standards that represent minimum requirements and provide a clear and concise set of regulations to be use for all exterior development at Sea-Tac. These standards are consistent with the Master Plan and will improve the aesthetic quality of future airport facilities. Based on a SEPA checklist, the Port rendered a DNS for the standards in August 1999. Based on the FAA's consideration of the SEPA checklist, the landscaping standards do not create any significant adverse environmental consequence and the analysis in the FEIS/FSEIS remains valid.

12. Air Cargo Development Plan (ACDP)

In 1999, the Port of Seattle completed an air cargo development plan that refined elements of the Master Plan Update relative to the north cargo area. To comply with SEPA, the Port prepared a programmatic evaluation of the project, but at this time does not have any specific construction plans. The ACDP is a 10-year development plan for facilities and actions recommended to meet the needs of existing air cargo customers at Sea-Tac Airport. Master Plan Update elements included in the ACDP are: purchasing of airport leases to allow redevelopment in the north cargo area, constructing four aircraft hardstands in the north cargo area, constructing freight warehousing in the north cargo area, preparing a site development plan for property north of SR 518 (the "L-shaped parcel"), and redeveloping Port building 313 for air cargo, constructing mail processing and transfer facilities. Items not included in the Master Plan Update include: constructing a non-public bridge across SR 518 (adjacent to the existing 24th Ave. S. bridge), and constructing a ground support equipment storage area. Development of the L-shaped parcel north of SR518 could increase impervious surface because the parcel is currently undeveloped. In addition, preliminary information indicates the presence of wetlands on the site. At the time that the Port pursues development of these non-Master Plan Update projects, the FAA will consider what, if any, additional NEPA evaluations are required.

13. North End Development Project

The North End Development Project (NEDP) is in the initial planning stages by the Port and would cover primarily the area north of the existing main terminal. It is the FAA's understanding from Port briefings, that the project builds on and includes the Master Plan Update improvements to construct a North Unit Terminal (which is currently being called the North End Terminal). The Port continues to define the elements of this project, and as a result, the FAA has not been presented with a plan for review and/or approval. Thus, consideration by the FAA of the NEDP relative to NEPA is not ripe. When the FAA has been presented with a plan for review and approval, the FAA will conduct the appropriate NEPA evaluation.

14. Water System Improvements

The Port proposes to construct water system improvements, including a two-million gallon reservoir, expansion of an existing booster pump station, and other improvements to the fire and domestic water distribution systems at Airport. The reservoir will be constructed on Port-owned land on Host Road, west of the Washington Memorial Cemetery on the east side of the Airport. This location is about 350 feet south of the existing water tower. Construction of the reservoir will involve relocating utilities and the east west portion of Host Road to a point approximately 100 feet north of the new reservoir.

15. Miscellaneous Airport Projects

The following projects are at various stages of the design and planning process. At this time, it is not possible to identify the impacts of the project or to determine, for those projects that were included in the Master Plan Update, how their final design/plan would alter conditions identified in the EIS. These projects include:

- **SASA (South Aviation Support Area):** A final design for the facility has not been completed and the Port is continuing to work on the amount of each proposed use. There are no new environmental documents for SASA. Final evaluations of the SASA facility will take into account the SR509/South Access project and the buffering of Des Moines Creek.
- **TRACON (Terminal Approach Control)**: The Master Plan Update FEIS and FSEIS evaluated this project as being located at the base of the new air traffic control tower that is under construction. Since the completion of that study, the FAA has determined that a site on-airport is not necessary and is conducting a siting evaluation, which is investigating a 19-acre potential site at 8th Ave. and 160th Street. The FAA will prepare all requisite environmental analysis for the final site.
- **ASDE (Airport Surface Detection Equipment)**: The Master Plan Update EIS evaluated placing the ASDE on top of the air traffic control tower. Since that time, the FAA has learned that there are performance issues associated with locating this type of radar close to buildings. The FAA is currently conducting a siting study for this facility, which to date has determined that the location on top of the new tower could pose visibility issues. Upon selection of a final site, it is expected that the Port will conduct an additional SEPA review, and the FAA will complete any requisite NEPA documentation.
- **Airport Surveillance Radar (ASR-9):** To complete the Third Runway requires the relocation of the existing ASR-9, which is presently located west of the existing runway system. Relocation of the ASR-9 was considered in the FEIS/FSEIS through the review of nine possible sites. The FAA has selected Site 3, at Eighth Place (170th Avenue) and Eighth Avenue South. The radar antenna will be elevated at the site by 160 feet. This will be

accomplished with a 160-ft non-standard tower, or by a standard 45-ft tower placed on fill. The site consists of about 1.1 acres and would have two access points, with the main access being from Eighth Place. On March 15, 2001, the FAA (Seattle NAS Implementation Center) issued a re-evaluation of this project per the FEIS/FSEIS. This project was included in the Biological Assessment (BA) prepared for the Services, and upon which the Services rendered an opinion/concurrence as documented. No wetland impacts would occur. Based on the evaluation of Site 3, the FAA determined in its re-evaluation titled "Re-Evaluation Seattle-Tacoma International Airport Master Plan Update Environmental Impact Statement, Relocation of Airport Surveillance Radar-9" that the project consequences noted in the FEIS/FSEIS remain valid.

- **Approach Lighting with Sequential Flashers (ALSF) for 16L:** Installation of the ALSF-2 on Runway 16L was included in the Master Plan Update FEIS/FSEIS. The Port of Seattle (POS) conducted field investigations for wetlands in the area between March 1998 and October 2000 as access to individual parcels was obtained during the POS property acquisition phase. This field investigation determined that approximately 10 acres of wetland in three distinct locations were present north of Runway 16L.

  The typical ALSF-2 structures consist of lights mounted upon individual towers set into the ground and secured with stabilizing cable guy lines. Because the location of the ASLF-2 is fixed in relation to the landing threshold of the runway, the standard design would have required placement of several tower foundations and stabilizing guy line anchors within the wetlands. To avoid disturbance to the wetlands a span-arch frame was designed to provide a mounting platform for the ALSF-2 lights in their proper location while avoiding the installation of tower foundations or guy line anchors in the wetland areas. The foundations for the span-arch will be located outside the wetlands on their north and south borders. The span-arch will be fabricated off-site, assembled on-site and set into place in a single piece spanning the wetland areas. The remainder of the ALSF-2 lights required in locations outside the wetlands will be installed upon individual towers.

K

Wetland Delineation Report

Master Plan Update Improvements
Seattle-Tacoma International Airport

Port of Seattle

Parametrix, Inc.
December 2000

FINAL

WETLAND DELINEATION REPORT
MASTER PLAN UPDATE IMPROVEMENTS
SEATTLE-TACOMA INTERNATIONAL AIRPORT

Prepared for

PORT OF SEATTLE

Seattle-Tacoma International Airport
P.O. Box 68727
Seattle, WA 98168

Prepared by

PARAMETRIX, INC.
5808 Lake Washington Blvd. NE, Suite 200
Kirkland, WA 98033-7350

December 2000
556-2912-001 (41)

TABLE OF CONTENTS

AR 008949

LIST OF FIGURES

LIST OF TABLES

AR 008950

EXECUTIVE SUMMARY

Parametrix, Inc. conducted a detailed wetland investigation of the Seattle-Tacoma International Airport (STIA) Master Plan Update improvement sites. The improvement sites are owned by the Port of Seattle (Port) and located in the cities of SeaTac and Des Moines in King County, Washington. This report describes the wetlands located within the study area and updates previous wetland studies conducted for the Master Plan Update improvements.

Wetland delineation followed methods outlined in the *Washington State Wetland Identification and Delineation Manual* (Washington Department of Ecology [Ecology] 1997) and the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987). Where applicable, farmed wetland and prior converted cropland were identified as defined by the Food Security Act of 1985 and other regulatory guidelines.

A total of 117 wetlands, ranging in size from 0.01 to over 35 acres, were identified in the study area. They include palustrine forested, scrub-shrub, emergent, and open-water wetland habitat. Ten of these wetlands are identified as farmed wetlands. Two ponds and eight drainage channels within the study area are classified as Other Waters of the U.S.

In addition to wetland studies completed at STIA wetlands were delineated at a 65-acre site located in the city of Auburn, Washington. This site is owned by the Port and is the location of an off-site mitigation project planned as mitigation for the wildlife habitat impacts of Master Plan Update improvements.[1]

The U.S. Army Corps of Engineers (ACOE) made site visits to confirm these wetland determination and boundary delineations between July 1998 and November 2000. Modifications to delineated wetlands that were requested by ACOE during those site visits have been made and are reflected in the mapping and analysis presented in this report.

The findings of this report will be used to determine wetland impacts and mitigation requirements for the Master Plan Update improvements, as presented in a *Wetland Functional Assessment and Impact Analysis Report* (Parametrix 2000a) and *Natural Resource Mitigation Plan* (Parametrix 2000b).

---

[1] As described in the *Natural Resource Mitigation Plan* (Parametrix 2000b), non-habitat impacts are mitigated on-site at STIA.

AR 008951

1. INTRODUCTION

1.1 PURPOSE OF REPORT

The Port of Seattle (Port) has updated the Master Plan for Seattle-Tacoma International Airport (STIA); the Plan includes construction of a new third runway and expansion of airport support facilities. This report documents the findings of wetland delineation studies conducted to identify and map wetlands on approximately 4 square miles of Port-owned property near STIA that could be affected by airport expansion. This report describes wetlands located within the study area, and updates previous wetland studies undertaken to support the Master Plan Update improvements. This information is used to support a wetlands impact assessment, an evaluation of wetland functions, and a wetland mitigation plan. The information is also required to obtain Clean Water Act (CWA) Section 404 and Section 401 approval from the U.S. Army Corps of Engineers (ACOE) and the Washington Department of Ecology (Ecology), respectively.

The Port will construct a wetland mitigation project on 65 acres of Port-owned property in the City of Auburn, Washington. The wetland mitigation is planned as off-site mitigation to partially compensate for wetlands filled by Master Plan Update improvements constructed at the STIA. A report describing the delineation of jurisdictional wetlands on this 65-acre property is attached in Appendix A.

1.2 STUDY AREA

STIA is located in the Cities of SeaTac and Des Moines, in King County, Washington (Figure 1). The study area includes STIA, the surrounding Port-owned property, and privately owned property that is to be acquired to accommodate proposed Master Plan Update improvements. The study area is generally bounded by State Route (SR) 99 to the east, South 140th Street to the north, SR 509 and Des Moines Memorial Drive to the west, and South 216th Street to the south. The study area consists of the following general areas (Figure 2):

- **The North Employee Parking Lot Area** is located between SR 518 and South 146th Street and between 16th Avenue South and 22nd Avenue South. Wetlands in this area are not impacted by Master Plan Update improvements.

- **The Runway Safety Area Extension** is located north of the existing airport runways and south of SR 518. The Port will modify portions of this area to provide runway safety areas (RSAs) for the existing runways to meet current Federal Aviation Administration (FAA) standards.

- **The Third Runway Project Area** is located west of the existing airport runways, portions of which would be affected by third runway construction and other associated facilities, including stormwater management facilities, construction equipment staging, security, and emergency access roads. This area is further divided into four sub-areas:
  - The north airfield, located northwest of the existing runways and South 154th Street
  - The west airfield, located just west of the existing runways

AR 008952

- The west acquisition area, a residential area located between 12th Avenue South and Des Moines Memorial Drive or SR 509
- Vacca Farm, located south of Lora Lake, between Des Moines Memorial Drive and 12th Avenue South

- **Borrow Areas 1, 3, and 4** are generally located south of the airport. Borrow Areas 1 and 3 are located between 24th Avenue South and 15th Avenue South, and between South 200th Street and South 216th Street (see Figure 2). Borrow Area 4 is located north of South 200th Street and west of 15th Avenue South. These areas may be excavated as a source of fill material to construct the runway embankment. Borrow Area 4 contains no wetlands, as verified by ACOE; therefore, it is not discussed further in this report.

- **The Tyee Valley Golf Course** is located south of the airport between South 188th Street and South 200th Street and between Des Moines Memorial Drive and 20th Avenue South. Existing wetlands on the Tyee Valley Golf Course are being considered for on-site wetland mitigation to support Master Plan Update improvements.

- **The South Aviation Support Area (SASA)** is located southeast of the airport, between 20th and 28th Avenue South, and north of South 200th Street. The SASA site includes the eastern portion of Tyee Valley Golf Course. This area will be used to construct aircraft maintenance and air cargo facilities.

- **The South Aviation Support Area Detention Pond** is located southeast of the airport, between the SASA and South 188th Street. Portions of this vacant land adjacent will be used for the stormwater management facilities required for the SASA. A new electrical substation for the airport is also proposed for this area.

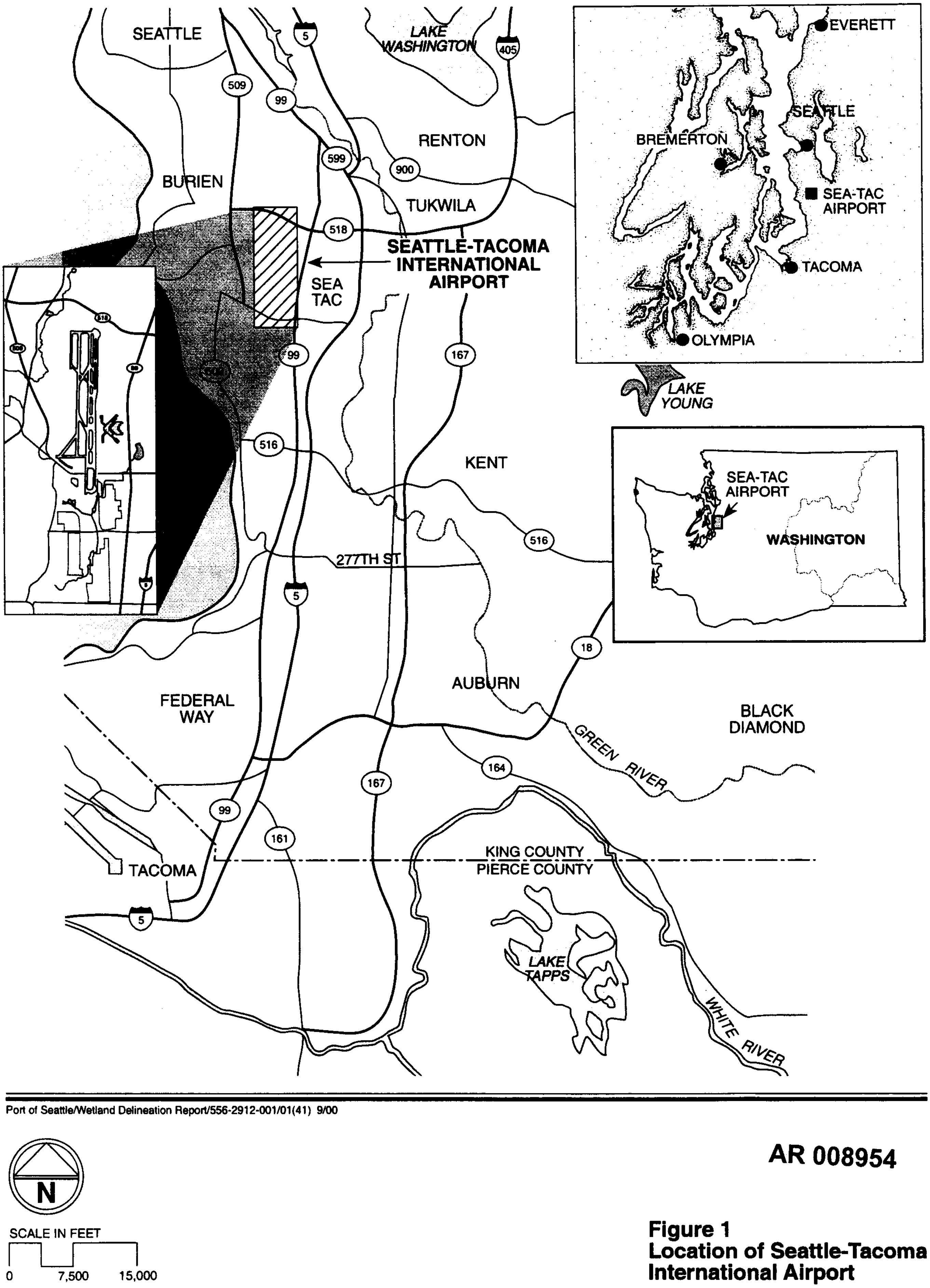
- **Industrial Waste System (IWS) Lagoon 3 Area** is located southeast of the airport, south of South 188th Street and east of 16th Avenue South. The IWS lagoon system is expanding to meet treatment requirements of the Port's NPDES permit.

- **The Auburn Wetland Mitigation Site** is located in northeast Auburn, south of South 277th Street, east of Auburn Way, and west of the Green River. The evaluation of this site is described in Appendix A.

1.3 WETLAND JURISDICTION

Pursuant to the CWA and through the Section 404 permitting process, ACOE has responsibility and authority to regulate the discharge of dredged or fill material into waters of the United States, including wetlands (Federal Register 1986). Under these regulations, wetlands are defined as those "areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil." The specific methods for determining wetland versus non-wetland areas are described in Section 3.

AR 008953

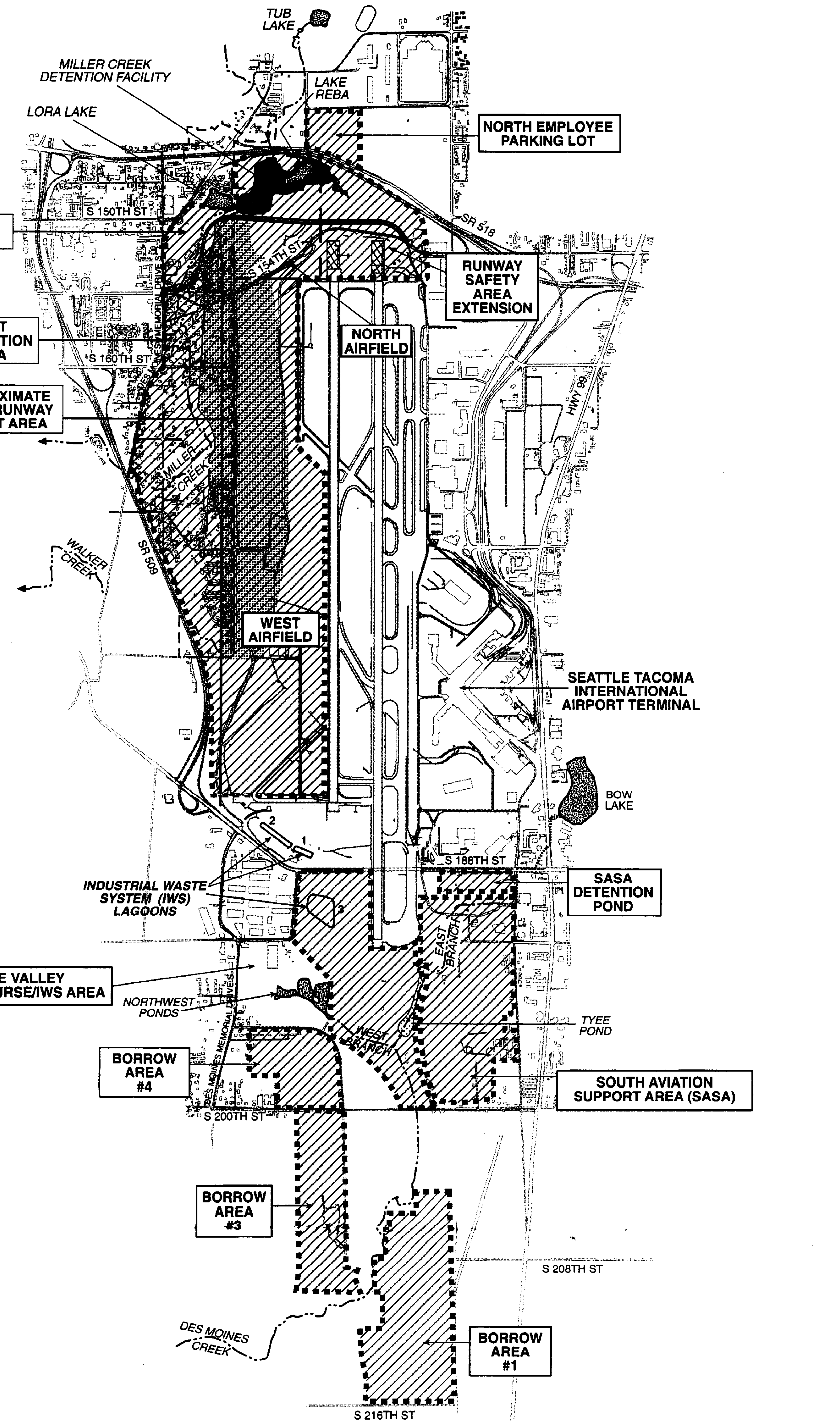


Port of Seattle/Wetland Delineation Report/556-2912-001/01(41) 9/00

AR 008954

Figure 1
Location of Seattle-Tacoma International Airport

AR 008955



Port of Seattle/Wetland Delineation Report/556-2912-001/01(41) 12/00 (K)

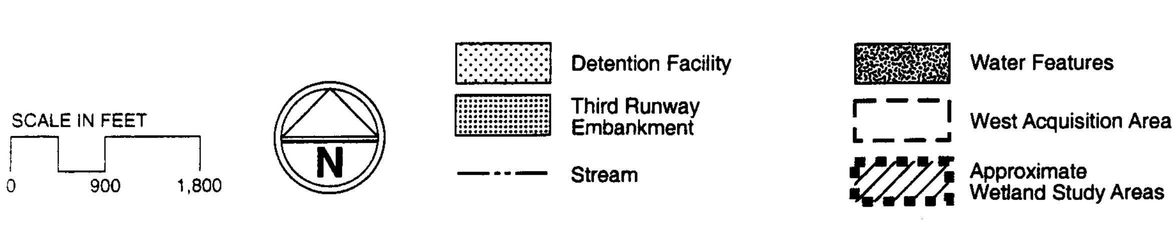


Figure 2
Wetland Study Area for the Master Plan Update at STIA

2. METHODS

The wetland investigation included a review of existing reports, inventories, and historic aerial photographs and a complete field investigation following federal and state requirements for identifying wetlands.

2.1 LITERATURE REVIEW

Information on the project area was reviewed prior to fieldwork to identify vegetation, topography patterns, soils, streams, and other natural resources in the project area. Other wetland investigations that have been completed in the study area were also reviewed. Documents reviewed included the following:

- *Seattle-Tacoma International Airport Master Plan Update Improvement Final Environmental Impact Statement, Appendix H-A: Jurisdictional Wetland Delineation* (FAA 1995)
- *Port of Seattle Des Moines Creek Technology Campus Draft Environmental Impact Statement* (CH2M Hill and Associated Firms 1995)
- *South Aviation Support Area Final Environmental Impact Statement* (FAA 1994)
- *U.S. Geological Service (USGS) Survey, 7.5 Minute Topographic Series* Des Moines, Washington, Quadrangle (Photo-revised 1995)
- *National Wetland Inventory Map*, Des Moines, Washington, Quadrangle (U.S. Fish and Wildlife Service [USFWS] 1987)
- *King County Sensitive Areas Map Folio* (King County 1990a)
- *King County Wetland Inventory* (King County 1990b)
- *Port of Seattle Wetlands Inventory* (Butler and Associates and Sheldon and Associates 1992)

2.2 WETLAND DELINEATION

Field investigations for wetlands were completed between March 1998 and October 2000. During these site visits, the study area was inspected for wetland characteristics and surface water drainage features.

Wetlands were identified and delineated in the study area using the routine determination method outlined in the *Washington State Wetland Identification and Delineation Manual* (Ecology 1997) and the *U.S. Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987). The delineation incorporated the following regulatory guidance letters and memoranda: ACOE Regulatory Guidance Letters 82-2, 86-9, and 90-7; ACOE 3-92 Memorandum; ACOE, Seattle District, 5-94 Public Notice; and Ecology, 3/95 Public Notice.

AR 008956

To be considered a wetland, under normal circumstances an area must have hydrophytic (wetland) vegetation, hydric soils, and wetland hydrology (Ecology 1997; Environmental Laboratory 1987). Areas that do not support indicators of these parameters are generally not regulated as wetlands.

Wetland determinations were made by evaluating vegetation, soil, and hydrologic conditions throughout the study area. These data were collected at sampling locations (data plots) that were established in potential wetlands and adjacent areas (Appendix B). For comparison purposes, additional data plots were established in adjacent upland areas to document differences in vegetation, soil, and hydrology. Specific methods used to record vegetation, soil, and hydrology data are described below.

Once an area was determined to be wetland, the boundary between wetland and upland areas was established by determining where wetland parameters were present or absent. These areas were marked with survey flagging that was sequentially lettered and numbered. A professional surveyor then surveyed and flag-marked the wetland boundaries.

2.2.1 Hydrology

Wetlands occur where soil is saturated or soil inundation is present; therefore, water must be present for wetlands to exist. However, water need not be present in wetlands throughout the year. An area is considered to have wetland hydrology when soils are inundated or saturated for at least 12.5 percent of the growing season (typically about 14 consecutive days of inundation during the February to mid-November period).

To determine if wetland hydrology was present, project staff recorded and described these observations of wetland hydrology and wetland hydrology indicators. The most reliable indicators of wetland hydrology are surface inundation or saturation within 12 inches of the soil surface, and soil pots were dug at each data plot to determine the depth to saturated soils. Other wetland hydrology indicators include oxidized root channels, wetland drainage patterns, watermarks on vegetation or other fixed objects, and water-stained leaves; the presence or absence of these indicators was also noted.

Direct observations of hydrology, such as ponding and soil saturation, may not be possible during the dry summer season, or they may be misleading during or following periods of heavy rain. However, under most circumstances, wetland hydrology indicators are present and observable throughout the year. When Parametrix staff conducted delineations during the dry season, wetland hydrology was inferred from the presence of hydric soil, hydrophytic vegetation, and wetland indicators such as oxidized root zones, water marks, and wetland drainage patterns. During the non-growing season or other exceptionally wet periods, temporarily saturated soils were sometimes found that lacked hydrophytic vegetation or hydric soil indicators, and such areas were not considered wetland.

2.2.2 Soils

AR 008957

Hydric soils develop when soils are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part (10 inches) of the soil profile. By definition, organic soils (peats and mucks) are hydric soils (Ecology 1997; Environmental

Laboratory 1987; USDA 1991). In mineral soils, soil colors become distinctive under anaerobic conditions: low-chroma colors are typical for the soil matrix, and mottles of bright color form within the matrix. These color patterns are the most commonly used indicators of hydric soil conditions. Other important indicators include high organic matter content in the surface horizon, reduced-sulfur odors, and staining by organic matter in the subsurface horizons.

Project staff examined soils at each data plot by digging sample pits to a depth of 18 inches or more to observe soil properties and determine hydrologic conditions. Using the Munsell color chart they determined soil colors in the field (Greytag MacBeth 1998). Soil texture, the presence of sulfidic odor, and the occurrence of oxidized rhizospheres were determined in the field.

2.2.3 Vegetation

Hydrophytic (wetland) vegetation is specially adapted for life in saturated or anaerobic conditions. To determine the presence of hydrophytic vegetation, plants species within each vegetation strata (tree, sapling/shrub, and herb), and their percent coverage at each data plot, were recorded on data sheets. Each species was then assigned an indicator status using the *National List of Plant Species that Occur in Wetlands: Northwest - Region IX* and its 1993 supplement (Reed 1988, 1993, hereafter cited as *The Region IX List*). The species indicator status defines the relative frequency with which the species occurs in jurisdictional wetlands (Table 1). All scientific and common plant names used in their delineation are consistent with *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1991).

Table 1. Key to plant indicator status.

Category	Abbreviation [a]	Definition
Obligate Wetland Plants	OBL	Plants that almost always (>99% of the time) occur in wetlands, but which may rarely (<1% of the time) occur in non-wetlands
Facultative Wetland Plants	FACW	Plants that often (67 to 99% of the time) occur in wetlands, but sometimes (1 to 33% of the time) occur in non-wetlands
Facultative Plants	FAC	Plants with a similar likelihood (33 to 67% of the time) of occurring in both wetlands and non-wetlands
Facultative Upland Plants	FACU	Plants that sometimes (1 to 33% of the time) occur in wetlands, but occur more often (67 to 99% of the time) in non-wetlands
Upland Plants	UPL	Plants that rarely (<1% of the time) occur in wetlands, and almost always (>99% of the time) occur in non-wetlands
Not Listed	NL	Plants not on the wetland indicator list (assumed to be non-wetland plants)

Source: Reed (1988, 1993).

[a] Within the FACW, FAC, and FACU categories, a plus (+) or a minus (-) sign specifies a relatively higher or lower probability, respectively, of a plant occurring in wetlands. Plants with a FAC- indicator status are not wetland plants.

AR 008958

To meet the hydrophytic vegetation criteria, more than 50 percent of the dominant[2] plant species within each stratum must have an indicator status of obligate wetland, facultative wetland, and/or facultative.

For a variety of reasons, non-wetland plants may sometimes occur in areas that contain wetland soils and experience wetland hydrology. For this reason, the ACOE Seattle District may determine areas dominated by facultative upland plants to be wetland when the presence of wetland hydrology and hydric soils are clearly present (ACOE 1994).

2.2.4 Disturbed Areas

Disturbed wetlands are wetlands that have been modified by human activity (such as vegetation clearing, grading, or filling) or by natural events. In disturbed wetlands, one or more of the three wetland parameters may be absent because of recent alteration. To determine whether a disturbed area was wetland, both on-site observations and off-site research (i.e., evaluation of aerial photographs) were used.

Project staff reviewed historic aerial photographs to identify the timing and nature of any disturbance, and to establish pre-disturbance site conditions. In areas that were cleared of vegetation, or where the vegetation was maintained as lawn or with landscaping plants, the wetland determinations were based on the presence of hydric soils and wetland hydrologic indicators. Fill material and disturbed soil may contain unweathered materials that have characteristics of hydric soil, or may exhibit hydric soil characteristics that formed at the fill source location. In fill areas, soils were examined to determine whether hydric characteristics occurred in place, or at their original location. Where it appeared that hydric soil characteristics were remnant from the source location, wetland determinations were based on the presence of hydrophytic vegetation and wetland hydrologic indicators.

2.3 OTHER WATERS OF THE U.S.

ACOE has jurisdiction over wetlands and other Waters of the U.S. under the CWA. These other Waters of the U.S. include, but are not limited to, perennial and intermittent streams, drainages, swales, and, under certain circumstances, constructed drainage ditches. Within the study site, water conveyances that had defined bed and bank, conveyed naturally occurring surface water, and did not meet the federal definition of a wetland were identified, flagged, and surveyed by Parametrix, Inc. as Waters of the U.S. These areas were evaluated by ACOE as potential "Waters of the U.S."

2.4 FARMED WETLANDS AND PRIOR CONVERTED CROPLAND

Parametrix staff conducted a partial review of the farming history on several parcels of farmland in the Port of Seattle's acquisition area (referred to as Vacca Farm) to classify these areas as upland,

---

[2] Dominant species are those species in each vegetation layer (stratum) that, when ranked in descending order of abundance and cumulatively totaled, immediately exceed 50 percent cover of the total dominance measure for that stratum, plus any species that comprises at least 20 percent cover.

AR 008959

farmed wetland (FW), prior converted (PC) cropland, or wetland. This review included an evaluation of aerial photographs, field studies during 1998 and 1999, discussions with local landowners, and contacting the USDA. The Vacca Farm site was visited on several occasions throughout the rainy seasons of 1998 and 1999 to determine the extent of inundation and saturation. Areas within the Vacca Farm site that satisfy the criteria for farmed wetlands were staked and surveyed in the field.

The Food Security Act (FSA, Sections 514.22a,d; USDA 1994) defines PC croplands as wetlands that were drained (or otherwise manipulated) for agricultural production and where an agricultural commodity was planted or produced prior to December 23, 1985. These areas are not subject to federal regulation under the CWA jurisdiction provided that:

1. The land has been in active agriculture since December 23, 1985, and that agricultural use has not been abandoned[3].

2. Vegetation and hydrology have been extensively and permanently altered such that there is no prolonged (greater than 14 consecutive days) inundation during the growing season.

Some areas that had been converted to agricultural production prior to December 23, 1985 are considered farmed wetlands. FWs are used for agricultural purposes but have prolonged inundation during the growing season and are therefore considered wetlands. Areas that qualify as FWs have:

1. Land that has been in active agriculture since December 23, 1985 and agricultural use has not been abandoned.

2. At least a 50 percent chance of being seasonally inundated for at least 15 consecutive days or 10 percent of the growing season, whichever is less.

The presence of PC and FW at the Vacca Farm site was determined from field studies, evaluation of past agricultural uses, and evaluation of inundation of farmland within the study area. Agricultural uses and inundation were evaluated using historic aerial photographs (taken between May 1965 and April 1995) available at the University of Washington library. Based on this review, PC and FW determinations were made (Appendix C).

AR 008960

[3] Agricultural lands are considered abandoned when cropping, forage production, or management has ceased for 5 consecutive years.

3. RESULTS

The 117 wetlands identified in the study area are described below. They include palustrine forested, scrub-shrub, emergent, and open-water wetland habitat. Additionally, there are eight drainage channels (including Miller and Des Moines Creeks) and two small ponds within the study area that are classified as Other Waters of the U.S. Six of the drainage channels convey natural runoff to Miller and Des Moines Creeks.

3.1 GENERAL SITE DESCRIPTION

3.1.1 Streams and Surface Hydrology

The study area includes portions of the Miller Creek and Des Moines Creek watersheds (Figure 3)[4]. Hydrologic features within the study area include small lakes, streams, groundwater seeps, and many seasonally to permanently saturated to permanently flooded depressions.

3.1.1.1 Miller Creek Watershed

The northern part of the study area lies in the Miller Creek watershed, which covers approximately 8.1 square miles of predominantly urban land. The upper reaches north of SR 518 drain a gently rolling plateau between the Duwamish/Green River Valley and Puget Sound. South of SR 518 the stream flows though the north airfield area, then through the residential neighborhood west of the airfield, passing through a series of roadway culverts throughout this reach. In its lower reaches, the stream flows in an incised ravine, which eroded through glacial material before draining to Puget Sound. A relatively small portion of STIA drains to Miller Creek, including the north end of the runways and air cargo areas north of the terminal.

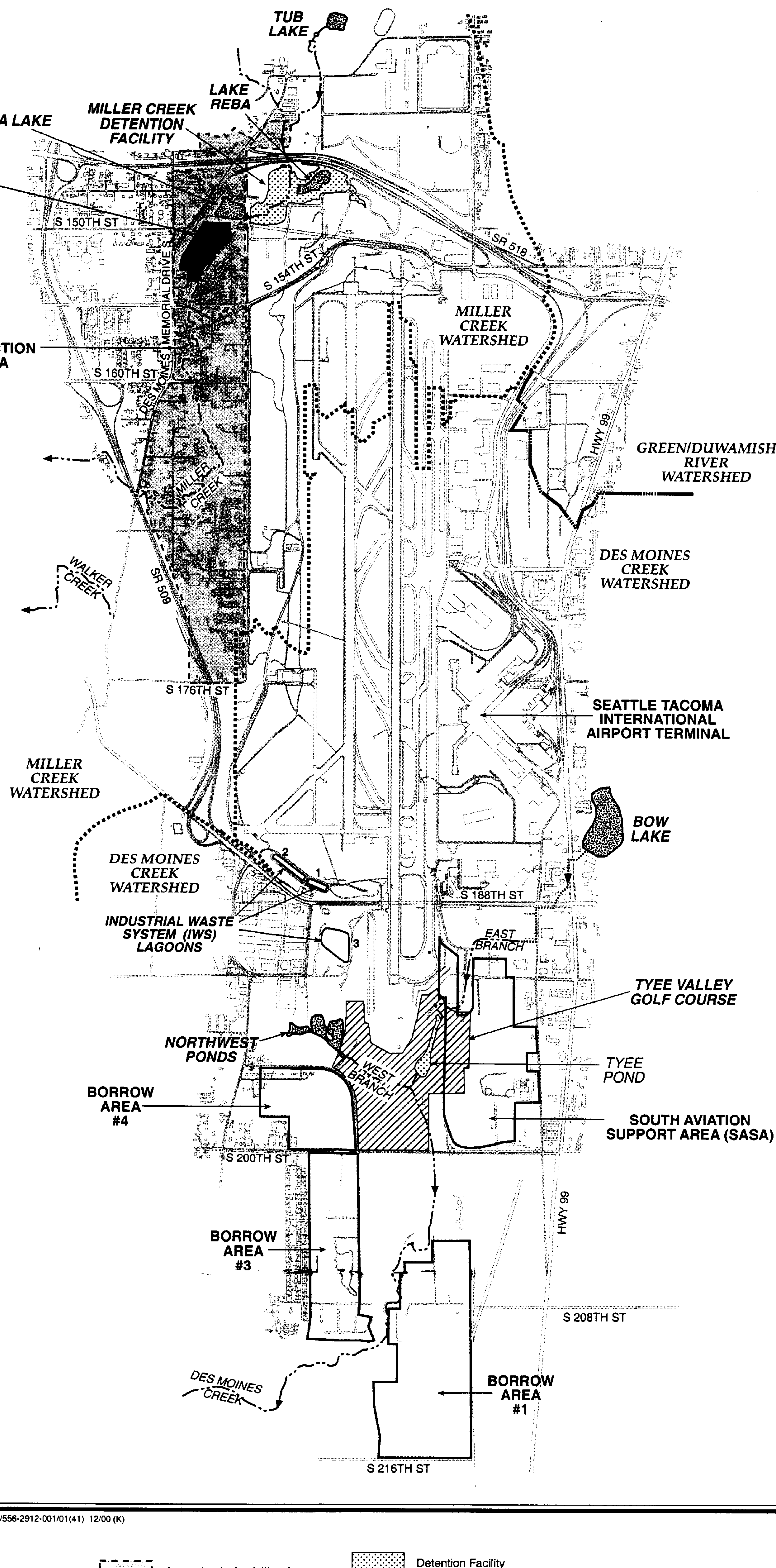
Tub Lake, the Miller Creek Detention Facility, and Lora Lake drain to Miller Creek. Tub Lake, located north of the study area, is surrounded by an extensive wetland system. The Miller Creek Detention Facility, located just south of SR 518, is a constructed stormwater detention facility that includes extensive wetlands. The facility receives stormwater runoff via conveyance systems from SR 518, South 154th Street, and STIA. Lora Lake is located west and southwest of the Miller Creek Detention Facility. Lora Lake was excavated from a peat wetland and receives its water from groundwater seeps. During flood events, the Miller Creek floodplain extends across the lake.

Two small ephemeral streams originate in the forested area west of the airfield and flow westward to Miller Creek. They are located in shallow ravines and are associated with small wetlands. Waters from these streams combine along the east side of 12th Avenue South in a roadside ditch and then enter a relatively large wetland system between South 160th Street and South 166th Street.

---

[4] While a water tower located in the Gilliam Creek watershed will be replaced, no wetlands occur on the paved site where this project will occur.

AR 008961



AR 008962

Port of Seattle/Wetland Delineation Report/556-2912-001/01(41) 12/00 (K)

SCALE IN FEET
0 900 1,800

N

Approximate Aquisition Area
Water Features
Stream
Current Watershed Boundaries
Detention Facility
Tyee Valley Golf Course
Vacca Farm
Piped Stream

Figure 3
Locations of Existing Water Features, Stormwater Facilities, Watershed Boundaries, and Aquisition Area of STIA

3.1.1.2 Des Moines Creek Watershed

The southern part of the study area lies in the Des Moines Creek watershed, which covers 5.9 square miles of predominantly urban area. Des Moines Creek drains most of the airport, the City of SeaTac commercial area along International Boulevard (SR 99), and residential areas in the remainder of the basin.

The east branch of Des Moines Creek originates at Bow Lake and is conveyed in culverts and an artificial stream channel excavated between parking lots for about 4,000 feet. The stream then flows to the northeast corner of Tyee Valley Golf Course where it is adjacent to a hillside seep wetland (Wetland 52). Finally, the stream flows into the Tyee Regional Detention Pond, which is connected to the west branch of Des Moines Creek by a 400-foot culvert.

The west branch of Des Moines Creek originates southwest of the airport and is fed by seeps and stormwater runoff. The intermittent stream flows into the Northwest Ponds, located just northwest of the Tyee Valley Golf Course, then through the golf course to its confluence with the east branch. The main stem of the stream flows south in a narrow, deeply-incised channel to Puget Sound. Borrow Areas 1 and 3 occur east and west (respectively) of this ravine.

3.1.2 Wetlands

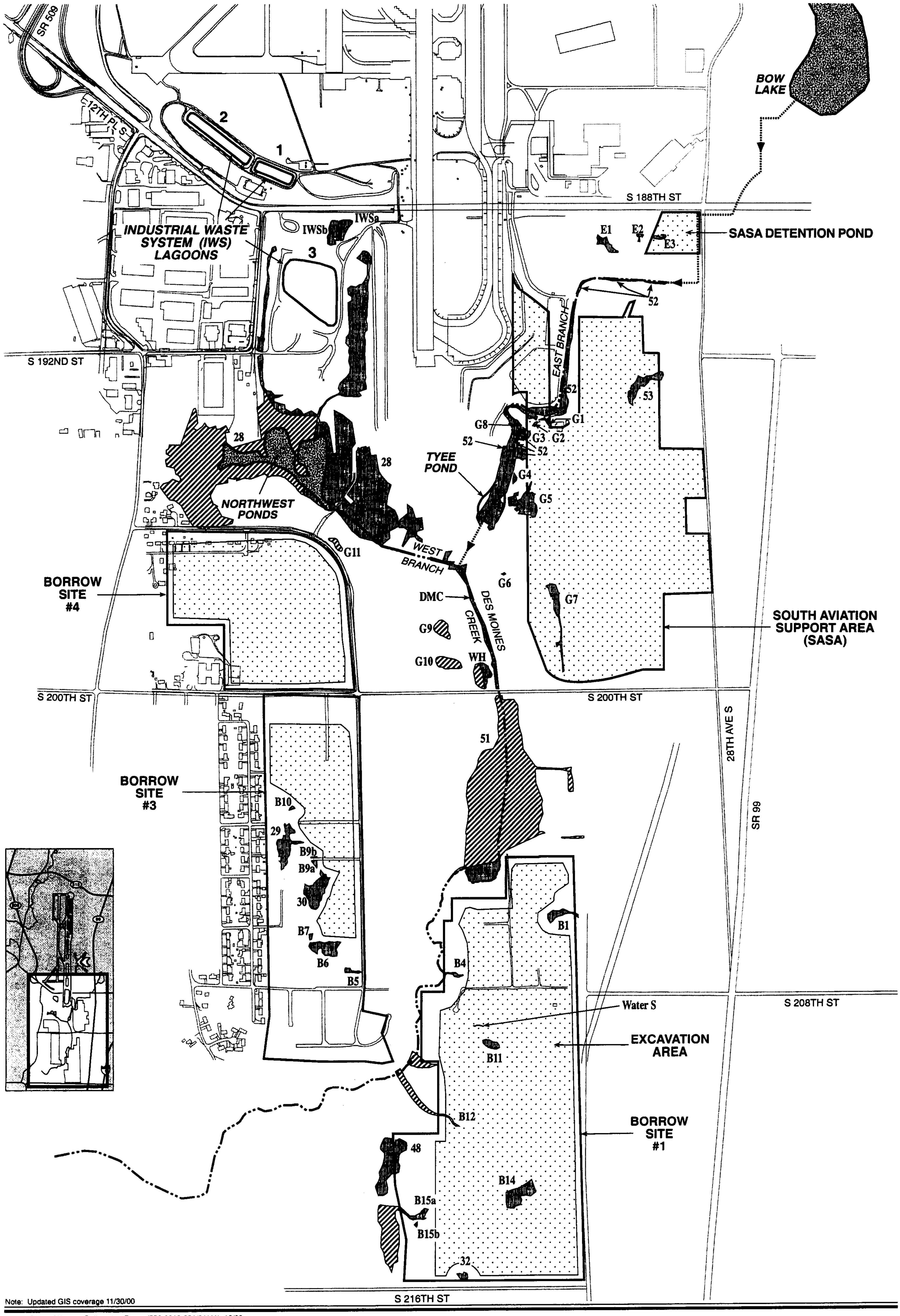
A total of 117 wetlands occur in the project area (Figures 4 and 5). Wetlands within the study area are associated with lakes, streams, groundwater seeps, and seasonally saturated to permanently flooded depressions.

The wetlands in the RSA expansion are part of the Lake Reba wetland complex. Most of the wetlands in this area are separated from each other by fill associated with abandoned streets and emergency access roads. Culverts convey water generally west between wetlands. The Miller Creek Detention Facility is located in this group of wetlands, as is Lora Lake. Miller Creek also flows through the wetland complex. Several of these wetlands are seasonally inundated.

Several small wetlands occur along the Miller Creek riparian corridor within the west acquisition area. They receive surface runoff and groundwater from surrounding hillslopes as well as occasional overbank flow from the stream. A larger wetland in the west acquisition area that collects water from several hillside drainages is also connected to Miller Creek. Portions of this wetland are seasonally or permanently saturated.

Several wetlands are associated with groundwater seeps. They occur in steep ravines that are fed by hillside seeps (on slopes in the west airfield area and surrounding Lake Reba) or at the toe of steep slopes (in the west acquisition and borrow source areas). Many of these wetlands are perennially saturated. Several wetlands at the north and west side of Runway 16R appear to be fed from seeps located near runway fill.

The remaining wetlands are isolated depressions or depressions along drainage swales that collect sufficient runoff to support hydrophytic vegetation. The north and west airfields have several depressions with compact soils that pool water during the wet season. Many of the depressional



Note: Updated GIS coverage 11/30/00

Port of Seattle/Wetland Delineation Report/556-2912-001/01(41) 12/00

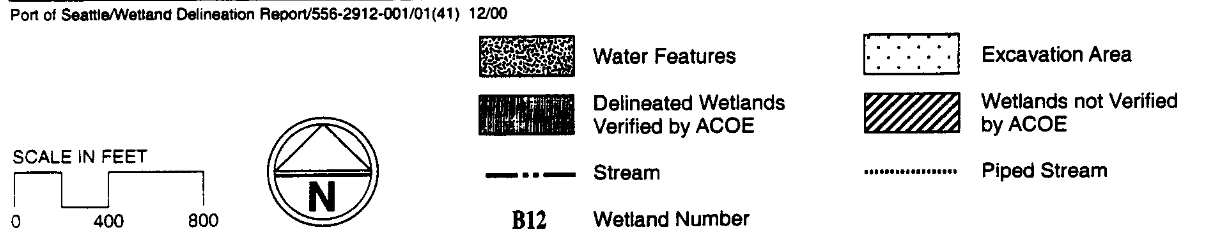
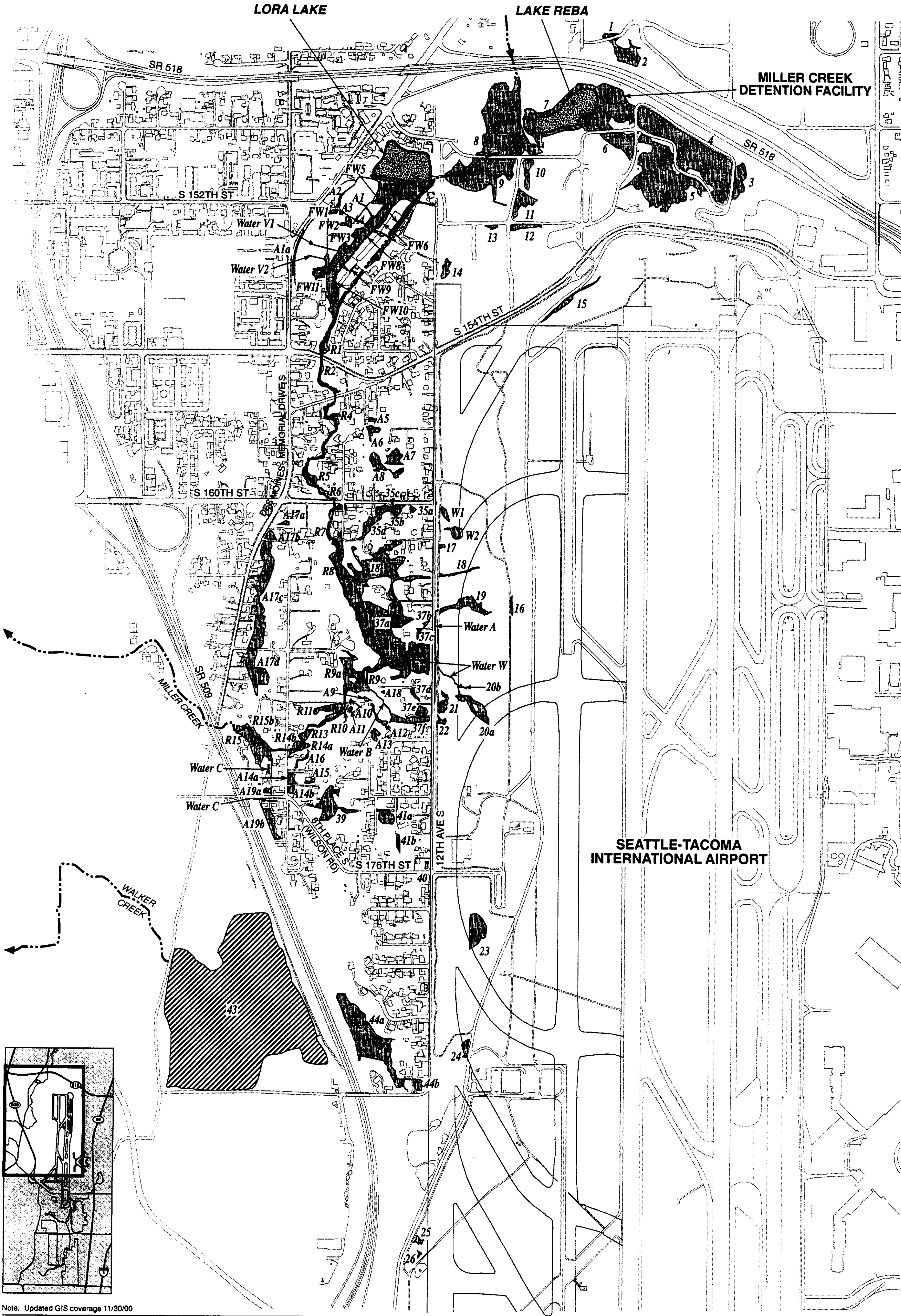


Figure 5
Wetlands and Other Waters of the U.S. in the Des Moines Creek Basin Near STIA

AR 008964



Note: Updated GIS coverage 11/30/00

Port of Seattle/Wetland Delineation Report/556-2912-001/01(41) 12/00

Water Features

Delineated Wetlands Verified by ACOE

Wetlands Not Verified by ACOE

Stream

41a Wetland Number

SCALE IN FEET
0 400 800

N

Figure 4
Wetlands and Other Waters of the U.S. in the Miller Creek Basin Near STIA

AR 008965

wetlands in the west acquisition area were historically part of continuous wetland systems, but these systems have been segmented by fill for road and building construction.

In the SASA, IWS, and borrow areas, several seasonally saturated, closed depressions and permanently saturated riparian and slope wetlands were identified. Generally, these wetlands have been impacted by various developments, including the Tyee Valley Golf Course, parking lots, residential development, and/or urban refuse and fill.

During field investigations that took place between March 1998 and November 2000, hydrology in the wetlands varied substantially. Many areas that were inundated or saturated during the early part of the 1998 growing season were dry to 18 inches or more below the soil surface during the summer. When Parametrix staff conducted delineations during the dry season, wetland hydrology was inferred from the presence of hydric soil, hydrophytic vegetation, and wetland indicators such as oxidized root zones, water marks, and wetland drainage patterns.

3.1.3 Soils

The *Soil Survey of the King County Area, Washington* (Snyder et al. 1973) identifies only soil series in the southernmost study area; the Soil Conservation Service (SCS) typically does not map soils in urban areas. The SCS identified six different soil series in the Borrow Areas: Alderwood gravelly sandy loam; Arents Alderwood material; Bellingham silt loam; Everett gravelly sandy loam; Indianola loamy fine sand; and Norma sandy loam. Only the Bellingham and Norma series are identified as hydric soils (USDA 1991); however, inclusions of hydric soils within the other soil series often occur.

The most common upland soil in the project area is generally a brown (10YR 3/3) loam over light brown (10YR 4/3) sandy loam. They most closely match the SCS description of Arents composed of Alderwood parent material. Because of a lack of hydric indicators, these soils are considered to be non-hydric.

The most common hydric soil in the project area generally has a very dark brown (10YR 3/2) to black (10YR 2/1) loam to sandy loam surface horizon overlying grayish brown (2.5Y 5/2) and gray (2.5Y 5/1) gravelly sandy loam. In places the subsoils are dark grayish brown (2.5Y 4/2) or very dark grayish brown (2.5YR 3/2). Distinct and prominent mottles are typically present in the subsurface horizons.

Very dark grayish brown (10YR 3/2) to black (10YR 2/1) loam and silt loam soils are also a common hydric soil in the project area. Mottles are typically present in the subsoils. These soils are most common in the west acquisition area and the borrow areas.

Hydric soils with gleyed colors occur in places throughout the study area. Gleyed horizons typically occur in the subsoil, are sand or silt loam in texture, and range from dark greenish gray (5G 4/1) to greenish gray (5BG 5/1) in color.

Within the riparian wetlands, the soils are hydric with a high organic content. Surface and subsoil colors are black (10YR 2/1), very dark gray (10YR 3/1), gray (10YR 5/1), and very dark brown

AR 008966

(10YR 2/2). Textures range from sand to sandy clay loam, with lenses of muck occurring in places. Mottles are typically present in the subsurface horizons.

Organic soils occur within most of the larger wetlands. Two types of organic soils were found. The first is black (10YR 2/1) or very dark brown (10YR 2/2) muck. In some places, this soil is overlain by a layer of black loam. The second organic soil is a black or very dark brown muck or mucky peat overlying gleyed mineral subsoils.

3.1.4 Vegetation

A variety of upland and wetland plant communities occur in the study area. The more prevalent types are described below. Common and scientific names of plant species found in the study area are listed in Table 2.

3.1.4.1 Forested Wetland

Mixed deciduous forested wetland occurs throughout the study area. The overstory typically contains a mixture of red alder, black cottonwood, western redcedar, Pacific willow, and Sitka willow. The undergrowth varies considerably, depending on the wetland moisture regime and the density of the forest canopy. The most common shrubs include Himalayan blackberry, willow, salmonberry, and Douglas spirea. Common herb species include creeping buttercup, bentgrass, soft rush, lady fern, giant and field horsetail, and reed canarygrass.

Willow-dominated forested wetlands are also common. Sitka and Pacific willow dominate these communities. Red alder, black cottonwood, and Scouler willow are associated canopy species, with willow shrubs dominating the understory. Herb species that grow under the thick canopy include tall mannagrass, small-fruited bulrush, field and giant horsetail, lady fern, creeping buttercup, watercress, American brooklime, and soft rush.

3.1.4.2 Shrub Wetland

Small areas of shrub wetland communities occur primarily in the west acquisition area and the borrow areas. The dominant vegetation is salmonberry, Himalayan blackberry, and Pacific and Sitka willow. Common herbaceous plants include common velvet-grass, soft rush, bentgrass, and fireweed.

3.1.4.3 Emergent Wetland

Several emergent wetland plant communities occur in the project area. These communities include monotypic stands of reed canarygrass, mowed lawns and a golf course consisting of various grasses and forbs, and small stands of cattail. The grass-dominated wetlands generally occur in shallow depressions with compact soils, and in association with groundwater seeps located in disturbed areas. Common species include lady fern, giant horsetail, field horsetail, soft rush, fireweed, and a variety of grasses such as common velvet-grass, bentgrass, and reed canarygrass.

AR 008967

Table 2. **Plant species observed in the STIA Master Plan Update study area.**

Common Name	Scientific Name	Indicator Status	Non-Native (x)
TREES			
big-leaf maple	*Acer macrophyllum*	FACU	
birch	*Betula* sp.	NL	x
bitter cherry	*Prunus emarginata*	FACU	
black cottonwood	*Populus balsamifera* ssp. *trichocarpa*	FAC	
Douglas fir	*Pseudotsuga menziesii*	FACU	
European mountain-ash	*Sorbus aucuparia*	UPL	x
hazelnut	*Corylus cornuta*	FACU	
horse chestnut	*Aesculus hippocastanum*	NL	x
Norway spruce	*Picea abies*	NL	x
Oregon ash	*Fraxinus latifolia*	FACW	
Pacific crabapple	*Malus fusca*	FACW	
Pacific madrone	*Arbutus menziesii*	NL	
paper birch	*Betula papyrifera*	FAC	
red alder	*Alnus rubra*	FAC	
Scouler willow	*Salix scouleriana*	FAC	
Sitka willow	*Salix sitchensis*	FACW	
sugar maple	*Acer saccharinum*	NL	x
western hemlock	*Tsuga heterophylla*	FACU	
western redcedar	*Thuja plicata*	FAC	
willow	*Salix* sp.	FACW	
SHRUBS			
black hawthorn	*Crataegus douglasii*	FAC	
laurel cherry	*Prunus laurocerasus*	UPL	
current	*Ribes* sp.	FAC	
Douglas spirea	*Spiraea douglasii*	FACW	
English holly	*Ilex aquifolium*	FACU	x
evergreen blackberry	*Rubus laciniatus*	FACU+	x
hazelnut	*Corylus cornuta*	FACU	
Himalayan blackberry	*Rubus discolor*	FACU	x
Indian plum	*Oemleria cerasiformis*	FACU	x
Nootka rose	*Rosa nutkana*	FAC-	
ornamental cherry	*Prunus* sp.	NL	x
Pacific willow	*Salix lucida*	FACW+	
red alder	*Alnus rubra*	FAC	
red elderberry	*Sambucus racemosa*	FACU	
red-osier dogwood	*Cornus stolonifera*	FACW	
salal	*Gaultheria shallon*	FACU	
salmonberry	*Rubus spectabilis*	FAC+	

AR 008968

Table 2. Plant species observed in the STIA Master Plan Update study area (continued).

Common Name	Scientific Name	Indicator Status	Non-Native (x)
Scots broom	*Cytisus scoparius*	UPL	x
vine maple	*Acer circinatum*	FAC-	
white poplar	*Populus alba*	FAC	x
willow	*Salix* sp.	FACW	
HERBS			
American brooklime	*Veronica americana*	OBL	
American vetch	*Vicia americana*	FAC	x
barnyard grass	*Echinochloa crusgalli*	FACW	x
bedstraw	*Galium* sp.	FACU	
bentgrass	*Agrostis* sp.	FAC	x
birdsfoot trefoil	*Lotus corniculatus*	FAC	x
bittersweet nightshade	*Solanum dulcamara*	FAC+	x
bluegrass	*Poa* sp.	FAC	x
bracken fern	*Pteridium aquilinum*	FACU	
broadleaf plantain	*Plantago major*	FACU+	x
Canada thistle	*Cirsium arvense*	FACU+	x
cattail	*Typha latifolia*	OBL	
cleavers bedstraw	*Galium aparine*	FACU	
clover	*Trifolium* sp.	FAC	
colonial bentgrass	*Agrostis capillaris (tenuis)*	FAC	x
common chickweed	*Stellaria media*	NL	x
common St. Johnswort	*Hypericum perforatum*	FAC	x
common tansy	*Tanacetum vulgare*	NL	x
common velvet-grass	*Holcus lanatus*	FAC	x
Cooley hedgenettle	*Stachys cooleyae*	FACW	
creeping bentgrass	*Agrostis stolonifera*	FAC	x
creeping buttercup	*Ranunculus repens*	FACW	x
curly dock	*Rumex crispus*	FAC	x
dagger-leaf rush	*Juncus ensifolius*	FACW	
dandelion	*Taraxacum officinale*	FACU	x
English daisy	*Bellis perennis*	NL	x
English ivy	*Hedera helix*	NL	x
fescue	*Festuca* sp.	NL	
field bindweed	*Convolvulus arvensis*	NL	x
field horsetail	*Equisetum arvense*	FAC	
fireweed	*Epilobium ciliatum*	FACW-	
geranium	*Geranium robertianum*	NL	x
giant horsetail	*Equisetum telmateia*	FACW	
giant mannagrass	*Glyceria grandis*	OBL	
impatiens	*Impatiens* sp.	NL	

AR 008969

Table 2. Plant species observed in the STIA Master Plan Update study area (continued).

Common Name	Scientific Name	Indicator Status	Non-Native (x)
Kentucky bluegrass	*Poa pratensis*	FAC	x
lady fern	*Athyrium filix-femina*	FAC+	
lanceleaf plantain	*Plantago lanceolata*	FAC	x
marsh horsetail	*Equisetum palustre*	FACW	
meadow fescue	*Festuca pratensis*	FACU+	x
morning glory	*Convolvulus* sp.	NL	
northern mannagrass	*Glyceria borealis*	OBL	
orchardgrass	*Dactylis glomerata*	FACU	x
perennial ryegrass	*Lolium perenne*	FACU	x
pineapple weed	*Matricaria matricarioides*	FACW	x
purple loosestrife	*Lythrum salicaria*	FACW+	x
quackgrass	*Agropyron repens*	FACU	x
red clover	*Trifolium pratense*	FACU	x
red fescue	*Festuca rubra*	FAC+	
redtop	*Agrostis gigantea (alba)*	FAC	x
reed canarygrass	*Phalaris arundinacea*	FACW	x
sawbeak sedge	*Carex stipata*	OBL	
self-heal	*Prunella vulgaris*	FACU+	x
skunk cabbage	*Lysichiton americanum*	OBL	
small bedstraw	*Galium trifidum*	FACW	
small-fruited bulrush	*Scirpus microcarpus*	OBL	
soft rush	*Juncus effusus*	FACW	
spotted cat's-ear	*Hypochaeris radicata*	FACU	x
stinging nettle	*Urtica dioica*	FAC+	
sweet vernalgrass	*Anthoxanthum adoratum*	FACU	x
sword fern	*Polystichum munitum*	FACU	
tall fescue	*Festuca arundinacea*	FAC-	x
tall mannagrass	*Glyceria elata*	FACW+	
thistle	*Cirsium* sp.	FACU	x
water parsley	*Oenanthe sarmentosa*	OBL	
western bitter-cress	*Cardamine occidentalis*	FACW+	
wheat brome	*Bromus secalinus*	NL	x
white clover	*Trifolium repens*	FACU+	x
lily-of-the-valley	*Maianthemum dilatatum*	FAC	
yellow iris	*Iris pseudacorus*	OBL	x

AR 008970

3.1.4.4 Upland Forest

Mixed deciduous and coniferous forest occurs throughout the project area. Red alder, big-leaf maple, western redcedar, Douglas fir, and black cottonwood are the most common tree species seen. Common shrubs include Indian plum, Himalayan blackberry, hazelnut, and English ivy. Creeping buttercup, sword fern, and bracken fern grow on the forest floor.

Douglas fir-dominated forest is found in portions of the borrow areas. Associated canopy species include big-leaf maple and western hemlock. The shrub layer is dominated by salal. Associated species include salmonberry, Himalayan blackberry, bracken fern, and Indian plum.

3.1.4.5 Upland Shrub Communities

Himalayan blackberry thickets occur throughout the study area in both upland and wetland locations, and blackberry is one of the most prevalent species in the project area. Relatively large thickets of Scots broom occur along unmowed edges of the airfield, in areas where houses have been removed, and along service roads.

3.1.4.6 Grassland

Much of the area north, west, and south of the airfield contains mowed grassland. Several small grassland areas are also located in the borrow areas. The most common species are sweet vernalgrass, bentgrass, perennial ryegrass, quackgrass, and white clover. In pastures in the west acquisition area, quackgrass and bluegrass are the dominant species. Tall fescue, thistle, dandelion, and perennial ryegrass also commonly occur. Large areas of mowed turf grasses occur on the Tyee Valley Golf Course and in residential lawns in the west acquisition area, and include ornamental trees, shrubs, and fruit trees.

3.2 WETLAND DESCRIPTIONS

One hundred and seventeen wetlands, two ponds, and ten channels (including Miller and Des Moines Creeks), were identified in the study area (Table 3; see Figures 4 and 5). Data collected at the wetlands are provided in Appendix B. Detailed maps and aerial photographs showing the location and extent of wetlands and the location of data plots are provided in Appendix D.

Table 3. Summary of wetland and Other Waters of the U.S. areas in the STIA Master Plan Update improvements area.

Wetland [a]	Classification [b]	Area (Acres)	Drainage Basin
North Employee Parking Lot Area			
1	Forest	0.07	Miller
2	Forest	0.73	Miller
	Subtotal	**0.80**	
Runway Safety Area Extension			
3	Forest	0.56	Miller
4	Forest	5.00	Miller

AR 008971

Table 3. **Summary of wetland and Other Waters of the U.S. areas in the STIA Master Plan Update improvements area (continued).**

Wetland [a]	Classification [b]	Area (Acres)	Drainage Basin
5	Forest/Scrub-Shrub	4.63	Miller
6	Scrub-Shrub	0.86	Miller
	Subtotal	**11.05**	
Third Runway Project Area			
North Airfield			
7[c]	Forest/Open Water/Emergent	6.68	Miller
8	Scrub-Shrub/Emergent	4.95	Miller
9	Forest/ Emergent (40/60)	2.83	Miller
10	Scrub-Shrub	0.31	Miller
11	Forest/Emergent (80/20)	0.50	Miller
12	Forest/Emergent (20/80)	0.21	Miller
13	Emergent	0.05	Miller
14	Forest	0.19	Miller
West Airfield			
15	Emergent	0.28	Miller
16	Emergent	0.05	Miller
17	Emergent	0.02	Miller
18	Forest/Scrub-Shrub/Emergent (50/20/30)	3.56	Miller
19	Forest	0.56	Miller
20	Scrub-Shrub/Emergent (90/10)	0.57	Miller
21	Forest	0.22	Miller
22	Scrub-Shrub/Emergent (90/10)	0.06	Miller
23	Emergent	0.77	Miller
24	Emergent	0.14	Miller
25	Forest	0.06	Miller
26	Emergent	0.02	Miller
W1	Emergent	0.10	Miller
W2	Forest/Emergent (20/80)	0.22	Miller
	Other Waters of the U.S.	0.02	Miller
Vacca Farm Site			
FW1	Farmed Wetland	0.03	Miller
FW2	Farmed Wetland	0.09	Miller
FW3	Farmed Wetland	0.59	Miller
FW5	Farmed Wetland	0.08	Miller
FW6	Farmed Wetland	0.07	Miller
FW8	Farmed Wetland	0.03	Miller
FW9	Farmed Wetland	0.01	Miller
FW10	Farmed Wetland	0.02	Miller
FW11	Farmed Wetland	0.11	Miller
	Other Waters of the U.S.	0.02	Miller

Table 3. Summary of wetland and Other Waters of the U.S. areas in the STIA Master Plan Update improvements area (continued).

Wetland [a]	Classification [b]	Area (Acres)	Drainage Basin
West Acquisition Area			
35a-d	Forest/Emergent (40/60)	0.67	Miller
37a-f	Forest/Emergent (70/30)	5.73	Miller
39	Forest/Scrub-Shrub/Emergent (25/50/25)	0.90	Miller
40	Scrub-Shrub	0.03	Miller
41a and b	Emergent/Open Water	0.44	Miller
44a and b	Forest/Scrub-Shrub (70/30)	3.08	Miller
A1	Forest/Scrub-Shrub/Emergent (15/15/70)	4.66	Miller
A2	Scrub-Shrub	0.05	Miller
A3	Scrub-Shrub	0.01	Miller
A4	Scrub-Shrub	0.03	Miller
A5	Emergent	0.03	Miller
A6	Forest	0.16	Miller
A7	Forest	0.30	Miller
A8	Forest/Scrub-Shrub (30/70)	0.38	Miller
A9	Scrub-Shrub	0.04	Miller
A10	Scrub-Shrub	0.01	Miller
A11	Scrub-Shrub	0.02	Miller
A12	Scrub-Shrub	0.11	Miller
A13	Forest	0.12	Miller
A14a and b	Forest/Scrub-Shrub/Emergent (50/25/25)	0.19	Miller
A15	Emergent	0.04	Miller
A16	Scrub-Shrub/Emergent (20/80)	0.09	Miller
A17	Forest/Scrub-Shrub/Emergent (20/80)	2.66	Miller
A18	Scrub-Shrub	0.01	Miller
A19	Emergent	0.04	Miller
Lora Lake	Open Water	3.06	Miller
	Other Waters of the U.S.	0.33	Miller
Riparian Wetlands			
R1	Emergent	0.17	Miller
R2	Scrub-Shrub/Emergent (70/30)	0.12	Miller
R3	Scrub-Shrub	0.02	Miller
R4	Emergent	0.11	Miller
R4b	Forest/Emergent (25/75)	0.11	Miller
R5	Emergent	0.05	Miller
R5b	Forest/Emergent (25/75)	0.07	Miller
R6	Forest/Emergent (25/75)	0.21	Miller
R6b	Emergent	0.09	Miller
R7	Forest/Emergent (25/75)	0.04	Miller
R7a	Emergent	0.04	Miller

AR 008973

Table 3. **Summary of wetland and Other Waters of the U.S. areas in the STIA Master Plan Update improvements area (continued).**

Wetland [a]	Classification [b]	Area (Acres)	Drainage Basin
R8	Scrub-Shrub/Emergent (40/60)	0.40	Miller
R9	Forest	0.38	Miller
R9a	Forest/Scrub-Shrub/Emergent (25/50/25)	0.74	Miller
R10	Scrub-Shrub	0.04	Miller
R11	Emergent	0.42	Miller
R12	Forest	0.03	Miller
R13	Emergent	0.12	Miller
R14a	Scrub-Shrub/Emergent (25/27)	0.13	Miller
R14b	Emergent	0.08	Miller
R15a	Forest/Scrub-Shrub/Emergent (25/65/10)	0.79	Miller
R15b	Forest/Emergent (25/75)	0.25	Miller
R17	Forest	0.31	Miller
	Subtotal	**51.33**	
Borrow Area 1			
32	Emergent	0.09	Des Moines
48	Forest/Emergent (20/80)	1.58	Des Moines
B1	Forest/Scrub-Shrub (30/70)	0.27	Des Moines
B4	Scrub-Shrub	0.07	Des Moines
B11	Emergent	0.18	Des Moines
B12[d]	Scrub-Shrub	0.63	Des Moines
B14	Scrub-Shrub/Emergent (70/30)	0.78	Des Moines
B15 a and b [d]	Scrub-Shrub	2.05	Des Moines
	Other Waters of U.S.	0.01	Des Moines
	Subtotal	**5.66**	
Borrow Area 3			
29	Forest	0.74	Des Moines
30	Forest/Scrub-Shrub (80/20)	0.88	Des Moines
B5	Forest/Scrub-Shrub (40/60)	0.08	Des Moines
B6	Forest/Scrub-Shrub (30/70)	0.55	Des Moines
B7	Forest/Scrub-Shrub (30/70)	0.03	Des Moines
B9	Forest	0.05	Des Moines
B10	Forest	0.02	Des Moines
	Subtotal	**2.35**	
South Aviation Support Area (SASA)/Tyee Valley Golf Course			
28 [d]	Scrub-Shrub/Emergent/Open Water (50/30/20)	35.45	Des Moines
52	Forest/Scrub-Shrub/Emergent (80/20/20)	4.70	Des Moines
53	Forest	0.60	Des Moines
G1	Emergent	0.05	Des Moines
G2	Emergent	0.02	Des Moines
G3	Emergent	0.06	Des Moines

AR 008974

Table 3. **Summary of wetland and Other Waters of the U.S. areas in the STIA Master Plan Update improvements area (continued).**

	Wetland [a]	Classification [b]	Area (Acres)	Drainage Basin
	G4	Emergent	0.04	Des Moines
	G5	Emergent	0.87	Des Moines
	G6	Emergent	0.01	Des Moines
	G7	Forest/Scrub-Shrub (30/70)	0.50	Des Moines
	G8	Emergent	0.04	Des Moines
	WH	Open Water	0.25	Des Moines
	DMC	Forest/Scrub-Shrub/Emergent	1.08	Des Moines
		Subtotal	**43.67**	
IWS Area				
	IWS a and b	Forest	0.67	Des Moines
		Subtotal	**0.67**	
South Aviation Support Area Detention Pond				
	E1	Forest	0.23	Des Moines
	E2	Forest	0.04	Des Moines
	E3	Forest	0.06	Des Moines
		Subtotal	**0.33**	Des Moines
TOTAL			**115.86**	

[a] Due to the number of wetlands, their location within the project area, and the history of their documentation, a wetland labeling protocol was developed.

- Wetlands with numbered designations (e.g., Wetland 35 or Wetland 44) were described by Shapiro and Associates, Inc. (FAA 1995).
- Wetlands with an 'A' designation (e.g., Wetland A5 or A10) are new wetlands occurring within the west acquisition area.
- Wetlands with an 'R' designation (e.g., Wetland R5 or R6) are new riparian wetlands occurring within the west acquisition area.
- Wetlands with a 'W' designation (e.g., Wetland W1 or W2) are new wetlands occurring within the west airfield area.
- Wetlands with a 'G' designation (e.g., Wetland G5 or G6) are new wetlands occurring within the Tyee Valley Golf Course or the SASA areas.
- Wetlands with an 'E' designation (e.g., Wetland E1 or E2) are new wetlands occurring within the SASA detention pond area.
- Wetlands with an 'IWS' designation (e.g., IWSa and IWSb) are new wetlands occurring near the IWS lagoon.
- Wetlands with a 'B' designation (e.g., Wetland B5 or B10) are new wetlands occurring within the borrow sites.
- Wetland numbers followed by a small case letter designate subsections of a wetland (i.e., Wetland 35a, or 35b) where constructed features (i.e., driveways) fragment a larger wetland.

[b] Numbers indicate approximate percentage of cover by respective wetland classes (Cowardin et al. 1979).

[c] Includes Lake Reba.

[d] Portions of the wetland area are estimated.

Several of the wetlands delineated by Shapiro and Associates and previously confirmed by ACOE (letter dated October 18, 1996, see Appendix E) were reexamined. No changes have been made to Wetlands 1 through 4, 6 through 17, 19, 21 through 26, 29, 32, 53, and portions of Wetland 18. The Draft Environmental Impact Statement (DEIS) descriptions (FAA 1995) and the Final Environmental Impact Statement (FEIS) areas (FAA 1996) of these wetlands are presented in Appendix E of this document.

AR 008975

Parametrix, Inc. modified boundaries of Wetlands 5, 20, 28, 30, 48, and 52 and the new wetland boundaries were verified by ACOE. Wetlands 20, 28, 30, 48, and 52 are described in this chapter, and Wetland 5 is described in Appendix E.

Due to property access restrictions, Shapiro and Associates, Inc. could not delineate and survey several wetlands that were identified in the DEIS and FEIS. These include Wetlands 35, 37, 40, 41, 44, and portions of Wetland 18. Parametrix, Inc. delineated and surveyed these wetlands and their boundaries were confirmed by ACOE. These wetlands are described in this chapter.

Additional wetlands, Wetlands 43, 51, and A20, are located near Master Plan Update improvements, but will not be impacted by the improvements (Table 4). Delineated portions of these wetlands that are close to construction activities were confirmed by ACOE. Wetland A20 will not be affected by Master Plan Update improvements and was not confirmed by ACOE.

Parametrix staff conducted the field investigations for wetlands from March 1998 to October 2000. ACOE made site visits to confirm wetland identifications and boundary delineations on July 6, 8, 14, and 16, 1998; August 6, 1998; September 23, 1998; October 19, 22, 27, and 29, 1998; November 17, 18, and 19, 1998; January 8 and 12, 1999; March 8, 1999; June 7 and 21, 1999; August 2, 1999; January 18, 2000; February 3, 2000; October 26, 2000; and November 3, 8, 20, and 30, 2000.

Table 4. Significant wetlands near the STIA project area (areas are estimated).

Wetland	Classification [a]	Approximate Area (Acres)	Drainage Basin
43	Forest/Scrub-Shrub/Emergent (25/50/25)	33.4	Miller
51	Forest/Scrub-Shrub (30/70)	16.0	Des Moines
A20	Emergent	0.3	Miller
	TOTAL	**49.7**	

[a] Numbers indicate approximate percentage of cover by respective wetland classes (Cowardin et al. 1979).

3.2.1 North Employee Parking Lot Area

The North Employee Parking Lot Area is located between SR 518 and South 146th Street and between 16th Avenue South and 22nd Avenue South. The wetlands in this area will not be impacted by Master Plan Update improvements.

Shapiro and Associates (FAA 1995) delineated two predominantly forested wetlands, identified as Wetlands 1 and 2, in this area during previous investigations; ACOE confirmed their boundaries (see Appendix E). The locations of these wetlands are shown in Figure 4 and on Maps No. 2 and 3 in Appendix D, and are described in Appendix E.

AR 008976

3.2.2 Runway Safety Area Extension

The RSA extension area lies north of the existing runways in the area bounded on the south by South 154th Street and on the north by SR 518. Northward expansion of the RSA will require relocation of South 154th Street. Houses that were once located in this area were removed during the 1960s and 1970s. The old residential streets provide access to most of the area.

The area is predominantly forested and contains the Miller Creek Detention Facility (Wetland 9). The surrounding system of wetlands is referred to as the Lake Reba wetland complex. Lake Reba (approximately 3 acres of open water) is contained within Wetland 7. Miller Creek enters the north end of the area and flows past the north end of Lake Reba.

Shapiro and Associates (FAA 1995) delineated four wetlands, identified as Wetlands 3 through 6, in this area during previous investigations; ACOE confirmed their boundaries (see Appendix E). The locations of these wetlands are shown in Figure 4 and on Maps No. 2 and 3 in Appendix D, and descriptions are provided in Appendix E. Parametrix staff evaluated the wetlands for changed conditions during site investigations in 1999, and minor changes were made to Wetland 5. An additional 0.05 acre was added to Wetland 5 to increase its size to a total of 4.63 acres.

3.2.3 Third Runway Project Area

As previously noted, portions of this area will be affected by construction of the new third runway, stormwater management facilities, other support facilities, and wetland or stream mitigation. For discussion purposes, the area is divided into four sub-areas: the north airfield, the west airfield, the west acquisition area, and the Vacca Farm site.

3.2.3.1 North Airfield

In this area the terrain slopes to the north and northeast and is generally forested. Eight wetlands, identified as Wetlands 7 through 14, were delineated in this area during previous wetland investigations (FAA 1996 and Appendix E), and their boundaries were confirmed by ACOE (see Appendix E). Wetland locations are shown in Figure 4 and in Maps 2, 3, and 5 in Appendix D. During site investigations in 1998 and 1999, the wetlands were examined for changed conditions; no changes to previously delineated boundaries were made.

3.2.3.2 West Airfield

The west airfield lies west of the existing airfield, south of South 154th Street, and east of 12th Avenue South. The terrain slopes to the west and is generally forested. Wetlands in this area will be filled for construction of the new runway.

Twelve wetlands (Wetlands 15 through 26) located in this area were delineated during previous wetland investigations (FAA 1996); their boundaries were confirmed by ACOE (see Appendix E). Appendix E contains descriptions of these wetlands. During site investigations in 1998 and 1999, Wetland 20 was redelineated to include additional wetland areas (20a and 20b), and Wetlands W1 and W2 were identified and delineated. These wetlands are described below. Wetland locations are shown in Figure 4, and on Maps 5, 6, 10, 12, 14, and 15 in Appendix D.

AR 008977

Wetland 20
USFWS Classification: PSS/EM
Size: 0.57 acre
Wetland data plots: 20a-A1, 20a-A2, 20b-A
Upland data plots: None
Maps No. 10, 12

Wetlands 20a and 20b lie west of the airfield and east of 12th Avenue South in a shallow drainageway on a west-facing slope. Wetland 20 was originally described in the FEIS (FAA 1996) as a 0.16-acre scrub-shrub/emergent wetland. During a January 1999 site visit, three additional wetland areas surrounding and hydrologically connected to Wetland 20 were delineated. Emergent wetlands located northwest and a forested/scrub-shrub area to the southeast of the original Wetland 20 were delineated and mapped as Wetland 20a. A small forested/scrub-shrub wetland area to the north is mapped as Wetland 20b. The area to the north is connected to the other wetland areas via a non-wetland swale (identified in this report as Water W).

<u>Hydrology:</u> The wetland may receive surface runoff from the airfield to the east and groundwater from hillside seeps. Water leaving the wetlands drains to a swale (Water W) that flows toward the northwest to a drainage ditch along 12th Avenue (Water A). A culvert beneath 12th Avenue conveys this surface water into Wetland 37. During the January 1999 site visit, portions of the wetland were inundated with several inches of water, and surface water was flowing downslope through the wetland.

<u>Soils:</u> Soil characteristics vary throughout the wetland. Near the west end, the wetland soils are black (10YR 2/1) muck. Farther downslope, wetland subsoils are a light brownish gray (2.5Y 6/2) loamy sand with mottles. Within the small lobe at the north end of the wetland, the soils are disturbed and are very dark grayish brown (10YR 3/2) loam without mottles. Although this soil does not meet color criteria of a hydric soil, the soil was determined to be hydric because the area was inundated for at least two weeks during the growing season in February and March 1999.

<u>Vegetation:</u> The shrub community is dominated by Himalayan blackberry and salmonberry. Red alder and black cottonwood trees occur in places. The emergent community is comprised of fireweed, field horsetail, creeping buttercup, small-fruited bulrush, and American brooklime. Grasses present in the area include creeping bentgrass and common velvet-grass.

<u>Upland:</u> The upland area is dominated by big-leaf maple and Himalayan blackberry. The soils are well drained and no evidence of wetland hydrology is apparent.

<u>Delineation:</u> The wetland boundary was delineated based on changes in hydrology, soil characteristics, and vegetation.

AR 008978

Wetland W1
USFWS Classification: PEM
Size: 0.10 acre
Wetland data plot: W1-A
Upland data plot: W2-B
Map No. 10

Wetland W1 is located in a shallow depression and immediately south of temporary water treatment ponds that are located between the airfield and 12th Avenue South. A paved security road borders the west side of the wetland.

Hydrology: Hydrology is supported by precipitation and runoff. During portions of 1999, treated stormwater from the treatment ponds was pumped upslope of this wetland, which may have supplied additional water to this area. Portions of the wetland were inundated to a depth of 4 inches during the January 1999 site visit. Inundation was also observed during the March 8, 1999 ACOE visit. There is no surface water outlet from the wetland.

Soils: The soil beneath the A horizon is black (10YR 2/1) loam with mottles. A sulfidic odor was detected during soil sampling.

Vegetation: The emergent community is comprised of bentgrass, soft rush, and reed canarygrass. Himalayan blackberry and black cottonwood saplings are scattered throughout the wetland.

Upland: The forested upland area surrounding the wetland contains black cottonwood and red alder with an understory of dense Himalayan blackberry and reed canarygrass. Greater than 50 percent of the dominant plant species is hydrophytic. However, the soils are non-hydric. The subsoil is dark grayish brown (10YR 4/2) silt loam without mottles.

Boundary: The wetland boundary was delineated based on changes in soil characteristics and vegetation associated with the presence of wetland hydrology. The western margin of the wetland was delineated along the edge of access road fill.

Wetland W2
USFWS Classification: PFO/EM
Size: 0.22 acre
Wetland data plot: W2-A
Upland data plot: W2-B
Map No. 10

AR 008979

Wetland W2, which is located on a hillslope west of the airfield and south of Wetland W1, sits in a closed depression.

Hydrology: Wetland hydrology is supported by precipitation, runoff, and shallow groundwater. There is no surface water outlet from the wetland. During the January 1999 site visit, soils were saturated at a depth of 1 inch from the surface, and a water table was observed at a depth of 10 inches.

Soils: The soil beneath the A horizon is very dark gray (10YR 2/1) gravelly loam without mottles.

Vegetation: The emergent community is dominated by reed canarygrass. Himalayan blackberry shrubs, red alder trees, and black cottonwood trees are scattered throughout the wetland.

Upland: A deciduous forest community surrounds the wetland and is composed of black cottonwood and red alder with an understory of dense Himalayan blackberry and reed canarygrass. More than 50 percent of the dominant plant species is hydrophytic, although the soils are non-hydric. The subsoil is dark grayish brown (10YR 4/2) silt loam without mottles.

Delineation: The wetland boundary was delineated based on the presence of wetland hydrology and hydric soils.

3.2.3.3 Other Waters of the U.S.

One area (Water W) within the west airfield area is classified as Waters of the U.S. This area conveys natural surface runoff within a natural drainage channel that lacks wetland soil or vegetation. East of 12th Avenue South, Water W is 337 ft long by 3 ft wide (0.02 acre) and conveys water from Wetland 20 to a culvert on the east side of the perimeter fence along 12th Avenue South. The culvert drains to Water A located along the west side of the 12th Avenue South perimeter fence. Portions of these areas are mapped as streams by King County (1990a).

3.2.3.4 Vacca Farm Site

Past agricultural use and historical documentation of inundation within the Vacca Farm site area were determined by examining aerial photographs taken between the May 1965 and April 1995 (available at the University of Washington Library). Except for areas fringing Miller Creek or drainage ditches and land southeast of Lora Lake, the area has been in agricultural uses since at least 1965. Aerial photographs were taken during the dry part of the year and, therefore, failed to demonstrate that ponding occurs on the site. Additionally, no records for the site were available from the USDA offices.

Based on field observations, nine low-lying areas within the Vacca Farm site satisfied the criteria for farmed wetlands. These areas (FW1, FW2, FW3, FW5, FW6, FW8, FW9, FW10, and FW11) had hydric soil and were inundated for more than 15 days in the growing season (see Figure 4, and Maps No. 1 and 4 of Appendix D). The areas range in size from 0.01 to 0.59 acre and reach a total combined size of 1.03 acres. The boundaries of these farmed wetlands were observed over two winters with above normal precipitation (1998 and 1999). Except for FW11, the analysis was conducted in late February 1999, following 4 months of above normal to near record rainfall. These wet periods allowed accurate determination of farmed wetland boundaries over a 2-year period and served as the basis of ACOE's confirmation of the delineation. Due to property access limitations, FW11 was delineated from aerial photos taken in March of 1974 following ACOE guidance. March of 1974 was a month of above normal precipitation.

Other actively farmed areas within the Vacca Farm site parcels were found to meet the criteria for PC cropland. These areas total 7.88 acres and have hydric soils and saturation within 12 inches of the soil surface for more than 15 consecutive days. However, these areas lacked inundation for at least 15 consecutive days and, therefore, do not meet the criteria for FWs according to the FSA (Section 514.22). It is likely that these areas were wetlands before being converted to active farmland. Federal jurisdiction is not taken over PC cropland according to the CWA requirements. The analysis for PC cropland at the Vacca Farm site parcels is summarized in Appendix C.

3.2.3.5 Other Waters of the U.S.

Two drainage ditches within the Vacca Farm site are classified as Waters of the U.S. These maintained ditches, Waters V1 and V2, total about 0.02 acre (V1 is approximately 215 ft long by 2 ft wide and V2 is approximately 155 ft long by 2 ft wide). The channels convey flowing water from tile drains to Wetland A1 and do not contain wetland vegetation.

3.2.3.6 West Acquisition Area

The portion of the west acquisition area addressed in this document was a former residential area located west of 12th Avenue South and generally east of Miller Creek. It was acquired by the Port for the construction of the third runway, the associated stormwater management and other support facilities, and noise mitigation. Property located west of Miller Creek is in the process of being acquired by the Port.

Wetlands identified and delineated within the west acquisition area during the 1998-2000 field investigations are described below. Wetlands 18, 35, 37, 39, 40, 41, and 44 were identified during a previous wetland investigation (FAA 1996); however, they were not delineated because permission to access the properties had not been obtained. In previous studies, the wetlands were identified using aerial photographs and from observations made from public streets. These wetlands were delineated during the 1998-2000 field investigations. Additional wetlands were identified in the west acquisition area during the 1998-2000 field investigations. These isolated wetlands in the acquisition area are identified as Wetlands A1 through A19. Riparian wetlands along Miller Creek are labeled Wetlands R1 through R15 and R17.

Wetland 18
USFWS Classification: PFO/SS/EM
Size: 3.56 acres
Wetland data plots: 18-A1, 18-A2, 18-A3
Upland data plots: 18-B1, 18-B2, 18-B3, 18-B4
Maps No. 7, 9, 10

The eastern portion of Wetland 18 is in a shallow ravine that begins east of 12th Avenue South west of the airfield. The wetland drains through a culvert beneath 12th Avenue South, into a narrow drainage ditch, then widens into a broad emergent and forested area that slopes westward to Miller Creek. Riparian portions of Wetland 18 connect to riparian portions of Wetland 37.

Wetland 18 has been filled in several locations to develop residential properties and these fill pads form the wetland boundary in many locations. A large portion of the wetland west of 12th Avenue South has been grazed, and a tilled garden is located at the north end of the wetland. A young red alder forest grows at the western end of the wetland along Miller Creek.

AR 008981

The portion of Wetland 18 east of 12th Avenue South was delineated for the FEIS (FAA 1996). The portion of the wetland located west of 12th Avenue South was delineated during site visits conducted in July, October, and November 1998.

Hydrology: Wetland hydrology is supported by groundwater discharge and precipitation. The wetland is located on a slope, and water entering the wetland flows west to Miller Creek. Periodic flooding of Miller Creek augments hydrology in limited riparian areas. On several site visits, Parametrix staff observed standing water in the northern portion of Wetland 18 and soil saturation within 12 inches of the surface was present throughout the remainder of the wetland. Oxidized rhizospheres, an indicator of prolonged saturation during the growing season, were also observed in several locations.

Soils: Within the wetland, surface soils are black (10YR 2/1) or very dark gray (10YR 3/1). Soils immediately below the A horizon typically ranged from black (10YR 2/1) to dark grayish brown (10YR 4/2) with mottles. Soil textures ranged from clay loam to gravelly sandy loam.

Vegetation: East of 12th Avenue South, the forested wetland overstory is a mixture of red alder, big-leaf maple, and western redcedar trees. The shrub layer is dominated by salmonberry. Associated forbs include giant horsetail and lady fern. West of 12th Avenue South, the forested wetland community is dominated by red alder. In some areas, Himalayan blackberry dominates the understory. Forested areas along Miller Creek have an understory dominated by creeping buttercup and lady fern. Shrub communities are typically dominated by Himalayan blackberry. Grazed and mowed emergent communities are dominated by redtop and common velvet-grass with perennial ryegrass, sawbeak sedge, giant horsetail, and small-fruited bulrush as associated species. Other emergent plants consist of reed canarygrass and soft rush with a few skunk cabbages.

Upland: Surrounding upland areas include yards, gardens, and other disturbed vegetation on fill. Herbaceous vegetation is predominantly bluegrass, creeping bentgrass, fescue, and reed canarygrass. Communities dominated by giant horsetail occur in some areas. Where present, forested areas are dominated by red alder and big-leaf maple, with Himalayan blackberry as the dominant shrub. Many upland areas are dominated by greater than 50 percent wetland plants. However, these areas do not have hydric soils or wetland hydrology and, therefore, are not wetlands.

Subsurface horizons of adjacent upland soils generally range from very dark yellowish brown (10YR 3/2) to yellowish brown (10YR 5/4) without mottles. An exception to this occurs at Plot 18-B2, where soils are dark yellowish brown (10YR 3/2) with mottles throughout. These soils were determined by ACOE to be fill material with relict hydric soil colors, and, therefore, not wetland soils.

Delineation: The western wetland boundary was delineated along the ordinary high water mark (OHWM) of Miller Creek. On some residential lots where lawns were present, the wetland boundary was delineated at the limits of wetland hydrology along the edges of fill pads. On Parcel 281, where facultative plants dominate vegetation, the wetland edge was based on changes of soil color and hydrology. In remaining areas, the wetland boundary was determined by the presence of wetland vegetation growing on hydric soil with the presence or indicators of wetland hydrology.

AR 008982

Wetland 35
USFWS Classification: PFO/EM
Size: 0.67 acre
Wetland data plots: 35a/b-A, 35c-A, 35d-A
Upland data plots: 35c-B, 35d-B
Map No. 7

Wetland 35, located on a gentle slope along the south side of South 160th Street, lies in a shallow drainage swale that terminates in a French drain at its westernmost end. Driveways segment the wetland into four sections (Wetlands 35a through 35d). Culverts beneath the driveways hydrologically connect these wetland areas.

Hydrology: Wetland hydrology is supported by seasonal shallow groundwater and surface water runoff. A French drain and culvert at the west end of the wetland collects surface water and directs it to roadside ditches and storm sewers that eventually convey the water to Miller Creek. At the time of the July 1998 site visit, soils were generally saturated to the soil surface throughout most of the wetland. In Wetland 35a, the soils were not saturated; however, wetland drainage patterns were present.

Soils: Within the wetland, the soil immediately below the A horizon typically ranged from black (10YR 2/1) silt loam to dark grayish brown (2.5Y 4/2) sand with mottles.

Vegetation: Black cottonwood and red alder dominate the small area of forested wetland with bittersweet nightshade, giant horsetail, and skunk cabbage in the understory. The emergent community is dominated by lawn grasses. However bentgrass, common velvet-grass, tall mannagrass, giant horsetail, and lady fern occur in localized unmowed areas.

Upland: Surrounding uplands are dominated by mowed lawn and ornamental woody plants. Subsurface soil color ranges from brown (10YR 4/3) with mottles to dark yellowish brown (10YR 4/4) without mottles. Soil textures range from silt loam to sandy loam.

Delineation: The eastern portion of the wetland was delineated based on the presence of hydric soils and wetland hydrology indicators. The western portion of the wetland was delineated based on the presence of hydric soils and wetland hydrology.

Wetland 37
USFWS Classification: PFO/EM
Size: 5.73 acres
Wetland data plots: 37a-A1, 37a-A2, 37a-A3, 37e-A, 37f-A
Upland data plots: 37a-B1, 37a-B2, 37e/f-B
Map No. 9

Wetland 37 is located west of 12th Avenue South, between South 160th Street and South 166th Place. A previous wetland investigation (FAA 1996) identified only a portion of this wetland. During the 1998/1999 investigation, project personnel determined the wetland to be much larger than previously identified, and it was found to be hydrologically connected to Wetland 18.

AR 008983

The wetland has been fragmented by residential development into six sections (labeled 37a through 37f). Wetland 37a, the largest wetland section (5.09 acres), is located on the east bank of Miller Creek. Wetlands 37b and 37c drain to Wetland 37a from the north, and Wetlands 37d, 37e, and 37f drain to the same section from the south.

Hydrology: Wetland hydrology throughout most of the wetland is supported by groundwater seepage from upslope areas. Portions of the western side of the wetland are occasionally flooded by Miller Creek. The wetland conveys groundwater seepage, surface water runoff, and discharge from Wetland 20 to Miller Creek. During the October 1998 site visit, soils were saturated within 12 inches of the surface throughout most of the wetland, and inundation and flowing were present in the center of Wetland 37a. Because the site visit was conducted during the dry season, wetland hydrology was not evident in some places near the wetland margin. These areas were assumed to have wetland hydrology because they have hydric soils and support wetland vegetation.

Wetland 37a receives water from several sources, including seepage water entering through a culvert beneath 12th Avenue South and overbank flow from Miller Creek.

Water entering the north side of Wetland 37 originates as groundwater that surfaces in Wetland 19 and flows via a culvert beneath 12th Avenue South to Wetlands 37b, Wetland 37c, and finally via a French drain to Wetland 37a. During the October 1998 site visit, saturation within 12 inches of the soil surface and areas of shallow inundation and flowing water were observed in these wetlands.

Water entering the south side of the wetland flows through three discontinuous wetlands (Wetlands 37f through Wetland 37e, then through Wetland 37d) that are maintained by groundwater seeps. Wetland 37f is located on a small bench at the highest elevation of the drainage. A portion of Wetland 37f drains northward to Wetland 37e via surface and subsurface flow, and an additional portion drains westward to Wetland A9 via a drainage channel (Water B). Wetland 37e drains through a culvert to a small ravine (Wetland 37d) where the flowing water is impounded by driveway fill at the northern end of the wetland section. The impounded water drains through two 4-inch pipes for approximately 200 feet to Wetland 37a. During the July 1998 site visit, soils were saturated to the surface in Wetland 37e, and Wetlands 37f and 37d were inundated.

Water entering the east side of the wetland originates in Wetland 20, Wetland 21, and Water A. These flows combine in Water W and are carried to the wetland through a culvert beneath 12th Avenue South.

Soils: Within Wetland 37, soil colors immediately below the A horizon typically ranged from black (10YR 2/1) to dark brown (10YR 2/2) with mottles. Soil textures ranged from sandy clay loam to silt loam, with some areas of organic muck in Wetland 37a.

Vegetation: The largest portion of Wetland 37 is predominantly a red alder-dominated forest with an understory of Himalayan blackberry, field horsetail, and lady fern. A shrub community in Wetland 37a is dominated by salmonberry with water parsley and skunk cabbage in the understory. Red alder with an understory of Sitka willow, field horsetail, and Himalayan blackberry dominates forested communities in Wetland 37e and 37f; skunk cabbage occurs in low spots. Himalayan blackberry and salmonberry dominate shrub communities of these wetlands. The northern portion

AR 008984

of Wetland 37 is emergent pasture dominated by colonial bentgrass, common velvet-grass, and creeping buttercup.

Upland: Upland areas surrounding Wetland 37 include disturbed lawns, pasture, undeveloped hillslopes, and roads. Dominant plants include colonial bentgrass, reed canarygrass, and common velvet-grass with patches of Himalayan blackberry. Although some upland areas are dominated by greater than 50 percent wetland plants, these areas do not have hydric soils or wetland hydrology and, therefore, are not wetland. The soil color immediately below the A horizon generally ranged from dark yellowish brown (10YR 3/2) without mottles to olive (5Y 5/3) with mottles.

Delineation: The wetland boundaries of the smaller sections of Wetland 37 were based on distinct changes in hydrology, vegetation composition, and soil color. The western boundary of Wetland 37a was delineated at the ordinary high water mark (OHWM) along Miller Creek, and portions of the eastern and southern boundaries were delineated at the edge of fill associated with 12th Avenue South and several driveways.

Wetland 39
USFWS Classification: PFO/SS/EM
Size: 0.90 acre
Wetland data plots: 39-A1, 39-A2, 39-A3, and 39-A4
Upland data plots: 39-B1, 39-B2, and 39-B3
Map No. 11

Wetland 39 is a 0.90-acre shrub and forested slope wetland located east of 8th Avenue South and north of Wilson Road. The wetland consists of two parts separated by an upland slope. The area was identified in the FEIS (FAA 1996). The site has been disturbed by logging and farming.

Hydrology: Direct indicators of hydrology were observed in Wetland 39 during several site visits in both the dry (August 1999) and wet season (February 2000). Shallow groundwater expresses at the soil surface throughout the wetlands. Groundwater seeps and discharge from a 12-inch plastic stormwater pipe coalesce in a ravine at the eastern lobe of Wetland 39. This flowing water descends downslope in sheet and channelized flow. The surface water is collected in a cement ditch at the terminus of Wetland 39's western lobe and is directed into the storm sewer on Wilson Road. Other areas in Wetland 39 range from seasonally to permanently saturated.

Soils: Within Wetland 39, the soil immediately below the A horizon typically ranged from grayish brown (2.5Y 5/2) gravelly loam to black (10YR 2/1) loam with mottles throughout.

Vegetation: Within Wetland 39, black cottonwood and red alder dominate the small area of forested wetland, with Himalayan blackberry and giant horsetail in the understory. Himalayan blackberry dominates the shrub portion of the wetland, with giant horsetail and creeping buttercup present in the understory.

Upland: Surrounding uplands are dominated by mowed lawn, Himalayan blackberry, or upland forest. Subsurface soil color ranges from dark brown (10YR 3/3) with mottles to reddish brown (10YR 4/4) without mottles. Soil textures range from silt loam to clay loam.

AR 008985

Delineation: Wetland 39 was delineated based on the presence of hydric soils, wetland hydrologic indicators, wetland hydrology, and hydrophytic plants.

Wetland 40
USFWS Classification: PSS
Size: 0.03 acre
Wetland data plot: 40-A
Upland data plot: 41b-B
Map No. 12

Wetland 40 is an isolated wetland in a steep-sided depression located at the northwest corner of 12th Avenue South and South 170th Street.

Hydrology: Surface water runoff and shallow groundwater maintain wetland hydrology. No surface water drains from this wetland. Wetland hydrology was not present during dry season sampling (October 1998), but is assumed to occur in the wetland based on the presence of watermarks, sediment deposits, and wetland drainage patterns. Standing water was observed in the wetland on December 1, 1998. Stormwater runoff from 12th Avenue South enters the wetland through a culvert located at the southern edge of the wetland.

Soils: Soils within the wetland are very dark grayish brown (10YR 3/2) sandy loam with abundant mottles.

Vegetation: The shrub community of Wetland 40 is dominated by Pacific willow and Himalayan blackberry. Yellow iris grows in the center of the wetland.

Upland: The surrounding upland is similar to the upland surrounding Wetland 41b.

Delineation: The boundary of Wetland 40 was delineated based on the presence of wetland vegetation, hydric soil characteristics, and wetland hydrologic indicators. These wetland conditions correspond to sharp changes in topography.

Wetland 41a
USFWS Classification: PEM/POW
Size: 0.35 acre
Wetland data plot: 41a-A
Upland data plot: 41b-B
Map No. 12

Wetland 41a is located south of South 168th Street and west of 12th Avenue South within a grazed pasture. The wetland is a small farm pond surround by wet pasture. Ducks and cattle graze the wetland and surrounding buffer. Soils within the wetland have been disturbed by grading and tilling.

Hydrology: Wetland 41a occurs in a shallow closed depression where precipitation and localized runoff collect. At the time of the October 1998 site visit, the pond was inundated with about 10 inches of water, but wetland hydrology was not present in the surrounding emergent (pasture) areas.

AR 008986

Seasonal wetland hydrology was assumed to be present in portions of the pasture based on the presence of hydrophytic vegetation and hydric soils.

Soils: The soil in the wetland is compacted due to cattle grazing and is a very dark grayish brown (10YR3/2) loam with mottles.

Vegetation: The heavily grazed emergent community is dominated by bluegrass. White clover, broadleaf plantain, and pineapple weed are associated species. The open-water area is unvegetated. Red alder and black cottonwood saplings and a few Pacific willow shrubs grow along the edge of the water.

Upland: Upland vegetation and soils are the same as described for uplands around Wetland 41b.

Delineation: Along the north and east wetland boundary, the delineation was based on the OHWM of the pond, which corresponds to the presence of hydric soils. Along the west and south wetland boundary, the delineation was based on the presence of hydric soil colors and wetland vegetation.

Wetland 41b
USFWS Classification: PEM
Size: 0.09 acre
Wetland data plot: 41b-A
Upland data plot: 41b-B
Map No. 12

Wetland 41b is located approximately 100 ft south of Wetland 41a. Ongoing grazing has disturbed vegetation within the wetland, and grading and tilling have disturbed the soils.

Hydrology: Wetland 41b occurs in a shallow closed depression that is seasonally saturated by precipitation and local runoff. Because the wetland was examined during the dry season (October 1998), wetland hydrology was not observed. The presence of wetland drainage patterns combined with topographic conditions and the observation of flooding during the winter months (December 1998) indicate seasonal wetland hydrology.

Soils: The upper 10 inches of the wetland soil were dry and compacted, and are very dark grayish brown (10YR3/2) loam with mottles. Below a depth of 10 inches, the soil is a dusky red (2.5YR3/2).

Vegetation: The emergent community is dominated by bluegrass and is grazed to such an extent that identification to species was not possible. Associated species include creeping bentgrass, pineapple weed, and broadleaf plantain. Based on the presence of hydric soils and wetland hydrology, ACOE assumes hydrophytic species would dominate the area if grazing were discontinued.

Upland: In the surrounding upland, white clover, creeping bentgrass, and spotted cat's-ear dominate vegetation. The upper 12 inches of upland soil are dark brown (10YR3/3) sandy loam with mottles. Below a depth of 12 inches, the soil is dark yellowish brown (10YR3/4) with no mottles.

AR 008987

Delineation: Because the delineation was conducted during the dry season, wetland boundaries were identified based on the presence of hydric soil.

Wetland 44
USFWS Classification: PFO/SS
Size: 3.08 acres
Wetland data plots: 44-A1, 44A-2, 44-A3, 44-A4
Upland data plot: 44-B1, 44-B2, 44-B3, 44-B4
Maps No. 13, 14

Wetland 44 is located in a steep-sided ravine between South 174th Street and SR 509. The base of the ravine is crossed by SR 509 road fill, which creates an artificial depression. Water entering the ravine is conveyed in a culvert beneath SR 509 to a ditch on the west side of the highway, and then to Wetland 43 (see FAA 1996), which is the source of Walker Creek, a tributary of Miller Creek. The wetland was examined during several site visits between July 1998 and October 2000. In June 2000, approximately 0.01 acre of wetland occurring on the SR 509 road fill was added to Wetland 44b. In October 2000, the eastern edge of the wetland was modified when about 0.25 acre was determined to be upland.

Hydrology: Wetland 44 is maintained by groundwater that seeps from upslope areas. Groundwater seeps concentrate into a small creek near the downslope end of the ravine. During the site visits, flowing water, discontinuous surface water, or soil saturation within 12 inches of the surface were evident within the wetland.

Soils: Colors of mineral soils immediately below the A horizon typically range from dark brown (10YR 2/2) with mottles to gleyed colors (N4/7 and 5BG5/1). Textures range from loam to sand. Organic soils within the wetland include black (10YR2/1) peat and very dark brown (7.5YR 2.5/2) muck.

Vegetation: Wetland 44 is a forested wetland that is fringed by shrub communities. The forested component is dominated by an open canopy of red alder, with lesser amounts of big-leaf maple, willow, and bitter cherry. Himalayan blackberry, Sitka willow, Pacific willow, salmonberry, and vine maple occur in the shrub layer. The herbaceous understory, when present, is dominated by giant horsetail, lady fern, tall mannagrass, and reed canarygrass. A shrub community that occurs near the edge of the wetland is dominated by Himalayan blackberry in many areas, with salmonberry, Sitka willow, and Pacific willow in others.

Upland: Upland forest communities surrounding the wetland are dominated by big-leaf maple, red alder trees with Indian plum, and large amounts of Himalayan blackberry. Also present in the shrub layer are red alder saplings, vine maple, salmonberry, and English holly. Large amounts of English ivy are found in portions of the understory. Limited upland areas (data plot 44-B1) have hydric soils, but were determined to be non-wetland because they lack hydrophytic vegetation.

Delineation: The western margin of the wetland was delineated near the toe of the SR 509 fill slopes. The remaining wetland boundary was delineated based on the presence of wetland hydrology, hydric soils, and wetland vegetation.

AR 008988

Wetland A1
USFWS Classification: PFO/SS/EM
Size: 4.66 acres
Wetland data plots: A1-A1, A1-A2, A1-A3, A1-A4, A1-A5
Upland data plots: A1-B1, A1-B2, A1-B3, A1-B4
Maps No. 1, 4

Wetland A1 is located in the Vacca Farm site area. The wetland is a scrub-shrub/forested system that includes Lora Lake to the north, and is bound by Miller Creek to the east and the Vacca Farm site to the south and west. The wetland extends to the south, forming emergent and forested riparian wetland along the banks of Miller Creek. Another elongated band of emergent and scrub-shrub wetland parallels a ditch that drains to Miller Creek. Site visits took place in April, July, and September 1998, June 1999, and September 2000.

Wetland A1a is an emergent wetland located on the western edge of Parcel 062R. The wetland has a ditch that drains through a culvert to Wetland A1 at the eastern edge of Parcel 062R.

Hydrology: In the northern portion of the wetland and the Miller Creek riparian area (data plots A1-A1 and A1-A2) soils were saturated to the surface and free water was observed within 10 inches of the surface in April 1998. Wetland hydrology was not observed in the western arm of the wetland during the dry season (July and September). The area was assumed to have wetland hydrology based on the presence of wetland vegetation and hydric soils. During later field visits (November 1998 through February 1999), wetland hydrology was observed throughout Wetland A1. Adjacent to Lora Lake, the soils were saturated at 6 inches and oxidized root channels were present during a September 2000 site visit.

Soils: Within the wetland, mineral soils occur along the creek and the drainage ditch. Immediately below the A horizon, soil colors typically range from black (10YR 2/1) with mottles to very dark gray (7.5YR 3/1) with mottles. Most of the wetland has organic soils consisting of black (10YR2/1) muck over dark yellowish brown (10YR 4/4) peat. Adjacent to Lora Lake, the soils are a gray (10RY 5/1), very sandy loam with mottles.

Vegetation: Emergent communities in the northern part of the wetland are predominantly reed canarygrass. Emergent areas in the southern lobes are dominated by bentgrass, common velvet-grass, small-fruited bulrush, birdsfoot trefoil, and creeping buttercup. The forested community has a red alder and black cottonwood canopy with an understory dominated by Himalayan blackberry. The shrub community is dominated by Himalayan blackberry. Bittersweet nightshade and nettles are often associated with the blackberry. Adjacent to Lora Lake, the vegetation consisted of lawn grass.

Upland: Agricultural activities or housing development have disturbed all upland areas surrounding Wetland A1. Upland data plots A1-B1 and A1-B2 are located in PC cropland. These are actively farmed areas with no vegetation and black organic soils (10YR 2/1). Upland data plot A1-B3 was located in a disturbed area between a house and Miller Creek. The woody vegetation contains predominantly ornamental species with lawns of bentgrass and velvet-grass. The soil color immediately below the A horizon is dark brown (10YR 2/2) without mottles.

AR 008989

The upland area adjacent to Lora Lake consists mainly of maintained lawns that lack indicators of wetland hydrology or hydric soils.

Delineation: The northern edge of the Wetland A1 was delineated along the southern margin of Lora Lake. Portions of the wetland adjacent to farmed wetlands were delineated along the boundary between the vegetation and the tilled soils. The southern extreme of the wetland was delineated along fill margins. The remaining segments of the wetland boundary were delineated based on the presence of wetland hydrology, vegetation, and soil characteristics.

Wetlands A2, A3, and A4
USFWS Classification: PSS
Size: A2 = 0.05 acre, A3 = 0.01 acre, A4 = 0.03 acre
Wetland data plots: A2-A, A3-A, A4-A
Upland data plot: A2-B, A3/4-B
Maps No. 1, 4

Wetlands A2, A3, and A4 are Himalayan blackberry-dominated wetlands located on the Vacca Farm site. The wetlands are surrounded by farmland. Fill for a parking area forms the western margin of Wetland A2.

Hydrology: At the time of April 1998 site visit, Wetland A2 was saturated to within 4 inches of the soil surface, Wetland A3 was saturated to within 6 inches of the surface, and Wetland A4 was inundated with up to 6 inches of water.

Soils: Soils in Wetland A2 are black (10YR 2/1) sandy loam over gleyed subsoils of bluish black (10B 5/1) sandy loam. Below a depth of 4 inches, soils in Wetlands A3 and A4 are black (10YR 2/1) and very dark brown (10YR 2/2) peat.

Vegetation: Dense thickets of Himalayan blackberry vegetate the wetlands. Creeping buttercup is present in places, particularly near the wetland edge. Although Himalayan blackberry is not rated as a wetland plant, the presence of wetland hydrology and hydric soil conditions indicate the area is wetland, in accordance with guidelines in ACOE Public Notice (1994).

Upland: The area surrounding these wetlands is tilled as part of ongoing farming operations. The farmland is classified as PC cropland and is not subject to Section 404 jurisdiction.

Delineation: Wetland boundaries were generally delineated along the edge of tilled farmland, except for the western boundary of Wetland A2, where the edge of the wetland corresponds to the edge of parking lot fill.

AR 008990

Wetland A5
USFWS Classification: PEM
Size: 0.03 acre
Wetland data plot: A5-A
Upland data plot: None
Map No. 7

Wetland A5 is a mowed lawn in a residential yard, located approximately 40 ft north of Wetland A6. A driveway is located along the western edge the wetland, and a house is located along the southern edge.

Hydrology: Wetland A5 is a shallow depression that is maintained by seasonally high groundwater. It is approximately 1 to 3 ft lower than the surrounding area and has no inflow or outflow channel. On the October 1998 site visit, the homeowner told Parametrix staff that the wetland portion of the yard has prolonged saturation during the winter and spring months. The southwest corner of the wetland was inundated at that time. Inundation and soil saturation were not observed at the sample plot location, but the area was assumed to have wetland hydrology based on the presence of hydric soils and oxidized root channels.

Soils: The wetland surface soil is very dark grayish brown (10YR 3/2) sandy loam with mottles. The soil immediately below the A horizon is black (10YR 2/1) loam with mottles.

Vegetation: The wetland vegetation is predominantly non-native lawn grasses dominated by bentgrass, fescue, common velvet-grass, and bluegrass.

Upland: Surrounding uplands consist of yard and deciduous forest and are similar to uplands surrounding Wetland A6 described below.

Delineation: Driveway fill marks the western wetland boundary, and the house marks the southern boundary. The remaining wetland boundary was delineated based on wetland hydrology indicators and hydric soil conditions.

Wetland A6
USFWS Classification: PFO
Size: 0.16 acre
Wetland data plot: A6-A
Upland data plot: A6-B
Map No. 7

Wetland A6 is approximately 40 ft south of Wetland A5.

Hydrology: The wetland is in a closed depression with no apparent surface water channels. During the July 1998 site visit, neither saturation nor inundation was evident. The area was assumed to have wetland hydrology based on the presence of water marks, sediment deposits, and drainage patterns in the wetland, as well as hydric soils and hydrophytic vegetation.

Soils: Below a depth of 10 inches, the wetland soil is black (10YR 2/1) silt loam without mottles with a high organic content.

Vegetation: The wetland is generally forested with red alder and black cottonwood trees, and has a dense understory of Himalayan blackberry. Among the blackberry are patches of other wetland plants, including yellow iris, cooley hedgenettle, giant horsetail, and creeping buttercup. The northern margin of the wetland is residential lawn.

Upland: The surrounding upland is typically red alder forest with a Himalayan blackberry understory and no other wetland vegetation. Soils immediately below the surface horizon are dark yellowish brown (10YR 4/6) loam without mottles.

Delineation: The wetland boundary was delineated based primarily on hydric soil characteristics and minor topographic changes. The northern wetland boundary follows the edge of fill associated with adjacent lots. The western boundary occurs along fill placed for a sewer line that runs north/south through the area. Along the eastern and southern boundaries of the wetland, delineation was based on the presence of hydric soil color, wetland vegetation, and gradual changes in topography.

Wetland A7
USFWS Classification: PFO
Size: 0.30 acre
Wetland data plot: A7-A
Upland data plot: A7-B
Map No. 7

This wetland area has been subject to grazing and farming, but these land uses were discontinued about 20 years ago. The site is currently covered with a 15- to 20-year-old red alder forest.

Hydrology: Wetland A7 is in a closed depression and has seasonal wetland hydrology. No significant surface flow to or from the wetland occurs. At the time of the June 1998 site visit, saturation or inundation was not evident. The area was assumed to have wetland hydrology based on the presence of oxidized root channels, hydrophytic vegetation, and hydric soil. A low earthen berm along the southern and western edges of the wetland may block seasonal drainage.

Soils: The wetland soil consists of black (10YR 2/1) sandy loam with a high organic content over dark gray (10YR 4/1) loamy sand with mottles.

Vegetation: Wetland A7 is a forested wetland with a red alder overstory and a dense Himalayan blackberry and salmonberry understory. The herb layer includes wetland plants such as sawbeak sedge, soft rush, creeping bentgrass, and creeping buttercup.

Upland: The surrounding upland is also red alder forest with a Himalayan blackberry and English holly understory without associated wetland plants. The soils are black (10YR 2/1) silt loam over dark yellowish brown (10YR 4/4) loamy sand with mottles.

Delineation: The eastern and northern wetland boundaries were delineated based on the presence of hydric soil characteristics, which corresponded to a gradual rise in topography. The western and southern boundaries were delineated based on the presence of wetland vegetation, hydric soils, and changes in topography.

AR 008992

Wetland A8
USFWS Classification: PFO/SS
Size: 0.38 acre
Wetland data plots: A8-A1, A8-A2, A8-A3, A8-A4
Upland data plots: A8-B1, A8-B2, A8-B3
Map No. 7

The wetland is composed of two broad lobes connected by a narrow swale. The wetland has been disturbed by fill, debris, and land clearing.

Hydrology: The wetland occurs in a shallow depression that has seasonal hydrology. No significant surface waters flow into or out of the wetland. At the time of the June 1998 site visit, neither saturation nor inundation was present. The area was assumed to have wetland hydrology based on the presence of oxidized root channels, hydrophytic vegetation, and hydric soils.

Soils: Wetland surface soils are black (10YR 2/1), very dark gray, or very dark brown. Soils beneath the A horizon are mottled with matrix colors ranging from black (10YR 2/1) to grayish brown (10YR 5/2). Textures are typically loam or sandy loam.

Vegetation: The eastern lobe of the wetland is forested. The canopy is dominated by black cottonwood, red alder, and western redcedar, with salmonberry and skunk cabbage in the understory. The western lobe is a shrub community dominated by Himalayan blackberry, soft rush, and giant horsetail.

Upland: Dominant plant species in surrounding upland areas include red alder, English holly, Himalayan blackberry, and English ivy. Subsurface soils generally range in color from dark yellowish brown (10YR 3/2) without mottles to yellowish brown (10YR 5/4) with mottles, and are sandy loam in texture. Some upland areas contain piles of fill and other debris and the vegetation is predominantly Himalayan blackberry.

Delineation: The northwest portion of the wetland was delineated based on the presence of wetland plants in the understory and hydric soil colors. Distinct changes between the hydric and non-hydric soil were used to delineate the southern wetland boundary. The eastern portion of the wetland was delineated based on the presence of obligate wetland plant species.

Wetland A9
USFWS Classification: PSS
Size: 0.04 acre
Wetland data plot: A9-A
Upland data plot: A11-B
Map No. 9

Wetland A9 is located on a west-facing hillslope in the Miller Creek Nursery (Parcel 313). The wetland is defined by a service road to the east and west, a sidewalk and garden to the south, and a ditch to the north. This ditch connects to Wetland A12. The wetland is partially filled with rubble and yard waste.

AR 008993

Hydrology: Wetland A9 is located in a closed depression. At the time of the September 1998 site visit, soils were saturated at a depth of 12 inches and free water was observed at 14 inches. Oxidized root channels were also observed in the wetland soils.

Soils: The wetland soils are dark gray (10YR 3/1) loam and silt loam, to a depth of 15 inches, over gray (10 YR 5/1) loamy sand. Mottles occur below a depth of 9 inches.

Vegetation: Himalayan blackberry dominates the shrub community. Giant mannagrass, giant horsetail, birdsfoot trefoil, creeping buttercup, and lady fern occur in the herb layer. One western redcedar is also present. Upland vegetation within the wetland is composed of non-native nursery stock.

Upland: The wetland is surrounded by the nursery facilities and non-native nursery stock. The soil immediately below the surface horizon is yellowish brown (10YR 5/4) without mottles.

Delineation: The wetland boundary was delineated based on the presence of wetland hydrology and hydric soil conditions, and the edges of various constructed features, such as roads, sidewalks, and ditches.

Wetland A10
USFWS Classification: PSS
Size: 0.01 acre
Wetland data plot: A10-A
Upland data plot: A11-B
Map No. 9

Wetland A10 is located at the base of a steep slope in the Miller Creek Nursery. Service roads, planted nursery stock, or lawn surround the wetland. A house is located between Wetlands A10 and A11.

Hydrology: The wetland is located in a shallow depression that has seasonal wetland hydrology. Neither inundation nor saturation was observed during the September 1998 site visit. The area is assumed to have wetland hydrology based on the presence of oxidized root channels, hydric soils, and hydrophytic vegetation.

Soils: The soil immediately below the A horizon is greenish gray (10G 6/1) sandy clay loam with mottles.

Vegetation: The shrub community is dominated by Himalayan blackberry. The herb layer consists of yellow iris, giant horsetail, and lady fern with small amounts of small-fruited bulrush and American brooklime.

Upland: The wetland is surrounded by nursery stock of non-native plants. The soil immediately below the surface horizon is yellowish brown (10YR 5/4) sandy loam without mottles. The soil material may be fill.

AR 008994

Delineation: Driveways, parking lots, residential lawn, and planted nursery stock surround the wetland. The wetland boundary was delineated based on distinct changes in soil color, vegetation, and hydrology.

Wetland A11
USFWS Classification: PSS
Size: 0.02 acre
Wetland data plot: A11-A
Upland data plot: A11-B
Map No. 9

Wetland A11 is located at the base of a steep slope in the Miller Creek Nursery. Service roads, planted nursery stock, or yard surround the wetland. A house is located between Wetlands A10 and A11.

Hydrology: The wetland is located in a depression that has seasonal wetland hydrology. Neither inundation nor saturation was observed during the September 1998 site visit. The area is assumed to have wetland hydrology based on the presence of oxidized root channels, hydric soils, and hydrophytic vegetation.

Soils: The soil immediately below the A horizon is very dark grayish brown (10YR 4/2) gravelly loam with mottles.

Vegetation: Himalayan blackberry dominates the shrub community. The herb layer is dominated by yellow iris, giant horsetail, and small-fruited bulrush.

Upland: The wetland is largely surrounded by nursery stock of non-native plants. The soil immediately below the surface horizon is yellowish brown (10YR 5/4) sandy loam without mottles. The soil horizon is disturbed.

Delineation: Driveways, parking lots, residential lawn, and planted nursery stock surround each wetland. The wetland boundary was delineated based on distinct changes in soil color, vegetation, and hydrology.

Wetland A12
USFWS Classification: PSS
Size: 0.11 acre
Wetland data plot: A12-A
Upland data plot: A12/13-B
Map No. 9

Wetland A12 occurs in a shallow drainageway on a steep west-facing slope. The upslope end of the wetland is located behind a residence. The downslope end narrows into a swale that terminates in a drainage ditch that drains to Miller Creek through Wetland A9.

Hydrology: During the September 1998 site visit, Parametrix staff found that soils were saturated to the surface and the water table was within 3 inches of the soil surface. In other locations, surface water and wetland drainage patterns were also present.

AR 008995

Soils: The surface horizon has high organic matter content. The subsoil is dark gray (2.5YR 4/1) sandy loam with mottles immediately between 10 and 16 inches of the soil surface.

Vegetation: The shrub community is dominated by Himalayan blackberry and salmonberry. Skunk cabbage and lady fern occur in the herb layer, but are not dominant.

Upland: Adjacent uplands are dominated by big-leaf maple and Indian plum. The soils below the surface horizon are brown (10YR 5/3) and yellowish brown sand without mottles.

Delineation: The wetland was delineated based on the presence of wetland hydrology and hydric soil conditions; these generally related to changes in topography.

Wetland A13
USFWS Classification: PFO
Size: 0.12 acre
Wetland data plot: A13-A
Upland data plot: A12/13-B
Maps No. 9, 12

The wetland is located on a slope behind a residential area where the vegetation has been disturbed by nearby homeowners.

Hydrology: Wetland A13 is an isolated wetland that is fed by groundwater seeps. During the September 1998 site visit, saturation to the soil surface and a water table at 9 inches from the soil surface were observed.

Soils: The wetland surface soils have a high organic matter content. The subsoils are gray (5N 4/1) cobbley sand with mottles immediately below 10 inches.

Vegetation: Red alder dominates the forested community. Himalayan blackberry, giant horsetail, lady fern, and field bindweed occur in the understory.

Upland: Upland conditions surrounding the wetland are similar to those described for Wetland A12.

Delineation: The wetland boundary was delineated based on the presence of hydric soil colors, wetland vegetation, and wetland hydrology.

Wetland A14
USFWS Classification: PFO/SS/EM
Size: 0.19 acre
Wetland data plots: A14a-A, A14b-A
Upland data plots: A14-B
Map No. 11

Wetland A14 is located on Parcels 326 and 327 and is a 0.19-acre wetland that is divided into two sections by driveway fill. The two sections, A14a (0.12 acre) and A14b (0.07 acre), are forested slope wetlands. A steep slope bounds the wetlands to the east and roads or driveway fill along the remaining sections.

Hydrology: Saturation to within 10 inches of the soil surface was observed in Wetland A14a and saturation to the soil surface was observed in A14b during the dry season (September 1999). The wetland is maintained by shallow groundwater that discharges along the toe of the eastern slope. A jurisdictional ditch occurs within the wetland and drains to Miller Creek.

Soils: The soil in Wetland A14 range from eleven inches of a black (10YR2/1) muck over a mottled dark gray (10YR 4/1) silt loam to a dark gray (10YR 3/1) silt loam over a very dark gray (10YR 3/1) fine sandy silt.

Vegetation: Wetland A14 is a red alder-dominated forested wetland with Himalayan blackberry and salmonberry in the shrub layer and lady fern, giant horsetail, and traces of mannagrass and skunk cabbage in the understory.

Upland: The upland area to the east of Wetland A14 is composed of a red alder and big-leaf maple forest. The upland soils to the east of Wetland A14 are a grayish brown (2.5Y 5/2) loam.

Delineation: Wetland A14 was delineated on the clear break in wetland hydrology, soils, and vegetation at the toe of the slope to the east and driveway and road fill in the remaining sections.

Wetland A15
USFWS Classification: PEM
Size: 0.04 acre
Wetland data plots: A15-A
Upland data plots: A14-B
Map No. 11

Wetland A15 is located on Parcel 325 and results from grading on the site for residential development. Leveling of the eastern portion of the site exposed compacted till. The extent of the wetland is limited to the shallow compacted material exposed by this grading. ACOE determined that the wetland is jurisdictional.

Hydrology: Wetland hydrology was not observed during the September 1999 field visit when the wetland data was collected. However, saturation to the soil surface was observed on previous site visits during spring 1999.

Soils: The soil in Wetland A13 is 3 inches of a dark yellowish brown (10YR 4/4) silty clay over a mottled gray (10YR 6/1) silty clay.

Vegetation: Wetland A15 is an emergent wetland limited to the residential yard on Parcel 325. The grasses are dominated by common velvet-grass and bluegrass with a co-dominance of creeping buttercup.

Upland: The upland area to the east of Wetland A15 is composed of a red alder and big-leaf maple forest. The upland soils to the east of Wetland A15 are a grayish brown (2.5Y 5/2) loam.

Delineation: Wetland A15 was delineated on the presence of hydric soils and wetland vegetation that corresponded to the compacted, silty clay.

AR 008997

Wetland A16
USFWS Classification: PSS/EM
Size: 0.06 acre
Wetland data plots: A16-A
Upland data plots: A16-B
Map No. 11

Wetland A16 is a narrow wetland (ranging from approximately 2 to 10 feet wide) that occurs on a hillslope subject to groundwater seepage. The southern portion of the wetland (on Parcels 323 and 322) has been altered by fill.

Hydrology: During the September 1999 site visit, Wetland A16 was saturated to the soil surface. The hydrology of the wetland is supported by groundwater seepage that perches on shallow clay soils.

Soils: The soil in Wetland A16 consists of a 6-inch mottled dark gray (10YR 4/1) gravelly loam surface layer. The subsoil is a dark greenish gray (5BG 4/1) clay.

Vegetation: Portions of Wetland A16 are dominated by red alder saplings and soft rush. Other portions of the wetland are mowed lawn. Greater than 50 percent of the dominant plants within Wetland A16 are hydrophytic and therefore satisfy the wetland plant criteria.

Upland: The upland area surrounding Wetland A16 is composed of landscaped yards and gardens that lack wetland hydrology, soils, and wetland vegetation.

Delineation: Wetland A16 was delineated on the clear break in wetland hydrology, soils, and vegetation along the narrow band where groundwater surfaces.

Wetland A17
USFWS Classification: PFO/PSS/PEM
Size: 2.66 acre
Wetland data plots: A17a-A, A17b-A, A17c-A1, A17c-A2, A17c-A3, A17d-A1, A17d-A2, and A17c-A3
Upland data plots: A17-B1, A17-B2, and A17-B3
Maps No. 8, 11

Wetland A17 is a discontinuous slope wetland that is segmented by several roads and driveways. The wetland is located on several parcels east of Des Moines Memorial Drive, west of 8th Avenue South, and south of South 160th Street. Water D, an intermittent channel, flows through wetland sections A17c through A17d and eventually drains to Miller Creek.

Hydrology: Wetland hydrology consisting of inundation and soil saturation was observed in several locations throughout the wetland in both the wet (April 2000) and dry (October 2000) seasons. An intermittent channel (Water D) flows through A17b, A17c, and A17d. The wetland hydrology is maintained by shallow groundwater and periodic overbank flow from Water D.

Soils: Within the Wetland A17, the soil immediately below the A horizon typically is a very dark gray (10YR 3/1) sandy loam with mottles. In areas adjacent to Water D within the center of

Wetland A17, the soil immediately below the A horizon typically ranged from very dark gray (10YR 3/1) loam with a high organic content to black (10YR 2/1) sapric muck.

Vegetation: Wetland A17 contains areas of emergent, shrub, and forested vegetation. In several locations there are saturated lawns dominated by red fescue, bluegrass, common velvet-grass, and creeping buttercup. The shrub-dominated areas consist of Himalayan blackberry and salmonberry with giant horsetail in the understory. The forested sections are typically dominated by red alder.

Upland: The upland area surrounding Wetland A17 is composed of landscaped yards and gardens that lack wetland hydrology, soils, and wetland vegetation.

Delineation: Wetland A17 was delineated by the presence of wetland hydrology, hydric soils, and hydrophytic vegetation. In several locations, the wetland boundaries are defined by areas of road and driveway fill.

Wetland A18
USFWS Classification: PSS
Size: 0.01
Wetland data plots: A18-A
Upland data plot: A18-B
Map No. 9

Wetland A18 is a small depressional wetland located in the northwest corner of Parcel 305.

Hydrology: During the January 2000 site visit, soils in Wetland A18 were saturated to within 4 inches of the soil surface. The hydrology of Wetland A18 is supported by precipitation and shallow interflow that enters the wetland from upslope areas.

Soils: Surface soils in Wetland A18 are very dark gray (10YR 3/1) sandy loam with high organic content. Below 11 inches, the soils are a coarse sand. The soil color and high organic content in the upper 11 inches satisfy the hydric soil criteria. The subsoils in upland area adjacent to the wetland are generally a very dark grayish brown (10YR 3/3) silt loam with no mottles.

Vegetation: The vegetation within Wetland A18 is dominated by salmonberry, Himalayan blackberry, sword fern, lady fern, and creeping buttercup. Greater than 50 percent of the dominant plants within Wetland A18 are hydrophytic and therefore satisfy the wetland plant criteria.

The upland areas surrounding the wetlands are well drained and dominated by upland plant species, including big-leaf maple, Indian plum, and Himalayan blackberry.

Delineation: The wetland boundary was delineated by the presence of distinct changes in hydrology and soil conditions.

AR 008999

Wetland A19
USFWS Classification: PEM
Size: 0.04 acre
Wetland data plots: A19-A
Upland data plots: A19-B
Map No. 11

Wetland A19 is a 0.04-acre depression located along the toe of a rockery retaining the South 168th Street road fill. Wetland A19 contains a garden, mowed lawn, and landscaping.

Hydrology: Water C, a ditch that contains perennial flow, enters Wetland A19 via a 4-inch pipe and into a cement-lined basin. The basin drains into a buried culvert that daylights farther down the slope. Wetland A19 may also drain into the cement basin. The remaining area of Wetland A19 is seasonally saturated. During the September 2000 site visit, Wetland A16 was saturated to the soil surface.

Soils: The subsoil in Wetland A19 is a mottled very dark gray (10YR 3/1) loam that has been gardened for several years.

Vegetation: Wetland A19 is dominated by creeping buttercup and field horsetail that occurs under and around garden and landscape plants. Less than 50 percent of the dominant plants within Wetland A19 are hydrophytic and therefore do not satisfy the wetland plant criteria. Because of recent and ongoing disturbance, vegetation at this site cannot be used to indicate the presence or absence of wetlands.

Upland: The upland area surrounding Wetland A19 is composed of landscaped yards and gardens that lack wetland hydrology, soils, and vegetation community.

Delineation: Wetland A19 was delineated on the presence of wetland hydrology and soils. Vegetation was not used to establish the wetland boundary because of ongoing disturbance.

3.2.3.7 Miller Creek Riparian Wetlands

Wetlands R1 through R13, R4b, R5b, R6b, R7a, R9a, R14a, R14b, R15a, R15b, and R17
USFWS Classification: PFO/SS/EM
Size: 4.72 acre
Wetland data plots: R1-A through R13-A, R4b-A, R5b-A, R6b-A, R7a-A, R9a-A1/A2, R14a-A, R14b-A, R15a-A1/A2, R15b-A1/A2, and R17-A
Upland data plots: R-3/4B, R5b-B, R6-B, R7-B, R8-B1/B2, R9-B, R11-B, R15a-B, R15b-B
Maps No. 4, 7, 9, 11

Site visits between September 1998 and November 2000 identified several riparian wetlands that occur along Miller Creek between South 154th Street and Des Moines Memorial Drive. The larger of these, Wetlands A1, 18, and 37 are described above. Sixteen smaller riparian wetlands (labeled R1 through R7, R9 through R15, and R17) were identified. The riparian wetlands along Miller Creek range in size from 0.02 to 0.79 acre (see Table 3), and collectively total 4.72 acres. These

AR 009000

small riparian wetlands have similar hydrology, soils, and vegetation, and because of these similarities, they are described together.

Hydrology: The riparian wetland is typically a slope wetland that is adjacent to and contiguous with Miller Creek. Shallow groundwater surfaces on the slopes and supports the hydrology of the wetlands. However, adjacent to the stream, the hydrology of the wetlands is also supported by periodic overbank flow from Miller Creek.

Soils in all of the wetlands (with the exception of Wetlands R6 and R7a) were saturated to the soil surface or within 12 inches of the surface during the September and October 1998 site visits. Although neither inundation nor saturation was present in Wetlands R6 and R7a, the areas were assumed to have wetland hydrology based on the presence of oxidized root channels, hydric soils, and hydrophytic vegetation.

Soils: Typical surface soil colors in the riparian wetlands are black (10YR 2/1), very dark gray (10 YR 3/1), gray (10YR 5/1), and very dark brown (10YR 2/2). Soils immediately below the A horizon are black (10YR 2/1), very dark gray (10 YR 3/1), gray (10YR 5/1), very dark brown (10YR 2/2) with mottles, and dark brown (7.5YR 3/2) with mottles. Soil textures range from sand to sandy clay loam to muck.

Vegetation: Wetlands R1, R4, R5, R6b, R7a, R11, R13, and R14b are emergent wetlands. Dominant species within emergent communities include creeping buttercup and common velvet-grass, with lesser amounts of lady fern, stinging nettle, horsetail, and bentgrass species. Portions of several wetlands are maintained lawns.

Wetlands R3 and R10 are scrub-shrub wetlands dominated by salmonberry and Himalayan blackberry. Wetlands R2, R8, and R14a contain both emergent and shrub wetland habitat. Dominant species include Himalayan blackberry in the shrub stratum with lady fern, reed canarygrass, redtop, and stinging nettle below.

Wetlands R4b, R5b, R6, R7, R9, R15a, and R15b are forested wetlands with an emergent component. Dominant species are red alder and black cottonwood in the canopy and salmonberry, red-osier dogwood, and Himalayan blackberry in the shrub stratum. Bentgrass species, giant horsetail, English holly, creeping buttercup, and bittersweet nightshade are dominant in the herbaceous and vine stratum. Wetland R7 contains a uniform canopy of red alder with Himalayan blackberry in the shrub stratum.

Upland: Uplands surrounding the riparian wetlands are predominantly coniferous forest or areas of residential yards with mowed lawn grasses. The upland forest is comprised of western redcedar in the overstory with smaller amounts of red alder. Shrubs present include Indian plum, salmonberry, Himalayan blackberry, cherry laurel, and English holly. Grasses include reed canarygrass, colonial bentgrass, and orchardgrass. Hydrophytic vegetation dominates some upland areas, but the areas were determined not to be wetland because they lacked hydric soils and wetland hydrology. Soil color immediately below the surface horizon in the upland areas was generally dark yellowish brown (10YR 3/2 to 10YR 3/4) without mottles.

Delineation: Each riparian wetland was delineated based on changes in hydrology, soil characteristics, and plant community composition in relation to changes in topography.

3.2.3.8 Other Waters of the U.S.

Within the West Acquisition Area, there are six channels (Waters A, B, C, D, W, and Miller Creek) and one pond (Lora Lake) that are classified as Waters of the U.S. These areas either convey or store natural surface runoff water but lack wetland soil or vegetation. Miller Creek is described in Section 3.1.1.

Water A is an approximately 814-ft-long by 5-ft-wide (0.09-acre) drainage ditch. This ditch collects surface water runoff from 12th Avenue South, the airport security road, and several upslope wetlands (Wetlands 19, 21, and 22). A portion of Water W, which originates in Wetland 20, also drains westward into Water A. These waters drain into Wetland 37 through a culvert under 12th Avenue South and convey channelized flow through a continuation of Water W for approximately 494 feet (0.03 acre) to Miller Creek. Water A and portions of Water W are mapped in the King County sensitive area map folio (King County 1990) as an unclassified stream.

Water B is an approximately 314-ft-long by 4-ft-wide (0.03-acre) incised channel that conveys water from the east end of Wetland 37f northeast to riparian Wetland R9, which, in turn, drains to Miller Creek. Water C is a discontinuous ditch that flows through culverts or cement-lined landscaped channels on Parcel 251. The exposed ditch totals approximately 170 linear feet (0.01 acre) from South 168th Street to Miller Creek. Lastly, Water D is a intermittent stream that begins east of Des Moines Memorial Drive and north of South 160th Street. The channel flows approximately 1,830 linear feet (0.16 acre) through several sections of Wetland A17 and enters Miller Creek on Parcel 243, approximately 200 feet upslope of Des Moines Memorial Drive.

3.2.4 <u>Borrow Areas 1 and 3</u>

Borrow Areas 1 and 3 are located south of the airfield between 24th Avenue South and 15th Avenue South, and between South 200th Street and South 216th Street (see Figure 2). Historically these areas were made up of forest, small farms, and residences.

3.2.4.1 Borrow Area 1

In 1980, Borrow Area 1 consisted of a residential neighborhood (Figure 6). Between 5 and 20 years ago, the Port acquired Borrow Area 1 as part of a noise abatement program. By 1990, a demolition program cleared the area north of 210th Street South of structures. By 1996, the area south of 210th Street South was cleared (Figure 7). The demolition process included removing structures, filling excavated areas, and grading the site. In some areas, clay or clay loam fill was used, and grading frequently created shallow, closed depressions.

Once demolition was complete, drainage facilities such as ditches, culverts, storm sewer lines, and French drains were no longer maintained and began to deteriorate. As these facilities became nonfunctional, local hydrology was altered, and localized areas became seasonally wet. Over time, mowed and landscaped areas began to naturalize, converting yards and fields into forest and shrub communities of mixed native and ornamental species.

Eight wetlands and one Water of the U.S. are located in Borrow Area 1; they have a total area of 2.16 acres. Wetland 32 was identified during a previous investigation (FAA 1995) and its boundary was confirmed by ACOE (see Appendix E). This wetland is described in Appendix E, and its location is shown on Map No. 24 in Appendix C. Wetland 48 was also identified during a previous investigation (FAA 1996), but was redelineated in 1999 and is described below. Wetlands B1, B4, B11, B12, B14, and B15 were delineated in 1998 and 1999 and are also described below.

Wetland B1
USFWS Classification: PFO/SS
Size: 0.27 acre
Wetland data plot: B1-A
Upland data plot: B1-B
Maps No. 22, 24

Wetland B1 is located along the eastern edge of the Port-owned property and is connected via a ditch to the residential neighborhoods east of 24th Avenue South. To the north, west, and south the wetland is surrounded by upland forest.

Hydrology: Wetland B1 is a shallow depression that receives residential stormwater runoff from the ditch to the east. At the time of the May 1998 site visit, the soil was saturated to the surface and free water filled the soil pit. Additional hydrological indicators such as water-stained leaves, watermarks, and wetland drainage patterns were also observed.

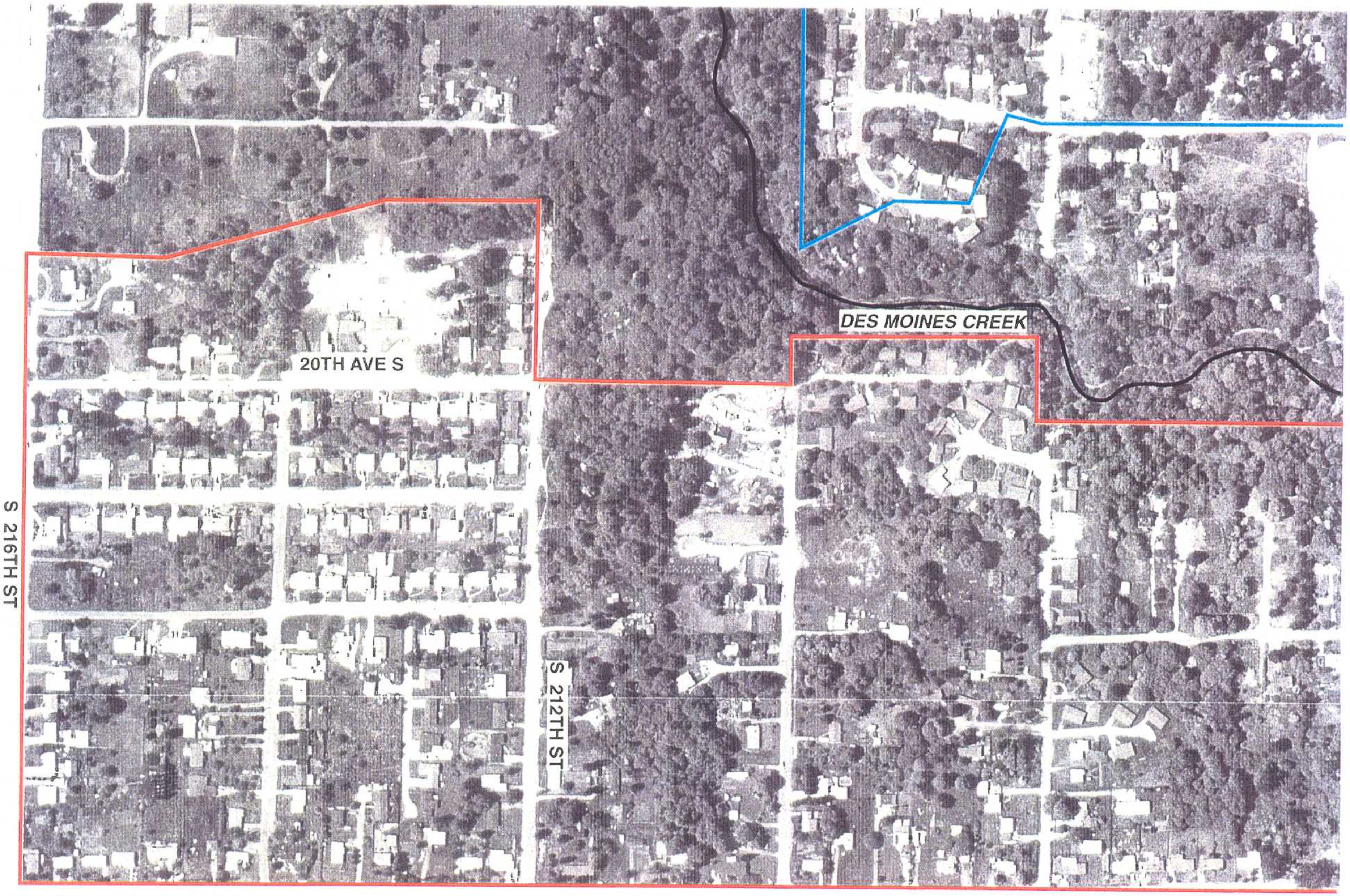
Soils: The wetland surface soil has high organic matter content. The soil immediately below 10 inches is very dark gray (10YR 3/1) clay loam without mottles.

Vegetation: The forested community has a canopy of red alder and black cottonwood. The shrub community is predominantly Douglas spirea, salmonberry, and Himalayan blackberry, with sedges and horsetail in the herbaceous layer.

Upland: Big-leaf maple with a Himalayan blackberry and Indian plum understory dominate the adjacent upland plant community. Upland subsoils are dark yellowish brown (10YR 4/4) and yellowish brown (10 YR5/8) sandy loams without mottles.

Delineation: The wetland was delineated based on the presence of hydric soil colors, wetland hydrology, and wetland vegetation.

AR 009003



Port of Seattle/Wetland Delineation Report/556-2912-001/01(41) 9/00

N

APPROXIMATE
SCALE IN FEET
0 100 200

Approximate Boundary of Borrow Site 1
Approximate Boundary of Borrow Site 3
Des Moines Creek

Figure 6
Aerial Photograph of Borrow Area 1 (1980)

Port of Seattle/Wetland Delineation Report/556-2912-001/01(41) 9/00

N

APPROXIMATE SCALE IN FEET

0 100 200

Approximate Boundary of Borrow Site 1

Approximate Boundary of Borrow Site 3

Des Moines Creek

Figure 7
Aerial Photograph of Borrow Area 1 (1996)

Wetland B4
USFWS Classification: PSS
Size: 0.07 acre
Wetland data plot: B4-A
Upland data plot: B4-B
Map No. 24

Wetland B4 is located at the base of a steep ravine where groundwater seeps into a seasonal drainage. The area is part of a failed stormwater discharge channel, and the ravine is littered with disconnected sections of 12-inch-diameter clay culvert. The culvert was designed to convey storm water from 208th Street South to Des Moines Creek. Within the last 30 years, however, the pipe sections separated and stormwater has eroded the ravine.

Hydrology: Groundwater seeps into the ravine slopes and stormwater runoff enters the area from developed areas east of South 208th Street. A channel in the base of the ravine conveys water to Des Moines Creek. Flowing water was observed in the channel in July 1998, when the wetland soils were saturated to the surface. Other indicators of wetland hydrology, including water-stained leaves, watermarks, and wetland drainage patterns, were also observed.

Soils: The wetland soils are black (10YR 2/1) loam over gray (10 YR 5/1) loam with mottles.

Vegetation: The shrub community is dominated by salmonberry and Himalayan blackberry, with creeping buttercup in the herb layer. Small areas along the wetland fringe are dominated by less than 50 percent wetland vegetation, but were determined to be included in the wetland by ACOE during a July 1998 site visit because of the presence of wetland hydrology.

Upland: Big-leaf maple forest with an Indian plum and vine maple understory dominate the surrounding upland plant community. Upland subsoils are dark yellowish brown (10YR 3/3) loam without mottles.

Delineation: The wetland was delineated predominantly because of wetland hydrology along the north and south slopes of the ravine. To the east, the wetland edge is at the stormwater outfall. To the west, the wetland edge is at the OHWM of Des Moines Creek.

Wetland B11
USFWS Classification: PEM
Size: 0.18 acre
Wetland data plot: B11-A
Upland data plot: B11-B
Map No. 24

This wetland occurs in a previously farmed area. The farm has been abandoned for about 20 years. The southern and eastern edges of the wetland have been filled with clay, gravel, and rubble.

Hydrology: Wetland B11 is located in an isolated depression. During the January 1999 site visit, 1.5 inches of inundation, saturation to the soil surface, watermarks, and wetland drainage patterns were observed in the wetland.

AR 009006

Soils: Below a depth of 9 inches, the wetland soil is a reddish gray (2.5YR 5/1) gravelly sandy loam with mottles.

Vegetation: Reed canarygrass dominates the emergent vegetation.

Upland: The surrounding upland vegetation is bentgrass and reed canarygrass. Greater than 50 percent of the vegetation is hydrophytic. The filled areas outside the wetland were inundated during the January 1999 site visit; however, this area was determined to be non-wetland because the subsoils are reddish brown (2.5YR 4/3) without mottles, which does not satisfy the hydric soil criteria.

Delineation: Wetland B11 was delineated along the southern and eastern edges based on the presence of native hydric soils and changes in soil composition associated with the edge of fill. The remaining boundary was delineated based on the presence of hydric soil colors, reed canarygrass, and the presence of wetland hydrology.

Wetland B12
USFWS Classification: PSS
Size: 0.63 acre
Wetland data plot: B12-A
Upland data plot: B12-B
Map No. 25

Wetland B12 is located north of 208th Street at the head of a ravine. The ravine and wetland continue to slope to the west, off the Port of Seattle property, eventually draining toward Des Moines Creek. The surveyed portion of Wetland B12 on Port property totals 0.07 acre; however, the total area is estimated to be 0.63 acre.

Hydrology: Groundwater discharge from the ravine sideslopes supports hydrology within the wetland. During the January 1999 site visit, surface water was observed flowing in the ravine. Saturation to the soil surface, water marks, and drainage patterns were also observed in the wetland. Water surfacing in the wetland flows downslope to Des Moines Creek.

Soils: The wetland soil immediately below the A horizon is very dark gray (10YR 3/1) silt loam with mottles.

Vegetation: The shrub community is dominated by vine maple with a lady fern and sword fern understory.

Upland: The surrounding upland forest is dominated by big-leaf maple, Douglas fir, and hemlock forest, with salmonberry and sword fern in the understory. The soil below the surface horizon is dark brown (10YR 3/3) sandy loam without mottles.

Delineation: The wetland boundary was delineated based on the presence of wetland hydrology, hydric soil colors, and wetland vegetation.

AR 009007

Wetland B14
USFWS Classification: PSS/EM
Size: 0.78 acre
Wetland data plot: B14-A
Upland data plot: B14-B
Map No. 26

The edges of this wetland have been disturbed by the removal of the residential area and filled with clay loam soil.

Hydrology: The wetland is a closed, shallow depression. Drainage ditches were observed within the wetland. During the January 1998 site visit, 1 inch of inundation was observable in the wetland.

Soils: The wetland soil is black (10YR 2/1) mucky loam over black sandy loam.

Vegetation: The shrub community is dominated by Himalayan blackberry, the emergent community by soft rush, reed canarygrass, and creeping buttercup.

Upland: Houses that once surrounded the wetland were removed within the last 5 years, and the soil and vegetation are disturbed. The dominant vegetation is red alder with an understory of Himalayan blackberry, bentgrass, and common velvet-grass. Outside the wetland, the soil is disturbed dark brown (10YR 3/3) loam with mottles.

Delineation: The western and northern edges of the wetland were delineated based on the presence of hydric soil colors and the boundary between native and fill soils. The remaining boundary was delineated based on the presence of wetland hydrology, hydric soil colors, and wetland vegetation.

Wetland B15
USFWS Classification: PSS
Size: 2.05 acres
Wetland data plot: B15a-A
Upland data plot: B15a-B
Map No. 25

Wetland B15 occurs on a gentle slope and is the eastern end of a larger wetland extending to the west beyond the borrow area boundary. The portion of Wetland B15 on Port property totals 0.23 acre; however, the total area is estimated to be 2.05 acres. Only the portion of the wetland on Port-owned property was delineated. The wetland's two lobes are divided by a narrow upland strip. Figure 6 shows that most of the wetland existed prior to the demolition of the neighborhood, but the wetland edges have been disturbed.

Hydrology: During the December 1998 site visit, 2 inches of inundation, water marks, and wetland drainage patterns were observed in the wetland.

Soils: The wetland soils are black (10YR 2/1) mucky loam to a depth of 13 inches or greater.

Vegetation: Salmonberry is the only dominant plant in the wetland.

AR 009008

Upland: The adjacent upland community is a big-leaf maple forest with Himalayan blackberry, English holly, and sword fern in the understory. The subsoil is dark brown (7.5YR 3/3) loam.

Delineation: The wetland boundary was delineated along the northern edge based on the presence of hydric soil colors and the boundary between native and fill soils. The remaining boundary was delineated based on hydric soil colors, wetland vegetation, and wetland hydrology.

Wetland 48
USFWS Classification: PFO/EM
Size: 1.58 acres
Wetland data plot: 48-A
Upland data plot: 48-B
Map No. 25

Wetland 48, located at the west end of South 212th Street, is the east end of a large wetland that extends to the west beyond the borrow area boundary. All of Wetland 48 has been delineated and surveyed. The portion of Wetland 48 on Port property is 0.46 acre; however, the entire area is 1.58 acres. The wetland occurs on a slope that extends between the borrow area and Des Moines Creek. Only that portion of the wetland on Port-owned property was delineated.

Hydrology: Groundwater seeps from the toe of the surrounding upland slopes drain into the wetland and then downslope to Des Moines Creek. During the January 1998 site visit, 1 inch of inundation, oxidized root channels, and wetland drainage patterns were observed in the wetland.

Soils: The wetland soil is grayish brown (10YR 5/2) gravelly sand with mottles to a depth of 18 inches.

Vegetation: The forested community is dominated by red alder, Himalayan blackberry, soft rush, bentgrass, and creeping buttercup. The emergent community is dominated by soft rush and creeping buttercup.

Upland: The adjacent upland community is a red alder and Douglas fir forest with Himalayan blackberry in the understory. The soils are brown (10YR 4/3) sand with mottles in the subsoil.

Delineation: The western edge of the wetland was delineated along the fence marking the edge of Port property. The remainder of the wetland was delineated based on hydric soil colors, wetland hydrology, and wetland vegetation. These indicators correlated to distinct changes in topography that define most of the wetland edge.

3.2.4.2 Other Waters of the U.S.

A small conveyance within the borrow area is classified as a Water of the U.S. This area, Water S, is a naturally intermittent drainage area, but does not contain wetland soil or vegetation. Water S is a 90-ft-long by 3-ft-wide (0.01-acre) channel that conveys water from a small spring into a 4-inch drainage pipe.

AR 009009

3.2.4.3 Borrow Area 3

Seven wetlands located in Borrow Area 3 have a total area of 2.35 acres. Wetlands 29 and 30 were identified during a previous investigation (FAA 1995) and their boundaries were confirmed by ACOE (see Appendix D). Wetland 29 is described in Appendix E and shown on Map No. 23 in Appendix D. Wetland 30 was delineated in March 1998 and is described below. Wetlands B5, B6, B7, B9, and B10 were delineated in May and June 1998 and are also described below.

Wetland B5
USFWS Classification: PFO/SS
Size: 0.08 acre
Wetland data plot: B5-A
Upland data plot: B5-B
Map No. 23

The wetland is located near the corner of South 18th Street and 208th Avenue South. In 1980 the wetland was surrounded by structures to the north; to the south it was cleared and leveled. Remnants of this former development, such as fill, ditches, and an old well, were seen during the site visit.

Hydrology: Wetland B5 occurs in a shallow swale that drains to the southeast. During the June 1998 site visit, the soil was saturated at 18 inches below the surface, and water-stained leaves were observed; these indicate areas of ponding. The wetland was inundated during additional site visits in the spring of 1998 and winter of 1998/1999.

Soils: The wetland soil immediately below the surface horizon is weak red (2.5Y 4/2) with mottles. A layer of black (10YR 2/1) muck occurs below a depth of 17 inches.

Vegetation: The forested community is composed of red alder and Oregon ash. The shrub community is predominantly willow and Douglas spirea, with creeping buttercup and bedstraw in the herb layer.

Upland: The adjacent upland community is a red alder forest interspersed with fruit trees and English holly. The upland soil immediately below the surface horizon is dark brown (10YR 3/3) sandy loam without mottles. A layer of black (10YR 2/1) sandy loam occurs between a depth of 8 and 17 inches. This non-hydric layer was determined to be a buried A horizon.

Delineation: The wetland was delineated based on hydric soil colors, wetland hydrology, and wetland vegetation. These indicators correspond to topographic changes that define the wetland edge.

AR 009010

Wetlands B6 and B7
USFWS Classification: PFO/SS
Size: B6 = 0.55 acre, B7 = 0.03 acre
Wetland data plot: B6-A
Upland data plot: B5-B
Map No. 23

Wetlands B6 and B7 have similar hydrologic indicators, soil conditions, and plant communities. Approximately 20 ft of upland separates the two wetlands. Because of the similarity and proximity of these wetlands, they are described collectively.

Hydrology: Wetlands B6 and B7 occur in isolated depressions. Wetland hydrology is supported by a seasonally high groundwater table. During the June 1998 site visit, neither inundation nor soil saturation was present. The area was assumed to have wetland hydrology based on the presence of oxidized root channels, hydric soils, and hydrophytic vegetation. The wetland was inundated during site visits conducted in the winter of 1998/1999.

Soils: Wetland soil immediately below the A horizon is highly organic with a black (10YR 2/1) color and no mottles.

Vegetation: The forested component of the wetland is dominated by red alder, and the shrub component is dominated by salmonberry with false lily-of-the-valley in the herb layer.

Upland: The adjacent upland is similar to that described for Wetland B5.

Delineation: The wetland boundary was delineated based on the presence of hydric soil colors, wetland hydrology, and wetland vegetation.

Wetland B9
USFWS Classification: PFO
Size: 0.05 acre
Wetland data plot: B9-A
Upland data plot: B8/9-B
Map No. 23

This wetland, located on a south-facing slope, is bisected by South 205th Street. Its two sections are connected by a culvert.

Hydrology: The wetland is maintained by a groundwater seep at the edge of a slope at the north wetland edge. During the June 1998 site visit, the area north of the road was inundated and small amounts of surface water were flowing over the abandoned street and into the south section of the wetland. Up to 2 inches of standing water could be seen in the wetland area south of the road. There is no outlet from the wetland.

Soils: Soils within the wetland have a surface horizon of 11 inches of black (10YR 2/1) muck overlying a light brownish gray (10YR 6/2) sandy substrate with mottles.

AR 009011

Vegetation: In the forested community, red alder, willow, and big-leaf maple trees form the overstory, and red alder saplings, bedstraw, and creeping buttercup form the understory.

Upland: The wetland is surrounded by a red alder forest and shrub community composed of English holly, bitter cherry, Himalayan blackberry, and Douglas spirea. The soil immediately below the surface horizon is brown (10YR 4/3) silt loam.

Delineation: The northern portion of the wetland was delineated based on the presence of wetland hydrology, which was associated with changes in slope and the presence of road fill. The remainder of the wetland was delineated based on the presence of hydric soil colors, wetland hydrology, and wetland vegetation.

Wetland B10
USFWS Classification: PFO
Size: 0.02 acre
Wetland data plot: B10-A
Upland data plot: B10-B
Map No. 23

The wetland is located at the edge of a rock wall at the bottom of a steep, southeast-facing slope.

Hydrology: Groundwater discharge from the toe of the slope maintains the area as wetland. Surface water flows from the seep for approximately 75 ft to the southeast before recharging into sandy soil. During the June 1998 site visit, up to 2 inches of inundation, watermarks, and wetland drainage patterns could be seen in the wetland.

Soils: The hydric soils consist of 4 inches of black (10YR 2/1) sapric organic matter overlying a 1-inch-thick gray (10YR 5/1) clay loam layer. Below 5 inches, the soil is yellowish brown (10YR 5/4) with mottles.

Vegetation: The forested overstory of the wetland is composed of red alder. The dominant understory species are salmonberry and giant horsetail.

Upland: Upland areas surrounding the wetland are red alder and madrone forest with an understory of English holly and salmonberry. The soils immediately below 10 inches are brown (10YR 5/3) clay loam with mottles.

Delineation: The western edge of the wetland was delineated based on the presence of wetland hydrology and hydric soil colors. The remaining boundary was delineated based on hydric soil colors, wetland vegetation, and wetland hydrology.

AR 009012

Wetland 30
USFWS Classification: PFO/SS
Size: 0.88 acre
Wetland data plots: 30a-A, 30b-A
Upland data plot: B9-B
Map No. 23

Wetland 30 was originally delineated as a 0.08-acre wetland in 1994 and its boundary was confirmed by ACOE. During a June 1998 site visit, the wetland boundary was expanded by 10 ft to encompass wetland indicators found outside the original flagged boundary. Additionally, a larger wetland lobe extending northeast of the original wetland was included in the wetland boundary. The area of expansion totaled 0.80 acre and was confirmed by ACOE on a July 8, 1998 site visit. Wetland 30 now totals 0.88 acre. The area of expansion of Wetland 30 is described below.

Hydrology: Wetland 30 is an isolated depression supported by shallow groundwater. No surface water inlets or outlets are visible. During the June 1998 site visit, soils in the northeast lobe of wetland were saturated to a depth of 12 inches. Along the remainder of the wetland, soils were saturated to the surface and standing water was present 12 inches below the surface.

Soils: In the northeast lobe of the wetland, the soil beneath the A horizon is very dark gray (10YR 3/1) sandy loam with mottles. Elsewhere, near the wetland boundary, the soil consists of 10 inches of black (10YR 2/1) muck overlying a highly organic black (10YR 2/1) silt loam. In the remaining portions of the wetland, the soils consist of black (10YR 2/1) mucky peat overlying gray (5Y 5/1 and 6/1) silt loam.

Vegetation: The shrub community in the northeast lobe of the wetland is composed of Himalayan blackberry and salmonberry with an understory of giant horsetail and lady fern. Between the original and adjusted wetland edge, the vegetation is composed of western redcedar, red alder, and big-leaf maple trees with Sitka willow. The understory is dominated by salmonberry, Himalayan blackberry, and nettles. The remainder of the wetland is dominated by Pacific and Sitka willow trees. Associated species include Douglas spirea, creeping buttercup, water parsley, and tall mannagrass.

Upland: The adjacent upland is dominated by a red alder forest and upland shrub community composed of English holly, bitter cherry, Himalayan blackberry, and Douglas spirea. The soils below 10 inches are brown (10YR 5/3) with mottles.

Delineation: The northeast lobe of the wetland was delineated using wetland hydrology, hydric soil colors, and wetland vegetation. These parameters correspond with the edge of the depression.

3.2.5 South Aviation Support Area (SASA)/Tyee Valley Golf Course

The SASA/Tyee Valley Golf Course area is located southwest of the airport between South 188th Street and South 200th Street and between 18th and 28th Avenue South (see Figure 2). The SASA site is located on the western slope of a broad hill and extends down to the east branch of Des Moines Creek. The SASA footprint covers a portion of the Tyee Valley Golf Course and areas that have experienced residential, commercial, industrial, and airport-related development. Wetlands on the Tyee Valley Golf Course outside the SASA footprint are being considered for on-site wetland mitigation as part of the Master Plan Update improvements.

In the SASA/Tyee Valley Golf Course area, Wetlands 28, 52, and 53 were delineated during previous wetland investigations (Parametrix 1992; FAA 1996). Wetlands 28 and 52 are described below because their boundaries were modified during the 1998 to 2000 site investigations. The boundaries of Wetland 53, a 0.60-acre forested wetland, were found to correspond to previous delineations, and are described in Appendix E. An additional area, Wetland DMC, was originally delineated by Shapiro and Associates, Inc. and is presented in the *SR 509/South Access Road Discipline Report* (509 Discipline Report: CH2M Hill, April 2000) and is summarized below. Nine wetlands, G1 through G8 and WH (water hazard), were identified through the 1998 to 2000 field seasons. These wetlands are also described below.

Wetland 28
USFWS Classification: PSS/EM/OW
Size: 35.45 acres
Wetland data plots: 28-A1, 28-A2, 28-A3
Upland data plot: 28-B
Maps No. 16, 18, 19

Wetland 28 is located south of the existing airfield, on and west of the Tyee Valley Golf Course. A portion of the wetland extends north along the west side of the runway almost to South 188th Street. The portion of the wetland west of the Tyee Valley Golf Course, just south of the runways, was delineated during previous investigations (FAA 1996). The portion of the wetland on the golf course was delineated in January 1999.

Collectively, the portions of the wetland on the golf course are 9.75 acres in size and consist of fairways and rough for the golf course. The wetlands are separated by fill used for service or golf cart roads. Historically, the area was a peat wetland. Prior to use as a golf course (about 1970), the area was farmed. When the golf course operations began, the area was landscaped for topographic variability (i.e., tees and greens) and planted with mixed lawn grasses.

<u>Hydrology</u>: The wetland is maintained by a high groundwater table and groundwater seeps that are found along the northern and southwestern portions of the wetland. Stormwater enters the north end of the wetland via a large culvert.

The west branch of Des Moines Creek originates at the Northwest Ponds, located in the western portion of Wetland 28. The ponds are located southwest of the existing runways, between South 192nd Street and South 196th Street. They were excavated in the early 1970s as part of the airport stormwater management system. The creek flows south to the northern edge of Tyee Valley Golf Course, where it enters a narrow drainageway. The stream runs along the southern margin of the golf course portions of the wetland.

The golf course portions of the wetland are maintained by a seasonally high water table, occasional flooding from the creek, and the Northwest Ponds. On the January 1999 site visit, saturation occurred at the soil surface and the water table was found within 6 inches of the surface at each wetland data plot location in the golf course area.

AR 009014

Soils: In the golf course area, the wetland soil is primarily black (10YR 2/1) histic peat to a depth greater than 18 inches. Mineral soils consist of 4 to 10 inches of very dark gray (10YR 3/1) surface soils without mottles overlying gray (10YR 5/1) subsoils with mottles. Soils in other portions of the wetland are black (10YR 2/1) muck and loam.

Vegetation: Golf course area vegetation consists of planted turf grass. Dominant grass species are bluegrass and bentgrass. Because of specific planting and maintenance for golfing, vegetation is not a reliable indicator of wetland and non-wetland conditions.

The shrub community west of the golf course is dominated by Sitka and Pacific willow. Red elderberry and red alder are also found in the shrub layer. The understory is dominated by a mixture of cattail, bittersweet nightshade, creeping buttercup, and bentgrass. Associated species include soft rush, reed canarygrass, small-fruited bulrush, and fireweed. Several small patches of emergent vegetation in the northern arm of the wetland are dominated by cattail. Associated species include soft rush, spike rush, and bittersweet nightshade.

Upland: Upland golf course areas adjacent to the wetland are dominated by planted turf grass. The upland areas lack wetland hydrology and, in most areas, lack hydric soils. The upland soils are disturbed with a very dark grayish brown (10YR 3/2) buried A horizon with no mottles at a depth of 7 to 15 inches. A dark yellowish brown (10YR 4/4) B horizon occurs below 15 inches.

Delineation: The wetland boundary was delineated based on the distinct boundary between native organic soil and fill material associated with roads, golf greens, and tees.

Wetland 52
USFWS Classification: PFO/SS/EM
Size: 4.70 acres
Wetland data plot: 52-A
Upland data plot: None
Maps No. 17, 20

Wetland 52, located along the west branch of Des Moines Creek on the Tyee Valley Golf Course, drains to the creek upstream of the Tyee detention pond. Most of Wetland 52 was delineated during a previous investigation (Parametrix 1992). During site visits in 1999, additional wetland areas just south of the original wetland were delineated. Because these areas are hydrologically connected via the detention pond, they are discussed as part of Wetland 52.

Hydrology: The wetland is located along the south bank of Des Moines Creek at the base of a steep hillside; it is fed by hillside seeps, many of which flow throughout the summer months. The newly identified areas at the south end of the wetland had shallow inundation (up to 2 inches) at the time of the March 1999 site visit.

Soils: Soils near the stream are dark grayish brown (10YR 4/2) loam. Very dark brown (10YR 2/2) muck can be seen in the western part of the wetland. At the southern end of the wetland, subsoil colors are gray (Gley N/4 and N/5).

Vegetation: Red alder dominates the forested community, with Himalayan blackberry, madrone saplings, and Indian plum found in the understory. The shrub community is dominated by willow, with creeping buttercup, soft rush, and grasses in the herb layer. The riparian zone is dominated by Himalayan blackberry and field horsetail. The emergent area at the southern end of the wetland, on the golf course, contains a mixture of seeded turf grasses and other herbaceous vegetation. Colonial bentgrass, creeping buttercup, soft rush, and tall fescue are dominant species in the emergent area.

Upland: The surrounding upland areas are maintained golf course, parking lots, and forested hillside. On the golf course, dominant vegetation adjacent to the wetland includes colonial bentgrass, English daisy, spotted cat's-ear, and white clover. Soil in this upland area ranged from very dark brown (10YR 2/2) sandy loam without mottles to dark yellowish brown (10YR 3/4) gravelly sandy loam with mottles.

Delineation: For areas on the golf course, the wetland boundary was delineated based the presence of wetland hydrology and hydric soil colors. In other areas, the wetland was delineated based on the presence of wetland vegetation, as well as hydric soil and wetland hydrology.

Wetland G7
USFW Classification: PFO/SS
Size: 0.50 acre
Wetland data plot: G7-A
Upland data plot: G7-B
Map No. 21

Wetland G7 is located in the city of SeaTac in a fenced area that was mined for fill material to construct other airport facilities. It is located north of South 200th Street, south of the Tyee Valley Golf Course, east of a gravel parking lot, and west of a forested hill slope. Most of the wetland is located in a flat area at the base of a hill slope. The wetland extends south to South 200th Street within a constructed ditch. Water from the wetland eventually enters Des Moines Creek via the South 200th Street drainage system.

Hydrology: Wetland hydrology is supported by groundwater and precipitation. An artificially created ditch, ranging from 1 to 3 ft wide, borders the east side of the wetland. This ditch intercepts groundwater from the base of the hill slope. During the March 1999 site visit, 1 to 2 inches of standing water was present in the northern portion of the wetland. From 1 to 3 inches of water was flowing south in the constructed ditch. Soils were saturated from the surface to a depth of 6 inches, where groundwater was encountered.

Soils: Soil in the upper horizon is greenish gray (5GY 6/1) gravelly sandy loam with mottles, and the subsoil is reddish brown (2.5Y 5/3) gravelly sandy loam with mottles.

Vegetation: Vegetation in the forested and shrub communities consists of variable aged and sized black cottonwood and red alder trees, with colonial bentgrass, Himalayan blackberry, and soft rush in the understory.

Upland: The upland hill slope east of the wetland consists of a closed canopy forest dominated by red alder and black cottonwood to the north; western redcedar is also dominant to the south. The upland area west of the wetland contains red alder, Scots broom, Himalayan blackberry, and colonial bentgrass, with Pacific madrone scattered throughout. Soils were brown and dark yellowish brown (10YR 4/3 and 4/4) gravelly sandy loam and gravelly loamy sand without mottles.

No wetland hydrology was observed in either of these areas during the March 1999 field investigation.

Delineation: The wetland boundary was delineated based on the presence of wetland hydrology, hydric soil colors, and wetland vegetation.

Wetlands G1, G2, G3, G4, G5, G6, G8, WH
USFW Classification: PEM
Size: 1.34 acres
Wetland data plot: G1-A, G2-A, G4-A, G5-A, G6-A, and G8-A
Upland data plot: G1-B, G2-B, G3-B, G4-B, G5-B, G6-B, and G8-B
Maps No. 17, 20, 21

Seven new wetlands were identified on the Tyee Valley Golf Course during site visits conducted in January and March 1999: Wetlands G1, G2, G3, G4, G5, G6, G8, and WH. All are emergent wetlands, ranging in size from 0.01 to 0.87 acre (see Table 3); collectively they are 1.34 acres. The wetland locations are shown on Figure 5 and Maps 16, 19, and 20 of Appendix D. Wetland data plots were established in each wetland, and are identified as Data Plots G1-A, G2-A, G4-A, G5-A, G6-A, G8-A, and WH-A. Upland comparison plots were established outside the wetlands, and are identified as Data Plots G1-B, G2-B, G3-B, G4-B, G5-B, G6-B, and G8-B.

Hydrology: Wetlands on the Tyee Valley Golf Course are maintained by groundwater and precipitation. Some of these wetlands are located on a hill slope where groundwater surfaces and wetland conditions have developed. Inundation during the March 1999 site visit ranged up to 1.5 inches in Wetlands G5. Soils were saturated to the surface in all other wetlands. Wetland WH contains a perennial pond that is partially used for irrigation return.

Soils: All soils sampled within the wetlands contained a combination of low-chroma colors, mottles, and an aquatic moisture regime. Soil colors ranged from very dark brown (10YR 2/2) with mottles to gray (N4/1) with mottles. Soil textures within the wetlands are primarily gravelly sandy loam and gravelly loam. Sulfidic odor was detected in Wetlands G1, G4, and G5 during the March 1999 field investigation.

Vegetation: Vegetation in these wetlands is a mixture of seeded turf grass and other herbaceous vegetation. Dominant species include colonial bentgrass, creeping buttercup, English daisy, soft rush, and tall fescue. Because the area is planted with turf grass and is maintained as golf greens, vegetation is not a reliable indicator of wetland and non-wetland conditions.

Upland: Upland areas surrounding the wetlands are golf course dominated by turf grass. Species include colonial bentgrass, English daisy, spotted cat's-ear, and white clover. Soil in the upland areas ranged from very dark brown (10YR 2/2) sandy loam without mottles to dark yellowish brown (10YR 3/4) gravelly sandy loam with mottles.

Delineation: The wetland boundary was delineated based on the presence of wetland hydrology and hydric soil colors.

AR 009017

Wetland DMC
USFWS Classification: PFO/SS/EM
Size: 1.08 acres
Wetland data plots: Shapiro Data Plot
Maps No. 19, 20, 21

Wetland DMC is a 1.08-acre riparian slope wetland, which includes a portion of Des Moines Creek. The wetland is located downstream from Wetland 28 on the Tyee Valley Golf Course, east of the Runway 16L/34R light towers and north of South 200th Street. Shapiro and Associates, Inc. delineated the boundary of this wetland and their results are presented in *the SR 509 Wetland Discipline Report* (see Wetland G, CH2M Hill 2000).[5] Parametrix, Inc. verified the wetland delineation and presented the boundary to ACOE on October 26, 2000.

Shapiro and Associates, Inc. describes this area as an emergent and shrub wetland with wetland hydrology and hydric soils. The emergent component contains mowed grasses of the Tyee Valley Golf Course and the shrub component contains Pacific willow and red alder. Parametrix, Inc. confirmed these observations over several sight visits. However, an additional forested area of red alder and Pacific willow should be noted.

3.2.6 Industrial Waste System (IWS)

The IWS area is located southwest of the airport between South 188th Street and South 200th Street and east of 16th Avenue South (see Figure 2). The wetlands on this site are located north of the IWS Lagoon 3.

Wetlands IWSa and IWSb
USFWS Classification: PFO
Size: 0.67 acre
Wetland data plot: IWSa-A, IWSb-A
Map No. 16

Wetlands IWSa and IWSb are located north of the IWS lagoon and are separated from each other by a gravel access road. They are bordered by compacted fill to the south, a road to the east, and a steep slope to the north and west. Because of their small size and physical similarities, they are described together.

Hydrology: These wetlands are maintained by shallow groundwater. During the June 1999 site visit, areas within the wetland were inundated to approximately 4 inches. Soil was saturated to the surface at both data plot locations. No outlet from the wetland was observed.

Soils: Soil identified within both wetlands have a surface horizon of very dark gray (10YR 3/1) loamy sand overlying a dark gray (10YR 4/1) gravelly coarse sand with mottles. Other areas of the

AR 009018

[5] Wetland G is described as 7.88 acres in size and includes 6.80 acres of wetland included in Wetland 28 in this report.

wetland have a very dark grayish brown (10YR 3/2) loamy sand with high organic content over a gray (2.5Y 5/1) sandy loam with mottles.

Vegetation: In the forested community, red alder, willow, and black cottonwood form the overstory. Giant horsetail and Himalayan blackberry are the dominant plant species in the understory.

Delineation: The wetlands were delineated on sharp changes in hydrology and hydric soil conditions related to topography. The wetland boundary along the road was delineated along the fill edge. The southern portions of the wetlands were delineated along the edge of compacted fill.

3.2.7 SASA Detention Pond Area

The SASA detention pond area, located east of the airport and south of South 188th Street (see Figure 2), is the proposed site for a new airport electrical substation. Vacant land east of the south substation is earmarked for the stormwater management facilities required for SASA. Three small wetlands occur in this area, as described below.

Wetland E1
USFW Classification: PFO
Size: 0.23 acre
Wetland data plot: E1-A
Upland data plot: E1-B
Map No. 17

Wetland E1, located in the western portion of the site, is separated from a roadside ditch by an elongated berm.

Hydrology: Wetland E1 is located on a hill slope and has no surface water outlet. Hydrology is derived from groundwater seeps and surface water runoff. Small portions of the wetland were inundated at the time of the January 1999 site visit.

Soils: The wetland soil consists of black (10YR 2/1) gravelly sandy loam over gray (10YR 5/1) gravelly sandy loam without mottles.

Vegetation: The forested wetland community is dominated by black cottonwood, Scouler willow, and red alder saplings. The understory consists of soft rush and creeping buttercup, with patches of Himalayan blackberry.

Upland: The surrounding upland community is dominated by Himalayan blackberry with scattered black cottonwood saplings. Colonial bentgrass dominates the herb layer. The upland soil is reddish brown (2.5YR 4/3) gravelly sandy loam with mottles below a depth of 10 inches.

Delineation: The wetland boundary was delineated based on the presence of wetland vegetation, wetland hydrology, and hydric soil characteristics.

AR 009019

Wetland E2
USFW Classification: PFO
Size: 0.04 acre
Wetland data plot: E2-A
Upland data plot: E2-B
Map No. 17

Wetland E2 is a highly disturbed wetland north of a gravel parking area and east of a gravel driveway. The wetland appears to have been created from excavation activities associated with previous land uses.

Hydrology: Wetland hydrology is maintained by groundwater discharge and precipitation. Pockets of standing water, ranging in depth from 4 to 14 inches, were observed during the February 1999 field investigations. In other areas, soils were saturated to the surface.

Soils: Soil in the upper 2 inches of the wetland consists of black (10YR 2/1) gravelly sandy loam. Gray (10YR 5/1) gravelly sandy loam was observed between a depth of 2 to 12 inches.

Vegetation: Wetland E2 contains both shrub and forested communities. Dominant tree species in the canopy are red alder and black cottonwood, with Himalayan blackberry dominant in the shrub layer.

Upland: Dominant vegetation in upland areas north, east, and west of the wetland consists of Himalayan blackberry, colonial bentgrass, and black cottonwood saplings. Scots broom, Pacific madrone, and Douglas fir are also present to the north. A gravel parking lot borders the south side of the wetland.

Delineation: The wetland boundary was delineated based on the presence of wetland vegetation, wetland hydrology, and hydric soil characteristics.

Wetland E3
USFW Classification: PFO
Size: 0.06 acre
Wetland data plot: E3-A
Upland data plot: E2-B
Map No. 17

Vegetation and soils in Wetland E3 are highly altered. The wetland is located north of a gravel parking area and east of a gravel driveway. Similar to Wetland E2, Wetland E3 appears to have been created from excavation activities associated with previous land uses.

Hydrology: Wetland hydrology is supported by groundwater and precipitation. Pockets of standing water up to 12 inches deep were observed during the February 1999 field investigation.

Soils: The wetland soils consist of gray (10YR 5/1) fine sand down to a depth of 8 inches, with white (2.5Y 5/1) fine sand to a depth of 18 inches.

AR 009020

Vegetation: The forested wetland community is dominated by black cottonwood, with soft rush present in the understory.

Upland: Dominant vegetation in upland areas north, east, and west of the wetland consists of Himalayan blackberry, colonial bentgrass, and black cottonwood saplings. Scots broom, Pacific madrone, and Douglas fir are also present to the north. A gravel parking lot borders the south side of the wetland.

Delineation: The wetland boundary was delineated based on the presence of wetland vegetation, wetland hydrology, and hydric soil characteristics.

AR 009021

4. SUMMARY

Parametrix, Inc. conducted a detailed wetland investigation of the Seattle-Tacoma International Airport (STIA) Master Plan Update improvement sites. The improvement sites are owned by the Port of Seattle (Port) and located in the cities of SeaTac and Des Moines in King County, Washington. This report describes the wetlands located within the study area and updates previous wetland studies conducted for the Master Plan Update improvements.

This study found total of 117 wetlands, ranging in size from 0.01 to 35.45 acres, were delineated in the study area, totaling 115.89 acres of wetland. They include palustrine forested, scrub-shrub, emergent, and open-water wetland habitat. Ten of the identified wetlands are farmed wetlands. Other Waters of the U.S. within the study area include Miller Creek and Des Moines Creek as well as ponds and several drainage channels that convey natural runoff to these streams. These areas, ranging in size from 0.01 to 3.09 acres, total 3.43 acres. Several other large wetlands that extend outside the study area will not be impacted and were not delineated. These areas total approximately 50.00 acres.

The results of this study have been reviewed and confirmed by ACOE. Site visits by ACOE to confirm wetland boundary delineations took place on July 6, 8, 14, and 16, 1998; August 6, 1998; September 23, 1998; October 19, 22, 27, and 29, 1998; November 17, 18, and 19, 1998; January 8 and 12, 1999; March 8, 1999; June 7 and 21, 1999; August 2, 1999; January 18, 2000; February 3, 2000; October 26, 2000; and November 3, 8, 20, and 30, 2000.

Modifications that were requested by ACOE during these site visits have been made and are reflected in the mapping and analysis presented in this report.

The findings of this report will be used to determine wetland impacts and mitigation requirements for the Master Plan Update improvements, as presented in a *Wetland Functional Assessment and Impact Analysis Report* (Parametrix 2000a) and *Natural Resource Mitigation Plan* (Parametrix 2000b).

5. REFERENCES

ACOE (U.S. Army Corps of Engineers). 1982. Clarification of 'Normal Circumstances' in the Wetland Definition. Regulatory Guidance Letter No. 82-2.

ACOE (U.S. Army Corps of Engineers). 1986. Clarification of 'Normal Circumstances' in Wetland Definition. Regulatory Guidance Letter No. 86-9. (33 CFR 323.2(c)).

ACOE (U.S. Army Corps of Engineers). 1990. Clarification and Interpretation of the 1987 Manual. Regulatory Guidance Letter No. 90-7.

ACOE (U.S. Army Corps of Engineers). 1992. Clarification and Interpretation of the 1987 Manual. 3-92 Memorandum.

ACOE (U.S. Army Corps of Engineers), Seattle District. 1994. Washington Regional Guidance on the 1987 Wetland Delineation Manual. 5-94 Public Notice.

Butler & Associates and Sheldon & Associates. Revised January 22, 1992. Seattle-Tacoma Airport Wetland Management Plan.

CH2M Hill and Associated Firms. 1995. Port of Seattle Des Moines Creek technology campus DEIS. Bellevue, Washington.

CH2M Hill and Associated Firms. 2000. SR 509/South Access Road Wetland Discipline Report. Bellevue, Washington.

Cowardin, L.M.; V. Carter; F.C. Golet; and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, Washington, D.C.

Ecology (Washington State Department of Ecology). 1995. Use of the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual. 3-95 Public Notice.

Ecology (Washington State Department of Ecology). 1997. Washington State wetlands identification and delineation manual. Ecology Publications #96-94.

Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

FAA (Federal Aviation Administration). 1994. South Aviation Support Area Final Environmental Impact Statement. Seattle, Washington.

FAA (Federal Aviation Administration). 1995. Draft final environmental impact statement for proposed master plan update development activities at Seattle-Tacoma International Airport, Appendix H-A: Jurisdictional Wetland Delineation Report. Prepared for the Port of Seattle. Seattle, Washington.

FAA (Federal Aviation Administration). 1996. Final environmental impact statement for proposed master plan update development activities at Seattle-Tacoma International Airport. Prepared for the Port of Seattle. Seattle, Washington.

Federal Register. 1986. Regulatory programs of the Corps of Engineers: Final rule. Volume 51, No. 219; 33 CFR Parts 320 through 330. U.S. Government Printing Office, Washington, D.C.

Greytag MacBeth. 1998. Munsell Soil Color Charts. New Windsor, New York.

Hitchcock, C.L. and A. Cronquist. 1991. Flora of the Pacific Northwest, 8th ed. University of Washington Press. Seattle, Washington.

King County, Washington Department of Parks, Planning and Resources, Planning and Community Development Division. 1990a. King County sensitive areas map folio. Seattle, Washington.

King County, Washington. 1990b. King County Sensitive Areas Ordinance. King County Council Ordinance No. 9614. Seattle, Washington.

Parametrix, Inc. 1992. South Aviation Support Area wetlands discipline report. Prepared for Port of Seattle. Kirkland, Washington.

Parametrix, Inc. 2000a. Wetland functional assessment and impact analysis, Master Plan Update improvement projects. Prepared by Parametrix for the Port of Seattle. Kirkland, Washington.

Parametrix, Inc. 2000b. Natural resource mitigation plan. Prepared for Port of Seattle. Kirkland, Washington.

Reed, P.B. 1988. National list of plant species that occur in wetlands: northwest region (Region 9). U.S. Fish and Wildlife Service, Washington, D.C. Biological Report 88(26.9).

Reed, P.B. 1993. 1993 Supplement to national list of plant species that occur in wetlands: northwest region (Region 9). U.S. Fish and Wildlife Service, Washington, D.C. Biological Report 88(26.9).

Snyder, D.E., P.S. Gale, and R.F. Pringle. 1973. Soil survey of King County area, Washington. U.S. Department of Agriculture, Soil Conservation Service in cooperation with Washington State University, Agriculture Research Center, Seattle, Washington.

USDA (U.S. Department of Agriculture), Soil Conservation Service. 1991. Hydric soils of the United States. U.S. Department of Agriculture, Soil Conservation Service Miscellaneous Publication No. 1491.

USDA (U.S. Department of Agriculture), Natural Resource Conservation Service (NRCS). 1994. National Food Security Act manual, 180-V-NFSAM, March 1994.

USFWS (U.S. Fish and Wildlife Service). 1987. National Wetlands Inventory, Des Moines, Washington Quadrangle.

USGS (U.S. Geological Survey). 1995. 7.5 Minute Topographic Series, Des Moines, Washington Quadrangle.

A. AUBURN WETLAND
MITIGATION SITE DELINEATION
REPORT

APPENDIX A

WETLAND DELINEATION REPORT - AUBURN MITIGATION SITE

WETLAND DELINEATION REPORT FOR THE AUBURN WETLAND MITIGATION SITE

MASTER PLAN UPDATE IMPROVEMENTS SEATTLE-TACOMA INTERNATIONAL AIRPORT

Prepared for

PORT OF SEATTLE
Seattle-Tacoma International Airport
P.O. Box 68727
Seattle, WA 98168

Prepared by

Parametrix, Inc.
5808 Lake Washington Blvd. NE, Suite 200
Kirkland, WA 98033-7350

December 2000
556-2912-001 (41)

TABLE OF CONTENTS

APPENDICES

A SOIL PROFILE DESCRIPTIONS - KING COUNTY SOIL SURVEY
B GROUNDWATER WELL DATA
C MILL CREEK AND NORTHWEST WETLAND INVENTORY MAP
D WETLAND DETERMINATION DATA SHEETS
E WASHINGTON DEPARTMENT OF ECOLOGY WETLAND RATING

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

In October 2000, Parametrix conducted a jurisdictional wetland delineation on a 67-acre land parcel located in the City of Auburn, Washington. The site (hereafter referred to as the "mitigation site") is owned by the Port of Seattle and planned as an off-site wetland mitigation project. The project will mitigate, in part, wildlife habitat functions impacted by filling wetlands near the Seattle-Tacoma International Airport for Master Plan Update improvement projects.

The wetland delineation followed required methods of the U.S. Army Corps of Engineers *Wetlands Delineation Manual* (Environmental Laboratory 1987) and the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997). This report describes the results of the delineation.

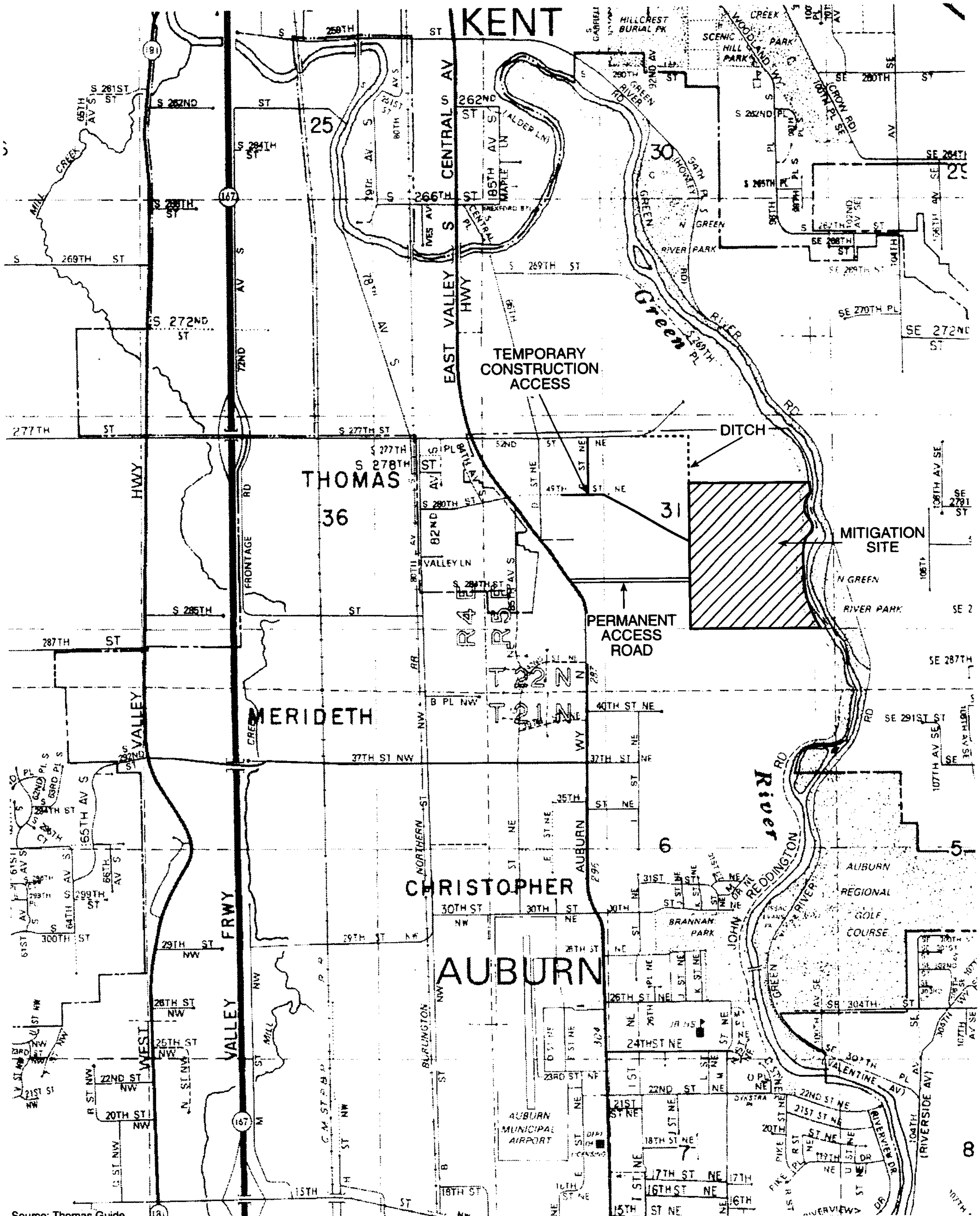
Two palustrine emergent wetlands, dominated by non-native pasture grasses, were delineated on the mitigation site: Wetland 1 occurs in the northwest and central portions of the site. About 20.45 acres of Wetland 1 occur on the mitigation site, and the wetland extends off-site to the west and north. Wetland 2 is 0.60 acre in size and is located in the south-central part of the site. Wetland 3 is 0.01 acre in size and is located in the north-central part of the site. Wetlands 1 and 2 meet the Washington Department of Ecology criteria of a Category III wetland and Wetland 3 meets the criteria for a Category IV wetland. The remainder of the mitigation site (about 44 acres) was determined to be non-wetland. The Seattle District of the U.S. Army Corps of Engineers, Washington State, and the City of Auburn have jurisdiction over activities that may impact these wetlands.

1. INTRODUCTION

The Port of Seattle (hereafter cited as the Port) will construct a wetland mitigation project on 65 acres of property it owns in the City of Auburn, Washington (Figure 1). The wetland mitigation is planned as off-site mitigation to partially compensate for wetlands filled by Master Plan Update (MPU) projects constructed at the Seattle-Tacoma International Airport (STIA). The wetland mitigation is part of a Section 404 individual permit, as described in the Port's JARPA # 96-4-02325 (Port of Seattle 1996, 2000). The wetland mitigation design is explained in detail in the *Revised Draft Natural Resource Mitigation Plan* (Parametrix 1999).

The purpose of this report is to describe and map jurisdictional wetlands that occur on the mitigation site. A jurisdictional determination of wetlands on the mitigation site was made by the U.S. Army Corps of Engineers (ACOE) based on a March 1997 field evaluation and delineations conducted by David Evans and Associates, Inc. (1995) and Parametrix (1999). Recent data collected from groundwater monitoring wells installed on site to document shallow groundwater hydrology and observations of recently formed hydric soil characteristics on the wetland mitigation have prompted ACOE to require a revision of the previous wetland delineation. A revised delineation of the mitigation site was completed during October 2000; this report documents the methods and results of that delineation.

The report is organized into four sections. The location and general site conditions are described in Chapter 2. Chapter 3 summarizes the wetland delineation methodology and Chapter 4 describes the results of the wetland delineation. Appendices A through E provide data and other documentation that support the wetland delineation and regulatory discussion.



POS Mitigation Site/556-2912-001/01(41) 10/00 (K)

Drainage Ditch

Temporary Construction Access Road

Permanent Access Road

Mitigation Site

SCALE IN FEET

0 1,000 2,000

N

Figure 1
Location of Port of Seattle Auburn Wetland Mitigation Site

2. SITE LOCATION AND DESCRIPTION

2.1 SITE LOCATION

The mitigation site is located in the City of Auburn, King County, Washington (Section 31, Township 22N, Range 5E W.M.) (Figure 1). The site is located west of the Green River, south of 277th Street Southeast, and west of Auburn Way North. Figure 2 shows an aerial photograph of the Site and surrounding properties.

2.2 SITE DESCRIPTION

The site is nearly level, with typical slopes ranging from 0 to 1 percent. Elevations on the site range from approximately 45 to 50 feet above mean sea level. Historically, the site has been in the floodplain of the Green River; however, the mapped floodplain of the river is currently in only a small portion of the northwest corner of the site (Figure 3).

The mitigation site was farmed until the late 1980s. No significant land disturbance has occurred on the site since that time. Agricultural operations continue on properties north and south of the site.

2.2.1 Soils

The soils on the mitigation site are alluvial in origin, developed from material deposited on the site by the Green River. The surficial layers of these soils are a complex of silty mineral soils, frequently intermixed with lenses of fine sand. Plowing has mixed the surficial layers of soil, typically to a depth of 9 to 10 inches.

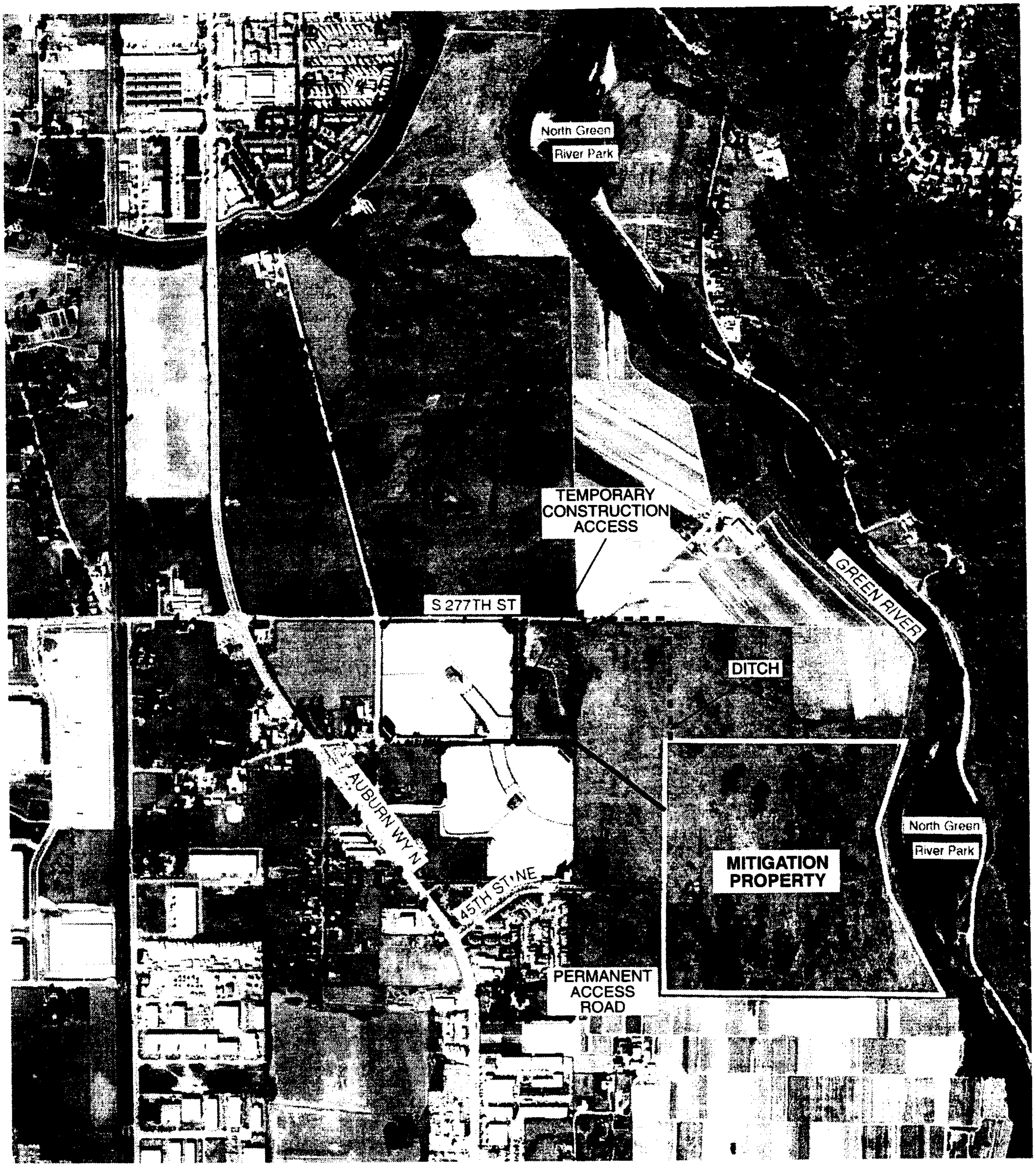
The King County Soil Survey (Snyder et al. 1973) maps soils on the site as the poorly drained Briscot, Oridia, and Woodinville silt loams and the somewhat poorly drained Renton silt loam (Figure 4; Table 1; Appendix A). Briscot, Oridia, Renton, and Woodinville silt loams are designated as hydric soils on the King County, Washington Hydric Soil List (NRCS 1992).

Since abandonment of agricultural activities approximately 10 years ago, redoximorphic[1] features have developed in areas with wetland hydrology in the upper 10 inches of the soil profile, indicating that these areas contain hydric soil. The hydric soil indicators typically found on the site are oxidized rhizospheres and the presence of mottles in soils with a low chroma matrix color.

In areas where high water tables are absent, the redoximorphic features or other hydric soil indicators are absent. The non-wetland soils are characterized by soil matrix color of 10YR 3/3 or 10YR 4/3 without prominent mottles.

---

[1] Redoximorphic features are patterns of soil color that develop from the repeated chemical oxidation and reduction process found in many hydric (wetland) soils.



POS Mitigation Site/556-2912-001/01(41) 12/00 (K)

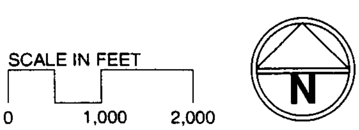
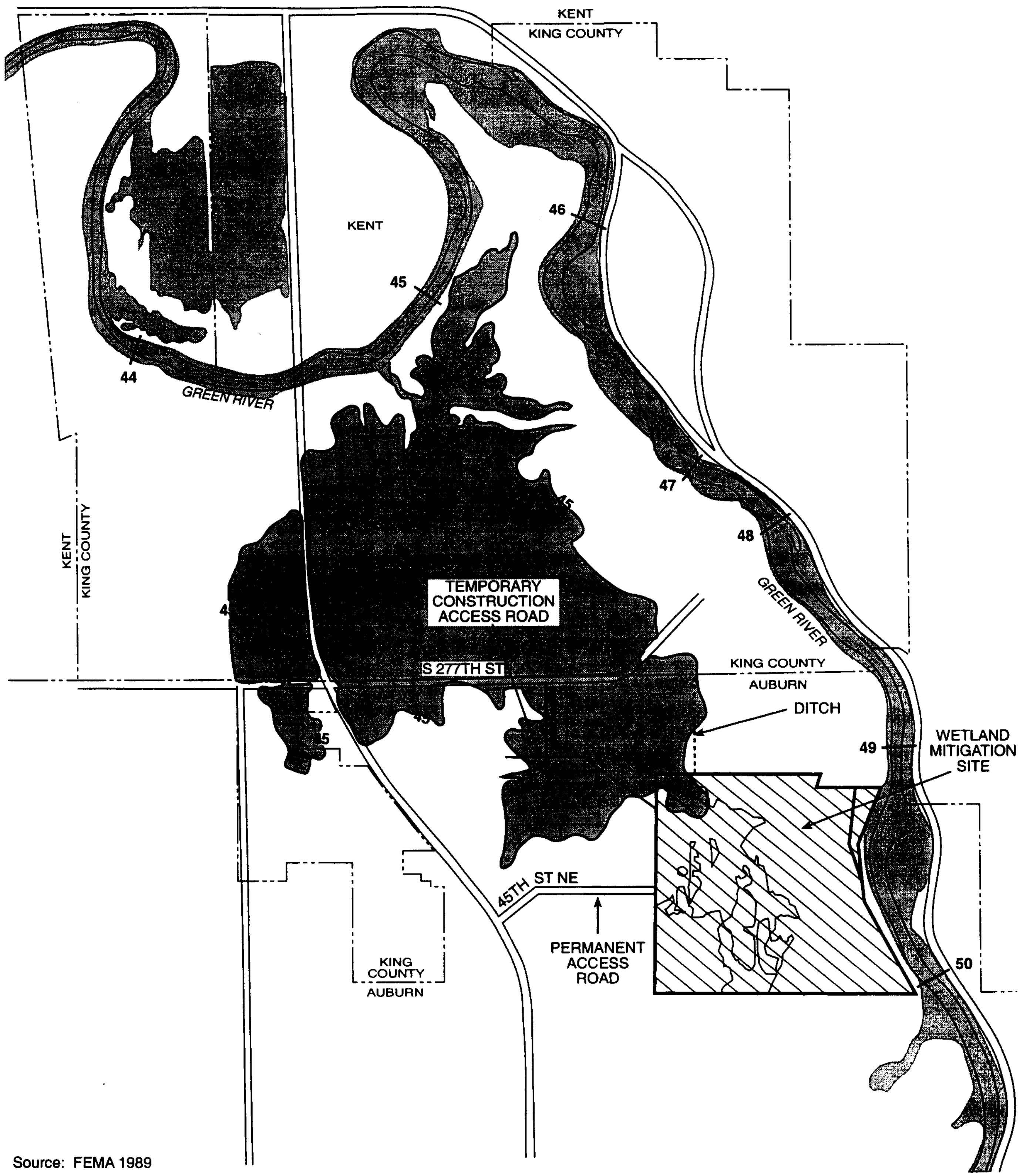


Figure 2
Aerial Photograph of the Wetland Mitigation Site



Source: FEMA 1989

POS Mitigation Site/556-2912-001/01(41) 12/00 (K)

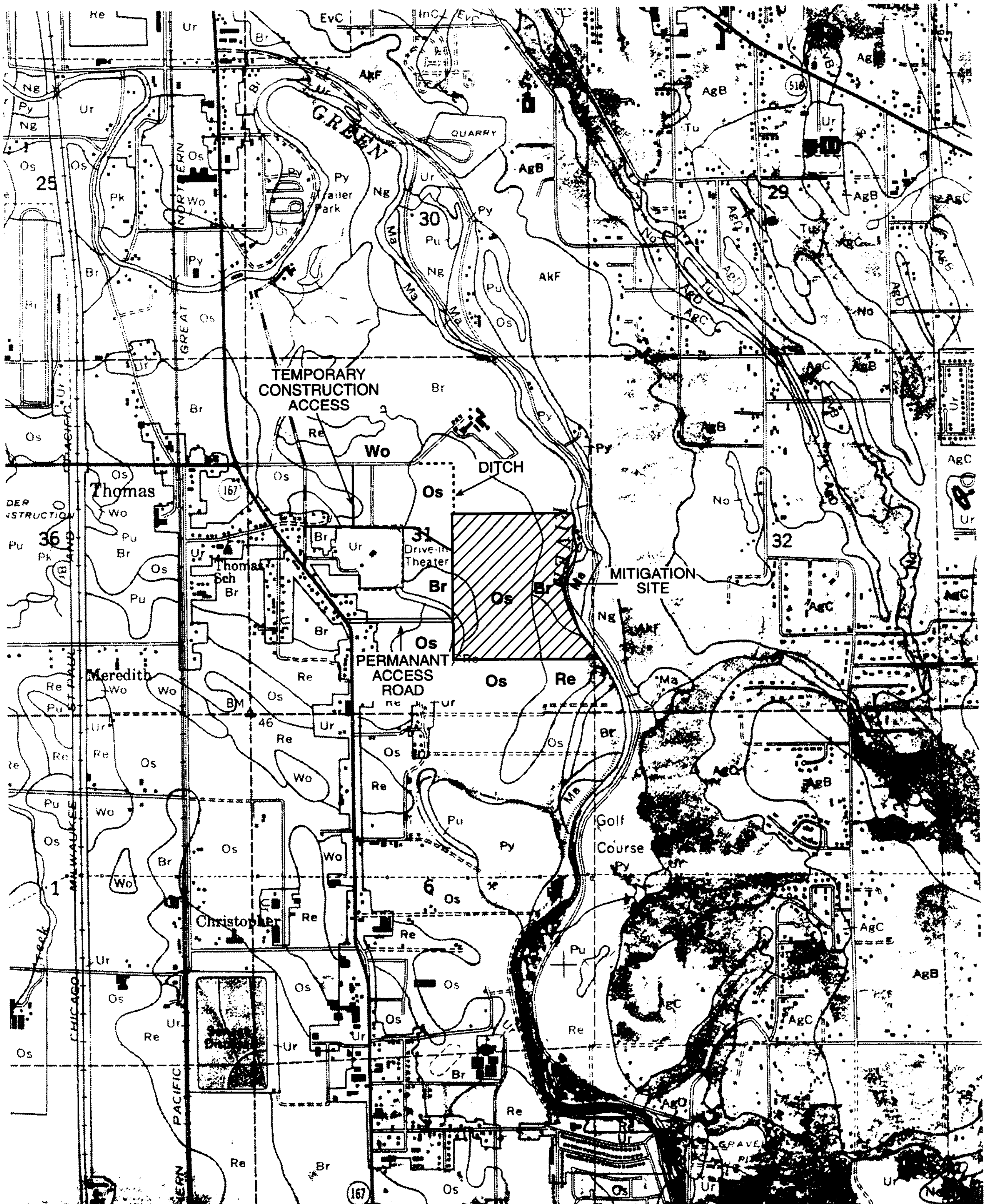
N

NOT TO SCALE

100-Year Floodplain

50 Flood Elevations

Figure 3
100-Year Floodplain On and Near the Wetland Mitigation Site



Source: Sheet 16, Soil Survey of King County Area. Washington. 1973.

POS Mitigation Site/556-2912-001/01(41) 12/00 (K)

SCALE IN FEET

0 1,000 2,000

N

Os Oridia Silt Loam
Br Briscot Silt Loam
Wo Woodinville Silt Loam
Re Renton Silt Loam

Figure 4
Soil Types on the Wetland Mitigation Site

Table 1. Hydrologic characteristics of soils present on the mitigation site.

		High Water Table			Flooding		
Soil Series	Drainage Class	Permeability (in/hr)	Depth (ft)	Months	Frequency	Duration	Months
Briscot	Poorly	0.63-2.0	1 to -1	Nov-Apr	Occasional	Brief	Dec-Feb
Oridia	Poorly	0.20-2.0	1 to 3	Nov-Apr	Occasional	Brief	Nov-Apr
Renton	Somewhat poorly	2.0-6.3	1 to 1.5	Nov-Apr	Common	Brief	Nov-Apr
Woodinville	Poorly	2.0-6.3	1 to -1	Nov-May	Common	Brief	Oct-Apr

Source: Snyder et al. (1973).

[a] All soils mapped are classified as hydric; however, evaluation of on-site conditions indicate non-hydric soil inclusions occur throughout the site.

[b] Within the top 20 inches of soil.

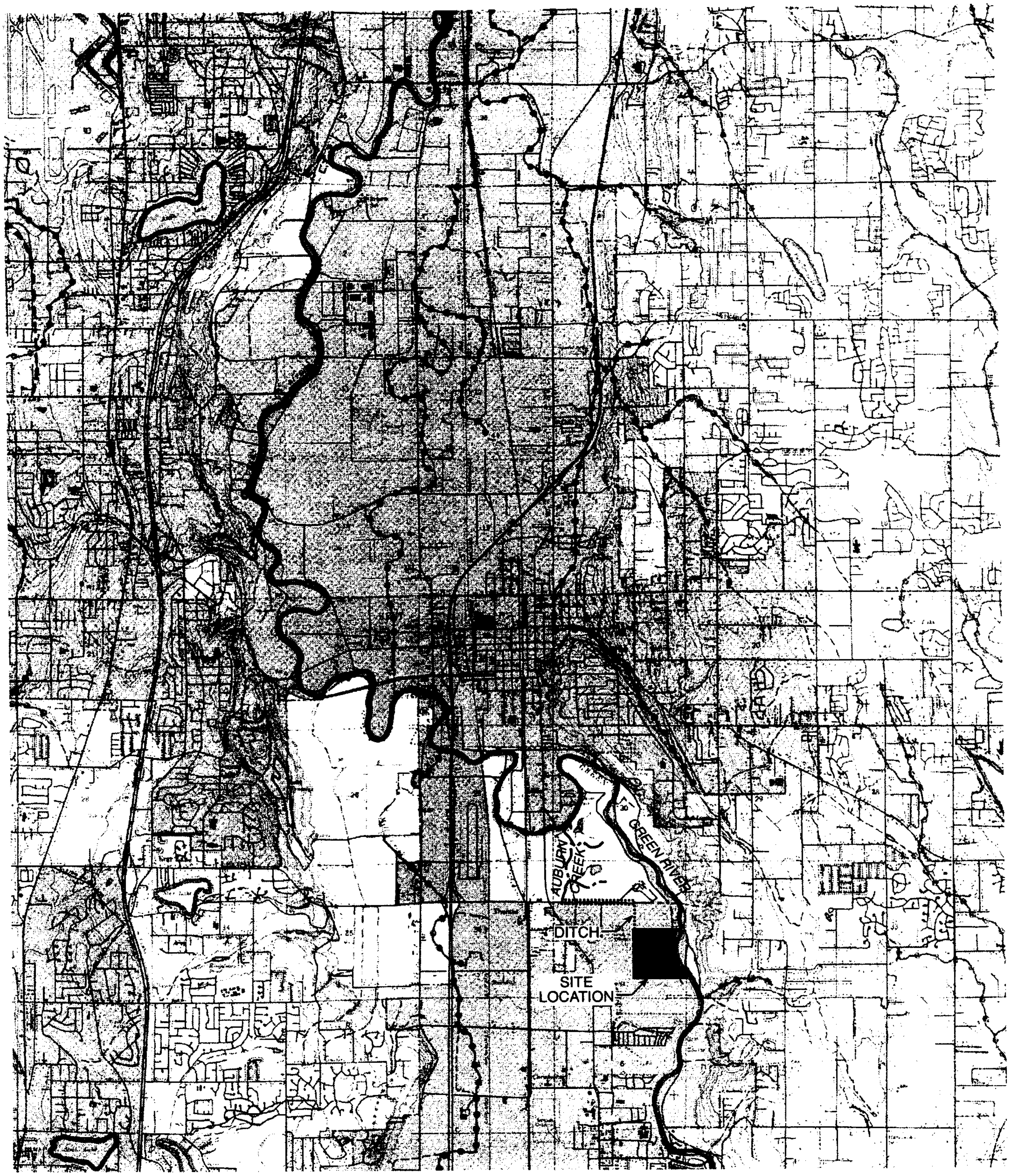
2.2.2 Hydrology

There are no natural surface water features on the mitigation site. Two streams, the Green River and Auburn Creek, are located near the mitigation site. The Green River flows from south to north about 100 feet east of the mitigation site. At this location, the river base elevation is about 12 to 15 feet below the site elevation. The river channel consists of a steep bank, largely vegetated with alder and black cottonwood saplings. North of the mitigation site and South 277th Street, King County et al. (1990) maps an intermittent stream (Auburn Creek). This creek drains pasture and farmland and flows into the Green River about 1 mile north of the site (Figure 5). At its confluence with the Green River, a small dike, culvert, and flap gate provide flood control.

A drainage ditch on the mitigation site conveys stormwater and groundwater runoff from the northwest portion of the site to other ditches along South 277th Street. This water eventually enters Auburn Creek.

Since September 1995, the groundwater hydrology of the site has been monitored using shallow groundwater monitoring wells (Figures 6 through 10; Appendix B). The well data indicate groundwater levels that are within 18 inches of the surface at a number of locations, and generally within 36 to 24 inches of the soil surface for extended periods of time during the late fall, winter, and early spring months.

Wetlands on the mitigation site appear to be largely supported by on-site precipitation that perches in the low permeability soils. During periods of excessive rain, backwater flow from the 100-year floodplain enters the northwest corner of the site. Overland flow also enters the site through a wetland drainageway crossing the site from south to north. This drainageway contains surface flow for short time periods (up to several days) following periods of heavy rain.



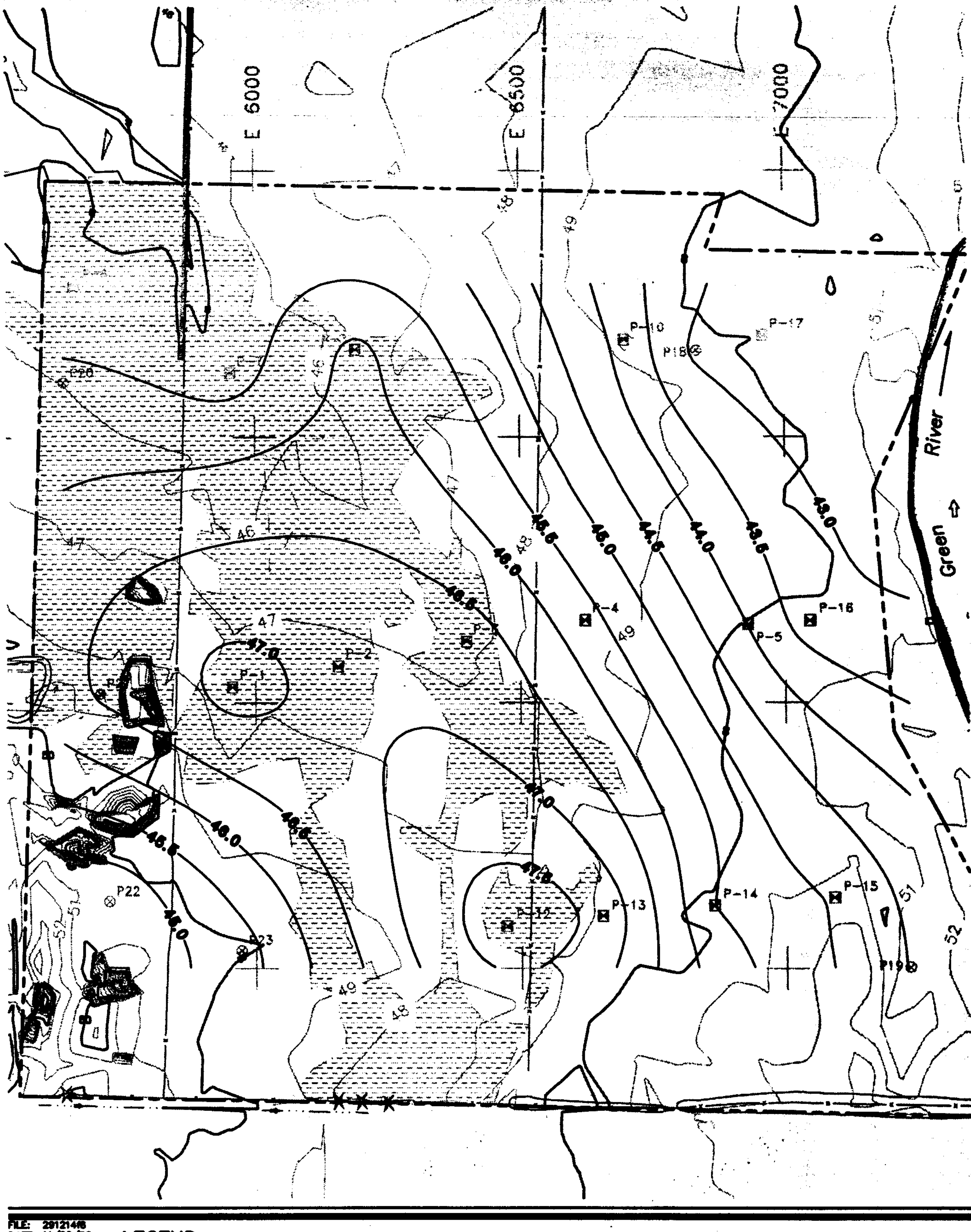
Source: Sensitive Areas Map Folio,
King County, Washington, December1990

POS Mitigation Site/556-2912-001/01(41) 11/00 (K)

SCALE IN MILES
0 .5 1

N

Figure 5
Streams and Surface Water Near the Mitigation Site



FILE: 29121446
DATE: 11/08/00

LEGEND:

—46.0— Groundwater Contour and Elevation

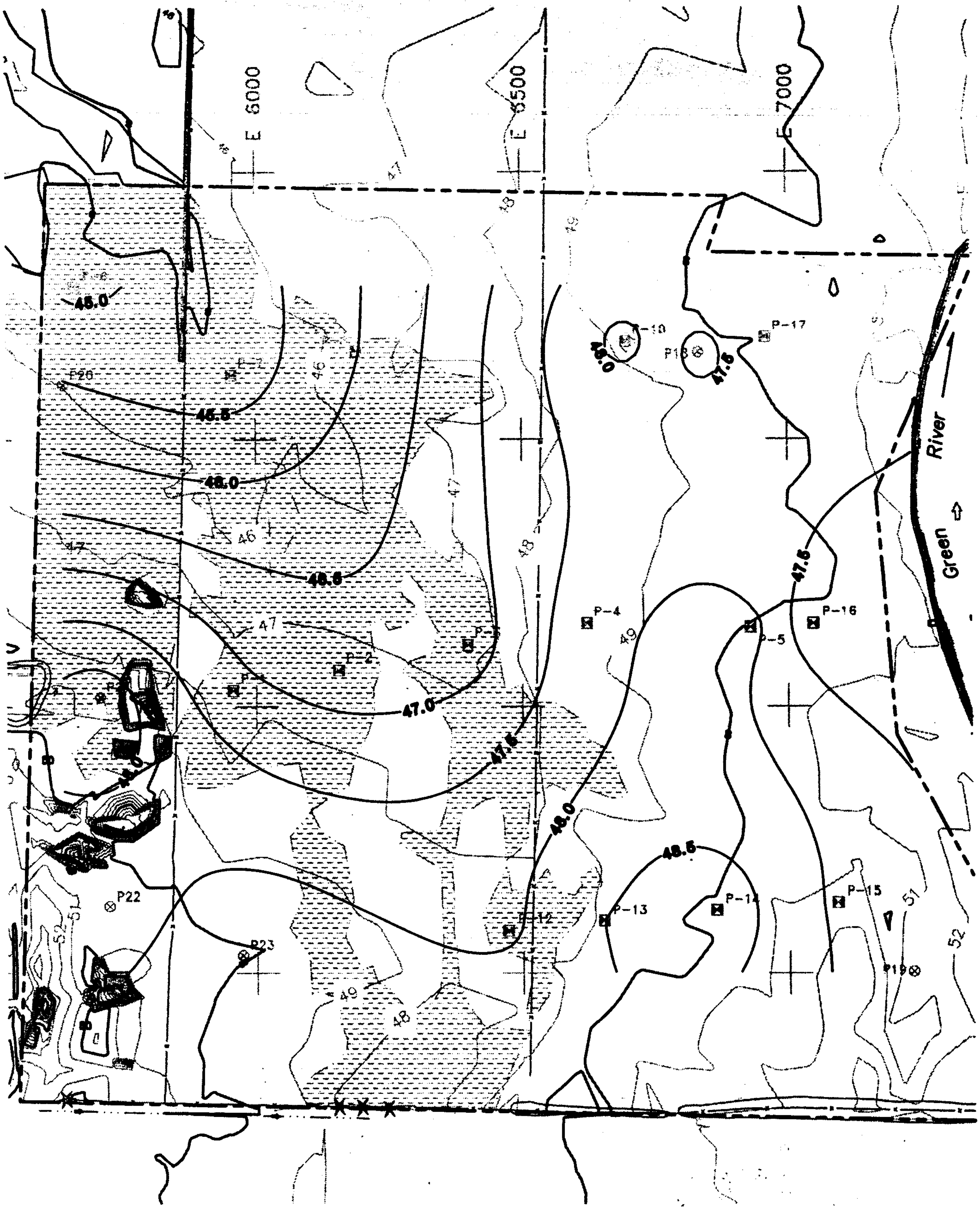
Existing Wetland

P20 Well Locations and Number

Existing Ground Surface Contour and Elevation

Figure 6
Groundwater Elevations on the Auburn Wetland Mitigation Site (December 2, 1999)

AR 009040



FILE: 29121467
DATE: 11/08/00

LEGEND:

46.5 Groundwater Contour and Elevation

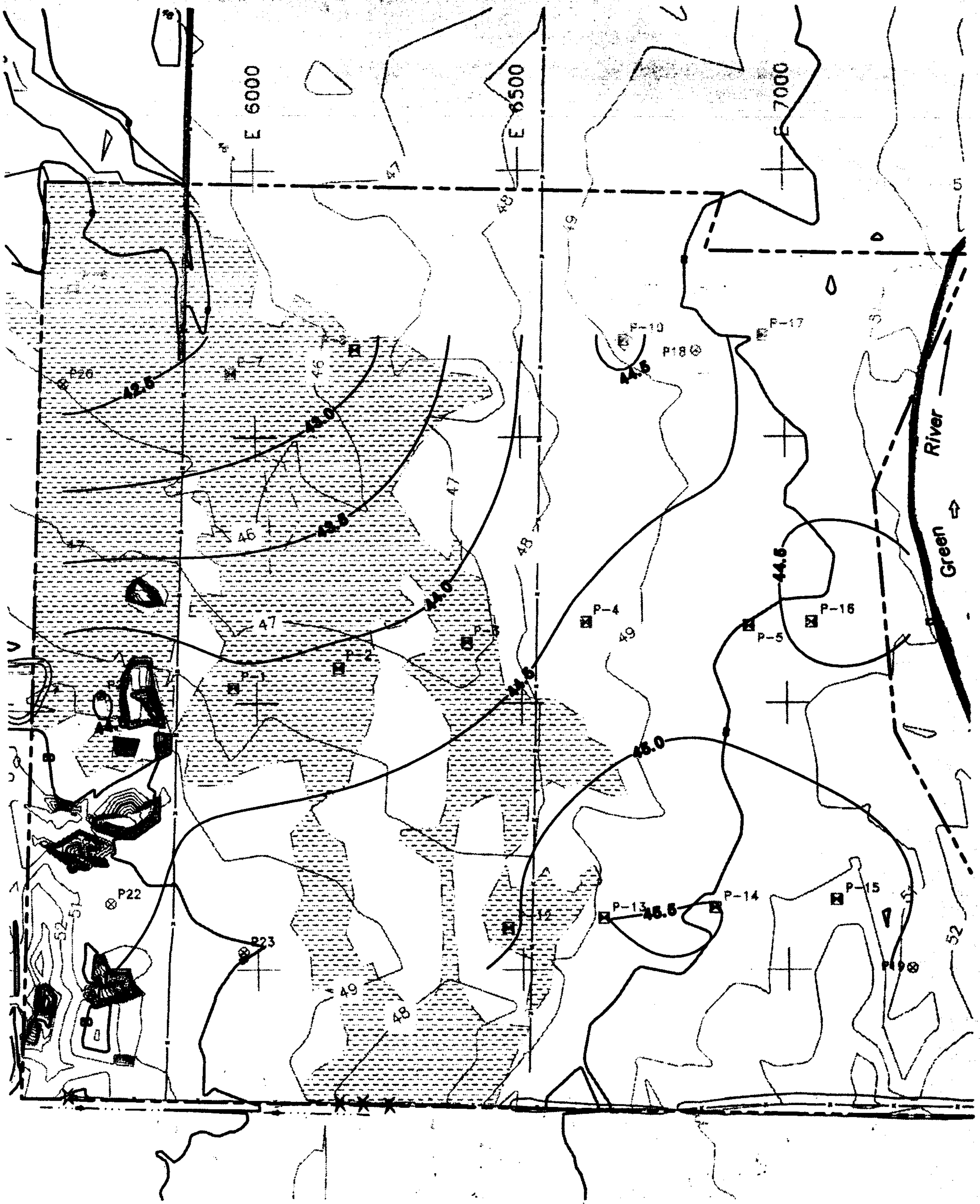
Existing Wetland

P20 Well Locations and Number

Existing Ground Surface Contour and Elevation

N

Figure 7
Groundwater Elevations on the Auburn Wetland Mitigation Site (March 8, 2000)



FILE: 28121448
DATE: 12/10/00

LEGEND:

44.5 — Groundwater Contour and Elevation

Existing Wetland

P20 — Well Locations and Number

Existing Ground Surface Contour and Elevation

N

Figure 8
Groundwater Elevations on the Auburn Wetland Mitigation Site (June 2, 2000)

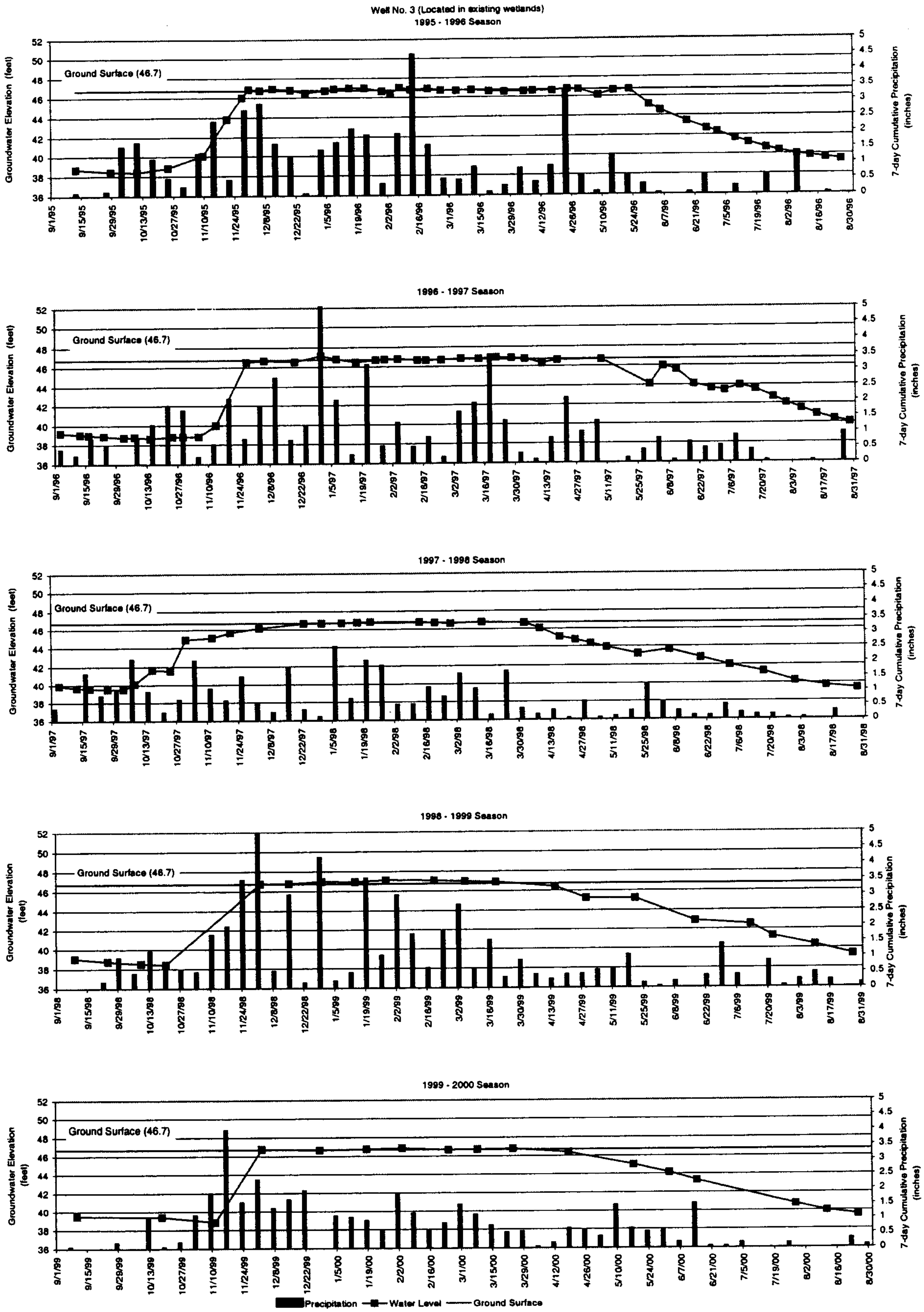


Figure 9
Variations in Groundwater and Daily Precipitation (Wetland)

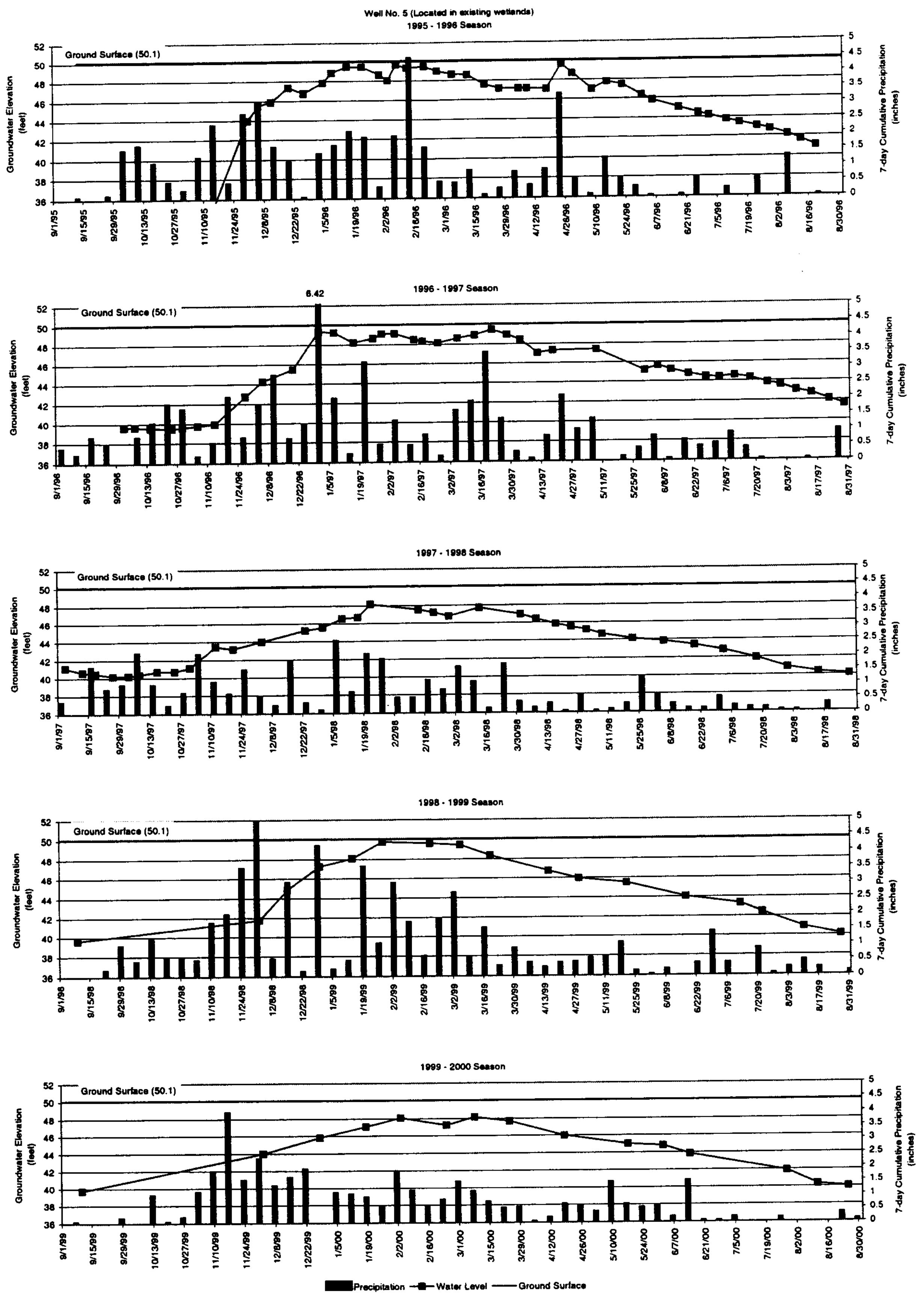


Figure 10
Variations in Groundwater and Cumulative Precipitation (Upland)

charts for NRMP.xls

Given the well monitoring data, the soils data, and field evidence of surface hydrology, the primary drivers of wetland hydrology on the mitigation site are:

- The seasonally high groundwater table
- Low soil permeability coupled with high seasonal levels of precipitation
- Overland flow during heavy precipitation from adjacent land south of the site

2.3 VEGETATION

Vegetation on the mitigation site and vicinity consists predominantly of a mix of non-native grasses and herbaceous plants, including species that are typical of abandoned agricultural land (Table 2). Locally dominant plants on the site include: meadow foxtail (*Alopecurus pratensis*), tall fescue (*Festuca arundinacea),* red fescue *(Festuca rubra),* Canada thistle (*Cirsium arvense)*, quackgrass (*Agropyron repens*), timothy (*Phleum pratense*), orchardgrass (*Dactylis glomerata*), common velvet-grass (*Holcus lanatus)*, perennial ryegrass (*Lolium perenne),* colonial bentgrass (*Agrostis tenuis*), and patches of reed canarygrass (*Phalaris arundinacea*). Other non-native species scattered throughout these areas include cocklebur (*Xanthium strumarium*), common dandelion (*Taraxacum officinale*), and nightshade (*Solanum* sp.). A few patches of Himalayan blackberry (*Rubus discolor*) shrubs occur in scattered areas on sidecast piles of soil. A small stand of young black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) is located along the west central property boundary.

Table 2. Mitigation site dominant vegetation.

Common Name	Scientific Name	Indicator Status	Non-Native (x)
TREES			
black cottonwood	*Populus balsamifera* ssp. *trichocarpa*	FAC	
red alder	*Alnus rubra*	FAC	
willow	*Salix* sp.	FACW	
SHRUBS			
Himalayan blackberry	*Rubus discolor*	FACU	x
red-osier dogwood	*Cornus stolonifera*	FACW	
salmonberry	*Rubus spectabilis*	FAC+	
Scot's broom	*Cytisus scoparius*	UPL	x
willow	*Salix* sp.	FACW	
HERBS			
American vetch	*Vicia americana*	FAC	x
bedstraw	*Galium* sp.	FACU	
bentgrass	*Agrostis* sp.	FAC	x
bittersweet nightshade	*Solanum dulcamara*	FAC+	x
bluegrass	*Poa* sp.	FAC	x
bracken fern	*Pteridium aquilinum*	FACU	
Canada thistle	*Cirsium arvense*	FACU+	x

Table 2. Mitigation Site dominant vegetation (continued).

Common Name	Scientific Name	Indicator Status	Non-Native (x)
HERBS (continued)			
clover	*Trifolium* sp.	FAC	
colonial bentgrass	*Agrostis capillaris (tenuis)*	FAC	x
common velvet-grass	*Holcus lanatus*	FAC	x
creeping bentgrass	*Agrostis stolonifera*	FAC	x
creeping buttercup	*Ranunculus repens*	FACW	x
curly dock	*Rumex crispus*	FAC	x
dandelion	*Taraxacum officinale*	FACU	x
fescue	*Festuca* sp.	NL	
field horsetail	*Equisetum arvense*	FAC	
fireweed	*Epilobium ciliatum*	FACW-	
giant mannagrass	*Glyceria grandis*	OBL	
Kentucky bluegrass	*Poa pratensis*	FAC	x
meadow fescue	*Festuca pratensis*	FACU+	x
orchardgrass	*Dactylis glomerata*	FACU	x
perennial ryegrass	*Lolium perenne*	FACU	x
quackgrass	*Agropyron repens*	FACU	x
red clover	*Trifolium pratense*	FACU	x
red fescue	*Festuca rubra*	FAC+	
redtop	*Agrostis gigantea (alba)*	FAC	x
reed canarygrass	*Phalaris arundinacea*	FACW	x
soft rush	*Juncus effusus*	FACW	
tall fescue	*Festuca arundinacea*	FAC-	x
thistle	*Cirsium* sp.	FACU	x
white clover	*Trifolium repens*	FACU+	x

AR 009046

3. WETLAND DELINEATION METHODS

The mitigation site was examined for wetland conditions, and all wetlands (as defined in 33 CFR 328.3(a)(1-8)) were delineated consistent with procedures and guidelines provided in the Environmental Laboratory (1987) and Washington State Department of Ecology (Ecology) (1997) manuals. The wetland delineation followed applicable ACOE Regulatory Guidance Letter and Memoranda, Natural Resource Conservation Service Memoranda, and Ecology Guidance letters concerning wetland delineations.

General information on the property and local area relating to wetlands was reviewed. This information included the *Soil Survey of King County Area, Washington* (Snyder et al. 1973), Federal Emergency Management Agency maps (FEMA 1989), and previous wetland evaluations (David Evans & Associates, Inc. 1995; Parametrix 1996). Wetland inventory maps, including the Mill Creek Special Areas Management Plan (City of Auburn et al. 1997) and the National Wetland Inventory (USFWS 1987), were also reviewed (Appendix C).

3.1 SOILS

Hydric soils are "soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (USDA et al. 1996). The presence of hydric soils was determined based on criteria described in the Environmental Laboratory (1987) and Ecology (1997) manuals and current regulatory guidance (ACOE 1992; NRCS 1992).

The presence of hydric soils was determined based on extensive field evaluation. Soils were characterized as hydric or non-hydric based on field indicators. Indicators of hydric soils (non-sandy soils) include: organic soils (histosols), histic epipedons, sulfidic material, aquic or periaquic moisture regime, reducing soil conditions, soil colors (gleyed soils, soils with contrasting mottles and/or low chroma matrix), soil appearing on the hydric soil list, and iron and manganese concretions (Ecology 1997).

3.2 HYDROLOGY

Consistent with the Environmental Laboratory (1987) and Ecology (1997) manuals, and current regulatory guidance (ACOE 3-92 Memorandum; ACOE, Seattle District, 5-94 Public Notice), the presence of wetland hydrology was determined by evaluating a variety of direct and indirect indicators. Field indicators of wetland hydrology must be present within 12 inches of the soil surface. These indicators include: visual observation of inundation and/or soil saturation, oxidized rhizospheres associated with living roots, water marks on vegetation or fixed objects, drift lines, water-born sediment deposits, water-stained leaves, surface scoured areas, wetland drainage patterns, morphological plant adaptations, and hydric soil characteristics.

Areas that are inundated and/or saturated to the surface at least 12.5 percent of the growing season (typically about 14 days during the period of February to mid-November) generally meet the technical criteria for wetlands (Environmental Laboratory 1987 and Ecology 1997 manuals). These areas are wetlands when hydric soil indicators and hydrophytic vegetation are also present (ACOE, Seattle District, 5-94 Public Notice).

Many wetlands lack saturated soils during the dry summer months. Because the study was completed prior to the onset of heavy fall rains, direct observation of hydrology was not possible. Therefore, in most cases, wetland hydrology was inferred from the presence of hydric soils and oxidized root zones. However, direct observations of groundwater hydrology in shallow groundwater wells measured between October 1999 and July 2000[2] were used to supplement the field study.

3.3 VEGETATION

The presence of hydrophytic vegetation was identified consistent with the Environmental Laboratory (1987) and Ecology (1997) manuals and current regulatory guidance. Species identifications and taxonomic nomenclature follow Hitchcock and Cronquist (1973). Dominant species[3] were identified. Each species' wetland indicator status was assigned using the *National List of Plant Species that Occur in Wetlands: Northwest - Region IX* (Reed 1988, 1993; hereafter cited as *The Region IX List*). The wetland indicator status (Table 3) designates the relative frequency with which the species occurs in jurisdictional wetlands.

Table 3. Wetland plant indicator categories.

Indicator Status	Definition
Obligate Wetland (OBL)	Occur almost always (estimated probability >99%) in wetlands.
Facultative Wetland (FACW)	Usually occur in wetlands (estimated probability 67% to 99%), but occasionally found in non-wetlands.
Facultative (FAC)	Equally likely to occur in wetlands or non-wetlands (estimated probability 34% to 66%). Considered wetland when growing on hydric soils and subject to wetland hydrology.
Facultative Upland (FACU)	Usually occur in non-wetlands, but occasionally found in wetlands (1% to 33%).
Upland (UPL)	Plants that rarely occur (estimated probability <1%) in wetlands, but occur almost always in non-wetlands.
No Indicator Status (NI)	Insufficient information exists to assign an indicator status.[a]
Not Listed (NL)	Not on the National List in any region.[a]

Source: Reed (1988).
[a] For purposes of wetland delineation, species with these designations are presumed upland.

---

[2] During this time period, precipitation at STIA was measured to be near normal, and groundwater hydrology on the site should be representative of typical conditions.

[3] Dominant species are those species that, when ranked in descending order of abundance and cumulatively totaled, immediately exceed 50 percent cover of the total dominance measure for that stratum, plus any species that comprises at least 20 percent cover.

An area meets the hydrophytic (wetland) vegetation criteria when, under normal circumstances, more than 50 percent of the dominant species are obligate wetland (OBL), facultative wetland (FACW), and/or facultative (FAC) species. A plus (+) or a minus (-) sign is often included in the indicator designation to specify a higher or lower level of the indicator status. For purposes of determining wetlands, plants with a FAC- indicator status are not considered to be an indicator of hydrophytic vegetation (i.e., it is treated as a facultative upland [FACU], upland [UPL], or a not listed [NL] species). In the Pacific Northwest, where a pronounced summer drought occurs, the ACOE Seattle District may include FACU dominated plant communities as wetland plants where the presence of wetland hydrology and hydric soils is clearly identified (ACOE 1994).

4. RESULTS

4.1 WETLAND IDENTIFICATION AND DELINEATION RATIONALE

Wetlands were identified and delineated consistent with procedures recommended for routine level jurisdictional determinations. The site has not been subjected to significant new soil, hydrologic, or vegetation disturbance for a period of at least 10 years, and "*normal circumstances*" [4] were determined to exist throughout the site during the Parametrix October 2000 wetland delineation.

A total of 15 data plots were sampled on the mitigation site (Figure 11; Appendix D). Four of these data plots were sampled adjacent to groundwater monitoring wells, while eleven were located throughout the site representing the variety of existing upland and wetland conditions. In addition to these plots, throughout the delineation process numerous soil pits were examined using a dutch soil augur or shovel to determine soil characteristics and define wetland boundaries.

Three jurisdictional wetlands were delineated on the mitigation site. Wetland 1 extends from the northwest corner to the south-central portion of the site (Figure 11) and covers 20.45 acres of the site. The wetland also extends east through the access easement for the site. Wetland 2 is adjacent to Wetland 1, is located in the south-central portion of the site, and is about 0.60 acre in size. Wetland 3 is located in the north-central portion of the site, and is about 0.01 acre in size. Wetlands 1 and 2 are Washington State Category III Wetlands (Appendix E). Wetland 3 is a Washington State Category IV wetland (Appendix C). The soil, hydrologic, and vegetation of these wetlands are similar.

4.2 SOILS

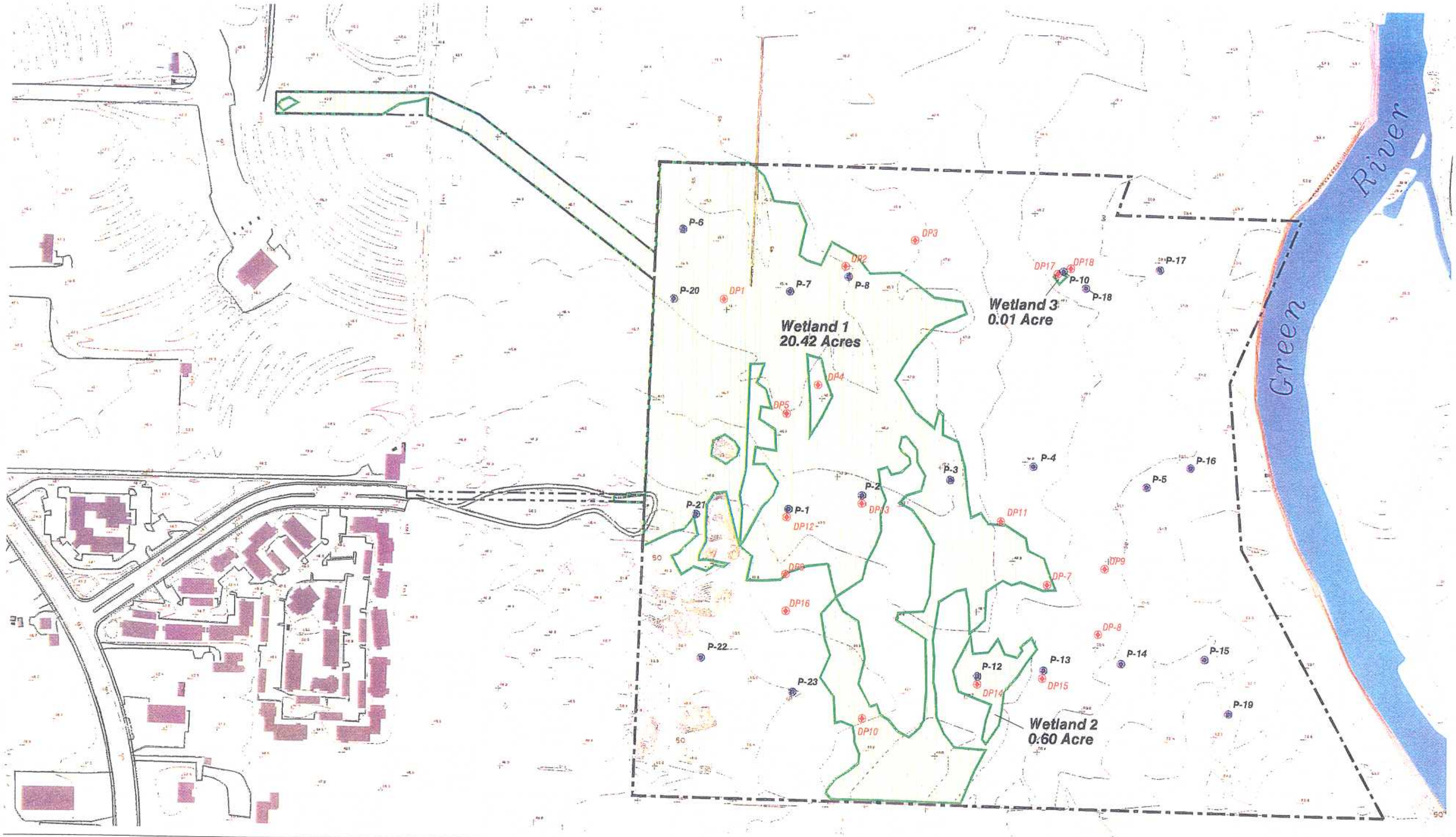
The *Soil Survey of the King County Area, Washington* (Snyder et al. 1973) identifies Briscot, Oridia, Renton, and Woodinville silt loam soils on the site (Figure 4). All of these soils are listed as hydric on the current *King County Hydric Soils List* (NRCS 1992). Soil sample characterizations on-site were found to be most similar to descriptions of Oridia silt loam (Appendices A and D). A silt loam plow horizon (Ap) 8 to 12 inches in depth was evident throughout most of the site. Soils in this layer typically consisted of a dark grayish-brown (10YR 4/2, 10YR 3/2 to 10YR 4/3, 10YR 3/3) matrix with common to many, fine to medium, faint to distinct mottles (7.5YR 4/6 to 7.5YR 5/6).

Soils were examined for hydric or non-hydric conditions immediately below the A-horizon or at 10 inches (whichever was shallower). The primary field indicators used to determine hydric versus non-hydric soil included:

- Matrix chroma of 2 with mottles
- Matrix chroma of 2 with mottles and oxidized rhizospheres

---

[4] The phrase *normal circumstances* means human or natural disturbances have not altered the site's vegetation, soils, or hydrology in the recent past (Ecology 1997; ACOE 1994).



Prepared by Parametrix, Inc. File: seatac1/11x17auburn_site_05dec00.aml creating p11x17auburn_site_05dec00.gra Date: December 12, 2000

Jurisdictional Wetlands
Property Boundary
Easement
Roads
Contour Lines (1 ft. interval)
Groundwater Monitoring Wells
Wetland Delineation Data Plots

N

FEET
0 250 500 750
Scale 1:3000

Figure 11
Jurisdictional Wetlands on the Wetland Mitigation Site

AR 009051

Although all soils mapped on the mitigation site are listed as hydric on *the King County Hydric Soil List* (NRCS 1992), field verification indicated that soils over much of the mitigation site do not meet the hydric soil criterion (see Figure 4). These non-hydric soils were generally a silt loam, and had the following characteristics:

- Matrix color of 10YR 4/3 or 10YR 3/3
- Matrix color of 10YR 4/2 or 3/2, but lacking mottles or oxidized rhizospheres

Throughout the site, distinct layers of well-sorted fine to medium sand lenses were observed at depths below 10 inches. The sand lenses were generally 3 to 6 inches thick and consisted of gleyed loamy sand.

4.3 HYDROLOGY

During the wetland delineation, soils were moist or dry. Saturated soil conditions were not observed in any of the sample plot locations. However, the groundwater well monitoring data indicate groundwater at or near the surface (within 12 inches) during the growing season at a number of wells on site during 1999-2000 (Figures 6 through 10; Appendix B). An 18-inch depth to groundwater was selected for data presentation due to attendant capillary fringe associated with actual groundwater elevation. Indicators used to determine the status of wetland hydrology at the mitigation site included:

- Recorded well monitoring data
- Oxidized rhizospheres surrounding living roots in the upper 12 inches of the soil profile
- Field indicators of hydric soils

The recorded well monitoring data indicate that Wells 1 through 4, 6 through 10, 12 through 14, and 20 through 21 had water at or near the surface (within 12 inches) for more than 14 days during the 1999-2000 growing season (Appendix D). The well data indicate the presence of groundwater at or near the surface at these well point locations; however, these data do not indicate the extent of wetlands throughout the site for jurisdictional purposes. Field sampling was used to delineate the extent of wetland hydrology and jurisdictional wetlands. The wetland field delineation included observations of several hundred soil samples taken throughout the site.

4.4 VEGETATION

The hydrophytic vegetation criterion was met at 10 of the 15 data plots (Appendix D).

Grasses including meadow foxtail, redtop, colonial bentgrass, quackgrass, tall fescue, common velvet-grass, and patches of reed canarygrass dominate Wetland 1. Other herbaceous species in the wetland include soft rush and creeping buttercup (*Ranunculus repens).* The vegetation in Wetland 2 is similar to that found in Wetland 1.

5. DISCLAIMER

Parametrix, Inc. has prepared this report for use by Port of Seattle. The results and conclusions of this report represent the professional opinion of Parametrix, Inc. They are based in part upon (a) site reconnaissance and testing, (b) information provided by the property owner(s), and (c) examination of public domain information concerning the proposed site.

Work performed conforms to accepted standards in the field of jurisdictional delineation using the U.S. Army Corps of Engineers *Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997). However, final determination of wetland boundaries pertinent to Clean Water Act Section 404 or local regulations is the responsibility of the Seattle District of the U.S. Army Corps of Engineers and/or local government. Thus, the findings and conclusions contained in this report should be reviewed by appropriate regulatory agencies prior to any detailed site planning and/or construction activities.

AR 009053

6. REFERENCES

ACOE (U.S. Army Corps of Engineers). 1982. Clarification of "normal circumstances" in the wetland definition. Regulatory Guidance Letter No. 82-2.

ACOE (U.S. Army Corps of Engineers). 1986. Clarification of "normal circumstances" in wetland definition. Regulatory Guidance Letter No. 86-9. (33 CFR 323.2(c)).

ACOE (U.S. Army Corps of Engineers). 1992. Clarification and interpretation of the 1987 manual. 3-92 Memorandum.

ACOE (U.S. Army Corps of Engineers), Seattle District. 1994. Washington regional guidance on the 1987 wetland delineation manual. 5-94 Public Notice.

Auburn, City of; City of Kent; King County; and ACOE (U.S. Army Corps of Engineers) Seattle District. 1997. Mill Creek Special Area Management Plan (SAMP), King County, Washington.

David Evans and Associates, Inc. 1995. Wetland determination on the Riverbend Master Plan Community. Report by David Evans and Associates, Inc. to Gentra Capital Corporation. Seattle, Washington.

Ecology (Washington State Department of Ecology). 1997. Washington State wetlands identification and delineation manual. Ecology Publications #96-94.

Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Technical Report Y-87-1. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Federal Register. 1986. Regulatory programs of the Corps of Engineers; Final Rule. Volume 51, No. 219; 33 CFR Parts 320 through 330.

FEMA (Federal Emergency Management Agency). 1989. Flood Insurance Rate Map, King County, Washington and Incorporated Areas. Panel 310 of 650, Map Number 53033c031D. Effective Date September 29, 1989.

Hitchcock, C.L. and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, Washington.

King County, Washington Department of Parks, Planning, and Resources, Planning and Community Development Division. 1990. King County sensitive areas map folio. Seattle, Washington.

NRCS (Natural Resources Conservation Service). 1992. King County hydric soil list. U.S. Department of Agriculture.

Parametrix, Inc. 1999. Natural resource mitigation plan, Master Plan update improvement. Seattle-Tacoma International Airport. Revised draft. Prepared for the Port of Seattle. Kirkland, Washington.

Port of Seattle. 1996. JARPA # 96-4-02325 for proposed Master Plan update improvements at Sea-Tac International Airport. Prepared by Parametrix, Inc.

Port of Seattle. 2000. JARPA for proposed Master Plan Update improvements at Sea-Tac International Airport. Prepared by Parametrix, Inc.

Reed, P.B. 1988. National list of plant species that occur in wetlands: Northwest region (Region 9). U.S. Fish and Wildlife Service Biological Report 88(26.9).

Reed, P.B. 1993. Supplement to National list of plant species that occur in wetlands: Northwest region (Region 9). Supplement to U.S. Fish and Wildlife Service Biological Report 88(26.9).

Snyder, D.E.; P.S. Gale; and R.F. Pringle. 1973. Soil survey of King County Area, Washington. U. S. Department of Agriculture, Soil Conservation Service in cooperation with Washington State University, Agriculture Research Center.

USDA (U.S. Department of Agriculture), Natural Resource Conservation Service in cooperation with USEPA, USFWS, USAC, and North Carolina State University. 1996. Field Indicators of Hydric Soils in the United States. Version 2.0.

USFWS (U.S. Fish and Wildlife Service). 1987. National wetlands inventory, Des Moines, Washington Quadrangle.

APPENDIX A

SOIL PROFILE DESCRIPTIONS
KING COUNTY SOIL SURVEY

Briscot Series

The Briscot series is made up of somewhat poorly drained soils. These soils formed in alluvium, under conifers and grass in river valleys. Slopes are less than 2 percent. The annual precipitation is 35 to 55 inches, and the mean annual temperature is about 50° F. The frost-free season is about 200 days. Elevation ranges from about sea level to 85 feet.

In a representative profile, the surface layer is dark grayish-brown silt loam about 9 inches thick. The subsoil is mottled grayish-brown and dark-gray, stratified fine sandy loam, silt loam, and fine sand to a depth of 60 inches or more.

Briscot soils are used for row crops and seeded grass pasture and for urban development.

Briscot silt loam (Br).--Areas of this soil are irregularly shaped and range from 5 to more than 80 acres in size.

Representative profile of Briscot silt loam, cultivated, 1,000 feet north and 1,410 feet east of the southeast corner of sec. 25, T. 22 N., R. 4 E.:

Ap--0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; moderate, medium, granular structure; slightly hard, friable, sticky, plastic; many roots; neutral; abrupt, smooth boundary. 8 to 10 inches thick.

B21g--9 to 17 inches, grayish-brown (2.5Y 5/2) silt loam, light brownish gray (2.5Y 6/2) dry; many, large, prominent, dark-brown (7.5YR 4/4 and 3/4) mottles, brownish yellow (10YR 6/6) dry; weak, very coarse, prismatic structure; slightly hard, friable, sticky, plastic; common roots; neutral; abrupt, wavy boundary. 7 to 9 inches thick.

B22--17 to 44 inches, grayish-brown (2.5Y 5/2) lenses of fine sandy loam, silt loam, and fine sand, light brownish gray (2.5Y 6/2) dry; many, large, prominent, dark-brown (7.5YR 4/4) mottles, yellowish brown (10YR 5/6) and light yellowish brown (10YR 6/4) dry; massive; slightly hard, very friable, slightly sticky, nonplastic; few roots; neutral; diffuse, smooth boundary. 25 to 28 inches thick.

B23g--44 to 60 inches, dark-gray (5Y 4/1) lenses of fine sandy loam, silt loam, and fine sand, grayish brown (2.5Y 5/2) dry; many, large, prominent, dark-brown (7.5YR 4/4) and dark-red (2.5YR 3/6) mottles, brown (7.5YR 5/4) and yellowish brown (10YR 5/6) dry; massive; very friable, slightly sticky, nonplastic; few roots; neutral. Many feet thick.

The A horizon ranges from dark gray to dark grayish brown and from silt loam to very fine sandy loam. The B horizon is grayish brown to olive gray mottled with dark brown. It is mostly fine sandy loam but is stratified with fine sand and silt loam.

Some areas are up to 5 percent included Puyallup soils, which are well drained and are on natural stream levees, and Newberg soils, which also are well drained and are in stream valleys; some areas are up to 2 percent the poorly drained Puget and Woodinville soils; and some are up to 5 percent Oridia and Renton soils.

Permeability is moderate. In winter the seasonal water table is within a depth of 1 to 2 feet. In drained areas, roots penetrate easily to a depth of 60 inches or more. In undrained areas, effective rooting depth is restricted. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. Stream overflow is a moderate hazard.

This soil is used for row crops and seeded grass pasture and for urban development. Capability unit IIw-2; woodland group 3w1.

Renton Series

The Renton series is made up of somewhat poorly drained soils that formed in alluvium in river valleys. Slopes are 0 to 1 percent. The annual precipitation is 35 to 55 inches, and the mean annual air temperature is about 50° F. The frost-free season is about 200 days. Elevation ranges from near sea level to 85 feet.

In a representative profile, the surface layer is very dark grayish-brown silt loam about 6 inches thick. The subsoil is mottled dark grayish-brown very fine sandy loam and fine sandy loam about 10 inches thick. The substratum is mottled black sand to a depth of 60 inches or more.

Renton soils are used for row crops and seeded grass pasture and for urban development.

Renton silt loam (Re).--This soil is nearly level to very gently undulating. Slopes are 0 to 1 percent. Areas are irregular in shape and range from 2 to nearly 300 acres in size.

Representative profile of cultivated Renton silt loam, 470 feet west and 1,050 feet north of the east quarter corner of sec. 23, T. 22 N., R. 4 E.:

Ap--0 to 6 inches, very dark grayish-brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate, medium and coarse, granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many roots; medium acid; abrupt, wavy boundary. 6 to 8 inches thick.

B21--6 to 11 inches, dark grayish-brown (2.5Y 4/2) very fine sandy loam, grayish brown (2.5Y 5/2) dry; many, medium, prominent, dark-brown (7.5YR 4/4) mottles, yellow (10YR 7/6) dry; massive; slightly hard, very friable, slightly sticky, slightly plastic; many roots; neutral (pH 6.6); clear, wavy boundary. 3 to 12 inches thick.

B22--11 to 16 inches, dark grayish-brown (2.5Y 4/2) fine sandy loam and thin lenses of fine sand, grayish brown (2.5Y 5/2) dry; many, medium, prominent, dark-brown (7.5YR 4/4) mottles, reddish yellow (7.5YR 6/6 and 7/6) dry; massive; soft, very friable, nonsticky, nonplastic; common roots; slightly acid; abrupt, irregular boundary. 3 to 12 inches thick.

IIC--16 to 60 inches, black (10YR 2/1) sand, dark grayish-brown (10YR 4/2) dry; common, medium, prominent, strong-brown (7.5YR 5/6) mottles, reddish yellow (7.5YR 7/6) and strong brown (7.5YR 5/6) dry; single grain; loose, nonsticky, nonplastic; few roots; slightly acid.

The A horizon ranges from dark grayish brown to very dark grayish brown. The B horizon ranges from mottled dark gray to grayish brown or dark grayish brown and from silt loam to fine sandy loam. The IIC horizon is mottled, ranges from black to dark grayish brown, and is sand or loamy sand. Depth to the IIC horizon ranges from 15 to 30 inches. Thick, silty layers occur in the IIC horizon in some places.

Some mapped areas of this soil are up to 2 percent inclusions of the well-drained Puyallup soils on natural stream levees; some are up to 2 percent the poorly drained Puget and Woodinville soils; and some are up to 5 percent the somewhat poorly drained Briscot and Oridia soils. Total inclusions do not exceed 10 percent.

Permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum. There is a seasonal high water table at a depth of 1 to 2 feet. In drained areas, the effective rooting depth is 60 inches or more. In undrained areas, rooting depth is restricted. The available water capacity is moderate to moderately high. Runoff is slow, and the erosion hazard is slight. Flood protection is provided. Thus, the hazard of stream overflow is slight. Capability unit IIIw-1; woodland group 3w1.

Oridia Series

The Oridia series is made up of somewhat poorly drained soils that formed in alluvium in river valleys. Slopes are 0 to 2 percent. The annual precipitation is 35 to 55 inches, and the mean annual air temperature is about 50° F. The frost-free season is about 200 days. Elevation ranges from about 0 to 85 feet.

In a representative profile, the surface layer is dark grayish-brown silt loam about 9 inches thick. The subsoil is grayish-brown, dark grayish-brown, and gray silt loam and silty clay loam that extends to a depth of 60 inches or more.

Oridia soils are used for row crops and pasture and for urban development.

Oridia silt loam (Os).--This gently undulating soil is in irregularly shaped areas. Slopes are less than 2 percent. Areas range from 10 to more than 200 acres in size.

Representative profile of Oridia silt loam, in pasture, 850 feet north, 620 feet east of the southwest corner of sec. 12, T. 22 N., R. 4 E.:

Ap--0 to 9 inches, dark grayish-brown (10YR 4/2) heavy silt loam, light brownish gray (2.5Y 6/2) dry; few, fine, prominent, strong-brown (7.5YR 5/6) mottles, reddish yellow (7.5YR 7/6) dry; moderate, medium, granular structure; hard, friable, sticky, plastic; many roots; medium acid; abrupt, smooth boundary. 9 to 11 inches thick.

B21g--9 to 17 inches, grayish-brown (2.5Y 5/2) heavy silt loam, light gray (2.5Y 7/2) dry; many, medium, prominent, brown (7.5YR 4/4) mottles, strong brown (7.5YR 5/6) and very pale brown (10YR 7/3 and 7/4) dry; moderate, medium and coarse, subangular blocky structure; hard, friable, sticky, plastic; many roots; slightly acid; clear, wavy boundary. 6 to 10 inches thick.

B22g--17 to 42 inches, dark grayish-brown (2.5Y 4/1) silt loam and fine sand, white (2.5Y 8/2) dry; fine sand is light gray (10YR 6/1) dry; mottles are many, large, prominent, brown (7.5YR 4/4) and strong brown (7.5YR 5/6) and medium, prominent, very pale brown (10YR 7/4) and reddish yellow (7.5YR 6/6) dry; silt loam is massive, hard, friable, sticky, plastic; fine sand is single grain; loose, nonsticky, nonplastic; common roots; neutral; abrupt, smooth boundary. 23 to 26 inches thick.

B23--42 to 54 inches, dark grayish-brown (2.5Y 4/2) silty clay loam, light gray (5Y 7/2) dry; mottles are many, large, prominent, strong-brown (7.5YR 5/6) and medium, prominent, yellow (10YR 7/6) and brownish yellow (10YR 6/6) dry; a discontinuous strong-brown (7.5YR 5/6) and dark-brown (7.5YR 3/4) ortstein layer 1/4 inch thick; massive; hard, friable, sticky, plastic; few roots, neutral; abrupt, wavy boundary. 9 to 15 inches thick.

B24g--54 to 64 inches, gray (5Y 5/1) heavy silt loam, gray (5Y 6/1) dry; few, medium, prominent, dark-brown (7.5YR 4/4) mottles; massive; hard, friable, sticky, plastic; few roots; very strongly acid.

The B horizon is mottled dark gray and dark grayish brown to olive gray. It is dominantly silt loam but contains layers of silty clay loam, fine sand, loamy fine sand, and very fine sandy loam. The sandy lenses commonly occur below a depth of 20 inches.

Some areas mapped are up to 10 percent inclusions of poorly drained Puget and Woodinville soils; and some are up to 10 percent the well-drained Newberg and Puyallup soils.

Permeability is moderate to moderately slow in the subsoil. The seasonal high water table is at a depth of 1 to 2 feet. In drained areas, the effective rooting depth is 60 inches or more. In undrained areas, rooting depth is restricted. Available water capacity is high. Runoff is slow, and the erosion hazard is slight. The flood hazard is moderate.

This soil is used for row crops and seeded grass pasture and for urban development. Capability unit IIw-2; woodland group 3w1.

APPENDIX B

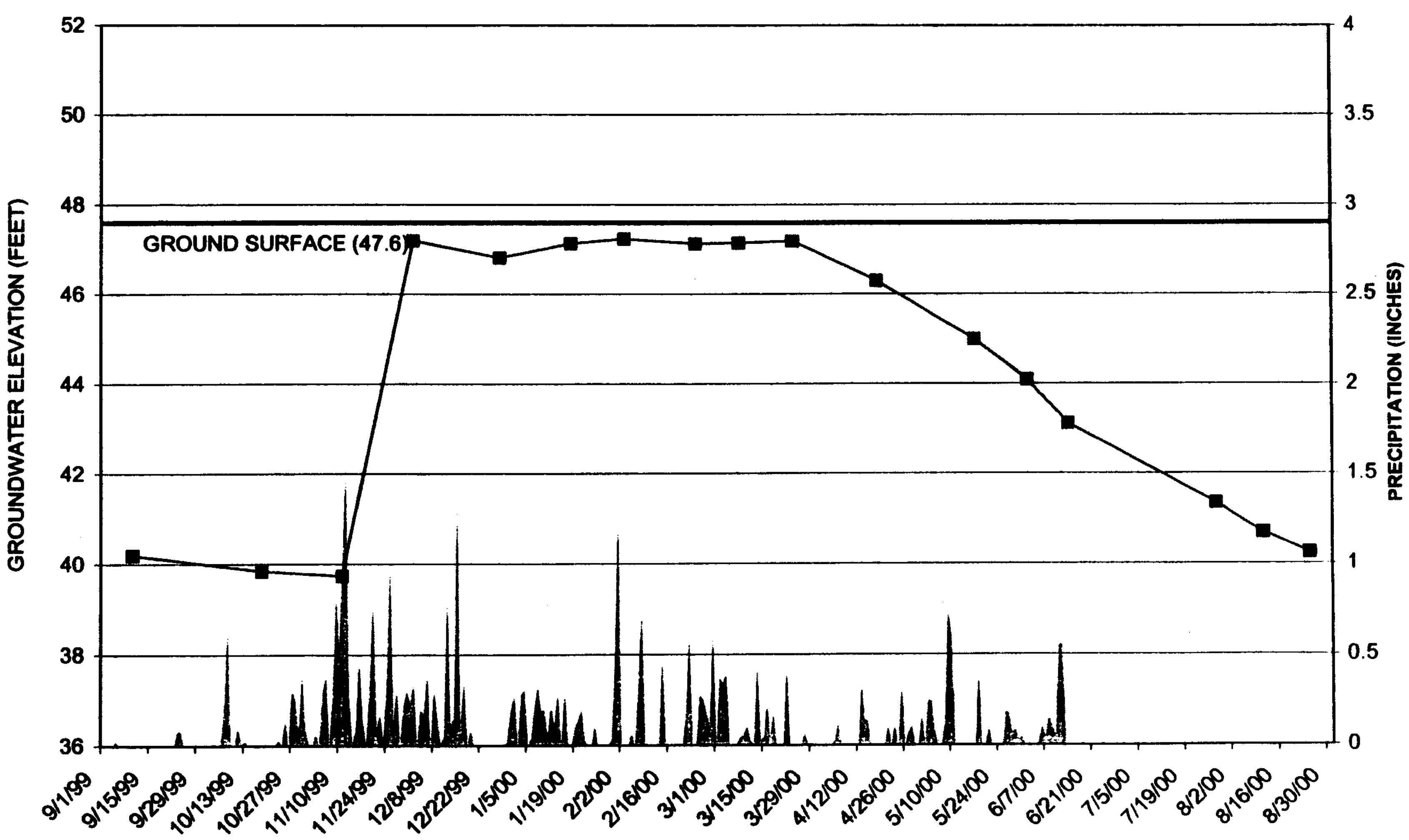
GROUNDWATER WELL DATA

Table B-1. Summary of groundwater monitoring data in relation to wetlands.

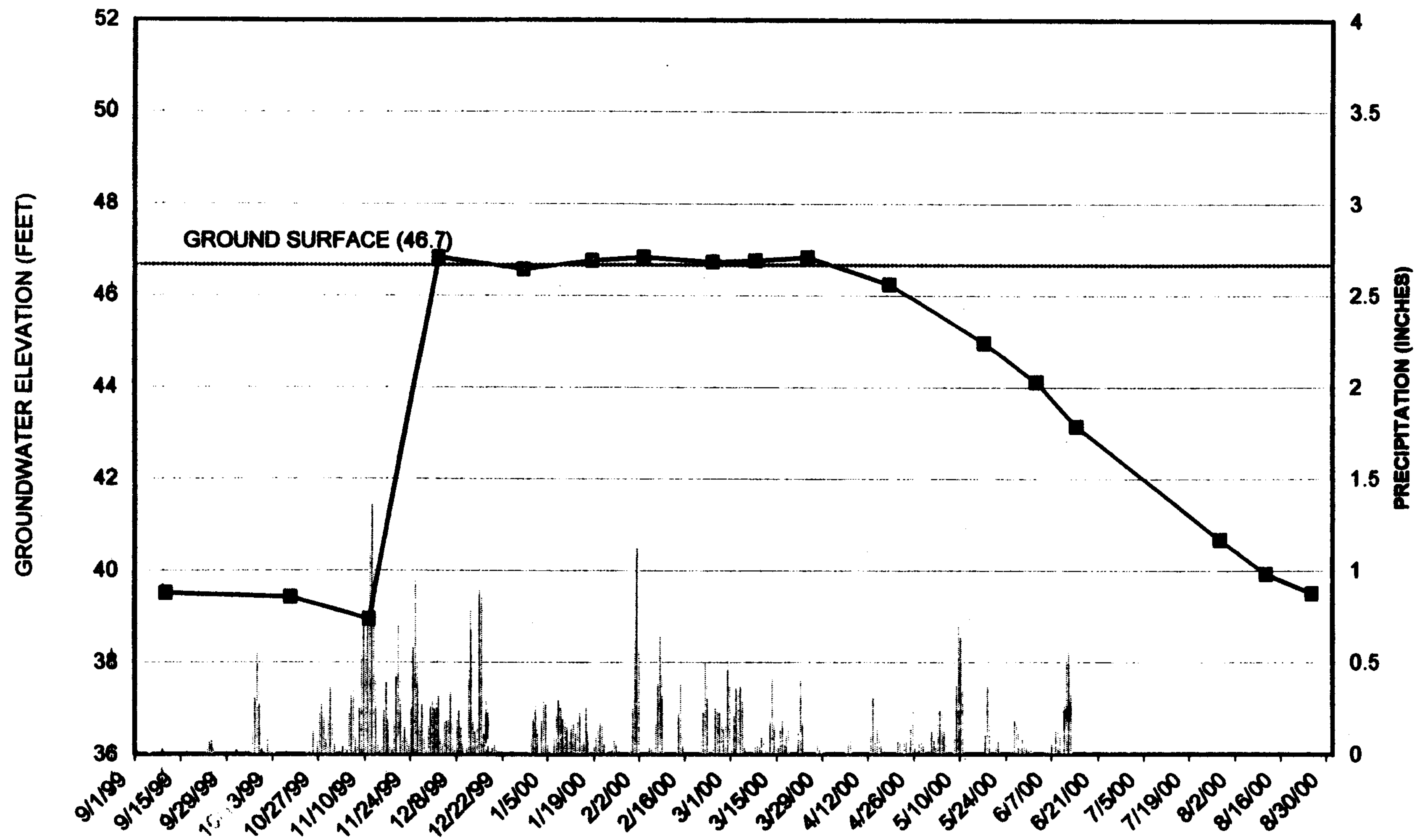
Well Number[a]	Wetland Data Plot	Location in Wetlands	Dates Groundwater is Within 12 inches of Surface
P-1	DP-12	No	Dec 2 -4.8", Dec 28 -9.6", Jan 18 -6", Feb 3 -4.8", Feb 24 -6", Mar 8 -6", Mar 24 -4.8"
P-2	DP-13	Yes	Dec 2 - April 18
P-3		Yes	Dec 2 - April 18
P-4		No	Jan 18 -10.8", Feb 3 -3.6", Feb 24 -12", Mar 8 -8.4", Mar 24 -8.4"
P-5		No	NONE
P-6		Yes	Dec 2 - March 24
P-7		Yes	Dec 2 - April 18
P-8		Yes	Dec 2 - March 24
P-10		Yes	Feb 3 -10.8", Mar 8 -12", Mar 24 -12"
P-12	DP-14	Yes	Dec 2 - March 24
P-13	DP-15	No	Dec 28 -8.4", Jan 18 -1.2", Feb 3 +2.4", Feb 24 -2.4", Mar 8 -0", Mar 24 -0"
P-14		No	NONE
P-15		No	NONE
P-16		No	NONE
P-17		No	NONE
P-18		No	NONE
P-19		No	NONE
P-20		Yes	Dec 2 - March 24
P-21		Yes	NONE
P-22		No	NONE
P-23		No	NONE

[a] See Appendix C and Figure 6. Depths are given for wells located outside of wetlands.

Well No. 1
1999 - 2000 Season

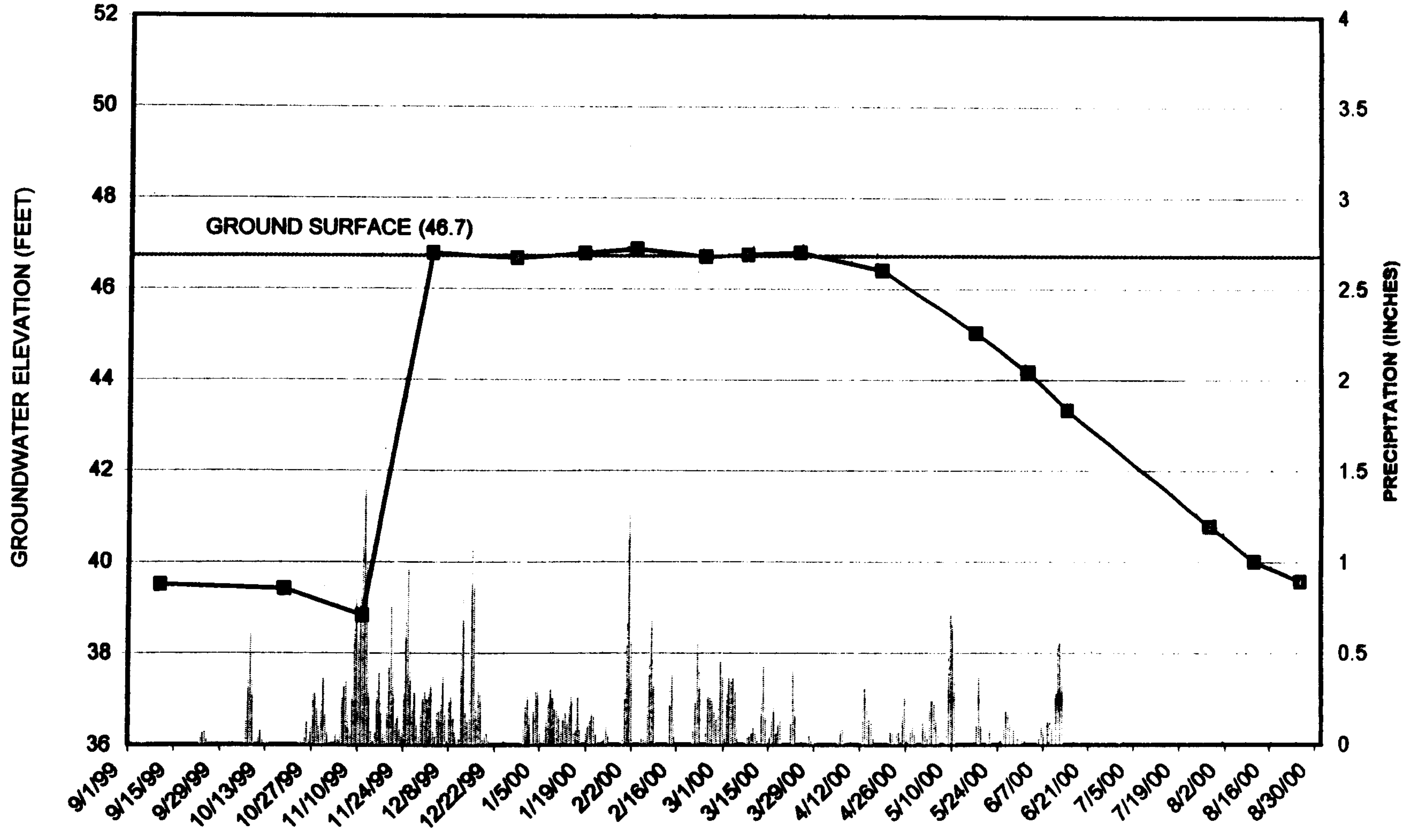


Well No. 2
1999 - 2000 Season

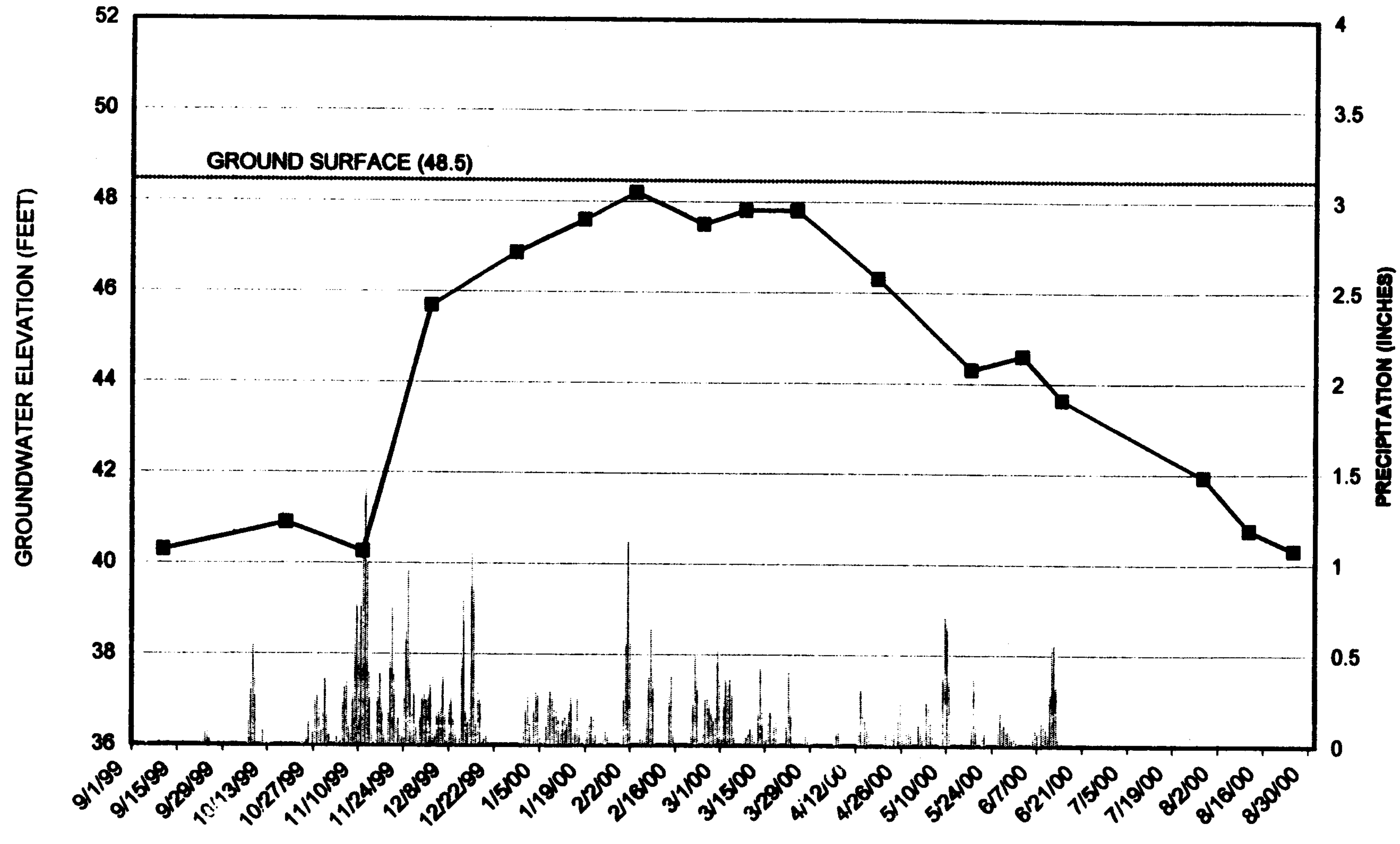


AR 009062

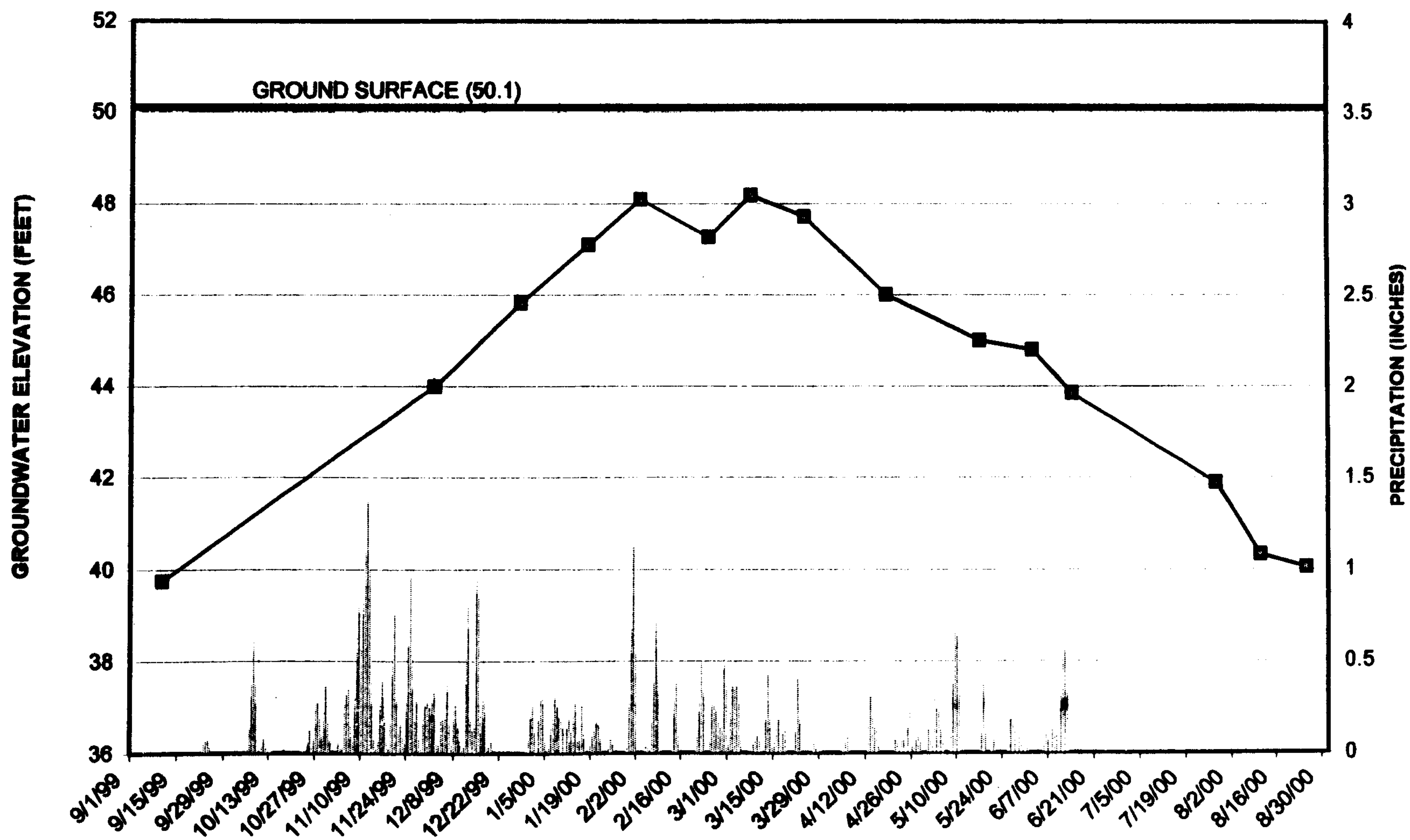
Well No. 3
1999 - 2000 Season



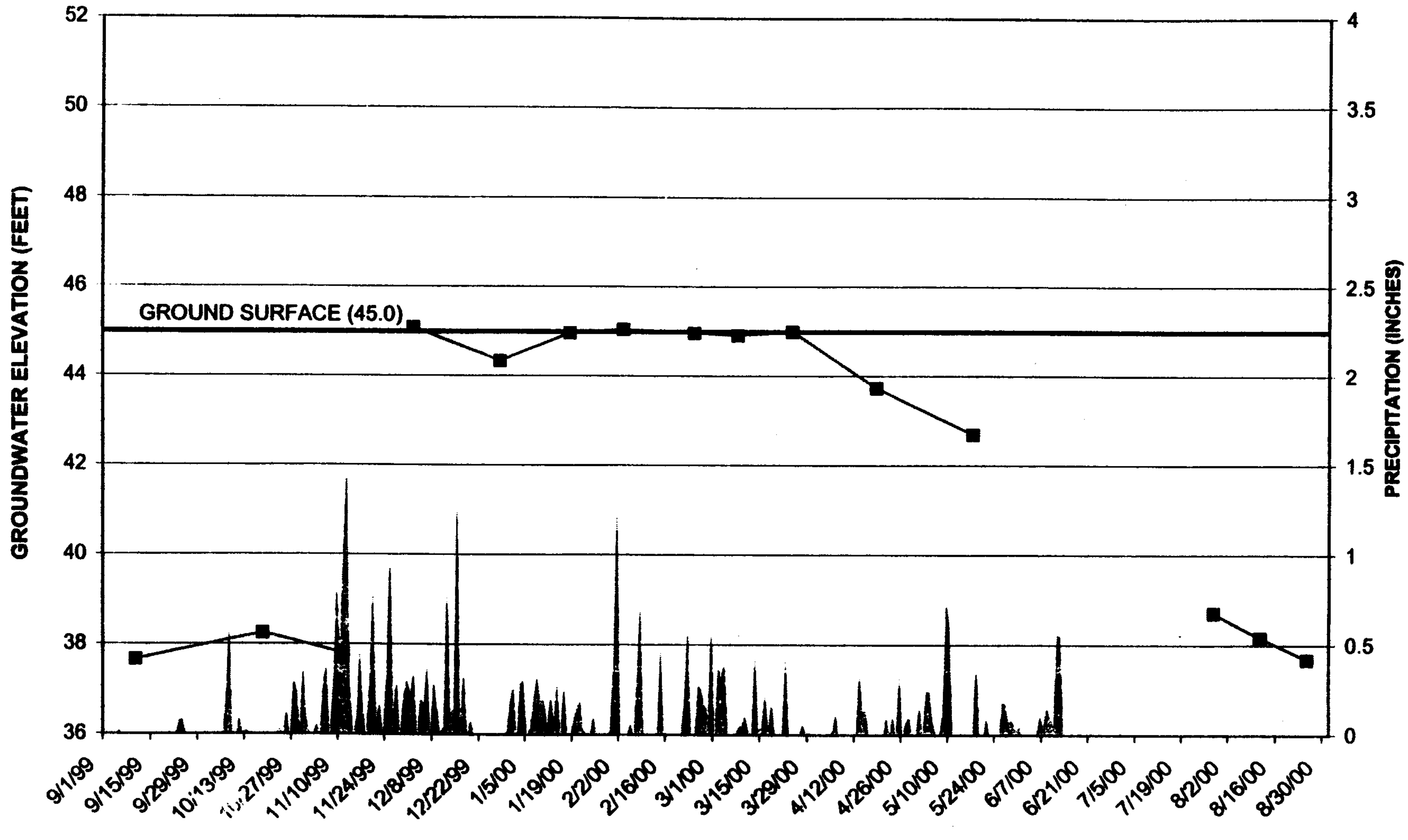
Well No. 4
1999 - 2000 Season



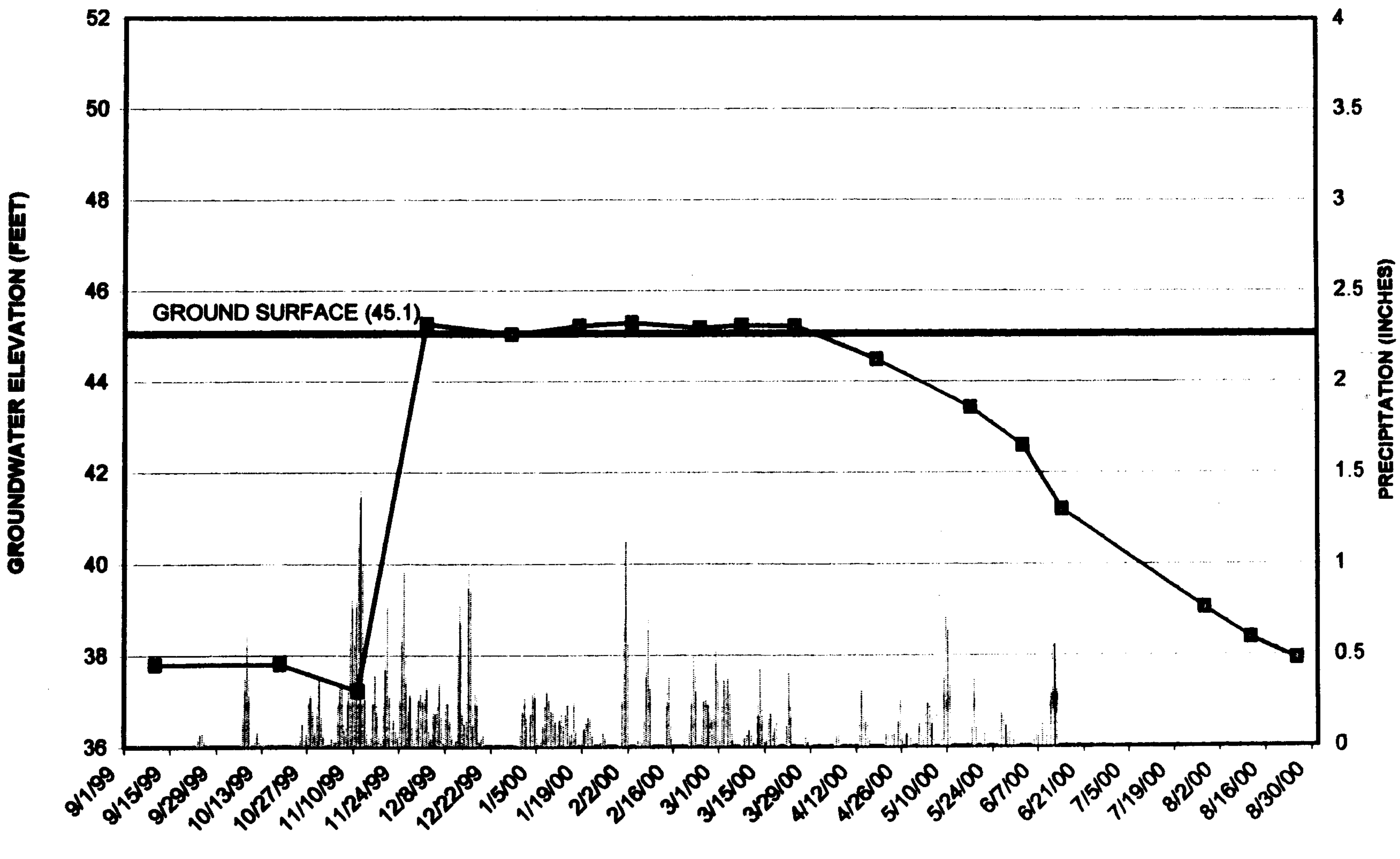
Well No. 5
1999 - 2000 Season



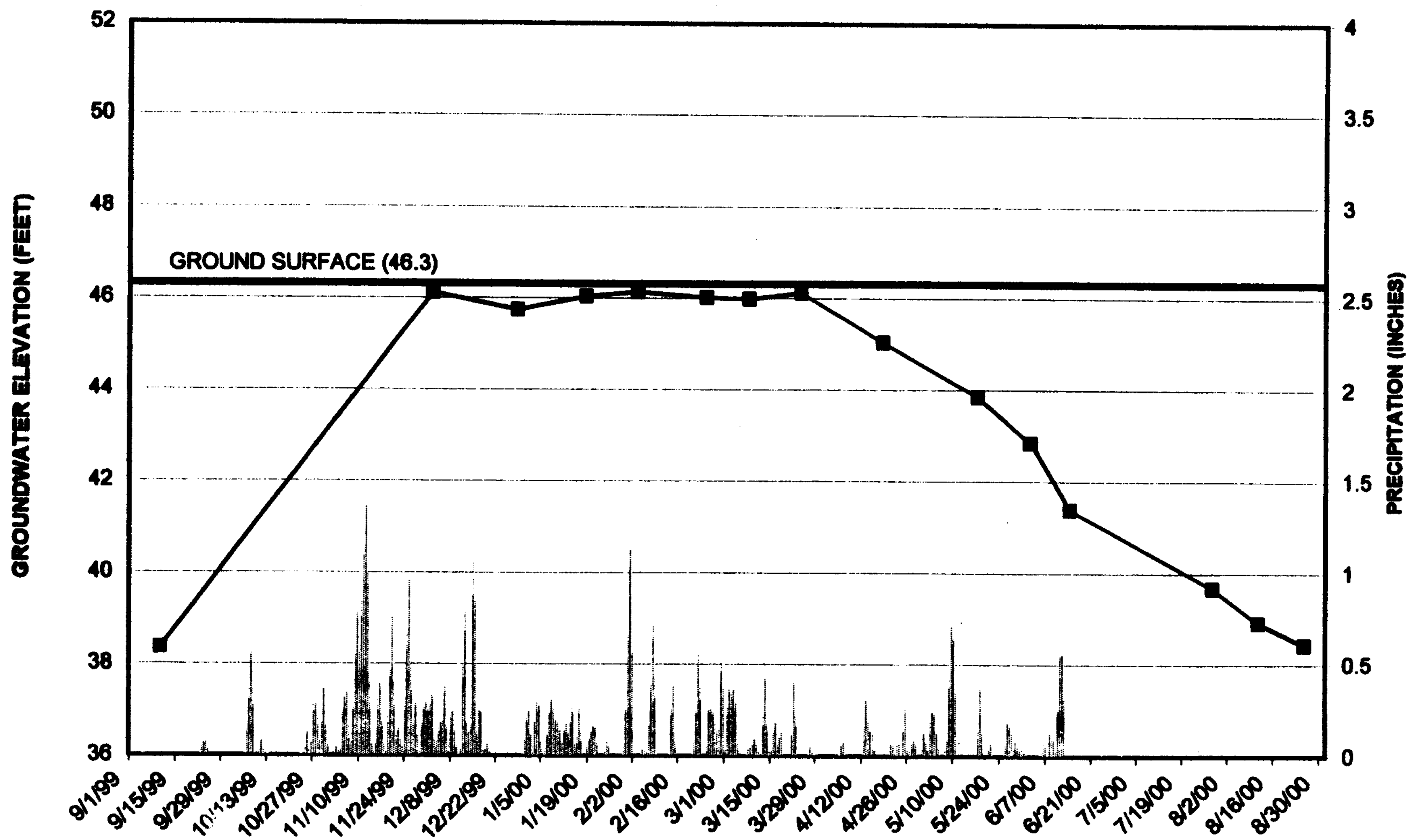
Well No. 6
1999 - 2000 Season



Well No. 7
1999 - 2000 Season

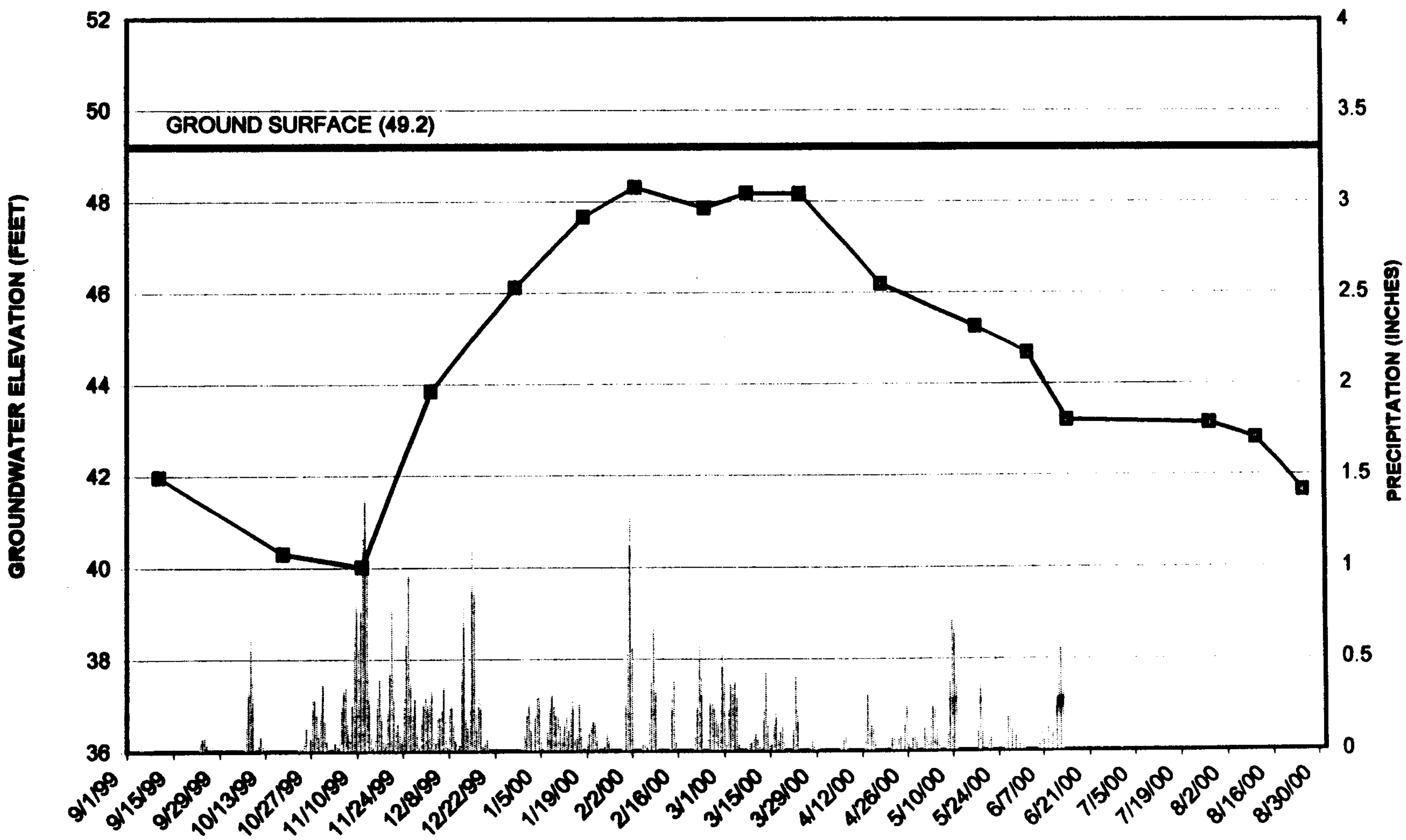


Well No. 8
1999 - 2000 Season

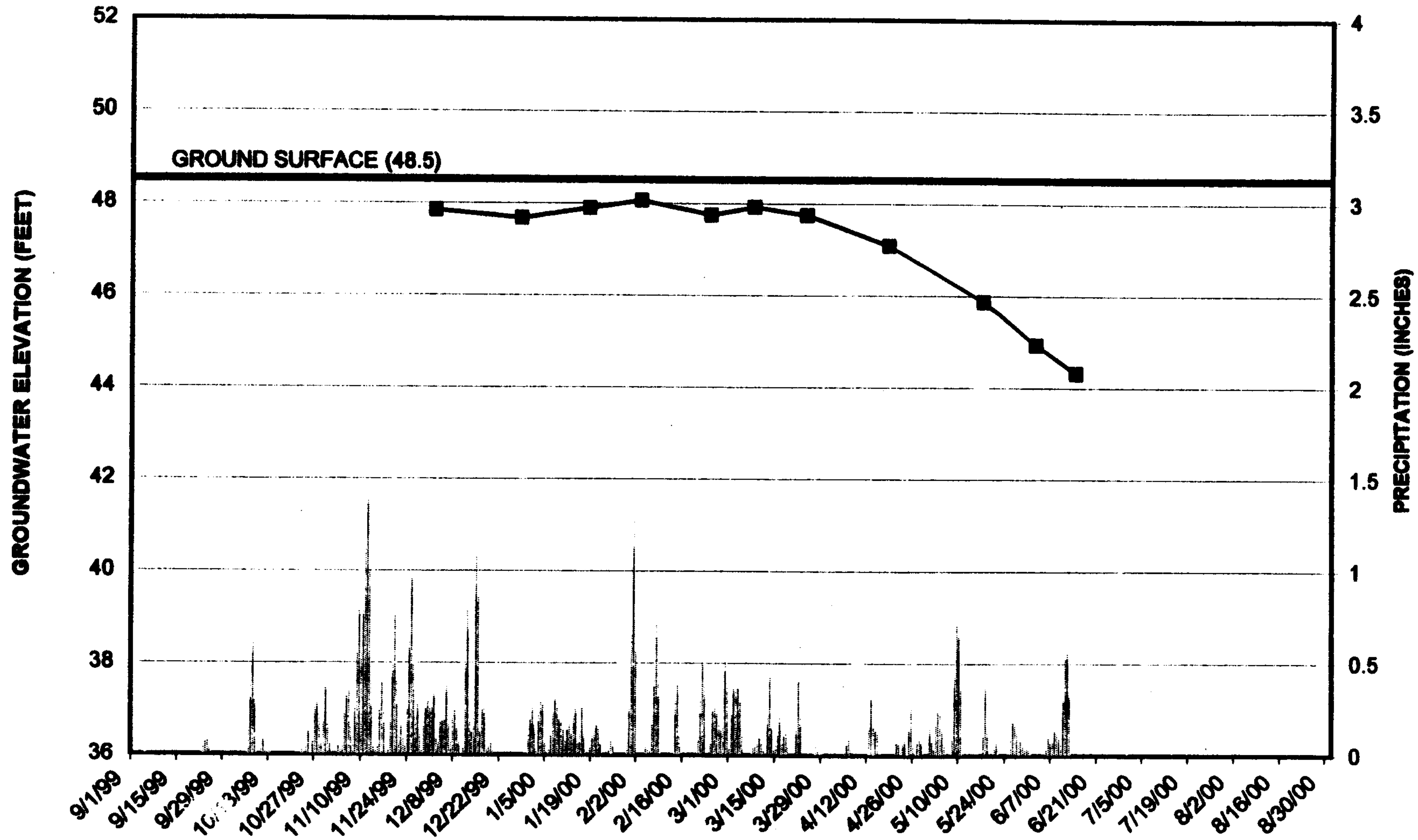


AR 009068

Well No. 10
1999 - 2000 Season

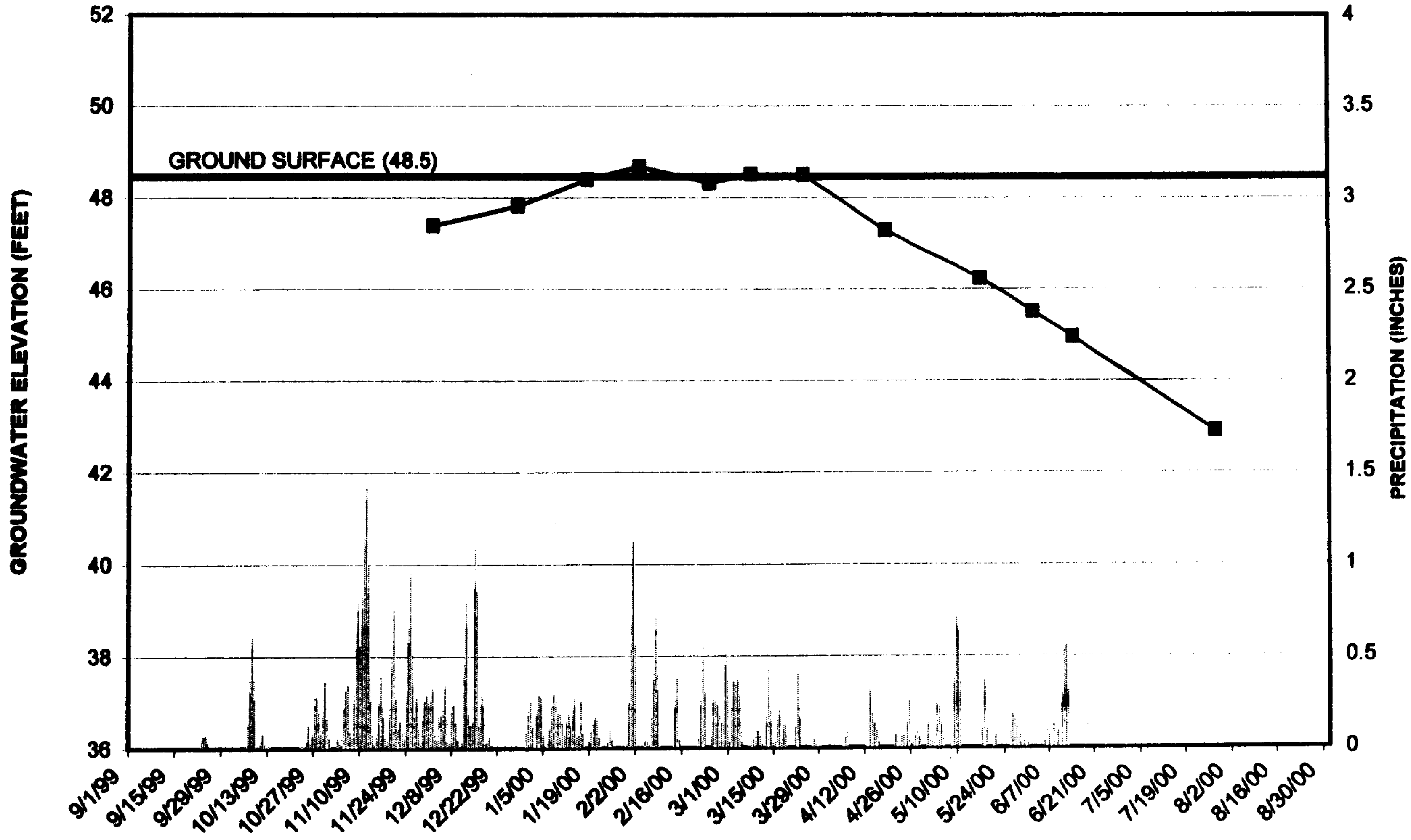


Well No. 12
1999 - 2000 Season

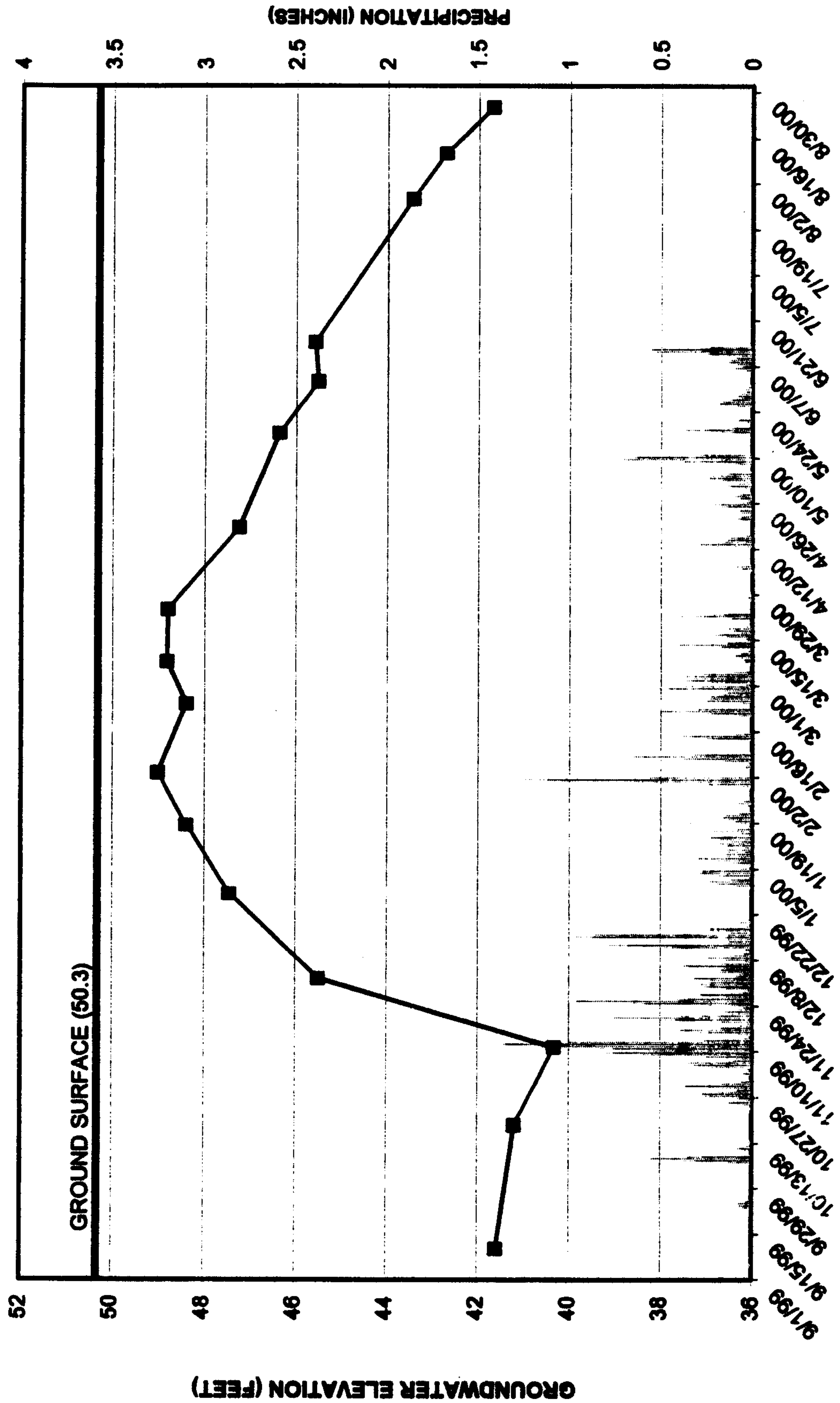


AR 009070

Well No. 13
1999 - 2000 Season

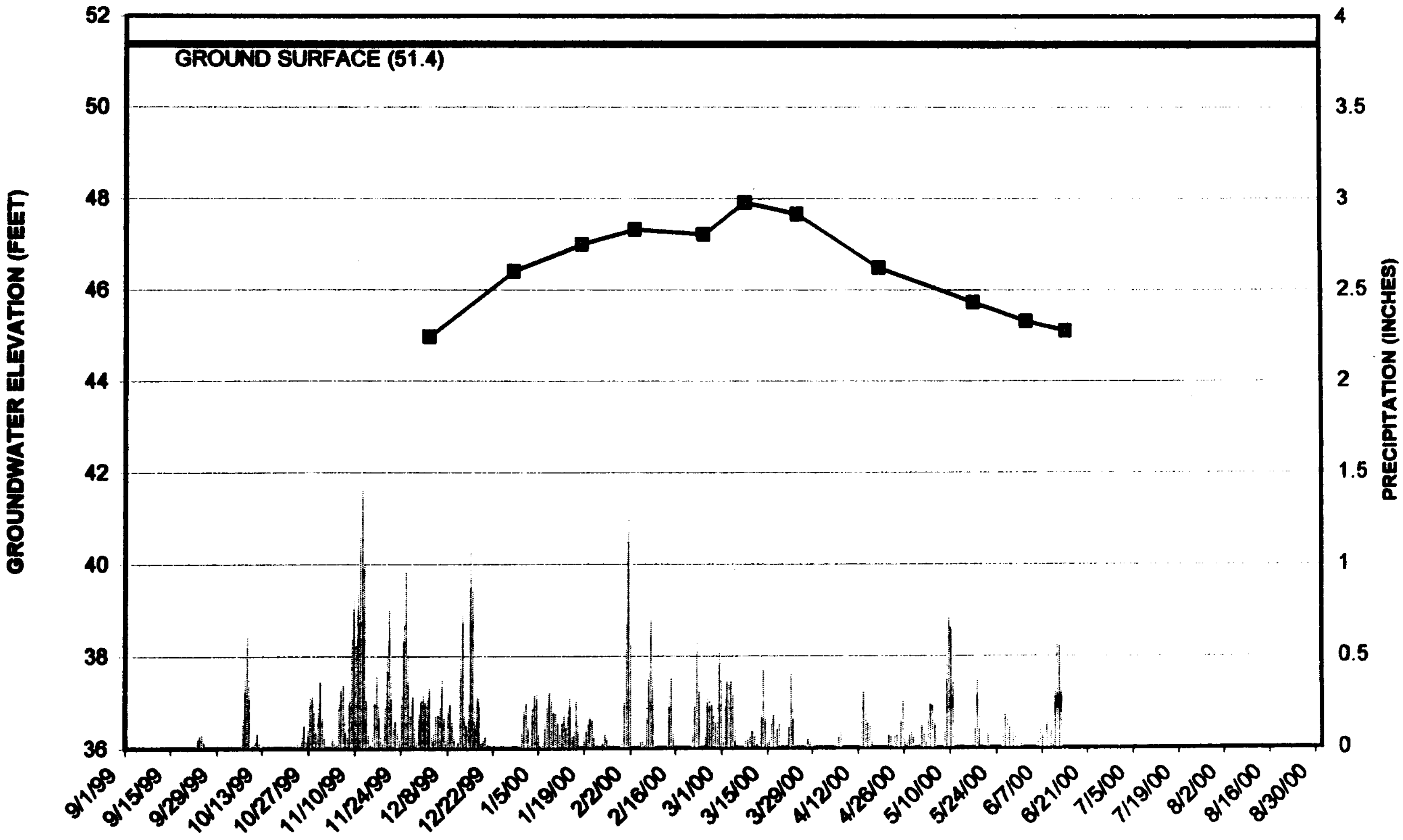


Well No. 14
1999 - 2000 Season

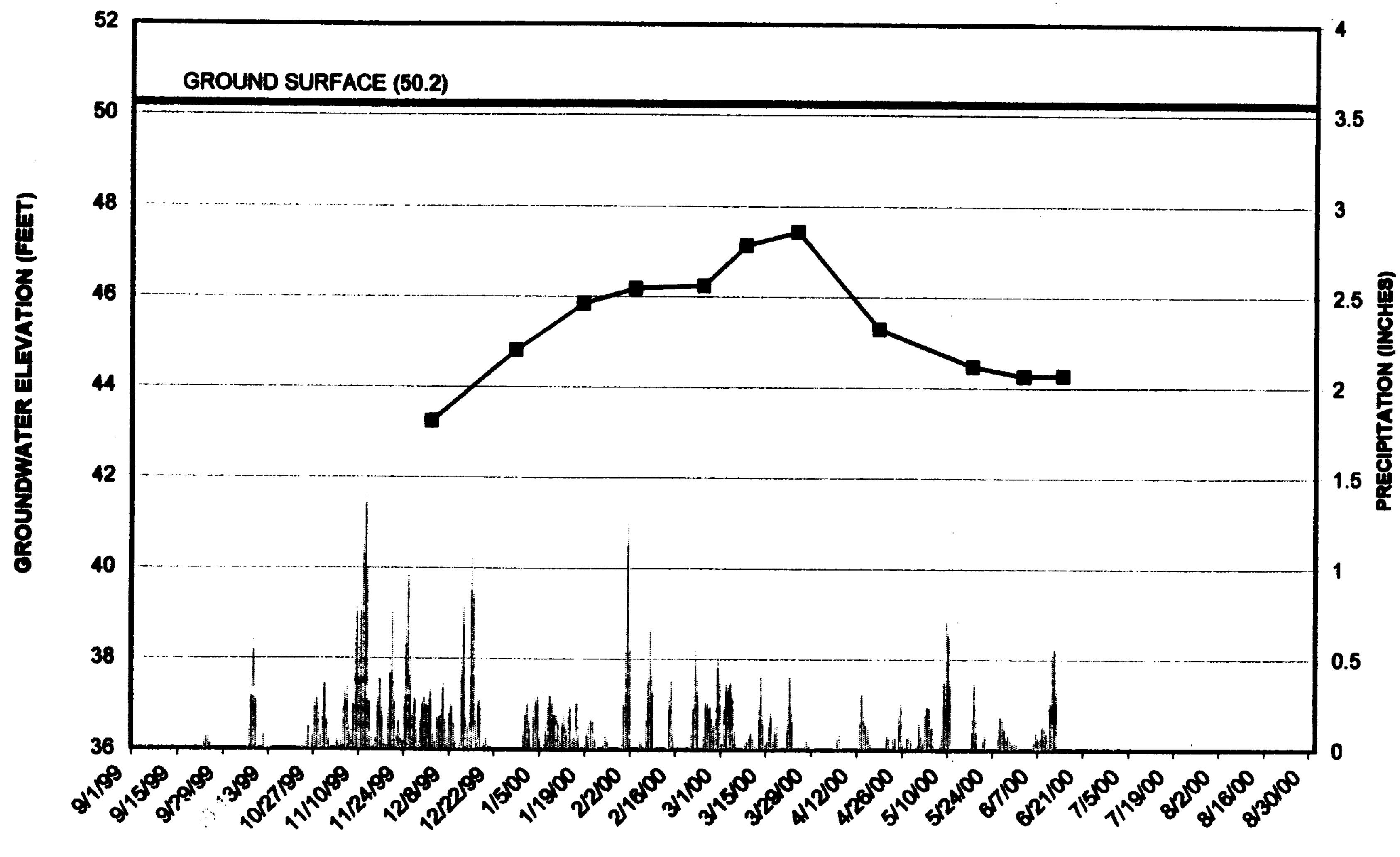


AR 009072

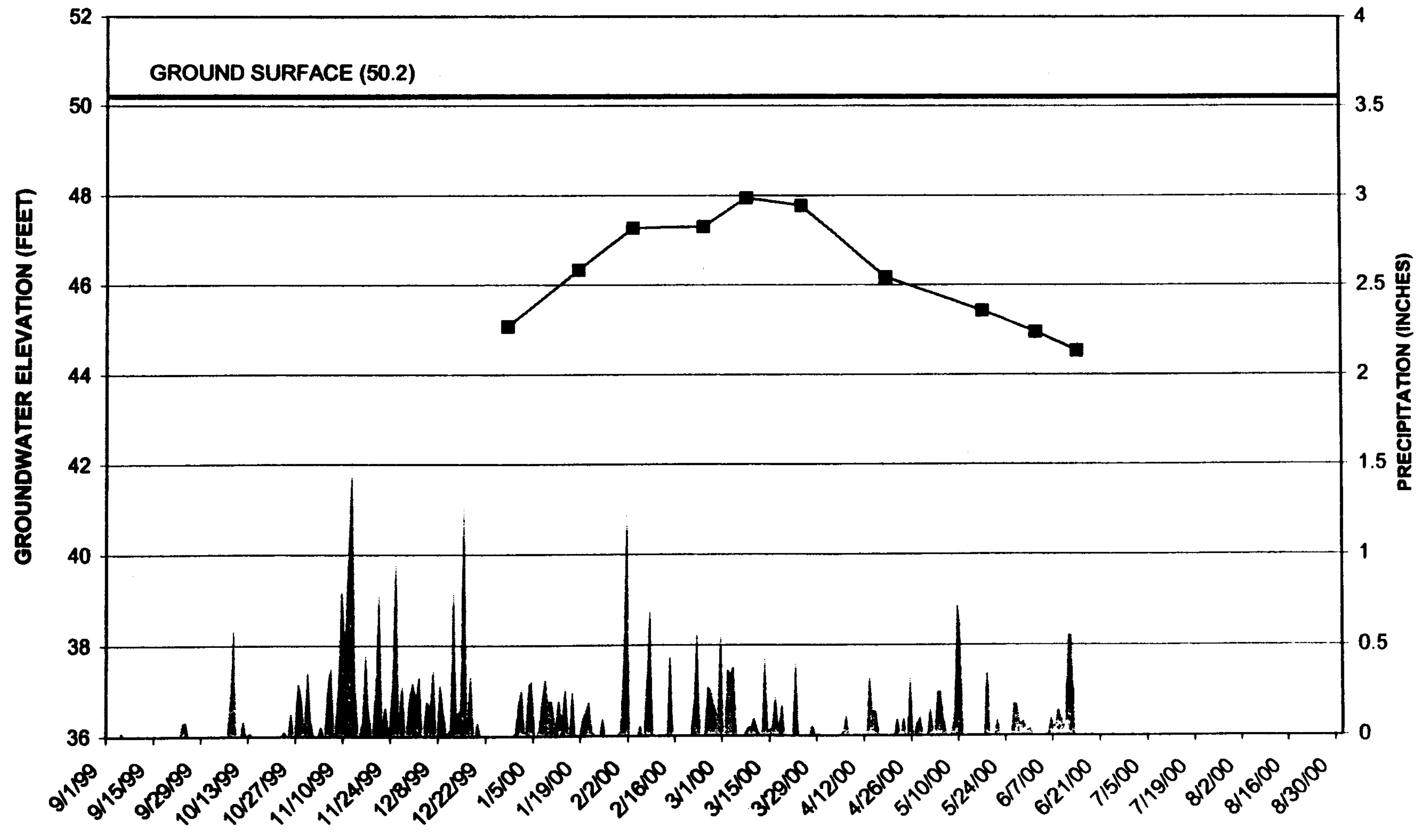
Well No. 15
1999 - 2000 Season

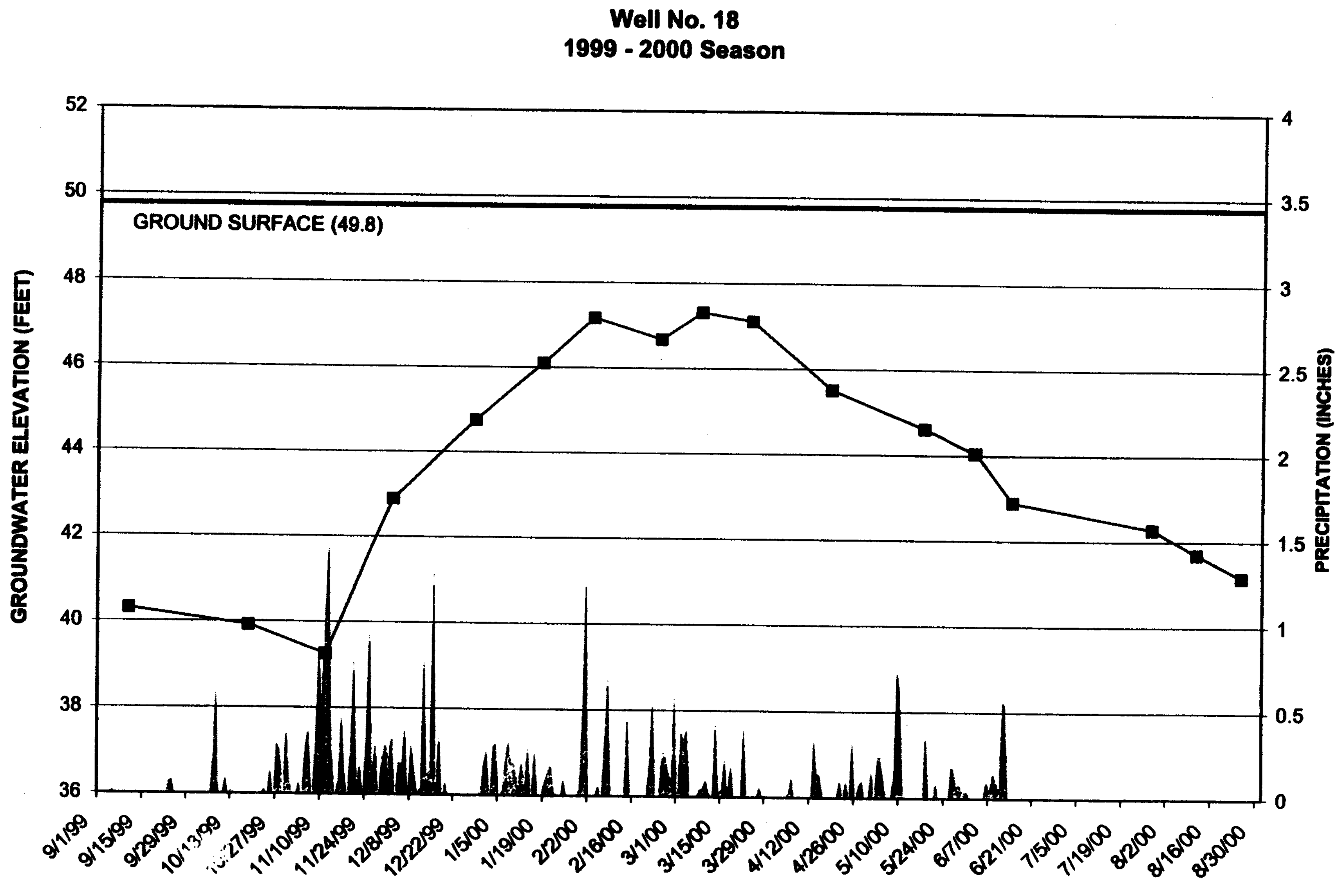


Well No. 16
1999 - 2000 Season



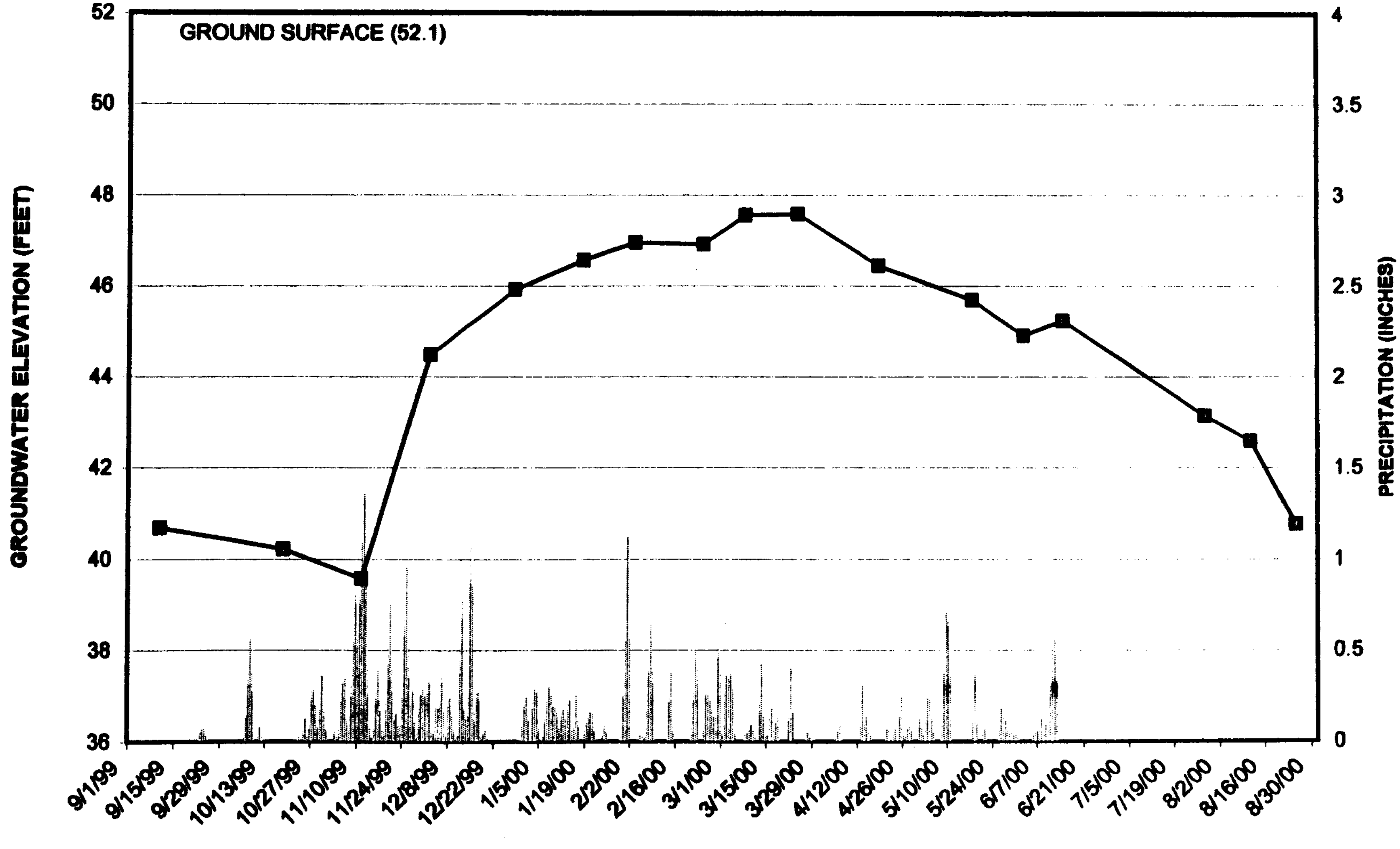
Well No. 17
1999 - 2000 Season



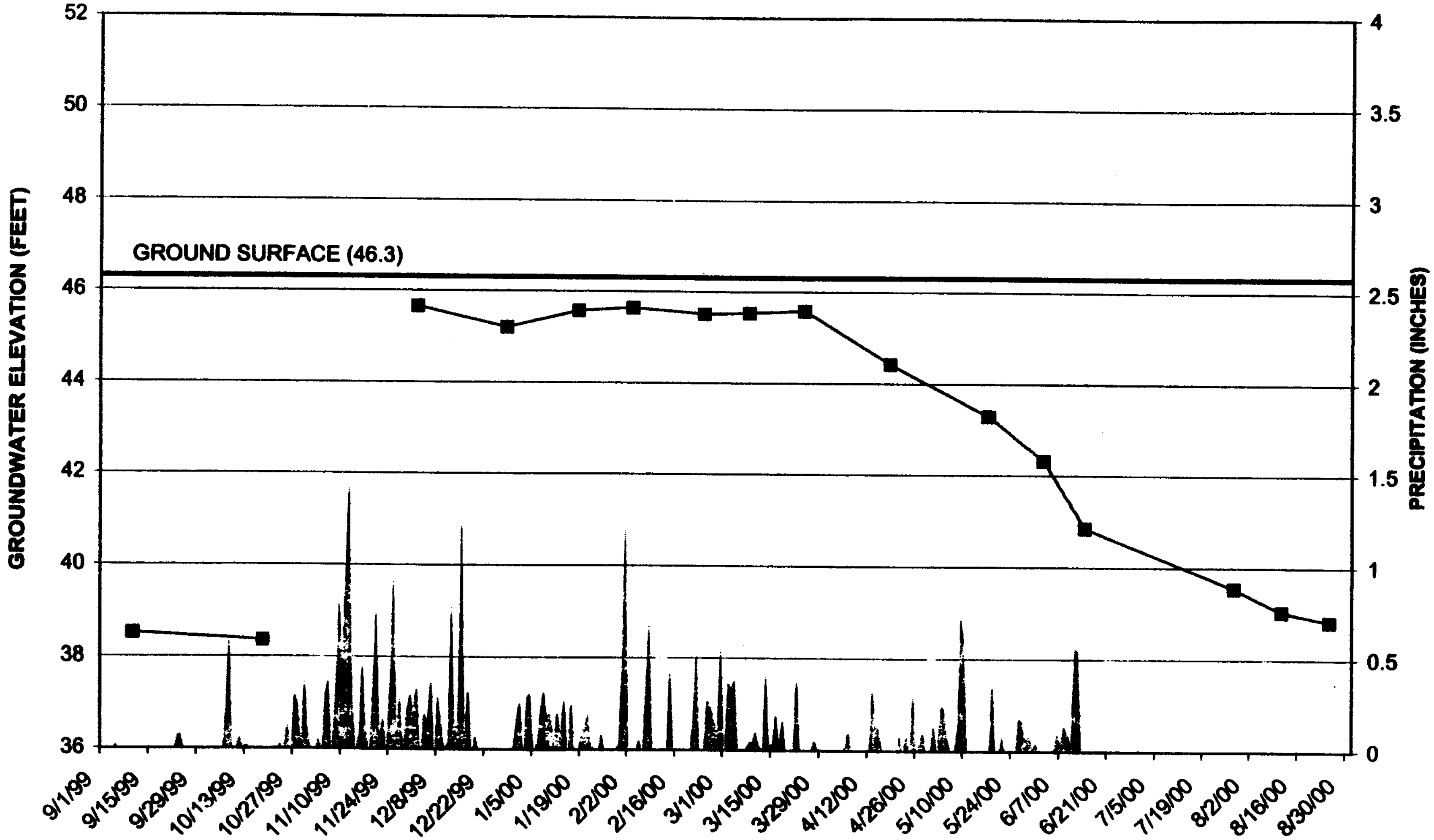

Well No. 18
1999 - 2000 Season
GROUND SURFACE (49.8)
GROUNDWATER ELEVATION (FEET)
PRECIPITATION (INCHES)
52
50
48
46
44
42
40
38
36
4
3.5
3
2.5
2
1.5
1
0.5
0
9/1/99
9/15/99
9/29/99
11/10/99
11/24/99
12/8/99
12/22/99
1/5/00
1/19/00
2/2/00
2/16/00
3/1/00
3/15/00
3/29/00
4/12/00
4/26/00
5/10/00
5/24/00
6/7/00
6/21/00
7/5/00
7/19/00
8/2/00
8/16/00
8/30/00

AR 009076

Well No. 19
1999 - 2000 Season

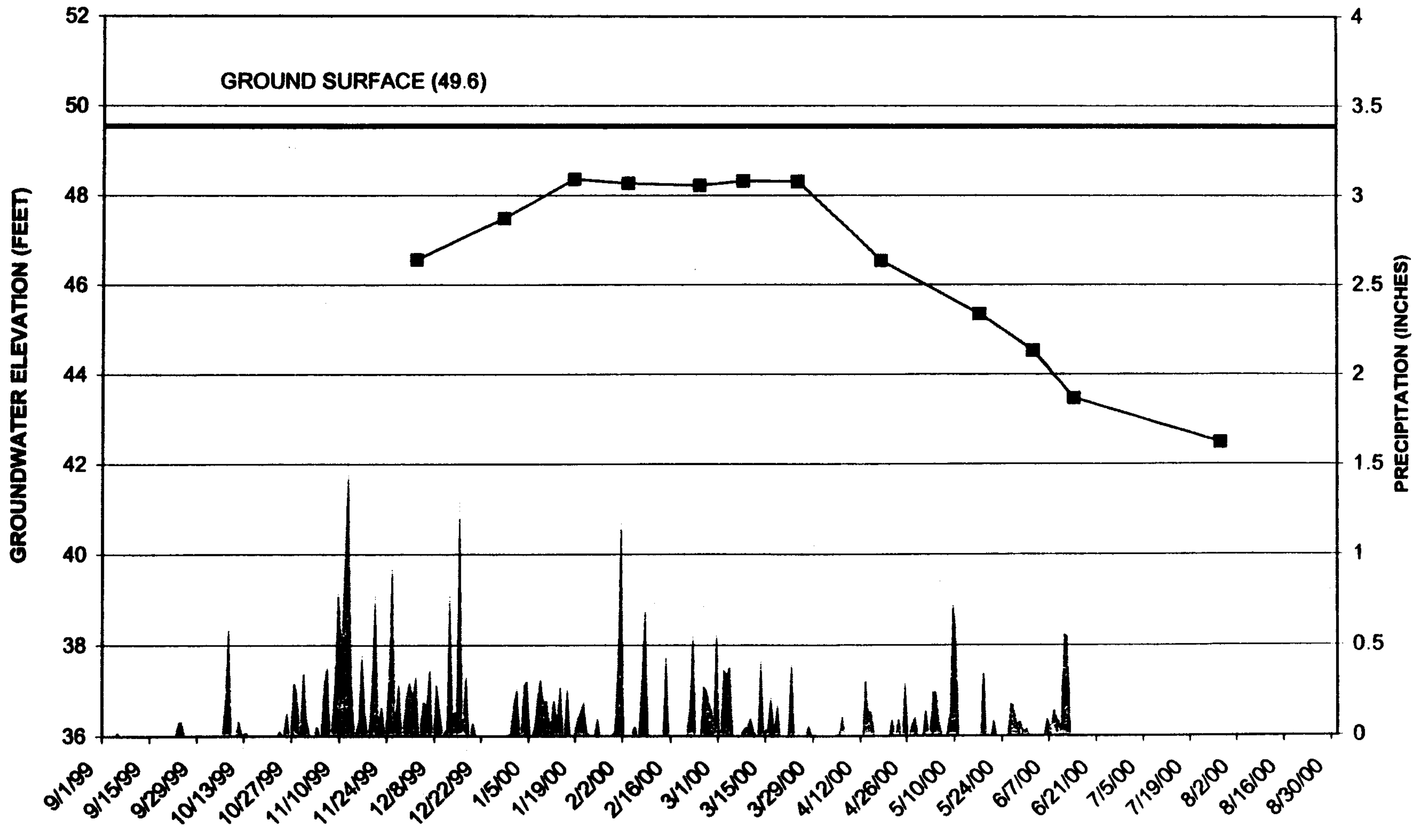


Well No. 20
1999 - 2000 Season

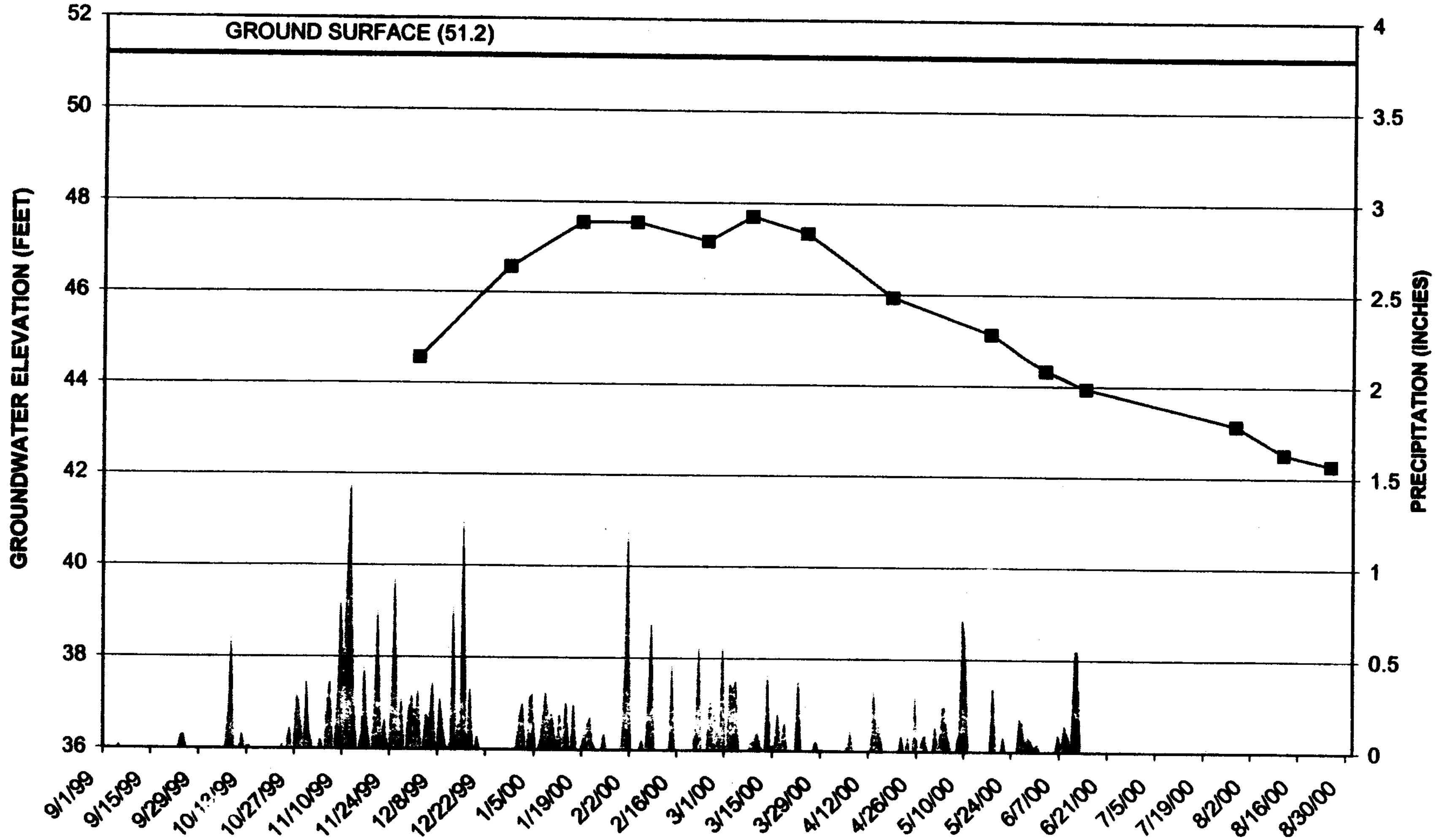


AR 009078

Well No. 21
1999 - 2000 Season

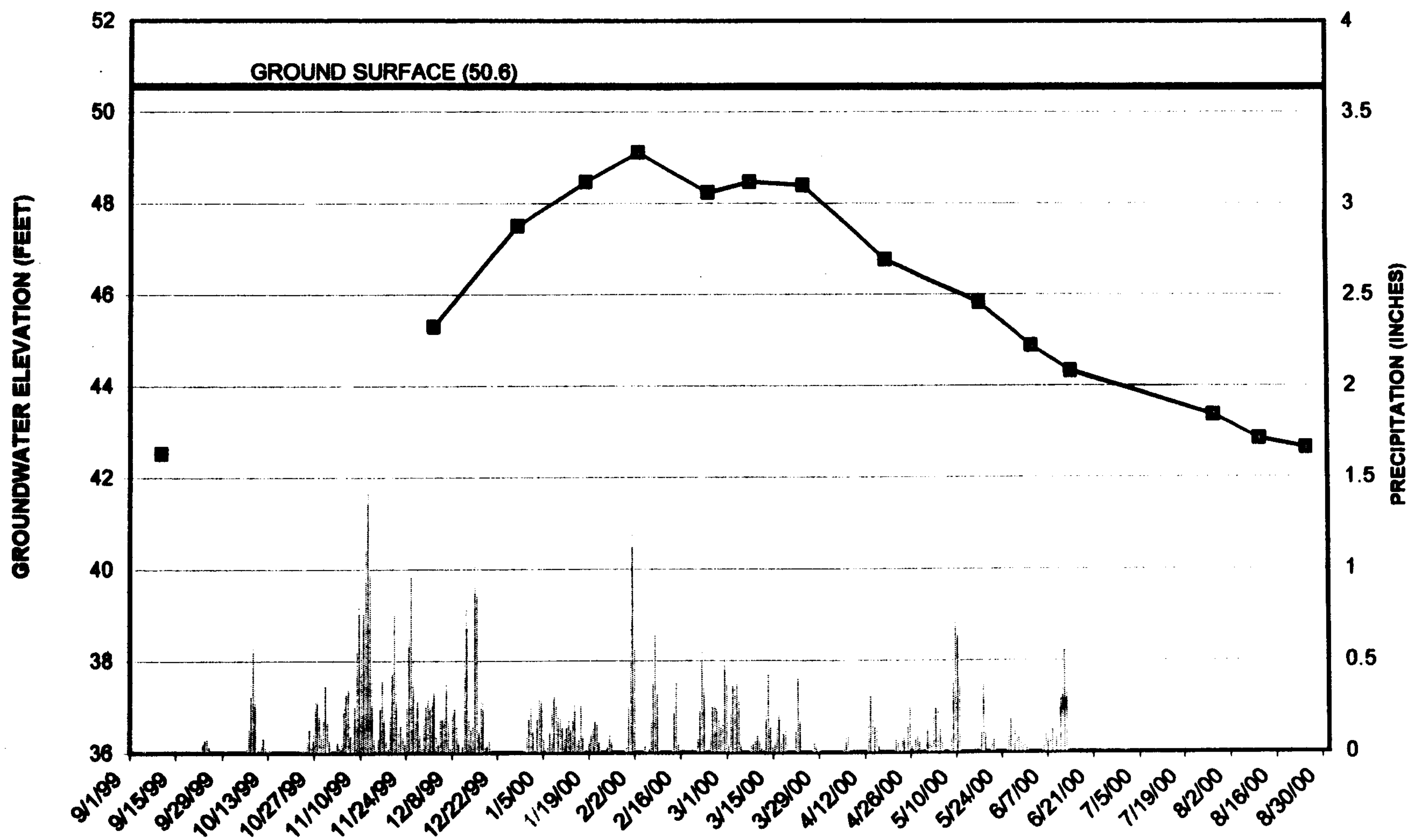


Well No. 22
1999 - 2000 Season



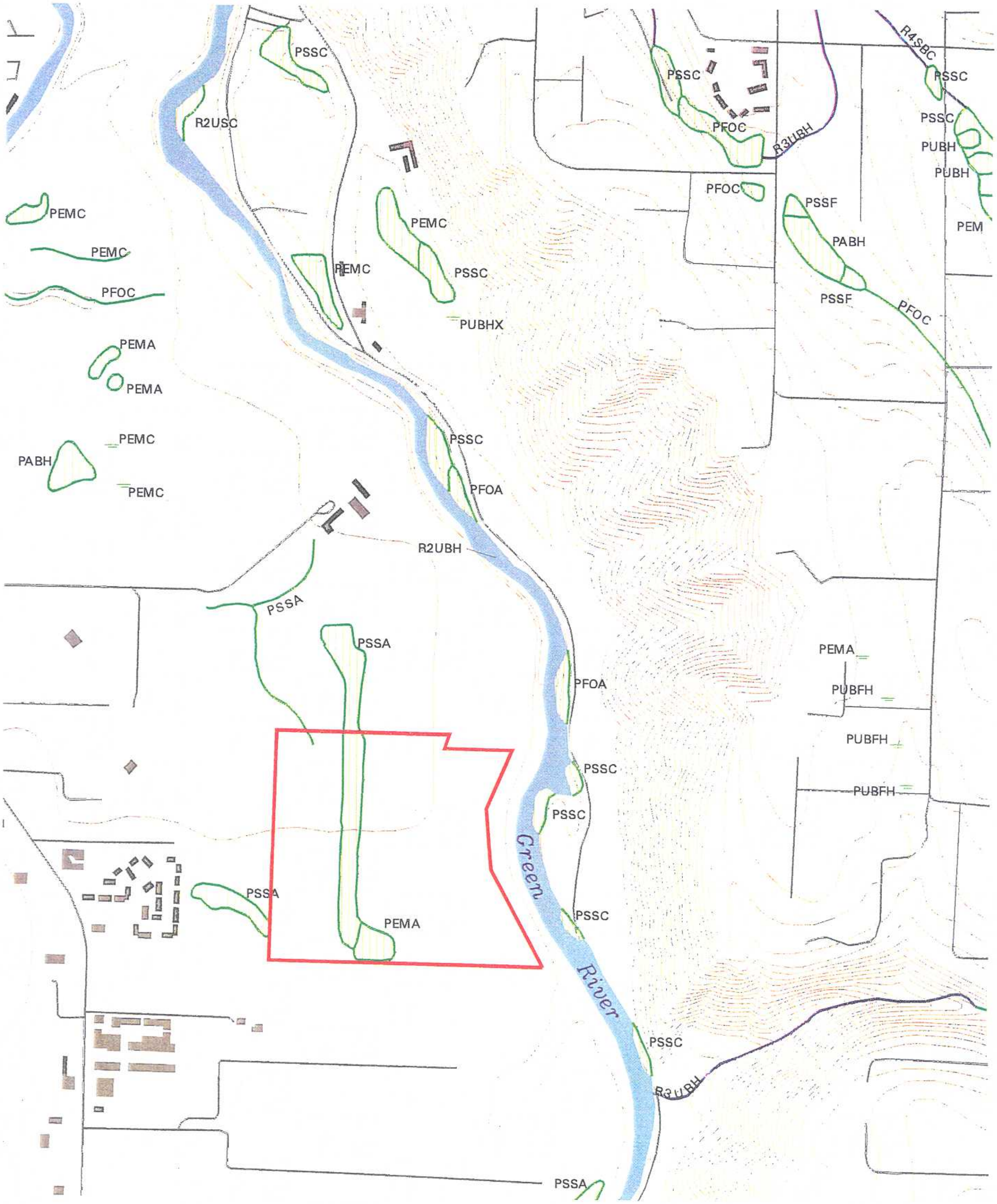
AR 009080

Well No. 23
1999 - 2000 Season



APPENDIX C

MILL CREEK AND NATIONAL WETLAND INVENTORY MAP



Prepared by Parametrix, Inc. File: seatac1/8x11_nwi.aml creating p8x11_nwi.gra Date: December 08, 2000

FEET
0 500 1000
Scale 1:12000

Property Boundary

PEMA Palustrine emergent temporarily flooded
PSSA Palustrine scrub-shrub temporarily flooded

Appendix C
National Wetland Inventory Map (1987)
Auburn Quadrangle

Source: National Wetland Inventory http://www.nwi.fws.gov/nwi.htm

APPENDIX D

WETLAND DETERMINATION DATA SHEETS

Parametrix, Inc.

Data Plot #: 1

Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site

Date: 10/18/00

Applicant/Owner: Port of Seattle

County: King

Investigator: Kevin Featherston and Jennifer Hawkins

State: WA

☑ 1987 Method ☐ 1989 Method

Community ID: PEM

Field Plot ID: DP-1

Do Normal Circumstances exist on the site? Yes X No ___

Is the site significantly disturbed (Atypical Situation)? Yes ___ No X

Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):

Located in Wetland 1.

VEGETATION

(✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Alopecurus pratensis	60	Herb	FACW+
✔	2.	Festuca arundinacea	40	Herb	FAC-

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 50

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):

The wetland vegetation criteria is not met because only 50 percent of the dominant species are wetland.

HYDROLOGY

Recorded Data (Describe in Remarks):

___ Stream, Lake, or Tide Gage

___ Aerial Photograph

___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: None (in.)

Depth to Free Water in Pit: >18 (in.)

Depth to Saturated Soil: >18 (in.)

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

___ Inundated

___ Saturated in Upper 12 inches

___ Saturated in Upper 18 inches

___ Water Marks

___ Drift Lines

___ Sediment Deposits

___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

X Oxidized Root Channels in Upper 12 inches

___ Water-Stained Leaves

X Local Soil Survey Data

___ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):

Wetland hydrology is not expected due to the time of year when the delineation was completed. The presence of oxidized rhizospheres and mapped soils on the King County Hydric Soils List satisfy the wetland hydrology criteria.

Parametrix, Inc.

Data Plot #: 1
Wetland: Auburn

Project/Site: Auburn Mitigation Site

Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Orida Silt Loam

Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents

Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-0.5	O	-	-	-	Roots and Shoots
0.5-9	Ap	10YR 3/3	-	-	Silt loam; oxidized rhizospheres
9->16	B	10YR 4/2	7.5YR 4/6	Many, Medium, Distinct	Silt loam; oxidized rhizospheres

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
X Probable Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer

X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
X Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators meet the hydric soil criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	___	No	X
Hydric Soils Present?	Yes	X	No	___
Wetland Hydrology Present?	Yes	X	No	___

Is this Sampling Point Within a Wetland?

Yes X No ___

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
The presence of wetland hydrology indicators and hydric soils indicate the site is a wetland. The predominance (greater than 60 percent coverage) of the site by wetland plant species is consistent with this finding.

Parametrix, Inc.

Data Plot #: 2
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 10/18/00
Applicant/Owner: Port of Seattle
County: King
Investigator: Kevin Featherston and Jennifer Hawkins
State: WA

☑ 1987 Method ☐ 1989 Method
Community ID: PEM
Field Plot ID: DP-2

	Yes	No
Do Normal Circumstances exist on the site?	X	
Is the site significantly disturbed (Atypical Situation)?		X
Is the area a potential Problem Area?		X

Remarks (Explain sample location, disturbances, problem areas):
Located in Wetland 1.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
	1.	Juncus effusus	<1	Herb	FACW
✔	2.	Poa pratensis	99	Herb	FAC

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 100

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since greater than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is met.

HYDROLOGY

Recorded Data (Describe in Remarks):

____ Stream, Lake, or Tide Gage
____ Aerial Photograph
____ Other
____ No Recorded Data Available

Field Observations:

Depth of Surface Water:	None	(in.)
Depth to Free Water in Pit:	>18	(in.)
Depth to Saturated Soil:	>18	(in.)

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

____ Inundated
____ Saturated in Upper 12 inches
____ Saturated in Upper 18 inches
____ Water Marks
____ Drift Lines
____ Sediment Deposits
____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

X Oxidized Root Channels in Upper 12 inches
____ Water-Stained Leaves
X Local Soil Survey Data
____ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
Wetland hydrology is not expected due to the time of year when the delineation was completed. The presence of oxidized rhizospheres and mapped soils on the King County Hydric Soils List satisfy the wetland hydrology criteria.

Parametrix, Inc.

Data Plot #: 2
Wetland: Auburn

Project/Site: Auburn Mitigation Site

Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam

Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents

Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-0.5	O	-	-	-	Roots and Shoots
0.5-11	Ap	10YR 3/2	7.5YR 4/6	Common, Fine, Distinct	Silt loam; oxidized rhizospheres
11->20	B	10YR 4/2	7.5YR 4/6	Common, Medium, Prominent	Silt loam; oxidized rhizospheres

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
X Probable Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer

X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
X Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators meet the hydric soil criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soils Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is this Sampling Point Within a Wetland?
Yes X No ___

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All technical criteria are met.

AR 009088

Parametrix, Inc.

Data Plot #: 3

Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site

Date: 10/18/00

Applicant/Owner: Port of Seattle

County: King

Investigator: Kevin Featherston and Jennifer Hawkins

State: WA

☑ 1987 Method ☐ 1989 Method

Community ID: Upland

Field Plot ID: DP-3

Do Normal Circumstances exist on the site? Yes X No ___

Is the site significantly disturbed (Atypical Situation)? Yes ___ No X

Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):

Sample location is in NW corner in upland adjacent to wetland.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Cirsium arvense	20	Herb	FAC-
	2.	Cirsium vulgare	10	Herb	FACU
✔	3.	Holcus lanatus	40	Herb	FAC
✔	4.	Ranunculus repens	30	Herb	FACW

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 66

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):

Since greater than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is met.

HYDROLOGY

Recorded Data (Describe in Remarks):

___ Stream, Lake, or Tide Gage

___ Aerial Photograph

___ Other

___ No Recorded Data Available

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

___ Inundated

___ Saturated in Upper 12 inches

___ Saturated in Upper 18 inches

___ Water Marks

___ Drift Lines

___ Sediment Deposits

___ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: None (in.)

Depth to Free Water in Pit: >18 (in.)

Depth to Saturated Soil: >18 (in.)

Secondary Indicators (2 or more required):

___ Oxidized Root Channels in Upper 12 inches

___ Water-Stained Leaves

X Local Soil Survey Data

___ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):

No field indicators of wetland hydrology are present.

Parametrix, Inc.

Data Plot #: 3
Wetland: Auburn

Project/Site: Auburn Mitigation Site

Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam

Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents

Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-0.5	O	-	-	-	Roots and Shoots
0.5-9	Ap	10YR 3/3	-	-	Silt loam
9-14	B	10YR 4/3	7.5YR 5/6	Common, Medium, Distinct	Silt loam
14-18	-	10YR 3/2	-	-	Sandy Loam

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Probable Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer
X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
___ Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
No field indicators of hydric soil are present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	X	No	
Hydric Soils Present?	Yes		No	X
Wetland Hydrology Present?	Yes		No	X

Is this Sampling Point Within a Wetland?

Yes ___ No X

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
Hydric soils and wetland hydrology are not present, therefore the area is not a wetland.

Parametrix, Inc.

Data Plot #: 4

Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 10/18/00

Applicant/Owner: Port of Seattle
County: King

Investigator: Kevin Featherston and Jennifer Hawkins
State: WA

☑ 1987 Method ☐ 1989 Method
Community ID: PEM

Field Plot ID: DP-4

	Yes	No
Do Normal Circumstances exist on the site?	X	
Is the site significantly disturbed (Atypical Situation)?		X
Is the area a potential Problem Area?		X

Remarks (Explain sample location, disturbances, problem areas):
Sample location is in a small area of upland in the north west quadrant of the site.

VEGETATION (✓Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✓	1.	Dactylis glomerata	50	Herb	FACU
✓	2.	Holcus lanatus	50	Herb	FAC

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 50

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
The wetland vegetation criteria is not met because only 50 percent of the dominant plants are wetland.

HYDROLOGY

Recorded Data (Describe in Remarks):

- ____ Stream, Lake, or Tide Gage
- ____ Aerial Photograph
- ____ Other
- ____ No Recorded Data Available

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Saturated in Upper 18 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Secondary Indicators (2 or more required):

- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water-Stained Leaves
- ____ Local Soil Survey Data
- ____ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
No field indicators of wetland hydrology are present.

Parametrix, Inc.

Data Plot #: 4
Wetland: Auburn

Project/Site: Auburn Mitigation Site Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam

Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents

Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-0.5	O	-	-	-	Roots and Shoots
0.5-12	Ap	10YR 3/3	-	-	Silt loam
12-17	B	10YR 4/2	7.5YR 4/4	Many, Medium, Distinct	Silt loam

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Probable Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer

X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
___ Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
No field indicators of hydric soil are present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes ___ No X
Hydric Soils Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is this Sampling Point Within a Wetland?
Yes ___ No X

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
None of the three parameters are present, therefore the area is not a wetland.

Parametrix, Inc.

Data Plot #: 5
Wetland: Auburn

WETLAND DETERMINATION
(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site | Date: 10/18/00
Applicant/Owner: Port of Seattle | County: King
Investigator: Kevin Featherston and Jennifer Hawkins | State: WA

☑ 1987 Method ☐ 1989 Method | Community ID: PEM

Do Normal Circumstances exist on the site? Yes X No ___ | Field Plot ID: DP-5
Is the site significantly disturbed (Atypical Situation)? Yes ___ No X
Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):
Located in Wetland 1.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Alopecurus pratensis	40	Herb	FACW+
✔	2.	Dactylis glomerata	20	Herb	FACU
✔	3.	Holcus lanatus	40	Herb	FAC

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 66

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since greater than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is met.

HYDROLOGY

Recorded Data (Describe in Remarks):

___ Stream, Lake, or Tide Gage
___ Aerial Photograph
___ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

___ Inundated
___ Saturated in Upper 12 inches
___ Saturated in Upper 18 inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

X Oxidized Root Channels in Upper 12 inches
___ Water-Stained Leaves
X Local Soil Survey Data
___ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
Wetland hydrology is not expected due to the time of year when the delineation was completed. The presence of oxidized rhizospheres and mapped soils on the King County Hydric Soils List satisfy the wetland hydrology criteria.

Parametrix, Inc.

Data Plot #: 5
Wetland: Auburn

Project/Site: Auburn Mitigation Site   Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam   Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents   Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-1	O	-	-	-	Roots and Shoots
1-9	Ap	10YR 4/2	-	-	Silt loam; oxidized rhizospheres
9->17	B	10YR 3/2	7.5YR 4/6	Common, Medium, Distinct	Silt loam; oxidized rhizospheres

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
X Probable Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer
X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
X Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators meet the hydric soil criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soils Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is this Sampling Point Within a Wetland? Yes X No ___

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All technical criteria are met.

Parametrix, Inc.

Data Plot #: 6
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 10/18/00
Applicant/Owner: Port of Seattle
County: King
Investigator: Kevin Featherston and Jennifer Hawkins
State: WA

☑ 1987 Method ☐ 1989 Method
Community ID: Upland
Field Plot ID: DP-6

	Yes	No
Do Normal Circumstances exist on the site?	X	
Is the site significantly disturbed (Atypical Situation)?		X
Is the area a potential Problem Area?		X

Remarks (Explain sample location, disturbances, problem areas):
Upland comparison plot.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
	1.	Cirsium arvense	15	Herb	FAC-
✔	2.	Dactylis glomerata	40	Herb	FACU
✔	3.	Elytrigia repens (Agropyron repens)	45	Herb	FAC-

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 0

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since less than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is not met.

HYDROLOGY

Recorded Data (Describe in Remarks):

- ___ Stream, Lake, or Tide Gage
- ___ Aerial Photograph
- ___ Other
- ___ No Recorded Data Available

Field Observations:

Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

- ___ Inundated
- ___ Saturated in Upper 12 inches
- ___ Saturated in Upper 18 inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ___ Oxidized Root Channels in Upper 12 inches
- ___ Water-Stained Leaves
- X Local Soil Survey Data
- ___ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
No field indicators of wetland hydrology are present.

Parametrix, Inc.

Data Plot #: 6
Wetland: Auburn

Project/Site: Auburn Mitigation Site

Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam

Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents

Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-0.5	O	-	-	-	Roots and Shoots
0.5-12	Ap	10YR 3/3	-	-	Silt loam
12-17	B	10YR 3/3	7.5YR 4/6	Common, Medium, Distinct	Silt loam; oxidized rhizospheres

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Probable Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer

X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
___ Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
No field indicators of hydric soil are present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes ___ No X
Hydric Soils Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is this Sampling Point Within a Wetland?
Yes ___ No X

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All three parameters absent, therefore the area is not a wetland.

AR 009096

Parametrix, Inc.

Data Plot #: 7
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 10/18/00
Applicant/Owner: Port of Seattle
County: King
Investigator: Kristie Dunkin
State: WA

☑ 1987 Method ☐ 1989 Method
Community ID: PEM
Field Plot ID: DP-7

	Yes	No
Do Normal Circumstances exist on the site?	X	
Is the site significantly disturbed (Atypical Situation)?		X
Is the area a potential Problem Area?		X

Remarks (Explain sample location, disturbances, problem areas):
Located in Wetland 1.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Alopecurus pratensis	80	Herb	FACW+
	2.	Cirsium arvense	<1	Herb	FAC-
	3.	Dactylis glomerata	15	Herb	FACU
✔	4.	Holcus lanatus	70	Herb	FAC

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 100

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since greater than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is met.

HYDROLOGY

Recorded Data (Describe in Remarks):

- ____ Stream, Lake, or Tide Gage
- ____ Aerial Photograph
- ____ Other
- ____ No Recorded Data Available

Field Observations:

Depth of Surface Water:	None	(in.)
Depth to Free Water in Pit:	>18	(in.)
Depth to Saturated Soil:	>18	(in.)

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

- ____ Inundated
- ____ Saturated in Upper 12 inches
- ____ Saturated in Upper 18 inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- X Oxidized Root Channels in Upper 12 inches
- ____ Water-Stained Leaves
- X Local Soil Survey Data
- ____ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
Wetland hydrology is not expected due to the time of year when the delineation was completed. The presence of oxidized rhizospheres and mapped soils on the King County Hydric Soils List satisfy the wetland hydrology criteria.

Parametrix, Inc.

Data Plot #: 7
Wetland: Auburn

Project/Site: Auburn Mitigation Site

Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam

Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents

Yes X No ___ NA ___

Profile Description:

Depth (inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-6	A	10YR 4/2	10YR 4/4	Common, Medium, Faint	Silt loam
6-15	B	10YR 4/2	7.5YR 4/6 and 7.5YR 4/4	Many, Medium, Distinct	Silt loam; Oxidized rhizospheres
15-24	C	2.5Y 4/2	7.5YR 4/6	Many, Medium, Distinct	Fine Sandy Loam

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Probable Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer

X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
X Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators meet the hydric soil criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soils Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is this Sampling Point Within a Wetland?

Yes X No ___

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All technical criteria are met.

Parametrix, Inc.

Data Plot #: 8
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 10/18/00
Applicant/Owner: Port of Seattle
County: King
Investigator: Kristie Dunkin
State: WA
☑ 1987 Method ☐ 1989 Method
Community ID: Upland
Do Normal Circumstances exist on the site? Yes X No ___
Field Plot ID: DP-8
Is the site significantly disturbed (Atypical Situation)? Yes ___ No X
Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):
Upland comparison plot.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
	1.	Cirsium arvense	<1	Herb	FAC-
	2.	Cirsium vulgare	<1	Herb	FACU
✔	3.	Dactylis glomerata	100	Herb	FACU
	4.	Festuca arundinacea	10	Herb	FAC-
✔	5.	Holcus lanatus	50	Herb	FAC
	6.	Lotus corniculatus	<1	Herb	FAC
	7.	Phleum pratense	10	Herb	FAC-

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 50

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
The wetland vegetation criteria is not met because only 50 percent of the dominant plants are wetland.

HYDROLOGY

Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gage
___ Aerial Photograph
___ Other
___ No Recorded Data Available

Wetland Hydrology Indicators (Describe in Remarks):
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 inches
___ Saturated in Upper 18 inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Field Observations:
Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 inches
___ Water-Stained Leaves
X Local Soil Survey Data
___ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
No field indicators of wetland hydrology are present.

Parametrix, Inc.

Data Plot #: 8
Wetland: Auburn

Project/Site: Auburn Mitigation Site

Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam

Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents

Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-8	Ap	10YR 3/3	-	-	Silt loam
8-12	B	10YR 4/2	-	-	Silt loam
12->18	C	2.5Y 4/2	-	-	Fine Sandy Loam

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Probable Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer

X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
___ Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
No field indicators of hydric soil are present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	___	No	X
Hydric Soils Present?	Yes	___	No	X
Wetland Hydrology Present?	Yes	___	No	X

Is this Sampling Point Within a Wetland?

Yes ___ No X

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All three parameters absent, therefore the area is not a wetland.

Parametrix, Inc.

Data Plot #: 9
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Applicant/Owner: Port of Seattle
Investigator: Marti Louther

Date: 10/18/00
County: King
State: WA

☑ 1987 Method ☐ 1989 Method

Community ID: Upland
Field Plot ID: DP-9

Do Normal Circumstances exist on the site? Yes X No ___
Is the site significantly disturbed (Atypical Situation)? Yes ___ No X
Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):
Upland comparison plot.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Cirsium vulgare	25	Herb	FACU
✔	2.	Dactylis glomerata	25	Herb	FACU
✔	3.	Festuca arundinacea	25	Herb	FAC-
✔	4.	Phleum pratense	25	Herb	FAC-

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 0

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since less than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is not met.

HYDROLOGY

Recorded Data (Describe in Remarks):

___ Stream, Lake, or Tide Gage
___ Aerial Photograph
___ Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

___ Inundated
___ Saturated in Upper 12 inches
___ Saturated in Upper 18 inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

___ Oxidized Root Channels in Upper 12 inches
___ Water-Stained Leaves
X Local Soil Survey Data
___ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
No field indicators of wetland hydrology are present.

Parametrix, Inc.

Data Plot #: 9
Wetland: Auburn

Project/Site: Auburn Mitigation Site   Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam   Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents   Yes X No ___ NA ___

Profile Description:

Depth (inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-18	A	10YR 4/3	-	-	Silt loam

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Probable Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ High Organic Content in Surface Layer
- X Listed on Local Hydric Soils List
- X Listed on State Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Aquic Moisture Regime
- ___ Organic Streaking in Sandy Soils
- ___ Mottles
- ___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
No field indicators of hydric soil are present.

WETLAND DETERMINATION

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soils Present?		X
Wetland Hydrology Present?		X

Is this Sampling Point Within a Wetland?

Yes ___ No X

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All three parameters absent, therefore the area is not a wetland.

Parametrix, Inc.

Data Plot #: 10
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 10/18/00
Applicant/Owner: Port of Seattle
County: King
Investigator: Kevin Featherston and Jennifer Hawkins
State: WA

☑ 1987 Method ☐ 1989 Method

Community ID: PEM
Field Plot ID: DP-10

Do Normal Circumstances exist on the site? Yes X No ___
Is the site significantly disturbed (Atypical Situation)? Yes ___ No X
Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):
Located in Wetland 1.

VEGETATION (✔Dominant species are checked)

	Plant Species	% Cover	Stratum	Indicator
✔ 1.	Phalaris arundinacea	100	Herb	FACW

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 100

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since 100% of the dominant plants are hydrophytic, the wetland vegetation criteria is met.

HYDROLOGY

Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gage
___ Aerial Photograph
___ Other
___ No Recorded Data Available

Wetland Hydrology Indicators (Describe in Remarks):
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 inches
___ Saturated in Upper 18 inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Field Observations:
Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Secondary Indicators (2 or more required):
X Oxidized Root Channels in Upper 12 inches
___ Water-Stained Leaves
X Local Soil Survey Data
___ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
Wetland hydrology is not expected due to the time of year when the delineation was completed. The presence of oxidized rhizospheres and mapped soils on the King County Hydric Soils List satisfy the wetland hydrology criteria.

Parametrix, Inc.

Data Plot #: 10
Wetland: Auburn

Project/Site: Auburn Mitigation Site Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-1	O	-	-	-	Roots and Shoots
1-8	Ap	10YR 3/2	5YR 3/4	Few, Medium, Distinct	Silt loam; oxidized rhizospheres
8->19	B	10YR 3/2	5YR 3/4	Many, Medium, Distinct	Silt loam; oxidized rhizospheres

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
X Probable Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer
X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
X Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators meet the hydric soil criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soils Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is this Sampling Point Within a Wetland? Yes X No ___

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All technical criteria are met.

AR 009104

Parametrix, Inc.

Data Plot #: 11
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 10/18/00
Applicant/Owner: Port of Seattle
County: King
Investigator: Kevin Featherston and Jennifer Hawkins
State: WA

☑ 1987 Method ☐ 1989 Method

Community ID: PEM
Field Plot ID: DP-11

	Yes	No
Do Normal Circumstances exist on the site?	X	
Is the site significantly disturbed (Atypical Situation)?		X
Is the area a potential Problem Area?		X

Remarks (Explain sample location, disturbances, problem areas):
Located in Wetland 1.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Cirsium arvense	40	Herb	FAC-
✔	2.	Dactylis glomerata	60	Herb	FACU

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 0

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since less than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is not met.

HYDROLOGY

Recorded Data (Describe in Remarks):

- ___ Stream, Lake, or Tide Gage
- ___ Aerial Photograph
- ___ Other
- ___ No Recorded Data Available

Field Observations:

Depth of Surface Water:	None	(in.)
Depth to Free Water in Pit:	>18	(in.)
Depth to Saturated Soil:	>18	(in.)

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

- ___ Inundated
- ___ Saturated in Upper 12 inches
- ___ Saturated in Upper 18 inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- ___ Oxidized Root Channels in Upper 12 inches
- ___ Water-Stained Leaves
- X Local Soil Survey Data
- ___ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
No field indicators of wetland hydrology are present.

Parametrix, Inc.

Data Plot #: 11
Wetland: Auburn

Project/Site: Auburn Mitigation Site   Date: 10/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam   Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents   Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-0.5	O	-	-	-	Roots and Shoots
0.5-16	-	10YR 3/3	-	-	Silt loam

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Probable Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer
X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
___ Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
No field indicators of hydric soil are present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes ___ No X
Hydric Soils Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is this Sampling Point Within a Wetland? Yes ___ No X

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All three parameters absent, therefore the area is not a wetland.

AR 009106

Parametrix, Inc.

Data Plot #: 12
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 9/18/00
Applicant/Owner: Port of Seattle
County: King
Investigator: Jan Cassin, Kristie Dunkin, Steve Emge
State: WA

☑ 1987 Method ☐ 1989 Method

Community ID: PEM
Field Plot ID: DP-12

Do Normal Circumstances exist on the site? Yes X No ___

Is the site significantly disturbed (Atypical Situation)? Yes ___ No X

Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):
Data plot is adjactent to well P-1 in Wetland 1.

VEGETATION

(✔Dominant species are checked)

	Plant Species	% Cover	Stratum	Indicator
✔ 1.	Alopecurus pratensis	20	Herb	FACW+
✔ 2.	Cirsium arvense	20	Herb	FAC-
✔ 3.	Dactylis glomerata	20	Herb	FACU
✔ 4.	Festuca arundinacea	20	Herb	FAC-
✔ 5.	Festuca rubra	20	Herb	FAC+

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 40

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since less than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is not met.

HYDROLOGY

Recorded Data (Describe in Remarks):

___ Stream, Lake, or Tide Gage
___ Aerial Photograph
X Other
___ No Recorded Data Available

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

___ Inundated
___ Saturated in Upper 12 inches
___ Saturated in Upper 18 inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Secondary Indicators (2 or more required):

X Oxidized Root Channels in Upper 12 inches
___ Water-Stained Leaves
X Local Soil Survey Data
X Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
Wetland hydrology is not expected due to the time of year when the delineation was completed. Well data at this location indicates water within 12 inches of the surface for more than 2 weeks during the growing season. The presence of oxidized rhizospheres and mapped soils on the King County Hydric Soils List satisfy the wetland hydrology criteria.

Parametrix, Inc.

Data Plot #: 12
Wetland: Auburn

Project/Site: Auburn Mitigation Site　　Date: 9/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam　　Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents　　Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-0.5	O	-	-	-	Roots and Shoots
0.5-7	A	10YR 3/2	-	-	Silt loam; oxidized rhizospheres
7-12	B	10YR 4/2	7.5YR 4/4	Faint, Common, Fine	Silt loam
12-18+	B2	5YR 4/1	7.5YR 4/3	Coarse, Common, Prominent	Silt Loam

Hydric Soil Indicators:

___	Histosol	X	Listed on Local Hydric Soils List
___	Histic Epipedon	X	Listed on State Hydric Soils List
___	Sulfidic Odor	___	Listed on National Hydric Soils List
___	Probable Aquic Moisture Regime	X	Aquic Moisture Regime
___	Reducing Conditions	___	Organic Streaking in Sandy Soils
X	Gleyed or Low-Chroma Colors	X	Mottles
___	High Organic Content in Surface Layer	___	Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators meet the hydric soil criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	___	No	X
Hydric Soils Present?	Yes	X	No	___
Wetland Hydrology Present?	Yes	X	No	___

Is this Sampling Point Within a Wetland?
Yes ___ No X

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All three parameters are not met, therefore the area is not a wetland.

Parametrix, Inc.

Data Plot #: 13
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 9/18/00
Applicant/Owner: Port of Seattle
County: King
Investigator: Jan Cassin, Kristie Dunkin, Steve Emge
State: WA

☑ 1987 Method ☐ 1989 Method
Community ID: PEM

Do Normal Circumstances exist on the site? Yes X No ___
Field Plot ID: DP-13

Is the site significantly disturbed (Atypical Situation)? Yes ___ No X

Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):
Site is located adjacent to well P-2 in Wetland 1.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Agrostis capillaris (tenuis)	20	Herb	FAC
✔	2.	Agrostis gigantea (alba)	20	Herb	FAC
✔	3.	Alopecurus pratensis	20	Herb	FACW+
✔	4.	Elytrigia repens (Agropyron repens)	20	Herb	FAC-
✔	5.	Holcus lanatus	20	Herb	FAC

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 80

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since greater than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is met.

HYDROLOGY

Recorded Data (Describe in Remarks):

___ Stream, Lake, or Tide Gage
___ Aerial Photograph
X Other
___ No Recorded Data Available

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

___ Inundated
___ Saturated in Upper 12 inches
___ Saturated in Upper 18 inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Secondary Indicators (2 or more required):

X Oxidized Root Channels in Upper 12 inches
___ Water-Stained Leaves
X Local Soil Survey Data
X Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
Wetland hydrology is not expected due to the time of year when the delineation was completed. Well data at this location indicates water within 12 inches of the surface for more than 2 weeks during the growing season. The presence of oxidized rhizospheres and mapped soils on the King County Hydric Soils List satisfy the wetland hydrology criteria.

Parametrix, Inc.

Data Plot #: 13
Wetland: Auburn

Project/Site: Auburn Mitigation Site   Date: 9/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam   Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents   Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-3	A	10YR 3/3	-	-	Silt Loam
3-8	B	2.5Y 2/2	7.5YR 4/4	Fine, Common, Distinct	Silt loam; oxidized rhizospheres
8-18	C	5YR 4/1	10YR 4/3	Coarse, Common, Distinct	Silt Loam

Hydric Soil Indicators:

___	Histosol	X	Listed on Local Hydric Soils List
___	Histic Epipedon	X	Listed on State Hydric Soils List
___	Sulfidic Odor	___	Listed on National Hydric Soils List
___	Probable Aquic Moisture Regime	X	Aquic Moisture Regime
___	Reducing Conditions	___	Organic Streaking in Sandy Soils
X	Gleyed or Low-Chroma Colors	X	Mottles
___	High Organic Content in Surface Layer	___	Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators meet the hydric soil criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes X	No ___
Hydric Soils Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is this Sampling Point Within a Wetland?

Yes X No ___

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All technical criteria are met.

Parametrix, Inc.

Data Plot #: 14
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 9/18/00
Applicant/Owner: Port of Seattle
County: King
Investigator: Jan Cassin, Kristie Dunkin, Steve Emge
State: WA

☑ 1987 Method ☐ 1989 Method

Community ID: PEM
Field Plot ID: DP-14

	Yes	No
Do Normal Circumstances exist on the site?	X	
Is the site significantly disturbed (Atypical Situation)?		X
Is the area a potential Problem Area?		X

Remarks (Explain sample location, disturbances, problem areas):
Site is adjacent to well P-12 in Wetland 2.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Cirsium arvense	25	Herb	FAC-
✔	2.	Dactylis glomerata	25	Herb	FACU
✔	3.	Juncus effusus	25	Herb	FACW
✔	4.	Phalaris arundinacea	25	Herb	FACW

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 50

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
The wetland vegetation criteria is not met because only 50 percent of the dominant plants are wetland.

HYDROLOGY

Recorded Data (Describe in Remarks):

- ___ Stream, Lake, or Tide Gage
- ___ Aerial Photograph
- X Other
- ___ No Recorded Data Available

Field Observations:

- Depth of Surface Water: None (in.)
- Depth to Free Water in Pit: >18 (in.)
- Depth to Saturated Soil: >18 (in.)

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

- ___ Inundated
- ___ Saturated in Upper 12 inches
- ___ Saturated in Upper 18 inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

- X Oxidized Root Channels in Upper 12 inches
- ___ Water-Stained Leaves
- X Local Soil Survey Data
- X Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
Wetland hydrology is not expected due to the time of year when the delineation was completed. Well data at this location indicates water within 12 inches of the surface for more than 2 weeks during the growing season. The presence of oxidized rhizospheres and mapped soils on the King County Hydric Soils List satisfy the wetland hydrology criteria.

Parametrix, Inc.

Data Plot #: 14
Wetland: Auburn

Project/Site: Auburn Mitigation Site

Date: 9/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam

Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents

Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-3	A	10YR 4/3 to 10YR 4/4	-	-	Silt loam with very dense root mat
3-9	B	10YR 4/3	-	-	Silt loam
9-14	B2	2.5Y 5/2	10YR 4/4 to 10YR 4/6	Few, faint	Silt loam; oxidized rhizospheres

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Probable Aquic Moisture Regime
___ Reducing Conditions
X Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer

X Listed on Local Hydric Soils List
X Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
X Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
X Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators meet the hydric soil criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes X No ___
Hydric Soils Present? Yes X No ___
Wetland Hydrology Present? Yes X No ___

Is this Sampling Point Within a Wetland?
Yes X No ___

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All technical criteria are met.

Parametrix, Inc.

Data Plot #: 15
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 9/18/00
Applicant/Owner: Port of Seattle
County: King
Investigator: Jan Cassin, Kristie Dunkin, Steve Emge
State: WA

☑ 1987 Method ☐ 1989 Method
Community ID: Upland
Field Plot ID: DP-15

Do Normal Circumstances exist on the site? Yes X No ___
Is the site significantly disturbed (Atypical Situation)? Yes ___ No X
Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):
Site is adjacent to well P-13.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Cirsium arvense	33	Herb	FAC-
✔	2.	Dactylis glomerata	33	Herb	FACU
✔	3.	Holcus lanatus	33	Herb	FAC

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 33

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since less than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is not met.

HYDROLOGY

Recorded Data (Describe in Remarks):

___ Stream, Lake, or Tide Gage
___ Aerial Photograph
X Other
___ No Recorded Data Available

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

___ Inundated
___ Saturated in Upper 12 inches
___ Saturated in Upper 18 inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Secondary Indicators (2 or more required):

___ Oxidized Root Channels in Upper 12 inches
___ Water-Stained Leaves
X Local Soil Survey Data
X Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
All mapped soils on-site are on the King County Hydric Soils List. Well data at this location indicates water within 12 inches of the surface for more than 2 weeks during the growing season, therefore the wetland hydrology criteria is met.

Parametrix, Inc.

Data Plot #: 15
Wetland: Auburn

Project/Site: Auburn Mitigation Site   Date: 9/18/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam   Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents   Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-6	A	10YR 3/2	-	-	Silt Loam
6-12	B	10YR 3/2	-	-	Silt Loam
12-18	B2	2.5Y 4/2	10YR 5/4	Few and Faint	Fine Sandy Loam

Hydric Soil Indicators:

___	Histosol	X	Listed on Local Hydric Soils List
___	Histic Epipedon	X	Listed on State Hydric Soils List
___	Sulfidic Odor	___	Listed on National Hydric Soils List
___	Probable Aquic Moisture Regime	X	Aquic Moisture Regime
___	Reducing Conditions	___	Organic Streaking in Sandy Soils
X	Gleyed or Low-Chroma Colors	___	Mottles
___	High Organic Content in Surface Layer	___	Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators do not meet the hydric soil criteria at 10 inches.

WETLAND DETERMINATION

	Yes	No
Hydrophytic Vegetation Present?	___	X
Hydric Soils Present?	___	X
Wetland Hydrology Present?	X	___

Is this Sampling Point Within a Wetland? Yes ___ No X

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
Vegetation and hydric soils criteria are not met, therefore the area is not a wetland.

AR 009114

Parametrix, Inc.

Data Plot #: 16
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Applicant/Owner: Port of Seattle
Investigator: William Kleindl

Date: 12/1/00
County: King
State: WA

☑ 1987 Method ☐ 1989 Method

Community ID: Upland
Field Plot ID: DP-16

Do Normal Circumstances exist on the site? Yes X No ___
Is the site significantly disturbed (Atypical Situation)? Yes ___ No X
Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):
Upland comparison plot, approxmitally 100 feet south of data plot 6.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Cirsium arvense	20	Herb	FAC-
✔	2.	Cirsium vulgare	20	Herb	FACU
✔	3.	Dactylis glomerata	20	Herb	FACU
✔	4.	Holcus lanatus	60	Herb	FAC

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 25

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since less than 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is not met.

HYDROLOGY

Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gage
___ Aerial Photograph
___ Other
X No Recorded Data Available

Wetland Hydrology Indicators (Describe in Remarks):
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 inches
___ Saturated in Upper 18 inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Field Observations:
Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
No field indicators of wetland hydrology are present.

Parametrix, Inc.

Data Plot #: 16
Wetland: Auburn

Project/Site: Auburn Mitigation Site   Date: 12/1/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam   Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents   Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-18	A	10YR 4/3	-	-	Silt Loam
18+	B	10YR 3/3	10YR 4/4	coarse, Common, Faint	Silt Loam

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Probable Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer
___ Listed on Local Hydric Soils List
___ Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
___ Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators do not meet the hydric soil criteria at 10 inches.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes ___ No X
Hydric Soils Present? Yes ___ No X
Wetland Hydrology Present? Yes ___ No X

Is this Sampling Point Within a Wetland? Yes ___ No X

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All three parameters are not met, therefore the area is not a wetland.

Parametrix, Inc.

Data Plot #: 17

Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 12/1/00

Applicant/Owner: Port of Seattle
County: King

Investigator: William Kleindl
State: WA

☑ 1987 Method ☐ 1989 Method
Community ID: PEM

Do Normal Circumstances exist on the site? Yes X No ___
Field Plot ID: DP-17

Is the site significantly disturbed (Atypical Situation)? Yes ___ No X

Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):
Site is adjacent to well P-10 in Wetland 3.

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Dactylis glomerata	40	Herb	FACU
✔	2.	Holcus lanatus	60	Herb	FAC

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 50

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is not met.

HYDROLOGY

Recorded Data (Describe in Remarks):

___ Stream, Lake, or Tide Gage
___ Aerial Photograph
X Other
___ No Recorded Data Available

Field Observations:

Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

___ Inundated
___ Saturated in Upper 12 inches
___ Saturated in Upper 18 inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):

___ Oxidized Root Channels in Upper 12 inches
___ Water-Stained Leaves
___ Local Soil Survey Data
X Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
All mapped soils on-site are on the King County Hydric Soils List. Well data at this location indicates water within 12 inches of the surface for more than 2 weeks during the growing season, therefore the wetland hydrology criteria is met.

Parametrix, Inc.

Data Plot #: 17
Wetland: Auburn

Project/Site: Auburn Mitigation Site

Date: 12/1/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam

Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents

Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-9	A	10YR 3/3	-	-	Silt loam
9-18+	B	10YR 4/2	10YR 3/3	Many, Coarse, Distinct	Silt loam

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Probable Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer

___ Listed on Local Hydric Soils List
___ Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
X Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Soil color and other hydric soil indicators do meet the hydric soil criteria at 10 inches.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes ___	No X
Hydric Soils Present?	Yes X	No ___
Wetland Hydrology Present?	Yes X	No ___

Is this Sampling Point Within a Wetland?

Yes X No ___

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
Vegetation criteria is not met, however well data inticates that wetland hydrology is present for at least 2 weeks in the growing season.

Parametrix, Inc.

Data Plot #: 18
Wetland: Auburn

WETLAND DETERMINATION

(Modified from: 1987 COE Wetlands Delineation Manual)

Project/Site: Auburn Mitigation Site
Date: 12/1/00
Applicant/Owner: Port of Seattle
County: King
Investigator: William Kleindl
State: WA

☑ 1987 Method ☐ 1989 Method
Community ID: Upland
Field Plot ID: DP-18

Do Normal Circumstances exist on the site? Yes X No ___
Is the site significantly disturbed (Atypical Situation)? Yes ___ No X
Is the area a potential Problem Area? Yes ___ No X

Remarks (Explain sample location, disturbances, problem areas):
Upland comparison plot for Wetland 3

VEGETATION (✔Dominant species are checked)

		Plant Species	% Cover	Stratum	Indicator
✔	1.	Cirsium arvense	40	Herb	FAC-
✔	2.	Cirsium vulgare	40	Herb	FACU
✔	3.	Holcus lanatus	20	Herb	FAC
✔	4.	Ranunculus repens	30	Herb	FACW
	5.	Rumex crispus	10	Herb	FAC+

Percent of **Dominant Species** that are OBL, FACW, or FAC (except FAC-). Include species noted (*) as showing morphological adaptations to wetlands. "T" indicates trace. 50

Remarks (Describe disturbances, relevant local variations, seasonal effects, etc.):
Since 50% of the dominant plants are hydrophytic, the wetland vegetation criteria is not met.

HYDROLOGY

Recorded Data (Describe in Remarks):

___ Stream, Lake, or Tide Gage
___ Aerial Photograph
___ Other
X No Recorded Data Available

Wetland Hydrology Indicators (Describe in Remarks):

Primary Indicators:

___ Inundated
___ Saturated in Upper 12 inches
___ Saturated in Upper 18 inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands

Field Observations:

Depth of Surface Water: None (in.)
Depth to Free Water in Pit: >18 (in.)
Depth to Saturated Soil: >18 (in.)

Secondary Indicators (2 or more required):

___ Oxidized Root Channels in Upper 12 inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ Other (Explain in Remarks)

Remarks (As relevant, describe recent precipitation, hydrologic modifications, local variations, etc.):
No field indicators of wetland hydrology are present.

Parametrix, Inc.

Data Plot #: 18
Wetland: Auburn

Project/Site: Auburn Mitigation Site   Date: 12/1/00

SOILS

Soil Survey Data:

Map Unit Name: Oridia Silt Loam   Drainage Class: Somewhat poorly drained

Field Observations Confirm Mapped Type?

Taxonomy (Subgroup): Typic Fluvaqents   Yes X No ___ NA ___

Profile Description:

Depth (Inches)	Horizon Designation	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Rhizospheres, etc.
0-18	A	10YR 3/3	-	-	Silt loam
18+	C	-	-	-	Sand

Hydric Soil Indicators:

___ Histosol
___ Histic Epipedon
___ Sulfidic Odor
___ Probable Aquic Moisture Regime
___ Reducing Conditions
___ Gleyed or Low-Chroma Colors
___ High Organic Content in Surface Layer
___ Listed on Local Hydric Soils List
___ Listed on State Hydric Soils List
___ Listed on National Hydric Soils List
___ Aquic Moisture Regime
___ Organic Streaking in Sandy Soils
___ Mottles
___ Other (Explain in Remarks)

Remarks (Describe soil disturbances, local variations, etc.):
Hydric soil criteria is not met.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	___	No	X
Hydric Soils Present?	Yes	___	No	X
Wetland Hydrology Present?	Yes	___	No	X

Is this Sampling Point Within a Wetland?

Yes ___ No X

Remarks (If applicable, explain any differences between 1987 and 1989 delineation results):
All three parameters are not met, therefore the area is not a wetland.

APPENDIX E

WASHINGTON DEPARTMENT OF ECOLOGY
WETLAND RATING

Wetlands Rating Field Data Form

Background Information:

Name of Rater: William Kleindl / Lorna Affiliation: Parametrix, Inc. Date: 10/30/00

Name of wetland (if known): Port of Seattle - Auburn Site wetlands 1 & 2

Government Jurisdiction of wetland: Federal / WA. State / City of Auburn

Location: 1/4 Section: ______ of 1/4 S: ______ Section: ______ Township: ______ Range: ______

Sources of Information: (Check all sources that apply)

Site visit: X USGS Topo Map: X NWI map: X Aerial Photo: X Soils survey: X

Other: ___ Describe: on-site wetland delineation

When The Field Data form is complete enter Category here: III

Q.1. High Quality Natural Wetland

Circle Answers

Answer this question if you have adequate information or experience to do so. If not find someone with the expertise to answer the questions. Then, if the answer to questions 1a, 1b and 1c are all NO, contact the Natural Heritage program of DNR.

1a. Human caused disturbances.

Is there significant evidence of human-caused changes to topography or hydrology of the wetland as indicated by any of the following conditions? Consider only changes that may have taken place in the last 5 decades. The impacts of changes done earlier have probably been stabilized and the wetland ecosystem will be close to reaching some new equilibrium that may represent a high quality wetland.

1a1. Upstream watershed > 12% impervious.	Yes: go to Q.2
1a2. Wetland is ditched and water flow is not obstructed.	Yes: go to Q.2
1a3. Wetland has been graded, filled, logged.	Yes: go to Q.2
1a4. Water in wetland is controlled by dikes, weirs, etc.	Yes: go to Q.2
1a5. Wetland is grazed.	Yes: go to Q.2
1a6. Other indicators of disturbance (list below)	Yes: go to Q.2
	No: go to 1b.

1b Are there populations of non-native plants which are currently present, cover more than 10% of the wetland, and appear to be invading native populations? Briefly describe any non-native plant populations and Information source(s):________	YES: go to Q.2 No: go to 1c.
1c. Is there evidence of human-caused disturbances which have visibly degraded water quality. Evidence of the degradation of water quality include: direct (untreated) runoff from roads or parking lots; presence, or historic evidence, of waste dumps; oily sheens; the smell of organic chemicals; or lifestock use. Briefly describe:________	YES: go to Q.2 NO: Possible Cat. I contact DNR
Q.2. Irreplaceable Ecological Functions: Does the wetland: • have at least 1/4 acre of organic soils deeper than 16 inches and the wetland is relatively undisturbed; OR [IIf the answer is NO because the wetland is disturbed briefly describe: Indicators of disturbance may include: - Wetland has been graded, filled, logged; - Organic soils on the surface are dried-out for more than half of the year; - Wetland receives direct stormwater runoff from urban or agricultural areas.]; OR	(NO to all: go to Q.3) YES go to 2a
• have a forested class greater than 1 acre; OR	YES: Go to 2b
• have characteristics of an estuarine system; OR	YES: Go to 2c
• have eel grass, floating or non-floating kelp beds?	YES: Go to 2d
2a. Bogs and Fens Are any of the three following conditions met for the area of organic soil? 2a.1. Are Sphagnum mosses a common ground cover (>30%) and the cover of invasive species (see Table 3) is less than 10%?	
Is the area of sphagnum mosses and deep organic soils > 1/2 acre? Is the area of sphagnum mosses and deep organic soils 1/4-1/2 acre?	YES: Category I YES: Category II NO: Go to 2a.3
2a.2. Is there an area of organic soil which has an emergent class with at least one species from Table 2, and cover of invasive species is < 10% (see Table 3)?	
Is the area of herbaceous plants and deep organic soils > 1/2 acre? Is the area of herbaceous plants and deep organic soils 1/4-1/2 acre?	YES: Category I YES: Category II NO: Go to 2a.3

2a.3. Is the vegetation a mixture of only herbaceous plants and Sphagnum mosses with no scrub/shrub or forested classes? Is the area of herbaceous plants, Sphagnum, and deep organic soils > 1/2 acre? Is the area of herbaceous plants, Sphagnum, and deep organic soils 1/4-1/2 acre?	YES: Category I YES: Category II NO: Go to Q.3.
Q.2b. Mature forested wetland.	
2b.1. Does 50% of the cover of upper forest canopy consist of evergreen trees older than 80 years or deciduous trees older than 50 years? ***Note:*** The size of trees is often not a measure of age, and size cannot be used as a surrogate for age (see guidance).	YES: Category I NO: Go to 2b.2
2b.2. Does 50% of the cover of forest canopy consist of evergreen trees older than 50 years, AND is the structural diversity of the forest high as characterized by an additional layer of trees 20'-49' tall, shrubs 6' - 20'. tall, and a herbaceous groundcover?	YES: Go to 2b.3 NO: Go to Q.3
2b.3. Does < 25% of the areal cover in the herbaceous/groundcover or the shrub layer consist of invasive/exotic plant species from the list on p. 19?	YES: Category I NO: Go to Q.3
Q.2c. Estuarine wetlands.	
2c1. Is the wetland listed as National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park, or Educational, Environmental or Scientific Reserves designated under WAC 332-30-151?	YES: Category I NO: Go to 2c.2
2c.2. Is the wetland > 5 acres; . . . . ***Note:*** If an area contains patches of salt tolerant vegetation that are 1) less than 600 feet apart and that are separated by mudflats that go dry on a Mean Low Tide, or 2) separated by tidal channels that are less than 100 feet wide; all the vegetated areas are to be considered together in calculating the wetland area.	YES: Category I
or is the wetland 1-5 acres;	YES: Go to 2c.3
or is the wetland < 1 acre?.	YES: Go to 2c.4

2c.3. Does the wetland meet at least 3 of the following 4 criteria: . . . . - minimum existing evidence of human related disturbance such as diking, ditching, filling, cultivation, grazing or the presence of non-native plant species (see guidance for definition); - surface water connection with tidal saltwater or tidal freshwater; - at least 75% of the wetland has a 100' buffer of ungrazed pasture, open water, shrub or forest; - has at least 3 of the following features: low marsh; high marsh; tidal channels; lagoon(s);woody debris; or contiguous freshwater wetland.	YES: Category I NO: Category II
2c.4. Does the wetland meet all of the four criteria under 2c3. (above)?. .	YES: Category II NO: Category III
Q.2d. Eel Grass and Kelp Beds. 2d.1. Are eel grass beds present?.	YES: Category I NO: go to 2d.2
2d.2. Are there floating or non-floating kelp bed(s) present with greater than 50% macro algal cover in the month of August or September?	YES: Category I NO: Category II
Q.3. Category IV wetlands. 3a. Is the wetland: less than 1 acre <u>and</u>, hydrologically isolated <u>and</u>, comprised of one vegetated class that is dominated (> 80% areal cover) by one species from Table 3 (page 19) or Table 4 (page 20)	YES: Category IV NO: go to 3b
3b. Is the wetland: less than two acres and, hydrologically isolated, with one vegetated class, and > 90% of areal cover is any combination of species from Table 3 (page 19)	YES: Category IV NO: go to 3c
3c. Is the wetland excavated from upland <u>and</u> a pond smaller than 1 acre without a surface water connection to streams, lakes, rivers, or other wetland, and has < 0.1 acre of vegetation.	YES: Category IV NO: go to Q.4

Q.4. Significant habitat value.

Answer all questions and enter data requested.

4a. Total wetland area

Estimate area, select from choices in the near-right column, and score in the far column:

Enter acreage of wetland here:_____acres, and source:___________

Circle scores that qualify

acres	points
> 200	6
40- 200	5
10 - 40	4
5 - 10	3
1 - 5	2
0.1 - 1	1
< 0.1	0

4b. Wetland classes: Circle the wetland classes below that qualify:

Open Water: if the area of open water is > 1/4 acre

Aquatic Beds: if the area of aquatic beds > 1/4 acre,

Emergent: if the area of emergent class is > 1/4 acre,

Scrub-Shrub: if the area of scrub-shrub class is > 1/4 acre,

Forested: if area of forested class is > 1/4 acre,

Add the number of wetland classes, above, that qualify, and then score according to the columns at right.
e.g. If there are 4 classes (aquatic beds, open water, emergent & scrub- shrub), you would circle 8 points in the far right column.

# of classes	Points
1	0
2	3
3	6
4	8
5	10

4c. Plant species diversity.

For each wetland class (at right) that qualifies in 4b above, count the number of different plant species you can find that cover more than 5% of the ground. You do not have to name them.

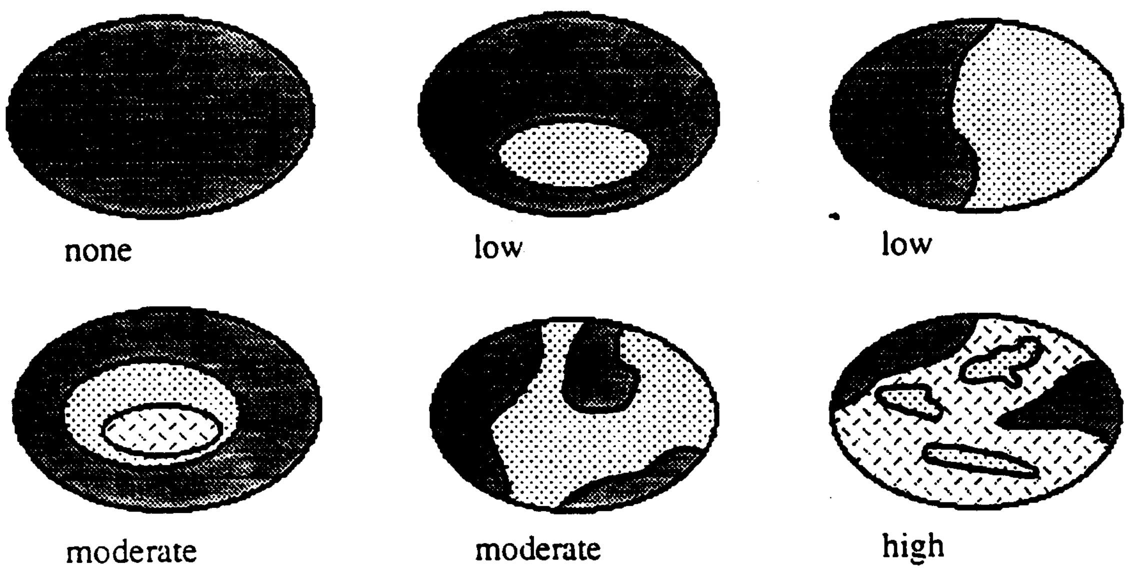
Score in column at far right:
e.g. If a wetland has an aquatic bed class with 3 species, an emergent class with 4 species and a scrub-shrub class with 2 species you would circle 2, 2, and 1 in the far column.

Note: Any plant species with a cover of > 5% qualifies for points within a class, even those that are not of that class.

Class	# species in class	Points
Aquatic Bed	1	0
	2	1
	3	2
	> 3	3
Emergent	1	0
	2-3	1
	4-5	2
	> 5	3
Scrub-Shrub	1	0
	2	1
	3-4	2
	> 4	3
Forested	1	0
	2	1
	3-4	2
	> 4	3

AR 009126

4d. Structural diversity. If the wetland has a forested class, add 1 point if each of the following classes is present within the forested class and is <u>larger than 1/4 acre</u>: -trees > 50' tall . . . . -trees 20' - 49' tall . . . . -shrubs. . . . . -herbaceous ground cover. . . . . Also add 1 point if there is any "open water" or "aquatic bed" class immediately next to the forested area (ie. there is no scrub/shrub or emergent vegetation between them).	 YES - 1 YES - 1 YES - 1 YES - 1 YES - 1 0
4e. Decide from the diagrams below whether interspersion between wetland classes is high, moderate, low or none? If you think the amount of interspersion falls in between the diagrams score accordingly (i.e. a moderately high amount of insterspersion would score a 4, while a moderately low amount would score a 2)	High - 5 Moderate - 3 Low - 1 None - 0



4f. Habitat features. Answer questions below, circle features that apply, and score to right: Is there evidence that the open or standing water was caused by beavers Is a heron rookery located within 300'? Are raptor nest/s located within 300'? Are there at least 3 standing dead trees (snags) per acre greater than 10" in diameter at "breast height" (DBH)?. Are there at least 3 downed logs per acre with a diameter > 6" for at least 10' in length? Are there areas (vegetated or unvegetated) within the wetland that are ponded for at least 4 months out of the year, and the wetland has not qualified as having an open water class in Question 4b. ?	 YES = 2 YES = 1 YES = 1 YES = 1 YES = 1 YES = 2

AR 009127

4g. Connection to streams. (Score one answer only.) 4g.1. Does the wetland provide habitat for fish at any time of the year AND does it have a perennial surface water connection to a fish bearing stream.	YES = 6
4g.2 Does the wetland provide fish habitat seasonally AND does it have a seasonal surface water connection to a fish bearing stream.	YES = 4
4g.3 Does the wetland function to export organic matter through a surface water connection at all times of the year to a perennial stream.	YES = 4
4g.4 Does the wetland function to export organic matter through a surface water connection to a stream on a seasonal basis?	YES = 2
4h. Buffers. Score the existing buffers on a scale of 1-5 based on the following four descriptions. If the condition of the buffers do not exactly match the description, score either a point higher or lower depending on whether the buffers are less or more degraded.	
Forest, scrub, native grassland or open water buffers are present for more than 100' around 95% of the circumference.	Score = 5
Forest, scrub, native grassland, or open water buffers wider than 100' for more than 1/2 of the wetland circumference, or a forest, scrub, grasslands, or open water buffers for more than 50' around 95% of the circumference.	Score = 3
Forest, scrub, native grassland, or open water buffers wider than 100' for more than 1/4 of the wetland circumference, or a forest, scrub, native grassland, or open water buffers wider than 50' for more than 1/2 of the wetland circumference.	Score = 2
No roads, buildings or paved areas within 100' of the wetland for more than 95% of the wetland circumference.	Score = 2
No roads, buildings or paved areas within 25' of the wetland for more than 95% of the circumference, or No roads buildings or paved areas within 50' of the wetland for more than 1/2 of the wetland circumference.	Score = 1
Paved areas, industrial areas or residential construction (with less than 50' between houses) are less than 25 feet from the wetland for more than 95% of the circumference of the wetland.	Score = 0

4i. Connection to other habitat areas: Select the description which best matches the site being evaluated.	
-Is the wetland connected to, or part of, a riparian corridor at least 100' wide connecting two or more wetlands; or, is there an upland connection present >100' wide with good forest or shrub cover (>25% cover) connecting it with a Significant Habitat Area?	YES = 5
- Is the wetland connected to any other Habitat Area with either 1) a forested/shrub corridor < 100' wide, or 2) a a corridor that is > 100' wide, but has a low vegetative cover less than 6 feet in height?	YES = 3
-Is the wetland connected to, or a part of, a riparian corridor between 50 - 100' wide with scrub/shrub or forest cover connection to other wetlands?	YES = 3
- Is the wetland connected to any other Habitat Area with narrow corridor (<100') of low vegetation (< 6' in height)?	YES = 1
- Is the wetland and its buffer (if the buffer is less than 50' wide) completely isolated by development (urban, residential with a density greater than 2/acre, or industrial)?	YES = 0
Now add the scores circled (for Q.5a - Q.5i above) to get a total. **Is the Total greater than or equal to 22 points?** 21	**YES = Category II** **NO = Category III**

Wetlands Rating Field Data Form

Background Information:

Name of Rater: William Kleindl Affiliation: Parametrix, Inc Date: 12/1/00

Name of wetland (if known): Port of Seattle - Auburn site wetland 3

Government Jurisdiction of wetland: Federal / WA State / City of Auburn

Location: 1/4 Section: ______ of 1/4 S: ______ Section: ______ Township: ______ Range: ______

Sources of Information: (Check all sources that apply)

Site visit: ✓ USGS Topo Map: ✓ NWI map: ✓ Aerial Photo: ✓ Soils survey: ✓

Other: ✓ Describe: on site wetland Delineation

When The Field Data form is complete enter Category here: IV

Q.1. High Quality Natural Wetland

Circle Answers

Answer this question if you have adequate information or experience to do so. If not find someone with the expertise to answer the questions. Then, if the answer to questions 1a, 1b and 1c are all NO, contact the Natural Heritage program of DNR.

1a. Human caused disturbances.

Is there significant evidence of human-caused changes to topography or hydrology of the wetland as indicated by any of the following conditions? Consider only changes that may have taken place in the last 5 decades. The impacts of changes done earlier have probably been stabilized and the wetland ecosystem will be close to reaching some new equilibrium that may represent a high quality wetland.

1a1. Upstream watershed > 12% impervious.	Yes: go to Q.2
1a2. Wetland is ditched and water flow is not obstructed.	Yes: go to Q.2
1a3. Wetland has been graded, filled, logged.	Yes: go to Q.2
1a4. Water in wetland is controlled by dikes, weirs, etc.	Yes: go to Q.2
1a5. Wetland is grazed.	Yes: go to Q.2
1a6. Other indicators of disturbance (list below)	Yes: go to Q.2
Farming; Recent test well placement	No: go to 1b.

1b Are there populations of non-native plants which are currently present, cover more than 10% of the wetland, and appear to be invading native populations? Briefly describe any non-native plant populations and Information source(s):__________	YES: go to Q.2 No: go to 1c.
1c. Is there evidence of human-caused disturbances which have visibly degraded water quality. Evidence of the degradation of water quality include: direct (untreated) runoff from roads or parking lots; presence, or historic evidence, of waste dumps; oily sheens; the smell of organic chemicals; or lifestock use. Briefly describe:__________	YES: go to Q.2 NO: Possible Cat. I contact DNR
Q.2. Irreplaceable Ecological Functions: Does the wetland: • have at least 1/4 acre of organic soils deeper than 16 inches and the wetland is relatively undisturbed; OR [If the answer is NO because the wetland is disturbed briefly describe: Indicators of disturbance may include: - Wetland has been graded, filled, logged; - Organic soils on the surface are dried-out for more than half of the year; - Wetland receives direct stormwater runoff from urban or agricultural areas.];	(NO to all: go to Q.3) YES go to 2a
OR • have a forested class greater than 1 acre;	YES: Go to 2b
OR • have characteristics of an estuarine system;	YES: Go to 2c
OR • have eel grass, floating or non-floating kelp beds?	YES: Go to 2d
2a. Bogs and Fens Are any of the three following conditions met for the area of organic soil?	
2a.1. Are Sphagnum mosses a common ground cover (>30%) and the cover of invasive species (see Table 3) is less than 10%?	
Is the area of sphagnum mosses and deep organic soils > 1/2 acre? Is the area of sphagnum mosses and deep organic soils 1/4-1/2 acre?	YES: Category I YES: Category II NO: Go to 2a.3
2a.2. Is there an area of organic soil which has an emergent class with at least one species from Table 2, and cover of invasive species is < 10% (see Table 3)?	
Is the area of herbaceous plants and deep organic soils > 1/2 acre? Is the area of herbaceous plants and deep organic soils 1/4-1/2 acre?	YES: Category I YES: Category II NO: Go to 2a.3

2c.3. Does the wetland meet at least 3 of the following 4 criteria: . . . . - minimum existing evidence of human related disturbance such as diking, ditching, filling, cultivation, grazing or the presence of non-native plant species (see guidance for definition); - surface water connection with tidal saltwater or tidal freshwater; - at least 75% of the wetland has a 100' buffer of ungrazed pasture, open water, shrub or forest; - has at least 3 of the following features: low marsh; high marsh; tidal channels; lagoon(s);woody debris; or contiguous freshwater wetland.	YES: Category I NO: Category II
2c.4. Does the wetland meet all of the four criteria under 2c3. (above)?. .	YES: Category II NO: Category III
Q.2d. Eel Grass and Kelp Beds. 2d.1. Are eel grass beds present?.	YES: Category I NO: go to 2d.2
2d.2. Are there floating or non-floating kelp bed(s) present with greater than 50% macro algal cover in the month of August or September?	YES: Category I NO: Category II
Q.3. Category IV wetlands. 3a. Is the wetland: less than 1 acre <u>and</u>, hydrologically isolated <u>and</u>, comprised of one vegetated class that is dominated (> 80% areal cover) by one species from Table 3 (page 19) or Table 4 (page 20)	YES: Category IV NO: go to 3b
3b. Is the wetland: less than two acres and, hydrologically isolated, with one vegetated class, and > 90% of areal cover is any combination of species from Table 3 (page 19)	YES: Category IV NO: go to 3c
3c. Is the wetland excavated from upland <u>and</u> a pond smaller than 1 acre without a surface water connection to streams, lakes, rivers, or other wetland, and has < 0.1 acre of vegetation.	YES: Category IV NO: go to Q.4

2a.3. Is the vegetation a mixture of only herbaceous plants and Sphagnum mosses with no scrub/shrub or forested classes? Is the area of herbaceous plants, Sphagnum, and deep organic soils > 1/2 acre? Is the area of herbaceous plants, Sphagnum, and deep organic soils 1/4-1/2 acre?	YES: Category I YES: Category II NO: Go to Q.3.
Q.2b. Mature forested wetland. 2b.1. Does 50% of the cover of upper forest canopy consist of evergreen trees older than 80 years or deciduous trees older than 50 years? ***Note:*** The size of trees is often not a measure of age, and size cannot be used as a surrogate for age (see guidance). 2b.2. Does 50% of the cover of forest canopy consist of evergreen trees older than 50 years, AND is the structural diversity of the forest high as characterized by an additional layer of trees 20'-49' tall, shrubs 6' - 20', tall, and a herbaceous groundcover? 2b.3. Does < 25% of the areal cover in the herbaceous/groundcover or the shrub layer consist of invasive/exotic plant species from the list on p. 19?	 YES: Category I NO: Go to 2b.2 YES: Go to 2b.3 NO: Go to Q.3 YES: Category I NO: Go to Q.3
Q.2c. Estuarine wetlands. 2c1. Is the wetland listed as National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park, or Educational, Environmental or Scientific Reserves designated under WAC 332-30-151? ..... 2c.2. Is the wetland > 5 acres; .... ***Note:*** If an area contains patches of salt tolerant vegetation that are 1) less than 600 feet apart and that are separated by mudflats that go dry on a Mean Low Tide, or 2) separated by tidal channels that are less than 100 feet wide; all the vegetated areas are to be considered together in calculating the wetland area. or is the wetland 1-5 acres; .... or is the wetland < 1 acre?.	 YES: Category I NO: Go to 2c.2 YES: Category I YES: Go to 2c.3 YES: Go to 2c.4

Q.4. Significant habitat value.	
Answer all questions and enter data requested. 4a. Total wetland area Estimate area, select from choices in the near-right column, and score in the far column: Enter acreage of wetland here:_____acres, and source:___________	**Circle scores that qualify** <u>acres</u> <u>points</u> > 200 6 40- 200 5 10 - 40 4 5 - 10 3 1 - 5 2 0.1 - 1 1 < 0.1 0
4b. Wetland classes: Circle the wetland classes below that qualify: Open Water: if the area of open water is > 1/4 acre Aquatic Beds: if the area of aquatic beds > 1/4 acre, Emergent: if the area of emergent class is > 1/4 acre, Scrub-Shrub: if the area of scrub-shrub class is > 1/4 acre, Forested: if area of forested class is > 1/4 acre, Add the number of wetland classes, above, that qualify, and then score according to the columns at right. e.g. If there are 4 classes (aquatic beds, open water, emergent & scrub- shrub), you would circle 8 points in the far right column.	<u># of classes</u> <u>Points</u> 1 . . . . 0 2 . . . . 3 3 . . . . 6 4 . . . . 8 5 10

4c. Plant species diversity.

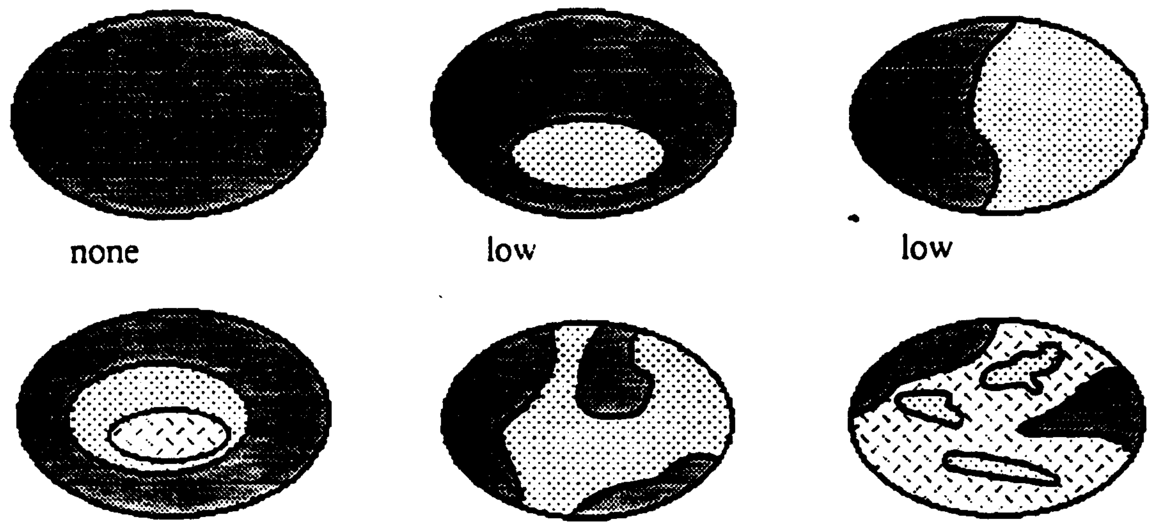
For each wetland class (at right) that qualifies in 4b above, count the number of different plant species you can find that cover more than 5% of the ground. You do not have to name them.

Score in column at far right:
e.g. If a wetland has an aquatic bed class with 3 species, an emergent class with 4 species and a scrub-shrub class with 2 species you would circle 2, 2, and 1 in the far column.

Note: Any plant species with a cover of > 5% qualifies for points within a class, even those that are not of that class.

<u>Class</u>	<u># species in class</u>	<u>Points</u>
Aquatic Bed	1	0
	2	1
	3	2
	> 3	3
Emergent	1	0
	2-3	1
	4-5	2
	> 5	3
Scrub-Shrub	1	0
	2	1
	3-4	2
	> 4	3
Forested	1	0
	2	1
	3-4	2
	> 4	3

4d. Structural diversity. **If the** wetland has a forested class, **add 1 point** if each of the following **classes** is present within the **forested class** and is <u>larger than 1/4 acre</u>: **-trees** > 50' tall . . . . **-trees** 20'- 49' tall . . . . **-shrubs**. . . . . **-herbaceous** ground cover. . . . . **Also add** 1 point if there is any **"open water"** or "aquatic bed" class **immediately** next to the **forested area (ie. there** is no scrub/shrub or **emergent** vegetation between **them).**	 YES - 1 YES - 1 YES - 1 YES - 1 YES - 1
4e. Decide from the diagrams **below whether** interspersion between **wetland** classes is high, **moderate, low or none**? If you think the **amount** of interspersion fails **in between** the diagrams score **accordingly** (i.e. a moderately high **amount of insterspersion** would score a 4, **while** a moderately low amount **would score** a 2)	High - 5 Moderate - 3 Low - 1 None - 0



none | low | low

moderate | moderate | high

4f. Habitat features. **Answer** questions below, circle **features** that apply, and score to right: **Is there** evidence that the **open or standing** water was caused by beavers **Is a heron** rookery located **within 300'?** **Are** raptor nest/s located within 300'? **Are there** at least 3 standing dead **trees (snags)** per acre greater than 10" in diameter at "breast height" **(DBH)**?. **Are** there at least 3 downed **logs per acre** with a diameter > 6" for at least 10' in length? **Are** there areas (vegetated **or unvegetated)** within the wetland that are **ponded** for at least 4 months **out of the year,** and the wetland has not **qualified** as having an **open water class** in Question 4b. ?	 YES = 2 YES = 1 YES = 1 YES = 1 YES = 1 YES = 2

AR 009135

4g. Connection to streams. (Score one answer only.) 4g.1. Does the wetland provide habitat for fish at any time of the year AND does it have a perennial surface water connection to a fish bearing stream.	YES = 6
4g.2 Does the wetland provide fish habitat seasonally AND does it have a seasonal surface water connection to a fish bearing stream.	YES = 4
4g.3 Does the wetland function to export organic matter through a surface water connection at all times of the year to a perennial stream.	YES = 4
4g.4 Does the wetland function to export organic matter through a surface water connection to a stream on a seasonal basis?	YES = 2
4h. Buffers. Score the existing buffers on a scale of 1-5 based on the following four descriptions. If the condition of the buffers do not exactly match the description, score either a point higher or lower depending on whether the buffers are less or more degraded.	
Forest, scrub, native grassland or open water buffers are present for more than 100' around 95% of the circumference.	Score = 5
Forest, scrub, native grassland, or open water buffers wider than 100' for more than 1/2 of the wetland circumference, or a forest, scrub, grasslands, or open water buffers for more than 50' around 95% of the circumference.	Score = 3
Forest, scrub, native grassland, or open water buffers wider than 100' for more than 1/4 of the wetland circumference, or a forest, scrub, native grassland, or open water buffers wider than 50' for more than 1/2 of the wetland circumference.	Score = 2
No roads, buildings or paved areas within 100' of the wetland for more than 95% of the wetland circumference.	Score = 2
No roads, buildings or paved areas within 25' of the wetland for more than 95% of the circumference, or No roads buildings or paved areas within 50' of the wetland for more than 1/2 of the wetland circumference.	Score = 1
Paved areas, industrial areas or residential construction (with less than 50' between houses) are less than 25 feet from the wetland for more than 95% of the circumference of the wetland.	Score = 0

4i. Connection to other habitat areas: Select the description which best matches the site being evaluated.	
-Is the wetland connected to, or part of, a riparian corridor at least 100' wide connecting two or more wetlands; or, is there an upland connection present >100' wide with good forest or shrub cover (>25% cover) connecting it with a Significant Habitat Area?	YES = 5
- Is the wetland connected to any other Habitat Area with either 1) a forested/shrub corridor < 100' wide, or 2) a a corridor that is > 100'wide, but has a low vegetative cover less than 6 feet in height?	YES = 3
-Is the wetland connected to, or a part of, a riparian corridor between 50 - 100' wide with scrub/shrub or forest cover connection to other wetlands?	YES = 3
- Is the wetland connected to any other Habitat Area with narrow corridor (<100') of low vegetation (< 6' in height)?	YES = 1
- Is the wetland and its buffer (if the buffer is less than 50' wide) completely isolated by development (urban, residential with a density greater than 2/acre, or industrial)?	YES = 0
Now add the scores circled (for Q.5a - Q.5i above) to get a total. **Is the Total greater than or equal to 22 points?**	**YES = Category II** **NO = Category III**

B. FIELD DATA SHEETS

APPENDIX B

FIELD DATA SHEETS

(bound separately)

C. PRIOR CONVERTED CROP-
LAND AT THE VACCA FARM SITE

APPENDIX C

PRIOR CONVERTED CROPLANDS AT THE VACCA FARM SITE

APPENDIX C
PRIOR CONVERTED CROPLAND

Parametrix, Inc. staff conducted a review of the farming history on several parcels of farmland in the Port of Seattle's acquisition area (referred to as Vacca Farm) to classify these areas as upland, farmed wetland (FW), prior converted (PC) cropland, or wetland. This review included an evaluation of aerial photographs, field studies during 1998 and 1999, discussions with local landowners, and contacting the U.S. Department of Agriculture (USDA). The Vacca Farm was visited on several occasions throughout the rainy seasons of 1998 and 1999 to determine the extent of inundation and soil saturation. Areas within the Vacca Farm that satisfy the criteria for farmed wetlands were staked and surveyed in the field. Areas that meet the farmed wetland criteria are described on pages 3-18 and 3-19 in the report text and Maps 1 and 4 in Appendix D.

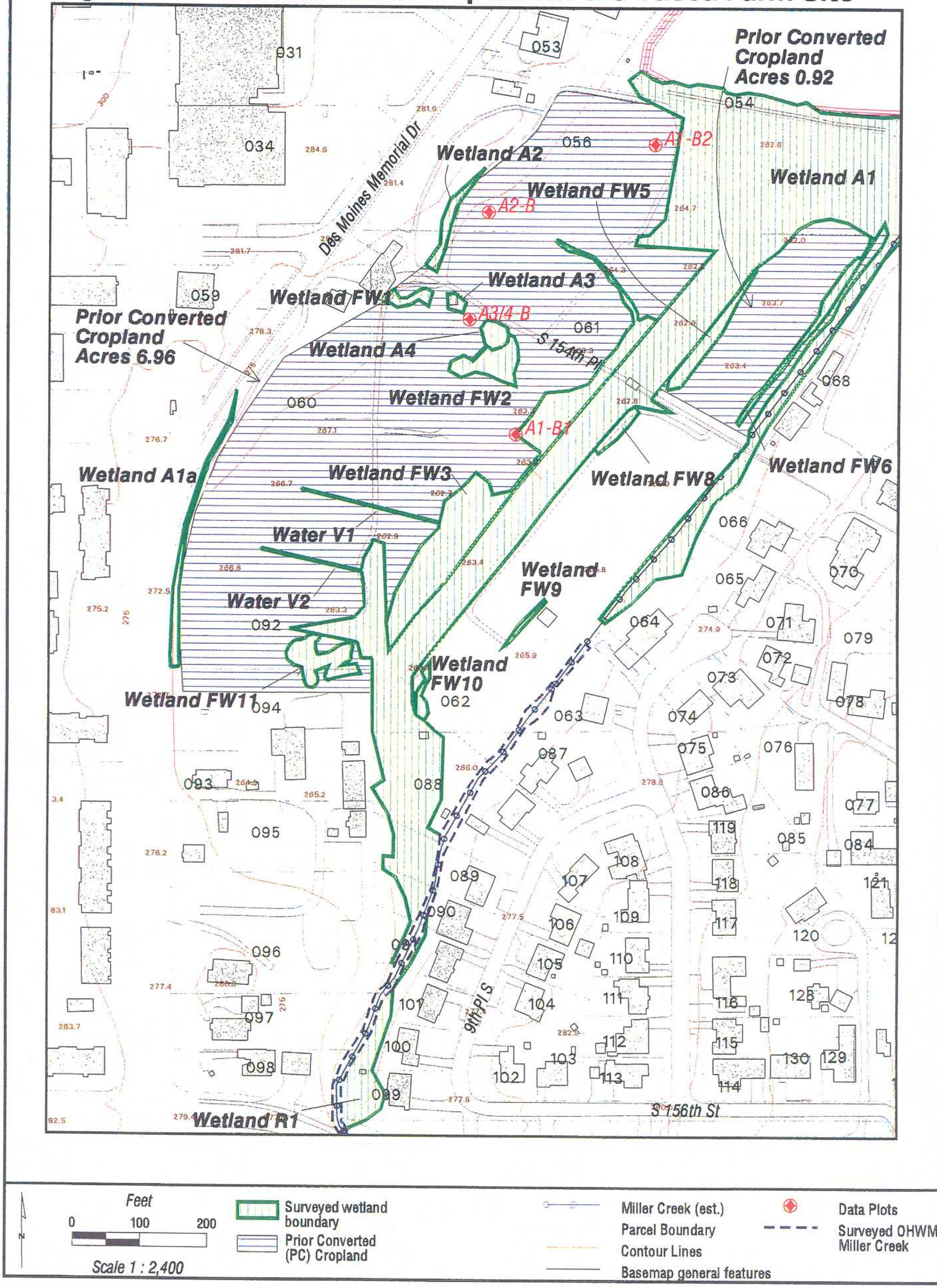
A total of 7.88 acres of actively farmed area within the Vacca Farm parcels were found to meet the criteria for PC cropland (see Figure B.1 and attached data sheets). These areas have hydric soils and soil saturation within 12 inches of the soil surface for more than 15 consecutive days during the growing season. It is likely that these areas were wetlands before being converted to active farmland. However, these areas lacked inundation for at least 15 consecutive days during the early growing season. They do not meet the criteria for farmed wetlands according to the Food Security Act (Section 514.22).

A system of tile drains has altered the soil saturation within the Vacca Farm site. However, saturation was observed within the prior converted area for greater than 14 consecutive days during the growing season during several site visits in 1998 and 1999. Portions of the PC area near Wetland A1, in the lowest portions of the site, remain saturated for much of the growing season. Other areas along the western edge of the site are better drained and soils are saturated during the winter and early spring months. Most of the PC areas are within the 100-year floodplain of Miller Creek and are subjected to periodic, short-term (typically 1 to several days) inundation during storm events.

The soils found in the prior converted cropland generally have a 6-inch till (Ap) layer of black (10YR 2/1) silt loam or highly organic loam over a highly organic loam or peat. The sub-soils range from black to dark yellowish brown (10YR 3/4) to gray (10YR 6/1) with mottles. Lenses of sands were also found in the sub-soil, indicating historic flooding.

Other farmed areas in the Vacca Farm site that lacked wetland hydrology or soil indicators were not considered or PC cropland (see Figure B.1). These areas include portions of Parcel 62 and the eastern farmed area of Parcel 68. Parcel 62 had been filled with approximately 3 feet of sandy loam obtained from the Highline High School expansion in the 1970s. The eastern farmed area of Parcel 68 is a well-drained upland.

Figure C1: Prior Converted Cropland at the Vacca Farm Site

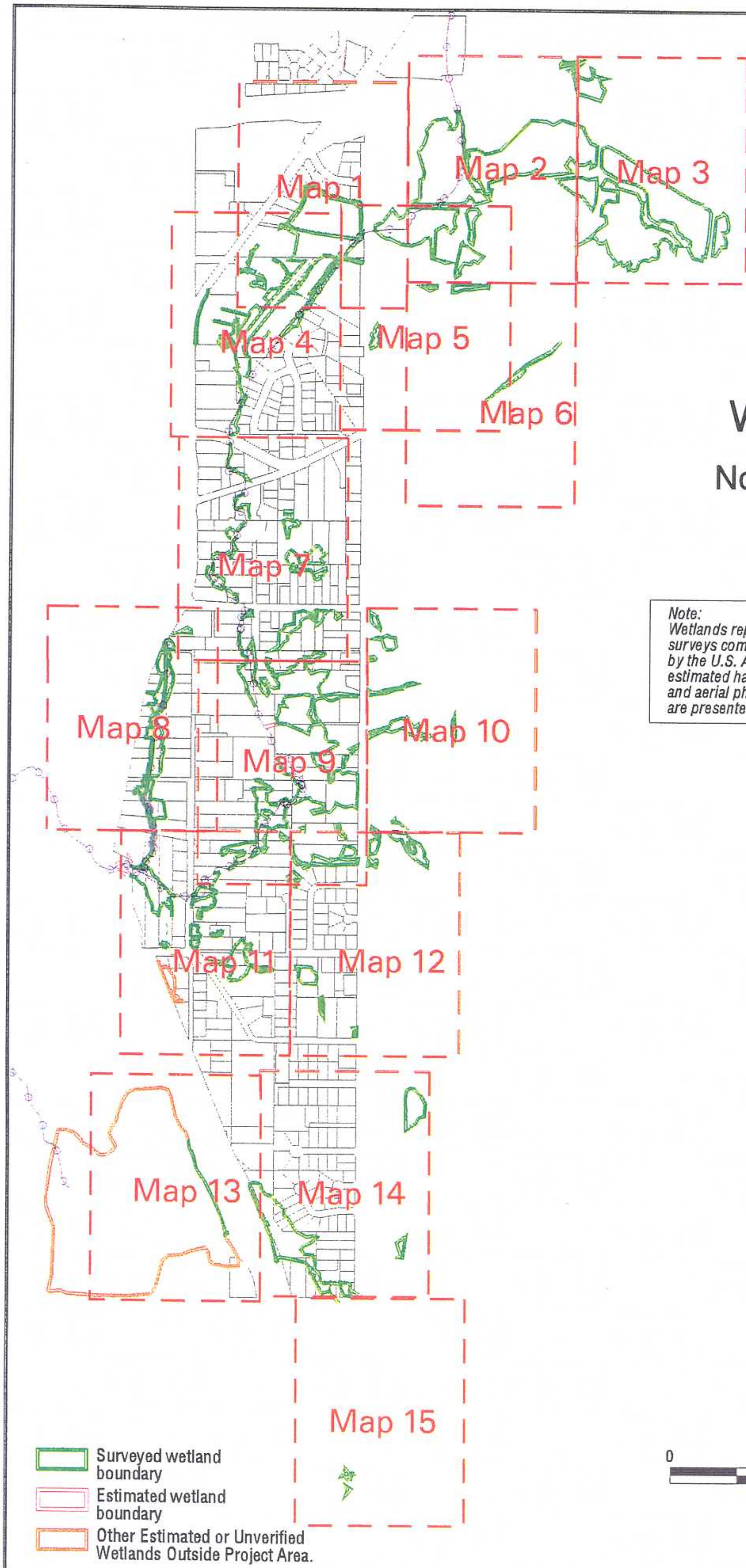


Prepared by Parametrix, Inc. File: seatac2/plotamls/p_water_state.aml creating water_map3.gra Date: December 12, 2000

D. MAP ATLAS

APPENDIX D

MAP ATLAS



Wetlands Atlas

North and West Sides

Note:
Wetlands represented as surveyed are based on professional surveys completed by Parametrix, Inc., and have been verified by the U.S. Army Corps of Engineers. Wetlands represented as estimated have approximate boundaries based on field reconnaissance and aerial photography. Wetlands represented as unverified are presented for reference only.

N

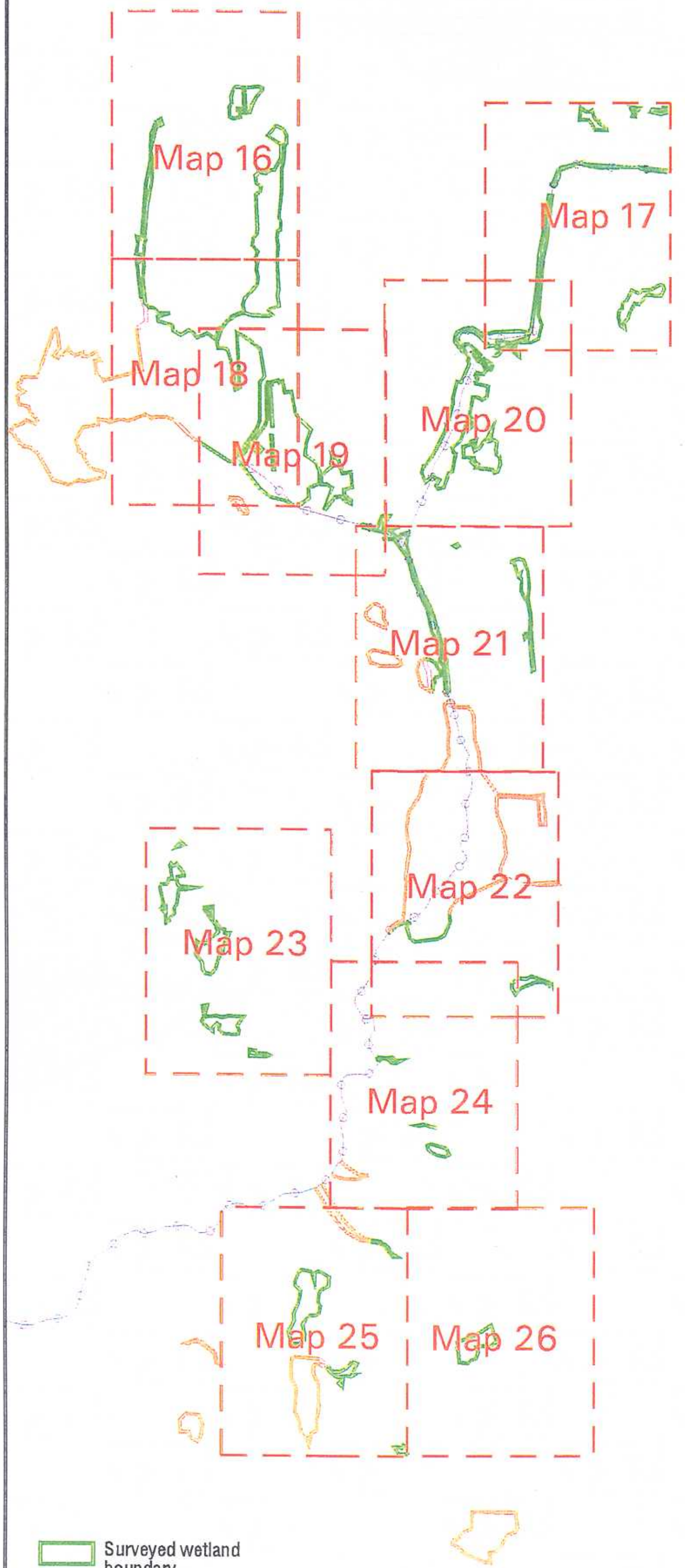
Feet

0 1000 2000 3000

Scale 1 : 14,400

AR 009146

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_index2000.aml creating atlas_index_n1.gra Date: December 06, 2000



Wetlands Atlas

SASA, Tyee Golf Course and Borrow Pit Areas

Note:
Wetlands represented as surveyed are based on professional surveys completed by Parametrix, Inc., and have been verified by the U.S. Army Corps of Engineers. Wetlands represented as estimated have approximate boundaries based on field reconnaissance and aerial photography. Wetlands represented as unverified are presented for reference only.

N

Feet

0 1000 2000 3000

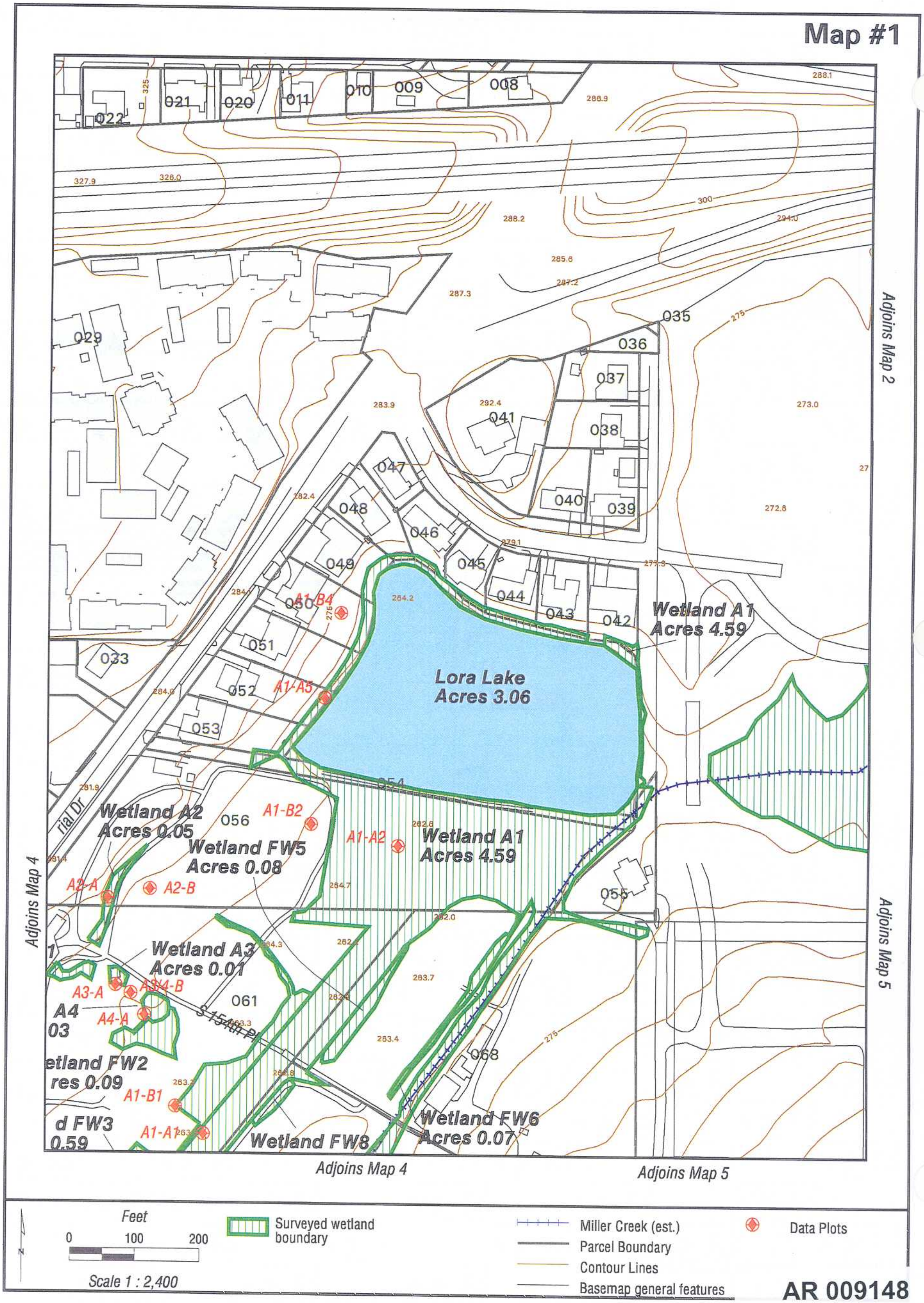
Scale 1 : 14,400

Surveyed wetland boundary

Estimated wetland boundary

Other Estimated or Unverified Wetlands Outside Project Area.

AR 009147



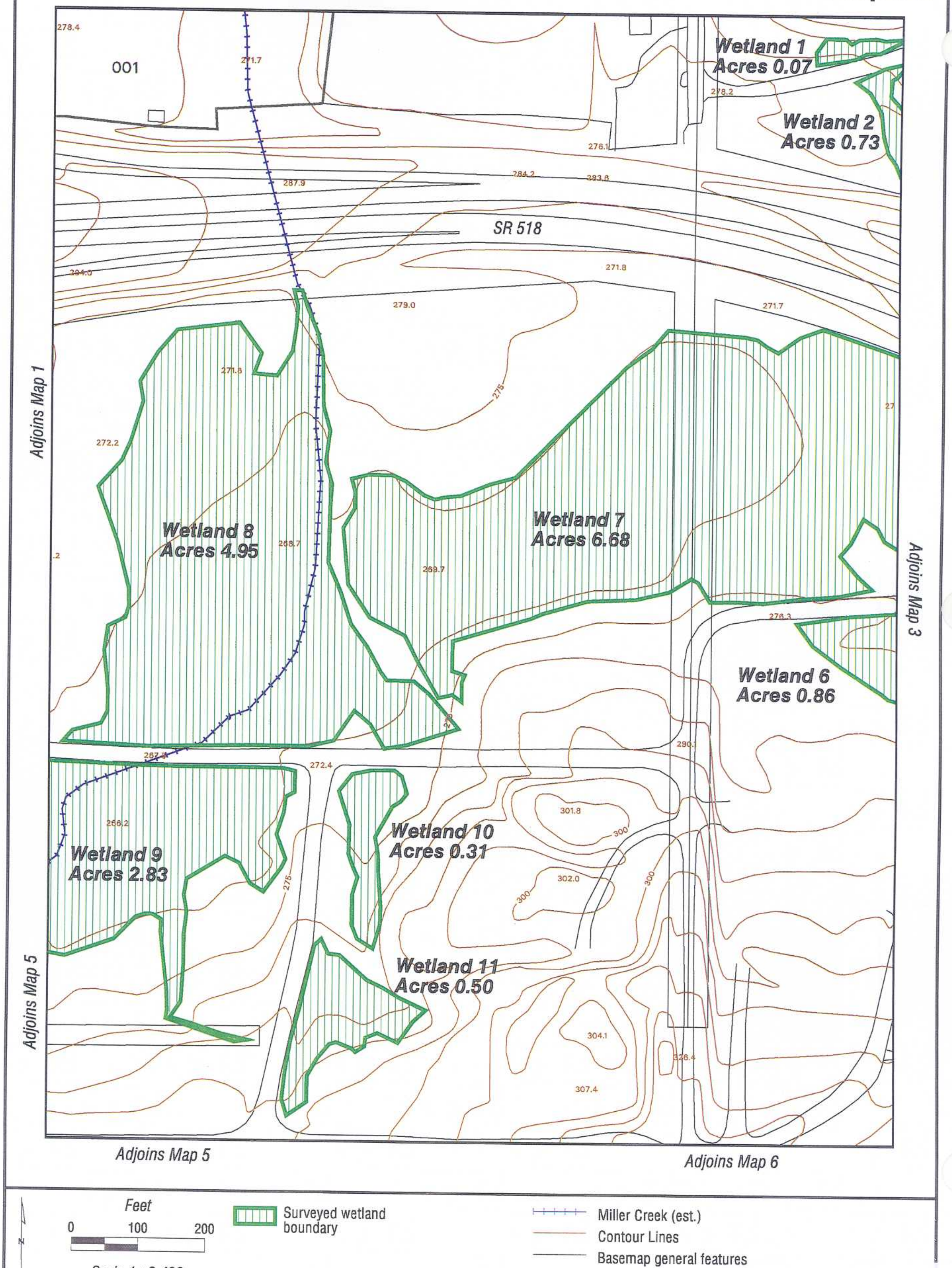
AR 009148

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #1

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

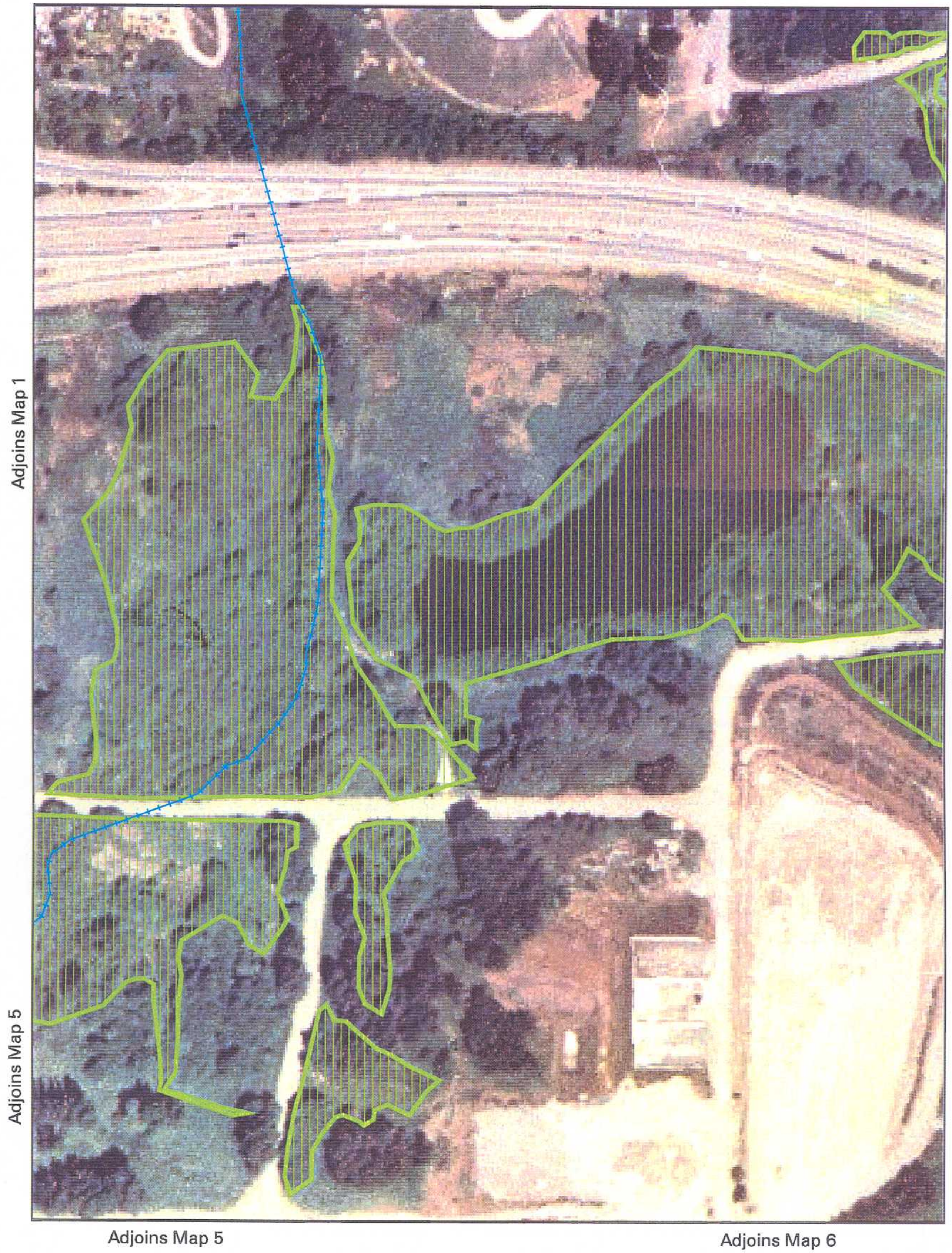
Map #2



AR 009150

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #2



Feet

0 100 200

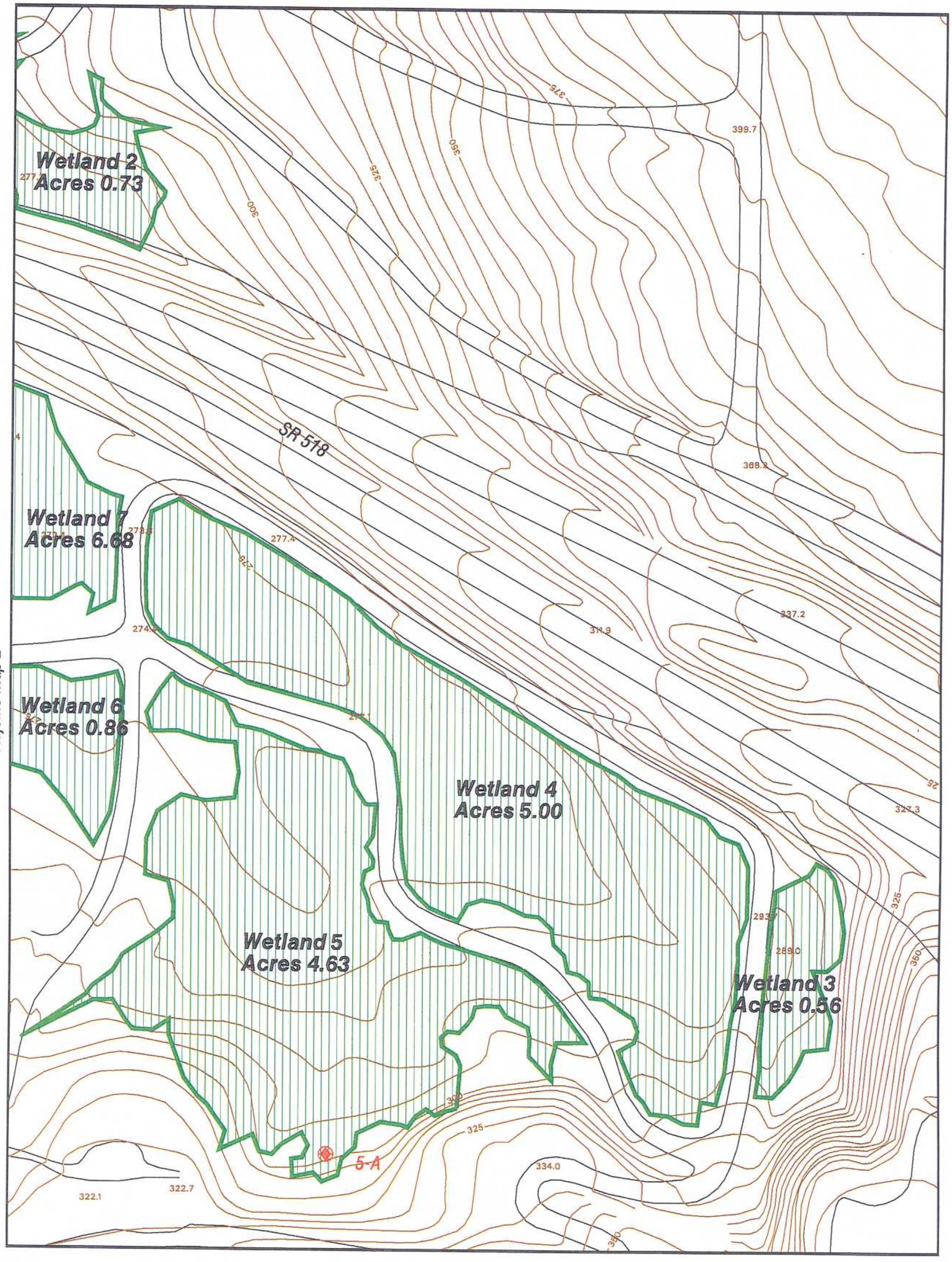
Scale 1 : 2,400

Surveyed wetland boundary

Miller Creek (est.)

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Map #3



Feet
0 100 200
Scale 1 : 2,400

Surveyed wetland boundary

Contour Lines
Basemap general features
Data Plots

AR 009152

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

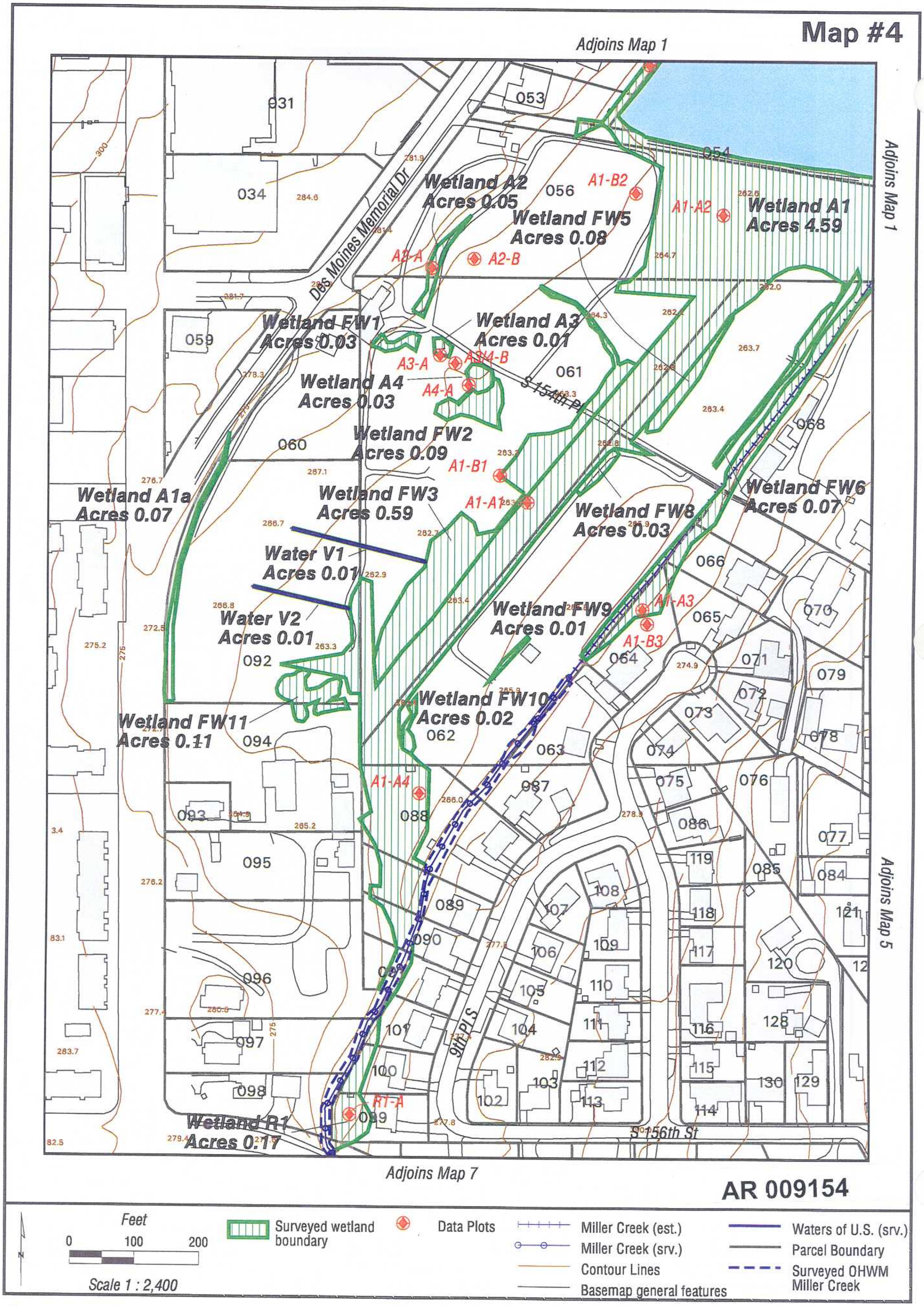
Image #3

Feet
0 100 200
Scale 1 : 2,400

Surveyed wetland boundary

AR 009153

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000



AR 009154

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #4

Adjoins Map 1

Adjoins Map 1

Adjoins Map 5

Adjoins Map 7

Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

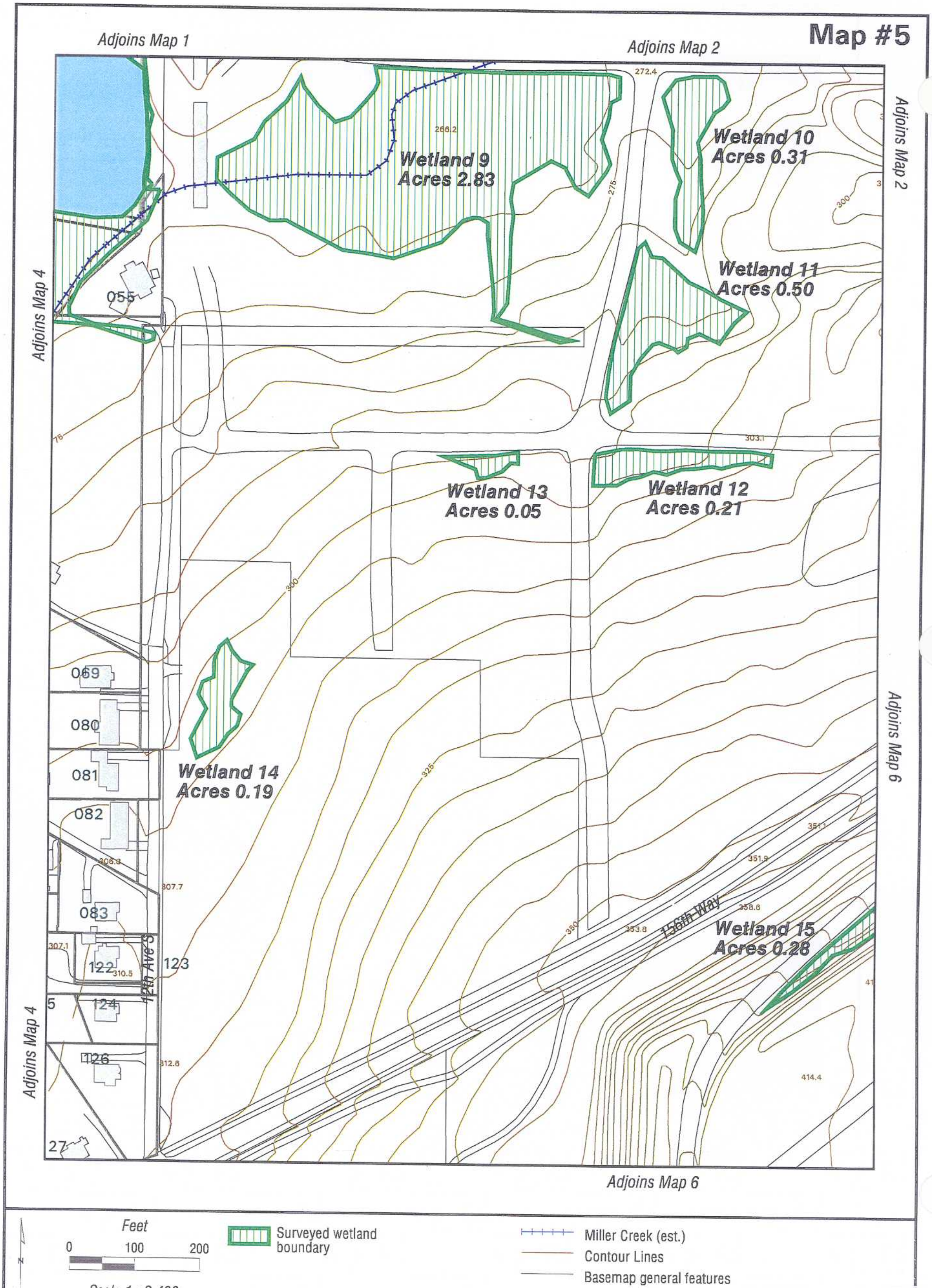
Miller Creek (est.)

Miller Creek (srv.)

Surveyed OHWM Miller Creek

Waters of U.S. (srv.)

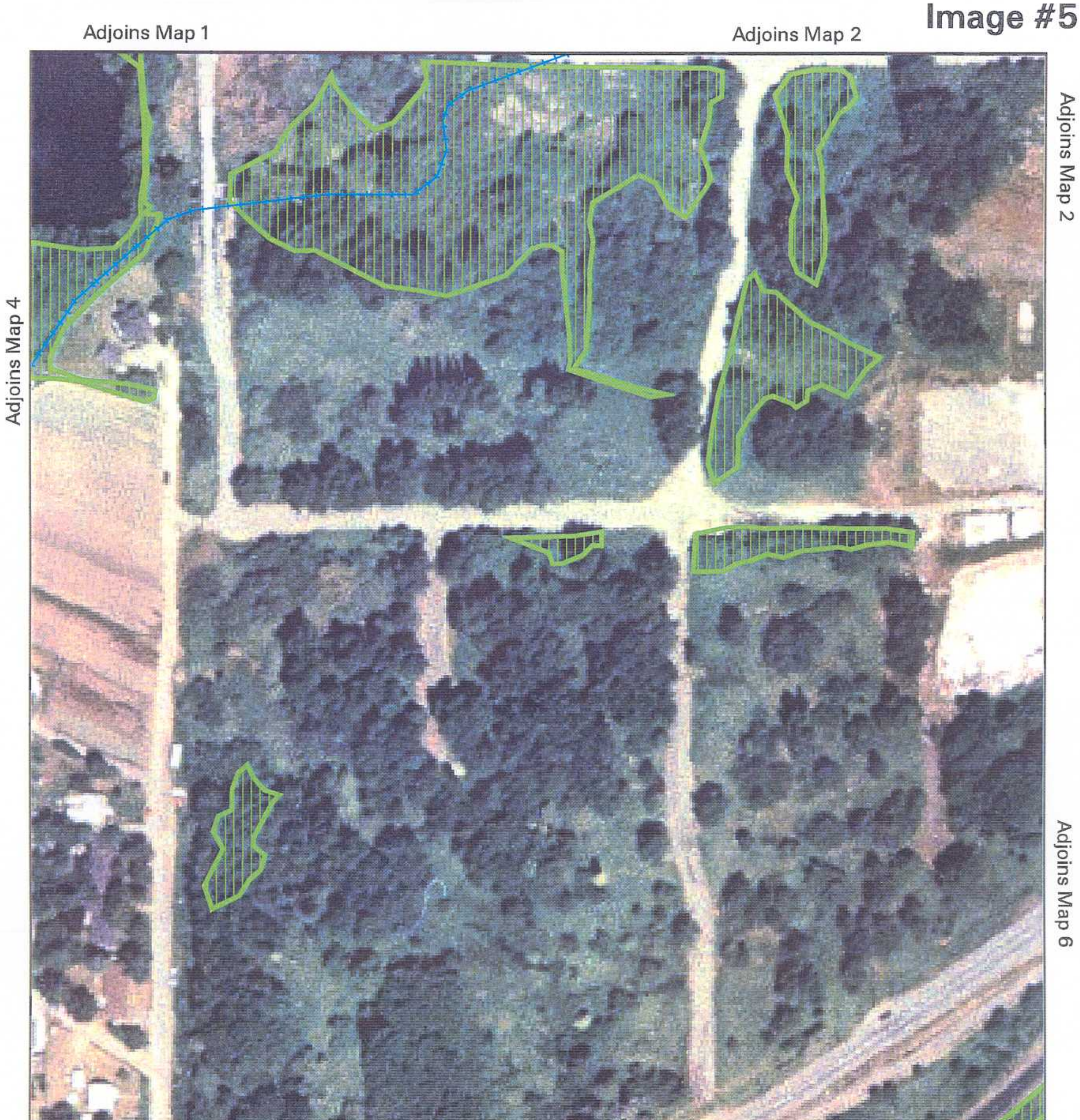
AR 009155



AR 009156

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #5



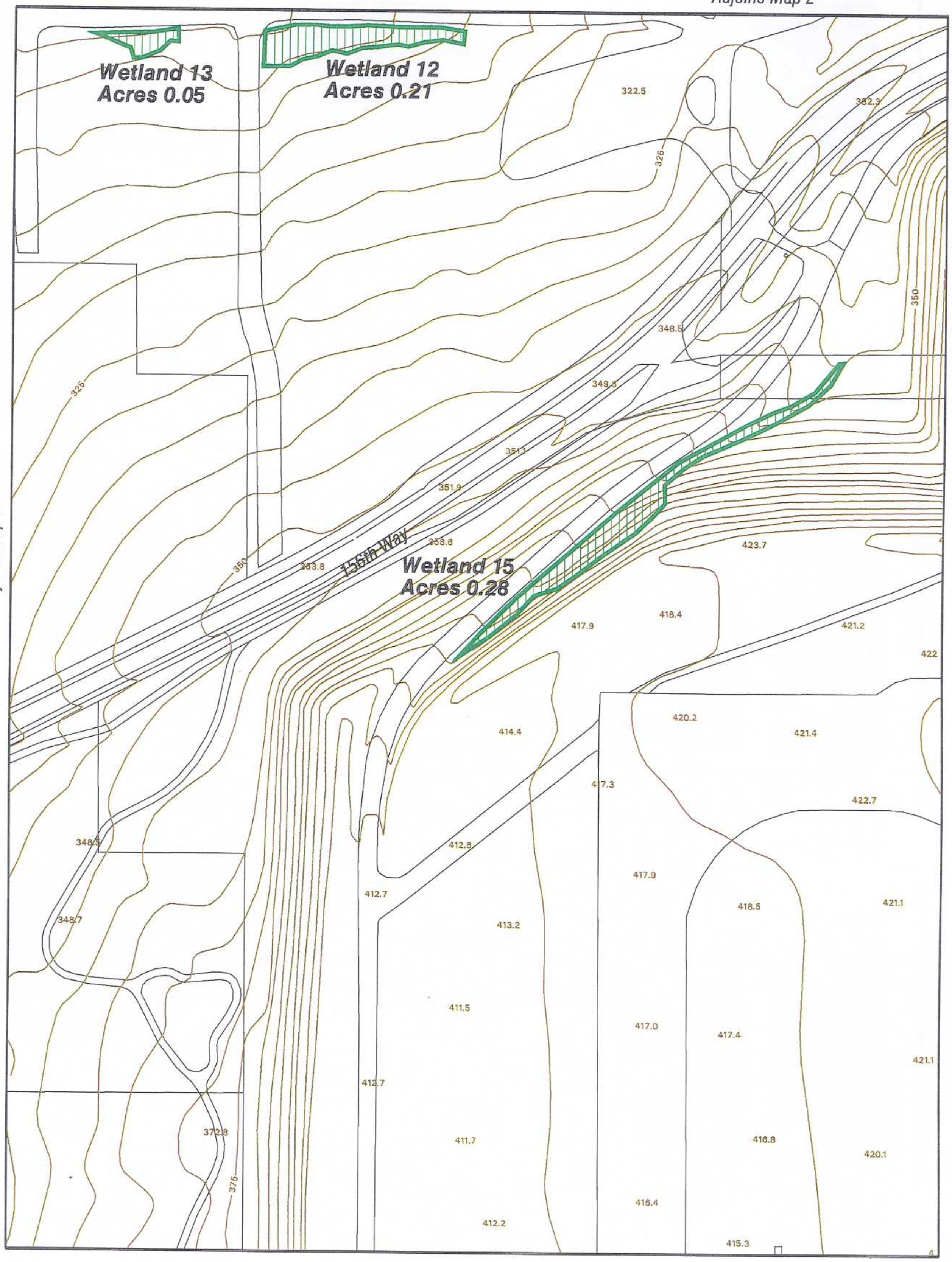
Feet
0 100 200
Scale 1 : 2,400

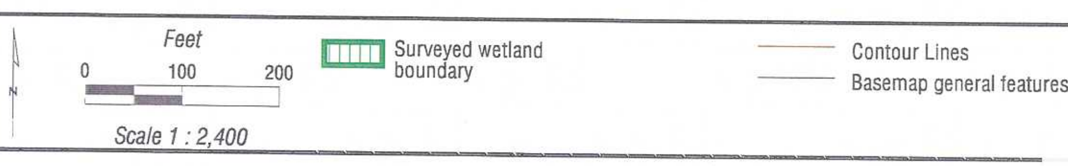
Surveyed wetland boundary

Miller Creek (est.)

AR 009157

Map #6





AR 009158

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #6

Adjoins Map 2

Adjoins Map 5

Feet

0 100 200

Scale 1 : 2,400

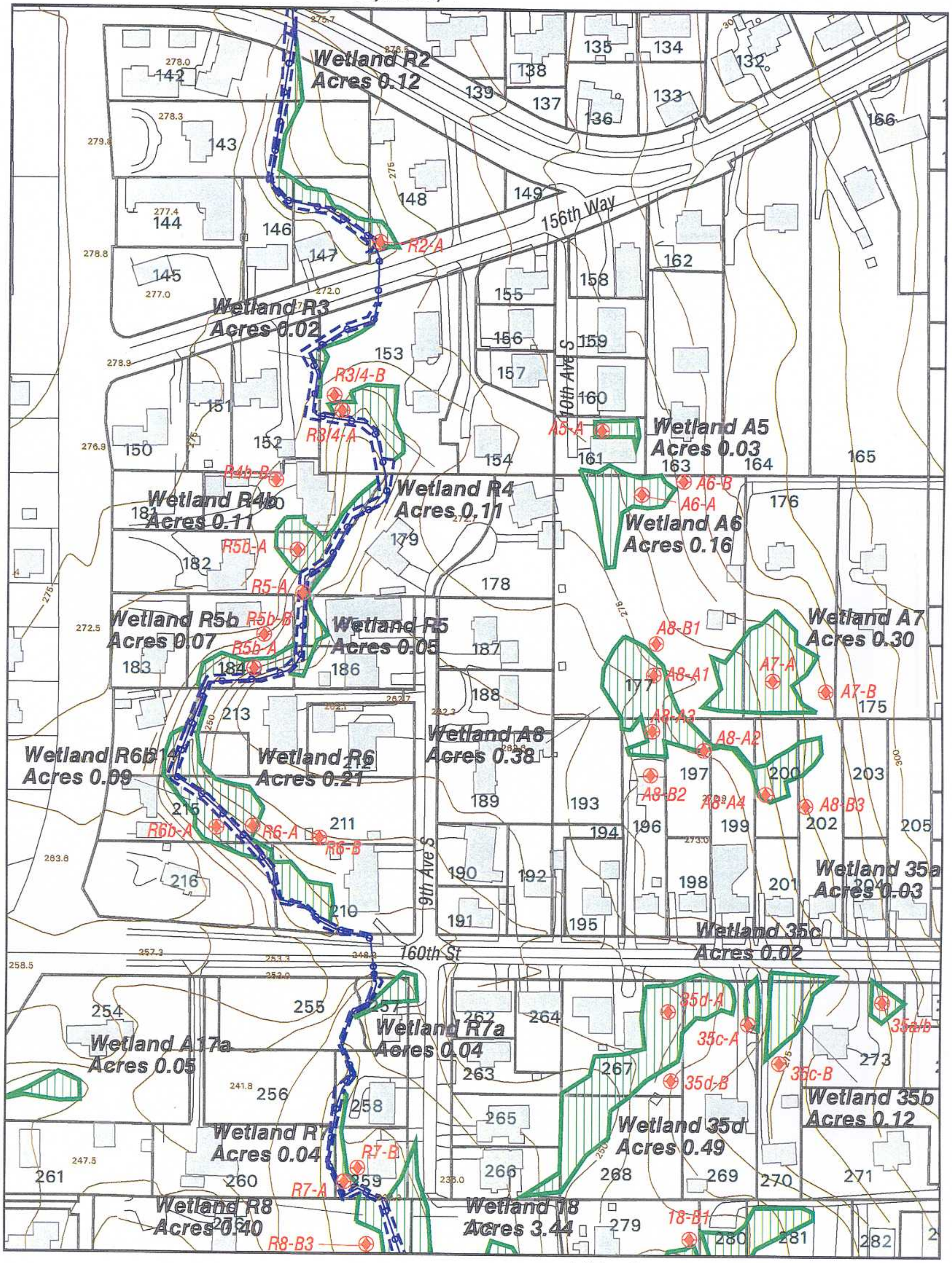
Surveyed wetland boundary

AR 009159

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Map #7

Adjoins Map 4



Adjoins Map 9

AR 009160

Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Miller Creek (srv.)

Parcel Boundary

Contour Lines

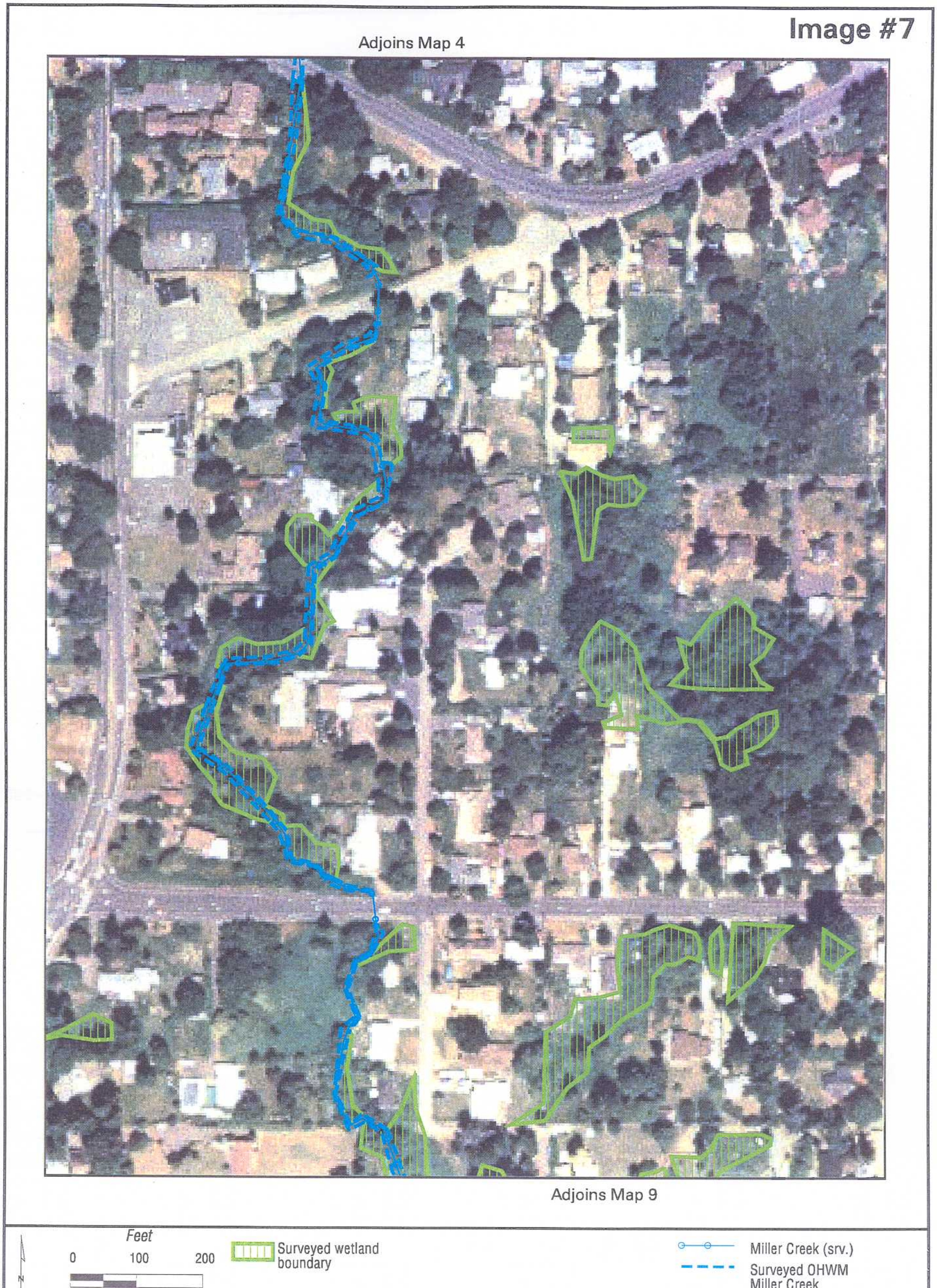
Basemap general features

Surveyed OHWM Des Moines Creek

Data Plots

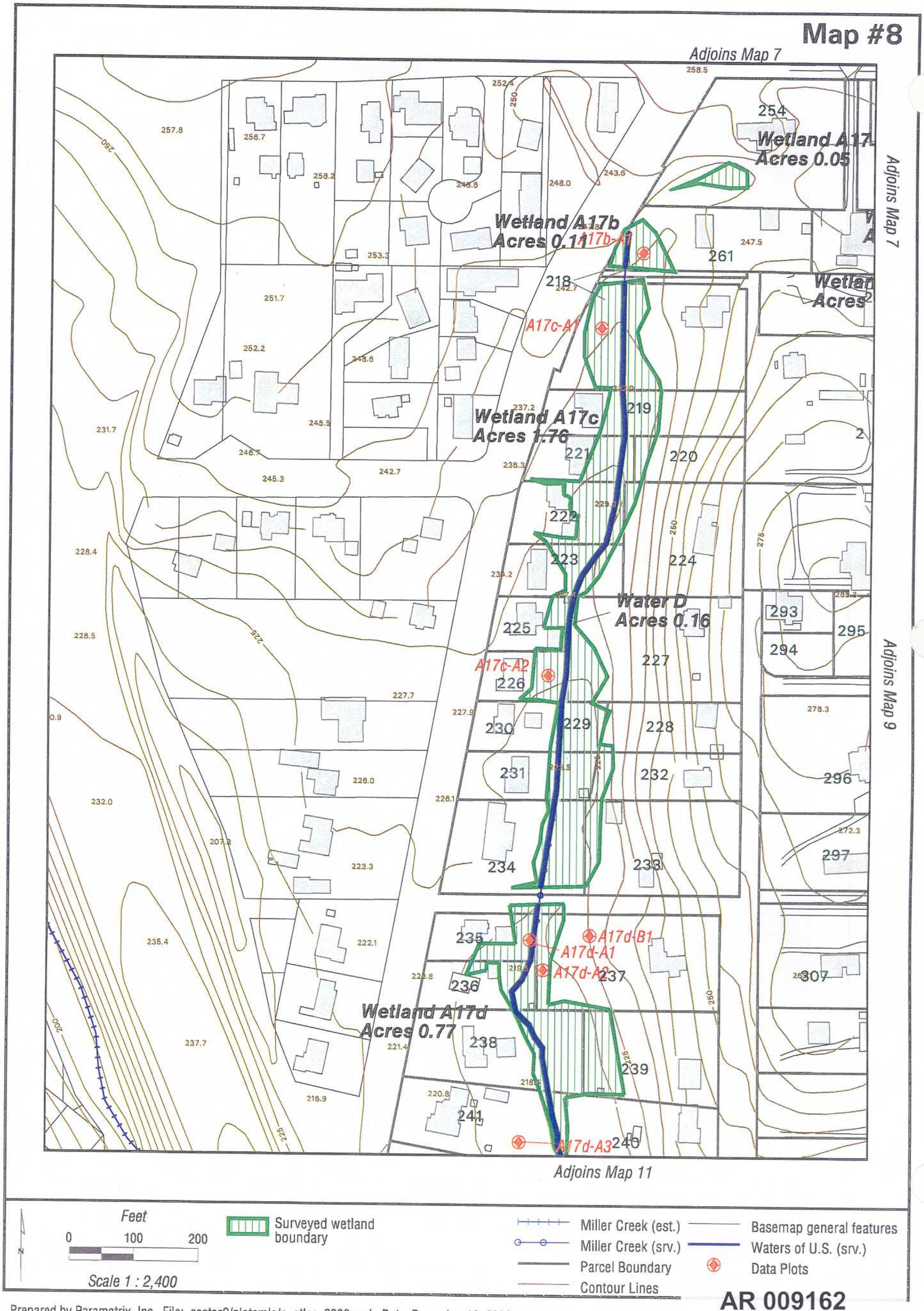
Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 10, 2000

Image #7



AR 009161

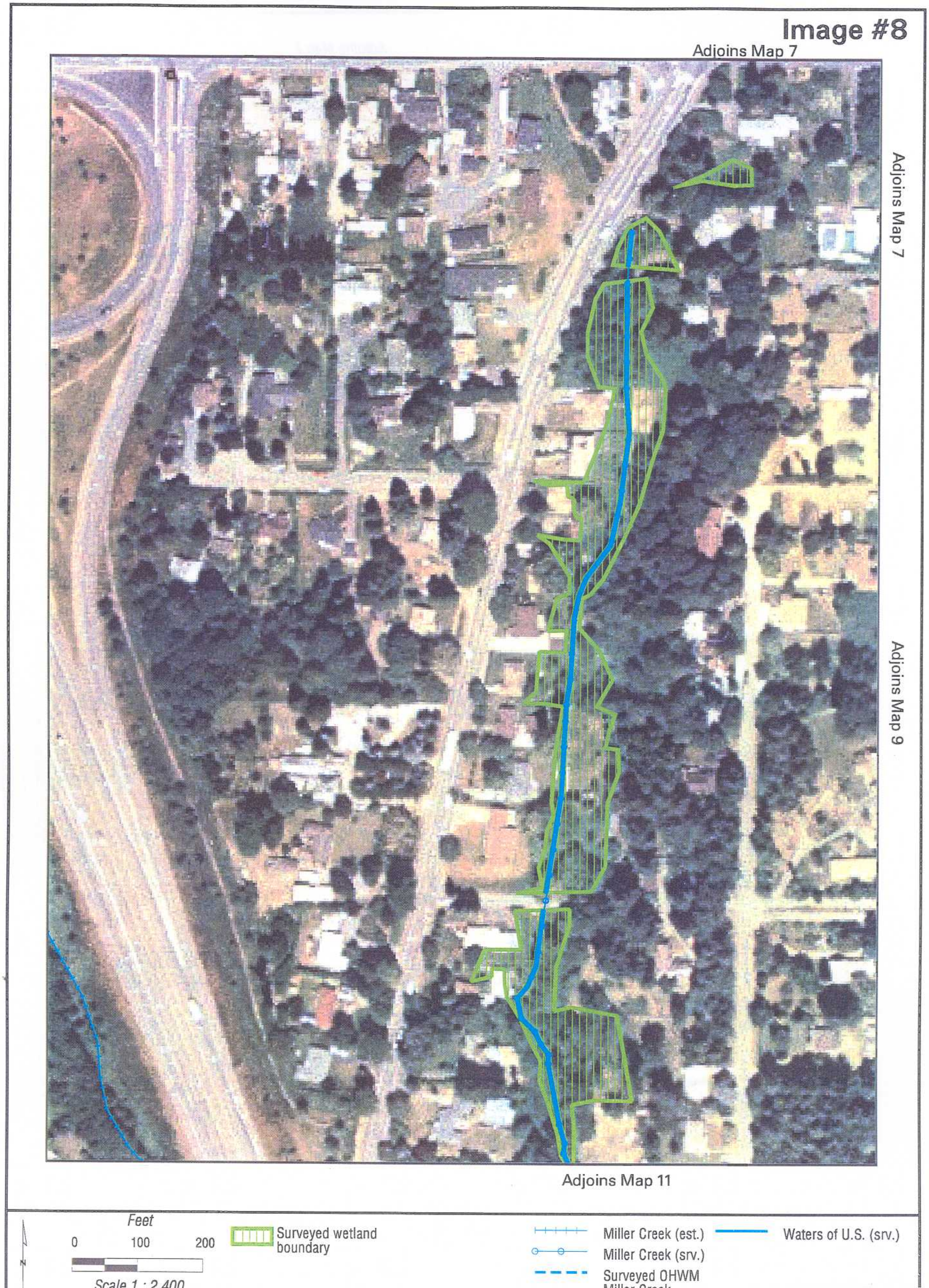
Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000



AR 009162

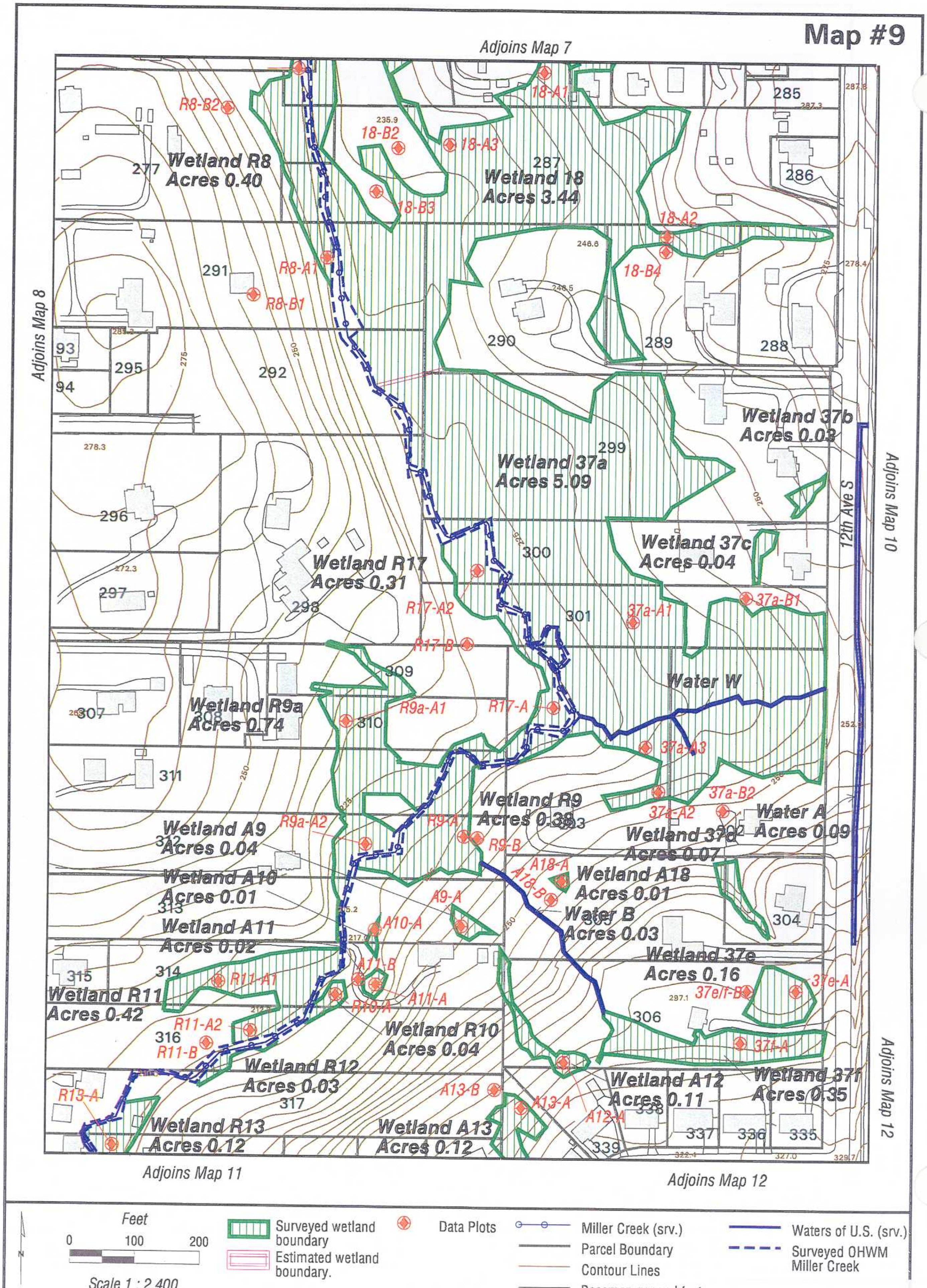
Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 10, 2000

Image #8



AR 009163

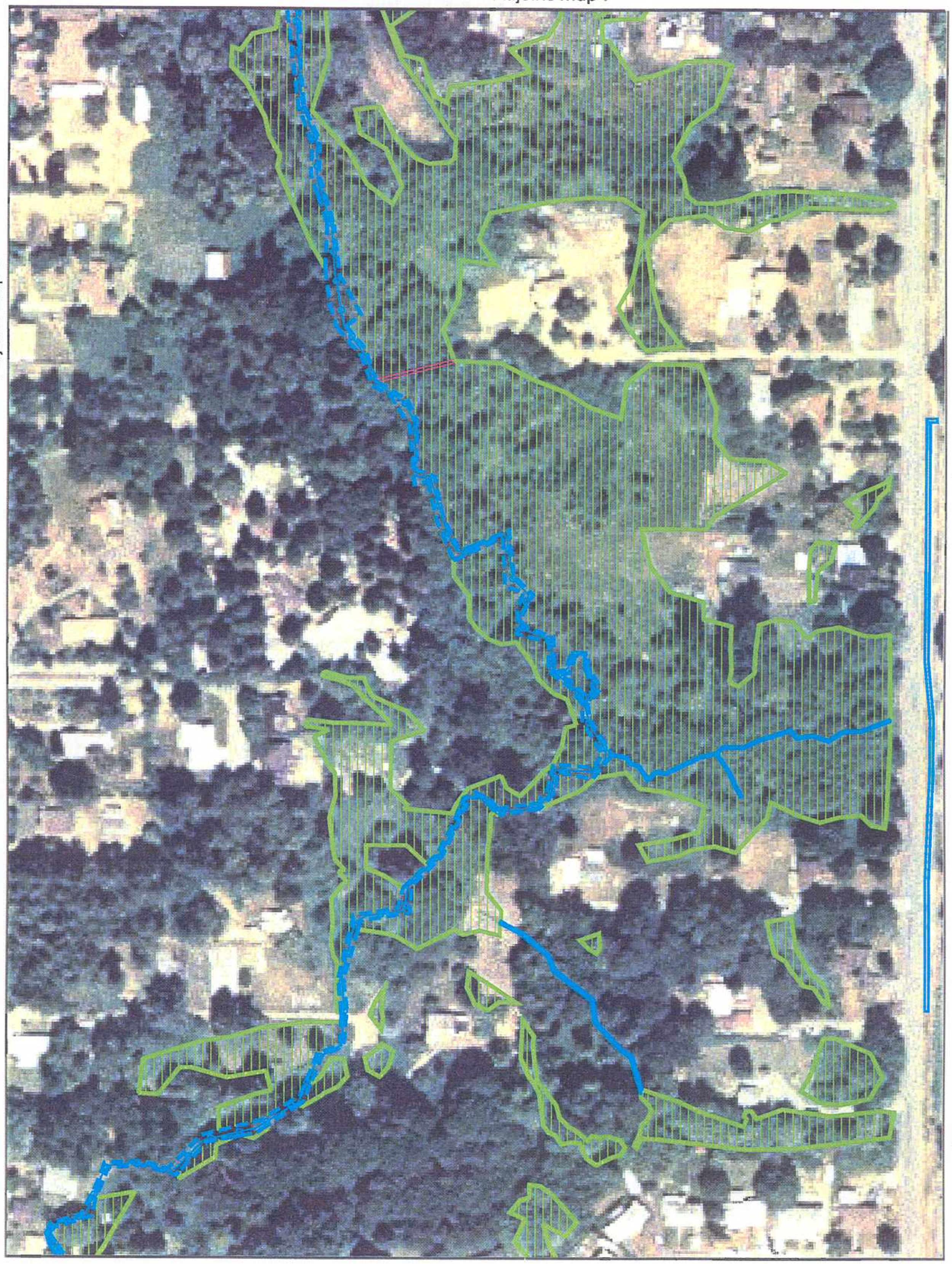
Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000



AR 009164

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 10, 2000

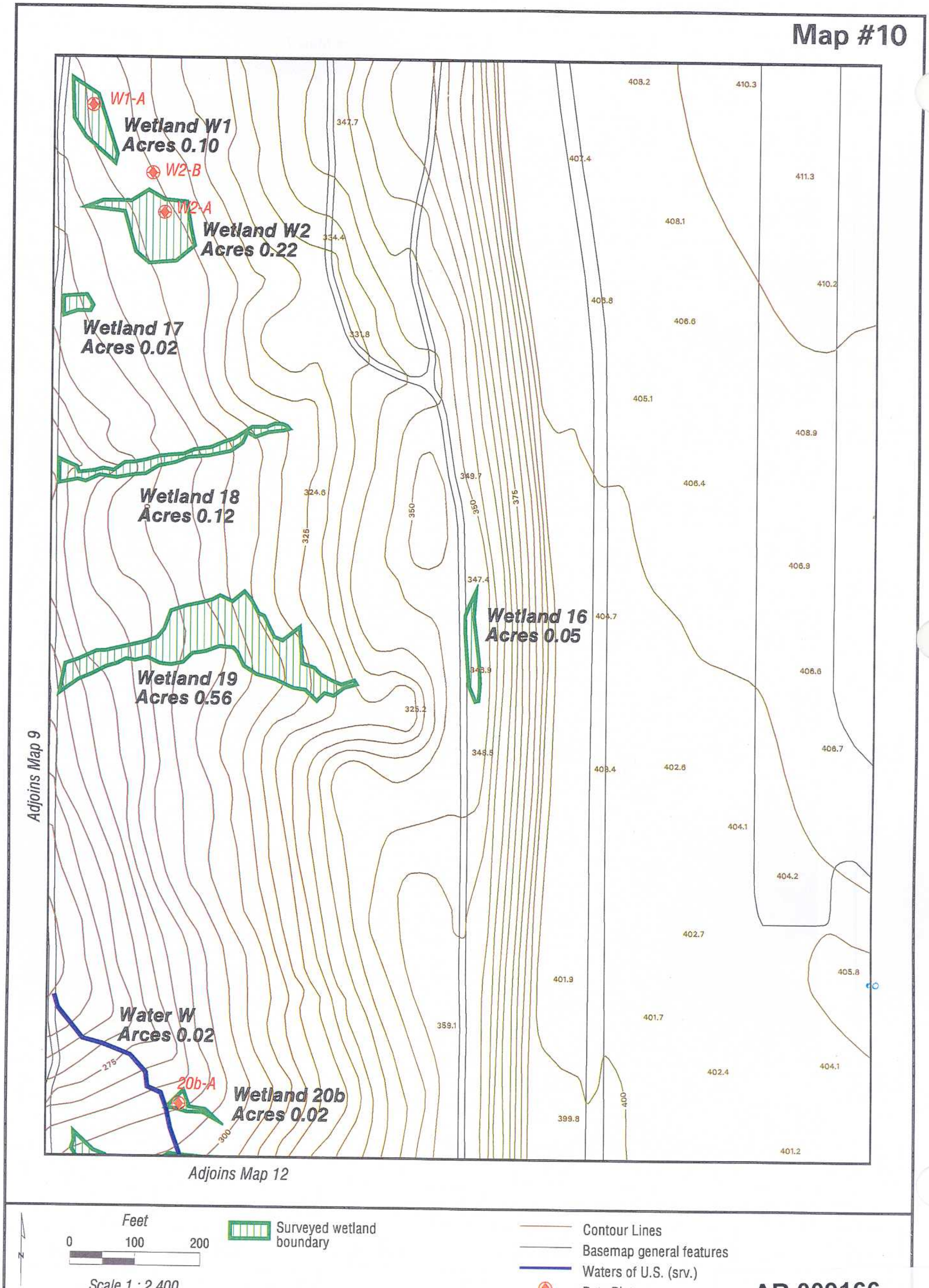
Image #9



Feet
0 100 200
Scale 1 : 2,400

Surveyed wetland boundary
Estimated wetland boundary.
Miller Creek (srv.)
Surveyed OHWM Miller Creek
Waters of U.S. (srv.)

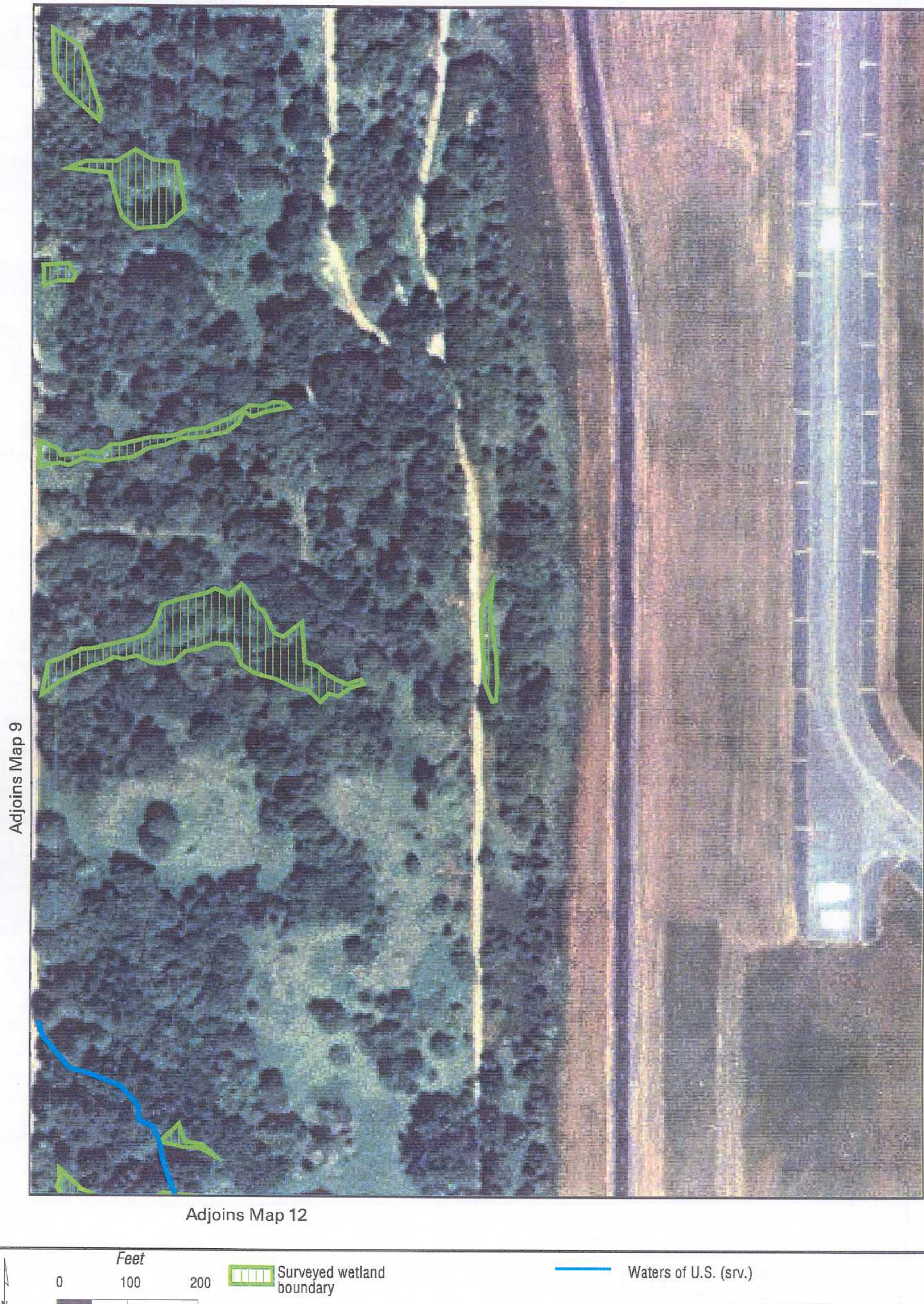
AR 009165



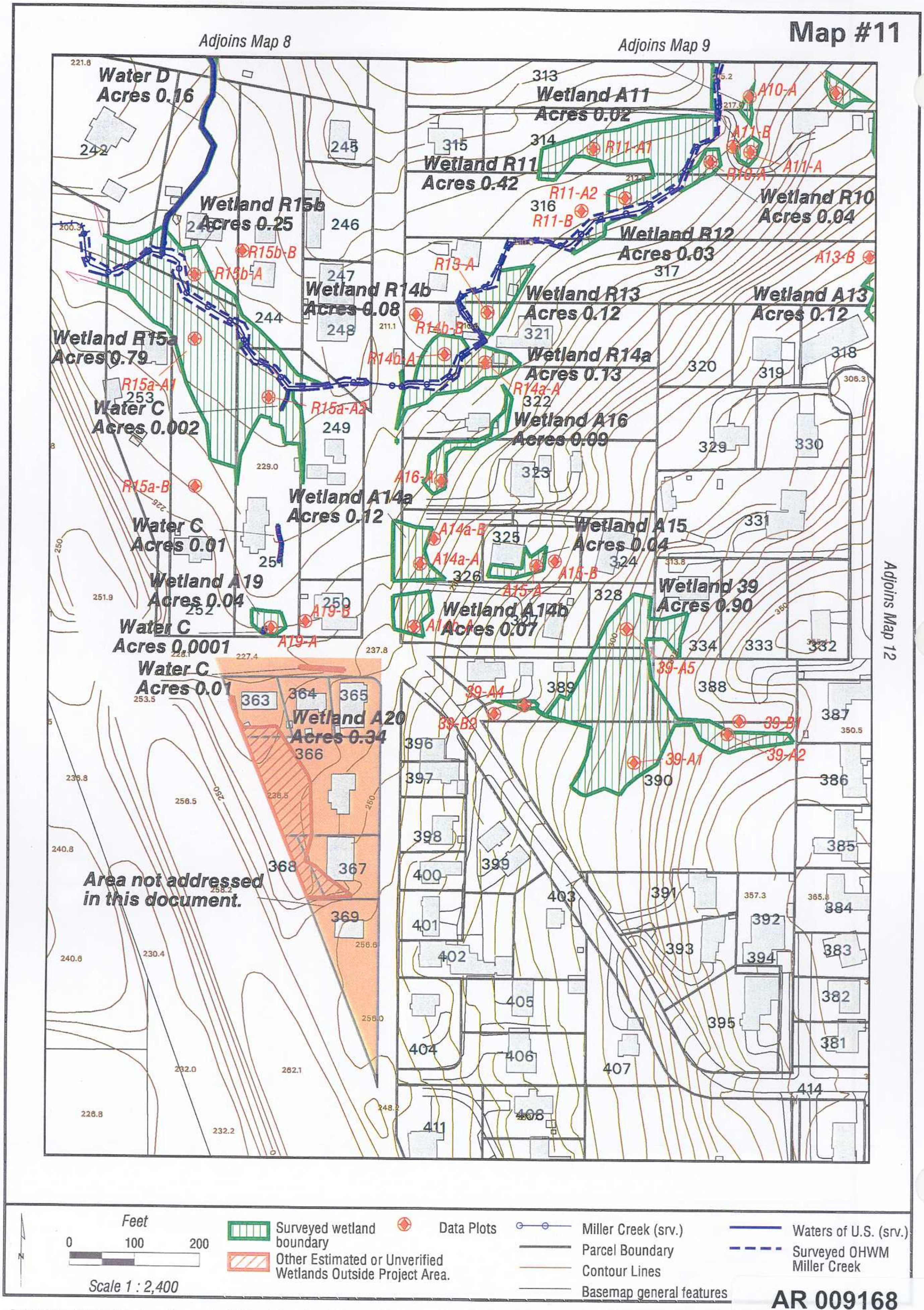
AR 009166

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #10



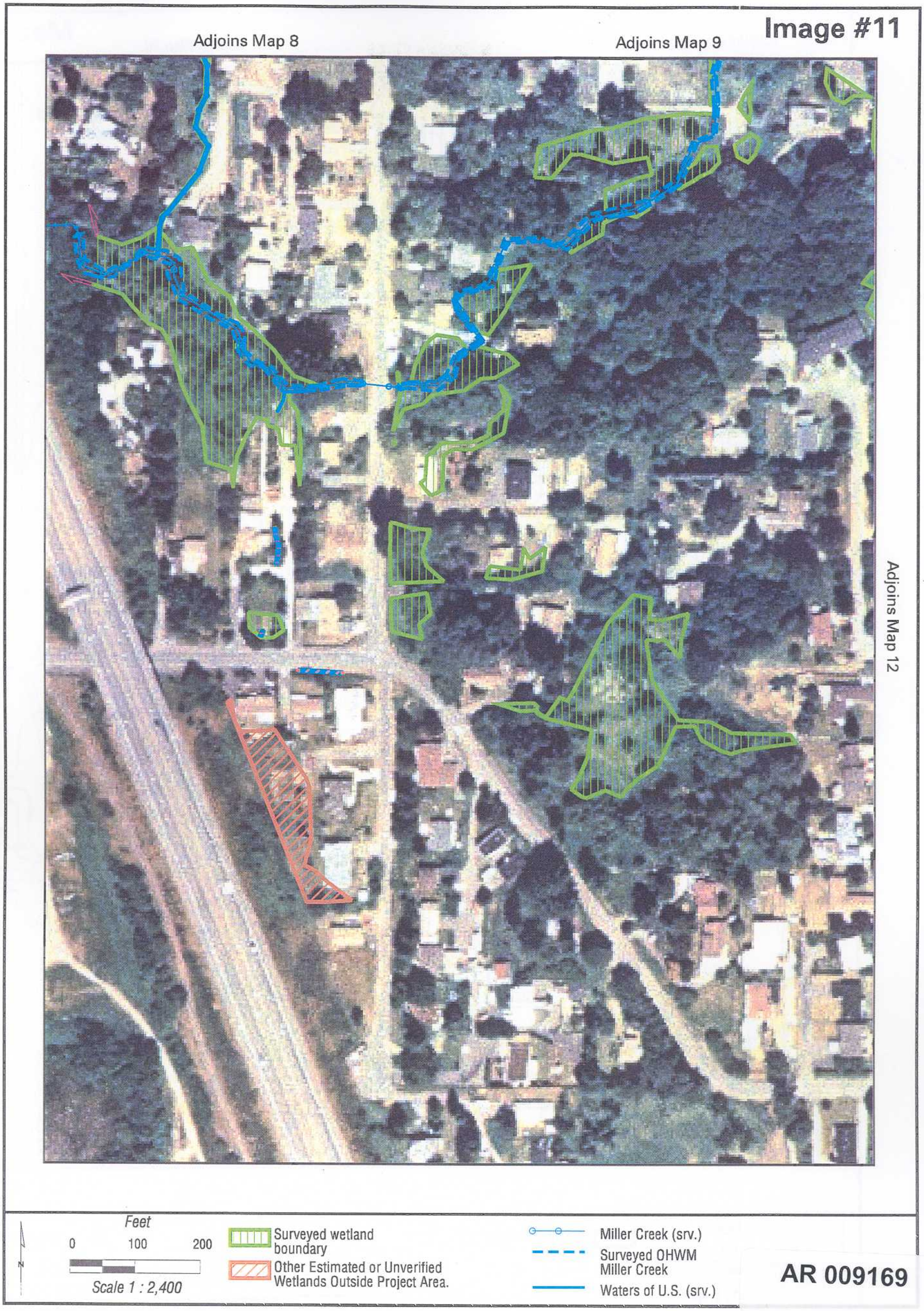
AR 009167



AR 009168

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 10, 2000

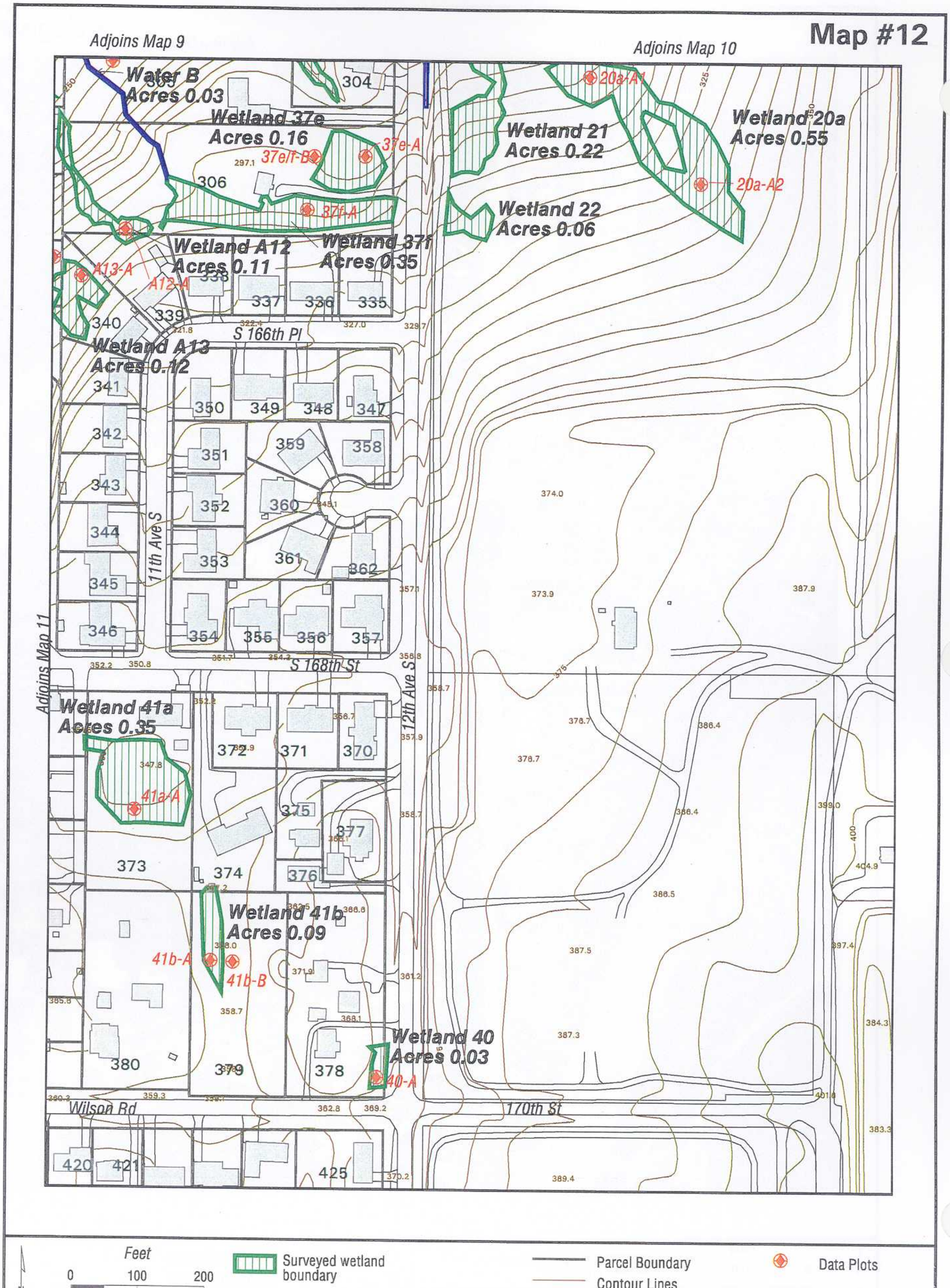
Image #11



AR 009169

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Map #12



AR 009170

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #12

Feet
0 100 200
Scale 1 : 2,400

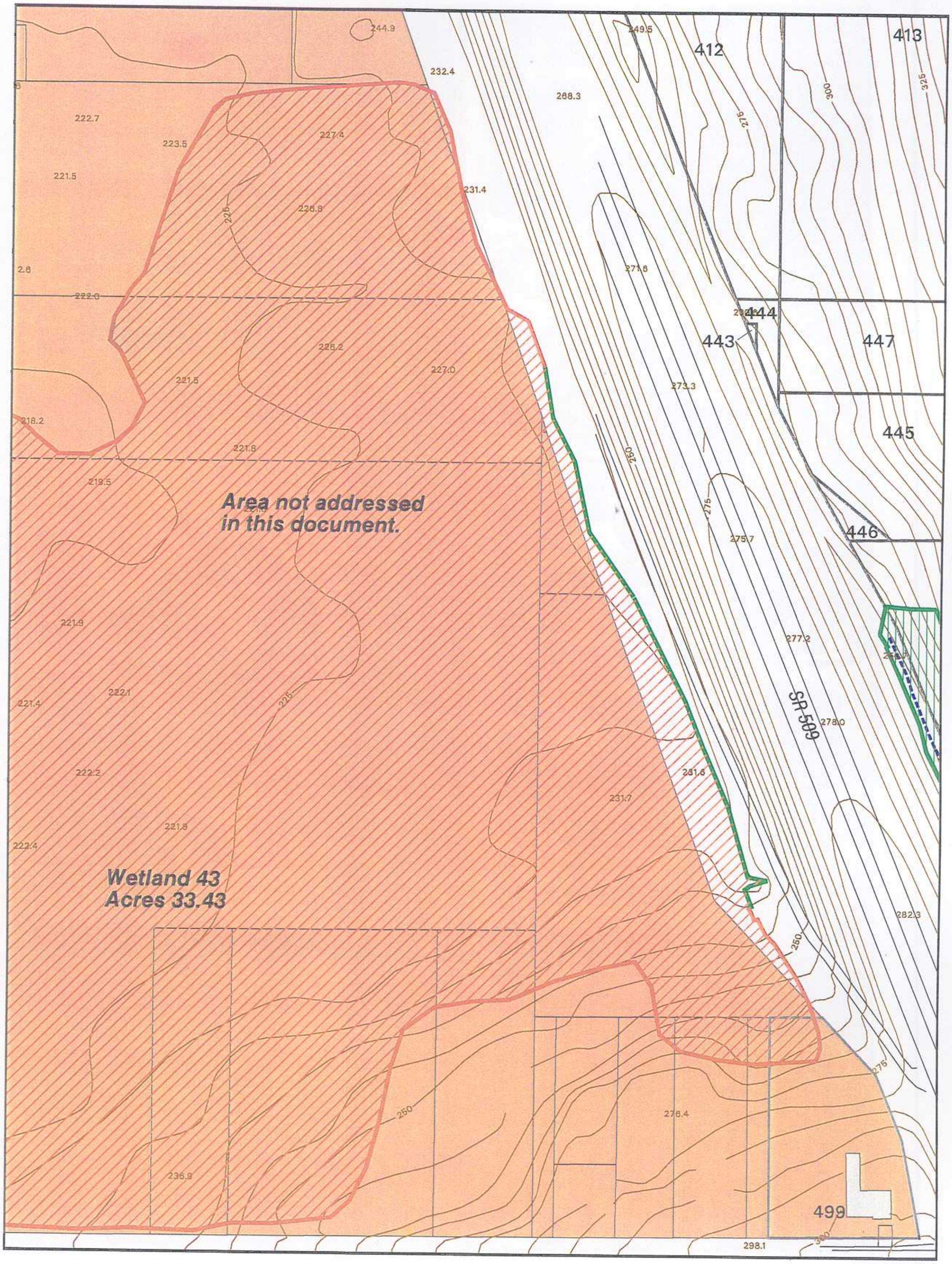
Surveyed wetland boundary

Waters of U.S. (srv.)

AR 009171

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Map #13



Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Other Estimated or Unverified Wetlands Outside Project Area.

Parcel Boundary

Contour Lines

Basemap general features

Intermittent (est.)

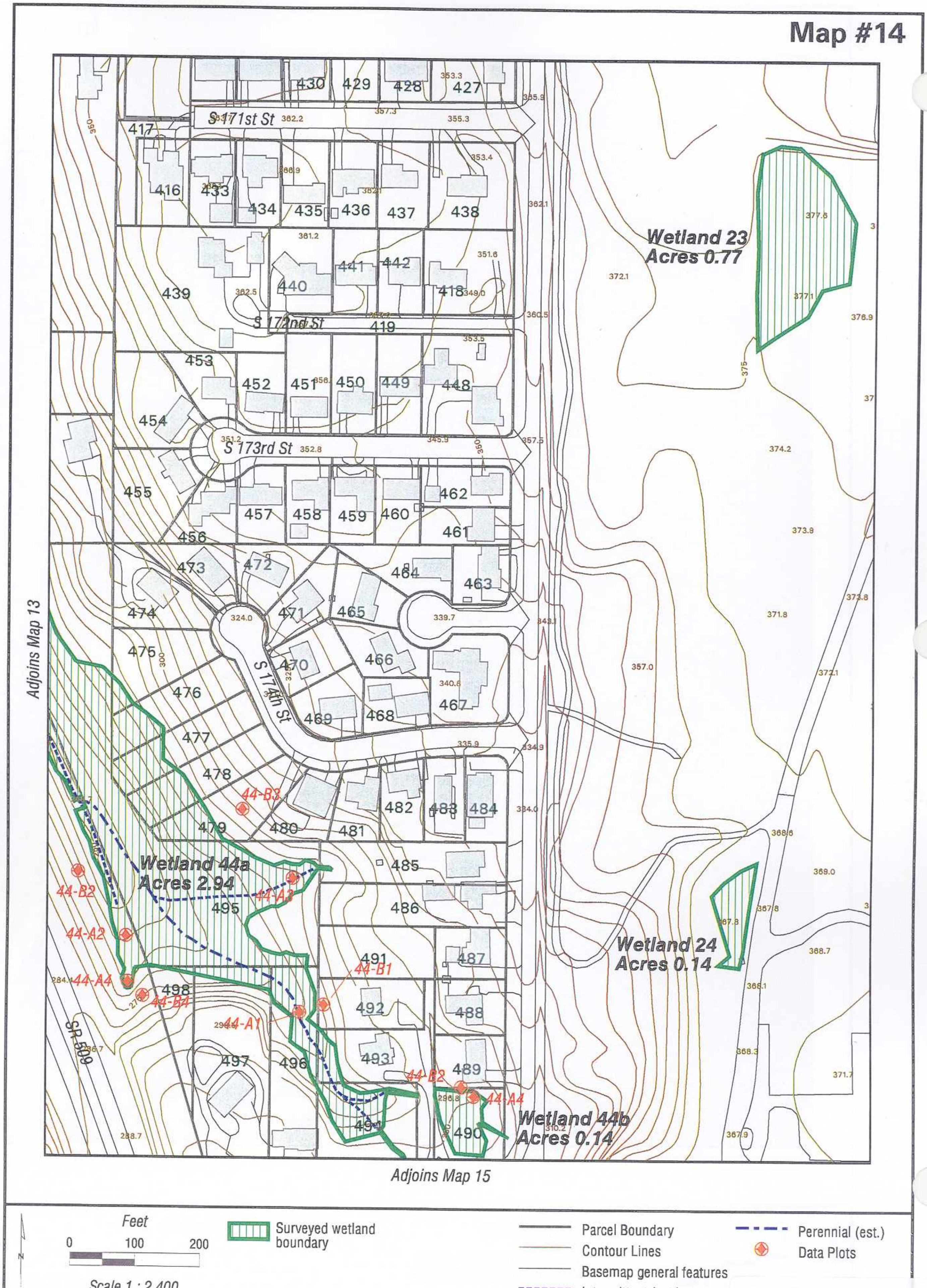
AR 009172

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #13

AR 009173

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000



AR 009174

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #14

Adjoins Map 13

Adjoins Map 15

Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

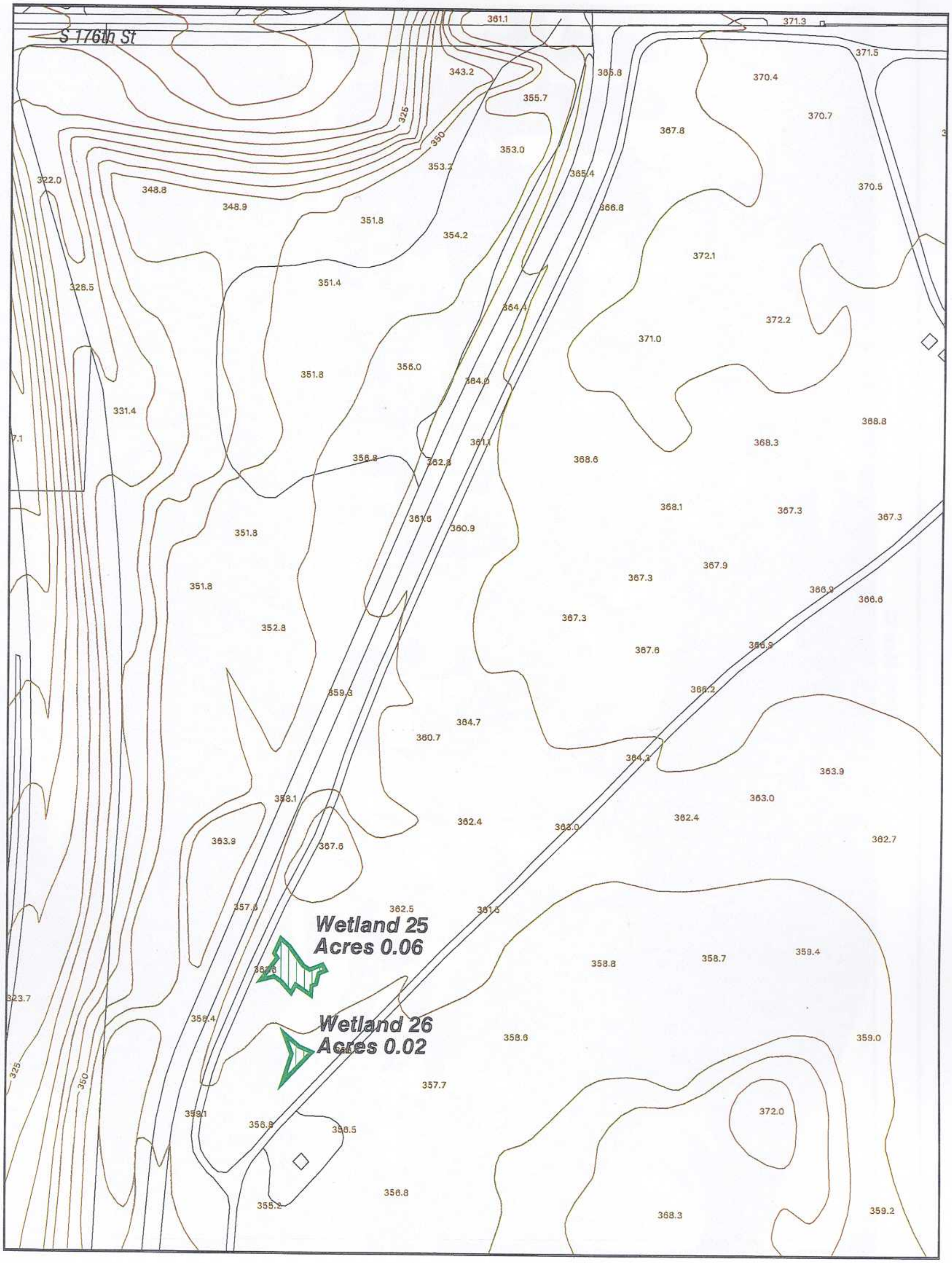
Intermittent (est.)

Perennial (est.)

AR 009175

Adjoins Map 14

Map #15



Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Contour Lines

Basemap general features

AR 009176

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #15

Feet

0 100 200

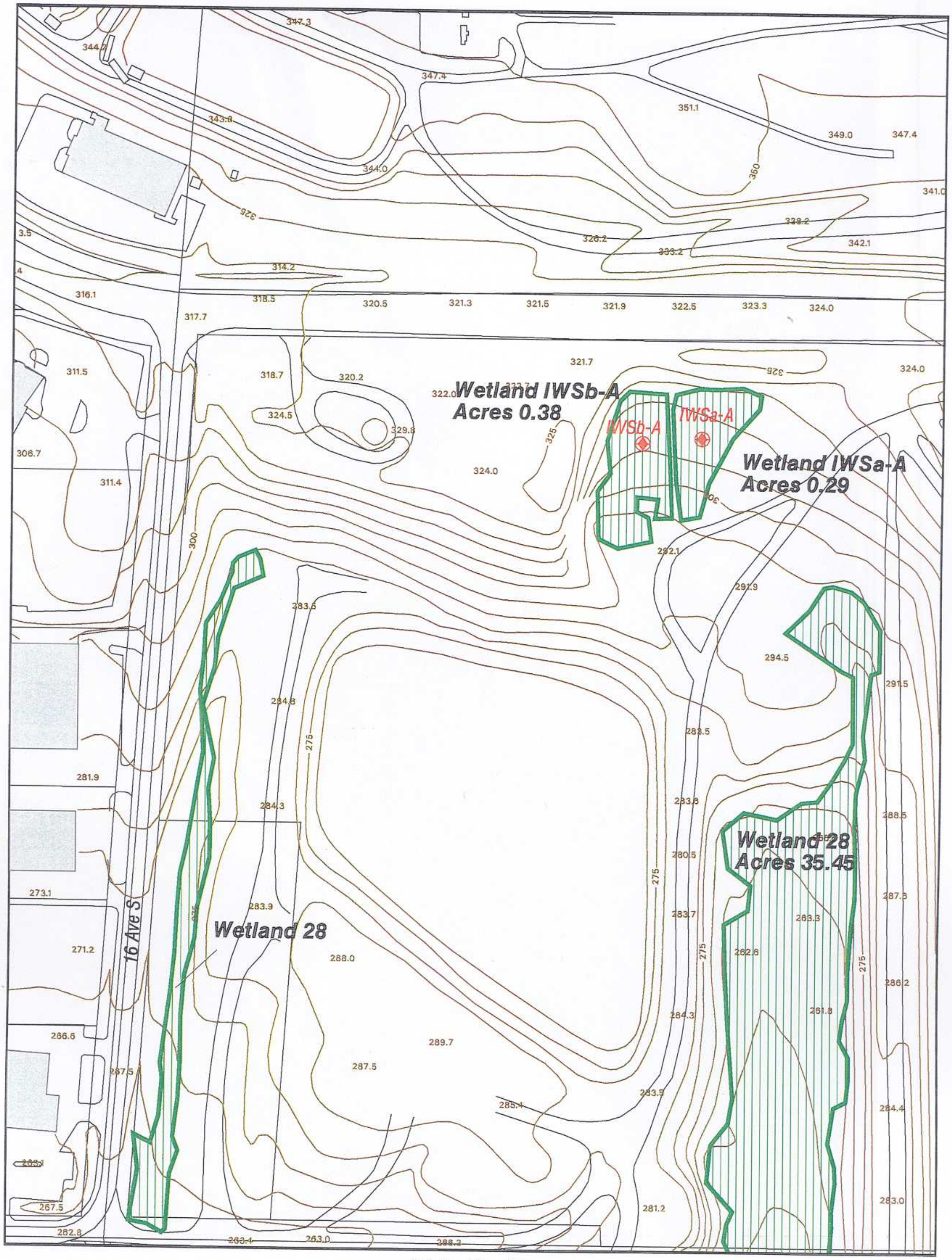
Scale 1 : 2,400

Surveyed wetland boundary

AR 009177

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Map #16



Adjoins Map 18

Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Contour Lines

Basemap general features

Data Plots

AR 009178

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #16

Adjoins Map 18

Feet

0 100 200

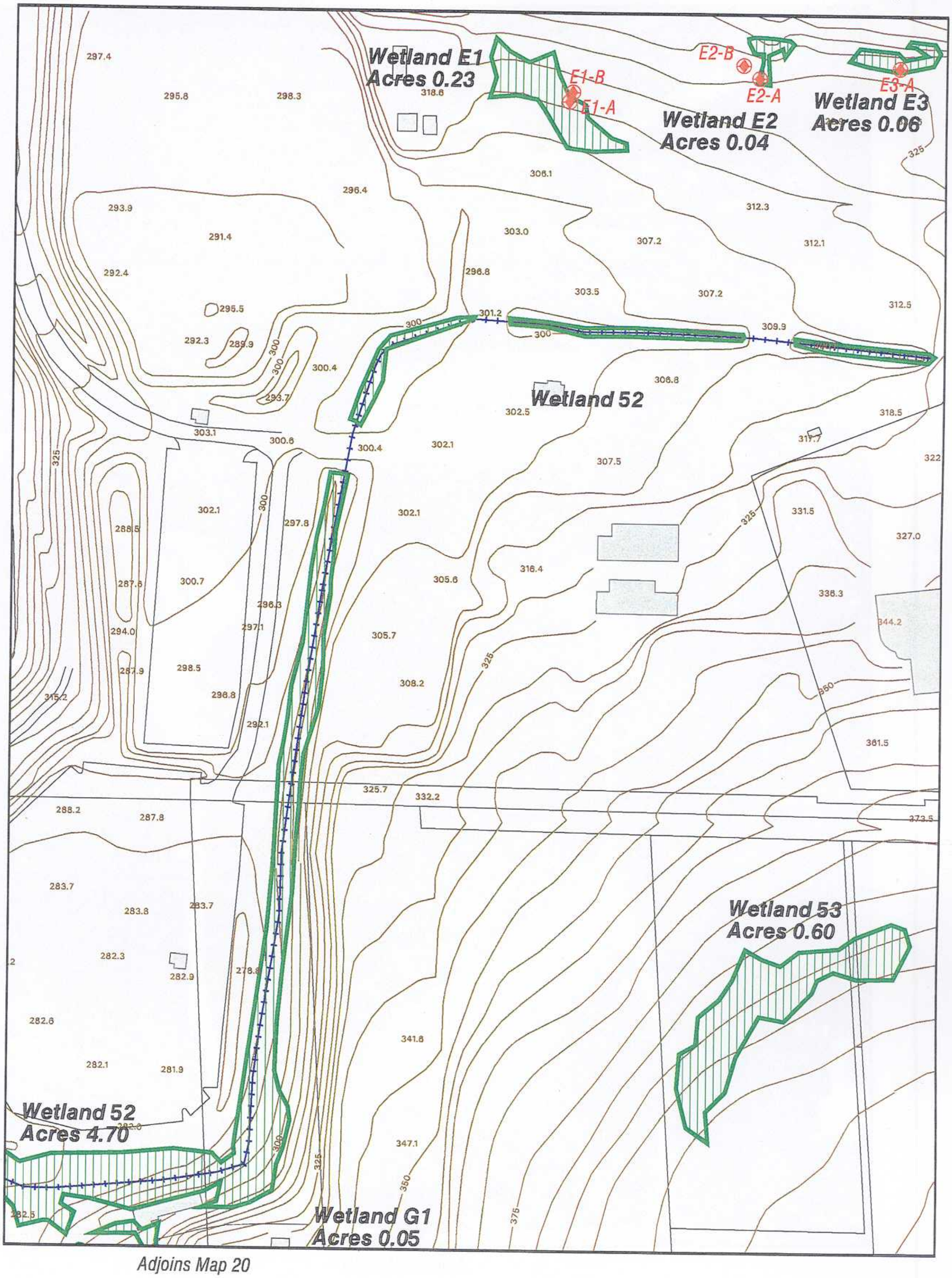
Scale 1 : 2,400

Surveyed wetland boundary

AR 009179

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Map #17



Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Des Moines Creek (est.)

Contour Lines

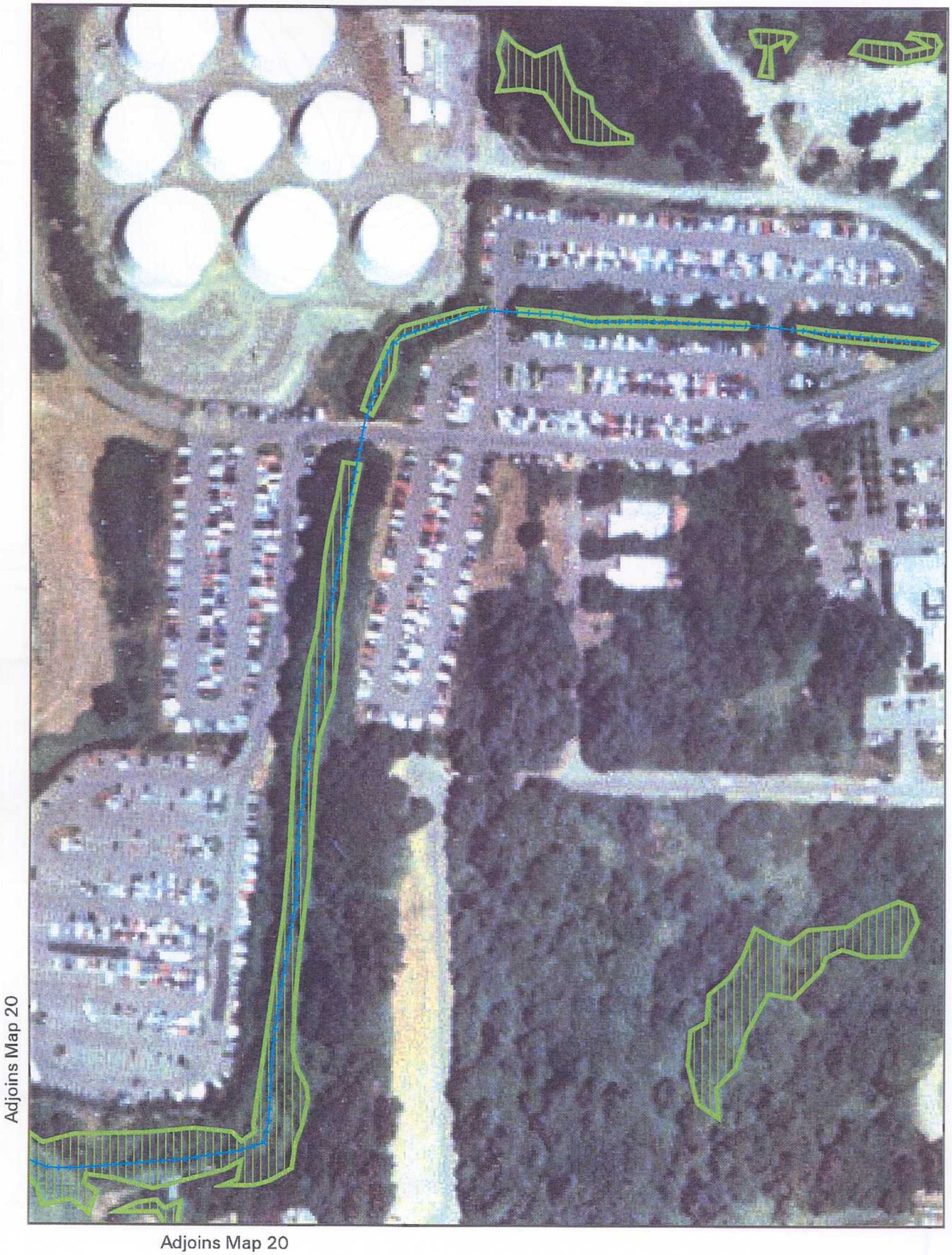
Basemap general features

Data Plots

AR 009180

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #17



Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Des Moines Creek (est.)

AR 009181

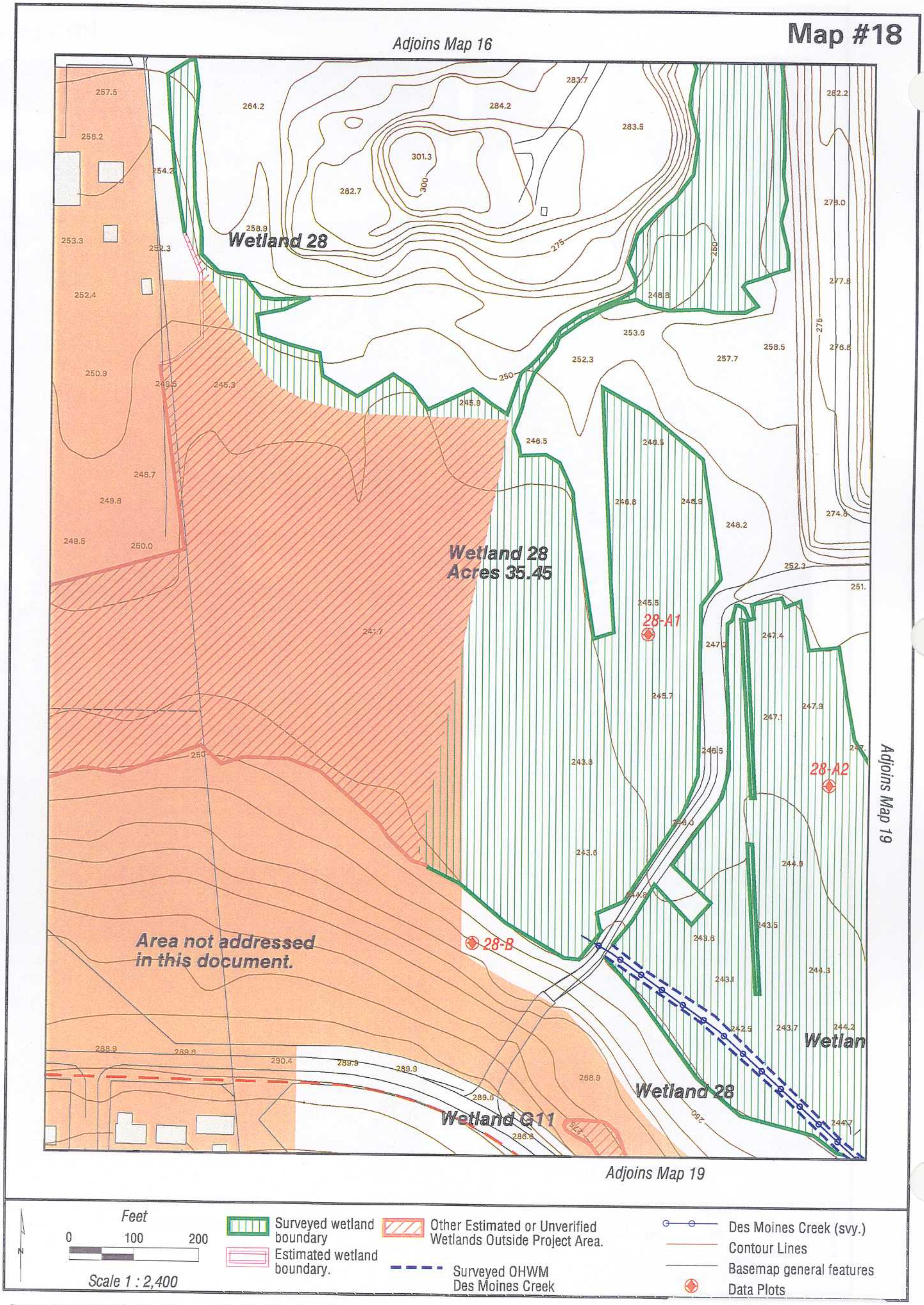
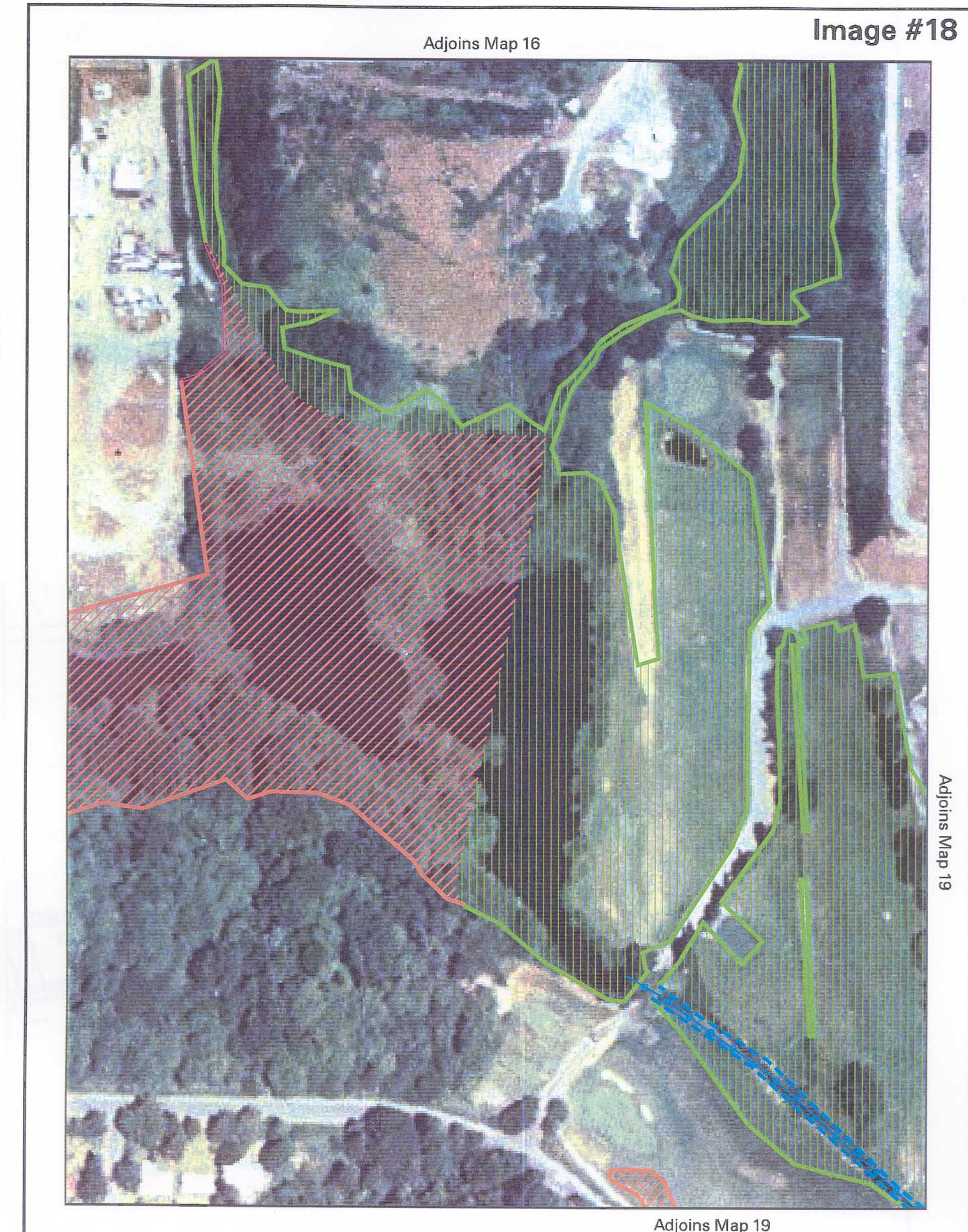

Map #18
Adjoins Map 16
Adjoins Map 19
Adjoins Map 19
Wetland 28
Wetland 28
Acres 35.45
Wetland 28
Wetland G11
Wetlan
Area not addressed
in this document.
28-A1
28-A2
28-B
Feet
0 100 200
Scale 1 : 2,400
Surveyed wetland boundary
Estimated wetland boundary.
Other Estimated or Unverified Wetlands Outside Project Area.
Surveyed OHWM Des Moines Creek
Des Moines Creek (svy.)
Contour Lines
Basemap general features
Data Plots

Image #18



Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

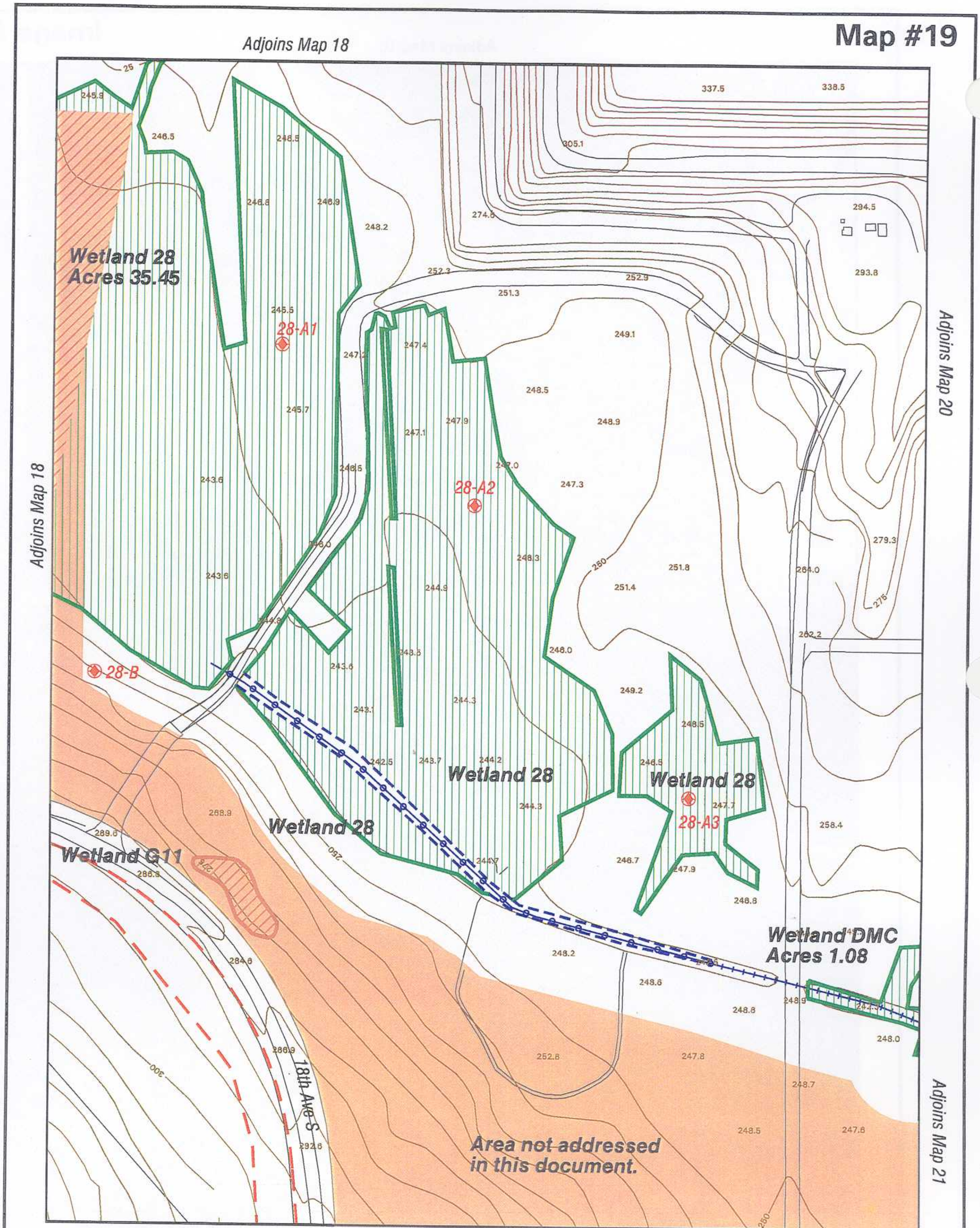
Estimated wetland boundary.

Other Estimated or Unverified Wetlands Outside Project Area.

Des Moines Creek (svy.)

Surveyed OHWM Des Moines Creek

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000



AR 009184

Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Other Estimated or Unverified Wetlands Outside Project Area.

Des Moines Creek (est.)

Des Moines Creek (svy.)

Borrow Site Source

Basemap general features

Surveyed OHWM Des Moines Creek

Contour Lines

Data Plots

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #19

Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Estimated wetland boundary.

Other Estimated or Unverified Wetlands Outside Project Area.

Des Moines Creek (est.)

Des Moines Creek (svy.)

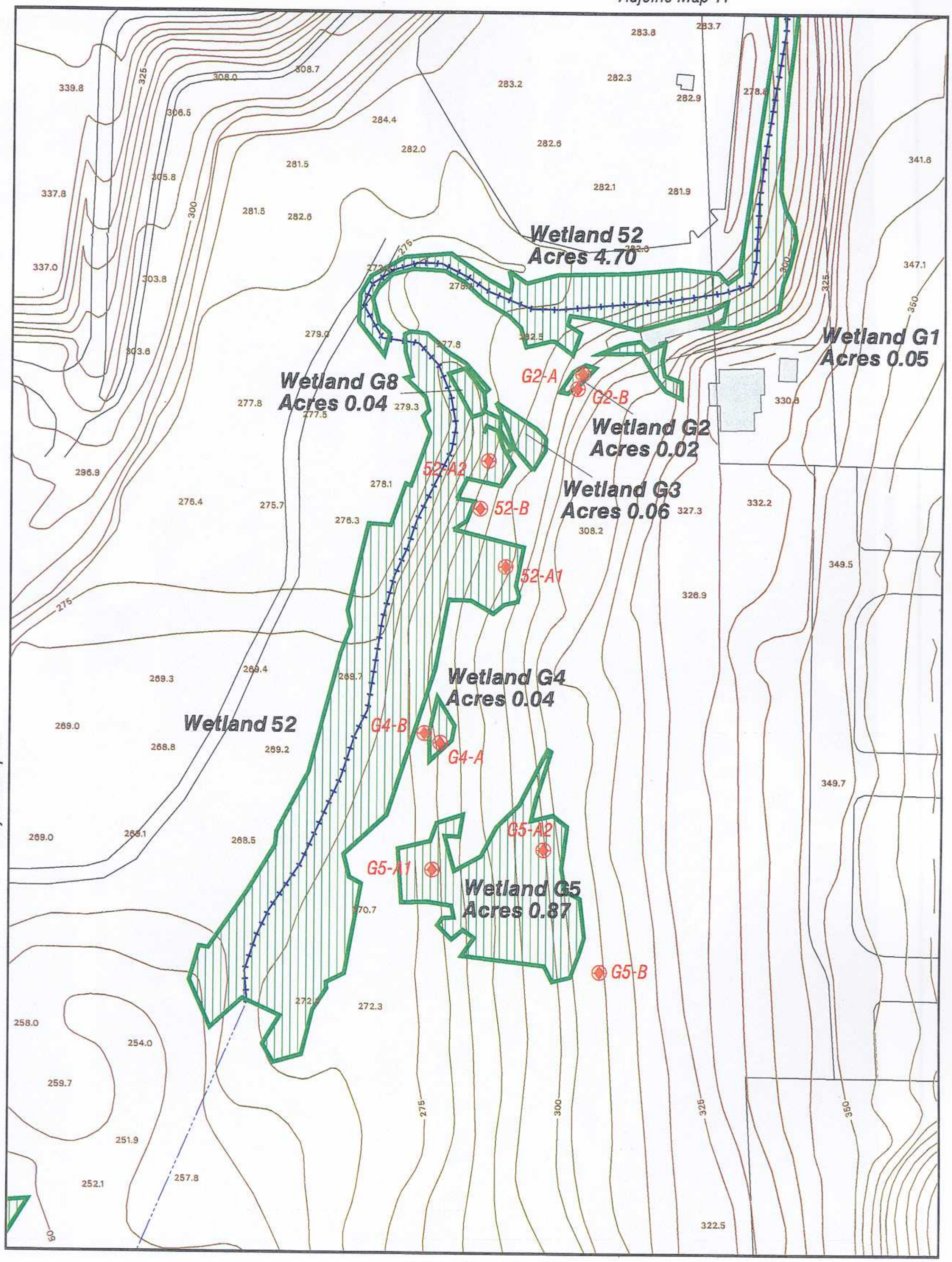
Surveyed OHWM Des Moines Creek

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

AR 009185

Map #20

Adjoins Map 17



Adjoins Map 17

Adjoins Map 19

Adjoins Map 21

Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Des Moines Creek (est.)

Des Moines Creek (culvert)

Contour Lines

Basemap general features

Data Plots

AR 009186

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Image #20

Adjoins Map 17

Adjoins Map 17

Adjoins Map 19

Adjoins Map 21

Feet

0 100 200

Scale 1 : 2,400

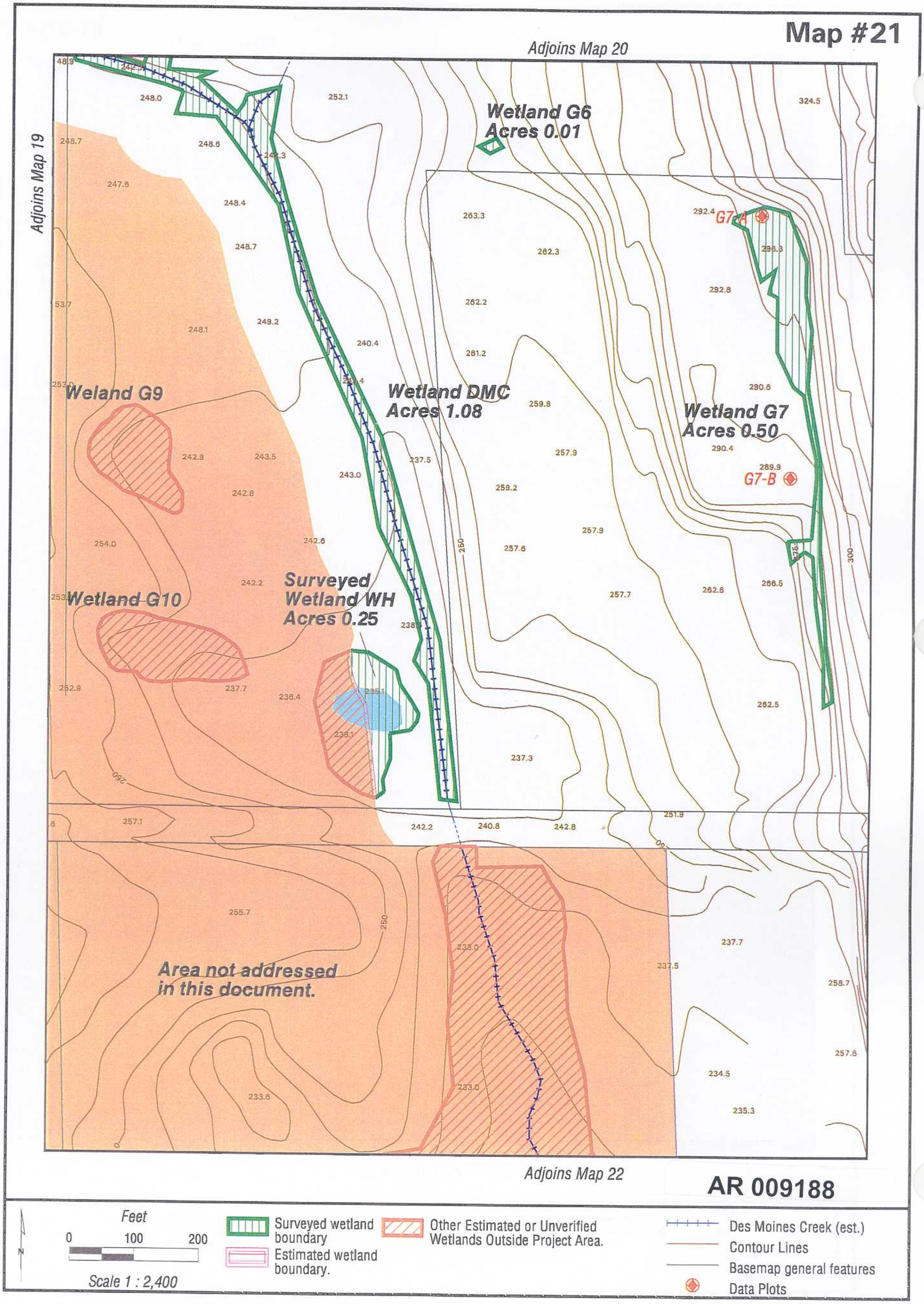
Surveyed wetland boundary

Des Moines Creek (est.)

Des Moines Creek (culvert)

AR 009187

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000



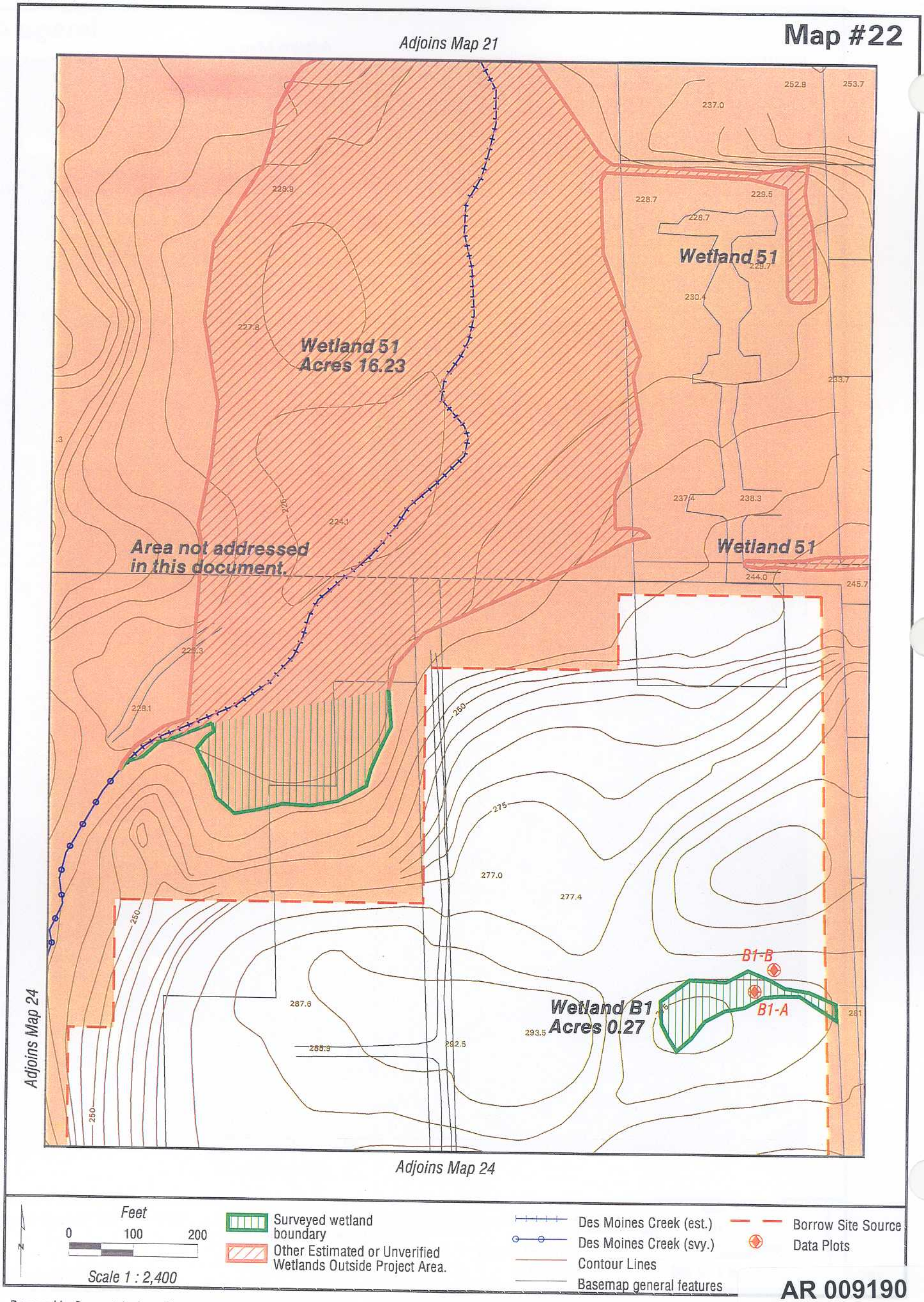
AR 009188

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 10, 2000

Image #21

AR 009189

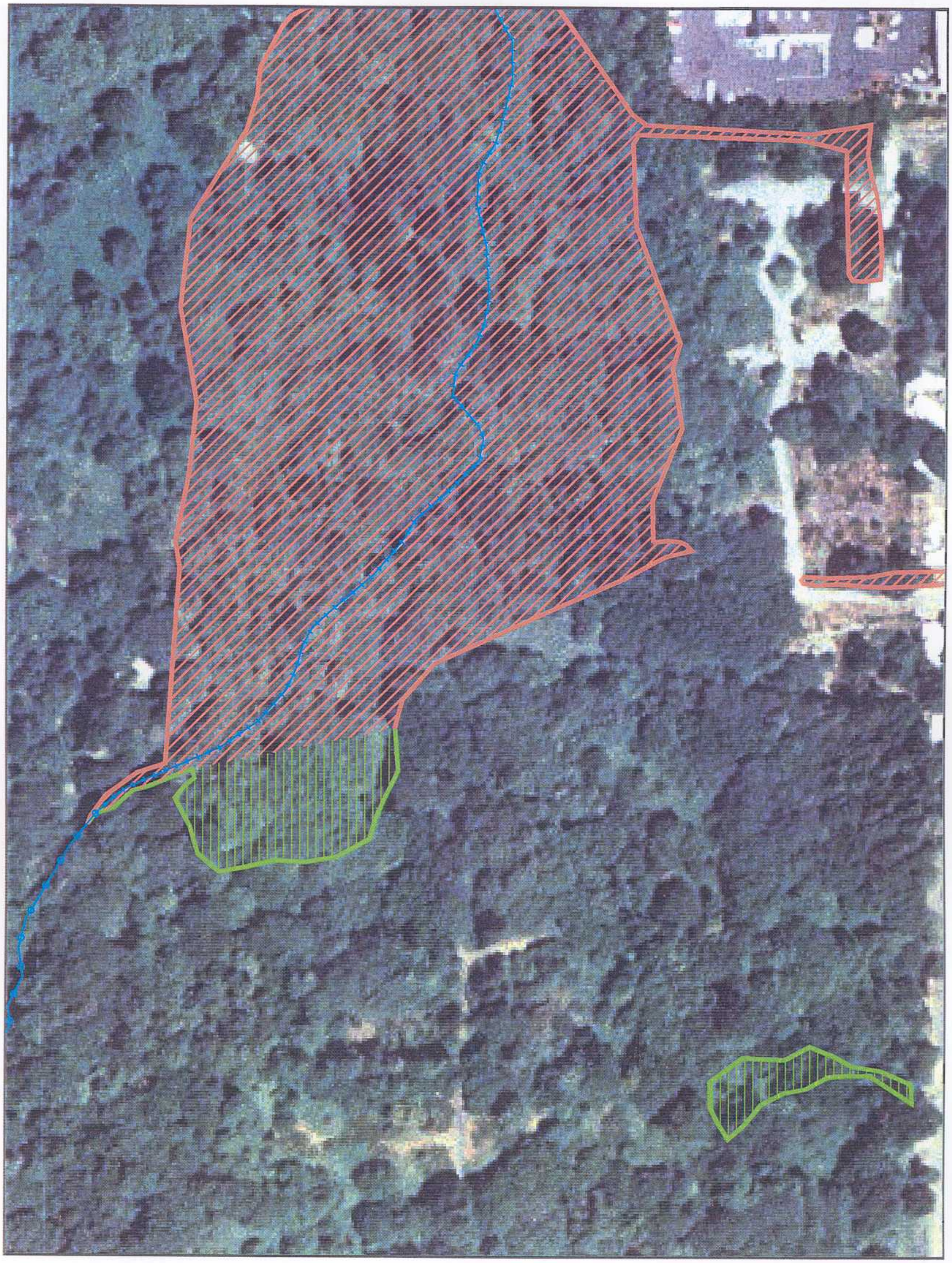
Map #22



Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 11, 2000

Image #22

Adjoins Map 21



Adjoins Map 24

Adjoins Map 24

N

Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Other Estimated or Unverified Wetlands Outside Project Area.

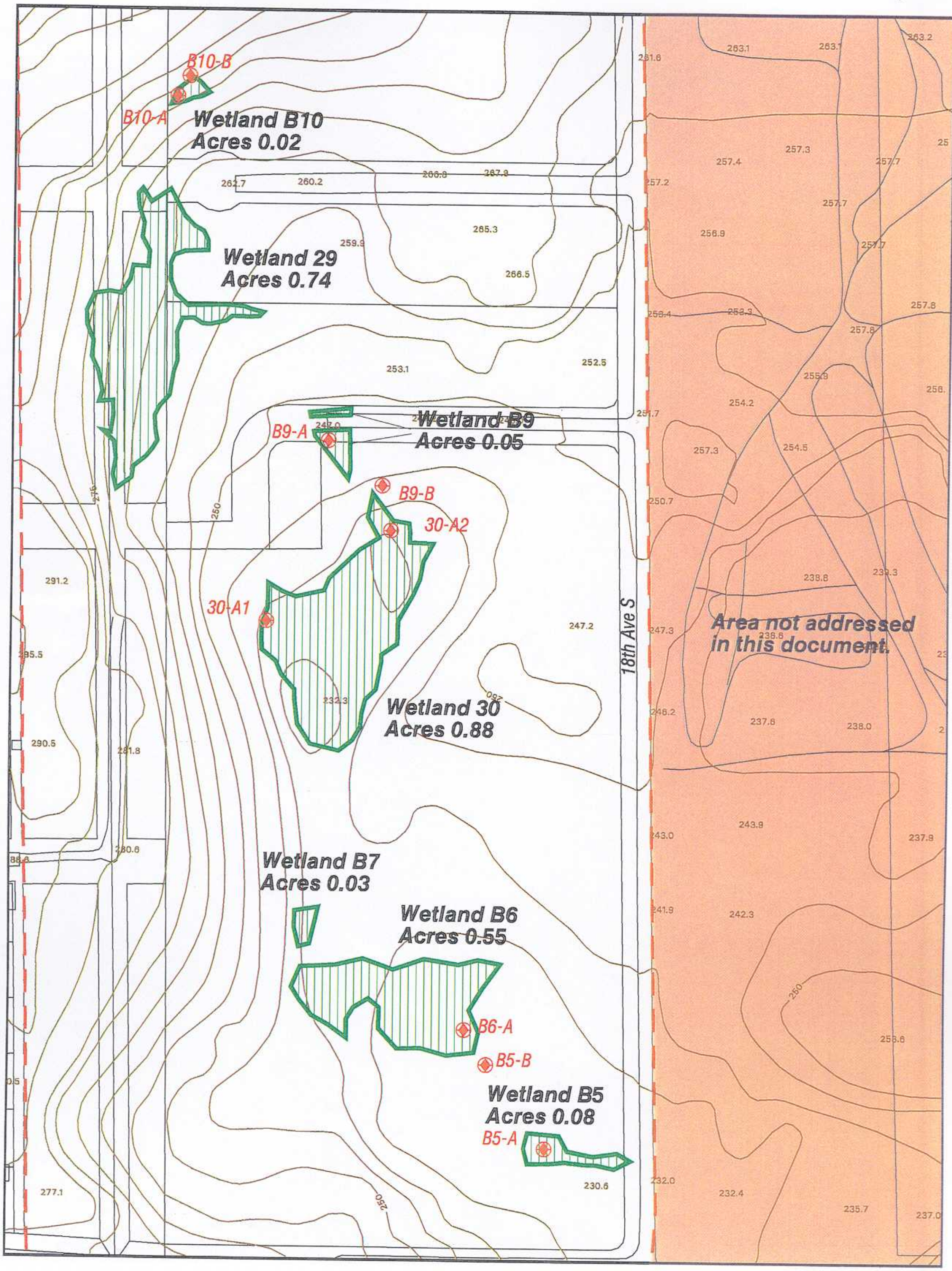
Des Moines Creek (est.)

Des Moines Creek (svy.)

AR 009191

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

Map #23



Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Contour Lines

Basemap general features

Borrow Site Source

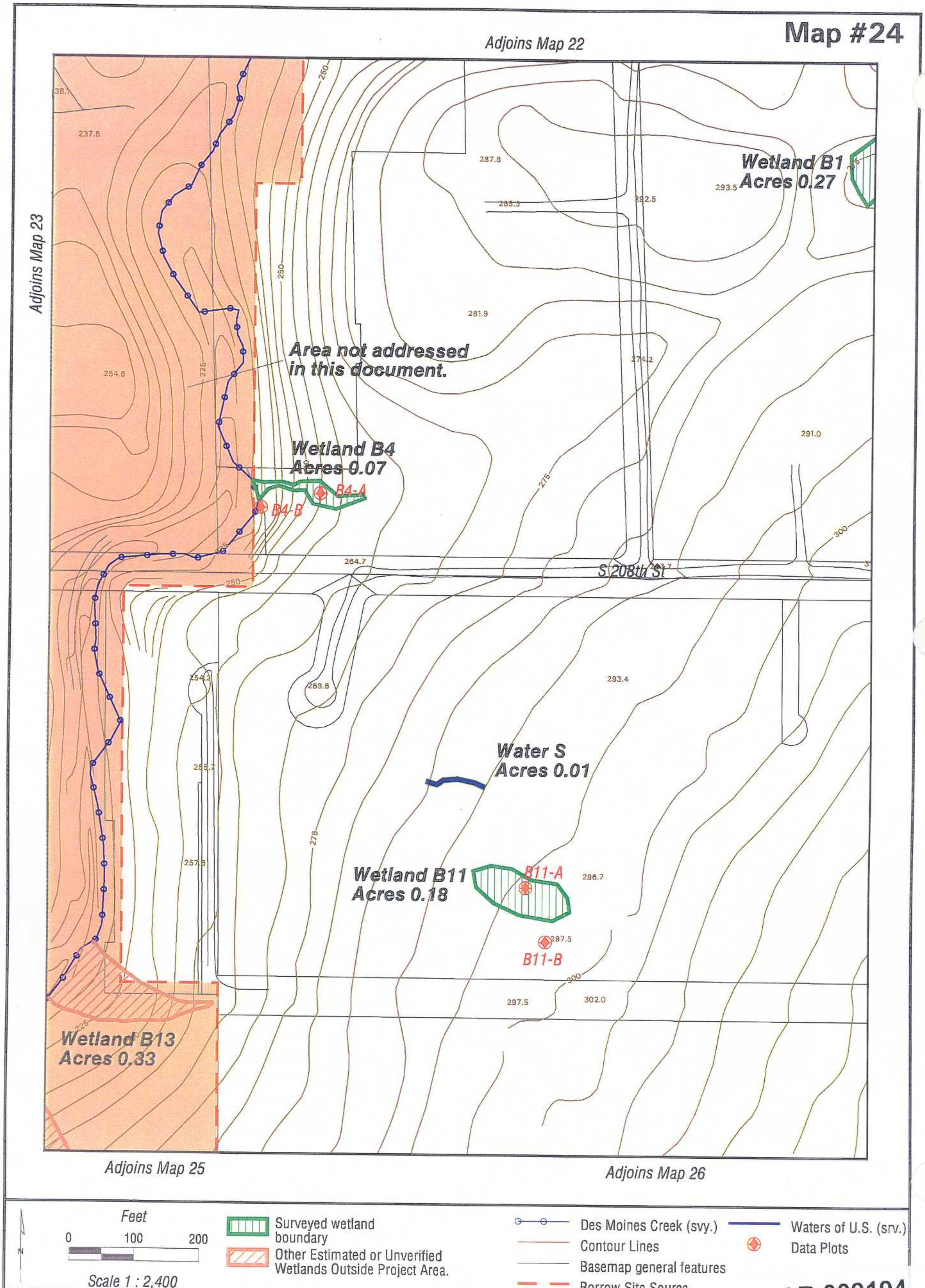
Data Plots

AR 009192

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 11, 2000

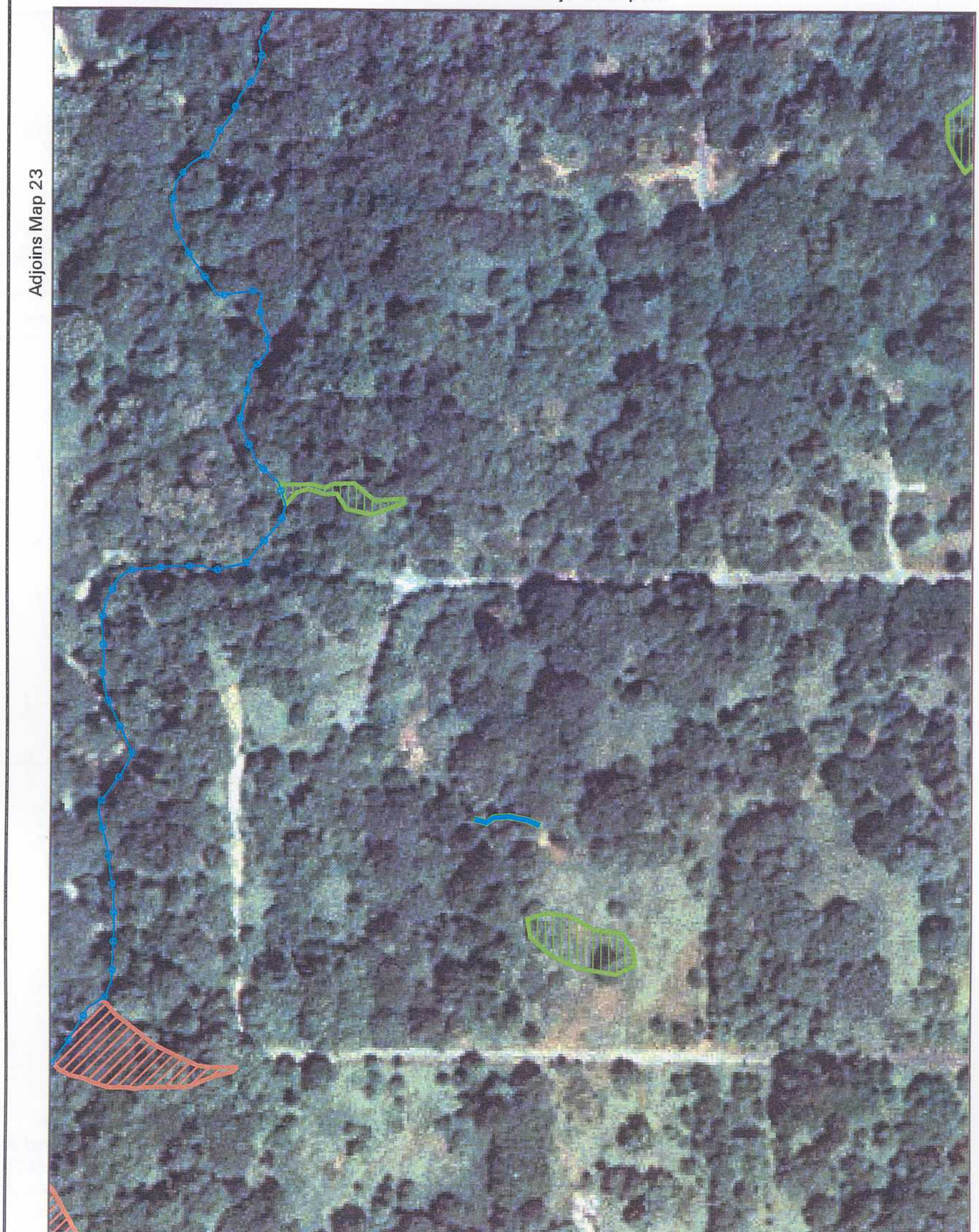
Image #23

AR 009193



Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 11, 2000

Image #24



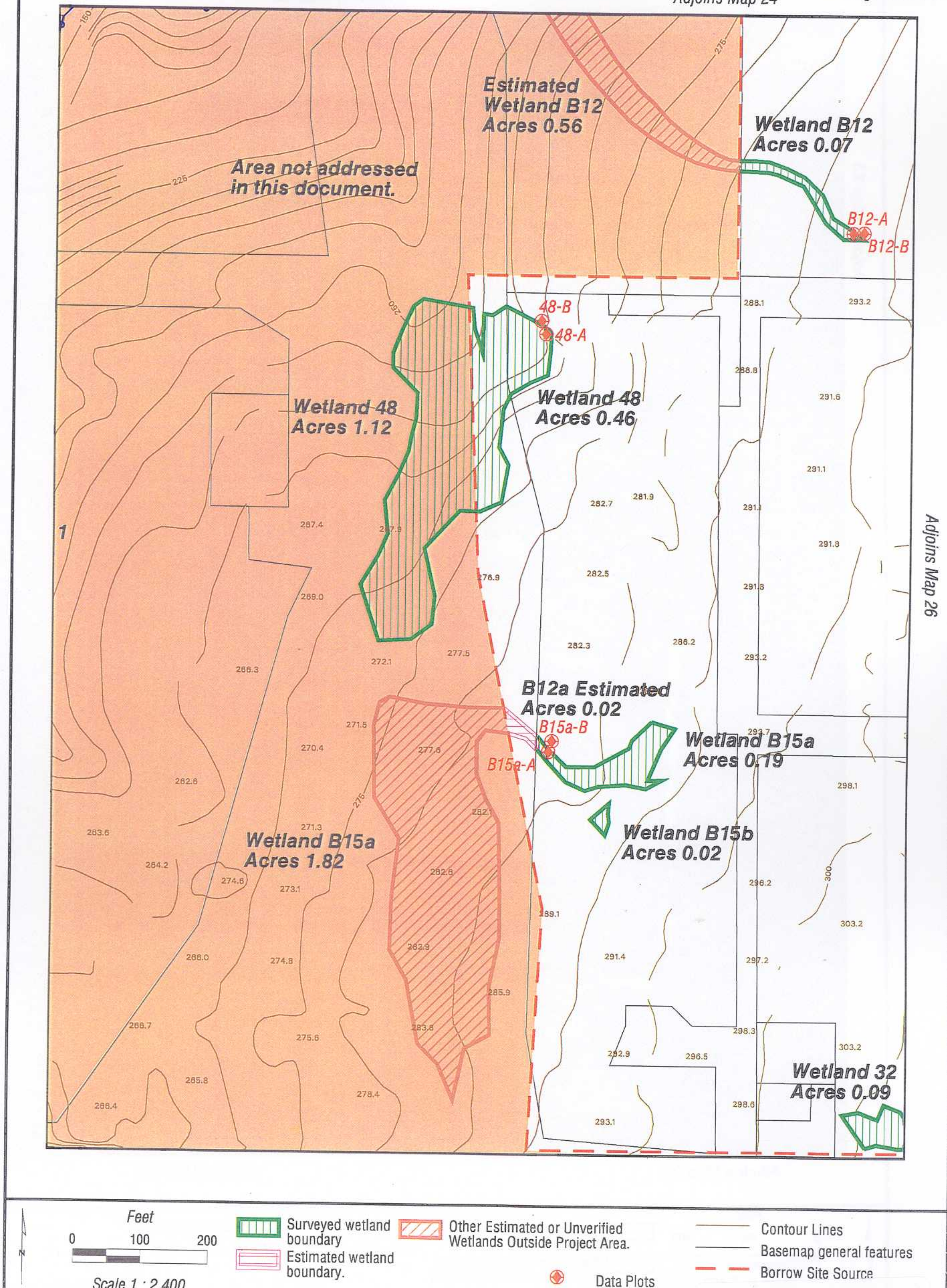
Feet
0 100 200
Scale 1 : 2,400

Surveyed wetland boundary
Other Estimated or Unverified Wetlands Outside Project Area.
Des Moines Creek (svy.)
Waters of U.S. (srv.)

AR 009195

Map #25

Adjoins Map 24



AR 009196

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 11, 2000

Image #25

Feet

0 100 200

Scale 1 : 2,400

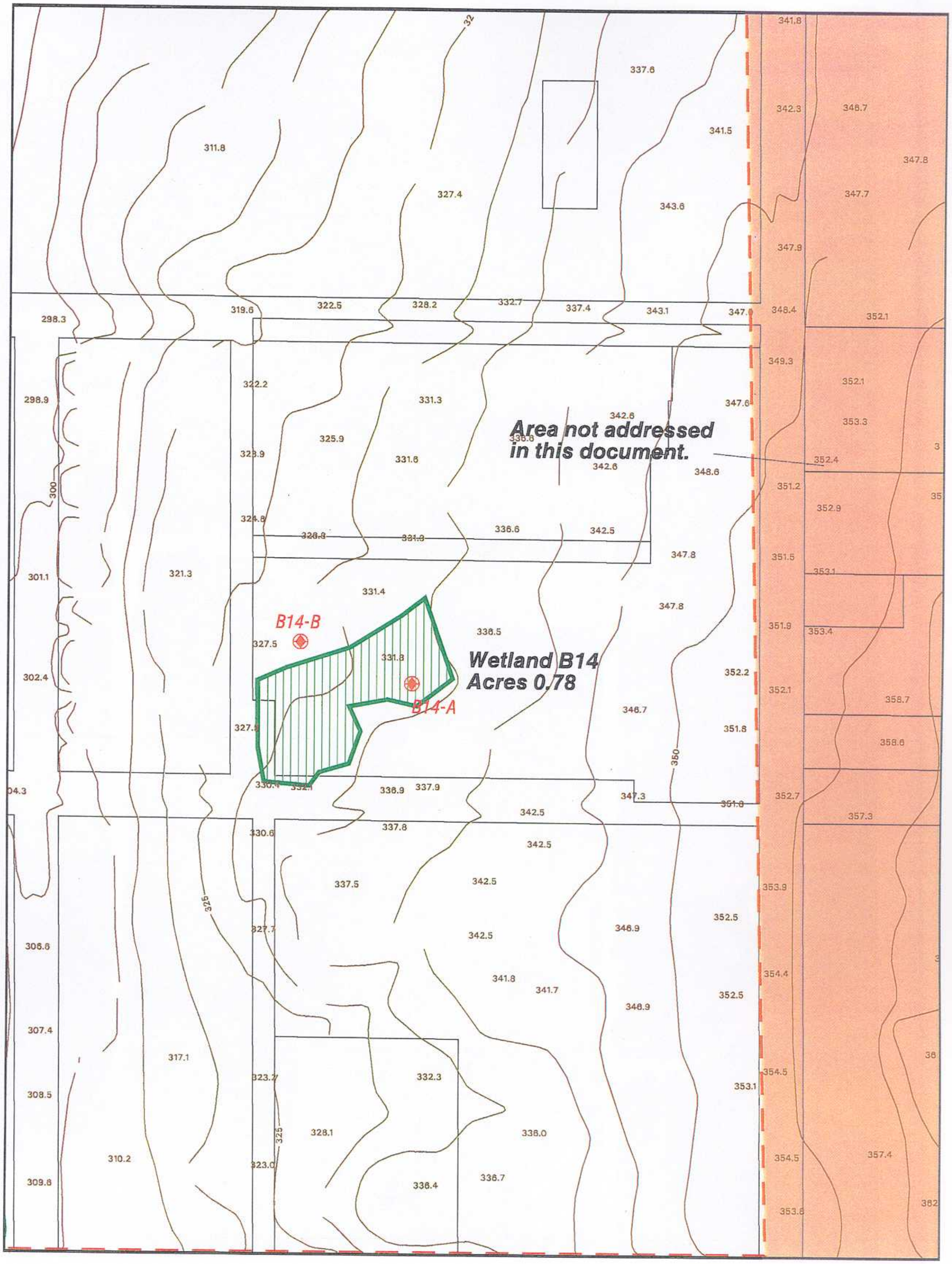
Surveyed wetland boundary

Estimated wetland boundary.

Other Estimated or Unverified Wetlands Outside Project Area.

AR 009197

Map #26



Feet

0 100 200

Scale 1 : 2,400

Surveyed wetland boundary

Contour Lines

Basemap general features

Borrow Site Source

Data Plots

AR 009198

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 11, 2000

Image #26

Adjoins Map 24

Adjoins Map 25

Feet
0 100 200
Scale 1 : 2,400

Surveyed wetland boundary

AR 009199

Prepared by Parametrix, Inc. File: seatac2/plotamls/p_atlas_2000.aml Date: December 08, 2000

E. PREVIOUSLY DELINEATED WETLANDS

APPENDIX E

PREVIOUSLY DELINEATED WETLANDS

The following table summarizes surveyed wetlands and areas that were provided in the Final Environmental Impact Statement (FEIS) (FAA, 1996: Table IV.11-1). The associated descriptions of wetlands were prepared by Shapiro and Associates, Inc (Shapiro) in the 1995 Draft EIS document (FAA, 1995: Appendix H-A). These wetlands were delineated by Shapiro and confirmed by the U.S. Corps of Engineers in 1996. Except for a few rounding differences, these surveyed areas are the same as the areas provided in this, the Wetland Delineation Report Seattle-Tacoma International Airport Master Plan Update Improvements document.

Table D-1. FEIS wetland classification and area (FAA 1996)[a].

Wetland	Classification	Area (Acres)[b]
1	Forested	0.07
2	Forested, Emergent Marsh	0.74
3	Forested	0.56
4	Forested	5.02
5	Forested, Shrub/Scrub	4.58
6	Shrub/Scrub	0.87
7	Forested, Open Water, Emergent Marsh	6.70
8	Shrub/Scrub, Emergent Marsh	4.95
9	Emergent Marsh, Forested	2.85
10	Shrub/Scrub	0.31
11	Forested, Emergent Marsh	0.50
12	Emergent Marsh, Forested	0.21
13	Emergent Marsh	0.05
14	Forested	0.19
15	Emergent Marsh	0.28
16	Emergent Marsh	0.06
17	Emergent Marsh	0.03
18	Forested	0.12
19	Forested	0.57
21	Forested	0.22
22	Shrub/Scrub, Emergent Marsh	0.06
23	Emergent Marsh	0.78
24	Emergent Marsh	0.14
25	Forested	0.06
26	Emergent Marsh	0.02
29	Forested	0.74
32	Emergent Marsh	0.05
53	Forested	0.60

[a] Format modified from Table IV.11-1 from the FEIS (FAA 1996).

[b] Source: Parametrix, Inc. and Shapiro & Associates. Wetland area values for Wetlands 1 through 31 based on survey conducted by Port of Seattle (1995). Area values for Wetlands 32 though 48 based on GIS data provided by Gambrell-Urban.

Wetland descriptions from: ***Jurisdictional Wetland Delineation Report, Sea-Tac Master Plan Update.*** **(FAA 1995)**

Wetland 1 is located north of SR 518 in the west-central portion of the north borrow area. It is classified under the U.S. Fish and Wildlife Survey classification system (Coward et al. 1979) as palustrine forested and broad-leaved deciduous saturated. It is bounded on the south by a road and on the north by fill. The wetland is dominated by black cottonwood in the overstory. Red alder and willow are also present. The understory is dominated by blackberry and Douglas spirea. Reed canarygrass and soft rush grow in the forb layer. Soils consist of very dark brown (10YR 2/2) loam overlying very dark grayish brown (10YR 3/2) gravelly sandy loam. Dark brown (7.5YR 3/3) mottles are present in the subsoil. At the time of the field investigation (December 6, 1994), water was seeping into the soil pit along a cemented soil layer at 16 inches below the surface.

Wetland 2 occupies a depression north of SR 518 in the north borrow area. It would be classified as a palustrine forested, broad-leaved deciduous, emergent, saturated system. The forested portions of the wetland are dominated by a mixture of black cottonwood, red alder, and willow. The understory is dominated by patches of spirea, Himalayan blackberry, and willow shrubs. Bentgrass, Watson's willow-herb, soft rush, sword fern, and sedge grow in the forb layer. The emergent area of the wetland is dominated by reed canarygrass. Cattail grows in the lowest portions of the wetland and soft rush grows throughout. Himalayan blackberry hedges define the boundary of the emergent areas. Soils consist of dark brown (10YR 5/8) mottles, and oxidized rhizospheres occur in the subsoil. Soils in the lowest portions of the wetland were saturated to the surface at the time of the investigation (December 6, 1994).

Wetland 3 is located near the southeast corner of the north borrow area and is the easternmost wetland in the Lake Reba complex. This wetland would classify as palustrine forested and broad-leaved deciduous, seasonally flooded. It is bounded on its eastern side by a relatively steep embankment and on its west side by a service road. Willow dominates the overstory. Black cottonwood and red alder are additional components of the overstory. Himalayan blackberry, willow shrubs, red alder saplings, salmonberry, and Pacific blackberry grow in the overstory. The forb layer is dominated by horsetail. Associated species include reed canarygrass, bittersweet nightshade, creeping buttercup, lady fern, and sword fern. Soils consist of dark grayish brown (2.5Y 4/2) sand; which becomes gleyed at 32 inches below the ground surface. The sandy surface material apparently has washed down from a sand stockpile upslope to the east of the wetland. Soils in the lower area to the north consist of mucks and mineral soil. A 36-inch culvert conveys water from the hill (to the east) to the southeast corner of the wetland. A channel along the western side of the wetland at the base of the road carries water to two 5-foot outlet culverts, one of which is filled with sediment. The operational culvert conveys water to Wetland 4. At the time of the investigation (December 7, 1994), flows in the channel were about 4 inches wide and 1 inch deep. Soils in the southern half of the wetland were moist at the time of the investigation. Standing water was observed in the north half of the wetland.

Wetland 4 is a relatively large wetland in the east portion of the Lake Reba wetland complex. This wetland would classify as a palustrine, forested, broad-leaved deciduous, and seasonally flooded system. Wetland 4 is surrounded by service roads. Willow is the dominant overstory species. Black cottonwood and red alder occur as associated species. The understory is dominated by willow shrubs. Salmonberry also grows in the wetland. Herbaceous species include horsetail, American speedwell, tall mannagrass, creeping buttercup, reed canarygrass, sedges, small-fruited bulrush, sword fern, soft rush, stinging nettle, and bentgrass. At the east end of the wetland, soils consist of dark greenish gray (5GY 4/1) sand. Organic soils, muck, and mucky peat increase in the western portion of the wetland. At the time of the investigation (December 7, 1994), soils were saturated to the surface and pools of standing water were present throughout the wetland. Water was observed flowing from the hillside in the southeast corner of the wetland. Culverts convey water to Wetland 4 from impervious surfaces associated with SR 518 to the north and the Airport Operations Area (AOA) to the south. Surface water generally flows to the west in several braided channels.

Wetland 5 is located in the north borrow area. This is a palustrine, forested, scrub-shrub, and broad-leaved deciduous wetland. Vegetation in its northern half is similar to that of Wetland 4. The southern half of the wetland is dominated by red alder and salmonberry. Arborescent willows and several large hemlock trees were also observed in the southern portion of this wetland. Indian plum, Himalayan blackberry, and willow shrubs are found in the understory. Herbaceous species growing in the wetland include lady fern, horsetail, tall mannagrass, creeping buttercup, and small-fruited bulrush. Soils in the wetland's northern half consist of dark gray (10YR 4/1) loam over very dark brown (10YR 2/2) mucky loam. Soils along the hillslope in the southern half of the wetland consist of layers of black (10YR 2/1) peaty muck and dark greenish gray (5GY 4/1) loamy sand. Soils were saturated to the surface at the time of the investigation (December 12, 1994). Small depressions and channels throughout the wetland were inundated with water. Seeps along the hillslope contribute water to this wetland. Two culverts discharge water to the wetland's south side and southwest corner. Water also enters this wetland via a culvert from Wetland 4. A culvert at the northwest end of Wetland 5 discharges water to Wetland 6.

Wetland 6 is located south of Lake Reba in the northern borrow area. It is bounded on the north and east sides by roads. Its southern edge is at the base of a fill. A silt fence is just upslope of the southern boundary. This wetland would classify as a palustrine, scrub-shrub, broad-leaved deciduous, and seasonally-flooded system. The vegetation composition is similar to that of Wetland 4. Soils consist of black (10YR 2/1) loam. At the time of the investigation (December 12, 1994), soils were saturated to the surface. A culvert conveys water to the southeast corner of this wetland, where it sheetflows to the northwest.

Wetland 7 is located in the north borrow area. Lake Reba lies within the wetland boundary. This is a palustrine, forested, broad-leaved deciduous, open-water, and emergent seasonally, permanently flooded wetland. The vegetative composition of the forested portion of this wetland is similar to that described for Wetland 4. The emergent vegetation community is dominated by reed canarygrass. Canadian thistle, bittersweet nightshade, and bentgrass also grow in emergent areas. Soils consist of black (10YR 2/1) loam over black (10YR 2.1) gravely sandy loam. At the time of the investigation (December 29, 1994), soils were saturated to the surface throughout most of the wetland. A culvert conveys water from Wetland 4, past the eastern portion of Wetland 7, to the east end of Lake Reba. Lake Reba outflow is conveyed past a water detention structure at the west end of the lake to Miller Creek. Lake Reba is used as a regional stormwater detention facility.

Wetland 8 is located west of Lake Reba and separated from Wetland 7 by fill that serves to dam Lake Reba. This wetland would be classified as palustrine scrub-shrub, broad-leaved deciduous, emergent, and semi-permanently and seasonally saturated. Forested portions of the wetland have a vegetation community very much like Wetland 4. A monotypic stand of reed canarygrass occurs along the northern side of the wetland. This wetland receives water from a variety of sources. Miller Creek enters the northeast corner, the outflow of Lake Reba is conveyed via a culvert to the east side, and runoff from SR 518 is conveyed to the north side of this wetland. Miller Creek flows southwest to the south side of the wetland, where it flows through a culvert to Wetland 9 and ultimately to Lora Lake. On December 29, 1994, soils throughout the wetland were saturated to the surface and, in many areas, inundated to varying depths.

Wetland 9 is located southwest of Lake Reba in the north borrow area. It is a palustrine, emergent, and forested broad-leaved deciduous, intermittently-exposed, saturated system. The eastern and northern portions of this wetland are dominated by cattail and reed canarygrass. The scrub-shrub portions are dominated by willow shrubs. Associated species include Himalayan blackberry, spirea, and red elderberry. Herbaceous species include reed canarygrass, horsetail, lady fern, and creeping buttercup. Red alder, paper birch, and black cottonwood grow in some areas. Watercress dominates a permanently inundated area that extends south and east of the main portion of the wetland. Soils consist of black (10YR 2/1) silt loam with strong brown (7.5 YR 4/6) mottles. Soils have a high organic content. At the time of the investigation (December 29, 1994), soils were saturated to the surface or inundated. Miller Creek enters the northern side of the wetland via several culverts and flows west toward Lora Lake.

Wetland 10 is located south of Lake Reba. This is a palustrine, scrub-shrub, and broad-leaved deciduous, seasonally flooded wetland. The dominant overstory species is willow. Himalayan blackberry, salmonberry, and red elderberry grow in association with the willow. Himalayan blackberry dominates the northwest corner of the wetland. Soils consist of black (10YR 2/0) loamy muck over very dark gray (10YR 3/1) and black (10YR 2/1) mucky loam and black (10YR 2/1) mucky peat. Soils were saturated to the surface and depressions were inundated at the time of the investigation. A newly installed polyvinyl chloride (PVC) pipe conveys stormwater from a recently constructed stormwater detention facility east of the wetland. A silt fence has been installed on fill material deposited to the east. Another culvert conveys water from Wetland 9 to the south side of Wetland 10. Water flows north to the lowest portion of the wetland. Soils throughout the wetland were saturated to the surface during the field investigation on December 12, 1994.

Wetland 11 is located west of, and approximately 20-feet higher than, Wetland 10 in the north borrow area. It is a palustrine, forested, broad-leaved deciduous, emergent, and intermittently exposed and saturated wetland. There are three distinct vegetation zones that occur in this wetland. The southern arm is dominated by red alder and has an understory dominated by reed canarygrass, horsetail, and small-fruited bulrush. The eastern portion of the wetland is dominated by lady fern and reed canarygrass. Associated species include small-fruited bulrush, horsetail, tall mannagrass, Watson's willow-herb, and soft rush. A large number of black cottonwood seedlings were also seen. The forested portion of the wetland, in the northwest corner, is dominated by black cottonwood. These trees overhang a semi-permanently flooded depression. Himalayan blackberry borders the north side of the wetland. Soils in the southern arm consist of very dark gray (10YR 3/1) mucky loam overlying black (5Y 2.5/1) sandy loam with dark red (2.5YR 4/6) mottles. Soils in the emergent area consist of black (10YR 2/0) loam overlying dark greenish gray (10YR 4/1 and 5GY 4/1) loam with strong brown (7.5YR 4/6) mottles. At the time of the investigation (December 13, 1994), soils were saturated to the surface in most areas. Water in both the southern arm and the emergent area flows to the forested section. The depression under the canopy retains water throughout most years. Water flows out of this depression to the roadside ditch, where it enters a culvert. The culvert conveys water to Wetland 10 to the east.

Wetland 12 is a hillside seep located in the southwest portion of the north borrow area. This wetland would classify as a palustrine, emergent, and forested broad-leaved deciduous, saturated system. The wetland is located on a 10 percent slope. The north side borders a road and the south side borders a hedge of Himalayan blackberry and Scots broom. Willow and red alder are the dominant overstory species. The understory is dominated by a mixture of soft rush, cattail, small-fruited bulrush, Watson's willow-herb, and blackberry seedlings. Soils consist of very dark grayish brown (10YR 3/2) sandy loam overlying dark greenish gray (5GY 4/1 and 5GY 3/1) sandy loam with gravel. Brown (7.5YR 4/4) and strong brown (7.5YR 4/6) mottles occur in the subsoil. The hydrology source appears to be discharge of shallow groundwater along the hillside.

Wetland 13 is associated with a hillside seep located in the southwest portion of the north borrow area. This wetland would classify as a palustrine, emergent, and permanently saturated system. Wetland B is separated from Wetland 12 by a service road. It is located on a 10 percent slope. The vegetation is essentially the same as that of Wetland 12. Like Wetland 12, the source of hydrology appears to be discharge of shallow groundwater along the hillside.

Wetland 14 is located in a depression in the southwest corner of the north borrow area. This is a palustrine forested and broad-leaved deciduous, saturated wetland. Red alder and black cottonwood dominate the overstory. The herbaceous undergrowth is dominated by creeping buttercup. Soft rush, horsetail, bentgrass, and Himalayan blackberry were also observed. Soils consist of very dark gray (10YR 3/1) loam over dark gray (10YR 3/1) and gray (10YR 4/1) silt loam. The silt loam horizon has strong brown (7.5 YR 4/6) mottles. Soils were saturated at a depth of 18 inches at the time of investigation (December 13, 1994).

Wetland 15 is located north of, and below, the western existing runway at the north side of the AOA. It is associated with a seep that originates halfway up the 40-degree slope south of the perimeter road. Water flows downhill to a ditch along the road. This is a palustrine, emergent, and permanently saturated wetland. Horsetail, Watson's willow-herb, and Himalayan blackberry are the dominant plant species on the hill. The ditch along the road contains cattail, soft rush, bentgrass, and red alder, willow, and black cottonwood saplings. Soils are dark grayish brown (10YR 4/2) loam overlying gray (5Y 5/2) gravelly silty loam with yellowish brown (10YR 5/6) mottles. Soils were moist or saturated to the surface at the time of the investigation (September 1, 1994).

Wetland 16 is located in a narrow depression along the east side of a north-south oriented service road in the center of the AOA. This wetland is classified as a palustrine emergent, seasonally saturated system. This wetland is dominated by bentgrass and common velvet-grass. Associated species include soft rush, curly dock, Himalayan blackberry, Scots broom, and red alder. Soils consist of extremely compact dark grayish brown (2.5Y 4/2) loam with (7.5YR 4/3) rhizospheres and mottles overlying olive gray (5Y 5/2) silt loam. Soils were dry at the time of the investigation (August 19, 1994). Wetland hydrology was inferred based upon a predominance of hydrophytic vegetation and presence of hydric soils. A stormwater drain located at the south end of the wetland conveys water from the wetland.

Wetland 17 is located in the west-central portion of the AOA. This is a palustrine, emergent, and permanently saturated wetland. Reed canarygrass is the dominant plant species. Associated species include horsetail and Himalayan blackberry. Red alder and weeping willow hang over the wetland. Soils were moist at the time of investigation (September 23, 1994). The wetland terminates at a culvert that conveys water west underneath a service road to a ditch on the east side of 12th Avenue South.

Wetland 18 is located in a narrow east-west oriented trough in the wet-central portion of the AOA. This wetland is a palustrine, forested, broad-leaved deciduous, and seasonally saturated system. A mixture of red alder, big-leaf maple, and redcedar dominates the overstory. The understory is dominated by salmonberry. Himalayan blackberry occurs along wetland's edge. Dominant forbs include lady fern and horsetail. Associated forbs include skunk cabbage, tall mannagrass, Watson's willow-herb, and bracken fern. Soils at the wetland's eastern end consist of dark gray (10YR 4/1) sandy loam. Muck soils occur in the wetland's central portion. The west end of the wetland contains gleyed loam soil. Soils were saturated at depths ranging from 8 inches to the surface at the time of the investigation (September 1, 1994). A small perennial stream flows west to a culvert at the west end of the wetland. The culvert conveys water to the ditch on the east side of 12th Avenue South.

Wetland 19 is a relatively large forested wetland located in the west-central portion of the AOA. This wetland would classify as a palustrine, forested, broad-leaved deciduous, and semi-permanently and seasonally saturated system. The wetland is confined by the side-slopes of a ravine. Red alder dominates the overstory. Black cottonwood, big-leaf maple, and redcedar also occur in the overstory. The understory is dominated by salmonberry. Indian plum, Himalayan blackberry, Pacific blackberry, and hazelnut occur as associated species. The forb layer is dominated by lady fern and horsetail. Associated species include reed canarygrass, skunk cabbage, and stinging nettle. Soils consist of very dark gray (10YR 3/1) silt loam overlying greenish gray (5Y 5/1) silt loam. High concentrations of organic matter occur throughout the soil profile. A perennial stream flows the length of the wetland. The stream originates as a seep at the base of fill in the wetland's eastern end. The stream enters a culvert at the wetland's west end and is discharged to the eastern side of 12th Avenue South. At the time of the investigation (August 25, 1994), water flowing in the stream was 3 inches wide and 2 inches deep at its western end. Soils throughout the wetland were moist or saturated to the surface.

Wetland 21 is located in the west-central portion of the AOA east of 12th Avenue South. and a service road. It is a palustrine, forested, broad-leaved deciduous, and semi-permanently and seasonally saturated wetland. Wetland 21 occurs on a 15 percent slope and is associated with a hillside seep. Precipitation likely infiltrates the soil in the AOA to the east and flows along relatively impervious soil layers, ultimately discharging to the surface at this location. Topography of the wetland is a series of hummocks and depressions. The dominant overstory species is red alder. The understory is dominated by salmonberry, horsetail, and Himalayan blackberry. Associated understory species include lady fern, ivy, and reed canarygrass. Soils consist of black (10YR 2/1) loam overlying gray (10YR 5/1) and dark gray (10YR 4/1) silt clay loam and dark gray

(10YR 4/1) and bluish gray (5B 5/1) silt loam. Lenses of sand occur below 14 inches. At the time of the investigation (August 23, 1994), soils were moist.

Wetland 22 is located south and uphill of Wetland 21 in the west-central portion of the site. It is located in a depression, and would classify as a palustrine, scrub-shrub, broad-leaved deciduous, and emergent, saturated system. Red alder saplings dominate the shrub layer. Sitka willow, Pacific willow, black cottonwood saplings, and Himalayan and Pacific blackberry are also found. The herbaceous layer is dominated by bentgrass and common velvet-grass. Associated herbaceous species include creeping buttercup, reed canarygrass, curly dock, and Watson's willow-herb. Soils consist of very dark grayish brown (10YR 3/2) gravelly sandy loam overlying dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) sandy loam. Strong brown (7.5Y 4/6) mottles are present in the subsoil. Soils were dry at the time of the investigation (August 25, 1994); wetland hydrology was assumed from vegetation and soils data.

Wetland 23 is located in the central portion of the AOA in the regularly mowed grassy fields. A public observation area is northeast of the wetland. The wetland would classify as a palustrine, emergent, and seasonally saturated system. Bentgrass and common velvet-grass are the dominant plant species. Associated species include soft rush, white clover, common plantain, Watson's willow-herb, and sweet vernalgrass. Regular mowing keeps trees and shrubs from growing in this wetland. Soils consist of dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) fine sandy loam overlying dark grayish brown (10YR 4/2) and dark brown (10YR 4/3) gravely loam with brown (7.5YR 4.4) mottles. At the time of the investigation (August 30, 1994), soils were dry. Stormwater drains convey water from the center and south end of the wetland.

Wetland 24 is located in the southern portion of the AOA and northwest of the Weyerhaeuser hanger. It is located in a small depression and is bounded on the east by a service road and on the south by a fence. A small portable building is located in the southeast corner of the wetland. This is a palustrine emergent and seasonally flooded wetland. It is dominated by bentgrass and common velvet-grass. Associated species include white clover, common plantain, soft rush, cattail, and cudweed. Soils are compacted and were dry at the time of the investigation (September 1, 1994). Wetland hydrology was inferred from the presence of algal mats, predominance of hydrophytic vegetation, and presence of hydric soils.

Wetland 25 is located at the south end of the AOA and is bounded on its west side by a service road. This is a palustrine, forested, broad-leaved deciduous, and seasonally flooded wetland. It lies in a depression that is characterized by hummock and swale topography. The overstory is dominated by black cottonwood and willow. The understory is largely unvegetated due to inundation for much of the year. Spike-rush, cattail, bentgrass, and soft rush grow in some areas. Dried algal mats and water lines on tree trunks were present at the time of the investigation. Pacific madrone, Himalayan blackberry, and Scots broom occur on the hummocks. Soils consist of dark gray (10YR 4/1) loamy sand overlying dark gray (10YR 4/1) very gravelly loamy coarse sand. Soils were dry at the time of the investigation (August 19, 1994). Wetland hydrology was inferred from algal mats and water marks on tree trunks. The depression provides some stormwater storage.

Wetland 26 is located at the south end of the AOA southeast of Wetland 25. It is bounded on the east by the perimeter road. This wetland would classify as palustrine, emergent, and seasonally saturated. Bentgrass dominates this wetland. Associated species include tall fescue, common velvet-grass, curly dock, soft rush, and Himalayan blackberry. Although soils were dry at the time of the investigation (August 19, 1994), the presence of wetland hydrology was inferred from dried algal mats located in the center of the wetland.

Wetland 29 is located in the northwest portion of the south borrow area. This wetland would classify as palustrine, forested, broad-leaved deciduous, and seasonally flooded. The overstory is dominated by red alder. Salmonberry dominates the understory. Himalayan blackberry and Pacific blackberry occur as associated species. Lady fern, horsetail, tall mannagrass, reed canarygrass, and sword fern grow below the shrub layer. Soils consist of black (10YR 2/0) loam over very dark gray (10YR 3/1) gravelly sandy loam. The western boundary of this wetland occurs along the upper edge of a hillside seep. Water generally flows downhill to the east, where it collects in a depression. During wetter times of the year, water likely flows southeast from the depression via an intermittent stream. Soils were saturated and standing water was observed at a depth of 10 inches at the time of the investigation (December 1, 1994). Old building foundations are located at the wetland's north end, near the road.

Wetland 32 is located in the south borrow area at the northwest quadrant of the intersection of South 216th Street and 20th Avenue South. This wetland would classify as palustrine, emergent, and temporarily flooded. Bentgrass is the dominant species. Associated species include common velvet-grass, soft rush, dandelion, horsetail, Watson's willow-herb, and black cottonwood saplings. A weeping willow overhangs the north arm of this L-shaped wetland. Soils consist of dark brown (10YR 3/3) loam overlying olive brown (2.5Y 4/3) sandy loam with dark yellowish brown (10YR 3/6 and 4/6) rhizospheres. At the time of the investigation (December 1, 1994), soils were saturated to the surface and water was seeping into the observation hole at 5 inches below the surface. The source of hydrology for this wetland appears to be runoff from a road.

Wetland 53 is located in depression between the southern tip of the southernmost runway and Highway 99, between South 192nd Street and South 194th Street. This wetland was delineated by Parametrix, Inc. during November 1991 and is described in the *Port of Seattle South Aviation Support Area Final EIS, Technical Appendices* (1991). It is a palustrine, forested, broad-leaved, and deciduous wetland. Red alder dominates the overstory. Douglas spirea, Indian plum, and Himalayan and Pacific blackberry form a sparse shrub layer. Herbaceous vegetation includes dense horsetail, slough sedge, and bracken fern. Very dark gray (10YR 3/1) silt loam with brown mottles was observed. Wetland hydrology was not present at the time of the investigation.