

**I-405, SR 520 to SR 522 Stage 1 (Kirkland Stage 1) (Forbes
Lake West) Mitigation Site**

USACE IP 200401410

Northwest Region

2010 MONITORING REPORT

Wetland Assessment and Monitoring Program

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I-405, SR520 to SR522 Stage 1 (Kirkland Stage 1) (Forbes Lake West) Mitigation Site

USACE IP 200401410

	General Site Information				
	USACE IP Number	200401410			
	Mitigation Location	Adjacent to Forbes Lake in Kirkland, King County			
	LLID Number	1221811476844			
	Construction Date	2007-2008			
	Monitoring Period	2008-2017			
	Year of Monitoring	3 of 10			
	Type of Project Impact	Wetland			Buffer
	Area of Project Impact	1.56 acres			2.91
	Type of Mitigation¹	Wetland Establishment	Wetland Enhancement	Wetland Preservation	Upland Habitat Enhancement
Area of Mitigation	0.26 acre	0.46 acre	0.74 acre	0.75 acre	

¹Additional wetland acreage provided by two other mitigation sites, including I-405 Forbes Lake East and I-405 Thrasher’s Corner. See Appendix 3.

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Summary of Monitoring Results and Management Activities (2010)

Performance Standards	2010 Results ²	Management Activities
Wetland Hydrology	Partially present	
Woody density of four plants per 100 ft ² in the forested and scrub-shrub wetlands	5.6 plants per 100 ft ² (CI _{80%} = 5 - 6 plants per 100 ft ²)	Replanting occurred in Feb. 2011..
80% cover of FAC and wetter herbaceous species in the emergent zone	79% cover (CI _{80%} = 74 - 84%)	
King county noxious weeds not to exceed 20% in the wetland	Less than 5%	Herbicide application and manual removal of invasive species. April, Aug., and Dec. 2010.

Report Introduction

This report summarizes Year-3 monitoring activities at the Interstate 405 Forbes Lake West Mitigation Site. Included are a site description, the performance standards, an explanation of monitoring methods, and an evaluation of site development. Monitoring activities included vegetation surveys, photo-documentation on July 6th and 7th and assessments of wetland hydrology in February and March, 2010.

² Estimated values are presented with their corresponding statistical confidence interval. For example, 5.6 plants per 100 ft² (CI_{80%} = 5 - 6 plants per 100 ft²) means we are 80% confident that the true density value is between 5 and 6 plants per 100 ft².

What is the I-405 Forbes Lake West Mitigation Site?

This 2.2-acre mitigation site (Figure 1) was established as partial compensation for impacts to 1.56 of wetland and 2.91 acres of buffer due to road improvements along I-405 between State Route (SR) 520 and SR 522. The site was primarily designed to mitigate for lost wetland habitat functions.

Two other mitigation sites provide additional compensation for project impacts: I-405 Forbes Lake East and I-405 Thrasher’s corner. To view a table detailing mitigation acreage at the three projects, see Appendix 3, Table 3.

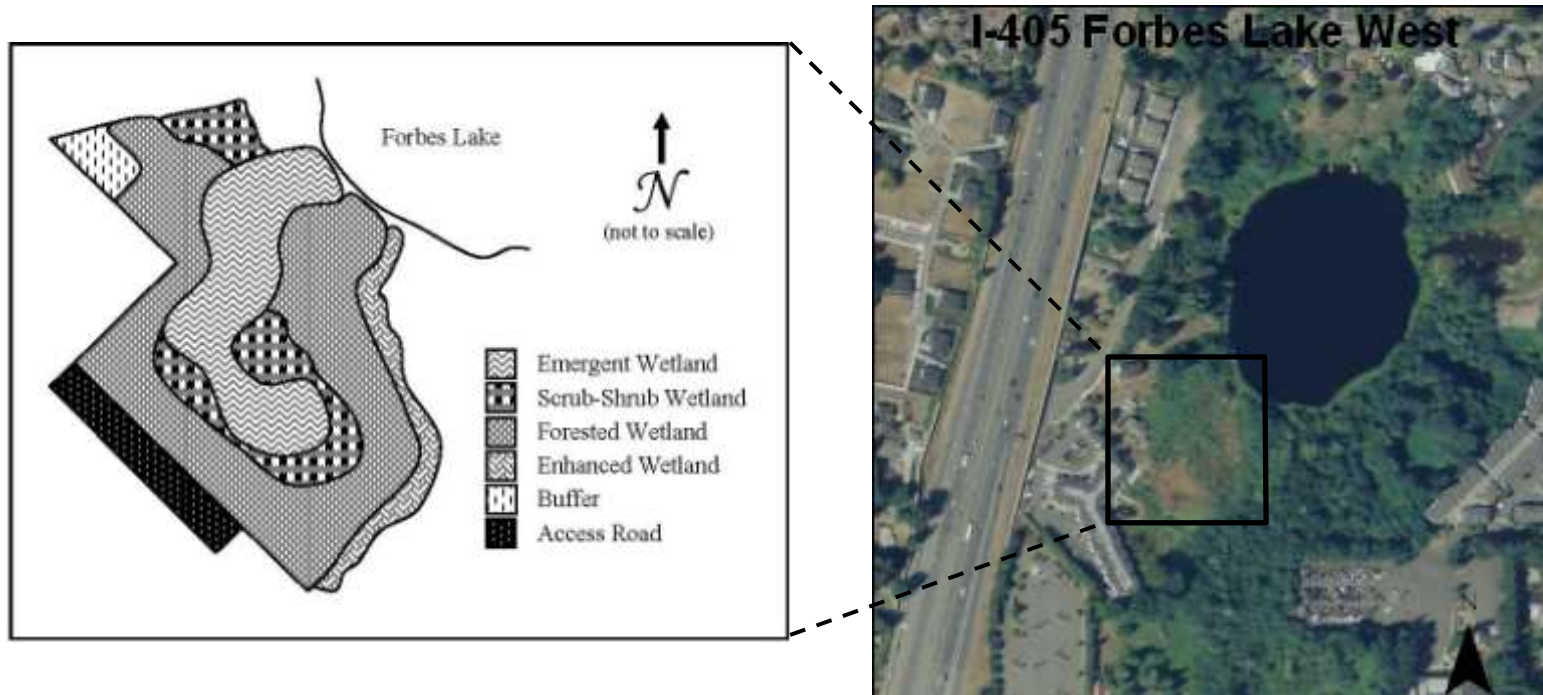


Figure 1 Site Sketch

The I-405 Forbes Lake West Mitigation site is adjacent to Forbes Lake on the southwest shoreline. An emergent area runs from the lakeshore down the center of the site, with a scrub-shrub zone bordering the southern half. The rest of the site is planted as forested wetland except for a small upland buffer area located in the northwestern corner.

What are the performance standards for this site?

Performance Standard 1

Soils will be saturated to the surface, or standing water will be present in a monitoring well at 12 inches below the surface or less for at least 2 consecutive weeks (5 percent) of the growing season in years when rainfall meets or exceeds the 30-year average, or hydrology will be present sufficient to support facultative or wetter vegetative species within the wetland as demonstrated by the vegetative performance measures.

Performance Standard 2

Native woody species (planted and volunteer) will maintain a stem density of four plants per 100 square feet in the forested and scrub-shrub wetlands.

Performance Standard 3

After three years, aerial cover of emergent (facultative and wetter) plant species will be at least 80 percent in the emergent wetland zone.

Performance Standard 4

Species identified as King County-listed noxious and obnoxious weeds, including, but not limited to, reed canarygrass, non-native blackberries, purple loosestrife, Scot's broom, and Japanese knotweed will not exceed 20 percent aerial cover in the wetland creation areas. If this cover threshold is exceeded, weed control measures will be implemented. Emergent areas will be planted with trees and shrubs if invasive plant management is unsuccessful in the emergent zones.

Appendix 1 provides the complete text of the performance standards for this project, and Appendix 4 shows the as-built planting plan (Meyers 2008).

How were the performance standards evaluated?

WSDOT staff collected hydrology data using methods described in the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997) (Performance Standard 1). Eight permanent hydrology pit locations were established in Year-1 of monitoring and recorded on a map (Appendix 3, Figure 3). During each monitoring visit, visual observations are made to determine the extent of inundation and surface saturation. Depth and location of standing water is recorded. At each pit location, in the absence of inundation or surface saturation, subsurface observations are made.

To evaluate standards for vegetative cover, a baseline was established through the middle of the site (Figure 2). Twenty-four sampling transects were randomly placed perpendicular to the baseline. The unequal-belt transect method was used to determine woody density (Performance Standard 2), and the point intercept method was used to determine herbaceous cover (Performance Standard 3). Photographs were taken to evaluate tree and shrub growth in the scrub-shrub wetland (Appendix 5).

The cover of invasive King County-listed noxious and obnoxious weeds was evaluated qualitatively due to the low amount of cover observed during monitoring (Performance Standard 4).

For additional details on the methods, see Appendix 2 of this report or view the [WSDOT Wetland Mitigation Site Monitoring Methods Paper](#) (WSDOT 2008).

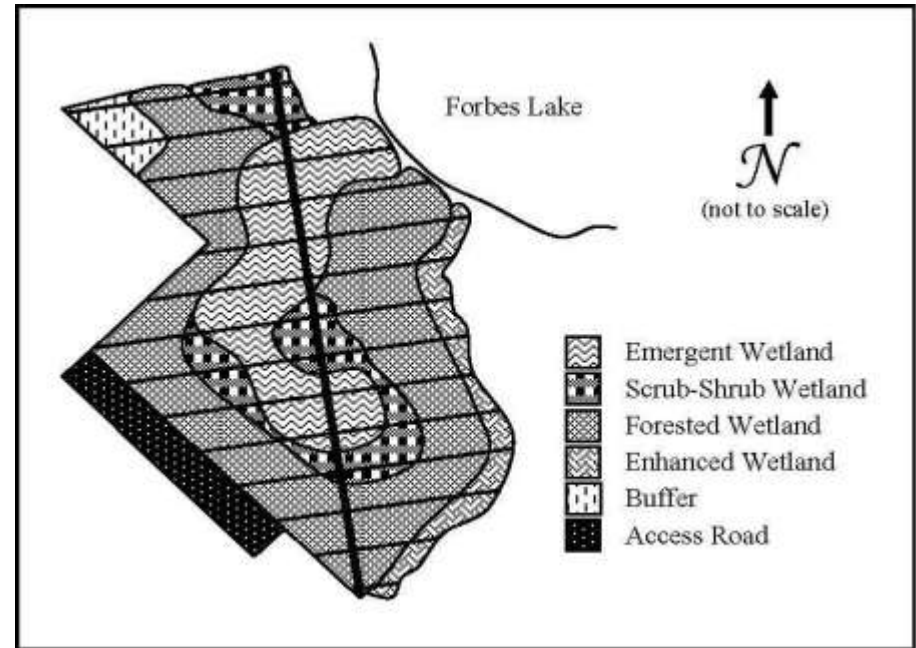


Figure 2 Site Sampling Design (2010)

How is the site developing?

This site is developing as planned. The forested and scrub-shrub zones have achieved the density requirements for Year-3 and the species present are thriving. The emergent zone is thriving as well despite concerns regarding invasive species and colonization of black cottonwood (*Populus balsamifera* ssp. *Trichocarpa*) seedlings. There are still many new seedlings in the emergent area, but they appear to be less than one year old suggesting that they die off each year when the water rises. The cottonwood seedlings do not appear to be negatively impacting the emergent community at this time.

There has been some concern regarding the hydrology at this site and its effect on total required acreage. An adjustment was made to the acreage at this site (Appendix 3, Table 3). WSDOT plans to delineate this site in spring 2011. Beaver activity has been observed through summer, fall, and winter by crew and design staff. During the summer vegetation monitoring visit, a beaver dam was observed just off the southern corner of the forested wetland. This resulted in inundation in the forested wetland and could possibly change the results of a delineation. In response to the vegetation damage that has occurred as a result of the beaver presence, replanting efforts were made in February, 2011.

The site is providing wildlife habitat and food chain support. Several species of birds and deer sign were observed during monitoring. Beaver and a beaver dam have also been observed during monitoring visits.

Results for Performance Standard 1
(Wetland Hydrology):

Based on our three hydrology visits in February and March, 2010 we did not achieve the hydrology standard this year. The second and third visits on March 9th and 24th showed two of six and three of six pits not meeting the wetland hydrology criteria (see results in Appendix 3, Table 1). However, the antecedent weather conditions showed that there was limited precipitation in the periods preceding the March visits (Appendix 3, Table 2). This may explain not meeting the performance standard.

During the course of our summer monitoring visit, we observed a beaver dam constructed in the south corner of the site. This has resulted in inundation in an area that was previously dry (Photo 1).

Results for Performance Standard 2
(Woody density of four plants per 100 ft² in the forested and scrub-shrub wetlands):

The density of woody species in the scrub-shrub and forested wetlands is 5.6 plants per 100 ft² (CI_{80%} = 5 - 6 plants per 100 ft²). Dominant species in these zones include black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), red alder (*Alnus rubra*), roses (*Rosa* spp.), and Pacific ninebark (*Physocarpus capitatus*). Most plants displayed vigorous growth (Photo 2).



Photo 1
Beaver dam inundation near the forested wetland
(July 2010)



Photo 2
Scrub-shrub cover in the wetland (July 2010)

Results for Performance Standard 3

(80% cover of FAC and wetter herbaceous species in the emergent zone):

The data was analyzed utilizing two separate approaches. The rationale for this approach is that the standard does not specifically state that the emergent species in the cover estimate are required to be native, however the objective is to establish native vegetative communities. Therefore both numbers are provided, native only and non-native included.

The aerial cover of native species only is 79% cover ($CI_{80\%} = 74 - 84\%$). The aerial cover inclusive of non-native species is 86% ($CI_{80\%} = 81 - 90\%$).

Dominant native species include hardstem bulrush (*Schoenoplectus acutus*), soft rush (*Juncus effusus*), and small-fruited bulrush (*Scirpus microcarpus*) (Photo 3). The dominant non-native species removed from the data set were bird's-foot trefoil (*Lotus corniculatus*) and meadow foxtail (*Alopecurus pratensis*).



Photo 3
Emergent cover in Wetland (July 2010)

Results for Performance Standard 4

(King county noxious weeds not to exceed 20% in the wetland):

Cover of invasive species was qualitatively estimated at less than five percent across the wetland. Species observed include reed canarygrass (*Phalaris arundinacea*), Himalayan blackberry (*Rubus armeniacus*), and Scotch broom (*Cytisus scoparius*). Most concentrations of these species were observed on the edges of the site. Evidence of invasive species management was observed across this site.

What is planned for this site?

Monitoring of beaver activity is planned, continued weed control is through the 2011 growing season, and replanting as necessary to meet the performance standards. A delineation is planned for the spring 2011.

Appendix 1 – Goals and Performance Standards

The following excerpt is from the *I-405, SR520 to SR 522 Stage 1 (Kirkland Stage 1) Wetlands Mitigation Plan* (WSDOT 2005). The performance criteria addressed this year are identified in **bold** font.

GOALS AND OBJECTIVES

Mitigation Goals

The mitigation goals for the Forbes Lake West site include:

- Establish native tree, shrub, and/or groundcover vegetation communities (emergents, herbs, and ferns) in the wetland creation and enhancement areas;
- Establish native tree, shrub, and/or groundcover vegetation communities in the wetland buffer areas;
- Establish wetland hydrology in the wetland creation areas.
- Provide improved wildlife habitat through the installation of standing dead coniferous snags for perching and nesting opportunities for birds; and installation of large woody debris for cover opportunities for small mammals, birds, and amphibians.

Objective – Hydrology

Establish wetland hydrology in a minimum of 0.561 acre.

Interim Performance Measures (Monitoring Years 1-9)

Soils will be saturated to the surface, or standing water will be present in a monitoring well at 12 inches below the surface or less for at least 2 consecutive weeks (5 percent) of the growing season in years when rainfall meets or exceeds the 30-year average, or hydrology will be present sufficient to support facultative or wetter vegetative species within the wetland as demonstrated by the vegetative performance measures.

Success Standard (Year 10)

Wetland areas will be delineated using methods described in the Washington State Wetlands Identification Manual (Ecology, 1997) to assure that the mitigation site contains at least 1.425 acre of created and enhanced wetland.

Objective – Wetland Vegetation

Establish native tree, shrub, and/or groundcover vegetation communities (emergents, herbs, and ferns) in the wetland creation and enhancement areas.

Interim Performance Measures

Performance Measure 1 (Year 1): Planted woody species in the wetland will achieve 100 percent survival at the end of the first year plant establishment period. If all dead woody plantings are replaced, the performance measure will be met.

Performance Measure 2 (Year 3): Native woody species (planted and volunteer) will maintain a stem density of four plants per 100 square feet in the forested and scrub-shrub wetlands.

Performance Measure 3 (Year 5): After five years, aerial cover of native woody species will be at least 50 percent in the forested and scrub-shrub wetlands, of this area no more than 30 percent will be volunteer red alder.

Performance Measure 4 (Year 5): At least three native, non-invasive facultative or wetter plant species will achieve a minimum of 5 percent relative cover for each species in the emergent wetland zone by Year 5.

Performance Measure 5 (Year 5): At least three native, non-invasive facultative or wetter plant species will achieve a minimum of 5 percent relative cover for each species in the forested and scrub-shrub wetland zones by Year 5.

Performance Measure 6 (Years 1-9): Species identified as King County-listed noxious and obnoxious weeds, including, but not limited to, reed canarygrass, non-native blackberries, purple loosestrife, Scot's broom, and Japanese knotweed will not exceed 20 percent aerial cover in the wetland creation areas. If this cover threshold is exceeded, weed control measures will be implemented. Emergent areas will be planted with trees and shrubs if invasive plant management is unsuccessful in the emergent zones.

Success Standards

Success Standard 1 (Year 3): After three years, aerial cover of emergent (facultative and wetter) plant species will be at least 80 percent in the emergent wetland zone.

Success Standard 2 (Year 10): After 10 years, aerial cover of native woody species will be at least 80 percent in the forested and scrub-shrub wetlands, of this area no more than 30 percent will be volunteer red alder.

Success Standard 3 (Year 10): At least three native, non-invasive facultative or wetter plant species will achieve a minimum of 8 percent relative cover for each species in the emergent wetland zone by Year 10.

Success Standard 4 (Year 10): At least three native, non-invasive facultative or wetter plant species will achieve a minimum of 10 percent relative cover for each species in the forested and scrub-shrub wetland zones by Year 10.

Success Standard 5 (Years 1-9): Species identified as King County-listed noxious and obnoxious weeds, including, but not limited to, reed canarygrass, non-native blackberries, purple loosestrife, Scot's broom, and Japanese knotweed will not exceed 20 percent aerial cover in the wetland creation areas. If this cover threshold is exceeded, weed control measures will be implemented. Emergent areas will be planted with trees and shrubs if invasive plant management is unsuccessful in the emergent zones.

Appendix 2 – Methods

WSDOT staff collected hydrology data using methods described in the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997) (Performance Standard 1). Eight permanent hydrology pit locations were established in Year-1 of monitoring and recorded on a map. During each monitoring visit, visual observations are made to determine the extent of inundation and surface saturation. Depth and location of standing water is recorded. At each pit location, in the absence of inundation or surface saturation, subsurface observations are made.

To assess wetland woody density and herbaceous cover standards, a 120-meter baseline was established north to south through the middle of the site. Twenty-four temporary sampling transects were placed perpendicular to the baseline using a systematic random sampling method (Figure 2). Density of woody species in the forested and scrub-shrub zones (Performance Standard 2) was assessed using the unequal belt transect method. The point intercept method was used to determine aerial cover of herbaceous species in the emergent zone (Performance Standard 3). To determine cover in the emergent wetland, Twenty-six randomly positioned five-meter point-line sample units (20 points each) were placed along sampling transects in this zone.

Sample size analysis confirmed sufficient sampling had been completed based on site sampling objectives and the desired level of statistical confidence. The sample size equation shown here (below) was used to perform the analysis on data collected (Performance Standard 3). In this equation, the precision level (B) equals half the maximum acceptable confidence interval width multiplied by the sample mean.

$$n = \frac{(z)^2 (s)^2}{(B)^2}$$

n = unadjusted sample size
 z = standard normal deviate
 s = sample standard deviation
 B = precision level

For additional details on the methods view the [WSDOT Wetland Mitigation Site Monitoring Methods Paper](#) (WSDOT 2008).

Appendix 3 – Data Tables

Table 1 Hydrology Observations

Date	Surface Observations	Subsurface Observations	
February 24, 2020	EM area inundated to 1-2". Minimal saturation and inundation in PSS/PFO zones.	Pit 1	Standing water at 14" and saturation at 11" after 35 minutes.
		Pit 2	Standing water at 9.5" after 30 minutes
		Pit 3	Inundated to 1" above the surface
		Pit 4	Standing water at 10"
		Pit 5	Eliminated (non-wetland area per NWR, USACE agreement)
		Pit 6	Solinst measurement - water at 12"
		Pit 7	Eliminated (non-wetland area per NWR, USACE agreement)
		Pit 8	Standing water at 14" and saturation at 12" after 35 minutes.
March 9, 2010	EM area inundated to 1-2". Minimal saturation and inundation in PSS/PFO zones.	Pit 1	standing water at 14"
		Pit 2	standing water at 10.5"
		Pit 3	Inundated to 1" above the surface
		Pit 4	saturated to the surface
		Pit 5	Eliminated (non-wetland area per NWR, USACE agreement)
		Pit 6	Solinst measurement - water at 13"
		Pit 7	Eliminated (non-wetland area per NWR, USACE agreement)
		Pit 8	Standing water at 14" and saturation at 12"
March 24, 2010	PEM inundated up to 4" deep. Some of PSS/PFO zones saturated or shallowly inundated at S end of PEM zone.	Pit 1	Standing water at 18" and saturation at 15" after 30 minutes.
		Pit 2	Standing water at 9" after 25 minutes.
		Pit 3	Inundated to 1"
		Pit 4	saturated to the surface
		Pit 5	Eliminated (non-wetland area per NWR, USACE agreement)
		Pit 6	Solinst measurement - water at 14"
		Pit 7	Eliminated (non-wetland area per NWR, USACE agreement)
		Pit 8	Standing water at 14.5" and saturation at 14" after 30 minutes.

Figure 3. Hydrology Pit Map

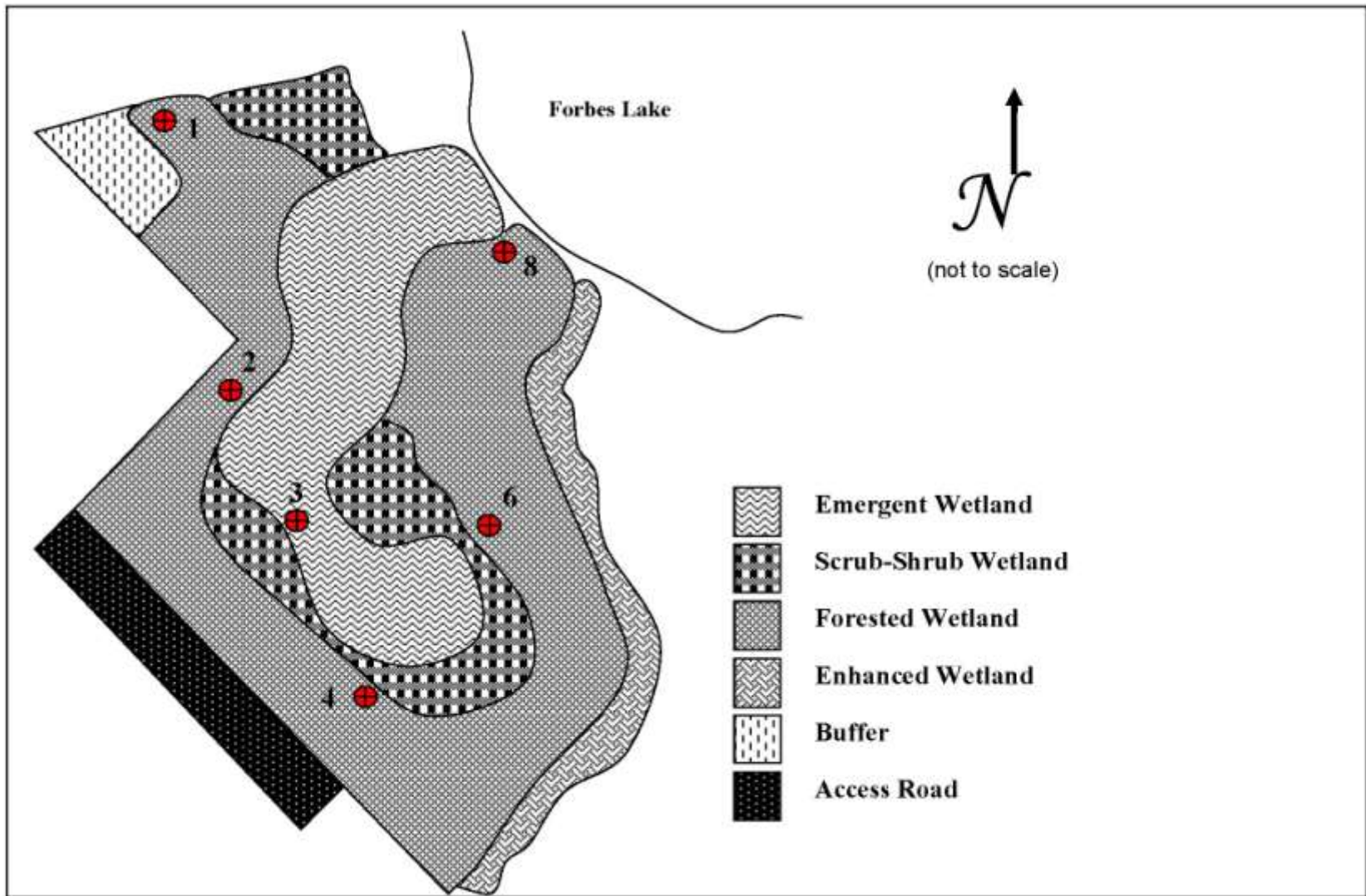


Table 2 – Rainfall graph from February 1, 2010 to March 31, 2010 located at North Rose Hill, Kirkland, weather station KWAKIRKL8.

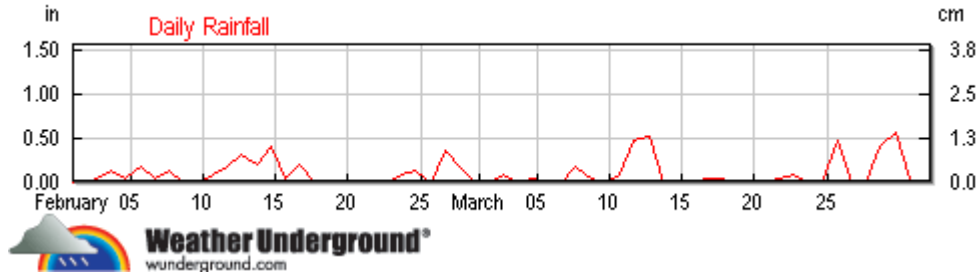


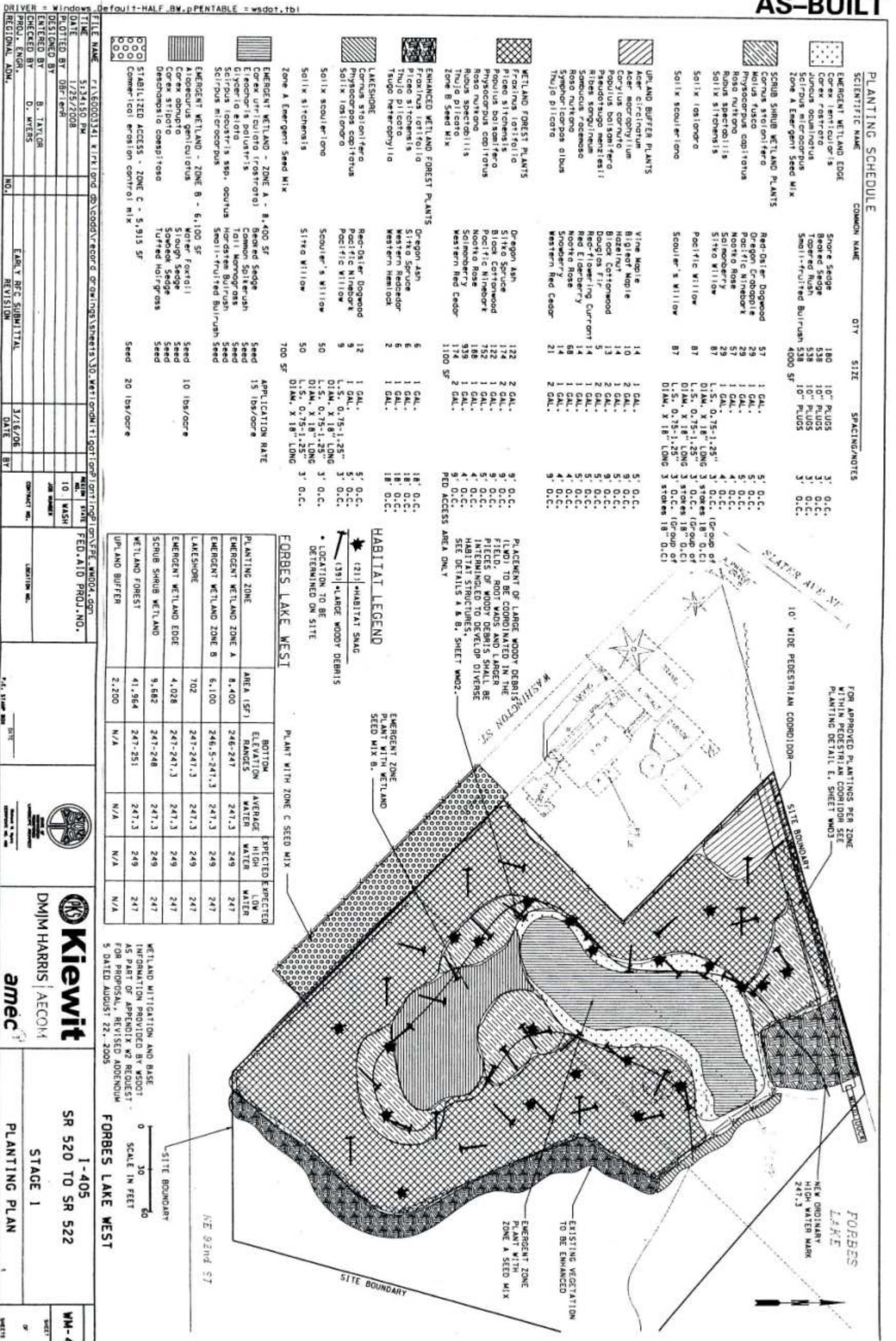
Table 3 – Constructed Mitigation Acreage at Wetland Mitigation Sites Associated with the I-405, SR 520 to SR 522 Stage 1 (Kirkland Stage 1) Project

Wetland Mitigation Site	Mitigation Type	Proposed Mitigation (acres)	Changes to Proposed Mitigation (acres)	Constructed Mitigation (acres)
Forbes Lake West	Establishment	0.56	-0.30	0.26
	Enhancement	0.86	-0.40	0.46
	Preserve	0.74		0.74
	Buffer	0.05	0.70	0.75
Forbes Lake East	Establishment	1.62		1.62
	Enhancement	0.57		0.57
	Buffer	1.49		1.49
Thrasher’s Corner	Establishment	0.21	-0.01	0.20
	Enhancement	0.72		0.72
	Preserve	3.22		3.22
	Buffer	0.00	0.01	0.01

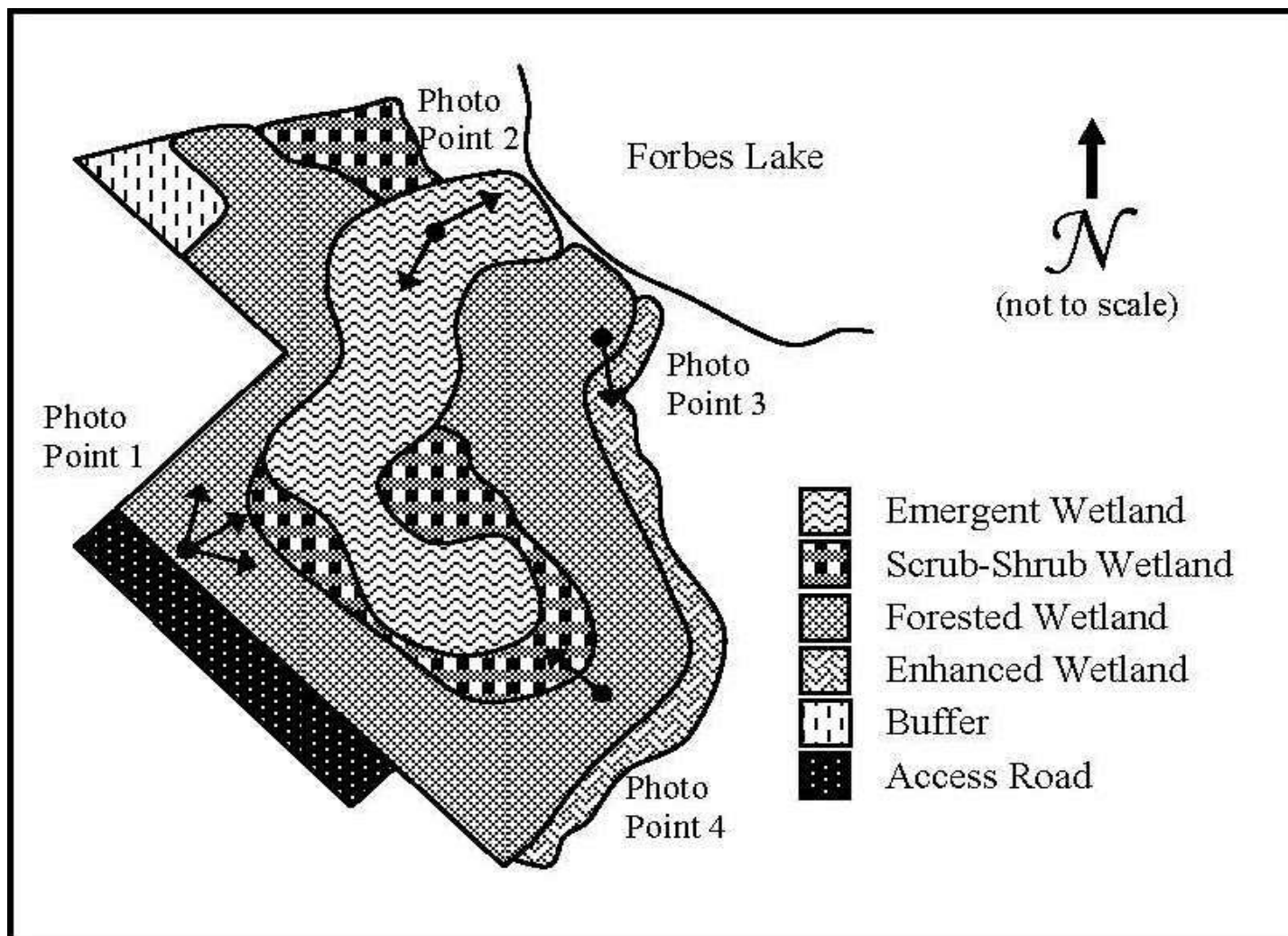
Appendix 4 – As-Built Planting Plan

(Myers 2008)

AS-BUILT



Appendix 5 – Photo Points



The photographs below were taken from permanent photo-points on July 7th, 2010 and document current site development.



Photo Point 1a



Photo Point 1b



Photo Point 1c



Photo Point 2a



Photo Point 2b



Photo Point 3



Photo Point 4

Literature Cited

1. Ecology. See Washington State Department of Ecology.
2. Stehman, S. and D. Salzer. 2000. Estimating Density from Surveys Employing Unequal-Area Belt Transects. *Wetlands*. Vol. 20, No. 3, pp. 512-519. The Society of Wetland Scientists, McLean, VA.
3. Myers RW. 2008. I-405, SR520 to SR522 stage 1 (Forbes Lake West) as-built planting plan.
4. United States Army Corps of Engineers. 2004. Department of the Army Individual Permit Number 200401410.
5. Washington State Department of Ecology (Ecology). 1997. Washington State wetlands identification and delineation manual. Olympia (WA): Washington State Department of Ecology. Ecology Publication No.96-94.
6. Washington State Department of Transportation (WSDOT). I-405, SR 520 to SR 522 Stage 1 (Kirkland Stage 1) Wetlands Mitigation Plan. 2005. WSDOT Urban Corridors Office, Bellevue, WA
7. Washington State Department of Transportation (WSDOT) WSDOT Wetland Mitigation Site Monitoring Methods (12 June 2008). <http://www.wsdot.wa.gov/NR/rdonlyres/C211AB59-D5A2-4AA2-8A76-3D9A77E01203/0/MethodsWhitePaper052004.pdf>
8. Weather Underground [Internet]. 2010. Weather history data – Washington State weather stations. Available from: <http://www.wunderground.com/weatherstation/ListStations.asp?selectedState=WA&selectedCountry=United+States>