

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

**USACE IP 200401410**

**Northwest Region**

**2010 MONITORING REPORT**

**Wetland Assessment and Monitoring Program**

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Department of Transportation**

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

**USACE IP 200401410**

	General Site Information		
	<b>USACE IP Number</b>	200401410	
	<b>Mitigation Location</b>	East of Forbes Lake in Kirkland, King County.	
	<b>LLID Number</b>	1221766476864	
	<b>Construction Date</b>	2006-2007	
	<b>Monitoring Period</b>	2008-2017	
	<b>Year of Monitoring</b>	3 of 10	
	<b>Type of Impact</b>	Wetland	Buffer
	<b>Area of Project Impact</b>	1.56 acres	2.91 acres
	<b>Type of Mitigation</b>	Wetland Establishment	Wetland Enhancement
	<b>Area of Mitigation<sup>1</sup></b>	1.628 acres	0.572 acre
	<b>Type of Mitigation</b>	Upland Habitat Enhancement	
	<b>Area of Mitigation</b>	1.49 acres	

<sup>1</sup>Additional wetland acreage provided by two other mitigation sites, including I-405 Forbes Lake West and I-405 Thrasher’s Corner. See Appendix 4.

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## Summary of Monitoring Results and Management Activities (2010)

Performance Standards	2010 Results <sup>2</sup>	Management Activities
Wetland hydrology present	Not present in all intended areas.	
Four plants per 100 square feet in the forested and scrub-shrub wetlands.	19 plants/100ft <sup>2</sup> (CI <sub>80%</sub> = 17-22)	Replanting occurred Feb. 2011..
Aerial cover of emergent (facultative and wetter) plant species will be at least 80 percent in the emergent wetland zone.	Native 62% (CI <sub>80%</sub> = 54-70) cover Non-native 80% (CI <sub>80%</sub> = 73-87) cover	
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.	Qualitatively estimated at 3 percent cover.	Two weed control efforts occurred in 2010.

## Report Introduction

This report summarizes third-year (Year-3) monitoring activities at the Interstate (I) 405 Forbes Lake East Wetland 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, and assessments of wetland hydrology. Vegetative monitoring occurred on the 6<sup>th</sup> and 7<sup>th</sup> of July, 2010 and hydrology visits occurred on February 24<sup>th</sup>, March 9<sup>th</sup> and 24<sup>th</sup>, 2010.

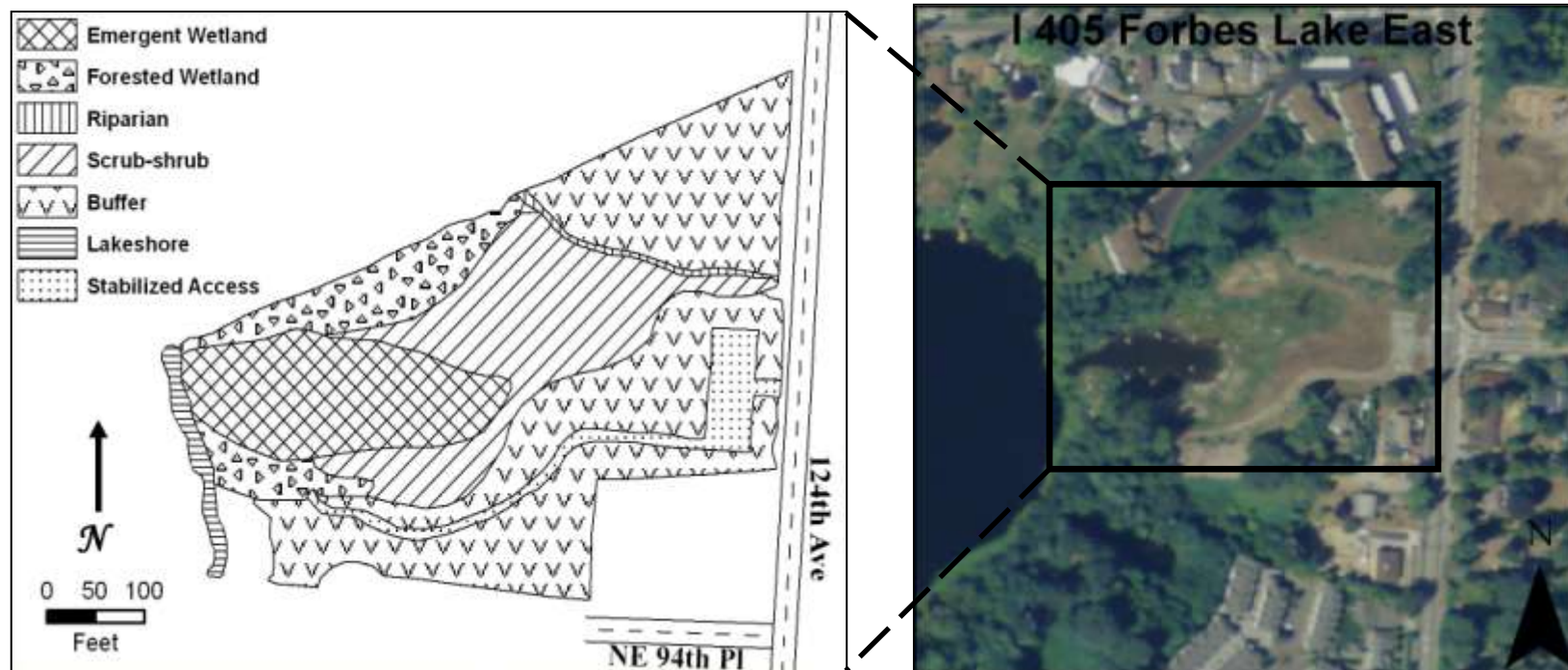
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<sup>2</sup> Estimated values are presented with their corresponding statistical confidence interval. For example, 19 plants/100ft<sup>2</sup> (CI<sub>80%</sub> = 17-22) means we are 80% confident that the true density value is between 17 and 22 plants/100ft<sup>2</sup>.

## What is the I-405 Forbes Lake East Mitigation Site?

This 3.7-acre mitigation site (Figure 1) was established as partial compensation for impacts to 1.56 acres 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 West and I-405 Thrasher's Corner. To view a table detailing mitigation acreage at the three projects, see Appendix 4.



**Figure 1 Site Sketch**

The I-405 Forbes Lake East Mitigation Site borders Forbes Lake. A low emergent area butts up against the permanently inundated area and is surrounded by forested and scrub-shrub wetland. The eastern side of the site is bisected by an intermittent stream flowing north. A long driveway follows the buffer and provides access to the site.

## **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 5 shows the as-built planting plan (WSDOT 2008).

## How were the performance standards evaluated?

To evaluate standards for vegetative cover, a baseline was established diagonally through the center of the site (Figure 2). Twenty-four sampling transects were randomly placed perpendicular to the baseline. The unequal-area belt transect method was used to estimate woody density (Performance Standard 2), and the point intercept method was used to estimate herbaceous cover (Performance Standard 3). Photographs were taken to evaluate tree and shrub growth in the scrub-shrub wetland (Appendix 6).

Cover of 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 was qualitatively estimated (Performance Standard 4).

WSDOT staff collected hydrology data using methods described in the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997) (Performance Standard 1). 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 (Appendix 3).

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

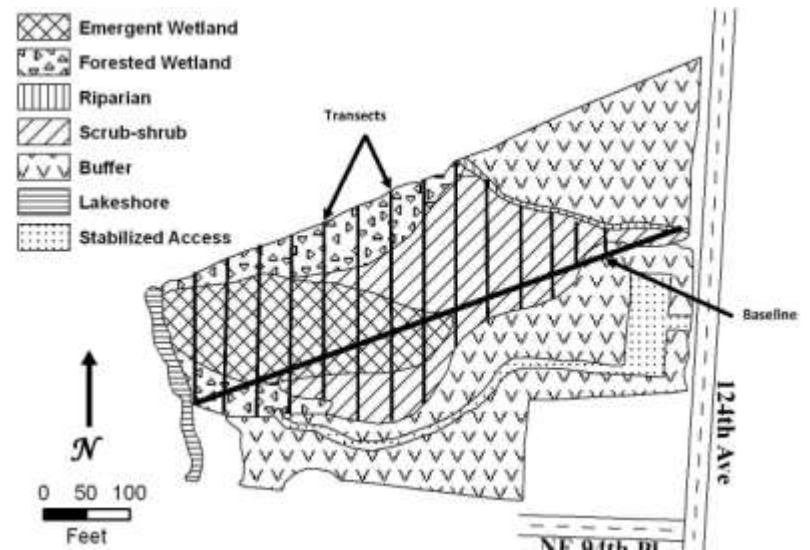


Figure 2 Site Sampling Design (2010)

## How is the site developing?

This site has not developed as planned. Intended hydroperiods do not match on-the-ground conditions. A significant portion of the intended emergent zone has developed as an open water component (Photo 1 – next page). The result is that the emergent zone has expanded into the scrub/shrub zone and there has been a decrease in the acreage intended within the scrub/shrub. Despite the alteration in zone configuration the site is developing a diverse plant community in the established wetland and has a low cover of invasive species.

Functions of wildlife habitat and food chain support are being supported. Willows (*Salix* sp), red alder (*Alnus rubra*), and redosier dogwood (*Cornus sericea*) are dominant species in the wetland, providing cover and foraging opportunities for wildlife. Twenty-one species of birds have been observed during the 3-year monitoring period. Deer and numerous species of dragonflies have also been observed on site.

Results for Performance Standard 1

(Site demonstrates adequate wetland hydrology):

Based on our three hydrology visits in the months of February and March, 2010 we did not achieve the hydrology standard this year. On all three visits we did not meet the hydrology standard at two of six sampling points. Both of the sampling points are located in the areas intended as palustrine forested wetlands (see results in Appendix 3). In 2010, rainfall was within the range of the 30 year average.

Results for Performance Standard 2

(4 plants per 100 ft<sup>2</sup> in the forested and scrub-shrub wetlands):

Native woody density within the scrub-shrub and forested wetland is estimated to be 19 plants/100ft<sup>2</sup> (CI<sub>80%</sub> = 17-22). This value significantly exceeds the performance standard target. Recruitment of willows (*Salix* species) in the southwest portion of the site contributes to this high density. The dominant native woody species are willows (*Salix* species) with red alder (*Alnus rubra*), redosier dogwood (*Cornus sericea*), and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) as sub-dominants.

Results for Performance Standard 3

(Aerial cover of emergent (facultative and wetter) plant species will be at least 80 percent in the emergent wetland 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 62 percent (CI<sub>80%</sub> = 54-70). The aerial cover inclusive of non-native species is 80 percent (CI<sub>80%</sub> = 73-87).

Dominant native species include hardstem bulrush (*Schoenoplectus acutus*), soft rush (*Juncus effusus*), and small-fruited bulrush (*Scirpus microcarpus*) (Photo 2 – next page). The dominant non-native species removed from the data set were bird’s-foot trefoil (*Lotus corniculatus*) and meadow foxtail (*Alopecurus pratensis*).



**Photo 1**  
**Inundated area intended to be the emergent zone**  
**(July 2010)**

Results for Performance Standard 4

(Noxious and obnoxious weeds will not exceed 20 percent aerial cover):

The cover of invasive species in the wetland establishment area was qualitatively estimated at three percent. Species observed include Himalayan blackberry (*Rubus armeniacus*), bull thistle (*Cirsium vulgare*), reed canarygrass (*Phalaris arundinacea*), and yellowflag iris (*Iris pseudacorus*). The majority of the invasives are located along the perimeter of the site and along the edge of Forbes Lake. This value is well below the performance standard threshold.



**Photo 2  
Emergent cover in Wetland (July 2010)**

**What is planned for this site?**

A wetland delineation is planned for the spring 2011. Weed control is planned through the 2011 growing season and replacement plantings as necessary to achieve performance standards.

# Appendix 1 – Goals and Performance Standards

The following excerpt is from the *I-405, SR 520 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 East 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 1.616 acres.

### **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 2.188 acres 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**

## PERMIT REQUIREMENTS

The following excerpt is from the *Washington State Department of Fish and Wildlife Hydraulic Project Approval 100242-5*. Requirements addressed this year are identified in bold font.

### Unnamed Tributary to Forbes Lake – Culvert Removal and Channel Change Provisions

Within seven (7) calendar days of project completion all disturbed area shall be protected from erosion using vegetation or other means. Within one year of project completion, the banks shall be re-vegetated with native or other approved woody species, **Vegetative cuttings shall be planted at a maximum interval of three feet (on center) and maintained as necessary for three years to ensure 80 percent survival.**

Forbes Lake – Shoreline Excavation Provisions

Within seven (7) calendar days of project completion, all disturbed areas shall be protected from erosion using vegetation other means. Within one year of project completion, the banks shall be re-vegetated with native or other approved woody species.

**Vegetative cuttings shall be planted at a maximum interval of three feet (on center) and maintained as necessary for three years to ensure 80 percent survival.**

# Appendix 2 – Methods

To evaluate standards for vegetative cover, a baseline was established diagonally through the center of the site (Figure 2). The unequal-belt transect method was used to estimate woody density (Performance Standard 2). Twenty-four one-meter sampling transects were randomly placed perpendicular to the baseline. The point intercept method was used to estimate herbaceous cover (Performance Standard 3). Twenty-five five-meter sample units were randomly placed perpendicular to the baseline. Twenty points with 0.25m spacing were sampled per sample unit. Photographs were taken to evaluate tree and shrub growth in the scrub-shrub wetland (Appendix 5).

Cover of 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 was qualitatively estimated (Performance Standard 4).

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

WSDOT staff collected hydrology data using methods described in the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997) (Performance Standard 1). 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.

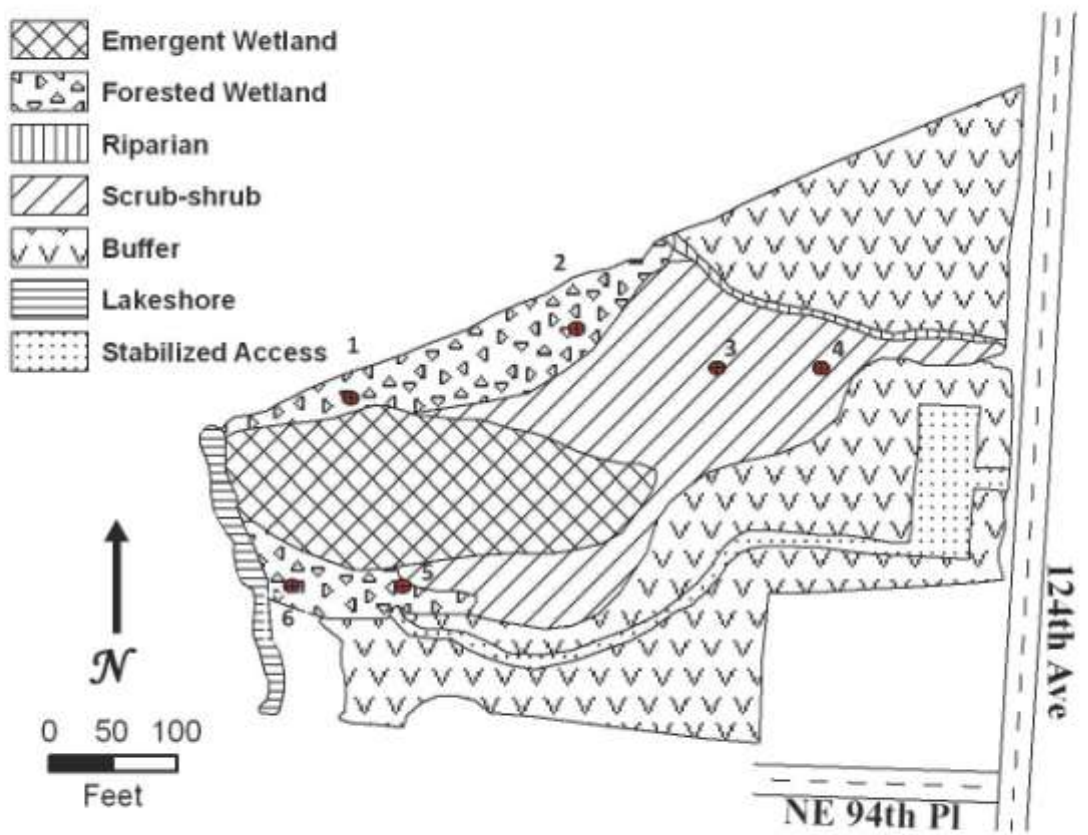
For additional details on the methods view the [WSDOT Wetland Mitigation Site Monitoring Methods Paper](#) (WSDOT 2008).

# Appendix 3 – Hydrology

Table 1- Hydrology Observations

Hydrology Observations For SR 405 Forbes Lake East			
<b>Date</b>	2/24/2010	3/9/2010	3/24/2010
<b>Observer</b>	DL, SP	TM, DL	DL, SP
<b>Was wetland hydrology observed in intended areas</b>	No	No	No
<b>Surface observation</b>	Hydrology was not present in all intended areas. EM zone was inundated and PSS was saturated to the surface. Both PFO zones lacked hydrology.	Hydrology was not present in all intended areas. EM zone was inundated and PSS was saturated to the surface. Both PFO zones lacked hydrology.	PEM inundated PSS saturated to the surface. PFO- no hydrology
<b>Subsurface Observations</b>			
<b>Pit 1</b>	Standing water at 22" and saturation at 17" after 30 minutes.	None	None
<b>Pit 2</b>	None.	None	None
<b>Pit 3</b>	Saturation to the surface	Saturation to the surface	Saturated to the surface
<b>Pit 4</b>	Saturation to the surface	Saturation to the surface	Saturated to the surface
<b>Pit 5</b>	Solinst measurement - water at 9.5"	Solinst measurement - water at 12.5"	Solinst measurement - water at 13.5"
<b>Pit 6</b>	None.	None.	None
<b>water marks</b>	None.	None.	None.

# Hydrology Pit Map

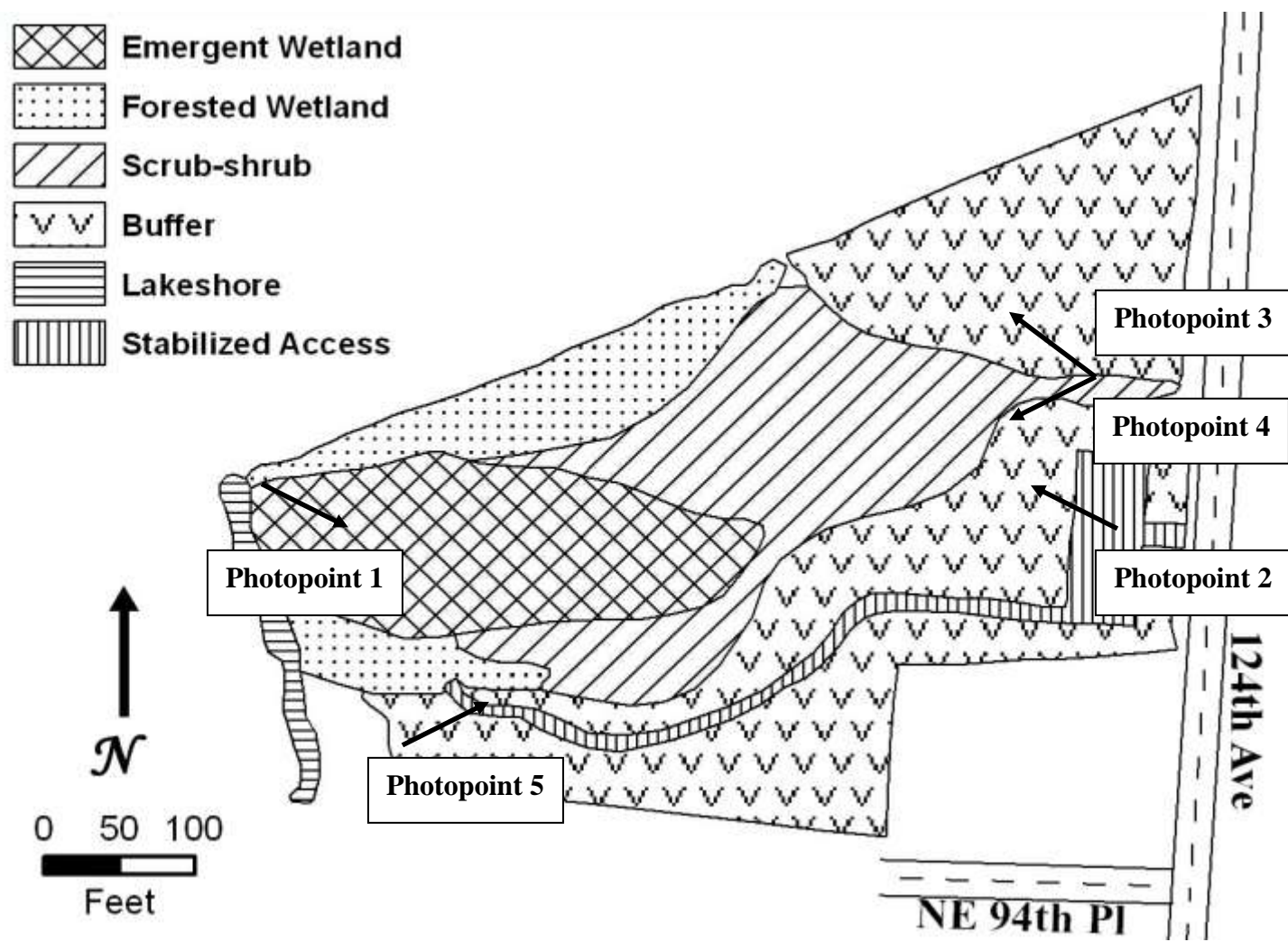


## Appendix - 4 Constructed Mitigation Acreage at Wetland Mitigation Sites Associated with the I-405, SR 520 to SR 522 Stage 1 (Kirkland Stage 1) Project

Site	Mitigation Type	Proposed	Changes	Constructed
<b>Forbes Lake West</b>	Creation	0.56	-0.30	0.26
	Enhancement	0.86	-0.40	0.46
	Preservation	0.74		0.74
	Buffer/upland	0.05	0.70	0.75
<b>Forbes Lake East</b>	Creation	1.62		1.62
	Enhancement	0.57		0.57
	Buffer/upland	1.49		1.49
<b>Thrashers</b>	Creation	0.21	-0.01	0.20
	Enhancement	0.72		0.72
	Preservation	3.22		3.22
	Buffer/upland	0.00	0.01	0.01



# Appendix 6 – Photo Point Locations



# Photo Points

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



**Photo Point 1**



**Photo Point 2**



**Photo Point 3**



**Photo Point 4**

The photograph below was taken from a permanent photo-point on July 7<sup>th</sup>, 2010 and document current site development.



**Photo Point 5**

## 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.
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