Appendix J Wetland Hydrology and Soil Analysis for Offsite Wetland Establishment Areas

Memorandum

Date:	July 29, 2010
To:	Dave Wickens U.S. Army Corps of Engineers - San Francisco District 1455 Market Street San Francisco, CA 94103-1398
Cc:	Laurie Monarres, U.S. Army Corps of Engineers Melissa Scianni, U.S. Environmental Protection Agency Jeremiah Puget, North Coast Regional Water Quality Control Board Craig Martz, California Department of Fish and Game
From:	Shanna Zahner California Department of Transportation
Subject:	**Willits Bypass Project – Hydrology at Proposed Wetland Establishment Sites in Little Lake Valley**

1 Introduction

The Willits Bypass Project (bypass project) has several compensatory mitigation components, including wetland establishment. As part of the Clean Water Act (CWA) Section 404 individual permit process for the bypass project, the U.S. Army Corps of Engineers (Corps) has requested information related to hydrology at the six offsite mitigation parcels where wetland establishment is proposed. (Corresponding information on soils and vegetation has also been requested by the Corps and will be provided under separate cover.) Table 1 lists the offsite mitigation parcels and the wetland establishment habitat type and acreage proposed at each parcel.

Table 1. Proposed Wetland Establishment Sites at the Offsite Mitigation Parcels

Offsite Mitigation Parcel	Assessor's Parcel Number	Proposed Wetland Establishment Habitat Type	Proposed Wetland Establishment at Parcel (acres)
Ford	108-010-06	Mixed marsh and wet meadow	2.85
Goss/MGC Plasma Middle/MGC Plasma North	103-230-02/ 103-250-14/ 103-230-06	Wet meadow	7.47
Niesen	108-040-02	Mixed marsh and wet meadow	5.66
Watson - Eastern	037-221-30	Wet meadow	8.33 (north area is 4.42 and south area is 3.91)
		Total	24.31

Attachment 1, "July 9, 2010, letter from Corps to California Department of Transportation (Caltrans)," lists the Corps' minimum information necessary to make a permit decision for the bypass project. This technical memorandum addresses Items 4a(1) and 4a(2) on pages 2 and 3 in Attachment 1 – hydrology at each proposed wetland establishment site. At the July 12 and 13, 2010, meeting between resource agencies (i.e., Corps, U.S. Environmental Protection Agency [USEPA], North Coast Regional Water Quality Control Board [RWB], and California Department of Fish and Game [CDFG]) and Caltrans, each of the items in the July 9, 2010 letter were discussed. With respect to Items 4a(1) and 4a(2), Caltrans indicated that site specific data on field-measured hydrology indicators for each proposed wetland establishment site were limited and that these data limitations would affect Caltrans ability to respond to Items 4a(1) and 4a(2) at the level of detail indicated in the July 9, 2010 letter. As an example, groundwater monitoring wells have been installed at the Goss and MGC Plasma North parcels (as part of Caltrans' study of North Coast semaphore grass) in the vicinity of the proposed wetland establishment sites but have not been installed at the other parcels where wetland establishment sites are proposed. As a result, groundwater availability at these parcels has been determined based on qualitative (non-field measured) information and extrapolated from valley-wide data. The Corps and USEPA agreed that some site specific hydrology data that was not available (e.g., existing wetland hydroperiod information) would need to be collected during the appropriate time of the year and would therefore not be included as part of this submittal.

This technical memorandum presents information on the following items for each proposed wetland establishment site per the July 9, 2010 letter:

- Site specific functions being replaced.
- Existing hydrologic conditions at wetland monitoring reference sites.
- Groundwater availability.
- Existing wetland hydroperiod information (i.e., frequency of flooding, depth, duration, timing of inundation, percent of open water).
- Historical hydrology of wetland establishment site if different from current conditions.
- Acres of contributing drainage areas.
- Water budget for wet and dry years that includes water sources (i.e., precipitation, surface runoff, groundwater, and stream flow).

A seventh item, results of water quality analysis (i.e., surface water, groundwater, redox, nutrients, organic content, suspended matter, dissolved oxygen, and heavy metals), was requested in the July 9, 2010 letter. Field measurements and laboratory analyses of these water quality constituents is slated to begin in late August 2010 and continue through June 2011 (or until ground disturbance and/or vegetation removal occurs as part of bypass project construction) to document baseline conditions at the offsite mitigation parcels. These data were not available prior to the submittal of this technical memorandum but will be provided as they become available.

2 Site Specific Functions and Values Being Replaced

Table 2 lists the target functions and values being replaced by wetland establishment at the proposed establishment sites. Please see Chapter 2 (pages 2-16 through 2-23) in the bypass project's Mitigation and Monitoring Proposal (Caltrans 2010a) for a description of each function and value listed in Table 2.

Table 2. Target Functions to be Replaced at Proposed Wetland Establishment Sites

Offsite Mitigation Parcel	Assessor's Parcel Number	Proposed Wetland Establishment Habitat Type	Target Functions and Values Replaced
Ford	108-010-06	Mixed marsh and wet meadow	Groundwater recharge, nutrient removal, wildlife diversity, and aquatic diversity
Goss/MGC Plasma Middle/MGC Plasma North	103-230-02/ 103-250-14/ 103-230-06	Wet meadow	Groundwater recharge, nutrient removal, wildlife diversity, and uniqueness
Niesen	108-040-02	Mixed marsh and wet meadow	Groundwater recharge, nutrient removal, wildlife diversity, and aquatic diversity
Watson - Eastern	037-221-30	Wet meadow	Groundwater recharge, nutrient removal, wildlife diversity, and uniqueness

Note:

a. MMP = Willits Bypass Project Mitigation and Monitoring Proposal (Caltrans 2010a).

3 Existing Hydrology at Wetland Monitoring Reference Sites

Currently, wetland monitoring reference sites have been identified for each proposed wetland establishment site and are located on the same offsite mitigation parcel as the proposed establishment site (MMP Appendix C, sheets C-30, C-54, C-69, C-77, and C-87). As such, the hydrology for the wetland monitoring reference site is the same as the hydrology for the proposed establishment site. Information on the hydrology of the wetland monitoring reference sites and proposed wetland establishment sites is described in Section 6. Please note that the wetland monitoring reference sites may be adjusted per Corps and USEPA direction.

4 Groundwater Availability

Site specific data on field-measured groundwater availability for each proposed wetland establishment site are limited. Groundwater monitoring wells have been installed at the Goss and

MGC Plasma North offsite mitigation parcels (as part of Caltrans' study of North Coast semaphore grass) in the vicinity of the proposed wetland establishment sites at these parcels but groundwater monitoring wells have not been installed at the other offsite mitigation parcels where wetland establishment sites are proposed. As a result, groundwater availability at some of the proposed wetland establishment sites has been determined based on qualitative (non-field measured) information and extrapolated from valley-wide data. Section 8, as part of the water budget discussion, presents information on groundwater availability at the proposed wetland establishment sites. Specifically, Sections 8.1.2 and 8.1.3 address groundwater availability.

5 Existing Wetland Hydroperiod Information

The July 9, 2010 letter requests that hydroperiod data for existing wetlands include frequency of flooding, depth, duration, timing of inundation, and percent of open water. Site specific field-measured data for the hydroperiod of existing wetlands occurring adjacent to the proposed wetland establishment sites are limited. As a result, existing wetland hydroperiod data at some of the proposed wetland establishment sites have been determined based on qualitative (non-field measured) information and extrapolated from valley-wide data. Qualitative information on existing wetland hydroperiod for each offsite mitigation parcel where wetland establishment is proposed is presented in Sections 6.2 through 6.5.

6 Historical and Current Hydrology

Historical and current hydrology for the offsite mitigation parcels where wetland establishment is proposed is provided below. Information on seasonal precipitation patterns is also included to provide context for environmental conditions.

6.1 Seasonal Precipitation Patterns

Precipitation data are available for Little Lake Valley from the Western Regional Climate Center (WRCC) for the Willits 1 NE station located just north of the City of Willits. Missing values were filled in with data from nearby stations, mostly with data from the California Data Exchange Center (CDEC) station WIL, located approximately 5 miles south of the City of Willits. Precipitation data from water years 2008 through 2010, which corresponds to wetland studies and site visits to the offsite mitigation parcels made by Caltrans and the Corps during wetland delineation efforts for the bypass project, are presented in Table 3. Seasonal precipitation patterns influenced observations of wetland hydrology on the mitigation parcels.

Table 3 shows the seasonal amount of precipitation from water years 2008 through 2010. Seasonal precipitation patterns for water years 2008 and 2009 were significantly below average and below average for the months of February through June, the months when most wetland data-points and field observations occurred. Seasonal precipitation patterns for water year 2010 were close to average, with nearly average or above average precipitation for the months of February through June.

Table 3. Precipitation Data from Water Years 2008 through 2010 from Western Regional Climate Center Willits 1NE Station

Water Year	Precipitation (inches)	Percentile	Percent of 50^{th} Percentile
2008	38.6	26%	75%
2009	29.7	2%	57%
2010	47.4	43%	92%
1961 – 2010 Average	51.2		
1961 – 2010 50^{th} Percentile	51.8		

6.2 Ford Offsite Mitigation Parcel

Wetland delineations on the Ford parcel were conducted by Wildlands, Inc., and wetland boundaries have been field verified by the Corps. Caltrans has access to ArcMap Shapefiles for jurisdictional wetland and other waters features but does not have access to the wetland datasheets and the information provided therein. This parcel was observed by Caltrans, Corps, USEPA, CDFG, RWB, Willits Environmental Center (WEC), and Caltrans (including contractor ICF International) on July 26, 2010. Figure 1 shows the Ford parcel.

The Ford parcel is situated in the flat section at the toe of the slope that forms the western border of the Little Lake Valley. The existing Highway 101 (US 101) and the Northwestern Pacific Railroad is located at the toe of this slope and the fill terraces associated with these features form the western boundary of the Ford parcel. A wide fill terrace occurs at the northern end of the Ford parcel (the area proposed for wetland establishment). The Ford parcel lies at the bottom of the Valley, in the area where “Little Lake” historically formed. Early soil survey information (Dean 1920) indicates that a lake historically formed at the northern end of Little Lake Valley during the rainy season, even during very low rainfall years. At the end of a series of heavy rainfall events in February 1915, the lake extended over 1,875 acres and was 12 feet deep over a 300-acre area. At that time, the high water mark of the lake was at the 1,330-foot contour, which would have covered all but the southernmost tip of the Ford parcel.

Old Outlet Creek forms the eastern boundary of the Ford parcel, and flows from southwest to northeast. Oat Canyon Creek, an intermittent stream, enters at the western boundary of the parcel. Oat Canyon Creek originates in the hillsides to the west of the Ford parcel and crosses the center of the parcel travelling from west to east before merging with Old Outlet Creek on the east side of the parcel. Additionally, it appears that another un-named drainage originating from hills to the west of the Ford parcel may have historically entered this parcel approximately 1,000 feet to the north of Oat Canyon Creek. Analysis of the USGS 7.5-minute quadrangle indicates that this system is now impounded off of the Ford parcel by a dam that forms a pond approximately 1,000 feet west of existing US 101. Evidence of this former channel on the Ford parcel to the east of US 101 is provided by a deep swale-like feature that supports mixed marsh vegetation, and flows to the northeast, eventually merging with Outlet Creek. Additional surface water flows, including highway stormwater discharges, are conveyed through culverts crossing US 101 from west to east. Although some surface subsurface water is probably entering the Ford parcel from the hillsides to the west (as evidenced by the placement of highway and railroad culverts and the flow of Oat Canyon Creek), observations of drainage patterns onsite indicate that surface and subsurface flows are generally moving from south to north and roughly parallel Outlet Creek.

Based on field observations on July 26, 2010, and based on the hydrologic patterns observed in adjacent and nearby parcels (Watson - West, Jacobs, Lusher, and Brooke), it appears that wet meadow and riparian wetlands on the Ford parcel most likely display soil saturation within 12" of the surface, or above surface inundation, depending upon site topography, between approximately November (based on precipitation patterns) and March in most years. Based on the observation of ½" of surface water and saturated soils in the lowest area of the marsh located on the parcel, surface water may persist in the marsh areas of the parcel until April or May, and soils in this area may remain saturated until late May or early June in most years.

6.3 Goss/MGC Plasma Middle/MGC Plasma North Offsite Mitigation Parcels

Analysis of the Willits United States Geological Survey (USGS) 7.5-minute quadrangle indicates that that an unnamed intermittent tributary of Davis Creek historically traversed the MGC Plasma Middle, MGC Plasma North, and Goss parcels from southeast to northwest and continued onto the adjacent parcel to the west (Arkelian parcel; Figure 2). The former channel indicated on the Willits USGS quadrangle is no longer distinguishable on the Goss or MGC Plasma parcels; a stand of mature riparian forest on the Goss parcel and a swale-like strip of wet meadow on the MGC Middle and MGC North parcels indicates the general area of the former stream channel. The Willits USGS 7.5-minute quadrangle also indicates a historical tributary to this stream which flows from east to west across the MGC Plasma North parcel, merging with the first historic stream at the western edge of the MGC Plasma North parcel. This former channel is also no longer distinguishable on the parcel. The presence of wetlands along these former stream channels may indicate that subsurface flows may still be occurring in these areas.

The eastern boundary of the MGC Plasma Middle parcel is bounded by a small hill situated at the toe of the hills forming the eastern boundary of Little Lake Valley. The toe of this hill supports a seasonal spring discharge. Surface water seeping from this hillside enters an artificial drainage ditch that has been constructed in the area of the historic northwest-flowing creek channel and is directed to the northwest toward, and onto, the MGC Plasma North parcel. This artificial drainage ditch runs for approximately 450 feet before it becomes indistinguishable from the wet meadow on the MGC Plasma North parcel.

Hydrology on the Goss and MGC Plasma North parcels is currently influenced by a series of artificial drainage ditches that appear to have been created to drain surface water away from the center of each parcel in order to drain these parcels to produce hay. Linear drainage swales form the west, south, and eastern boundaries of the Goss parcel generally direct surface water flows in a south to

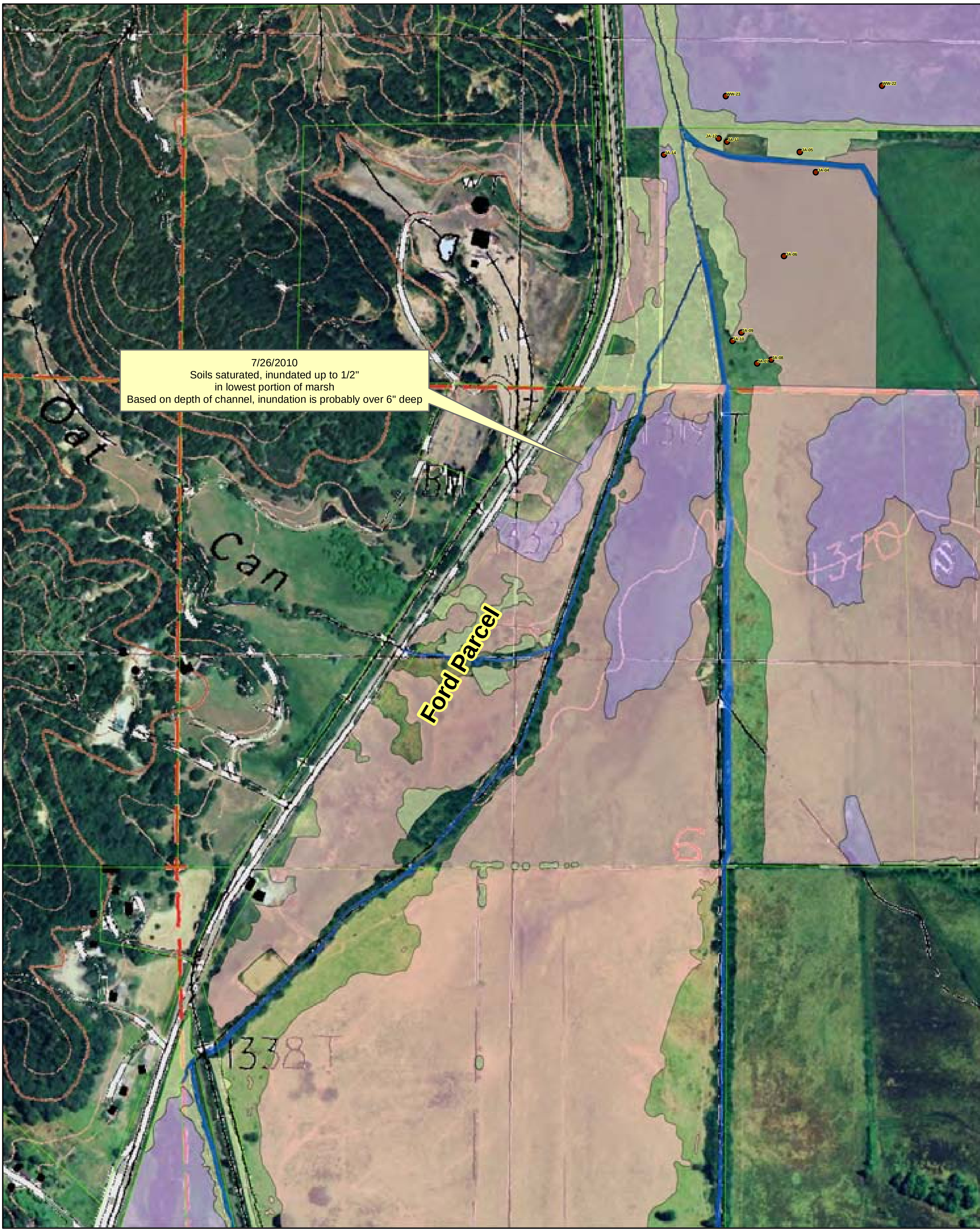

Figure 1
Ford
Caltrans Willits Bypass Project
State Route 101
EA: 01-26200

In: Tributaries to the Eel River
At: Little Lake Valley and the City of Willits
County of Mendocino, State of California

Layout View Delineation Map Prepared By:
Jason Meigs, Caltrans Associate Biologist
2800 Gateway Oaks Drive
Sacramento, CA 95833
July 28, 2010

Legend

- Parcel Boundaries
- Mixed Marsh
- Other Waters
- Riparian Scrub
- Riparian Woodland
- Swale
- Wet Meadow

0 125 250 500 750 1,000 1,250 Feet

1:6,000
1 inch = 500 feet

N
W E
S

Datum/Projection:
NAD 1983 California State Plane Zone 2

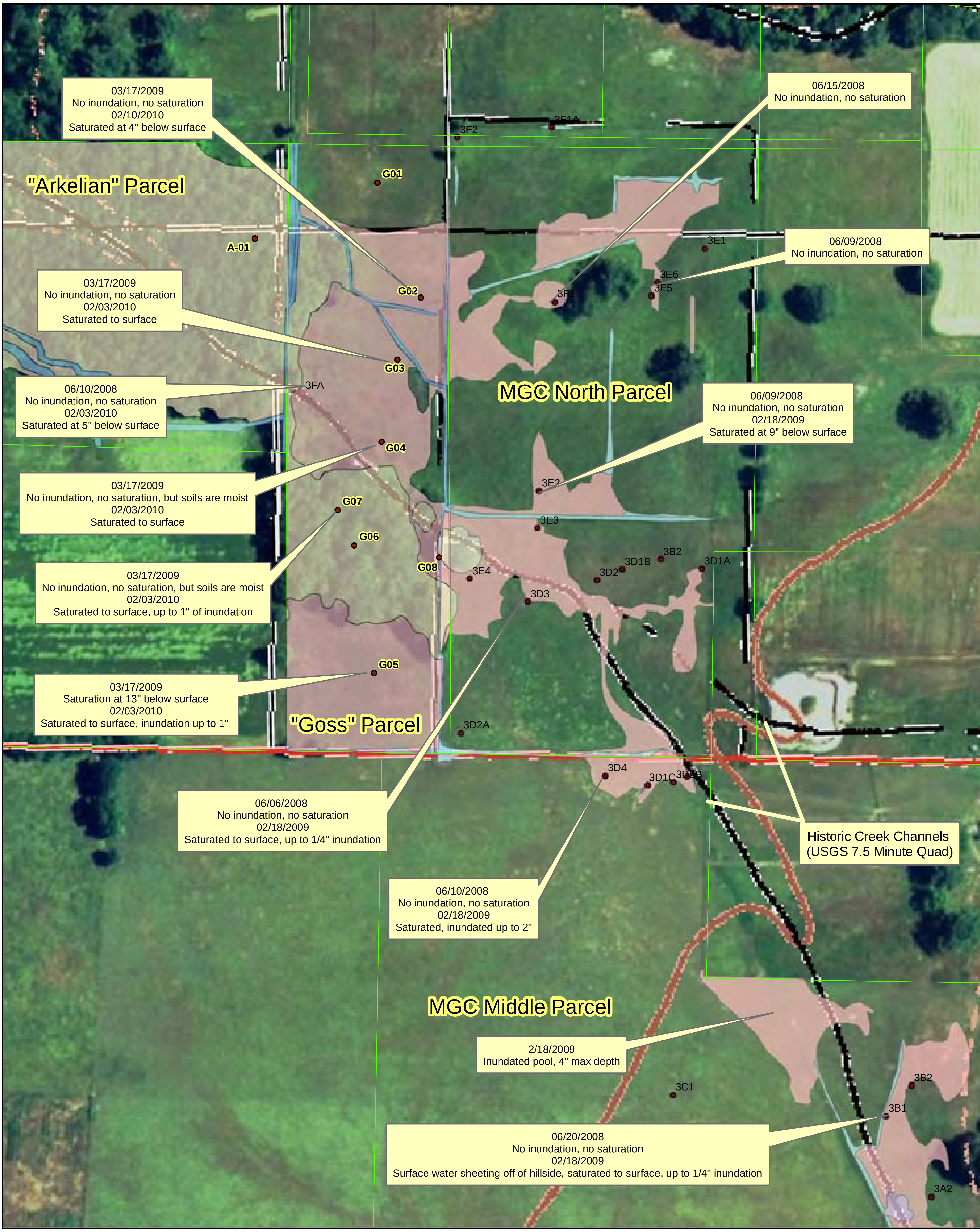

Figure 2
Goss/MGC Plasma
Caltrans Willits Bypass Project
State Route 101
EA: 01-26200

In: Tributaries to the Eel River
At: Little Lake Valley and the City of Willits
County of Mendocino, State of California

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On July 28, 2010

Legend

- Parcel Boundaries
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- Riparian Woodland
- Swale
- Upland
- Wet Meadow

0 50 100 200 300 400 500 Feet

1:2,400
1 inch = 200 feet

N E S W

Datum/Projection:
NAD 1983 California State Plane Zone 2

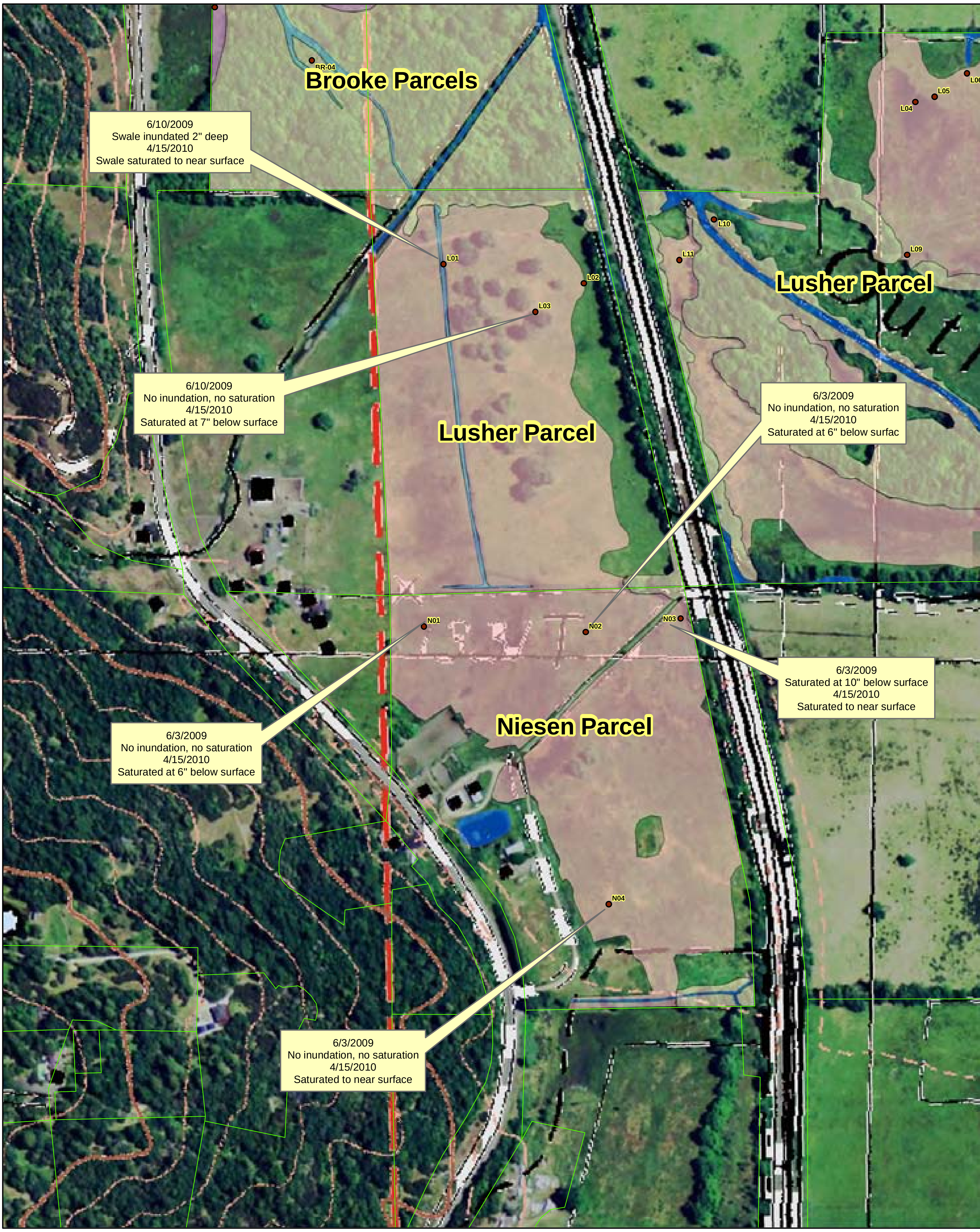

Figure 3
Niesen
Caltrans Willits Bypass Project
State Route 101
EA: 01-26200

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0 75 150 300 450 600 750 Feet

1:3,600
1 inch = 300 feet

N
W E
S

Datum/Projection:
NAD 1983 California State Plane Zone 2

northwest direction. An additional artificial drainage ditch bisects the Goss parcel and drains surface water from the southeast to northwest, and includes a corrugated metal culvert that allows equipment to access the south end of the parcel for mowing. It appears as if the excavation of this additional drainage ditch has allowed the northern part of the Goss parcel to develop into, or to remain, as uplands.

Wetland data for the MGC Plasma North and MGC Plasma Middle parcels were collected on June 5-16, 2008, and were field verified by the Corps on February 18, 2009. Data collected in June 2008 indicate that surface water and groundwater within 12”-18” of the soil surface were not available, even in the wettest sections (e.g., center of swales, bottom of ditches). Wetland datasheets were not filled out during the Corps verification in February 2009 and the descriptions above of “spring time” hydrologic conditions are based on personal observations (Meigs pers. comm.) across the four site visits to these parcels conducted between June 2008 and July 2010.

Based on field observations, it appears that wet meadow, swale, and riparian wetlands on the Goss and MGC Plasma North parcels display soil saturation within 12” of the surface, or above surface inundation, depending upon site topography, between approximately November (based on precipitation patterns) and March (based on wetland delineation datasheets and personal observations [Meigs pers. comm.]) in most years.

6.4 Niesen Offsite Mitigation Parcel

Based on a 1956 aerial photograph, the topography, and presumably the hydrology, on the Niesen parcel appears to have been altered some time during or just prior to 1956 for the production of hay or irrigated pasture, as evidenced by linear patterns that appear as berms on the aerial photograph. The current hydrology of the Niesen parcel, which is situated in the flat land at the toe of the slope that forms the western border of the Little Lake Valley, is dominated by a seasonal high water table.

Existing Highway 101 (US 101), which is located at the toe of the slope that forms the western border of Little Lake Valley, forms the western boundary of the Niesen Parcel (Figure 3). Surface water flows, including US 101 storm water discharges, are conveyed through a series of culverts crossing US 101 from west to east. The Northwestern Pacific Railroad line and its associated drainage ditch forms the eastern boundary of the parcel. Water in the railroad ditch flows from south to north, eventually discharging into Upp Creek approximately 1,500 feet to the north on the Brooke parcel. The southern boundary of the Niesen parcel is bound by the presence of an upland berm that mostly separates the majority of the parcel from an artificial drainage ditch that flows from west to east, discharging into the railroad ditch system on the eastern boundary of the site. Although some surface subsurface water is probably entering this parcel from the hillsides to the west (evidenced by the presence of the southern drainage ditch), observations of drainage patterns onsite indicate that surface and subsurface flows are generally moving from south to north, roughly paralleling the railroad ditch system, and are eventually concentrated into an artificial drainage to the north (on the Lusher parcel) that discharges into Upp Creek.

The Niesen parcel is relatively flat. An elevated overburden area has been constructed on the western side of the parcel, apparently to build structures that would be protected from damage due to seasonal ponding of the adjacent wetlands or occasional flooding of the parcel. A small artificial stock pond currently exists on the upland overburden area. It is unknown if this pond is filled naturally (precipitation and/or groundwater) or artificially (water pumps), but its position on the elevated overburden area suggests that the pond is filled artificially. The earthen dam of the pond is subject to some leakage, discharging into the adjacent wet meadow system.

No named streams or mapped un-named streams appear to enter or influence the hydrology of this parcel; the hydrology of the Niesen parcel appears dominated by the presence of a seasonal high water table. Small micro-topographic depressions are subject to shallow ponding.

Wetland data for the Niesen parcel were collected in June 2009 and field verified by the Corps in April 2010. Data collected in June 2009 indicate that surface water and groundwater within 12”-18” of the soil surface were not available, except in the northeastern corner of the parcel, where subsurface water was observed at 10” below the soil surface. Wetland datasheets were not filled out during the Corps field verification in April 2010 and the descriptions above of “spring time” hydrologic conditions are based on personal observations (Meigs pers. comm.) across the three site visits to this parcel conducted between April 2009 and July 2010.

Based on field observations, it appears that wet meadow wetlands on the Niesen parcel display soil saturation within 12” of the surface, or above surface inundation, depending upon site topography, between approximately November (based on precipitation patterns) and March (based on wetland datasheets and personal observations [Meigs pers. comm.]) in most years.

The following information on post-construction hydrology at the Niesen parcel is being provided in response to questions from the Corps and USEPA during the July 26, 2010 field visit to the proposed wetland establishment sites. The current hydrology on the Niesen parcel will be altered as part of project construction and wetland establishment actions. The land surface at the proposed wetland establishment site will be lowered to match the elevation of the existing adjacent wet meadow. The land surface will slope gently to the north from the southern parcel boundary. A culvert will enter the southwest corner of the established wetland and flow north to south across the wetland. In addition, another culvert will enter the parcel midway along its western boundary and flow across the established wetland from west to east and eventually drain into the existing wetland on the east side of the bypass through a culvert under the bypass embankment.

6.5 Watson (East and West) Offsite Mitigation Parcels

The Watson parcels are situated at the toe of the hills forming the northern rim of Little Lake Valley. The eastern edges of the Watson East parcel has areas of alluvium originating from the hills above and slopes gently to the west. The Watson West parcel lays at the bottom of the Valley, in the area where “Little Lake” historically formed. Early soil survey information (Dean 1920) indicates that a lake historically formed at the northern end of Little Lake Valley during the rainy season, even during very low rainfall years. At the end of a series of heavy rainfall events in February 1915, the lake extended over 1,875 acres and was 12 feet deep over a 300-acre area. At that time, the high water mark of the lake was at the 1,330-foot contour, which includes the western half of the Watson East parcel and the entirety of the Watson West parcel.

According to the USGS 7.5-minute quadrangle, the modern soil survey (Howard and Bowman 1991), and an historical soil survey (Dean 1920), Berry Creek enters the southern boundary of the Watson East parcel (Figure 4). The USGS quadrangle shows Berry Creek continuing northward through the parcel as a channelized ditch. Aerial photographs show a line of riparian trees following the path of the ditch indicated by the USGS quadrangle, demonstrating that flows from Berry Creek were historically discharged into this channel. Flows from this stream currently enter the southeastern corner of the Watson East parcel and quickly dissipate into an alluvial fan. Review of the aerial photography indicates that some of the flows from Berry Creek are diverted westward into an artificial east-west drainage ditch just south of the southern boundary of the Watson East and Watson West parcels.

Surface and groundwater are generally travelling from east to west across the parcels. A series of three ephemeral streams originating from the hills to the east enter the Watson East parcel through culverts crossing Reynolds Highway. These streams are incised as they travel eastward across the alluvial terrace but quickly lose stream characteristics and become wet meadow wetlands as they dump their sediment loads where the grade begins to flatten out. These three streams were observed with water in the channel during April 1, 2009 and February 3, 2010 site visits. Generally, the Watson parcels exhibit a groundwater and surface water gradient from drier to wetter from east to west as the topography gradually flattens out from east to west.

Wetland types range from marginal wet meadow (on the alluvial terrace, groundwater within 12” of the soil surface, but no surface water, and supporting hydric vegetation during the spring season) to wet meadow (near border of Watson East and Watson West parcels, surface water ½ -4 inches deep during winter and potentially deeper pools or swales), to mixed marsh (Watson East parcel, surface water greater than 4 inches during spring).

Areas on the Watson East parcel experiencing inundation during the spring season are indicated on Figure 4. The large inundation zone observed along the southwestern and northwestern portion of the parcel is likely the result of flooding from the major creeks in Little Lake Valley (e.g., Outlet and Davis Creeks).

Wetland data for the Watson parcels was collected in August 2009, and were field verified by the Corps in April 2010. Data collected in August 2009 indicate that surface water and groundwater within 12”-18” of the soil surface were not available, even in the wettest sections (mixed marsh habitat on the Watson West parcel). Some wetland data was collected on the northern-most section of the Watson East parcel during delineation of the adjacent Taylor parcel on April 1, 2009. Wetland datasheets were not filled out during the Corps field verification in February 2010 and the descriptions above of “spring time” hydrologic conditions are based on personal observations [Meigs pers. comm.] across the five site visits to this parcel conducted between April 2009 and July 2010.

Based on the field observations, it appears that wet meadow, swale, and riparian wetlands on the Watson parcels display soil saturation within 12” of the surface, or above surface inundation, depending upon site topography, between approximately November (based on precipitation patterns) and March (based on wetland datasheets and personal observations [Meigs pers. comm.]) in most years. Surface water may persist in the Watson West parcel until April or May, and soils in this area may remain saturated until late May or early June in most years.

7 Contributing Drainage Areas

Five sub-watersheds drain into the offsite mitigation parcels in Little Lake Valley where wetland establishment is proposed. These sub-watersheds, and the offsite mitigation parcels that occur in the sub-watersheds, are shown in Figure 5. The largest sub-watershed is Davis Creek, at 9,875 acres, and it includes the Goss/MGC Plasma Middle/MGC Plasma North parcels. Berry Creek sub-watershed is next in size, at 5,780 acres, and it includes the Watson – East parcel. Outlet Creek sub-watershed is 2,625 acres and it includes most of the Ford parcel. Wild Oat Canyon Creek sub-watershed is 590 acres and it includes a small section of the Ford parcel. Upp Creek sub-watershed is 1,135 acres and it includes the Niesen parcel.

8 Water Budget

To further evaluate the potential success of established wetlands, this technical memorandum presents a water budget for the proposed wetland establishment sites at the offsite mitigation parcels.

Existing wetlands in Little Lake Valley do not have a simple pattern of filling and draining. Preliminary data from the July 2010 soil suitability assessment of the proposed wetland establishment sites (see Section 8.1.1.4) and other sources of soils data indicate that existing wetlands in Little Lake Valley primarily result from a seasonally high water table. As a result of precipitation, the underlying aquifer rises in response to surface and subsurface inflow from the encircling mountains as well as from local infiltration on the Valley floor.

Wetland hydrology may also be influenced by the lateral movement of water, either subsurface flow, sheet flow, or overbank flow. In general the water in the aquifer slowly flows downhill towards the Valley floor and then north in the direction of the Valley's main waterways. With winter rains, however, lateral movement may increase near and above the soil surface as soil becomes saturated and moves downhill and drains to surface waterways. In the lowest portion of the northern part of the Valley, some wetlands may receive significant inflow from flooding by the major creeks.

This water budget assessment reviews data collected in Little Lake Valley that is pertinent to the evaluation of wetland hydrology at the wetland establishment sites. Available data were used to estimate wetland water elevations for a range of precipitation levels. This was necessary as field measurements of the hydroperiod of existing wetlands are not available. The water budget is based on the hypothesis that the established wetlands are expected to behave in a manner similar to the adjacent existing wetlands because soil types and depths to the aquifer are similar.

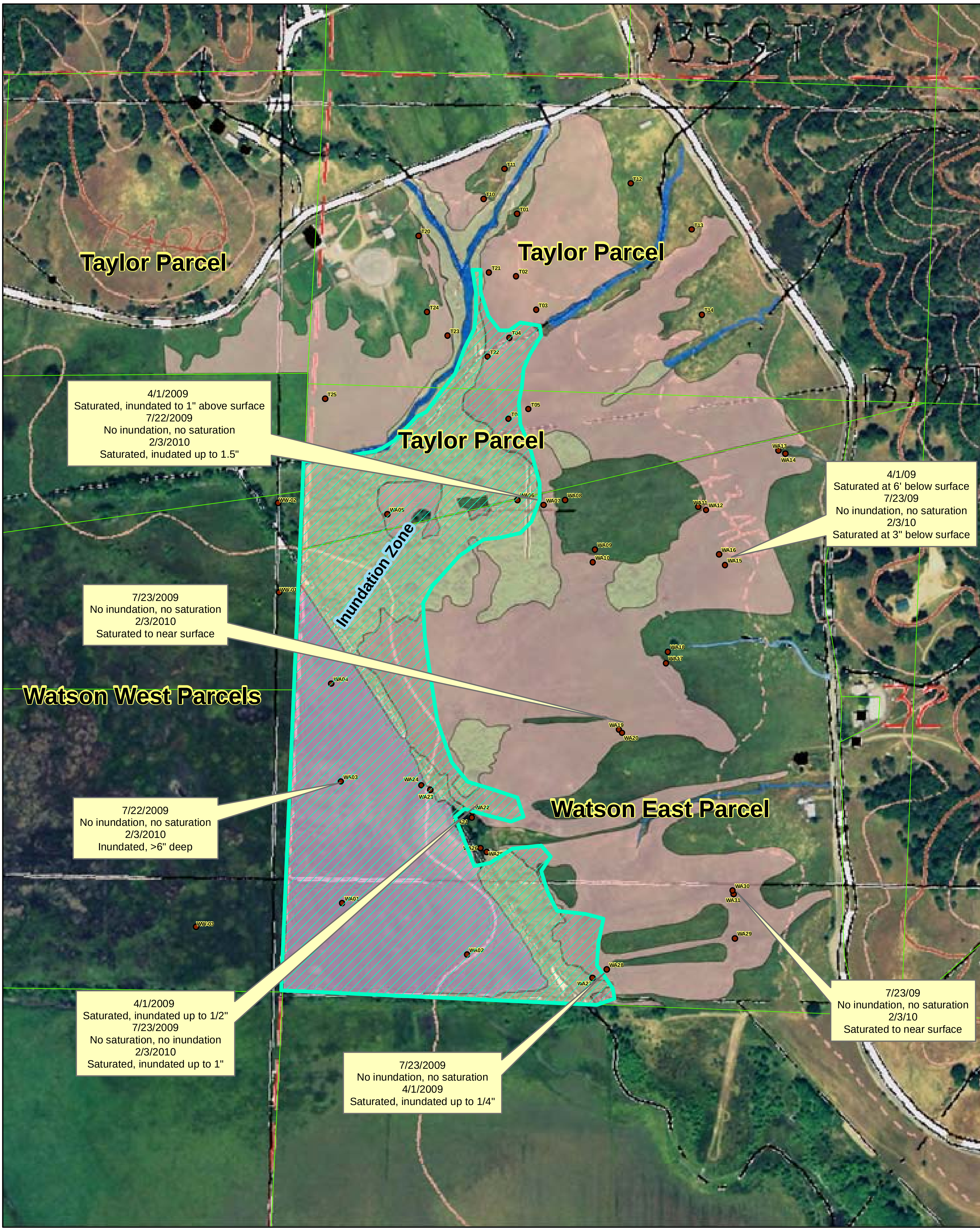

Figure 4
Watson
Caltrans Willits Bypass Project
State Route 101
EA: 01-26200

In: Tributaries to the Eel River
At: Little Lake Valley and the City of Willits
County of Mendocino, State of California

Layout View Delineation Map Prepared By:
Jason Meigs, Caltrans Associate Biologist
2800 Gateway Oaks Drive
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On July 28, 2010

Legend

- Parcel Boundaries
- Mixed Marsh
- Other Waters
- Riparian Scrub
- Riparian Woodland
- Swale
- Upland
- Wet Meadow

0 100 200 400 600 800 1,000 Feet

1:4,800
1 inch = 400 feet

N E S W

Datum/Projection:
NAD 1983 California State Plane Zone 2

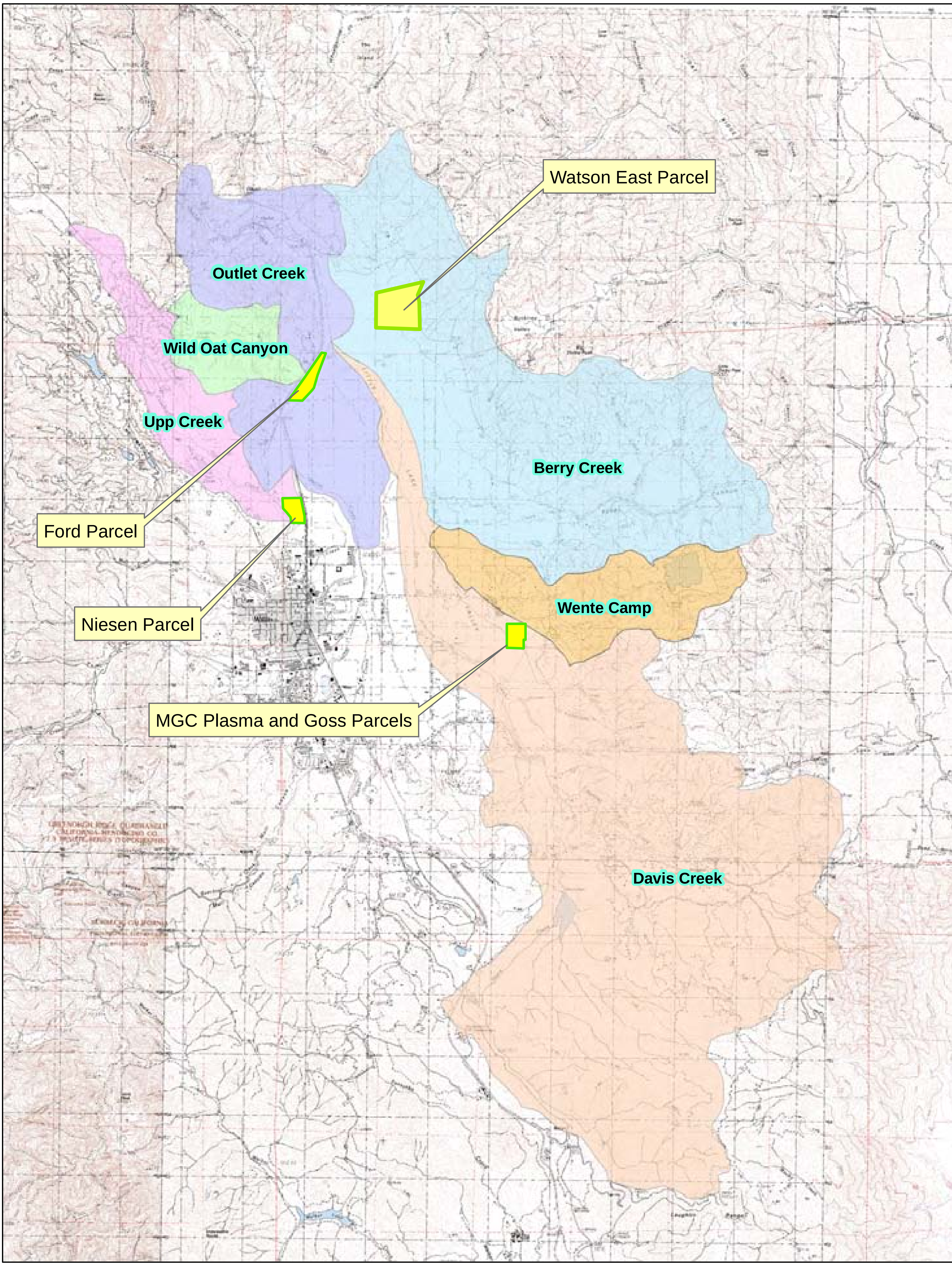


Figure 5
Sub-Watersheds Associated With Wetland Establishment Parcels

In: Tributaries to the Eel River
At: Little Lake Valley and City of Willits
County of Mendocino, Sate of California

Layout View Map Prepared By:
Jason Meigs, Caltrans Associate Biologist
2800 Gateway Oaks Drive, Sacramento, CA 95833
On July 28, 2010

Legend

- Berry Creek
- Davis Creek
- Outlet Creek
- Upp Creek
- Wente Camp
- Wild Oat Canyon

0 1,250 2,500 5,000 7,500 10,000 Feet

1:60,000

1 inch = 5,000 feet

N W E S

Datum/Projection:
NAD 1983 California State Plane Zone 2

8.1.1 Soil Types

8.1.1.1 Natural Resources Conservation Service (NRCS) Soil Surveys

As shown in the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil survey for Mendocino and Trinity Counties (Howard and Bowman 1991), the soils in Little Lake Valley are generally not strongly developed, such that the surface, subsurface, and subsoil layer textures do not differ markedly within a given profile. The soils formed under well to poorly drained conditions, but in some areas the internal drainage has been increased as a result of stream incision and drainage ditch construction to more quickly remove water from the parcels as a way of improving pasture land. Table 4 provides a summary of USDA NRCS soil survey results for Little Lake Valley at the offsite mitigation parcels where wetland establishment is proposed (Ford, Goss/MGC Plasma North/MGC Plasma Middle, Niesen, and Watson).

Table 4. Characteristics of Soils in Little Lake Valley as Mapped by USDA NRCS Soil Survey[a]

Soil Map Symbol	Soil Map Unit Name	Landform	Natural/ Existing Drainage Class	Generalized Typical Profile (Surface, Subsurface, and Subsoil)	Parcel Occurrence
112	Clear Lake clay, 0 to 2% slopes	basins	poor/partially drained	clay over clay loam	Goss, MGC Plasma North, MGC Plasma Middle
115	Cole clay loam, 0 to 2% slopes	alluvial plains and basins	somewhat poor/ somewhat poor	clay loam over clay loam	MGC Plasma North, MGC Plasma Middle, Niesen, Watson
123	Feliz loam, 0 to 2% slopes	alluvial plains and fans	well/well	loam over clay loam	Watson
126	Feliz clay loam, gravelly substratum, 2 to 8 percent slopes	alluvial plains and fans	well/well	clay loam over gravelly sandy clay loam	Watson
127	Fluvaquents, 0 to 1% slopes	floodplains	poor and very poor/poor and very poor	very fine sandy loam over silt loam[b]	Ford, Watson
128	Gielow sandy loam, 0 to 5% slopes	alluvial plains and fans	somewhat poor/somewhat poor	sandy loam and loam over sandy loam and fine sandy loam	Goss, MGC Plasma North, Niesen, Ford

Table 4. Continued

Soil Map Symbol	Soil Map Unit Name	Landform	Natural/ Existing Drainage Class	Generalized Typical Profile (Surface, Subsurface, and Subsoil)	Parcel Occurrence
133	Haplaquepts, 0 to 1% slopes	basins and floodplains	poor/poor	clay loam over silty clay loam over silty clay[b]	Ford, Watson
178	Pinole gravelly loam, 2 to 8% slopes	terraces	well/well	gravelly loam over clay loam over sandy clay loam	Ford, Watson

Notes:

a. The characteristics described above for each soil map unit do not cover map unit inclusions where drainage class and profile characteristics may be different from the primary soil component of the map unit.

b. Because of their variability, fluvaquents and haplaquepts have no typical profile. The profile described is one that commonly occurs in the USDA soil survey area.

Source: Howard and Bowman 1991.

8.1.1.2 Soil Texture at Wetland Delineation Sites

As part of wetland delineations, soil texture data is collected from soil sample pits. The texture data indicates the permeability of the soil. Table 5 provides a summary of the soil texture data that were collected as part of the wetland delineations for the proposed wetland establishment parcels. Clay loam and loam (or variants thereof) were the most abundant soil types detected. As discussed below, these soils are probably too permeable to create wetland conditions without a high water table or other external source of water. A limited number of sites had soils with clay or silty clay texture, which are better able to retain water (3 out of 35 at Watson, 2 out of 9 at MGC Plasma Middle, and 1 out of 12 at MGC Plasma North).

Table 5. Soil Texture Data Collected during Wetland Delineations at the Proposed Wetland Establishment Sites (soil textures with slow or very slow permeability are highlighted)

Texture of Least Permeable Soil Type in Pit	Number of Sites with Similar Texture		
	Upland	Wetland	Total
Watson			
clay		3	3
clay loam	2	9	11
gravelly clay loam	1		1
gravelly loam	7	6	13
gravelly sandy loam	1		1
loam	2	2	4
sandy loam	1		1
very gravelly loamy sand	1		1
Total	15	20	35

Table 5. Continued

Texture of Least Permeable Soil Type in Pit		Number of Sites with Similar Texture		
		Upland	Wetland	Total
Plasma Middle				
clay			1	1
clay loam		1	2	3
sandy clay			1	1
sandy clay loam		2		2
sandy loam			1	1
silty clay		1		1
	Total	4	5	9
Plasma North				
clay			1	1
clay loam		1	5	6
loam		1		1
sandy clay		1		1
sandy clay loam		2		2
sandy loam		1		1
	Total	6	6	12
Goss				
clay loam		1	6	7
loam			1	1
	Total	1	7	8
Ford				
loam		3	5	8
sandy loam		1		1
	Total	4	5	9
Niesen				
clay loam			4	4

8.1.1.3 Spring 2010 Soil Surveys at North Coast Semaphore Grass Study Sites

During the spring of 2010, soils were assessed in the vicinity of North Coast semaphore grass (*Pleuropogon hooverianus*; PLHO) populations as part of an ongoing Caltrans study of the special-status plant in Little Lake Valley.

Surface layer soil textures within PLHO populations were observed to be loamy to fine-loamy, generally ranging from loam to silty clay loam. Surface and subsurface layer soil textures in soils located outside of PLHO populations were observed to be similar to that of PLHO populations, generally ranging from loam to silty clay loam. Relatively few areas had surface layer soils that were outside of this textural range. These included gravelly clay loam, sandy loam, silt loam, and silty clay. Subsurface soil layer textures were also generally loamy to fine-loamy.

Table 6 summarizes the soil surface textures that were found. The soil texture for the majority of soil samples were clay loam or loam, which are generally assumed to have moderately slow to moderate permeability. Of the parcels evaluated, two (Goss and MGC Plasma North) are also proposed wetland establishment sites. On these parcels, clay loam texture was present at 11 soil sites out of 29 and only two soil samples had potential to be less permeable, one with silty clay and the other with clay. A more complete description of this survey was provided in a May 28, 2010 technical memorandum (Caltrans 2010). As described below, the soils detected at these sites are fairly permeable for wetland, suggesting that the wetlands are sustained by exogenous sources of water (a high water table being most likely) and not local precipitation.

Table 6. Summary of Soil Surface Layer Texture in Soil Sample Pits in the Vicinity of North Coast Semaphore Grass in Little Lake Valley

Texture	Number of Sites with Similar Texture
City of Willits and Huffman Parcels	
Clay loam	11
Loam	3
Silt loam	1
Silty clay	1
Lusher Parcel	
Loam	4
Sandy loam	2
Evans and Frost Parcels	
Clay loam	3
Gravelly clay loam	1
Hebrard Parcel	
Clay loam	2
Loam	5
Arkelian Parcel	
Clay loam	6
Silty clay	1
Goss and MGC Plasma North Parcels	
Clay loam	11
Loam	8
Silty clay	3
Silty clay loam	6
Clay	1

8.1.1.4 July 2010 Soil Surveys at Wetland Establishment Sites

Soils at the proposed wetland establishment sites were evaluated in July 2010 to further address soil information requirements in the July 9, 2010 letter (Item 4b on page 3). For this evaluation, 24-inch pits were dug in the proposed wetland establishment sites on Goss/MGC Plasma Middle/MGC Plasma North and Watson and up to 6-foot pits were dug in the proposed wetland establishment sites on Ford and Niesen. Preliminary results from 19 pits for the Goss/MGC Plasma Middle/MGC Plasma North proposed wetland establishment site (6 in wetlands, 12 in uplands, and 1 in a wetland-upland transition) show evidence that the average seasonal high level of soil saturation is within the top foot of the soil surface at all test pits (as evidenced by the presence of redoximorphic soil features). Soil texture from the pits was mostly clay loam, loam, and silty clay loam regardless of whether the pit was located in an existing wetland or an upland area. Soil from a few pits were less permeable; one of the six wetland pits contained a layer of fine silty clay and five of the twelve upland pits contained layers of clay, silty clay, or very gravelly heavy clay. As described below, the majority of the soils detected at these sites are fairly permeable for wetlands, suggesting that the wetlands are sustained by external sources of water (a high water table being most likely) and not local precipitation.

Once the July 2010 soil surveys at the wetland establishment sites are complete, a full discussion of the survey results will be provided to the Corps and USEPA. This is expected by August 2, 2010.

8.1.1.5 Permeability

The majority of the soils found on the wetland establishment sites were clay loam or loam. Soils with this texture are considered to have permeability that is moderately slow. Only a few sites had soil with lower permeability. Table 7 shows the estimated conversion between soil texture and saturated hydraulic conductivity. Saturated hydraulic conductivity is an indication of how quickly water may percolate downward. The saturated hydraulic conductivity is approximately equal to the infiltration rate of water on the soil surface when the water is fully saturated (Bedient and Huber 1992). The Food and Agricultural Organization of the United Nations (FAO) reports (2010) that clay loam has a basic infiltration rate (infiltration rate when the soil is saturated) of 5-10 mm/hour or an average value of about 7 inches per day. This is not much different than the 9.6 inches per day shown in Table 7.

The soil permeability labels are for general characterization of all soil types and are not wetland specific. In order for soil to retain precipitation for a sufficiently long duration to sustain a wetland, it generally needs to have very slow permeability or an alternate water source. Because the wetlands in Little Lake Valley generally have "moderately slow" permeability, they are most likely sustained by a high water table. Overbank and subsurface flow may also contribute at some locations. A further consequence of soil type and permeability in Little Lake Valley is that most precipitation is likely to infiltrate the soil and, as a result, the size of the sub-watershed around a wetland is unlikely to be important to wetland success.

Table 7. Estimated Conversion between Soil Texture and Saturated Hydraulic Conductivity

Permeability	Example Soil Texture	Saturated Hydraulic Conductivity (inches/hour)	Estimated Average Conductivity (inches/day)
Very slow	Clay	0.06 – 0.2	2.2
Slow	Silty clay	0.06 – 0.2	3.1
Moderately slow	Clay loam	0.2 – 0.6	9.6
Moderate	Loam	0.6 – 2.0	31.2
Moderately rapid	Gravelly loam	2.0 – 6.0	96.0

8.1.2 Aquifer

Little Lake Valley is underlain by a layer of Holocene alluvium that is estimated to be a maximum of 250 feet deep. The alluvium is composed of silt, clay, gravel, and sand. A layer of continental basin deposits is located under the alluvium and Franciscan Complex bedrock is located under the continental basin deposits.

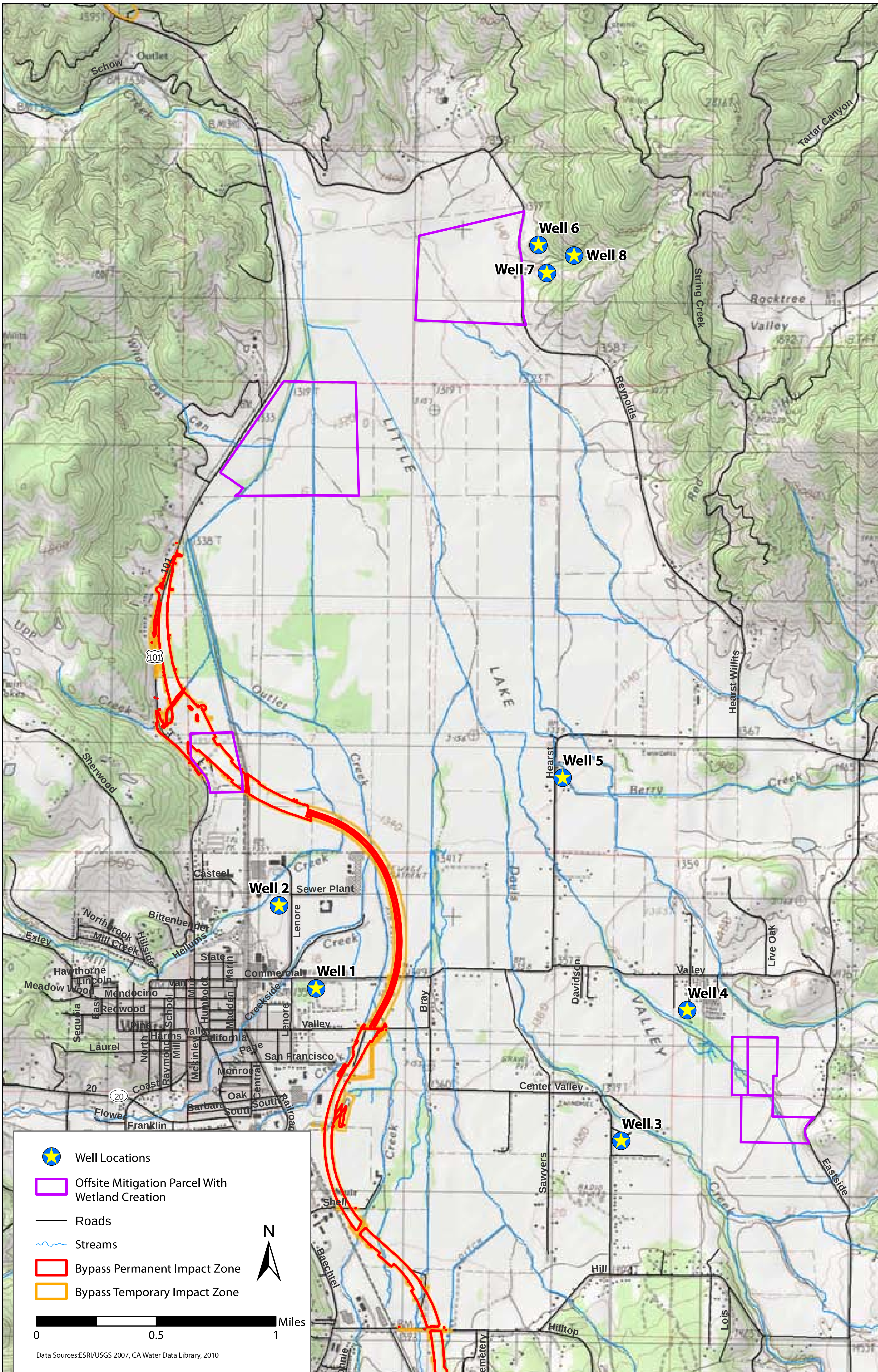
The alluvium layer is the most productive aquifer for groundwater wells because it generally has relatively high porosity and permeability (Farrar 1986). The presence of sheets of fine-grained sediments in the alluvium causes much of the aquifer to be confined or semiconfined (California Department of Water Resources 2004). While the City of Willits obtains its water from Morris Reservoir, groundwater wells are used for agriculture and residential use outside of Willits (Farrar 1986).

8.1.2.1 California Department of Water Resources Wells

The California Department of Water Resources (DWR) maintains records on groundwater elevations from seven wells in Little Lake Valley. The approximate locations of these wells are shown in Figure 6. The water elevations measured in these wells tend to peak at about 1340-1350 feet, although there were some exceptions (Figure 7). Measurements of depths to groundwater (Figure 8) indicate that groundwater is close to the ground surface. This shallow groundwater supports many depressional wetlands that occur throughout Little Lake Valley.

Groundwater levels measured in wells represent piezometric water surface levels. For an unconfined aquifer, the well elevations are roughly the same as the elevation of the top of the aquifer, but for confined aquifers, well elevations may be higher than the elevation at the top of the aquifer. Given the abundance of wetlands in Little Lake Valley, along with the moderately permeable soil, it seems likely that the top of the groundwater aquifer is close to the soil surface during the rainy season.

The presence of groundwater discharge at a large marsh at the north end of the Valley, located where water leaves the valley via Outlet Creek, further indicates that groundwater levels are close to the soil surface. During particularly wet winters, the marsh becomes a shallow lake as a result of both groundwater and surface water inflow. (Farrar 1986).



Path: Q:\Projects\Caltrans\00543_09_Willits_from_URS\mapdoc\OtherFigs\WDL_Well_Locations.mxd Author: DS Date: 7/26/2010

Figure 6
Location of DWR Groundwater Monitoring Wells in Little Lake Valley

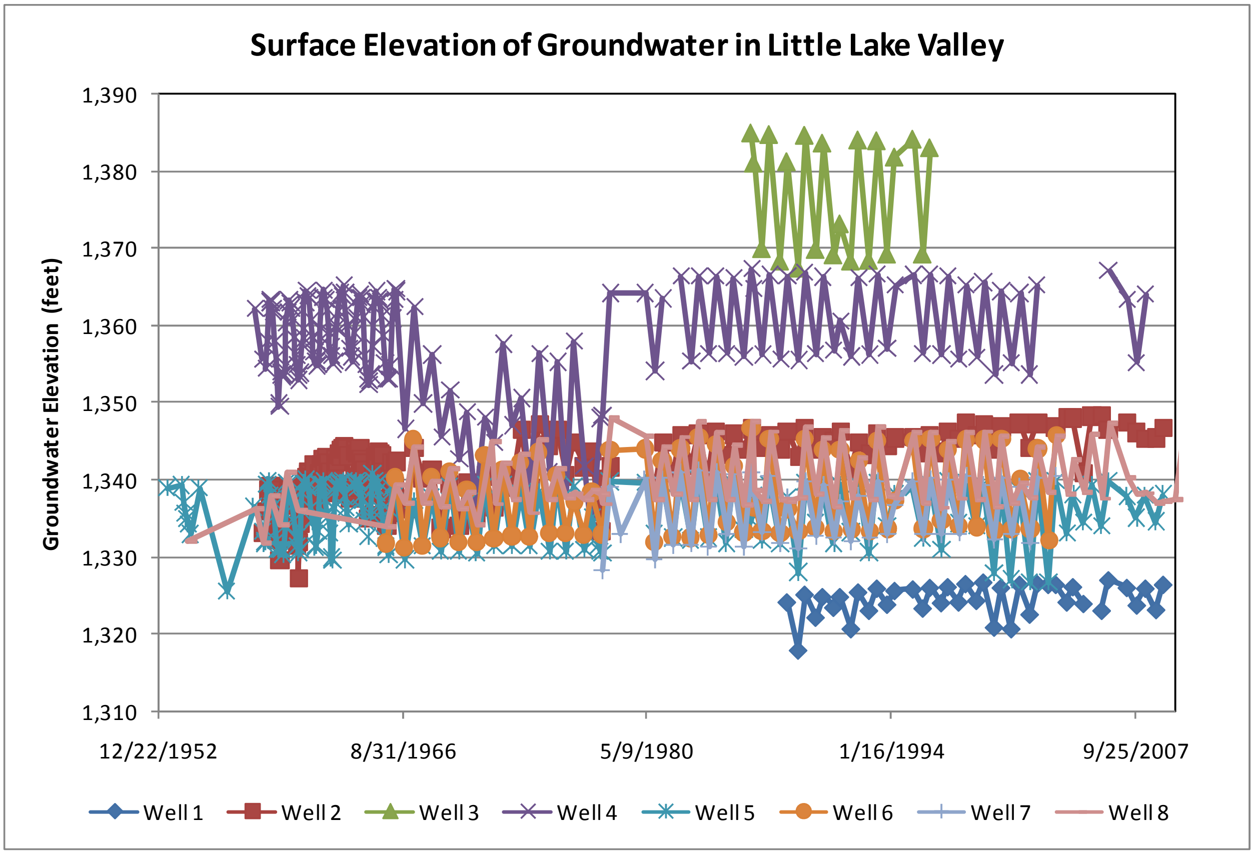
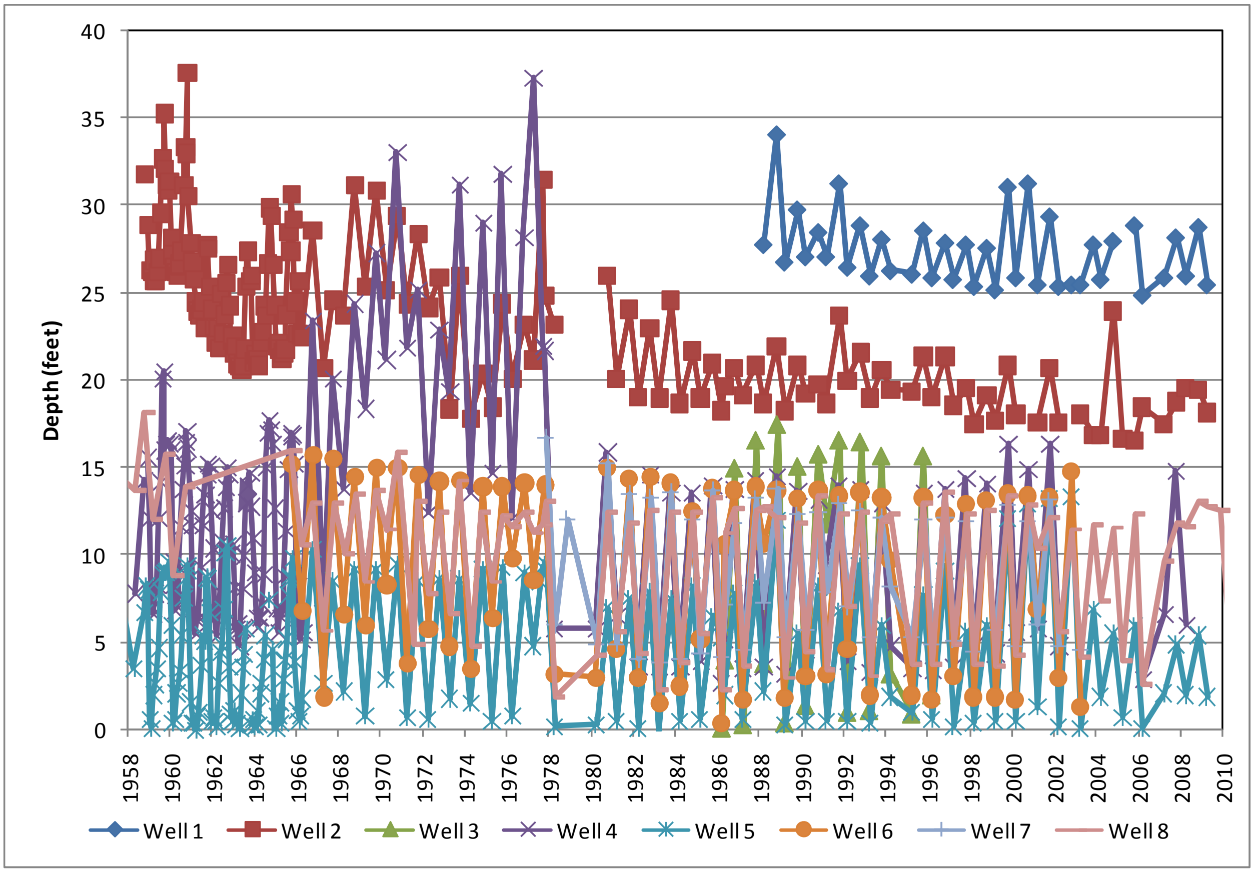


Figure 7. Groundwater Elevations Measured in Seven Department of Water Resources Wells Located in Little Lake Valley



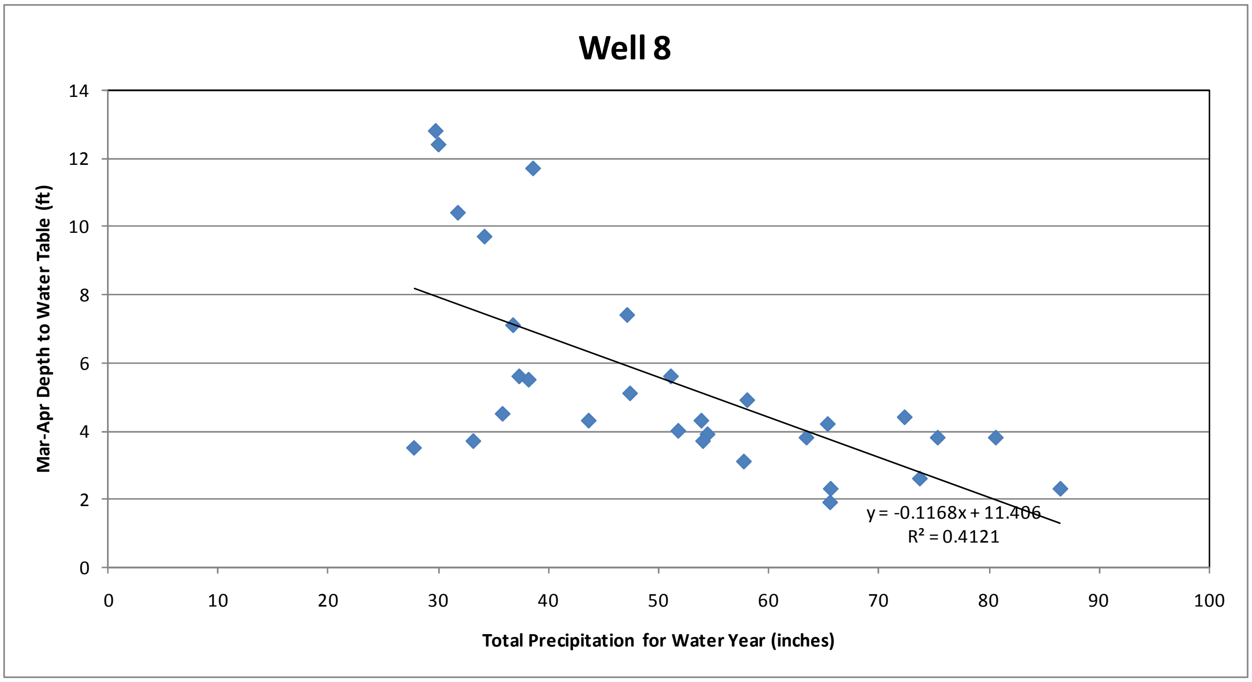
Data source: California Department of Water Resources 2010

Figure 8. Depth to Groundwater Measured in Seven Department of Water Resources Wells Located in Little Lake Valley

The DWR well data indicate that groundwater elevations may fluctuate seasonally from 5 to 15 feet (Figures 7 and 8). Seasonal fluctuations in groundwater level result primarily from pumping and precipitation (Farrar 1986), although other factors such as groundwater movement to and from streams, evapotranspiration, and recharge from irrigation play a role. Wells 2, 3, 4, 6, and 8 are no longer in use; fluctuations in their water levels are not a result of pumping by these wells, although pumping at other wells could be affecting the levels in Wells 2, 3, 4, 6, and 8.

The DWR well data also indicate that groundwater levels in the Valley may decrease slightly during periods of drought. For example, well-level recovery was slightly reduced in some wells during some dry winters such as 1977. However, it appears that in general there has been little change in well levels from year to year.

Portions of the aquifer that are most likely to support wetlands are those areas where the aquifer is close to the soil surface. It appears that during most years, there is sufficient rainfall to bring the water table close to the soil surface at some locations such as well 5. Once the aquifer approaches the surface, lateral runoff to surface waters is more likely to occur. Figure 9 shows a comparison of spring well elevations versus precipitation for a well with elevations close to the surface and a well with deeper water (Well 5 versus Well 8). It appears that total precipitation has more of an effect on spring aquifer elevations in well 8 than in well 5. For well 5, there is generally enough water to bring the aquifer close to the surface, which indicates that there is usually enough water to have a high water table at the lower elevations in Little Lake Valley. For both wells, there are other sources of year-to-year variability such as rain pattern and the particular timing of the measurements.



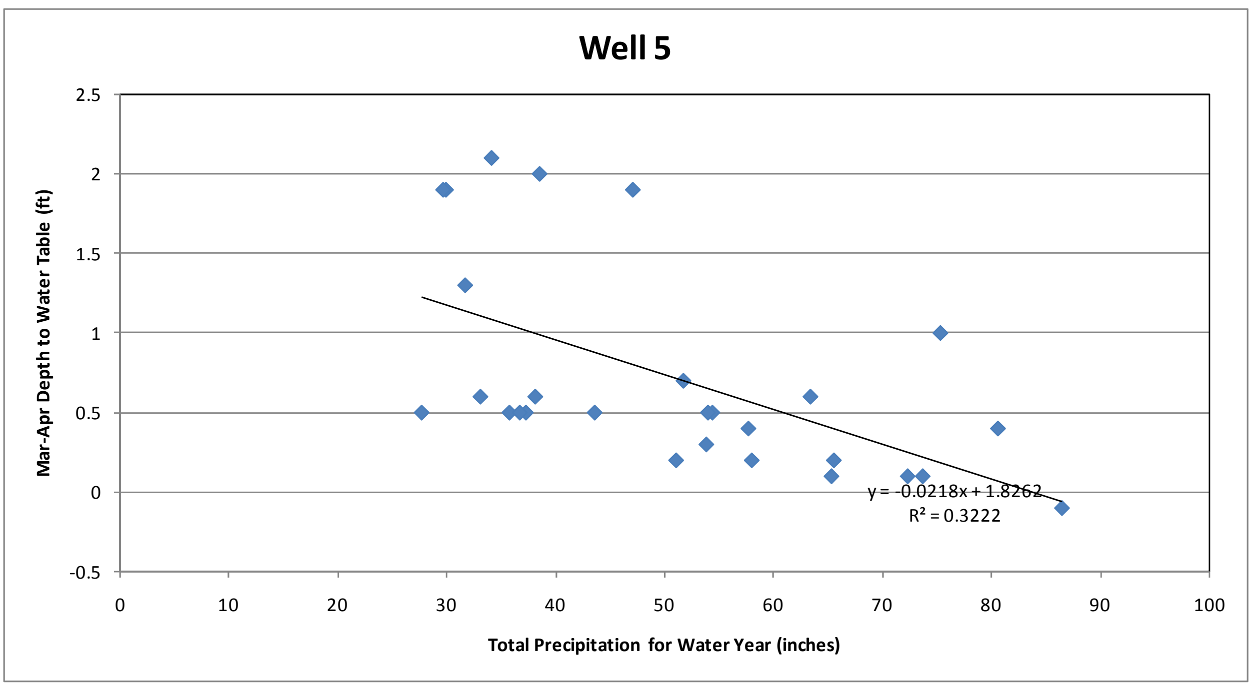


Figure 9. Comparison of Total Precipitation to Spring Well Elevations in a Well with Water Levels Close to the Soil Surface (within 2 feet, Well 5) and in a Well where the Elevations are Further from the Soil Surface (Well 8)

8.1.2.2 Aquifer Drawdown Rates

If a wetland is dependent on an aquifer, the ability of the wetland to be sustained in the spring will depend on how long the aquifer remains at high elevations and then how rapidly the water table declines.

Most of the DWR well measurements were collected twice a year, once in the spring when the aquifer is high and once in the fall, when the aquifer is low. During the early 1960s, however, data were collected approximately monthly in wells 4 and 5. These data show that the aquifer tends to remain high starting sometime between the beginning of December and mid February and then declines rapidly between March and mid May depending on rainfall patterns.

The DWR well data for the spring and fall were used to estimate aquifer drawdown rates for wells 4 through 8 for all data starting in 1978 (data from wells 1 and 2 were not used because the depth to the aquifer was too great to be representative of a portion of the aquifer that might be supporting wetlands and the data from well 3 was not used because the period of record was too short). The average drawdown rates for each well varied between about 0.4 and 0.6 inches per day, with an overall average of 0.5 inches per day.

8.1.3 Hydrologic Monitoring of North Coast Semaphore Grass Populations

As part of the evaluation of North Coast semaphore grass habitat in Little Lake Valley, 30-inch deep groundwater monitoring wells were installed in the vicinity of PLHO habitat in both wetlands (8 wet meadow sites and 5 riparian woodland sites) and uplands (7 sites). These wells are located on the Arkelian Parcel (2 sites), Frost Parcel (2 sites), Goss Parcel (6 sites), Huffman Parcel (6 sites), Lusher Parcel (2 sites), and MGC Plasma North Parcel (2 sites). Of these, only the Goss and MGC Plasma North parcels are proposed for wetland establishment. However, the data from the other parcels may be indicative of the variation in hydrology that might be expected at other establishment sites that do not have groundwater monitoring wells. Water levels were monitored intermittently in the wells between April 24, 2010 and June 27, 2010.

Data from these wells indicate that most wells behaved in a similar manner in response to rainfall and drain rates (Figure 10). Water elevations generally:

- increased between April 24, 2010 and April 29, 2010 (precipitation = 2.24 inches);
- decreased between April 29, 2010 and May 19, 2010 (precipitation = 1.15 inches);
- increased again between May 19, 2010 and June 7, 2010 (precipitation = 2.41 inches); and
- decreased after June 7, 2010.

There were exceptions to this pattern. Most notably, water levels in a few wells (e.g., Arkelian 3, Huffman 2, and Goss 9) continued to decline instead of increase between May 19 and June 7. A speculative explanation for this difference is that the groundwater aquifer at these sites may have declined such that drainage rates were increased and rainfall no longer could fill the wells in those sites. Surface water was only present briefly (as indicated by water depths greater than 30 inches) and only at a few sites.

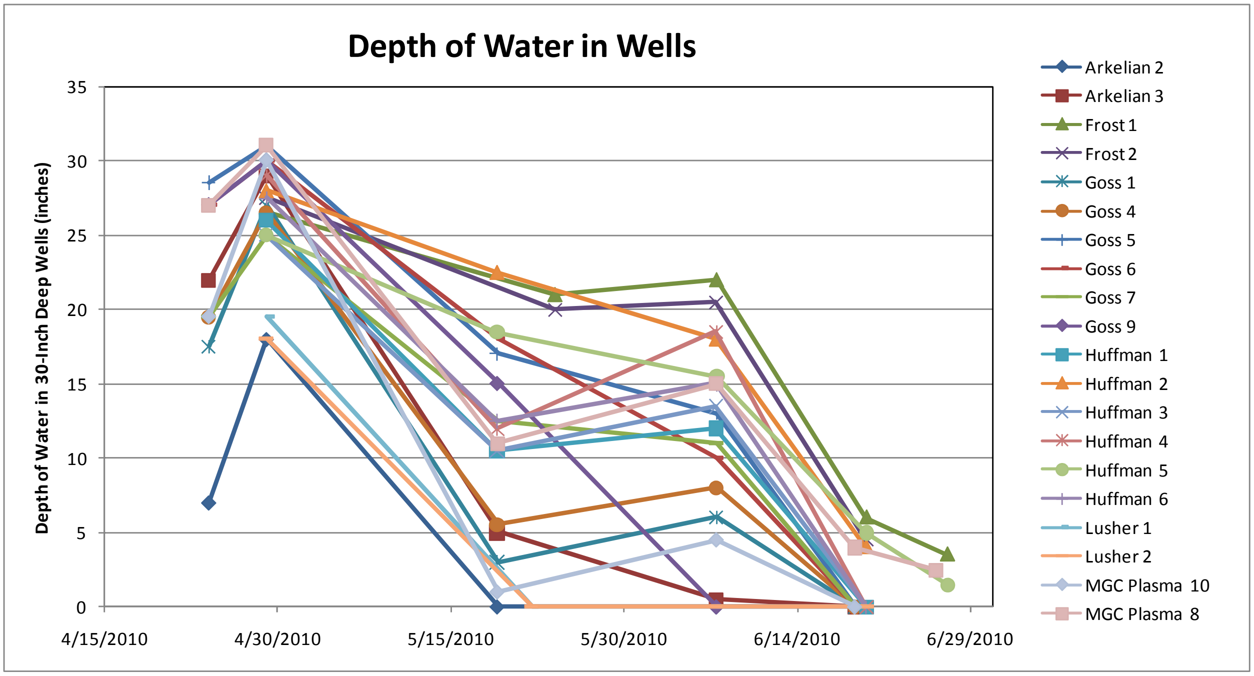


Figure 10. Depth of Water in Hydrologic Monitoring Wells near North Coast Semaphore Grass Populations

Precipitation data (from the WRCC for the Willits 1 NE site) was used along with the well data to algebraically estimate the effect of rainfall on water depths in the wells (the rainfall multiplier) and the drainage rates. These values can be estimated for each set of 3 surveys with most water depths greater than zero (April 24-April 29-May 19 and April 29-May 19-June7). The results of these calculations are shown in Table 8.

Table 8. Drainage Rates and Effect of Rainfall on Depth of Water in Wells (Rainfall Multiplier) Calculated from Precipitation and Depth of Water in Wetland Monitoring Wells

	Drain Rate (inches/day)	Rainfall Multiplier	Drain Rate (inches/day)	Rainfall Multiplier
Site	**Results Derived from Surveys 1 -3**		**Results Derived from Surveys 2 - 4**	
Arkelian 3	1.58	6.66	2.00	13.89
Frost 1			0.41	3.18
Frost 2			0.51	3.67
Goss 1	1.66	7.94	2.33	19.58
Goss 4	1.41	6.27	2.03	17.04
Goss 5	0.88	3.07	1.11	7.06
Goss 6	0.78	3.07	0.75	2.58
Goss 7	0.88	4.42	1.08	7.87
Goss 9	0.95	3.46		
Huffman 1			1.48	12.31
Huffman 2			0.31	0.55
Huffman 3			1.46	12.73
Huffman 4			1.84	17.19
Huffman 5			0.46	2.41
Huffman 6			1.48	12.71
MGC Plasma 10	1.97	9.09	2.81	23.57
MGC Plasma 8	1.27	4.61	2.00	17.46
Average	1.26	5.40	1.38	10.86
Average for Uplands	1.43	6.75	1.52	12.75

Notes:

Wells with insufficient data or that were dry on June 7, 2010 were not used in the analysis.

Upland sites used in the calculations were Goss 7, Huffman 3-6, and MGC Plasma 10.

An inch of rainfall may result in an increase of multiple inches of soil moisture. This can be seen clearly in the differences between the first and second survey. For example, the well elevations at site Arkelian 2 increased about 11 inches between April 24 and 29 even though it only rained about 2.2 inches. The primary explanation for this effect is that only a fraction of the soil volume is empty space available to be filled with water. The ratio between increase in groundwater level and precipitation could also be increased by local effects of water moving laterally into a wetland area. For the water budget discussed below, this multiplier is assumed to directly result from the limited amount of space available for water to fill the soil. A direct consequence of this value is that for an inch of surface water to infiltrate the soil, the water in the soil must be moving downward at a much faster rate that is estimated as the infiltration rate times the observed ratio.

The drain rates were relatively low, with an overall average of 1.3 to 1.4 inches per day, considerably lower than the estimated average basic infiltration rate or saturated hydraulic conductivity of 7-9.6 inches per day for clay loam soil. For 7 to 9.6 inches of surface water to move through the soil in a day, the water must move through the soil much faster because of limited soil space available for the water. There was little difference between the overall average values and the average values for the upland sites.

8.1.4 Water Budget Methods

In order to evaluate the potential for wetland establishment success, a water budget analysis was performed using a range of precipitation and hydrologic assumptions, including variable aquifer conditions and soil percolation and lateral movement drainage rates.

Water elevations were estimated with and without a high water table. If the water table is low, water in the wetlands must be perched on a semi-permeable soil layer and the water budget is dependent mostly on precipitation and soil permeability. If the water table is high, local precipitation may be retained by either the semi-permeable soil layer or by the presence of the aquifer. If water is retained by the presence of the aquifer, it becomes the upper portion of the aquifer. For the case of a high water table, three types of water levels were evaluated: the base aquifer elevation, the elevation of water perched on a semi-permeable soil layer, and the elevation of rainfall that may have percolated through the soil and become perched on top of the aquifer.

8.1.4.1 Precipitation

Daily precipitation data from 1960 to 2010 was obtained from the WRCC for the Willits 1 NE station located just north of the City of Willits. Missing values were filled in with data from nearby stations, mostly with data from the CDEC station WIL, located approximately 5 miles south of the City of Willits. Average annual precipitation for this dataset is 51.2 inches. Data from water years 1987 and 2006 were chosen to represent relatively dry (10^{th} percentile, with 33.1 inches of precipitation) and wet (90^{th} percentile, with 73.7 inches of precipitation) conditions. Data from water year 2010 (47.4 inches of precipitation) were also used in order to compare estimated water elevations with those that were measured in the PLHO wetland monitoring wells.

8.1.4.2 Evapotranspiration

Evapotranspiration was not explicitly included in the analysis. The effect of evapotranspiration is minimal compared to the permeability of the soils that are most abundant in the Valley (i.e., evapotranspiration would have little effect on the amount of water perched on the wetland soils). Furthermore, the drain rates used for the water perched on the aquifer were measured empirically (with the PLHO wetland monitoring wells) and therefore include any effects of evapotranspiration. Evaporation can have some affect on the aquifer as a whole if the top of the aquifer is located near the soil surface. However, aquifer elevations used in this water budget assessment are based on the measured DWR well data, which already include evaporation effects.

8.1.4.3 Elevation of Precipitation Perched on Wetland Soils

Elevation of local precipitation perched on the semi-permeable wetland soils is dependent on precipitation, the permeability of the soil (the basic infiltration rate), and the depth to the most restrictive soil layer. In addition, because much of the soil volume is occupied by the soil material itself as well as moisture, an inch of rain results in much more than an inch of saturated soil in the absence of infiltration. This ratio of inches of saturated soil to inches of precipitation is labeled here as the rainfall multiplier and is expected to be similar to 1 divided by the specific yield of the soil. However, it may also be affected other things. For example, lateral movement of water could increase or decrease this value. The elevation of local precipitation perched on wetland soils is estimated with the following equation in MicroSoft Excel:

$$EPS_t = \min(\ Emax,\ if\ (or(EPS_{t-1}>EL,\ Precip=0),\ EPS_{t-1,}\ EL) + RainMult * Precip - Infilt*RainMult)$$

Where:

EPS_t = Top elevation of water perched on wetland soils for current day

EPS_{t-1} = Top elevation of water perched on wetland soils for previous day

Emax = maximum elevation of water allowed before water would flow off site (assumed to be 10 inches)

EL = Elevation of least permeable soil

Precip = precipitation in inches for current day

RainMult = Conversion between inches of precipitation and inches of saturated soil

Infilt = Estimated infiltration rate for water on the soil surface (inches/day)

Note: Elevation of water above the soil surface is converted to actual elevations by dividing by RainMult.

8.1.4.4 Elevation of Aquifer

In the water balance assessment, the aquifer was assumed to either be deep enough that it would not affect wetlands or be relatively shallow. For the shallow aquifer scenario, the aquifer was assumed to behave in a manner similar to DWR's well #5, which frequently has a top elevation that approaches the soil surface during the rainy season. The regression equation in Figure 9 was used to estimate the elevation for the top of the aquifer. The elevation for the top of the aquifer was estimated in Excel with the following equation:

$$EA = if\ (PCum>15,\ AC + AMult * PCum,\ -50) + Drop$$

Where:

EA	=	Elevation of aquifer in inches
PCum	=	cumulative precipitation for the rainy season (inches)
AC	=	Aquifer constant, from regression for spring elevation for well 5 shown in Figure 9
AMult	=	Aquifer coefficient, from regression for spring elevation for well 5 shown in Figure 9
Drop	=	Decline in aquifer level, assumed to begin after March 1 when precipitation for the past 20 days has been less than 3 inches. The aquifer drain rate was assumed to be 0.4 inches per day based on the Well 5 data.

8.1.4.5 Elevation of Water Perched on Aquifer

The equation for estimating the aquifer level described above is an estimate of the general regional level. As the aquifer approaches the soil surface recent rain events could temporarily place additional water on top of the aquifer. In a sense, this water would be perched on the main body of the aquifer. Because of its high elevation, it would likely drain more rapidly than the main aquifer either into adjoining surface waters. The surface elevation of this temporary top layer of the aquifer was estimated with the following Excel equation:

$$EPA_t = EA + ETA_{t-1} + RainMult*Precip – drain$$

Where:

EPA_t	=	Elevation of the water perched on the aquifer for the current day. This value is not allowed to exceed Emax
Drain	=	Estimated water drainage rate for water level within the soil (inches/day)

Note 1: precipitation is only allowed to contribute to this layer when the aquifer elevation is greater than -24 inches, otherwise precipitation is assumed to contribute directly to the main aquifer.

Note 2: Elevation of water above the soil surface is converted to actual elevations by dividing by RainMult.

8.1.4.6 Scenarios

Two basic types of scenarios were evaluated:

1. High Water Table Scenario: An estimate of most likely hydrologic conditions, which includes a relatively high aquifer and a higher more realistic level of soil permeability.
2. Low Water Table Scenario: An estimate of hydrologic conditions that would be more favorable for soil-perched wetlands, which includes a relatively low aquifer and a very slow soil permeability.

Both of these scenarios were evaluated with precipitation data from 2010, 1987 (10th percentile), and 2006 (90th percentile).

8.1.4.6.1 High Water Table Scenario

For this scenario, the following assumptions were used:

Aquifer:

Depth to water table was assumed to be similar to the depth to water table measured at DWR well 5. During the winter and early spring, the water table was set to rise to within 3 to 18 inches of the soil surface.

Water perched on soil:

- An infiltration rate of 7 inches per day was used to represent clay loam, one of the most abundant soil textures found in the wetland areas.
- The clay loam was assumed to first occur at a depth of 5 inches.
- The rainfall multiplier was set to 5.4 based on the measurements at the test wells. This value is multiplied by the infiltration rate to estimate the speed that the water moves through the soil.

Water perched on aquifer:

- The rainfall multiplier was set to 5.4 based on the measurements at the test wells.
- The drain rate was set equal to 1.4 inches per day based on the measurements at the test wells. Note: this value is not multiplied by RainMult because it was a direct measurement of the decrease in water level within the soil.

8.1.4.6.2 Low Water Table Scenario

For this scenario, the following assumptions were used:

Aquifer:

Depth to water table was assumed to be at least 50 inches

Water perched on soil:

In this scenario the parameters for water perched on soil were chosen to be most favorable.

- An infiltration rate of 2 inches per day was used to represent clay. Of the 19 soil pits dug at the Goss and MGC Plasma parcels for the wetland soils evaluation, three (all located in uplands) contained clay or very gravelly heavy clay soil that was estimated to have very slow permeability.
- The clay was assumed to first occur at a depth of 1 inch (as occurred at one of the 19 soil pits).
- The rainfall multiplier was set to 3. A low multiplier helps retain water perched on soil because the multiplier is used to estimate how fast the water must move through the soil in order to

attain a certain infiltration rate. For example, an infiltration rate of 2 inches per day implies that the water must be moving through the soil at 6 inches per day if the rainfall multiplier is 3 (i.e., 1 inch of surface water fits into 3 inches of soil). A rainfall multiplier of 3 implies that the specific yield of the soil would be about 33% (i.e., 33% of the volume of saturated soil would contain extractable water). A low rainfall multiplier reduces the elevation increase associated with rainfall, but this effect is smaller than the reduced elevation associated with infiltration.

Water perched on aquifer:

Because of the depth to the aquifer, water was assumed not to become perched on the aquifer.

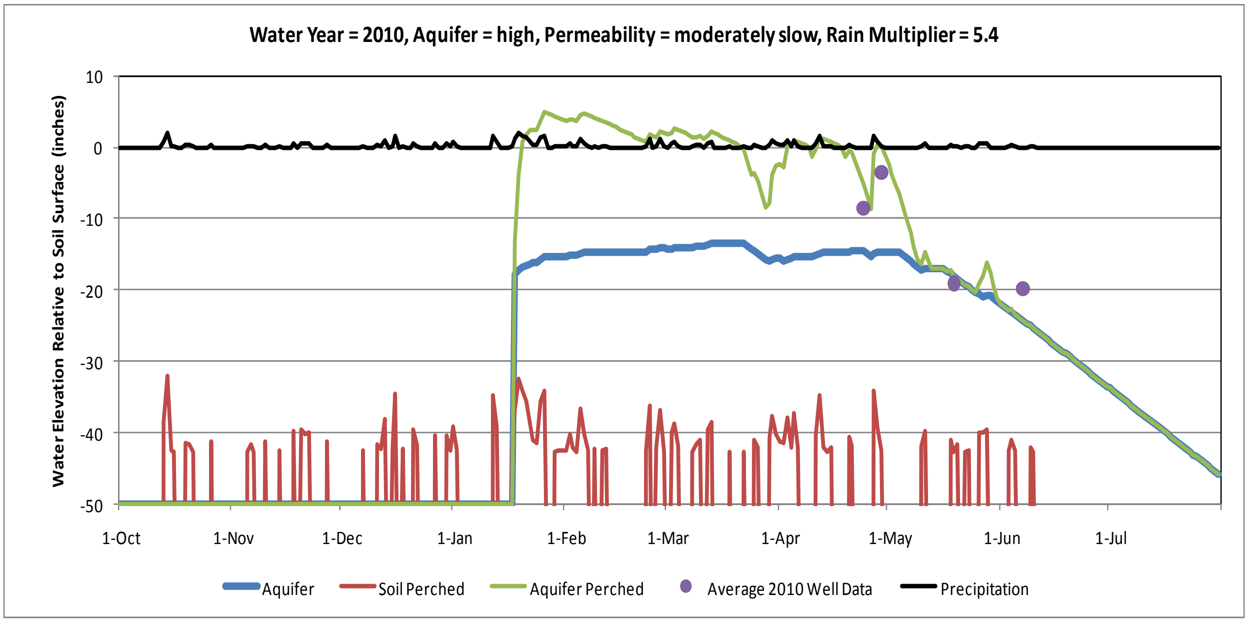
8.1.5 Results and Discussion

Water budget results are shown in Figures 11 through 13 for 2010, 1987, and 2006, respectively. Each figure shows the high water table scenario at the top (the most likely hydrologic scenario) and the low water table scenario at the bottom (the most optimistic parameter values for water perched on soil). All results are presented in terms of elevation in inches relative to the soil surface.

The results for 2010 precipitation show that both the high water table and low water table scenarios have elevations that are similar to those observed in the test wells. The average well elevation data shown in the graphs are a fairly close match to either the elevation of the water perched on the aquifer for the high water table scenario or the elevation of the water perched on the wetland soil for the low water table scenario. However, because the parameter values chosen for the low water table scenario were fairly extreme and not representative of the majority of the data, it is likely that most wetlands in Little Lake Valley exist as a result of the presence of a high water table. Under the high water table scenario, wetland water elevations were estimated to be much higher (frequently above the soil surface) than under the low water table scenario (elevations generally 4 inches or more below the soil surface.

The results for 1987 precipitation (Figure 12) show that during relatively dry years, wetland functionality would be limited, although much better under the high aquifer scenario than under the low aquifer scenario. One of the requirements of a wetland is that there be saturation within 12 inches of the surface for at least 2 consecutive weeks during the year. This condition is not quite met under the low aquifer scenario with 1987 precipitation.

The results for 2006 precipitation (Figure 13) show that both scenarios may produce wetland conditions, although the high water table scenario would generate much more water above the soil surface than the low water table scenario.



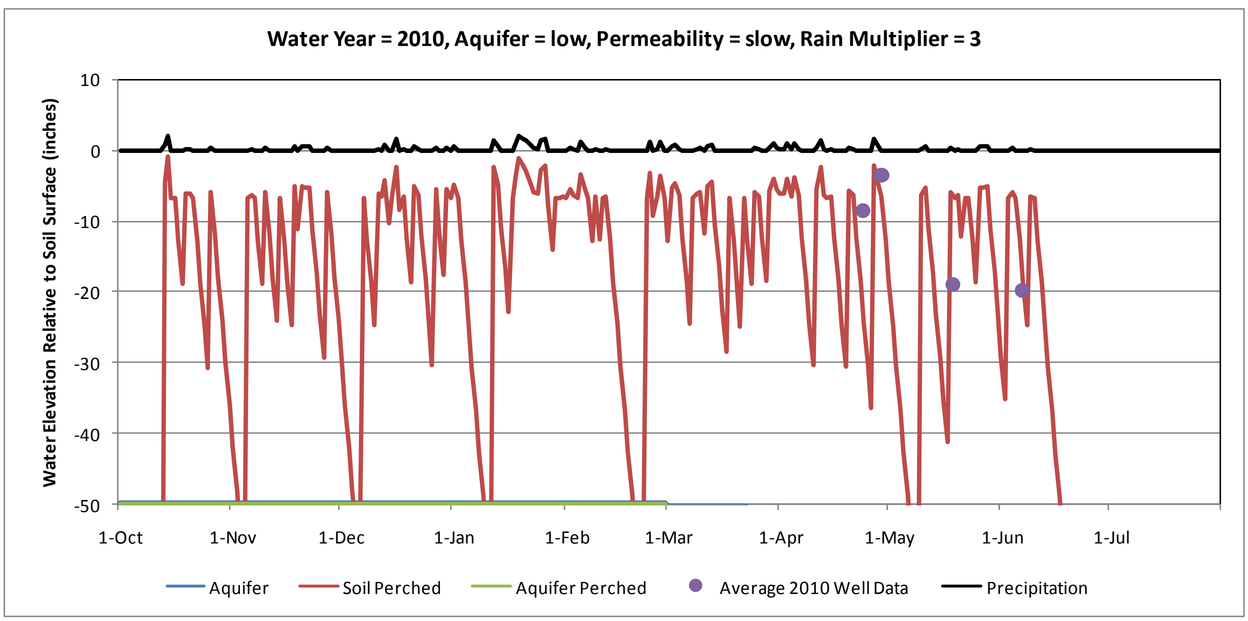
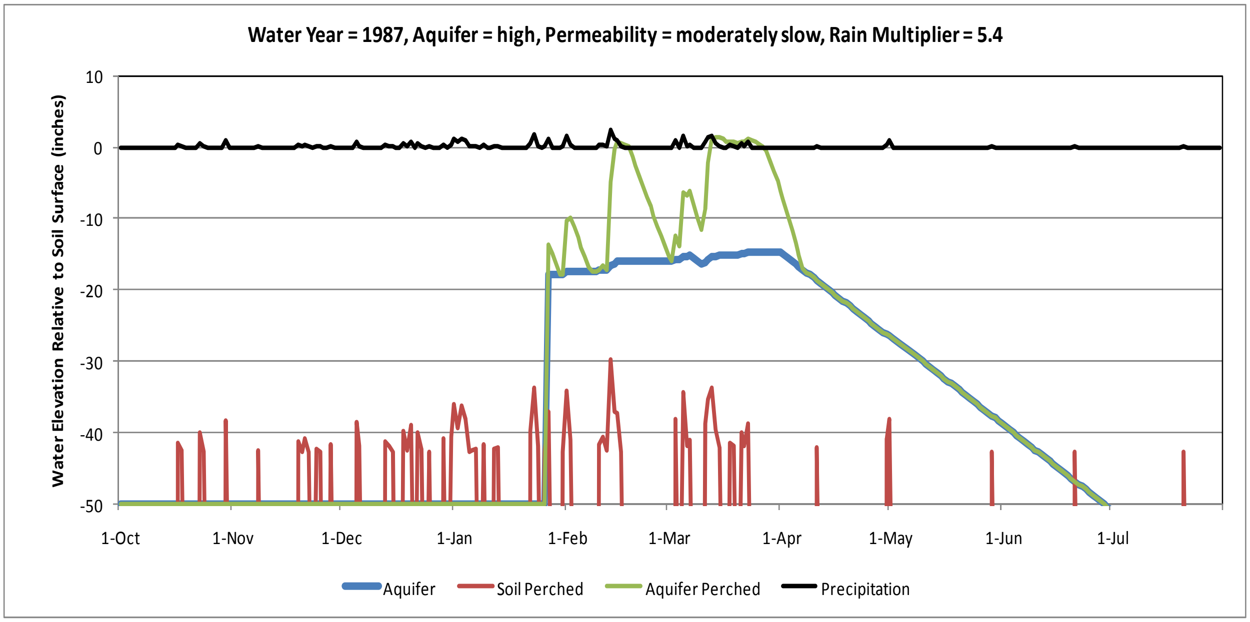


Figure 11. Estimated Water Surface Elevations for a High Aquifer and Low Aquifer Scenario with 2010 Precipitation



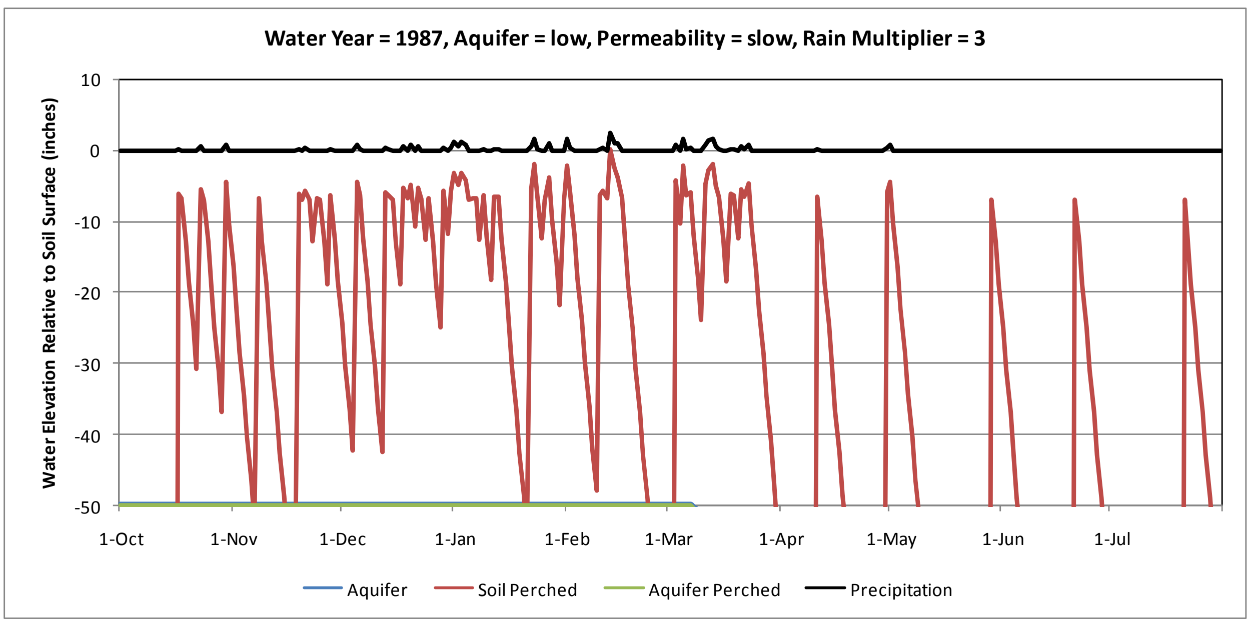
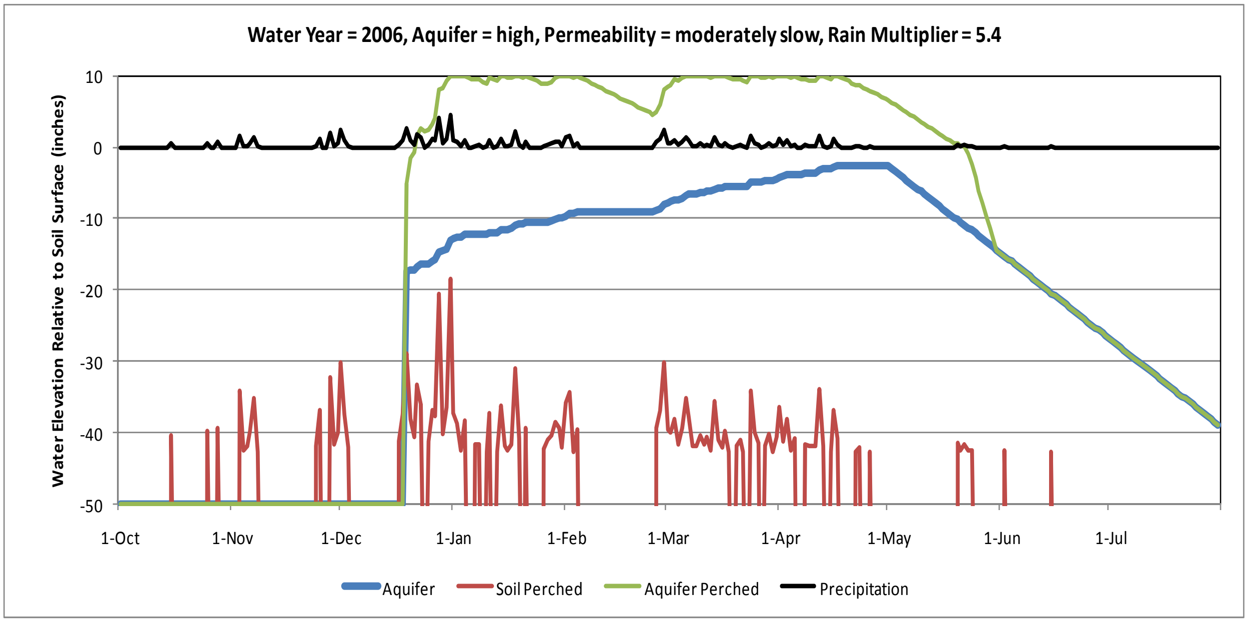


Figure 12. Estimated Water Surface Elevations for a High Aquifer and Low Aquifer Scenario with 1987 Precipitation



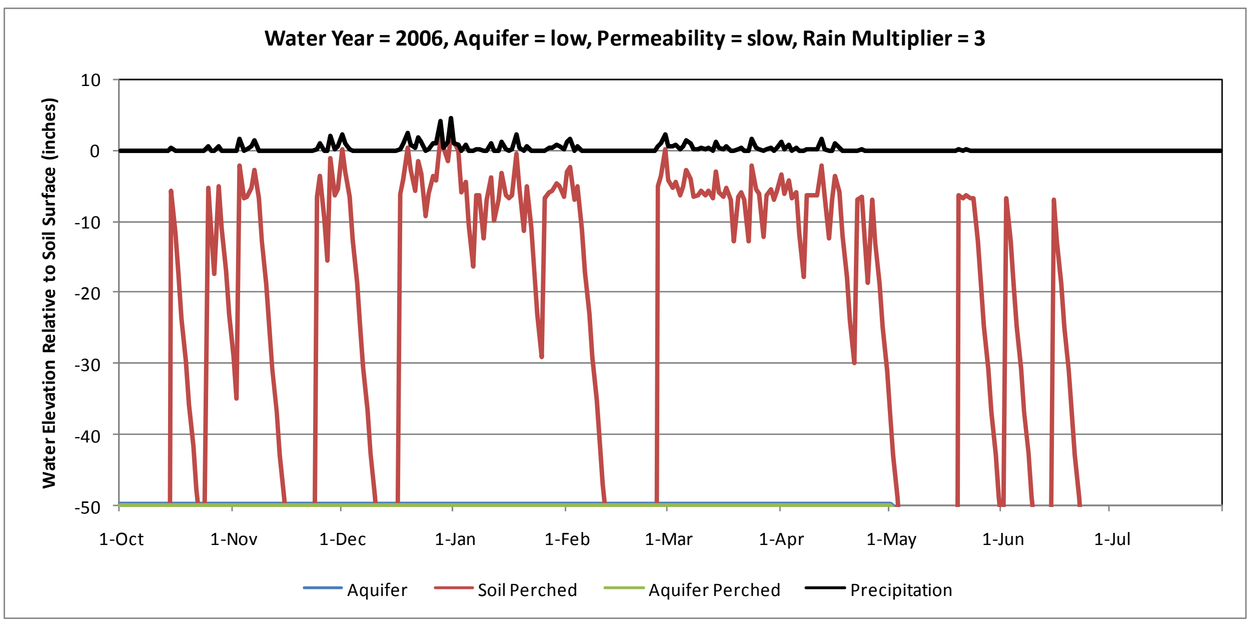


Figure 13. Estimated Water Surface Elevations for a High Aquifer and Low Aquifer Scenario with 2006 Precipitation

Based on existing soils data, it seems likely that most wetlands in Little Lake Valley could not be sustained merely by soils retaining local precipitation. It seems likely that the wetlands are sustained by the presence of a high water table or other sources of inflow.

There is limited data available to distinguish the potential differences between proposed wetland establishment sites in terms of the water budget assessment. Table 9 summarizes the available site specific data.

Table 9. Hydrologic and Soil Texture Information for Offsite Mitigation Parcels where Wetland Establishment is Proposed

Establishment Site	Water Elevation Data from Monitoring Wells for PLHO Study	Soil Texture Data from PLHO Soil Surveys and Wetland Delineations	Soil Texture and Redoximorphic Data from July 2010 Soil Surveys of Proposed Wetland Establishment Sites	Approximate Elevation of Soil Surface (feet above msl)	Field Observations
Ford Parcel 108-010-06		mostly clay loam and loam		1320 - 1330	Located at the bottom of the valley where Little Lake historically formed. Outlook Creek, Oat Canyon Creek, and an unnamed drainage present. Mixed marsh area near wetland establishment site had shallow inundation in July 2010.
Goss	√ [a]	mostly clay loam and loam	mostly clay loam and loam, redoxymorphic soil features generally within the top foot of the soil surface	1394	Presence of wetlands along former stream channels may indicate subsurface flows. Shallow inundation in winter.
MGC Plasma North	√ [a]	mostly clay loam and loam	mostly clay loam and loam, redoxymorphic soil features generally within the top foot of the soil surface	1394-1402	Presence of wetlands along former stream channels may indicate subsurface flows. Spring discharge carried by a ditch seeps into the soil at this site. Shallow inundation in winter.

Table 9. Continued

Establishment Site	Water Elevation Data from Monitoring Wells for PLHO Study	Soil Texture Data from PLHO Soil Surveys and Wetland Delineations	Soil Texture and Redoximorphic Data from July 2010 Soil Surveys of Proposed Wetland Establishment Sites	Approximate Elevation of Soil Surface (feet above msl)	Field Observations
MGC Plasma Middle		mostly clay loam and loam		1398-1402	Presence of wetlands along former stream channels may indicate subsurface flows. Shallow inundation in winter.
Nieson		mostly clay loam and loam		1344	Railroad ditch conveys water north through the site. Saturated soil during April 2010.
Watson 037-221-30		mostly clay loam and loam	a small area of clay pan detected	1330-1340	Receives seepage from ephemeral drainages. Floodwaters from the major creeks (e.g., Davis and Outlet Creeks) contribute to large area of winter inundation on the western (lower) portion of the site.

[a] MGC Plasma North tended to have higher drain rates and rainfall multipliers than Goss, but there were only two sample sites for MGC Plasma North and the wetland to be created on the Goss, MGC Plasma North, and MGC Plasma Middle will be contiguous.

There is little data available that distinguishes the proposed wetland establishment sites, although the soil surveys at the wetland establishment sites have not yet been completed. Because there is very little soil with very low permeability (e.g., clay), it is likely that wetlands are controlled by local aquifer conditions. Field observations of local drainages and topographic conditions suggest that a few of the wetland sites may benefit from lateral movement of surface and subsurface waters.

Based on available information, there is little hydrologic difference between upland sites and nearby wetlands in terms of soil permeability and well hydrology. It seems that the main difference between existing wetlands and nearby upland establishment sites is the ground surface elevation, which would be lowered for wetland establishment.

9 Citations

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California Department of Transportation (Caltrans). 2010b. Willits Bypass Technical Memorandum: Soil and Hydrology Site Characterization Monitoring Methods (Work Plan Task 4-4.1). May 28, 2010. District 3 North Region Environmental Division. Sacramento, CA.

10 Personal Communications

Meigs, Jason. Associate Biologist. California Department of Transportation. July 28, 2010 - notes provided on field observations at the offsite mitigation parcels where wetland establishment is proposed.

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

JUL - 9 2010

REPLY TO
ATTENTION OF

Regulatory Division

SUBJECT: File Number 1991-19474N

Mr. Charlie Fielder
District 1 Director
California Department of Transportation
P.O. Box 3700
Eureka, California 95502

Dear Mr. Fielder:

Per our District Commander's June 29, 2010 e-mail communication to you, we are hereby providing you with the list of items Caltrans must provide to the Corps by August 15, 2010, in order for us to come to a permit decision by August 30, 2010. To adequately address the three items specified by the District Commander, including the 401 Certification, a complete long-term management plan, and complete endowment calculations broken down by parcel (must use spreadsheet provided by the Corps by e-mail on June 2, 2010 for **each parcel**), you must provide the following 6 items to meet the spirit and intent of our commitments.

These items are a subset of the larger list provided today to you by the RWQCB representing the complete information needs of the Corps, the RWQCB, and the EPA. The list below represents the minimum information necessary for us to complete our public interest review, ensure compliance with mandatory "no net loss" policy, and ensure compliance with our Mitigation Regulations (33 CFR Part 332). To date, you have only proposed 23 acres of wetland establishment (creation) and have not shown how you will effect "no net loss" of the 83 acres of fill that is proposed.

1. A **clear accounting** of existing conditions on each mitigation parcel specific to waters of the U.S. including aquatic resource type (you must specify either wetlands, non-wetland waters of the U.S., OR riparian buffer) and acreage in a table with associated drawings. We also require a clear accounting of proposed conditions (i.e. climax community) on each mitigation parcel specific to waters of the U.S. including proposed aquatic resource types and acreages.

2. Compensation types must be clarified throughout the Mitigation and Monitoring Plan (MMP) and only Corps-recognized definitions are to be used. "Protection" is not a recognized Corps definition per 33 CFR Part 332 and any mitigation parcel areas

classified under this term **must be reclassified** according to one of the Corps-recognized definitions. The word "protection" may not be used in the final MMP.

You have counted returning areas that will be temporarily impacted to their original contours as "restoration". "Restoration" is not defined per 33 CFR Part 332 as "areas temporarily affected by onsite or offsite construction activities that will be restored to pre-project conditions." Any areas classified this way within the MMP **must be removed** from the mitigation totals, as the Corps does not recognize them as "restoration" areas.

3. As specified in our April 23, 2010 letter, information justifying areas proposed for preservation must be provided pursuant to 33 CFR Part 332.3(h).

4. Each and every area proposed for **establishment** must have the following details and baseline information: 1) Caltrans needs to describe the process used in selecting each site. 2) Caltrans needs to clearly define the purpose of each establishment site. What functions and values are being replaced at the establishment site? Performance standards and success criteria will be based on this. 3) Caltrans needs to provide **fully developed** construction plans: existing contours, proposed contours, planting plans, construction sequence. 4) Caltrans needs to clearly define the location and the size of each mitigation site (not give us the size of the actual parcel, we need to know the size of the mitigation site). 5) Caltrans must have a corresponding reference site for each establishment site. The enhancement plans must contain the following information:
   a. Hydrology. The following information is needed for each proposed wetland establishment site:
      1) Current conditions information:
         - Analysis of existing hydrologic conditions in reference sites.
         - Hydrologic testing of the mitigation sites. Testing must include:
           - Examination of the groundwater availability.
           - Hydroperiod Information: the frequency of flooding, depth, duration, timing of saturation or inundation, percent of open water.
           - Historical hydrology of mitigation site if different from present conditions.
           - Acres of contributing drainage areas.
           - Results of water quality analysis: data on surface water, groundwater, redox, nutrients, organic content, suspended matter, DO, heavy metals.
      2) Information to estimate proposed hydrological conditions:
         - A reliable water budget must be presented. You must be able to show that net inflows are greater than net outflows. Water budget must include: water source(s): precipitation, surface runoff, groundwater, stream. Water losses.

- Provide a water budget for wet years and dry years.
- Modification of the hydrologic characteristics should be kept to a minimum.
- Site should be hydrologically self sustaining.

b. Soil Characteristics. The following information is needed for each wetland establishment site:
   1) Soil profile. The MMP provided the soil survey information. Caltrans needs to locate those soils on site. Submit a report of soil samples with a map showing data sample points.
   2) Standard soil analysis: percent organic matter, structure, texture, permeability.
   3) What will be the source of the soils? (e.g., existing soil, imported hydric soil from impact site).
   4) Also need: erosion and soil compaction control measures.

c. Vegetation.
   1) Existing conditions: We generally have a list of the species that occur on site from the delineations that were completed. For each wetland establishment site we need:
      - Species characteristics such as: densities, age, health, natives/non natives.
      - Percent cover.
      - Community structure (canopy stratification).
      - Map showing the correct location of plant communities with representative site photos.
      - Proposed site should be located adjacent to existing waters of the U.S. or a high functioning buffer adjacent to waters of the U.S. to create a wildlife corridor. Provide documentation of this connectivity.

d. Watershed context/surrounding land use for each wetland establishment site:
   1) Impairment status and impairment type of aquatic resources.
   2) Description of watershed land uses (percent agriculture, forested, wetland, developed).
   3) Size of natural buffers (show on map and do not call them "riparian").
   4) Description of landscape connectivity: proximity and connectivity of existing aquatic resources and natural upland areas (and show on map).
   5) Relative amount of aquatic resource area that the impact site represents for the watershed and/or ecoregion (by individual type and by overall resources).

e. Goals of each wetland establishment site:
   1) Types and areas of habitat to be established.
   2) Specific functions of the habitat types.
   3) Time lapse between jurisdictional impacts of the project and mitigation site success.

4) Total cost of the establishment site: site preparation, planting, maintenance, monitoring.
5) Overall watershed improvement to be gained by the wetland establishment site.

f. Wetland Establishment Site Implementation:
   1) For each establishment site Caltrans must:
      - Provide a rationale for expecting implementation success.
      - Name responsible parties.
      - Provide financial assurance information.
      - Provide a construction schedule.
      - Provide a site preparation plan.
      - Provide a planting plan. The planting plan design must emulate a reference site in terms of plant species and spacing. Planting design must place plants relative to the water source supporting them specific to what the optimal condition would be for that species.
      - Prior to planting the site soil conditions must be confirmed: soil moisture, ph, salinity, organic matter, nitrogen, soil type. Be advised that the native soils must support the proposed wetland establishment. Clay liners or other artificial barriers are not permitted.
      - Provide as-builts within 45-days of construction of establishment wetland site.

g. Maintenance Activities During Monitoring Period for each wetland establishment site:
   1) Provide the list of maintenance activities
   2) Responsible parties
   3) Schedule

h. Monitoring Plan for each wetland establishment site:
   1) Target dates for performance standards and success criteria
   2) Target functions
   3) Target hydrological regime. Hydrologic functions must be compared to what is occurring at the reference site.
   4) Target mitigation acreage of establishment
   5) Monitoring method and schedule
   6) Annual monitoring report

i. Completion of each Mitigation Site:
   1) Written notification is required
   2) Agency confirmation will be required before mitigation is considered complete.

j. Contingency Measures for each mitigation site:

1) Initiation Procedures. Circumstances necessitating the initiation of contingency measures must be described.
2) Funding mechanism (See item 5. below)
3) Responsible parties

5. The Corps requires a performance bond or other Corps-approved financial assurance mechanism payable at the direction of the District Engineer to his designee or to a standby trust agreement. This financial assurance mechanism shall be posted **within 30 days of permit issuance** or else the Corps permit will be revoked. In order to determine the appropriate assurance amount, Caltrans must provide **sufficient and itemized calculations** by August 15, 2010 for the cost of the following: collection of all necessary baseline information, parcel-specific mitigation plan preparation based on a watershed approach, land acquisition, planning and engineering, legal fees, mobilization, construction, and monitoring, and a contingency fund for any necessary remediation.

6. As specified in our April 23, 2010 letter, the Corps believes discharge of fill for project construction should be carried out concurrently with project phase construction. Caltrans must provide us with the fill amount associated with Phase I alone, the additional fill amount associated with Phase II, and the associated drawings demonstrating the two separate Phases as described by Dave Kelley in our May 10, 2010 conference call.

These items collectively are the minimum information necessary (to be supplied by August 15, 2010) for the Corps to complete the application evaluation process.

Should you have any questions regarding this matter, please call me at (415) 503-6771. Please address all correspondence to the Regulatory Division and refer to the File Number at the head of this letter.

Sincerely,

Jane M. Hicks

Jane M. Hicks
Chief, Regulatory Division

Copy Furnished:

US EPA, San Francisco, CA (Attn: A. Strauss/J. Brush/ M. Scianni)
CA RWQCB, Santa Rosa, CA (Attn: C. Kuhlman/J. Puget)
California Department of Transportation, Sacramento, CA (Attn: R. Land)
California Transportation Commission, Sacramento, CA (Attn: J. Earp)

Memorandum

Date:	August 10, 2010
To:	Dave Wickens U.S. Army Corps of Engineers - San Francisco District 1455 Market Street San Francisco, CA 94103-1398
Cc:	Laurie Monarres, U.S. Army Corps of Engineers Melissa Scianni, U.S. Environmental Protection Agency Jeremiah Puget, North Coast Regional Water Quality Control Board Craig Martz, California Department of Fish and Game
From:	Shanna Zahner California Department of Transportation
Subject:	**Willits Bypass Project—Soil Characteristics at Proposed Wetland Establishment Sites in Little Lake Valley**

1 Introduction

The Willits Bypass Project (bypass project) has several compensatory mitigation components, including wetland establishment. As part of the Clean Water Act (CWA) Section 404 individual permit process for the bypass project, the U.S. Army Corps of Engineers (USACE) has requested information related to soils at the six offsite mitigation parcels where wetland establishment is proposed. (Corresponding information on hydrology and vegetation has also been requested by the Corps; the hydrology information was provided on July 29, 2010 (Caltrans 2010a) and the vegetation information and will be provided on August 10, 2010.) Table 1 lists the offsite mitigation parcels and the wetland establishment habitat type and acreage proposed at each parcel.

Table 1. Proposed Wetland Establishment Sites at the Offsite Mitigation Parcels

Offsite Mitigation Parcel	Assessor's Parcel Number	Proposed Wetland Establishment Habitat Type	Proposed Wetland Establishment at Parcel (acres)
Ford	108-010-06	Mixed marsh and wet meadow	2.854
Goss MGC Plasma Middle MGC Plasma North	103-230-02 103-250-14 103-230-06	Wet meadow	7.477
Niesen	108-040-02	Wet meadow	5.666
Watson—Eastern	037-221-30	Wet meadow	8.336 (north area is 4.420 and south area is 3.916)
		Total	**24.31**

Attachment 1, "July 9, 2010, letter from Corps to California Department of Transportation (Caltrans)," lists the Corps' minimum information necessary to make a permit decision for the bypass project. This technical memorandum addresses Items 4b(1-4) on page 3 in Attachment 1 – soil characteristics at each proposed wetland establishment site. At the July 12 and 13, 2010, meeting between resource agencies (i.e., USACE, U.S. Environmental Protection Agency [USEPA], North Coast Regional Water Quality Control Board [RWB], and California Department of Fish and Game [CDFG]) and Caltrans, each of the items in the July 9, 2010 letter were discussed. With respect to Item 4b(2), the resource agencies agreed that that site specific soils data on percent organic matter and permeability could be inferred from field conditions and did not require laboratory analysis.

This technical memorandum presents information on the following items for each proposed wetland establishment site per the July 9, 2010 letter:

- Soil profile (see discussion below).
- Standard soil analysis for percent organic matter, structure, texture, and permeability; see discussion below).
- Source of soils for wetland establishment. The source for topsoil for wetland establishment will be onsite salvage of topsoil at the Ford, Goss/MGC Plasma Middle/MGC Plasma North, and Niesen offsite mitigation parcels. The source for topsoil at the Watson East offsite mitigation parcel will be 1-2 inches of topsoil and plant duff harvested together within the bypass project alignment where Baker's Meadowfoam (*Limnanthes bakeri*) populations have been observed and will be impacted by the bypass project (Caltrans 2010c).

A fourth item, soil erosion and compaction measures, was requested in the July 9, 2010 letter. This information was previously provided to the USACE on August 3, 2010, as part of the construction drawings submittal.

1.1 Importance of Soil Characteristics to Wetland Establishment Suitability

The suitability of a proposed site for wetland establishment is controlled by its hydrologic characteristics and by its soil characteristics. With regard to the hydrologic *suitability of th*e proposed sites, a hydrology suitability assessment, including a water budget, was prepared and provided to the resource agencies on July 29, 2010 (Caltrans 2010a). Because discussion of soil characteristics is somewhat inseparable from discussing hydrologic characteristics, there is overlap in the information presented in this technical memorandum and the information presented in the hydrology technical memorandum (Caltrans 2010a). The soil characteristics most important to determining the suitability of a site for wetland establishment, as used in this evaluation, are soil texture (i.e., the proportions of sand-, silt-, and clay-sized particles) and redoximorphic ("redox") features (i.e., features formed by the processes of reduction, translocation, and/or oxidation of iron and manganese oxides [formerly called mottles and low-chroma colors] [USDA Natural Resources Conservation Service 2010]). Soil texture is the most important factor in controlling soil permeability. Permeability affects infiltration capacity, the rate of lateral groundwater movement, and the potential for a shallow perched water table to occur. Unless the soil has been drained, redox features are widely used as an indication of the depth at which prolonged soil saturation occurs, such as that caused by a seasonal high water table (USDA Natural Resources Conservation Service 2010). Redox features also can be used as an indication of surface water ponding/flooding. The use of redox features not only can provide an indication of long term average depths to the water table, but they are particularly useful when the soil is being evaluated during the dry season when the water table depth cannot be directly observed, such as in the present evaluation.

Other soil morphological characteristics useful in evaluating the suitability of wetland establishment include soil structure and organic matter content. Soil structure (or the lack thereof) affects water and gas permeability and root penetration. Soil organic matter content affects soil structure, water- and nutrient-holding capacity, nutrient cycling, and other processes (Donahue et al. 1983). In the context of wetland establishment, soil organic matter exerts a greater effect on vegetation growth than on controlling the presence or absence of saturated soil conditions necessary for wetland hydrologic conditions.

1.2 Wetland Establishment Parcel Descriptions

1.2.1 Landforms and Topography

1.2.1.1 Ford Offsite Mitigation Parcel

The Ford offsite mitigation parcel is proposed for 2.854 acres of wetland establishment (Figure 1). Based on field observations, the wetland establishment site on this parcel exists in the general vicinity of a floodplain landform.

The proposed wetland establishment site is elevated approximately four to five feet above the adjoining floodplain that exists to the north, south, and east. As evidenced by soil profile observations made for the present evaluation, the establishment site consists of fill material. The slope shape is planar to broadly convex, but one depressional area exists in the south-central part of the site. Sideslopes of the fill are approximately 2:1 horizontal:vertical.

The existing, adjoining wetlands have slope shapes that are mostly planar; some areas are slightly hummocky, which may be a result of the nearby fill placement. Slope gradients are 0 to 2%.

1.2.1.2 Goss/MGC Plasma Middle/MGC Plasma North Offsite Mitigation Parcels

The Goss/MGC Plasma Middle/MGC Plasma North offsite mitigation parcels are proposed for 7.477 acres of wetland establishment (Figure 2). Based on the soil survey map units and on field observations, the proposed wetland establishment site exists in the vicinity of alluvial fan, alluvial plain, and basin landforms.

The topography of these parcels appears to be comparatively similar. The slope shape is usually planar, but a few areas are slightly convex. The establishment site overall slopes downward westerly at gradients ranging from 0 to 3%.

The existing, adjoining wetlands have slope shapes that are planar or slightly concave and have slope gradients that are 0 to 3%.

1.2.1.3 Niesen Offsite Mitigation Parcel

The Niesen offsite mitigation parcel is proposed for 5.666 acres of wetland establishment (Figure 3). Based on the soil survey map units and field observations, the proposed wetland establishment site exists in the vicinity of alluvial fan and alluvial plain landforms.

The wetland establishment site is elevated up to approximately 9 feet above the adjoining alluvial plain that exists to the north, south, and east. As evidenced by soil profile observations made for the present evaluation, most of the establishment site consists of fill material, but some areas appear to have fill material mixed in with the surface layer of the native soil. Because the site has been highly altered, slopes are complex. Sideslopes of the fill are approximately 3:1 to 5:1 horizontal:vertical.

The existing, adjoining wetlands have slope shapes that are mostly planar. Slope gradients are 0 to 2%.

1.2.1.4 Watson East Offsite Mitigation Parcel

The Watson East offsite mitigation parcel is proposed for 8.336 acres of wetland establishment (Figure 4). Based on the soil survey map units and field observations, the proposed wetland establishment sites (two establishment sites are proposed in the north [4.420 acres] and south [3.916 acres] areas of the parcel, respectively) exist in alluvial fan and alluvial plain landforms.

The topography of both sites suggests that no fill material that has been placed in either site.

The slope shape of the north establishment site varies locally between planar and slightly convex, but as a whole it is broadly convex. The establishment site overall slopes downward westerly at gradients ranging from 0 to 3%.

The slope shape of the south establishment site is overall planar, but a slightly convex area occurs in the central part. The establishment site overall slopes downward westerly at gradients ranging from 0 to 3%.

The existing wetlands adjoining the north site are planar to broadly concave. The existing wetlands adjoining the south site are planar to slightly concave. The wetlands adjoining both sites have slope gradients that are 1 to 3%.

1.3 Natural Resources Conservation Service Soil Survey Mapping

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil survey for parts of Mendocino and Trinity counties (Howard and Bowman 1991) provides the most recent mapping of soils at the offsite mitigation parcels. Table 2 summarizes the NRCS soil survey information for those soil map units that occur at the offsite mitigation parcels.

As mapped by the NRCS, the soils at the offsite mitigation parcels generally are weakly to moderately developed, such that in many cases the surface, subsurface, and subsoil layer textures do not differ markedly within a given profile. None of the mapped soil series and other soils mapped at the subgroup taxonomic level have profiles that usually contain a well-defined subsurface restrictive layer, such as a claypan or a duripan. Claypans and duripans are commonly found in most California vernal pools and some seasonal wetlands[1]. Among the soil series mapped at the wetland establishment sites and their adjoining wetlands, the most strongly developed soils are the Cole and Pinole series, which are both Argixerolls, indicating that they have an argillic (subsoil) horizon with a minimum 20% increase in clay content relative to the overlying horizon.[2] However, in the modal pedon (i.e., most commonly occurring profile) described for the Cole and Pinole series, the argillic horizons have only a clay loam texture, which would be too permeable to cause a shallow perched water table. For the Cole series, the NRCS soil survey indicates that in some areas the argillic horizon subsoil may be silty clay or clay, which could cause a perched water table to form and persist for an undetermined period. (The presence of such a clayey subsoil in the Cole series was observed in profiles described in a few of the existing wetlands at all of the wetland establishment sites.)

The soils that occur at the establishment sites and their adjoining wetlands formed under well to poorly drained conditions, but in some areas the internal drainage has been changed as a result of stream incision and drainage ditch construction (Howard and Bowman 1991).

Table 2. Characteristics of Soils at the Offsite Mitigation Parcels as Mapped by USDA NRCS Soil Survey[a]

Soil Map Symbol	Soil Map Unit Name	Landform	Natural/ Existing Drainage Class	Generalized Typical Profile (Surface, Subsurface, and Subsoil)	Parcel Occurrence
112	Clear Lake clay, 0 to 2% slopes	basins	poor/partially drained	clay over clay loam	Goss, MGC Plasma Middle, MGC Plasma North
115	Cole clay loam, 0 to 2% slopes	alluvial plains and basins	somewhat poor/ somewhat poor	clay loam over clay loam	MGC Plasma Middle, MGC Plasma North, Niesen, Watson East
123	Feliz loam, 0 to 2% slopes	alluvial plains and fans	well/well	loam over clay loam	Watson East
126	Feliz clay loam, gravelly substratum, 2 to 8 percent slopes	alluvial plains and fans	well/well	clay loam over gravelly sandy clay loam	Watson East

1 Although the Clear Lake series soil (map unit 112) does not have a claypan or a duripan, it is typically clay to the surface, which could cause ponding to occur in depressional areas.

2 For reference, Haplaquepts may contain subsoil layers and substrates that are silty clay or clay. These layers appear to be depositional, rather than pedodenic layers and therefore do not indicate strong soil development.

Soil Map Symbol	Soil Map Unit Name	Landform	Natural/ Existing Drainage Class	Generalized Typical Profile (Surface, Subsurface, and Subsoil)	Parcel Occurrence
127	Fluvaquents, 0 to 1% slopes	floodplains	poor and very poor/poor and very poor	very fine sandy loam over silt loam[b]	Ford, Watson East
128	Gielow sandy loam, 0 to 5% slopes	alluvial plains and fans	somewhat poor/somewhat poor	sandy loam and loam over sandy loam and fine sandy loam	Goss, MGC Plasma North, Niesen, Ford
133	Haplaquepts, 0 to 1% slopes	basins and floodplains	poor/poor	clay loam over silty clay loam over silty clay[b]	Ford, Watson East
178	Pinole gravelly loam, 2 to 8% slopes	terraces	well/well	gravelly loam over clay loam over sandy clay loam	Ford, Watson East

Notes:

[a] The characteristics described above for each soil map unit do not reflect map unit inclusions, whose drainage class and profile characteristics may be different from the primary soil component of the map unit.

[b] Because of their variability, Haplaquepts and Fluvaquents have no typical profile. The profiles described are those that commonly occur in the soil survey area.

Source: Howard and Bowman 1991.

The NRCS soil survey also provides information on the type, depth, and timing of a seasonal high water table that typically occurs in the soil map units. Table 3 shows water table information for those soil map units in the offsite mitigation parcels where wetland establishment is proposed and that are subject to a seasonal water table within six feet of the surface. Those soil map units that occur in the offsite mitigation parcels that are not shown in the table have a seasonal high water table depth that is deeper than six feet below grade in most areas of the soil map unit.

Table 3. Water Table Characteristics of Selected Soil Map Units that Occur in the Offsite Mitigation Parcels

Soil Map Symbol	Soil Map Unit Name	Depth to Seasonal High Water Table (ft.)	Kind of Water Table[1]	Months of Water Table Presence[4]
112	Clear Lake clay, 0 to 2% slopes	1.5–3.0	Perched[3]	Dec.–Mar.
115	Cole clay loam, 0 to 2% slopes	1.5–3.0	Apparent	Nov.–May
128	Gielow sandy loam, 0 to 5% slopes2	1.5–3.0	Apparent	Dec.–Mar.

1 "Apparent" refers to the stabilized level of water in a fresh, unlined borehole; "perched" refers to a water table that lies above an unsaturated layer (Schoenberger et al. 2002).

2 Although the NRCS soil survey shows the Gielow series to be an Argixeroll, the official series description for the Gielow series shows the soil is classified as an Endoaquoll (Soil Survey Staff 1991). Soils in the "endo" taxonomic subgroup are saturated with water in all layers from the upper boundary of saturation to a depth of six feet or more from the soil surface. This is opposed to soils subject to "epi" saturation, in which the soil is saturated with water in one or more layers within six feet of the soil surface of the surface and also has one or more unsaturated layers, with an upper boundary above a depth of six feet, below the saturated layer (i.e., a perched water table) (Soil Survey Staff 1999).

3 The perched water table indicated for the Clear Lake series appears to refer to the ponding that may occur at the soil surface, since the restrictive layer begins at the surface (i.e., clay-textured topsoil layer.)

4 The NRCS does not regard saturated zones lasting for less than one month to be a "water table". Accordingly, any soils that have a rapidly fluctuating, shallow water table would not be included in this table, although the minimum length of time (14 consecutive days of saturation) for wetland hydrology may be present.

Source: Howard and Bowman 1991.

Most of the soil map units occurring in the offsite mitigation parcels where wetland establishment is proposed contain soils that formed under hydric conditions, although the hydric soils may occur only as inclusions (a soil that is dissimilar from the primary soil of the map unit and occupying up to 15% of the mapped body of the soil). Table 4 provides the hydric soil information for the map units occurring at the offsite mitigation parcels where wetland establishment is proposed.

Table 4. Hydric Soil Information for the Map Units Occurring in the Offsite Mitigation Parcels

Soil Map Symbol	Soil Map Unit Name	Map Unit Component	Landform	Hydric Status
112	Clear Lake clay, 0 to 2% slopes	Clear Lake	Basin floors	Yes
		Cole loam, drained	(not specified)	No
		Cole loam	(not specified)	No
		Feliz	(not specified)	No
		Gielow	(not specified)	No
		unnamed	(not specified)	No
115	Cole clay loam, 0 to 2% slopes	Cole	Alluvial fans	No
		unnamed	Depressions	Yes
		Clear Lake	Basin floors	Yes
		Cole	(not specified)	No
123	Feliz loam, 0 to 2% slopes	Feliz	Alluvial fans	No
		Unnamed	Depressions	Yes
		Cole	(not specified)	No
		Pinnobie	(not specified)	No
		Pinole	(not specified)	No
		Russian loam	(not specified)	No

Soil Map Symbol	Soil Map Unit Name	Map Unit Component	Landform	Hydric Status
		Talmage	(not specified)	No
		Xerofluvents	(not specified)	No
126	Feliz clay loam, gravelly substratum, 2 to 8 percent slopes	Feliz	Alluvial fans	No
		Unnamed	(not specified)	Yes
		Cole	(not specified)	No
		Pinole	(not specified)	No
		Russian	(not specified)	No
127	Fluvaquents, 0 to 1% slopes	Fluvaquents	Floodplains	Yes
		Cole	(not specified)	No
		Gielow	(not specified)	No
		Haplaquepts	Basin floors	Yes
128	Gielow sandy loam, 0 to 5% slopes	Gielow	Alluvial flats, floodplains	Yes
		Clear Lake	Basin floors	Yes
		Cole	(not specified)	No
		Feliz	(not specified)	No
		Russian	(not specified)	No
		Talmage	(not specified)	No
		unnamed	(not specified)	No
133	Haplaquepts, 0 to 1% slopes	Haplaquepts	Basin floors	Yes
		Cole clay loam	(not specified)	No
		Gielow sandy loam	Alluvial flats	Yes
		Fluvaquents	Floodplains	Yes
178	Pinole gravelly loam, 2 to 8% slopes	Pinole	Terraces	No
		Yokayo	Terraces	No
		unnamed	(not specified)	No
		Pinnobie	Terraces	No

Source: Soil Survey Staff 2010.

Owing to the texture and thicknesses of the surface, subsurface, and upper subsoil horizons (where the majority of the plant roots are concentrated), the soils at the proposed wetland establishment sites and in the adjoining existing wetlands generally have relatively high available water holding capacities (Donahue et al. 1983). As mapped in the NRCS soil survey (and as observed in the present evaluation), the soil textural classes of loam, silt loam, and clay loam are the most common textures in the upper 18 inches of the profile at the establishment sites and in the adjoining existing wetlands. For all the sites, these textural classes, low gravel content, and lack of a root-restrictive layer generally provide an abundant reservoir of plant-available soil-water to sustain perennial hydrophytic plant species.

1.4 Soil and Hydrologic Characteristics at Wetland Delineation Areas

Soil characteristics and hydrologic characteristics were also recorded from shallow soil pits as part of wetland delineations conducted on the offsite mitigation parcels. Those characteristics recorded that are relevant to this suitability evaluation are soil texture, depth to redox features, and depth to the water table. Table 5 provides a summary of the soil texture data that were collected as part of the wetland delineations. Clay loam and loam (or variants thereof) were the most common soil textures observed. As discussed below, these loamy to fine-loamy soils are too permeable to cause a perched water table to form, indicating that most of the delineated wetlands probably are supported by a high water table from an unconfined aquifer, rather than by a perched water table from a subsurface restrictive layer.

Table 5. Soil Texture Data Collected during Wetland Delineations at the Proposed Wetland Establishment Sites

Texture of Soil Horizon with Slowest Permeability in Pit	Number of Sites with Similar Texture		
	Upland	Wetland	Total
Ford			
loam	3	5	*8*
sandy loam	1		*1*
Total	*4*	*5*	*9*
Goss			
clay loam	1	6	*7*
loam		1	*1*
Total	*1*	*7*	*8*
MGC Plasma Middle			
clay		1	*1*
clay loam	1	2	*3*
sandy clay		1	*1*
sandy clay loam	2		*2*
sandy loam		1	*1*
silty clay	1		*1*
Total	*4*	*5*	*9*
MGC Plasma North			
clay		1	*1*
clay loam	1	5	*6*
loam	1		*1*
sandy clay	1		*1*
sandy clay loam	2		*2*
sandy loam	1		*1*
Total	*6*	*6*	*12*

Texture of Soil Horizon with Slowest Permeability in Pit	Number of Sites with Similar Texture		
	Upland	Wetland	Total
Niesen			
clay loam		4	*4*
Watson East			
clay		3	*3*
clay loam	2	9	*11*
gravelly clay loam	1		*1*
gravelly loam	7	6	*13*
gravelly sandy loam	1		*1*
loam	2	2	*4*
sandy loam	1		*1*
very gravelly loamy sand	1		*1*
Total	*15*	*20*	*35*

1.5 Spring 2010 Soil Evaluations at North Coast Semaphore Grass Study Sites

During the spring of 2010, soil and hydrologic conditions were assessed in the vicinity of North Coast semaphore grass (*Pleuropogon hooverianus*; PLHO) occurrences as part of an ongoing Caltrans study of the special-status plant in Little Lake Valley. PLHO's wetland indicator status is facultative wetland (FACW), and accordingly, PLHO usually occurs in wetlands. In the PLHO soil evaluations, the plant was nearly always observed to be associated with a wet meadow or riparian woodland wetland. Accordingly, the discussion of the soils in this section generally can be regarded as also pertaining to the soil characteristics found in existing wetlands.

Surface layer soil textures within the PLHO occurrences were observed to be loamy to fine-loamy, generally ranging from loam to silty clay loam.

Table 6 summarizes the soil surface textures that were found during the spring 2010 PLHO soil evaluations. The texture for the majority of the soil surface layers was clay loam or loam, which are generally regarded as having moderately slow to moderate permeability. Of the parcels evaluated, two (Goss and MGC Plasma North) are also proposed wetland establishment sites. On these parcels, clay loam texture was present at 11 soil sites out of 29 and only two sites had a potential to be more slowly permeable, one with silty clay and the other a clay texture. A more complete description of this survey was provided in a May 28, 2010 technical memorandum from Caltrans to CDFG and USFWS (Caltrans 2010b). Most of the soils observed at these sites are generally moderately to moderately slowly permeable, suggesting that the wetlands supporting PLHO are sustained by a high water table from an unconfined aquifer and not by a shallow perched water table.

Table 6. Summary of Soil Surface Layer Texture in Soil Pits in the Vicinity of North Coast Semaphore Grass Occurrences in Little Lake Valley

Soil Texture	Number of Sites with Similar Texture
City of Willits and Huffman Parcels	
Clay loam	11
Loam	3
Silt loam	1
Silty clay	1
Lusher Parcel	
Loam	4
Sandy loam	2
Evans and Frost Parcels	
Clay loam	3
Gravelly clay loam	1
Hebrard Parcel	
Clay loam	2
Loam	5
Arkelian Parcel	
Clay loam	6
Silty clay	1
Goss and MGC Plasma North Parcels	
Clay loam	11
Loam	8
Silty clay	3
Silty clay loam	6
Clay	1

2 Methods

The July 2010 soil evaluation to determine proposed wetland establishment site suitability was conducted on July 19 and 27-30 by a soil scientist. Soil pits were excavated at the wetland establishment site, the adjoining existing wetlands, and near the wetland reference monitoring site (Figures 1-4 and Appendix B-1) on the offsite mitigation parcels where wetland establishment is proposed: Ford, Goss/MGC Plasma Middle/MGC Plasma North, Niesen, and Watson East.

The number and location of the soil pits to be evaluated were determined in advance of the field work by considering the size and shape of the wetland establishment site, the type(s) of existing wetlands in the vicinity of the wetland establishment site, and the range of soils as mapped by the NRCS occurring within the establishment site and vicinity. Upon field review of conditions, the number and locations of the pits were adjusted to ensure that the pits would be representative of the range of conditions in the proposed wetland establishment sites and adjoining existing wetlands.

At a given establishment site, the existing wetland pits were excavated and described before the establishment site pits in order to provide a basis for assessing the suitability of the upland pit sites for wetland establishment.

The pits were excavated either using a sharpshooter shovel or a backhoe. The sharpshooter pits were excavated to 20 to 28 inches depth. The backhoe pits were excavated to 24 to 104 inches depth, with the deeper pits being excavated on the Ford and Niesen parcels where fill material was present on top of the native soil.[3] Table 7 summarizes the types and locations of pits excavated. The depth of excavation was based on the grading plan depth for the wetland establishment sites, plus an additional 12 more to assess soil characteristics below the targeted finish grade (Appendix D in June 2010 Mitigation and Monitoring Proposal [Caltrans 2010c]).

Table 7. Summary of Soil Pits Excavated In Wetland Establishment Sites and Adjoining Existing Wetlands

	Number of Pits	
Parcel	Wetland Establishment Sites	Existing Wetlands
Watson East		
Northern site	6 (all backhoe)	3 (all backhoe)
Southern site	6 (all backhoe)	5 (all backhoe)
Goss		
MGC Plasma Middle	13 (all sharpshooter)	6 (all sharpshooter)
MGC Plasma North		
Ford	4 (all backhoe)	4 (all sharpshooter)
Niesen	10 (all backhoe)	5 (all backhoe)
Total	**39**	**23**

Note: Included in the pits at the Goss/MGC Plasma Middle/MGC Plasma North parcels were two detailed soil profiles (numbers 18 and 19) that were described for the spring 2010 soil evaluations (PLHO study).

The following information was recorded for the soil profiles exposed in the soil pits on data forms developed specifically for this soil suitability study (Appendix A): horizon type and thickness; texture; structure; organic matter content (inferred)[4]; redoximorphic feature abundance, size, contrast, type, and location; and permeability (inferred). The soil organic matter content was inferred based on color, abundance of very fine roots, and presence of granular structure. Soil permeability was inferred by correlating texture to the saturated hydraulic conductivity range provided in the USDA soil survey (Howard and Bowman 1991), which was then correlated to the (qualitative) permeability class using the previous version of the Soil Survey Manual (Soil Survey

[3] Before excavation, Underground Service Alert (USA) was contacted to determine the possible presence and location of underground utilities at the Niesen and Ford wetland establishment sites due to the depth of soil pit excavation.

[4] The organic matter content ratings of low, medium, and high as used in this evaluation should be regarded as approximate and relative to other soils occurring at the wetland establishment sites.

Staff 1951).[5] Table 8 shows the inferred relationships between soil texture, saturated hydraulic conductivity, and permeability.

Table 8. Estimated Conversion between Soil Texture and Saturated Hydraulic Conductivity

Soil Texture	Saturated Hydraulic Conductivity (inches/hour)	Inferred Permeability Class
Clay	0.06–0.2	Very slow
Silty clay	0.06–0.2	Slow
Clay loam	0.2–0.6	Moderately slow
Loam	0.6–2.0	Moderate
Gravelly loam	2.0–6.0	Moderately rapid

Note: Not all textural classes observed during the field evaluation are shown.

Source: Howard and Bowman 1991, Soil Survey Staff 1951.

In addition to the soil profile descriptions, the following site characteristics were recorded on the data forms: land surface shape, landform, slope gradient, whether the pit was located in an existing wetland or in wetland establishment site, depth to soil saturation, presence of a biotic crust and drift lines, proximity to existing wetlands, and other characteristics that may have provided further indications as to the suitability for wetland establishment at the site.

Lastly, the following information was also recorded on the data forms: soil map unit as mapped in the NRCS soil survey, soil series observed, and digital image code for representative soil profiles. Digital images were taken at soil pits with representative soil profiles (Appendix B) and GPS coordinates were taken for each soil pit.

The above soil, hydrologic (as evidenced by redox features and other indirect indicators of wetland hydrology), and site characteristics, as well as the composition of the existing vegetation, were considered in evaluating the likelihood that wet meadow and/or mixed marsh habitat will establish in the immediate vicinity of each pit as a result of implementing the grading plan provided in the MMP (Caltrans 2010c). Each soil pit was given a suitability rating of low, medium, or high, or rated at intermediate levels between these primary ratings. The suitability rating is qualitative and based on professional judgment. Rather than using a fixed set of quantitative suitability criteria that would be applied to all the establishment sites, each evaluation was instead made on a site-by-site basis, in which the observed soil and site characteristics in wetlands adjacent to a given establishment site were used as points of reference only to the pits in the adjoining wetland establishment site. This was done in recognition of the fact that each establishment site differs with respect to the type and degree of influence of wetland hydrology, a primary factor in determining wetland establishment suitability (Caltrans 2010a).

[5] Since approximately 2003, the NRCS has used saturated hydraulic conductivity (expressed in inches per hour) as the primary way of describing the rate at which liquids, gases, and plant roots move through a soil layer. However, the term "permeability" is used in this technical memorandum for ease of use.

3 Results and Discussion

The soil pit locations are shown in Figures 1-4. The data forms are provided in Appendix A. Representative digital images taken at the pits are provided in Appendix B.

3.1 Ford Offsite Mitigation Parcel

3.1.1 Existing Wetlands

The wetlands that occur adjacent to the establishment site at the Ford offsite mitigation parcel occur on an overall planar floodplain. The wetlands exist below the elevated "bench" of the establishment site.

Based on the four pit excavations made in the existing wetlands, the subsoils range from sandy loam to silty clay and show the stratification expected in the floodplain environment in which the soils formed. All of the soils had redox features beginning within three inches of the surface and all had redox features in the subsoil, suggesting the presence of a seasonal high water table. These wetlands had been delineated as mixed marsh and wet meadow.

The existing wetlands appear to be sustained by a high water table and shallow flooding, based on the presence of redox features throughout the profile, a biotic crust, and sediment deposits.

3.1.2 Wetland Establishment Site

The four soil pits excavated in the establishment site show that the fill material consists of a heterogeneous mixture of gravelly loam, lumber waste, tree bark, and ash approximately 52 to 80 inches thick. (Appendix B-7). The native soil beneath the fill material was clay loam or silty clay loam. The upper boundary of the native soil appeared to be roughly level with that of the surrounding, existing wetlands. Redox features were observed in only one of the underlying native soils; however, this may be a result of the soil being permanently anerobic under the fill material, which would tend to produce the more gleyed-like colors observed. (Appendix B-8). Based on the lack of soil structure that is normally associated with a surface layer in the native soil material, it is possible that the upper part of the native soil profile was first removed before placement of the fill material, exposing a substrate layer without redox features.

Groundwater was observed in two of the pits, at 60 and 98 inches depth, respectively.

3.1.3 Suitability Evaluation

All the soil pits were rated as having a "medium-high" suitability because native alluvial, marsh-type soil material exists at the elevation of the proposed finish grade. Further, the buried native soils were saturated or very moist to the depth excavated. It is expected that once wetland construction is complete, the established wetland will be supported primarily by a high water table that will lead to moist soil conditions in the root zone of plants. Occasional overbank flows from Outlet Creek are expected to also provide hydrology to the site, based on the wetland hydrology indicators described above for the existing wetlands.

3.2 Goss/MGC Plasma Middle/MGC Plasma North Offsite Mitigation Parcels

3.2.1 Existing Wetlands

The wetlands that occur adjacent to the establishment site on the Goss/MGC Plasma Middle/MGC Plasma North offsite mitigation parcels occur on an overall planar alluvial fan and alluvial plain. Some of the wetlands occur on locally planar surfaces, others occur in subtle shallow depressions, while the remainder occur in swales. The wetlands exist upgradient, lateral to, and downgradient of the establishment site.

Based on the six pit excavations made in the existing wetlands, all but one had a clay loam or silty clay loam subsoil. The other soil had a fine sandy clay subsoil in which the upper boundary is approximately 13 inches beneath the surface. Most of the soils had redox features in the surface layer and all had redox features in the subsoil (Appendices B-2 and B-5), suggesting the presence of a seasonal high water table.

Depending on microtopographic location, the wetlands appear to be sustained by a high water table, sheetflow runoff (into depressional and planar areas), and locally, the slowly permeable subsoils.

3.2.2 Wetland Establishment Site

The soils in the establishment site had subsoil textures ranging from gravelly clay loam to clay. Of the 13 soil pits excavated, redox features were present in the surface layer of approximately half the pits. This suggests that saturation presently occurs at the soil surface at these sites and could be the result of soil compaction caused by livestock. Redox features were present in the subsoils in all but one of the soils (Appendix B-11), which suggest the presence of a water table at this depth. One soil profile (soil pit number 5) was clay nearly to the surface (Clear Lake clay) (Appendix B-6) and was the only Vertisol observed during the evaluation.

3.2.3 Suitability Evaluation

All the sites were rated as having a “medium” or higher suitability because one or more of the following characteristics were present at each pit site: favorable microtopograpy, redox features either at the surface or at depth, a restrictive layer, and hydrophytic species. It is expected that once wetland construction is complete, the established wetland will be sustained by a combination of a high water table (either the local water table or a perched water table), and local surface water from incident precipitation and upslope runoff contributions, depending on the location within the establishment site.

3.3 Niesen Offsite Mitigation Parcel

3.3.1 Existing Wetlands

The wetlands that occur adjacent to the establishment site at the Niesen offsite mitigation parcel occur on an overall planar alluvial fan and alluvial plain. The wetlands exist below the elevated "bench" of the establishment site.

Based on the five pit excavations made in the existing wetlands, the subsoils are mostly clay loam; one had a clay subsoil in which the upper boundary is 12 inches beneath the surface. All of the soils had redox features beginning within three inches of the surface (Appendix B-4) and all had redox features in the subsoil, suggesting the presence of a seasonal high water table.

The wetlands appear to be primarily sustained by a high water table.

3.3.2 Wetland Establishment Site

Gravelly to loamy fill material, ranging from 6 to 99 inches thick, was observed in most of the pits excavated in the establishment site. (Appendices B-9 and B-10). Two pits had fill material mixed into the surface layer of the native soil and in two pits, no fill material was detected. The native soil beneath the fill material ranged from silt loam to silty clay loam. The depth to the upper boundary of the native soil appeared to be roughly level with that of the surrounding, existing wetlands. Redox features were observed in most of the native soils below the fill material.

In the pit located downslope of the stock pond, groundwater was observed 40 inches depth. It is assumed that this water was a result of seepage from the pond.

3.3.3 Suitability Evaluation

All the sites were rated as having a "medium" or higher suitability because native alluvial, marsh-type soil exists at the elevation of the proposed finish grade, most of which have redox features in the buried topsoil layer. It is expected that once wetland construction is complete the established wetland will be sustained primarily by a high water table.

3.4 Watson East Offsite Mitigation Parcel

3.4.1 Watson East—North Establishment Site

3.4.1.1 Existing Wetlands

The existing wetland that adjoins the north establishment site on the Watson East offsite mitigation parcel occurs in a broad swale that begins east of the establishment site and continues along the southern boundary of the establishment site. The swale is roughly 1 to 1.5 feet below the existing grade of the north establishment site.

Based on the three soil pit excavations made in the existing wetland, the soils all have a slowly permeable subsoil ranging from a silty clay to a light clay, whose upper boundary is 9 to 24 inches beneath the surface. Redox features were present in the surface layer (Appendix B-3), but were absent in one pit below nine inches depth and absent in part of the subsoil in another pit. It is unknown whether the absence of redox in some of the subsoils of these pits was due to the fact the wetlands are supported by surface water, or have oxygenated, lateral-flowing groundwater that precludes the formation of redox features (less likely).

The existing wetlands appear to be sustained by sheetflow runoff and possibly by groundwater contributions from the adjoining uplands, and the slowly permeable soils. Additionally, as evidenced by a drift line that extends just upslope of the wetland boundary, the wetland may also be supported to a degree by floodwaters backing up from the lower end of Little Lake Valley and up into the swale.

3.4.1.2 Wetland Establishment Site

The soils in the establishment site had subsoil textures ranging from clay loam to light clay. Of the six soil pits excavated, redox features were present in the surface layer in five of the pits (Appendix B-12) and some of the profiles had redox in the subsoil. This suggests that saturation presently occurs at the soil surface and could be the result of soil compaction caused by livestock. Redox features were also present in some of the subsoils.

3.4.1.3 Suitability Evaluation

Four of the six soil pit sites were rated as having a "medium" suitability and two were rated as having a "low-medium" suitability. The two low-medium soil pit sites are positioned higher on the alluvial fan and therefore may have less favorable hydrologic support than the other pits positioned lower on the alluvial fan. It is expected that, once wetland construction is complete, the established wetland will be sustained by a combination of a high water table, upslope runoff contributions, and backwater inundation from down-valley flooding, depending on the location within the establishment site.

3.4.2 Watson East—South Establishment Site

3.4.2.1 Existing Wetlands

The wetlands that adjoin the south establishment site on the Watson East offsite mitigation parcel occur on a planar alluvial fan. The wetlands are roughly 0.5 to 1 foot below the existing grade of the south establishment site.

Based on the five pits excavations made in the existing wetlands, three have a moderately permeable subsoil of gravely clay loam. The other two have clay subsoils in which the upper boundary is approximately 16 inches beneath the surface. All of the soils had redox features in the surface layer and in some of the soils the redox features extended into the subsurface and subsoil horizons. It is unknown whether the absence of redox in some of the subsoils of these pits was due to the fact the wetlands are supported by surface water, or have oxygenated, lateral-flowing groundwater that precludes the formation of redox features (less likely).

The existing wetlands appear to be sustained by sheetflow runoff and possibly by groundwater contributions from the adjoining uplands, and locally, the slowly permeable soils. Additionally, as evidenced by a drift line that extends into the part of the wetland to the west of the establishment site, part of the wetland may also be supported to a degree by floodwaters backing up from the lower end of Little Lake Valley.

3.4.2.2 Wetland Establishment Site

The soils in the establishment site had subsoil textures ranging from gravelly loam to silty clay loam. Of the six soil pits described, redox features were present in the surface layer in all the pits. This suggests that saturation presently occurs at the soil surface and could be the result of soil compaction caused by livestock. Redox features were generally absent in the subsoils.

3.4.2.3 Suitability Evaluation

All but one soil pit was rated as having a “medium” or higher suitability. The other site was rated as having a “low-medium” suitability. The low-medium site is positioned higher on the alluvial fan and therefore may have less favorable hydrologic support than the other pits positioned lower on the alluvial fan. It is expected that once wetland construction is complete, the established wetland will be sustained by a combination of local surface water from incident precipitation, upslope runoff contributions, and by backwater inundation from down-valley flooding, depending on the location within the establishment site.

4 Conclusions

Based on published soil survey data, data collected from wetland delineations and the PLHO soil evaluations, and soil/site data collected specifically for this evaluation, it appears that most of the existing wetlands at the offsite mitigation parcels are primarily supported by the presence of a high water table, rather than primarily by a perched water table over a subsurface restrictive layer. However, depending on the wetland establishment site, “backwaters” from down-valley flooding, and/or a perched water table also appear to contribute the existing wetlands’ hydrology locally.

This conclusion is consistent with the conclusions of the hydrologic study (Caltrans 2010a) of the establishment parcels, which observed that because there are relatively few soils with slow to very slow permeability (e.g., clay), it is likely that most of the existing wetlands are primarily sustained by local aquifer conditions (Caltrans 2010a). The hydrologic study also observed that field observations of local drainageways and topographic conditions suggest that a few of the wetlands also may benefit from lateral movement of groundwater into the subsurface layer and subsoil of the wetlands (Caltrans 2010a).

At the Ford and Niesen parcels, the present evaluation has determined that it will be feasible to establish wet meadow and mixed marsh habitat by removing the fill material to an elevation that is roughly the same as that of the adjoining, existing wetlands, such that the establishment site will be subject to a seasonal high water table level and periodic flooding. The soil pits excavated in support of this evaluation show that the native topsoil layer exists beneath the fill material, at a level that is approximately at the proposed finish grade of the established wetlands.

At the Goss/MGC Plasma Middle/MGC Plasma North parcels, the present evaluation has determined that it will be feasible to establish wet meadow habitat by lowering the grade such that it will be closer to the seasonal high water table and by creating a more planar-to-broadly concave slope shape that tends to "collect" runoff rather than "shedding" it. A perched water table may form locally. The presence of hydrophytic species and some soil redox features at the soil pits suggest existing mesic conditions, such that the proposed grading will be sufficient to establish a dominance of hydrophytes and wetland hydrologic conditions.

At the Watson East parcel, the present evaluation has determined that it will be feasible to establish wet meadow habitat by lowering the grade such that it will be closer to the seasonal high water table and by creating a more planar-to-broadly concave slope shape that tends to "collect" runoff rather than "shedding" it. A perched water table may form locally. The grading is also expected to make the downslope parts of both establishment sites subject to inundation by occasional backwater flooding from down-valley. The presence of hydrophytic species and some soil redox features at the soil pits suggest existing mesic conditions, such that the proposed grading will be sufficient to establish a dominance of hydrophytes and wetland hydrologic conditions.

5 Citations

California Department of Transportation (Caltrans). 2010a. Willits Bypass Project – Hydrology Suitability at Proposed Wetland Establishment Sites. July 29. Technical memorandum from Shanna Zahner of Caltrans to Dave Wickens of the U.S Army Corps of Engineers.

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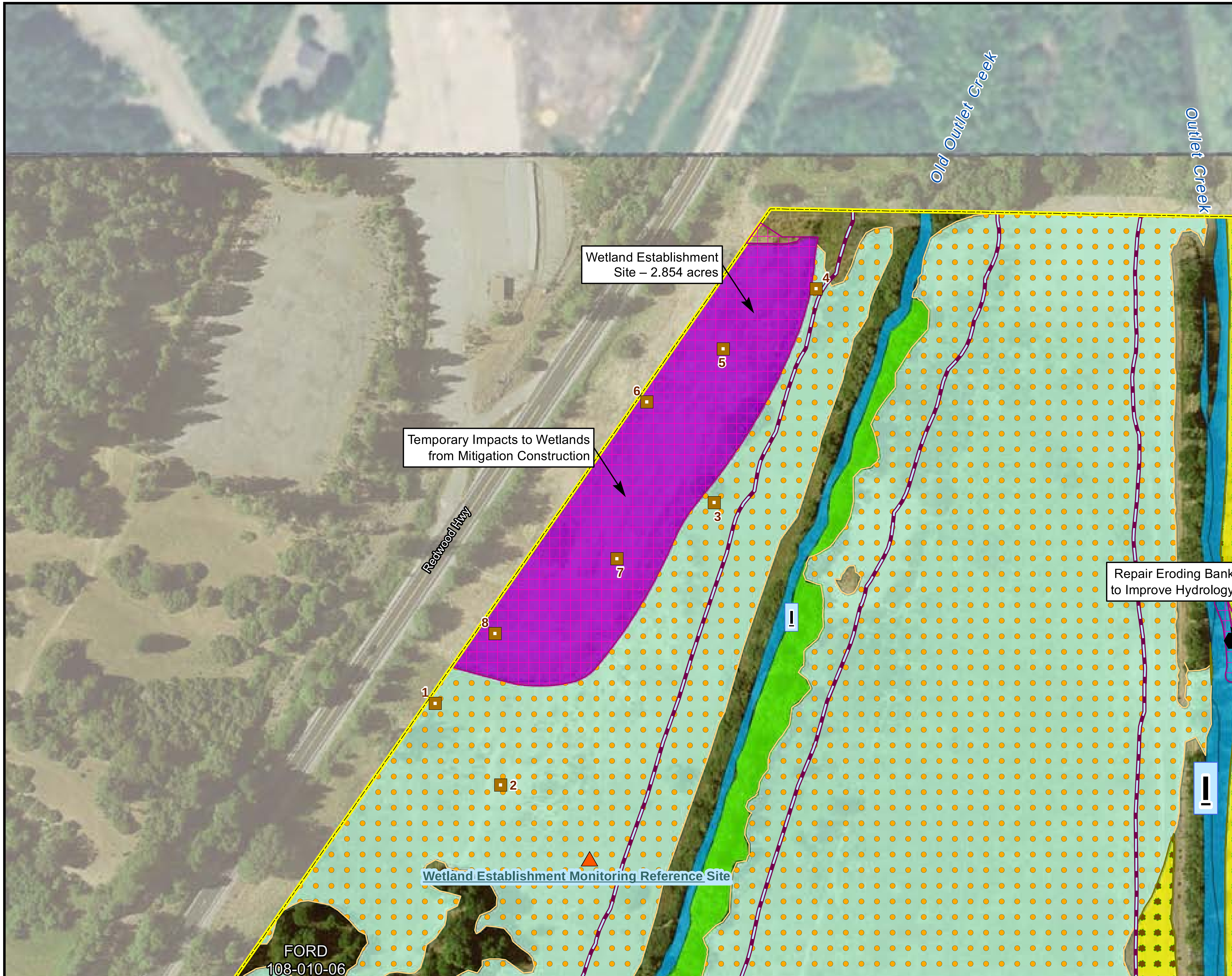


Offsite Mitigation Parcel

Habitat Mitigation Type

- Riparian Establishment
- Wetland Establishment
- Oak Woodland Establishment
- Riparian Enhancement
- Wetland Enhancement
- Other Waters Enhancement

Mitigation Actions

- Improve Hydrology (Grading)
- Headcut or Eroding Bank
- Control Invasive Plants
- Plant Oaks
- Plant Riparian
- Implement Grazing Plan
- Monitoring Reference Site
- 7 Soil Pit Location

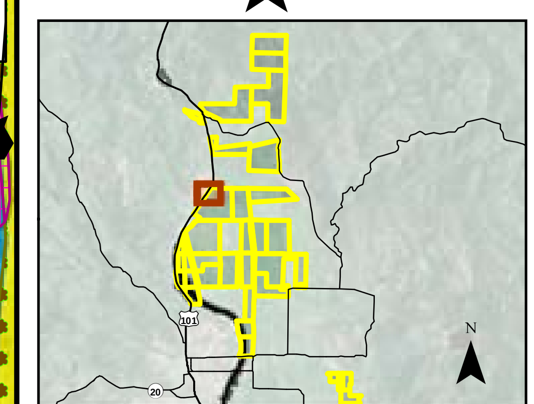
Riparian Corridors

- Category I Riparian Corridor
- Category II Riparian Corridor
- Category III Riparian Corridor

Project Bypass Footprint

- Permanent Impact Area
- Temporary Impact Area
- Right of Way

N



0 200

Scale in Feet

Figure 1
Mitigation Actions
Ford
APN 108-010-06

Proposed Willits Bypass
Riparian, Wetland, and Oak
Establishment and Enhancement

K:\Projects_1\Caltrans\00543_09_Willits_from_URS\mapdoc\Appendix_C\Willits_HMMP_Appendix_C_Mitigation_v14_Soil_Pit_Only.mxd ds 8/10/2010

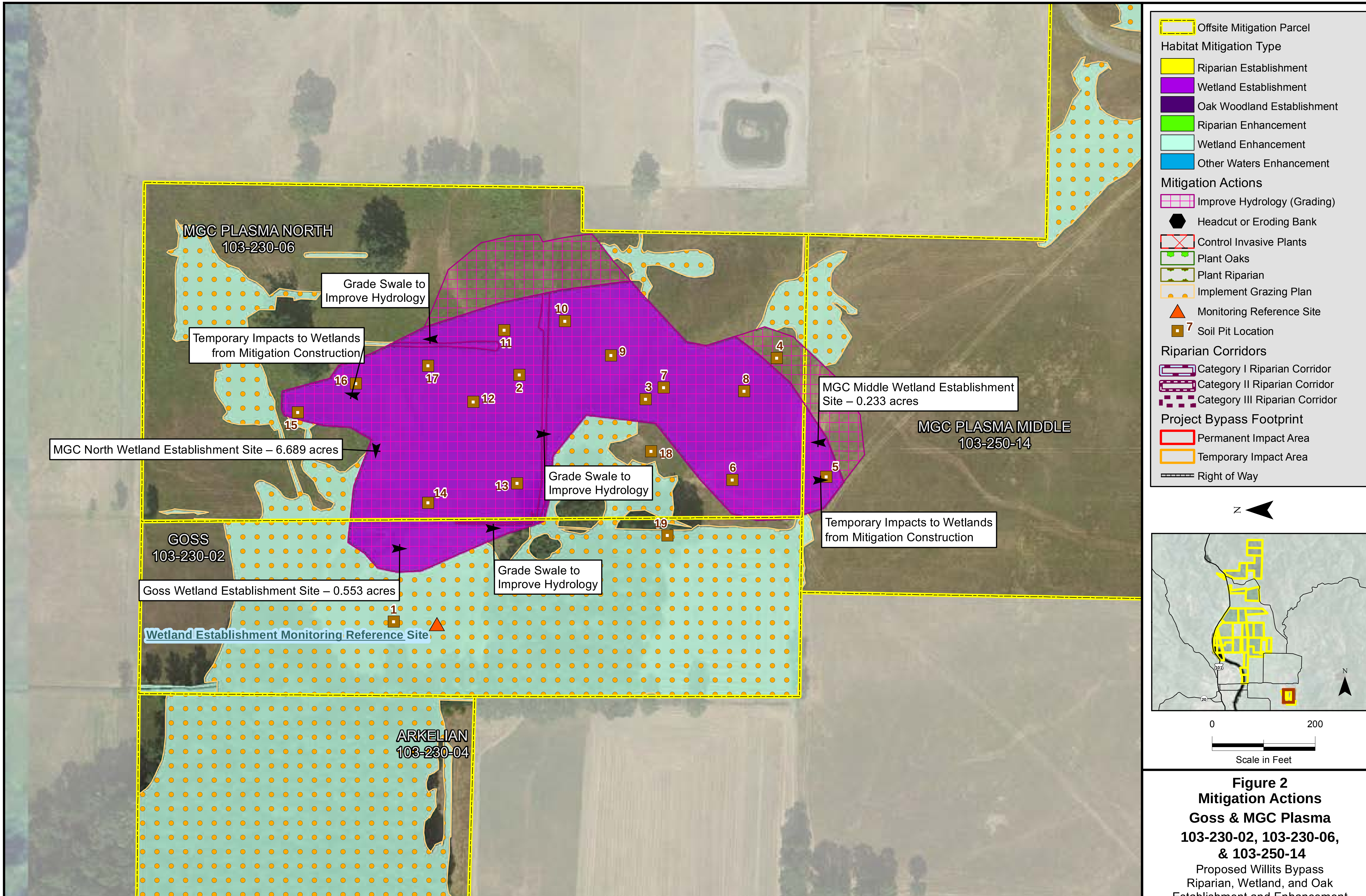


Figure 2
Mitigation Actions
Goss & MGC Plasma
103-230-02, 103-230-06, & 103-250-14
Proposed Willits Bypass
Riparian, Wetland, and Oak Establishment and Enhancement

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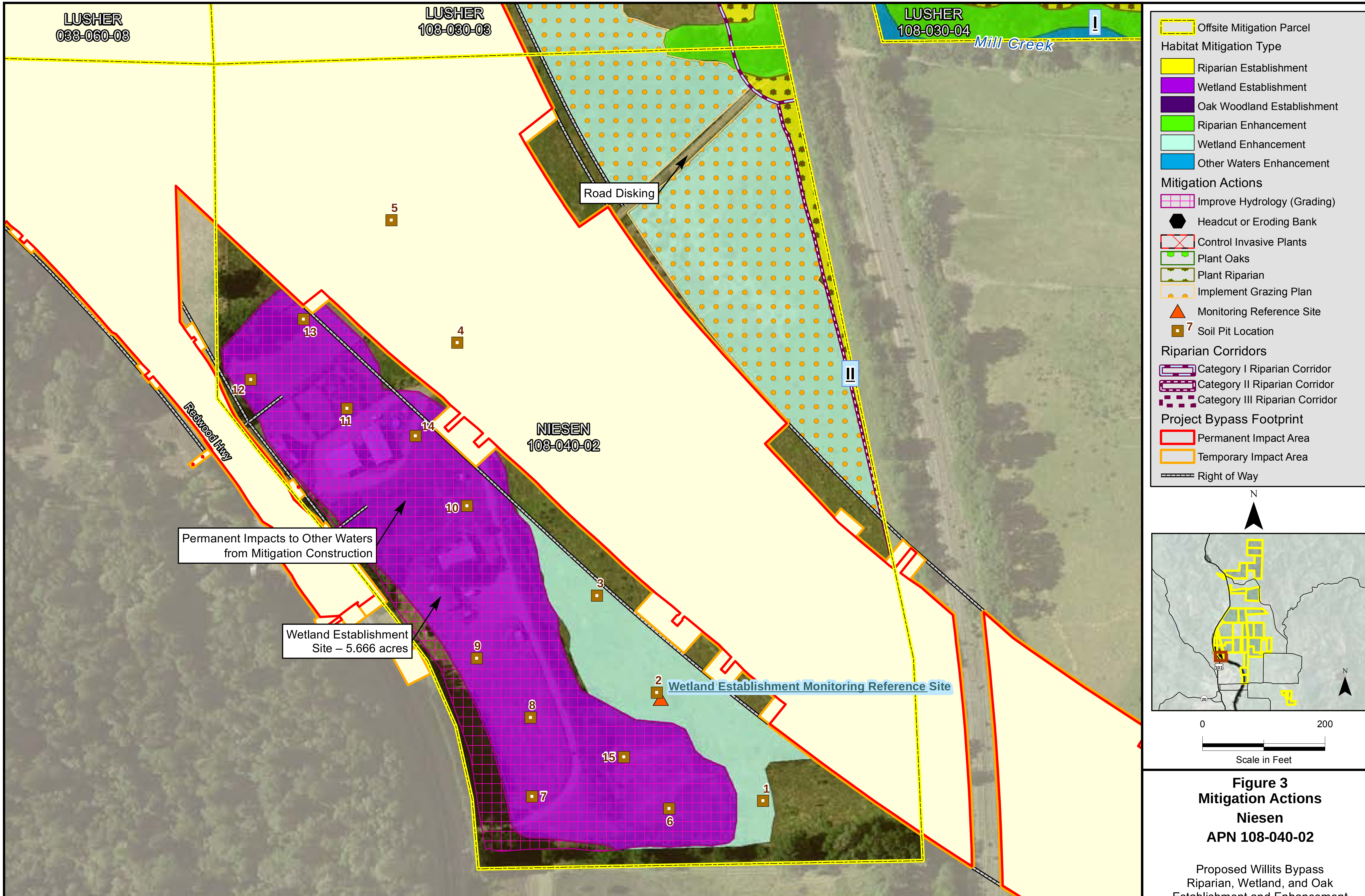

Figure 3
Mitigation Actions
Niesen
APN 108-040-02

Proposed Willits Bypass
Riparian, Wetland, and Oak
Establishment and Enhancement

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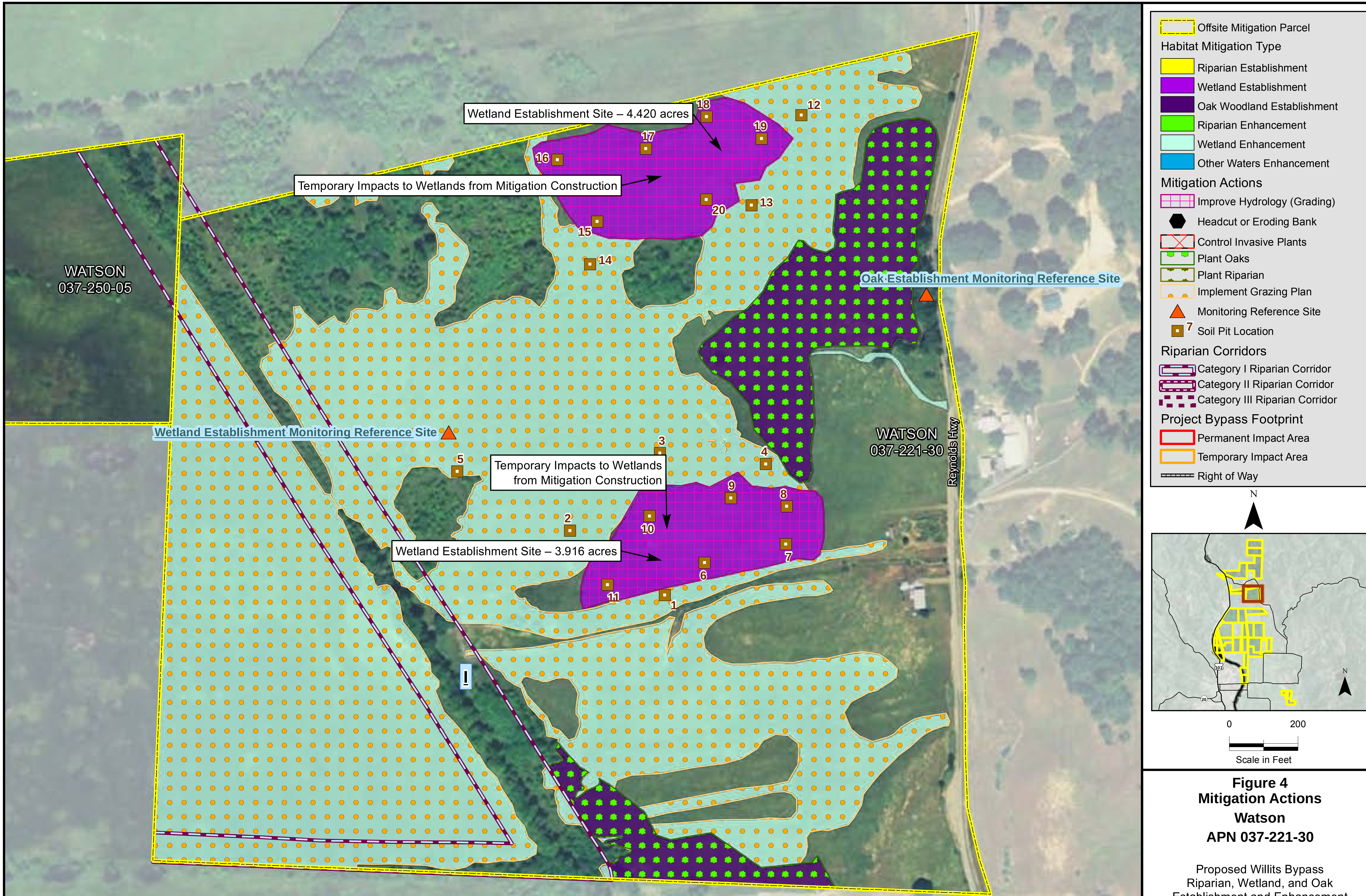

Figure 4
Mitigation Actions
Watson
APN 037-221-30

Proposed Willits Bypass
Riparian, Wetland, and Oak
Establishment and Enhancement

Appendix A

Data Forms

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Ford	Pit No.: 1
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex Slightly hummocky	Landform: alluvial fan low terrace swale <u>floodplain</u> basin Slope Gradient (%): 2
Soil Map Unit: Haplaquepts, 0 to 1% slopes (133)	Soil Series as Observed: Haplaquepts
General Comments: Elevated ~ 6" above area to southeast.	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 26
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	cl	gr, 2	High	None	Mod – slow	
3-11	A2	cl	abk, 1	Mod	c, m/f, D, Fe-x, RC & M	Mod –slow	A2 contains highly weathered sandstone fragments
11-26	Bw	cl	m	Low	m, m, P, Fe-x, M	Mod – slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Ford	Pit No.: 2
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale <u>floodplain</u> basin Slope Gradient (%): 0-1
Soil Map Unit: Haplaquepts, 0 to 1% slopes (133)	Soil Series as Observed: Haplaquepts
General Comments: Moderate biotic crust	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 27
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0 – 1	A1	cl	gr,2	High	m, f, D, Fe-x, RC	Mod – slow	
1 – 15	A2	cl	m	Mod	m, m, D, Fe-x, M/PL	Mod – slow	
15 – 19	Bw1	l	m	Low	m, c, D, Fe-x, M	Mod	10% gravel
19 – 27	Bw2	sl	m	Low	c, m, F, Fe-x, M	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Ford	Pit No.: 3
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: 0220 (knife at bottom of A2)	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale <u>floodplain</u> basin Slope Gradient (%): 0-1
Soil Map Unit: Haplaquepts, 0 to 1% slopes (133)	Soil Series as Observed: Haplaquepts
General Comments: weak biotic crust	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 31
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0 – 1	A1	cl	abk, 2	High	None	Mod – slow	
1 – 10	A2	sicl	abk, 1	Mod	m, m, D, Fe-x, M	Mod – slow	
10 – 21	Bw	sil	m	Low	m, m, D, Fe-x & D, M	Mod	
21 – 24	C1	ls	sg	Low	c, m, F, Fe-x, M	Mod – rapid	
24 – 31	C2	sil	m	Low	c, m, D, Fe-x, M+m, c, D, D, M	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Ford	Pit No.: 4
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex Slightly hummocky	Landform: alluvial fan low terrace swale <u>floodplain</u> basin Slope Gradient (%): 0-2
Soil Map Unit: Haplaquepts, 0 to 1% slopes (133)	Soil Series as Observed: Haplaquepts
General Comments: Sediment deposits; 30' east of edge of overburden	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): free water in pit at 31
Depth to Restrictive Layer (in.): 1" (slightly restrictive)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	cl	gr, 1	High	None	Mod – slow	
1-7	A2	sic	m	Mod	m, m, D, Fe-x, M	Slow	
7-17	Bw1	sic	m	Low	m, m, D, Fe-x, M+PL	Slow	
17-22	Bw2	sil	m	Low	m, m, D, Fe-x, M	Mod	
22-32	Bw3	sic	m	Low	m, m, D, Fe-x, M	Slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Ford	Pit No.: 5
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0230	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill area with in flood plain area
	Slope Gradient (%): 0-2
Soil Map Unit: Haplaquepts, 0 to 1% slopes (133)	Soil Series as Observed: N/A
General Comments: Native soil may have been truncated before fill placement	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 98
Depth to Restrictive Layer (in.): 80 (Ab somewhat restrictive)	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-80	FILL	grl	m	High	None	Mod	Ashy/burnt consistency; high bark and wood content
80-98	Ab	sic	m	Unknown	f, m, D, Fe-x, PL	Slow	Very moist

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Ford	Pit No.: 6
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0231	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill within alluvial fan
	Slope Gradient (%): 3-5
Soil Map Unit: Haplaquepts, 0 to 1% slopes (133)	Soil Series as Observed:
General Comments: native soil may have been truncated prior to fill placement	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): 94
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-49	FILL1	vgsl	m	Low	None	Mod – rapid	
49-72	FILL2	wood	m	High	None	---	Bark and lumber
72-91	Ab	sicl	m	Unknown	None	Mod – slow	Very moist

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Ford	Pit No.: 7
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill area within flood plain Slope Gradient (%): 0-3
Soil Map Unit: Haplaquepts, 0 to 1% slopes (133)	Soil Series as Observed: undetermined
General Comments: native soil may have been truncated before fill placement	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 57
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-52	FILL	grsl	m	Low	None	Mod – rapid	Contains lumber and tree bark
52-57	Ab	sicl	m	Unknown	None	Mod – slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Ford	Pit No.: 8
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: 0226 & 0228 (knife not at a horizon boundary)	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill area within alluvial fan
	Slope Gradient (%): 7
Soil Map Unit: Haplaquepts, 0 to 1% slopes (133)	Soil Series as Observed:
General Comments: Fill material also contains telephone pole and t-post; native soil may have been truncated before fill placement	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): 69
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-58	FILL	grl and cl	m	Low	None	Mod – mod slow	Mixed with wood fragments; angular gravel
59-69	Ab	sicl	m	Unknown	None	Mod - slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 1
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 2
Soil Map Unit: Gielow sandy loam, 0 to 5% slopes (128)	Soil Series as Observed: Cole
General Comments: In distal part of alluvial fan	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 26
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	Ap	sil	gr, 3	Mod	None	Mod	
4-11	A	cl	sbk, 2	Mod	c, 2, F, Fe-x, M	Mod – slow	
11-26	Bt	cl	sbk, 2	Low	c, 2, F, Fe-x, M	Mod - slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 2
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: 0184, 0186	

Land Surface Shape: <u>(slightly)</u> planar <u>concave</u> convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 3
Soil Map Unit: Gielow sandy loam, 0 to 5% slopes (128)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 28
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	l	gr, 2	Mod	c, l, D, Fe-x, RC	Mod	
3-11	A2	l	sbk, 1	Mod	c, 2, D, Fe-x, M	Mod	
11-21	Bt1	cl	sbk, 2	Mod – low	c, 2, D, Fe-x, M	Mod – slow	
21-28	Bt2	cl	sbk, 2	Low	c, 2, P, Fe-x, M	Mod - slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 3
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex Broad swale	Landform: alluvial fan low terrace (swale) floodplain basin Slope Gradient (%): 2-3
Soil Map Unit: Gielow sandy loam, 0 to 5% slopes (128)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland (Near wetland/non-wetland boundary)	Depth to Soil Saturation (in.): None to 24
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	gr, 2	Mod	c, l, D, Fe-x, RC	Mod	
2-10	A2	l	abk, 2	Mod	c, l, D, Fe-x, M	Mod	
10-15	Bt1	sicl	abk, 1	Mod-Low	c, l, D, Fe-x, M	Mod – slow	5% gravel
15-24	Bt2	sicl	abk, 1	Low	c, l, D, Fe-x, M	Mod – slow	5% gravel

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 4
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: 0188 Knife at top of Bt1	

Land Surface Shape: (slightly) planar concave convex Broad, poorly-defined swale	Landform: alluvial fan low terrace (swale) floodplain basin Slope Gradient (%): 1-2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole; trending slightly towards Clear Lake
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 23
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-6	A	l	gr, 2	Mod	c, l, F, Fe-x, RC	Mod	
6-9	Bt1	cl	abk, 3	Mod-Low	None	Mod – slow	
9-23	Bt2	sicl	abk, 3	Low	c, 2, D, Fe-x, M	Mod – slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 5
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: 0190	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale floodplain <u>basin</u> Slope Gradient (%): 1-2
Soil Map Unit: Clear Lake clay, 0 to 2% slopes (112)	Soil Series as Observed: Clear Lake
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 23
Depth to Restrictive Layer (in.): 1	Overall Soil and Site Suitability for Wetland Establishment: low medium <u>high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	l	gr, 1	High	None	Mod	
1-9	A2	c	abk, 3	Mod	None	Very slow	
9-23	Bss	c	pr, 3	Mod	m, 2, D, Fe-x, M	Very slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 6
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 2-3
Soil Map Unit: Clear Lake clay, 0 to 2% slopes (112)	Soil Series as Observed: undetermined
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 24
Depth to Restrictive Layer (in.): 12	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	cl	gr, 2	Mod-high	none	Mod slow	
2-12	A2	cl	abk, 2	Mod	f, 2, F, Fe-x, M	Mod slow	
12-24	Bt	c-	abk, 3	Mod	f, 2, F, Fe-x, M	Very slow	10% gravel

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 7
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 1-2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 26
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-9	A	cl	abk, 1	Mod	m, 2, D, Fe-x, M	Mod slow	
9-26	Bt	sicl	abk, 2	Low	m, 2, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 8
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: 0192	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 23
Depth to Restrictive Layer (in.): 13	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-13	A	cl	abk, 1	Mod	c, l, D, Fe-x, M	Mod. Slow	
13-33	Bt	sic	abk, 3	Low-Mod	m, 2, D, Fe-x, M	Slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 9
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 3
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: undetermined
General Comments: shift in veg to drier species; unusual profile	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 20
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium <u>high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A1	l	abk, 1	Mod	c, l, D, Fe-x, RC	Mod	
4-9	A2	grl	m	Mod	c, 2, D, Fe-x, M	Mod rapid	15% gravels, 10% cobbles
9-20	Btss	vgrc+	pr, 1	Low	c, 2, D, D, M	Very slow	Reddish brown matrix; 25% gravels, 15% cobbles

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 10
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 2
Soil Map Unit: Gielow sandy loam, 0 to 5% slopes (128)	Soil Series as Observed: Cole
General Comments: Bt horizon is slightly moist	
Jurisdictional Status at Pit: existing wetland (reference) <u>wetland-upland transition</u> upland	Depth to Soil Saturation (in.): None to 26
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium <u>high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-6	A1	l	gr, 1	Mod	c, l, D, Fe-x, RC	Mod	
6-16	A2	l	abk, 2	Mod	c, 2, D, Fe-x, M	Mod	
16-26	Bt	cl	abk, 1	Low	c, 2, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss–MGC Plasma	Pit No.: 11
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 2
Soil Map Unit: Gielow sandy loam, 0 to 5% slopes (128)	Soil Series as Observed: Cole transitioning toward Gielow
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 26
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium <u>high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A1	l	gr, 1	Mod	c, l, D, Fe-x, RC	Mod	
4-18	A2	l	abk, 1	Mod	c, 1+2, D, Fe-x, M+RC	Mod	
18-26	Bt	sicl	m	Low	M, 2, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 12
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin Slope Gradient (%): 2
Soil Map Unit: Gielow sandy loam, 0 to 5% slopes (128)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 24
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A1	sil	abk, 2	Mod	c, l, D, Fe-x, RC	Mod	
4-15	A2	sil +	abk, 2	Mod-low	c, 2, D, fe-x, M	Mod	
15-24	Bw	cl	abk, 1	Low	M, 2, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 13
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 2
Soil Map Unit: Clear Lake clay, 0 to 2% slopes (112)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 24
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A1	l	gr, 2	Mod	None	Mod	
4-12	A2	cl	abk, 1	Mod	c, 2, D, Fe-x, M	Mod slow	
12-24	Bt	cl	abk, 1	Low	M, 2, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 14
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex Broad, very poorly-defined swale	Landform: alluvial fan low terrace (swale) floodplain basin Slope Gradient (%): 1
Soil Map Unit: Gielow sandy loam, 0 to 5% slopes (128)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 24
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A1	l	gr, 2	Mod	c, l, D, Fe-x, RC	Mod	
4-11	A2	cl	abk, 2	Mod	c, 2, D, Fe-x, M	Mod slow	
11-15	Bt1	cl	abk, 2	Low - mod	None	Mod slow	
15-24	Bt2	cl	abk, 2	Low	c, 2, P, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 15
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 1-2
Soil Map Unit: Gielow sandy loam, 0 to 5% slopes (128)	Soil Series as Observed: Undetermined
General Comments: Bt horizon may be somewhat restrictive	
Jurisdictional Status at Pit: <u>existing wetland (reference)</u> wetland-upland transition upland	Depth to Soil Saturation (in.): None to 22
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	m	High	none	Mod	
2-13	A2	cl	m	Mod	c, l, D, Fe-x, M	Mod slow	
13-22	Bt	fsc	m	Low	m, 2, D, Fe-x, M	Slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss–MGC Plasma	Pit No.: 16
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 2
Soil Map Unit: Gielow sandy loam, 0 to 5% slopes (128)	Soil Series as Observed: Undetermined
General Comments: Shovel refusal at 21". AB horizon may be somewhat restrictive	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 21
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	l	gr, 3	Mod	None	Mod	
1-8	A2	l	gr, 2	Mod	c, l, D, Fe-x, RC	Mod	
8-18	AB	sic	abk, 2	Mod low	None	Slow	
18-21	Bw	grcl	m	Low	None	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 17
Investigator(s): Joel Butterworth	Date: July 19, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin Slope Gradient (%): 2
Soil Map Unit: Gielow sandy loam, 0 to 5% slopes (128)	Soil Series as Observed: Gielow
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 22
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-9	A1	l	gr, 2	Mod-high	none	Mod	
9-17	A2	cl	abk, 1	Mod	c, 2, D, Fe-x, M	Mod slow	
17-22	AB	cl	abk, 1	Low	c, 2, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 18
Investigator(s): Joel Butterworth	Date: June 14, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: 0137	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 0-1
Soil Map Unit: Clear Lake clay, 0 to 2% slopes (112)	Soil Series as Observed: Cole
General Comments: Profile data originally collected for North Coast semaphore grass study (site Goss 3) All but upper 3 inches of profile moderately moist when described	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): none to 25
Depth to Restrictive Layer (in.): n/a	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	gr, 2	Mod	none	Mod	
2-12	A2	l	sbk, 1	Mod	none	Mod	Gravel layer between 9-11 in.
12-21	Bt1	cl	m	Mod-low	m, 2, D, Fe-x, M	Mod slow	
21-25	Bt2	cl	m	Low	c, 2, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Goss-MGC Plasma	Pit No.: 19
Investigator(s): Joel Butterworth	Date: June 14, 2010	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number: 0140	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 0-1
Soil Map Unit: Clear Lake clay, 0 to 2% slopes (112)	Soil Series as Observed: Cole, trending toward Clear Lake
General Comments: Profile data originally collected for North Coast semaphore grass study (site Goss 4)	
Jurisdictional Status at Pit: <u>existing wetland (reference)</u> wetland-upland transition upland	Depth to Soil Saturation (in.): none to 26
Depth to Restrictive Layer (in.): n/a	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-6	A	cl	sbk, 1	Mod	c, 1, P, Fe-x, PL	Mod slow	
6-11	Bt1	cl	sbk, 1	Mod	none	Mod slow	
11-20	Bt2	cl	m	Mod-low	m, 2, D, Fe-x, M	Mod slow	
20-26	Bt3	sicl	m	Low	m, 2, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 1
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: 0218 (knife at bottom of A1)	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin Slope Gradient (%): 1-2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments: Biotic crust present (moderate)	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 27
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	cl	gr, 3	High	None	Mod slow	
3-17	A2	cl	abk, 3	Mod	m, m, D, Fe-x, M	Mod slow	
17-27	A3	cl	m	Low	m, m, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 2
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin
	Slope Gradient (%): 1
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 26
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	cl-	gr, 2	Mod	None	Mod slow	
3-16	A2	cl	abk, 2	Mod	c, m, D, Fe-x, M	Mod slow	
16-26	A3	cl	abk, 1	Low	m, m, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 3
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin
	Slope Gradient (%): 1
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments: Moderate biotic crust	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 26
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A1	cl	gr, 3	High	c, f, P, Fe-x, RC	Mod slow	
4-22	A2	cl	abk, 3	Mod	c, m, D, Fe-x, M	Mod slow	
22-26	A3	cl	m	Low	c, m, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 4
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 29
Depth to Restrictive Layer (in.): 12	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	cl	gr, 2	High	c, f, D, Fe-x, RC	Mod slow	
3-12	A2	cl	abk, 1	Mod	c, m, D, Fe-x, M	Mod slow	
12-29	Bt	c	m	Low	m, m, D, Fe-x, M	Very slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 5
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0219	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale <u>floodplain</u> basin
	Slope Gradient (%): 1-2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: <u>existing wetland (reference)</u> wetland-upland transition upland	Depth to Soil Saturation (in.): None to 28
Depth to Restrictive Layer (in.): 25	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	cl	gr, 1	High	None	Mod slow	
1-11	A2	cl	abk, 2	Mod	c, f, D, Fe-x, RC, c, m, D, Fe-x, M	Mod slow	
11-25	Bt1	sicl	m	Low	c, f, D, Fe-x, M	Mod slow	
25-28	Bt2	c	m	Low	c, f, D, Fe-x, M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 6
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill within floodplain area
	Slope Gradient (%): 2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: N/A
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 37
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium <u>high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-15	FILL	grl	m	Low-mod	none	mod	Angular gravels
15-28	Ab1	sicl	m	Mod	m, m, P, Fe-x, PL+M	Mod slow	
28-37	Ab2	sicl	m	Low	m, m, P, Fe-x, PL+M	Mod slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 7
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0222 and 0223 native soil buried under fill material	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill within overall alluvial fan
	Slope Gradient (%): 1-2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: N/A
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 104
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium <u>high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-49	FILL1	vgrl	m	Low-mod	None	Mod rapid	
49-59	FILL2	sc	m	Low	None	Slow	Saprolitic material; variegated
59-99	FILL3	grcosc	m	Low	None	Mod slow	___
99-104	Ab	sil	m	Mod	None	Mod	Partly decomposed detritus; dark grey

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 8
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill within overall alluvial fan
	Slope Gradient (%): 1-2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: N/A
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 103
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-41	FILL1	xgrsl	m	Low-mod	None	Rapid	
41-97	FILL2	lsc	m	Low	None	Mod-slow	Variegated
97-103	Ab	sil	m	Mod	f, m, f, Fe-x, M	Mod	Partly decomposed detritus

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 9
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill within overall alluvial fan area
	Slope Gradient (%): 2-3
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: N/A
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 99
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-72	FILL1	xgrl	m	Low-mod	None	Rapid	
72-87	FILL2	sicl	m	Low	None	Mod-slow	Variegated; partly decomposed organic material
87-99	Ab	sicl	m	Mod	m, m, D, Fe-x, M	Mod-slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 10
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex *disturbed area	Landform: alluvial fan low terrace swale floodplain basin *fill area with in overall floodplain
	Slope Gradient (%): 3
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments: shallow water table probably due to adjacent stock pond seepage	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): 40*
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-9	A1/FILL	cl	abk, 1	High	m, m, D, Fe-x, M	Mod-slow	Fill mixed with A horizon; 10% gravel
9-18	A2	cl	m	Mod	c, m, F, Fe-x, M	Mod-slow	
18-31	Bt	sicl	m	Low	m, m, D, Fe-x, M	Mod-slow	
31-41	BtC	vgrcl	m	Low	c, c, D, Fe-x, M	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niessen	Pit No.: 11
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill area within alluvial fan
	Slope Gradient (%): 3-5
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Undetermined
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): Free water at 53
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-6	FILL	grcl	m	Mod	c, m, D, Fe-x, M	Mod	
6-13	Ab	cl	m	Mod	c, m, D, Mn-x, M	Mod	
13-22	Bt	cl	abk, 1	Low	c, m, F, Fe-x, M	Mod	
22-53	BC	fsc	m	Low	m, m, D, Fe-x, M	Slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 12
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin
	Slope Gradient (%): 7
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments: No fill material present	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 63
Depth to Restrictive Layer (in.): 8 (Bt somewhat restrictive)	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	cl	abk, 1	Mod	c, f, D, Fe-x, RC	Mod-slow	
3-8	A2	cl	abk, 1	Mod	None	Mod-slow	
8-29	Bt	sic	abk, 1	Low	None	Slow	
29-63	C	cl	m	Low	m, m, D, Fe-x, M	Mod-slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 13
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin
	Slope Gradient (%): 3
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 41
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	cl	m	Mod	c, f+m, D, Fe-x, RC+PL	Mod-slow	
3-11	A2	cl	abk, 2	Low-mod	m,m, P, Fe-x, PL	Mod-slow	
11-21	Bt	sicl	abk, 1	Low	c, m, F, Fe-x, M	Mod-slow	
21-41	cl	cl	m	Low	c, m, F, Fe-x, M	Mod-slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 14
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill area within overall alluvial fan
	Slope Gradient (%): 5
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Undetermined
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): 47
Depth to Restrictive Layer (in.): 26	Overall Soil and Site Suitability for Wetland Establishment: low medium <u>high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-9	A1/FILL	cl	abk, 2	Mod	None	Mod-slow	Fill mixed within A1 horizon
9-26	A2	cl	m	Mod	m, m, D, Fe-x, M	Mod-slow	
26-35	Bt1	c	m	Low	m, m, D, Fe-x, M	Very slow	
35-48	Bt2	sic	m	Low	m, m, D,D, M	Slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Niesen	Pit No.: 15
Investigator(s): Joel Butterworth	Date: July 29, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0221	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale floodplain basin *fill material within floodplain area
	Slope Gradient (%): 5
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: N/A
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 53
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium <u>high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-35	FILL	n/a	sg	Low	None	Mod-rapid	Buried woody material and metallic fragments
35-53	Ab	sicl	m	Low	m, m, P, Fe-x, M	Mod-slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (North)	Pit No.: 12
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0211 (knife at top of Bt), 0212 (weathered rock fragments in A2 horizon [not redox])	

Land Surface Shape: (slightly) planar <u>concave</u> convex broad swale	Landform: alluvial fan low terrace swale <u>floodplain</u> basin
	Slope Gradient (%): 2-3
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments: 5% gravel in A1 and A2 horizons	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 29
Depth to Restrictive Layer (in.): 21"	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	grl	High	f, f, D, Fe-x, RC	Mod	
2-21	A2	cl	abk, 2	Mod	c, f, D, Fe-x, PL	Mod-slow	
21-29	Bt	c-	m	Low	c, m, D, Fe-x, M	Very slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (North)	Pit No.: 13
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin Slope Gradient (%): 2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 32"
Depth to Restrictive Layer (in.): 9"	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	l	m	High	m, f, D, Fe-x, RC	Mod	
1-9	A2	cl-	m	Mod	c, f, D, Fe-x, PL	Mod-slow	
9-22	Bt	c-	abk, 3	Low	None	Very slow	
22-32	BtC	grcl	m	Low	None	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance

- f - few
- c - common
- m - many

Redox Size

- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast

- F - faint
- D - distinct
- P - prominent

Redox Type

- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location

- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (North)	Pit No.: 14
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar <u>concave</u> convex	Landform: alluvial fan low terrace swale <u>floodplain</u> basin Slope Gradient (%): 1
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments:	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): none to 30"
Depth to Restrictive Layer (in.): 24" (Bt somewhat restrictive)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A1	l	gr, 2	High	c, f, F, Fe-x, RC	Mod	
4-13	A2	sicl	gr, 3	Mod	c, m, F, Fe-x, M	Mod-slow	
13-24	Bt1	sicl	abk, 3	Low	None	Mod-low	
24-30	Bt2	sic	m	Low	m, m, D, Fe-x, M	Slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (North)	Pit No.: 15
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0213 (knife at top of Bt)	

Land Surface Shape: (slightly) planar concave <u>convex</u>	Landform: <u>alluvial fan</u> low terrace swale floodplain basin
	Slope Gradient (%): 3
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Undetermined
General Comments: Approx. 1-1.5' higher than adjacent wetland	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 31
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	gr, 1	High	c, f, D, Fe-x, RC	Mod	
2-10	A2	cl	abk, 2	Mod	None	Mod-slow	
10-20	Bt	cl	abk, 3	Low	f, m, D, Fe-x, RC	Mod-slow	
20-31	BtC	grcl	m	Low	None	Slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (North)	Pit No.: 16
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin Slope Gradient (%): 3
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: undetermined
General Comments: approx. 1' higher than adjacent wetland	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): none to 28"
Depth to Restrictive Layer (in.): 18"	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A1	l	gr, 2	High	c, f, D, Fe-x, RC	Mod	
4-10	A2	cl	abk, 3	Low-mod	None	Mod-slow	
10-18	Bt	cl	abk, 3	Low	c, m, F, Fe-x, M	Mod-slow	
18-28	BC	c-	m	Low	None	Very slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (North)	Pit No.: 17
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0217 (knife at top of Bt horizon)	

Land Surface Shape: (slightly) planar concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Undetermined
General Comments: approx. 1.5 – 2' above adjacent wetland	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): none to 27"
Depth to Restrictive Layer (in.): 21"	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A1	cl	gr, 2	Mod	c, f, D, Fe-x, RC	Mod-slow	
4-13	A2	cl	abk, 2	Mod	c, m, F, Fe-x, M	Mod-slow	
13-21	Bt	cl	abk, 1	Low	None	Mod-slow	
21-27	BC	c-	m	Low	None	Very slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (North)	Pit No.: 18
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin Slope Gradient (%): 3
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Feliz
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 30
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	cl	m	Mod	c, f, F, Fe-x, RC	Mod-slow	
3-13	A2	cl	abk, 1	Mod	None	Mod-slow	
13-28	A3	cl	m	Low	None	Mod-slow	
28-30	C	cl	m	Low	None	Mod-slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (North)	Pit No.: 19
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin
	Slope Gradient (%): 4
Soil Map Unit: Feliz loam, 0 to 2% slopes (123)	Soil Series as Observed: Feliz
General Comments: Approx. 1' higher than adjacent wetland	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 36"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	grcl	m	Mod	c, f, F, Fe-x, RC	Mod	
3-19	A2	grcl	abk, 2	Mod	None	Mod	
19-32	C1	vgrcl	m	Low	None	Mod	
32-36	C2	cl+	m	Low	None	Mod-slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (North)	Pit No.: 20
Investigator(s): Joel Butterworth	Date: July 28, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 5
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Feliz
General Comments: Approx. 1' higher than adjacent wetland	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): none to 31"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	cl	gr, 1	Mod	None	Mod-slow	10% gravel
3-15	A2	cl	m	Low-mod	None	Mod-slow	10% gravel
15-30	A3	cl	m	Low	None	Mod-slow	10% gravel
30-31	AC	cl	m	Low	f, m, D, Fe-x, M	Mod-slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 1
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: 037	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin Slope Gradient (%): 1-2
Soil Map Unit: Feliz clay loam, gravely substratum 2 to 8% slopes (126)	Soil Series as Observed: Feliz
General Comments: about 30' south of establishment area; edge of small alluvial fan within floodplain	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 32"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-5	A1	l	abk, 3	Mod	m, f+m, d, Fe-x, RC	Mod	
5-10	A2	grl	abk, 2	Mod	c, m, F, Fe-x, M	Mod	
10-32	A3	grcl	abk, 1	Low	None	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 2
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0200	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin Slope Gradient (%): 2
Soil Map Unit: Feliz clay loam, gravely substratum 2 to 8% slopes (126)	Soil Series as Observed: Feliz, transitioning to Cole
General Comments:	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 25"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	l	gr, 2	Mod	c, f, D, Fe-x, RC	Mod	
3-17	A2	l	abk, 2	Mod	None	Mod	
17-25	A3/Bt	grcl	abk, 1	Low	None	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 3
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0201 Knife is at top of Bt	

Land Surface Shape: (slightly) planar concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin
	Slope Gradient (%): 2-3
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Cole
General Comments: shallow mud casts (about 1")	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 30"
Depth to Restrictive Layer (in.): 17"	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A1	l	gr, 3	Mod-high	c, f, D, Fe-x, RC	Mod	
4-17	A2	l	abk, 2	Mod	c, m, F, fe-x, M	Mod	
17-30	Bt	c	m	Low	m, m, F, Fe-x, M	Very slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 4
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0202	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: <u>alluvial fan</u> low terrace swale floodplain basin
	Slope Gradient (%): 2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Feliz grading towards Cole
General Comments: 5-10% gravel throughout	
Jurisdictional Status at Pit: <u>existing wetland</u> (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): none to 24"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-6	A1	l	gr, 1	High	c, f, D, Fe-x, RC	Mod	
6-19	A2	l+	abk, 1	Low-mod	None	Mod	
19-24	BC	grcl	abk, 1	Low	None	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 5
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: 0203 (overall), 0204 (of pit; knife at top of BT)	

Land Surface Shape: (slightly) planar concave convex	Landform: alluvial fan low terrace swale floodplain basin
	Slope Gradient (%): 2-3
Soil Map Unit: Feliz clay loam, gravely substratum 2 to 8% slopes (126)	Soil Series as Observed: Cole transitioning to Fluvaquents
General Comments: distal part of alluvial fan; sediment deposits	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): None to 27"
Depth to Restrictive Layer (in.): 15"	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	gr, 2	Mod-high	c, f, D, Fe-x, RC	Mod	
2-15	A2	cl	abk, 3	Mod	m, m, D, Fe-x, M	Mod-slow	
15-27	Bt	c-	m	Low	m, m, D, Fe-x, M	Very slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 6
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: None	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale <u>floodplain</u> basin Slope Gradient (%): 1-2
Soil Map Unit: Feliz clay loam, gravely substratum 2 to 8% slopes (126)	Soil Series as Observed: Feliz
General Comments: Biotic crust (weak); shallow mud casts (~1"); 5-10% gravel in profile.	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 29"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high Comments: Pit is approx. 6"-12" higher than adjacent wetland to south

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	gr, 2	Mod	c, f, D, fe-x, RC	Mod	
2-22	A2	l	abk, 2	Mod	None	Mod	
22-29	A3	sicl-	m	Low	None	Mod-slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 7
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (<u>slightly</u>) planar concave <u>convex</u>	Landform: alluvial fan low terrace swale <u>floodplain</u> basin
	Slope Gradient (%): 2
Soil Map Unit: Feliz clay loam, gravely substratum 2 to 8% slopes (126)	Soil Series as Observed: Feliz
General Comments: 10% gravel throughout	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 28
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: <u>low medium</u> high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	l	abk, 1	Mod-high	c, f, D, Fe-x, RC	Mod	
3-13	A2	l	abk, 2	Mod	None	Mod	
13-28	AC	cl	m	Low	None	Mod-slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 8
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale <u>floodplain</u> basin
	Slope Gradient (%): 2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Feliz
General Comments: adventitious Lolium roots; 10% gravel in all horizons	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): none to 29
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	cl-	abk, 1	Mod	m, f, D, Fe-x, RC	Mod-slow	
3-16	A2	cl	m	Mod	None	Mod-slow	
16-29	AC	cl	m	Low	None	Mod-slow	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 9
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0205 knife at top of AC horizon	

Land Surface Shape: (<u>slightly</u>) planar concave <u>convex</u>	Landform: <u>alluvial fan</u> low terrace swale floodplain basin
	Slope Gradient (%): 1
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Feliz
General Comments: weak, spotty biotic crust; 5% gravel in A1, A2 and AC horizons.	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 32”
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	abk, 1	Mod	c, f, D, Fe-x, RC	Mod	
2-12	A2	l	abk, 1	Mod	None	Mod	
12-19	AC	l	m	Low	None	Mod	
19-32	C	grl	m	Low	None	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

“-“ = “light” (as in a clay textural class with relatively low clay content)
“+“ = “heavy” (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 10
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: 0207, 0208	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale <u>floodplain</u> basin
	Slope Gradient (%): 1-2
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Feliz
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): None to 27”
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	grl	abk, 1	Mod	m, f, D, Fe-x, RC	Mod	
3-20	A2	l	abk, 1	Mod	None	Mod	
20-27	AC	grl	m	Low	c, m, F, Fe-x, M	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

“-“ = “light” (as in a clay textural class with relatively low clay content)
“+“ = “heavy” (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Offsite Mitigation Parcel: Watson East (South)	Pit No.: 11
Investigator(s): Joel Butterworth	Date: July 27, 2010	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: N/A	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: alluvial fan low terrace swale <u>floodplain</u> basin
	Slope Gradient (%): 0-1
Soil Map Unit: Cole clay loam, 0 to 2% slopes (115)	Soil Series as Observed: Feliz
General Comments:	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): none to 27"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-6	A1	l	abk, 2	Mod	m, f, D, Fe-x, RC	Mod	
6-14	A2	cl	abk, 1	Mod	None	Mod-slow	
14-27	AC	l	m	Low-mod	None	Mod	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

Redox Contrast
F - faint
D - distinct
P - prominent

Appendix B

Representative Digital Images from July 2010 Soil Evaluations at Wetland Establishment Sites

Appendix B-1. Ford Offsite Mitigation Parcel Wetland Establishment Site (Soil Pit 5)
Overview of backhoe pit excavation.

Appendix B-2. Goss/MGC Plasma Offsite Mitigation Parcels Existing Wetland (Soil Pit 2)
Clay loam subsoil; redox extends to surface.

00635.09 Willits RPP (08/10)

Appendix B
Representative Digital Images from July 2010 Soil Evaluations at Wetland Establishment Sites

Appendix B-3. Watson East Offsite Mitigation Parcel Existing Wetland (Soil Pit 3)
Knife at top of clay subsoil; redox extends to surface.

Appendix B-4. Niesen Offsite Mitigation Parcel Existing Wetland (Soil Pit 1)
Clay loam subsoil; redox begins at 3 inches depth (at knife).

Appendix B-5. Goss/MGC Plasma Offsite Mitigation Parcels Existing Wetland (Soil Pit 19)
Clay loam subsoil; redox at 0–6 inches and below 11 inches depth.

Appendix B-6. Goss/MGC Plasma Offsite Mitigation Parcels Wetland Establishment Site (Soil Pit 5)
Dense roots in A1 horizon, suggesting surface ponding or root restriction from clay soil (Clear Lake series) below; redox begins at 9 inches depth.

00635.09 Willits RPP (08/10)

Appendix B-7. Ford Offsite Mitigation Parcel Wetland Establishment Site (Soil Pit 7)
Woody refuse in fill material, which extends to 52 inches.

Appendix B-8. Ford Offsite Mitigation Parcel Wetland Establishment Site (Soil Pit 6)
Investigator standing on native soil at 72 inches; excavated fill in background.

Appendix B-9. Niesen Offsite Mitigation Parcel Wetland Establishment Site (Soil Pit 15)
Very gravelly fill material containing metal fragments and woody material.

Appendix B-10. Niesen Offsite Mitigation Parcel Wetland Establishment Site (Soil Pit 7)
Close-up of buried A horizon (with partly decomposed organic matter),
taken from 99 inches depth; reddish excavated fill is at right.

Appendix B-11. Goss/MGC Plasma Offsite Mitigation Parcels Wetland Establishment Site (Soil Pit 8)
Silty clay subsoil; redox extends to surface.

Appendix B-12. Watson East Wetland Establishment Site (Soil Pit 9)
Loam/gravelly loam soils; knife at bottom of subsurface layer; redox at 0–12 inches depth, suggesting short duration ponding on nearly level slope.

Attachment 1

DEPARTMENT OF THE ARMY
SAN FRANCISCO DISTRICT, U.S. ARMY CORPS OF ENGINEERS
1455 MARKET STREET
SAN FRANCISCO, CALIFORNIA 94103-1398

JUL - 9 2010

REPLY TO
ATTENTION OF

Regulatory Division

SUBJECT: File Number 1991-19474N

Mr. Charlie Fielder
District 1 Director
California Department of Transportation
P.O. Box 3700
Eureka, California 95502

Dear Mr. Fielder:

Per our District Commander's June 29, 2010 e-mail communication to you, we are hereby providing you with the list of items Caltrans must provide to the Corps by August 15, 2010, in order for us to come to a permit decision by August 30, 2010. To adequately address the three items specified by the District Commander, including the 401 Certification, a complete long-term management plan, and complete endowment calculations broken down by parcel (must use spreadsheet provided by the Corps by e-mail on June 2, 2010 for **each parcel**), you must provide the following 6 items to meet the spirit and intent of our commitments.

These items are a subset of the larger list provided today to you by the RWQCB representing the complete information needs of the Corps, the RWQCB, and the EPA. The list below represents the minimum information necessary for us to complete our public interest review, ensure compliance with mandatory "no net loss" policy, and ensure compliance with our Mitigation Regulations (33 CFR Part 332). To date, you have only proposed 23 acres of wetland establishment (creation) and have not shown how you will effect "no net loss" of the 83 acres of fill that is proposed.

1. A **clear accounting** of existing conditions on each mitigation parcel specific to waters of the U.S. including aquatic resource type (you must specify either wetlands, non-wetland waters of the U.S., OR riparian buffer) and acreage in a table with associated drawings. We also require a clear accounting of proposed conditions (i.e. climax community) on each mitigation parcel specific to waters of the U.S. including proposed aquatic resource types and acreages.

2. Compensation types must be clarified throughout the Mitigation and Monitoring Plan (MMP) and only Corps-recognized definitions are to be used. "Protection" is not a recognized Corps definition per 33 CFR Part 332 and any mitigation parcel areas

classified under this term **must be reclassified** according to one of the Corps-recognized definitions. The word "protection" may not be used in the final MMP.

You have counted returning areas that will be temporarily impacted to their original contours as "restoration". "Restoration" is not defined per 33 CFR Part 332 as "areas temporarily affected by onsite or offsite construction activities that will be restored to pre-project conditions." Any areas classified this way within the MMP **must be removed** from the mitigation totals, as the Corps does not recognize them as "restoration" areas.

3. As specified in our April 23, 2010 letter, information justifying areas proposed for preservation must be provided pursuant to 33 CFR Part 332.3(h).

4. Each and every area proposed for **establishment** must have the following details and baseline information: 1) Caltrans needs to describe the process used in selecting each site. 2) Caltrans needs to clearly define the purpose of each establishment site. What functions and values are being replaced at the establishment site? Performance standards and success criteria will be based on this. 3) Caltrans needs to provide **fully developed** construction plans: existing contours, proposed contours, planting plans, construction sequence. 4) Caltrans needs to clearly define the location and the size of each mitigation site (not give us the size of the actual parcel, we need to know the size of the mitigation site). 5) Caltrans must have a corresponding reference site for each establishment site. The enhancement plans must contain the following information:
   a. Hydrology. The following information is needed for each proposed wetland establishment site:
      1) Current conditions information:
         - Analysis of existing hydrologic conditions in reference sites.
         - Hydrologic testing of the mitigation sites. Testing must include:
            - Examination of the groundwater availability.
            - Hydroperiod Information: the frequency of flooding, depth, duration, timing of saturation or inundation, percent of open water.
            - Historical hydrology of mitigation site if different from present conditions.
            - Acres of contributing drainage areas.
            - Results of water quality analysis: data on surface water, groundwater, redox, nutrients, organic content, suspended matter, DO, heavy metals.
      2) Information to estimate proposed hydrological conditions:
         - A reliable water budget must be presented. You must be able to show that net inflows are greater than net outflows. Water budget must include: water source(s): precipitation, surface runoff, groundwater, stream. Water losses.

- Provide a water budget for wet years and dry years.
- Modification of the hydrologic characteristics should be kept to a minimum.
- Site should be hydrologically self sustaining.

b. Soil Characteristics. The following information is needed for each wetland establishment site:

1) Soil profile. The MMP provided the soil survey information. Caltrans needs to locate those soils on site. Submit a report of soil samples with a map showing data sample points.
2) Standard soil analysis: percent organic matter, structure, texture, permeability.
3) What will be the source of the soils? (e.g., existing soil, imported hydric soil from impact site).
4) Also need: erosion and soil compaction control measures.

c. Vegetation.

1) Existing conditions: We generally have a list of the species that occur on site from the delineations that were completed. For each wetland establishment site we need:
    - Species characteristics such as: densities, age, health, natives/non natives.
    - Percent cover.
    - Community structure (canopy stratification).
    - Map showing the correct location of plant communities with representative site photos.
    - Proposed site should be located adjacent to existing waters of the U.S. or a high functioning buffer adjacent to waters of the U.S. to create a wildlife corridor. Provide documentation of this connectivity.

d. Watershed context/surrounding land use for each wetland establishment site:

1) Impairment status and impairment type of aquatic resources.
2) Description of watershed land uses (percent agriculture, forested, wetland, developed).
3) Size of natural buffers (show on map and do not call them "riparian").
4) Description of landscape connectivity: proximity and connectivity of existing aquatic resources and natural upland areas (and show on map).
5) Relative amount of aquatic resource area that the impact site represents for the watershed and/or ecoregion (by individual type and by overall resources).

e. Goals of each wetland establishment site:

1) Types and areas of habitat to be established.
2) Specific functions of the habitat types.
3) Time lapse between jurisdictional impacts of the project and mitigation site success.

4) Total cost of the establishment site: site preparation, planting, maintenance, monitoring.
5) Overall watershed improvement to be gained by the wetland establishment site.

f. Wetland Establishment Site Implementation:
   1) For each establishment site Caltrans must:
      - Provide a rationale for expecting implementation success.
      - Name responsible parties.
      - Provide financial assurance information.
      - Provide a construction schedule.
      - Provide a site preparation plan.
      - Provide a planting plan. The planting plan design must emulate a reference site in terms of plant species and spacing. Planting design must place plants relative to the water source supporting them specific to what the optimal condition would be for that species.
      - Prior to planting the site soil conditions must be confirmed: soil moisture, ph, salinity, organic matter, nitrogen, soil type. Be advised that the native soils must support the proposed wetland establishment. Clay liners or other artificial barriers are not permitted.
      - Provide as-builts within 45-days of construction of establishment wetland site.

g. Maintenance Activities During Monitoring Period for each wetland establishment site:
   1) Provide the list of maintenance activities
   2) Responsible parties
   3) Schedule

h. Monitoring Plan for each wetland establishment site:
   1) Target dates for performance standards and success criteria
   2) Target functions
   3) Target hydrological regime. Hydrologic functions must be compared to what is occurring at the reference site.
   4) Target mitigation acreage of establishment
   5) Monitoring method and schedule
   6) Annual monitoring report

i. Completion of each Mitigation Site:
   1) Written notification is required
   2) Agency confirmation will be required before mitigation is considered complete.

j. Contingency Measures for each mitigation site:

1) Initiation Procedures. Circumstances necessitating the initiation of contingency measures must be described.
2) Funding mechanism (See item 5. below)
3) Responsible parties

5. The Corps requires a performance bond or other Corps-approved financial assurance mechanism payable at the direction of the District Engineer to his designee or to a standby trust agreement. This financial assurance mechanism shall be posted **within 30 days of permit issuance** or else the Corps permit will be revoked. In order to determine the appropriate assurance amount, Caltrans must provide **sufficient and itemized calculations** by August 15, 2010 for the cost of the following: collection of all necessary baseline information, parcel-specific mitigation plan preparation based on a watershed approach, land acquisition, planning and engineering, legal fees, mobilization, construction, and monitoring, and a contingency fund for any necessary remediation.

6. As specified in our April 23, 2010 letter, the Corps believes discharge of fill for project construction should be carried out concurrently with project phase construction. Caltrans must provide us with the fill amount associated with Phase I alone, the additional fill amount associated with Phase II, and the associated drawings demonstrating the two separate Phases as described by Dave Kelley in our May 10, 2010 conference call.

These items collectively are the minimum information necessary (to be supplied by August 15, 2010) for the Corps to complete the application evaluation process.

Should you have any questions regarding this matter, please call me at (415) 503-6771. Please address all correspondence to the Regulatory Division and refer to the File Number at the head of this letter.

Sincerely,

Jane M. Hicks

Jane M. Hicks
Chief, Regulatory Division

Copy Furnished:

US EPA, San Francisco, CA (Attn: A. Strauss/J. Brush/ M. Scianni)
CA RWQCB, Santa Rosa, CA (Attn: C. Kuhlman/J. Puget)
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California Transportation Commission, Sacramento, CA (Attn: J. Earp)

DEPARTMENT OF TRANSPORTATION
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Flex your power!
Be energy efficient!

August 25, 2010

Jane M. Hicks
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San Francisco District
1455 Market Street
San Francisco, CA 94103-1398

Mr. Jason Brush
Wetlands Regulatory Office
US EPA, Region 9
75 Hawthorne Street, WTR-8
San Francisco, CA 94105-3901

Dear Ms. Hicks and Mr. Brush:

The U.S. Army Corps of Engineers (USACE) provided the California Department of Transportation (Caltrans) a letter on July 9, 2010, that listed the minimum information necessary for the USACE to come to a Clean Water Act Section 404 permit decision on the Willits Bypass Project (bypass project). A meeting was held on July 12 and 13, 2010 in Santa Rosa with the USACE, Environmental Protection Agency (USEPA), North Coast Regional Water Quality Control Board (RWB), California Department of Fish and Game (CDFG), and other stakeholders to discuss the requested information in the July 9 letter and other agency-requested information and capture all of it in a permitting “punch list” for the bypass project. Since that time, Caltrans has been conducting field work, reviewing and analyzing data, running models, and documenting these efforts in technical memoranda submitted per the permitting punch list due dates. On August 15, 2010, Caltrans submitted the remaining requested information from the July 9 letter and permitting punch list, as well as miscellaneous requests from the July 12 and 13, 2010 meetings and the July 26, 2010 field meeting, and submitted these items to the USACE, USEPA, RWB, CDFG, and other stakeholders.

To-date, Caltrans has received the following comments from USACE and USEPA on some of the July 9 letter and punch list submittals:

- August 11, 2010 letter from USEPA regarding Niesen Parcel and Monitoring Reference Sites
- August 11, 2010 e-mail from Melissa Scianni of USEPA regarding the Long-term Management Plan (Chapter 11 of the MMP)
- August 13, 2010 e-mail from Melissa Scianni of USEPA regarding soil characteristics at wetland establishment sites
- August 5, 2010 e-mail from Melissa Scianni of USEPA regarding the preservation technical memorandum submitted on August 2, 2010
- July 29, 2010 e-mail from Dave Wickens of USACE regarding location in MMP of requested information from the July 9 letter from USACE to Caltrans

Caltrans is providing this letter to address the above comments on submittals in an effort to ensure that the USACE has as much information as is available at this time in order to issue a Clean Water Act Section 404 permit for the Willits Bypass Project by August 30, 2010. The permit is needed by this date so that the bypass project can continue to move forward by receiving approval from the Federal Highway Administration for federal matching funds.

Responses to August 11, 2010 letter from USEPA regarding Niesen Parcel and Monitoring Reference Sites

1) Reference Sites

USEPA has expressed concern over the currently identified wetland establishment monitoring reference sites. According to USEPA, since the reference sites are targeted for enhancement in the bypass project Mitigation and Monitoring Proposal (MMP), they may not represent the highest function attainable. However, due to their adjacency Caltrans believes the proposed reference sites provide the most similar vegetation, hydrologic, and soils information for the establishment sites. Caltrans appreciates the suggestion of using the Huff and Watson West offsite mitigation preservation parcels to come to resolution on the subject. However, replicating the riparian woodlands and scrub wetlands on Huff and the marsh wetlands on Watson West parcels at the proposed wetland establishment sites in Little Lake Valley would result in a disrupted ecological landscape at these sites.

Improved functions and values at the enhancement sites is a component of the mitigation plan. Grazing will be one action used to improve functions and values at the enhancement sites. Over the long-term, similar grazing prescriptions used at the enhancement sites would be used at the establishment sites resulting in the most continuous ecological landscape possible. Since this issue was not a "punch list" item, Caltrans expects that a permit decision can be made irrespective of a decision on this issue. As proposed by USEPA, and affirmed here by Caltrans, a quick resolution of the topic is a mutually desired outcome. However, if any changes are needed, then there is likely insufficient time to further inform the discussion or edit relevant document sections prior to the end of the month. Caltrans proposes that USACE approval of the final reference sites be included as a special condition in the 404 permit.

2) Wetland Establishment Site Hydrology

A telephone conference call was held on August 13 to discuss site-specific wetland establishment hydrology. Agency staff and staff from the Willits Environmental Center (WEC) noted the need for additional site-specific wetland establishment hydrology data to confirm that establishment would be successful and naturally sustainable.

Caltrans remains committed to continuing to collect site-specific hydrology data for the establishment areas, but believes that data currently available can be used to confirm the future success of proposed wetland establishment sites . Based on verified wetland delineations, field observations, the hydrology technical memorandum (July 29 submittal), and the soils technical memorandum (August 10 submittal), the established wetlands are expected to have the same hydrologic regime as the adjacent, existing wetlands. The elevation of the wetland establishment sites will be lowered to match that of adjacent wetlands so that any high water table, overbank channel flow, or sheetflow experienced by existing wetlands would extend into the adjacent wetland establishment sites. The soils technical memorandum indicates little difference between the soils in the establishment sites and adjacent existing wetlands, a further indication that the established wetlands will have hydrological conditions similar to the existing wetlands. Furthermore, the soils technical memorandum indicates that the restrictive layer of soils that was found in some soil pits was thick and extended below planned excavation depths. As a result, excavation planned for the wetland establishment sites would not remove the restrictive layer that could help support wetland hydrology at some locations (see mitigation construction plans – August 2 submittal). If the wetland establishment sites do not function as expected, the MMP protocols ensure that such a failure would be detected and remedial actions would be taken.

The hydrology technical memorandum (July 29 submittal) provided all available site specific information regarding surface water and groundwater observed at the Goss/MGC Plasma establishment site. The memorandum also provided water balance time series estimates of water level elevations under a wet and dry water year for a wetland supported by a high water table and a wetland supported by a restrictive layer, but it did not provide water balance time series estimates of water level elevations at each wetland establishment site. Since the hydrology technical memorandum was submitted, additional information has become available as presented in the soils technical memorandum (August 10 submittal). This additional information can be used to refine the hydrology discussion. However, to generate time series estimates of water level elevations for each establishment site, more data is needed such as rainfall runoff models for each site that may receive upslope sheetflow (such models need time series hydrological data for calibration), time series information regarding aquifer elevation at each site, and time series information regarding flooding at each site (e.g., from Old Outlet Creek at the Ford site or from backwater inundation at the Watson East parcel resulting from down-valley flooding). Fortunately, site-specific time series estimates are not necessary to be confident that the establishment sites will function as wetlands.

Table 1 and the following discussion provide site-specific hydrologic information from the soils technical memorandum.

Table 1. Site Specific Hydrologic Information for Wetland Establishment Sites from Soils Technical Memorandum (August 10 Submittal)

Wetland Establishment Site	Evidence for High Water Table at Site[a]	Evidence of Restrictive Layer	Other Potential Sources of Water[b]
Ford[c]	Subsurface redox features at reference and establishment sites and very moist surface soil at 2 of 4 establishment pits	Slow permeability in 1 of the 4 reference pits and 1 of the 4 establishment pits	Shallow flooding from Old Outlet Creek
Goss/MGC Plasma	Subsurface or subsoil redox features at reference and establishment sites. In addition, shallow groundwater present at North Coast semaphore grass groundwater monitoring sites (which usually occur in wetlands) despite lack of restrictive layer.	No sites with slow permeability in 6 reference pits, but slow or very slow permeability in 5 of the 12 establishment pits	Upslope sheetflow runoff
Niesen[c]	Subsurface redox features at reference and establishment sites	Very slow or slow permeability at 1 of the 5 reference pits and 3 of the 10 establishment pits	Seepage from pond
Watson East (North)	Subsurface redox features at some reference and establishment sites	Very slow or slow permeability at 3 of the 4 reference pits and 3 of the 6 establishment pits	Backwater inundation from down-valley flooding and upslope sheetflow runoff
Watson East (South)	Subsurface redox features at some reference and establishment sites	Very slow or slow permeability at 2 of the 5 reference pits, but none of the establishment pits	Backwater inundation from down-valley flooding and upslope sheetflow runoff

a. A high water table means that the top of an unconfined aquifer is near the soil surface. Redoximorphic (redox) features present in the subsurface are indicative of a high water table, although they can also form as a result of prolonged inundation from flooding (potentially at Ford and Watson East parcels) or the retention of water by a restrictive layer that retains water in subsurface soils (a condition not common at the wetland establishment sites).
b. Additional sources of water that support existing wetlands would also support adjacent established wetlands.
c. The redox features and other soil characteristics described for the soil pits excavated within the Ford and Niesen establishment sites refer to the native soil below the fill material.

At all wetland establishment sites except Watson East (South), soils with slow or very slow permeability were detected in some, but not all, soil pits. At the locations where the soils have slow or very slow permeability, there is a potential for the water to be retained in a manner similar to what was illustrated in the bottom (low aquifer) graphs shown in Figures 11 – 13 of the hydrology technical memorandum. However, because many soil pits did not contain soils with a restrictive layer, it is likely that the wetlands at the 5 establishment sites are dependent on outside sources of water (a high water table being most likely, but water from flooding and upslope sheetflow runoff may also contribute). At locations supported by a high water table or flooding (i.e., almost all sites), the wetlands are likely to behave in a manner similar to that shown in the top graphs (high aquifer) in Figures 11-13 of the hydrology technical memorandum. However, the exact water surface elevations (whether groundwater or surface water) will depend on the local groundwater table and pattern of flooding. If a site were supported by upslope sheetflow runoff, the hydrologic pattern would show the same "spiky" pattern dependent on rainfall that is shown in the perched aquifer line (red) shown in Figures 11-13 of the hydrology technical memorandum, but higher water elevations would be attained (see paragraph below for more information).

Figure 1 represents a hypothetical example where the soil is assumed to have moderately slow permeability of 5.4 inches per day, a value expected for typical (not very restrictive) soil textures found at the wetland establishment sites. In the sheetflow scenario, sheetflow is assumed to occur if daily rainfall is greater than 0.33 inches and it is assumed to increase the effect of precipitation by a factor of fifteen. Note that the values shown for no sheetflow are the same as the "soil perched" line that appears in the upper graph of Figure 11 of the hydrology technical memorandum (July 29 submittal).

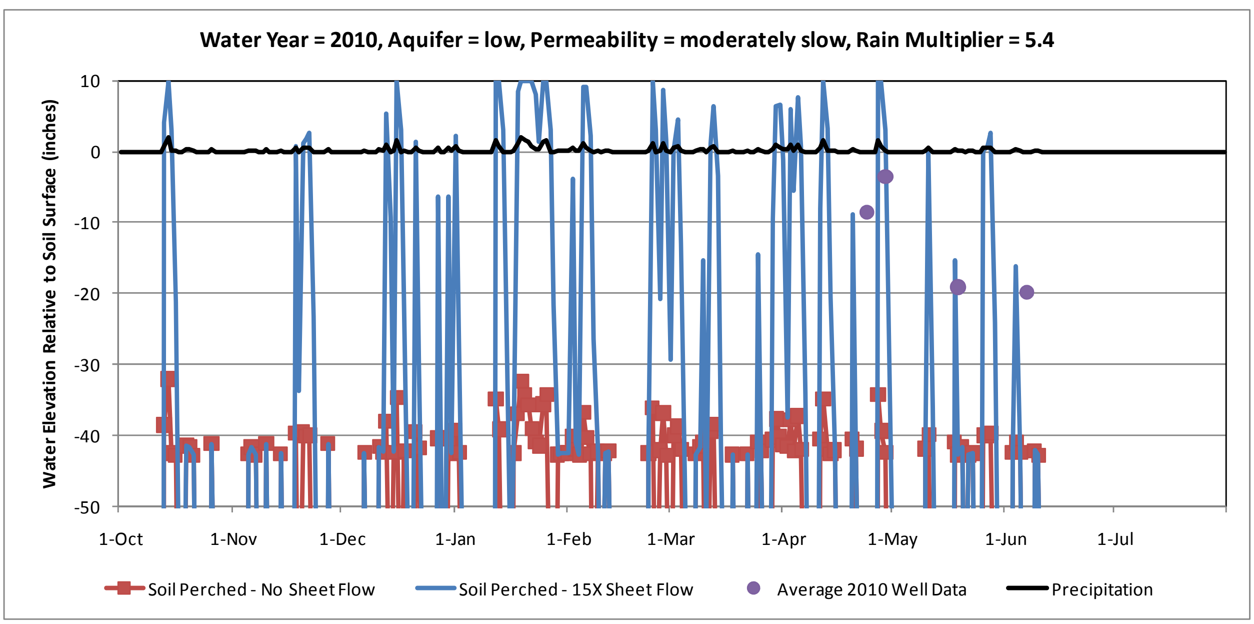

Figure 1. Estimated Water Surface Elevation for Water Perched on Soil with and without Sheetflow

Based on the information in Table 1, the following site-specific hydrologic inferences can be drawn at the wetland establishment parcels:

Ford. Existing wetlands at the Ford parcel are most likely supported by a high water table and/or overflow from Old Outlet Creek. Once the establishment site is excavated to the same elevation as the adjacent, existing wetlands, the establishment site is expected to have the same hydrology as the existing wetlands.

Goss/MGC Plasma. Existing wetlands at the Goss/Plasma site are most likely supported by a high water table. Upslope runoff to local depressions may provide some contribution, but because the soils upslope of the parcel are likely to absorb most precipitation, runoff contributions into the parcel are generally not expected to be large. None of the soil pits in existing wetlands had slow or moderately slow permeability, although 5 of the 12 pits in the establishment area had slow or moderately slow permeability. The presence of water in the PLHO monitoring wells during spring 2010, despite the lack of a restrictive layer, is indicative of a high water table. The Goss/ MGC Plasma wetland establishment site is expected to be supported by the same hydrologic conditions as the existing wetlands. In addition, the localized presence of soils with a restrictive layer may further benefit the established wetlands.

Niesen. Existing wetlands at the Niesen parcel are most likely supported by a high water table. Once the establishment site is excavated to the same elevation as the adjacent, existing wetlands, the establishment site is expected to have the same hydrology as the existing wetlands.

Watson East (North and South). There are multiple potential water sources for the existing wetlands at the Watson parcel, depending on location: backwater effects from down-valley flooding, upslope sheetflow runoff, retention of incident precipitation by restrictive layer soils, and a high water table. It is likely that the lower portions of the parcel receive more water from down-valley flooding than the locations farther upslope. Wetlands to be established on the site are likely to be supported by the same water sources as the existing wetlands. The soil pits indicate that there may be more areas with restrictive layer soils in the existing wetlands than in the establishment sites, but because the restrictive layer soils are not present everywhere, other sources of water are likely to be more important.

Caltrans will be collecting additional site-specific hydrology data at the wetland establishment sites as part of baseline studies that will begin in fall 2010 and continue through spring 2011. Additional groundwater wells and soil moisture data loggers are proposed to be installed to collect this data.

3) Niesen Wetland Establishment Site
USEPA has indicated that they have doubts regarding the Niesen wetland establishment site. The site is surrounded on three sides with non-native and invasive plants being prevalent.

The Niesen wetland establishment site has been included in the bypass project's mitigation plan in an effort to address agency direction to provide as much wetland establishment in Little Lake Valley as possible. Efforts to identify mitigation lands in the valley that would support wetland establishment are documented in the Feasibility Study (2005) and Mitigation Parcels Report (2007). Agency determinations that lands delineated by Caltrans as uplands were wetlands and changing preferences of land owner willingness to sell led to very little remaining wetland establishment opportunities in the valley. In July 2008 Caltrans briefed the agencies on the lack of viable wetland establishment opportunities within Little Lake Valley. The RWB response letter indicated that Caltrans needed to re-double their efforts for identifying wetland establishment both within and outside of Little Lake Valley. Considerable effort and cost has gone into the research and development of these sites. Caltrans understanding in moving forward with this work was that despite the costs, the maximum amount of wetland establishment should be pursued.

The Niesen wetland establishment site was presented in the March 2010 MMP and its location alone did not result in substantive comment at that time. However, Caltrans infers that the USEPA's concern is not based entirely on the fact that it is surrounded by roadways. Rather the concern is that since it is surrounded by roadways the site will pose problems from an invasive species maintenance standpoint and benefits of the established wetland site will be reduced due to poor hydrological connectivity. With respect to invasive species control, Caltrans has developed a Property Analysis Record (PAR) that provides for invasive species management in perpetuity at the wetland establishment sites. If invasive species are not controlled on this parcel, either as a result of enhancement or establishment efforts, then this parcel would continue to be degraded with invasive species infestations. With respect to hydrologic connectivity, it will be maintained at the Niesen parcel post-construction. The land surface at the wetland establishment site will be lowered to match the elevation of the existing adjacent wet meadow. The land surface will slope down gently to the north from the southern parcel boundary. A culvert will enter the southwest corner of the established wetland and flow north across the wetland. In addition, another culvert will enter the parcel midway along its western boundary and flow across the established wetland from west to east and eventually drain into the existing wetland on the east side of the bypass through a culvert under the bypass embankment. If the Niesen establishment site is eliminated from the bypass project's mitigation plan, there are limited options available to make up for the expected 5.66 acres of wet meadow to be established at this parcel. If the Niesen establishment site is eliminated, Caltrans will need to determine how the elimination of this establishment site affects permits already issued by the RWB and CDFG based on the inclusion of the Niesen establishment site.

The USEPA letter of August 11, 2010 also states that hydrology and plant community information have not yet been received for the Niesen parcel. Hydrology data was provided as part of the hydrology technical memorandum submitted on July 29 and vegetation/plant community data was provided as part of the vegetation technical memorandum submitted on August 10.

Response to August 11, 2010 e-mail from Melissa Scianni of USEPA regarding the Long-term Management Plan (Chapter 11 of the MMP)

Caltrans provided a Long-term Management Plan (LTMP) in the June 2010 MMP (Chapter 11). During the July 12-13th meeting the USEPA and USACE provided verbal comments on the MMP. All comments received from the July meeting were addressed in the August 9, 2010 version provided to the agencies. Caltrans anticipated either concurrence or comments focused on the new changes. Many of the comments in the August 11 e-mail are new requests for additional details based on a re-review of the entire document. Due to the timing of these new requests, Caltrans will address these comments in the next planned revision of the LTMP.

Responses to August 13, 2010 e-mail from Melissa Scianni of USEPA regarding Soil Characteristics at Wetland Establishment Sites

1) The topsoil at the Ford property consists of fill material and is not appropriate for placement on the wetlands after construction. Please remove the replacement of topsoil language from the MMP for this parcel. Since the topsoil cannot be replaced at this site, is there any need to treat the new surface layer to facilitate plant growth?

The requested change has been made to Chapter 7 in the MMP (provided as part of the August 15 submittal). With respect to treating the buried native soil surface layer, it appears from some of the soil pits excavated at the proposed wetland establishment site at the Ford parcel (e.g., soil pits #5 and #7) that the top of the native soil is below the finish grade elevation (0.8 meter and 0.4 meter, respectively). However, there appear to be areas at the Niesen parcel that have suitable, native topsoil that could be applied at the Ford parcel, or there may be areas in the bypass project alignment where native topsoil could be salvaged prior to disturbance and applied at the Ford parcel. There should be no need to treat/amend the new, applied surface layer soil.

2) Is there any evidence that the old mill site treated wood (e.g. with creosote), or did it only process natural wood? Was there any evidence of treated wood in the fill material at the Ford Parcel? If there is evidence of treated wood, some soil chemistry analysis may be necessary at the Ford parcel.

During the July 2010 soil evaluation at the wetland establishment site at the Ford parcel, no treated wood was observed where soil pits were excavated in the fill material. Crews did uncover a utility pole in one of the pits, but because it had been buried for many years, it was difficult to determine whether the pole had been treated with creosote; however, the crew did not observe any obvious creosote coating on the pole. Based on the results of the July 2010 soil evaluation, the fill material consists mostly of bark, natural wood and lumber pieces, partly burned wood, and ash.

In addition, Caltrans has conducted hazardous materials reconnaissance and assessment for the mitigation parcels, including Ford. The results of the assessment identified no significant hazardous waste/material issues at the parcel (see attached).

3) As I understand, the material to be removed from the Ford parcels is currently proposed for road base in the bypass. Given what was learned about the material present at this site, is it still appropriate for road base material? If not, can the wetland construction at the Ford parcel be moved up in the schedule?

Caltrans has determined that the fill material can be used for fill in the bypass project alignment. As such, the schedule in the MMP for wetland establishment at the Ford parcel (with the proposed wetland establishment site being constructed toward the end of the Phase 1 construction schedule) is still accurate.

4) The Niesen property contains gravelly fill material that appears to have been incorporated into the native soil in some locations. Will all of the foreign material be removed under the currently proposed grading plans? If not, they will need to be revised to ensure that all of the gravelly material is removed.

Based on the July 2010 soil evaluation at the wetland establishment site at the Niesen parcel, the amount of gravelly fill mixed in with the native soil is minor, and does not extend very deep. Excavating to the finish grade elevation will most likely remove most or all of the mixed-in gravel.

5) As with the Ford property, placement of the topsoil back on the wetlands after construction is not appropriate for the Niesen property. For this parcel, please remove the language about replacing the topsoil from the MMP. Since the topsoil cannot be replaced at this site, is there any need to treat the new surface layer to facilitate plant growth?

Based on the soil pits excavated at the Niesen property, it appears that the top of the native soil is at or just above finish grade. Therefore, it is expected that there will be no need to treat the soil at finish grade.

6) The soils memo suggests that the hydrology at Watson and Goss/MG Plasma may not be driven only by groundwater and is more complicated that what was presented in the MMP and hydrology memo. I will comment more on this once I have a chance to review the hydrology report in more detail.

The hydrology technical memorandum describes the Watson East and Goss/MGC Plasma establishment sites and adjoining wetlands at a broader scale than does the soils technical memorandum, the latter which was based on a more intensive site evaluation. For example, the hydrology technical memorandum necessarily did not factor-in the influence of microtopographic variations on the presence of wetland hydrologic conditions. Although the hydrology technical memorandum accurately identifies the hydrology of these sites to be predominately groundwater-driven, the soils technical memorandum also identified that surface water (i.e., shallow ponding) and a shallow perched water table are also localized factors in controlling the hydrology of the existing wetlands. Such factors are also expected to operate in the established wetlands on a localized basis.

Responses to August 5, 2010 e-mail from Melissa Scianni of USEPA regarding the Preservation Memorandum submitted on August 2, 2010

Caltrans provides the following additional technical information regarding the Watson West and Huff offsite mitigation parcels. Caltrans asserts that these parcels meet the standards pursuant to 33 CFR Part 332, Section 332.3(h) for inclusion of these parcels for preservation as part of the mitigation plan. Please see specific responses below.

1) The document states that preservation of the two parcels will contribute to the ecological sustainability of Baker's meadowfoam and North Coast semaphore grass populations in the Valley. However, the plant community section does not identify meadowfoam and semaphore grass on Watson or semaphore grass on Huff.

There is an observed population of Baker's meadowfoam on the Huff parcel (0.08 acre; see June 2010 MMP Appendix C, Sheet C-55); however, there is no observed population of North Coast semaphore grass on the Huff parcel. Surveys for Baker's meadowfoam and North Coast semaphore grass and have not been conducted on the Watson West parcel. Preservation of the Huff parcel would directly contribute to the sustainability of habitat for Baker's meadowfoam.

2) Are there downstream populations that will benefit from the preservation? Please clarify how preservation of Huff and Watson will benefit these plant species.

There are no known downstream populations of Baker's meadowfoam which would benefit from preservation of the species on the Huff parcel. However, preserving the Huff parcel will directly benefit the existing Baker's Meadowfoam population that has been observed on this parcel from future disturbance from development or trespass.

3) Please describe in more detail the condition of Outlet Creek on these parcels. For

example, is there riffle habitat, salmonid spawning areas, salmonid rearing habitat, etc. (for fish habitat information, please see #4 and #5)

Per the erosion site assessment conducted for the offsite mitigation parcels in May 2010 and the Outlet Creek Basin Assessment Report (LeDoux-Bloom and Downie 2008), relevant findings for instream habitat in Outlet Creek include:

- A majority of habitat units consist of long runs dominated by fine sediments (silts and sands); shallow pool depths were noted, probably resulting from the fine sediments; and riffles (although present near gravel bars) were not abundant.
- Fine sediment deposits contribute to small spawning substrate (and can lead to an increase in flooding through loss of channel capacity, which in turn exacerbates bank erosion).
- Embeddedness levels are unsuitable in many streams (which signals fine sediment deposition from bank and near-bank processes).
- Woody debris influence was generally low.
- The six dams in the Outlet Creek Basin have significantly decreased downstream gravel recruitment.

4) Do these reaches of Outlet Creek represent critical migration corridors for salmonids to reach upstream high quality spawning habitat?

Stream habitat quality for most streams in Little Lake Valley generally decreases as the channel geomorphology changes from a high gradient stream occurring on basin slopes to a low gradient stream occurring on the valley floor. This decrease in habitat quality is largely due to past and present land uses. Nonetheless, the lower stream reaches, including Outlet Creek, are important to varying degrees for coho and Chinook salmon and steelhead and support migration habitat for all species, seasonal rearing habitat for all species, year-round rearing habitat for steelhead, and spawning habitat for Chinook salmon. In addition, the lower reaches are designated critical habitat for coho and Chinook salmon and steelhead, and are designated as Essential Fish Habitat (EFH) for coho and Chinook salmon.

5) How does the condition of Outlet Creek on these parcels compare to other reaches of the Creek (e.g. is the Creek higher functioning here than in other areas)?

Based on consultation with the resource agencies, the streams and riparian corridors in Little Lake Valley have been categorized based on their relationship to designated critical habitat areas for listed anadromous fish. The category of the Outlet Creek stream and riparian corridor on the Huff and Watson West parcels is considered Category I Stream/Riparian Corridor. Category I Riparian Corridor represents those vegetated areas that occur along salmonid-bearing streams (i.e., Category I streams). These streams and riparian corridors are designated critical habitat for listed salmonids, including coho salmon. The health of these streams and riparian corridors has an immediate and direct effect on anadromous fish populations. Parts of Category I streams and riparian corridors fall under USACE jurisdiction as wetlands or other waters.

6) How do the riparian and wetland habitats on these parcels compare to the other wetland and riparian habitats in the valley?

The preservation technical memorandum (August 2 submittal, Section 4) describes site-specific plant community conditions on the Huff and Watson West parcels. Based on qualitative observations and information contained in the verified wetland delineations, wetland and riparian habitats on the Huff and Watson West parcels are relatively undisturbed and provide important linkages across the northern part of Little Lake Valley and along Outlet Creek. The wetland and riparian types present on Watson West are more mesic than those occurring further south in the valley based on overall valley hydrology. The riparian habitats on the Huff parcel are dense and in some places impenetrable. They also support a well-developed understory.

7) Are there any unique species/habitats present? Do the habitats on these parcels represent the highest functioning wetlands/riparian areas in the Valley?

The Huff parcel supports riparian scrub which is uncommon on the offsite mitigation parcels (August 15 submittal, Table 2). The Watson West parcel supports marsh which is also uncommon on the offsite mitigation parcels (August 15 submittal, Table 2).

8) What proportion of mature, high functioning riparian habitat around Outlet Creek occurs on these parcels (i.e. do these parcels represent a significant portion of the good riparian habitat in the Valley)?

Please refer to the watershed technical memorandum (August 10 submittal) and the preservation technical memorandum (August 2 submittal). Table 1 of the watershed technical memorandum lists the total existing wetlands occurring on the offsite mitigation parcels by habitat type. The total riparian woodland wetland occurring on the offsite mitigation parcels is 107.557 acres.

9) What proportion of mixed marsh in the Valley is present on Watson (i.e. is this a significant portion of the mixed marsh present in the Valley)?

Please refer to the watershed technical memorandum (August10 submittal) and the preservation technical memorandum (August 2 submittal). Table 1 of the watershed technical memorandum lists the total existing wetlands occurring on the offsite mitigation parcels by habitat type. The total marsh wetland habitat type is 141.051 acres. Watson West has 39.69 acres of marsh (Table 2 of the preservation technical memorandum), which is 28% of the marsh on the offsite mitigation parcels.

10) The document identifies several invasive plant species on both parcels (e.g. Himalayan blackberry, teasel). Please describe the extent of these invasive plant populations and how they affect aquatic resource functions on the parcels.

Please refer to the preservation vegetation sites technical memorandum (August 15 submittal). There is currently no data available showing the boundaries and density of invasive plant populations. However, point-intercept transect data was collected for plant communities and the information collected is summarized below.

On the Huff parcel, within the wet montane meadow community, two invasive plant species, medusahead and teasel were observed with 3% absolute cover in transect 4. In the Oregon ash grove community, one invasive plant, Himalayan blackberry, was observed with 1% absolute cover in a single transect. In the annual brome grassland alliance, yellow star thistle was observed with an absolute cover of 10% in a transect, and medusahead was also observed with 12% absolute cover in a transect.

On the Watson West parcel, the only invasive plant observed was Himalayan blackberry, which was 5% of the absolute cover in one Oregon ash grove community transect.

11) The document states that the parcels are important for maintaining habitat linkages. Please provide additional detail about how Huff and Watson connect with other high functioning habitat in the Valley, including whether or not Huff and Watson are critical components to maintaining connectivity of high functioning habitat.

Figure 4 in the watershed technical memorandum (August 10 submittal) shows the landscape connectivity of all offsite mitigation parcels. This includes the connection of Huff and Watson West with Outlet Creek and other stream corridors and the wetlands surrounding them. Outlet Creek is the main drainage of the valley and as such serves as a major wildlife corridor. Outlet Creek supports salmonids and provides a water source for wildlife throughout the year. The Watson East offsite mitigation parcel is connected to the Watson West parcel which creates an east-west wildlife migration corridor that includes Outlet Creek on its western border. The Huff offsite mitigation parcel also contains a portion of Outlet Creek downstream of the Watson West parcel, and riparian woodlands there are extensive and completely shade the Outlet Creek channel.

12) Outlet Creek and the Eel River are 303(d) listed for temperature and sediment. Yet the document does not address how the preservation of the Huff and Watson parcels will advance the sediment and temperature TMDLs. Please provide a discussion of how the habitats on these parcels are important for achieving the specific goals presented in the TMDLs. Please provide quantitative discussions for the above items to the extent possible.

Please refer to the memorandum titled "*TMDL Nexus, Willits Bypass Project*" David Melendrez, Caltrans, August 4, 2010 (attached).

The Willits Bypass Project is located in the Upper Main Eel River Hydrologic Area (111.60), Outlet Creek Hydrologic Sub-area (111.61). The Outlet Creek HAS is listed in the current, 2006, Clean water Act 303(d) List of Water Quality Limited Segments, as impaired for Sedimentation/Siltation and Temperature.

As stated in the Upper main Eel River TMDL: "*The primary purpose of the TMDL program for the California's Eel River is to assure that beneficial uses of water (such as salmonid habitat) are protected from adverse increases in natural sediment and temperature. <u>The water quality problems in the Upper Main Eel River and tributaries addressed in this report are related to the decline of west coast salmon and steelhead populations</u>.*"

The following activities are listed for contributing Temperature impairment:

- Channelization
- Habitat Modification
- Removal of Riparian Vegetation
- Streambank Modification/Destabilization
- Drainage/Filling of Wetlands and
- And Nonpoint Sources

The following activities are listed for contributing Sediment/Siltation impairment:

- Agriculture/Grazing
- Silviculture
- Harvesting, Restoration, Residue Management
- Logging Road Construction/Maintenance
- Silviculture Point Sources
- Construction/Land Development
- Highway/Road/Bridge Construction
- Removal of Riparian Vegetation
- Streambank Modification/Destabilization and
- Erosion and Siltation

Offsite Mitigation Lands

The bypass project's MMP was developed by evaluating Little Lake Valley through historical research and study of current conditions with an objective of developing a comprehensive and successful ecosystem restoration project with positive effects on listed plants, sensitive habitats, and fish. The objective of the compensatory mitigation proposed for the bypass project is to establish, enhance, repair, preserve, and protect a mosaic of high-functioning habitats in perpetuity and increase the ecological values of Little Lake Valley and the Upper Main Eel River watershed.

Under the bypass project's Clean Water Act Section 401 water quality certification, an extensive Monitoring and Reporting Program (MRP) issued by the RWB will apply to both the onsite impact areas and to the offsite mitigation parcels. Both sediment and temperature will be monitored on a continuous basis for a minimum of seven years, following implemented mitigation actions, and in years five and ten.

Temperature and sediment are grouped together because mitigation actions implemented to address these two parameters should have beneficial effects that apply to both. For example, riparian planting and stabilization of eroding headcuts will likely have a beneficial effect on temperature, as well as decreasing localized turbidity of the receiving waters.

Caltrans has prepared and submitted a Technical Memorandum to the Resource Agencies for consideration and proposed as part of the MMP: *Assessment of Erosion Sites On Offsite Mitigation Parcels in Little Lake Valley, May 2010*. The technical memorandum is written in a fashion that models previous studies and information developed by the RWB to address sediment delivery sites.

Implementation of specific plans will be further supported by baseline data collection efforts. Baseline shade /canopy data within the offsite mitigation parcels will be established according to California SWAMP protocols, and may go beyond SWAMP protocols due to the length of the various stream reaches. Mitigation constructiton plans for riparian planting, erosion restoration (headcut sites), wetland establishment, and fish passage are being finalized by Caltrans staff.

Implementing actions identified in the *Assessment of Erosion Sites On Offsite Mitigation Parcels in the Little Lake Valley* technical memorandum will have positive benefits to address both sediment and temperature. Additionally, preserving the Huff and Watson West mitigation parcels for their ecological values in perpetuity will ensure that future developments and activities contributing to temperature, sediment, and siltation impairment of the Outlet Creek basin (such as stream channelization, riparian vegetation removal, drainage/filling of wetlands, logging road construction, silviculture, and land development) are not conducted on these parcels. No grazing is proposed on these two preservation parcels, thereby further reducing contributions to temperature, sediment, siltation, and nutrient impairment to the Outlet Creek basin.

Preservation of the Watson West offsite mitigation parcel provides a connection to the Watson East offsite mitigation parcel creating an east-west wildlife migration corridor that includes Outlet Creek on its western border, and will preserve existing high-quality marsh habitat, including a portion of the historic “Little Lake” situated at the north end of the Little Lake Valley. The Huff offsite mitigation parcel will preserve a portion of Outlet Creek downstream of the Watson West parcel that supports riparian woodlands that are mature, extensive, and completely shade the Outlet Creek channel. Additionally, the Huff parcel is unique in its geographic position, in that it is the point at which Outlet Creek exits Little Lake Valley and enters a more canyon-like landscape. Maintaining the naturally high functions of the marsh system at the Watson West parcel and the mature dense riparian woodland on the Huff parcel in perpetuity is important in achieving the TMDL goals for this basin.

Responses to July 29, 2010 e-mail from Dave Wickens of USACE regarding location in MMP of requested information from the July 9, 2010 letter from USACE to Caltrans

In response to the USACE July 9 letter that requested information related to the bypass project’s mitigation plan, Caltrans provided the location for the requested information in the June 2010 MMP, where applicable. USACE responded in their July 29 e-mail that most of the requested information was not in the June 2010 MMP and provided additional detailed information requests. Caltrans respectfully disagrees that most of the requested information in the July 9 letter was not included in the June 2010 MMP. Caltrans also notes that USACE provided the comments in the July 29 e-mail in advance of the submittal of the series of technical memoranda on hydrology, soils, vegetation, preservation parcels, and miscellaneous information prepared by Caltrans that further refined available information and presented new information (e.g., plant communities present at the wetland establishment sites and preservation parcels). Please consult these memoranda for the requested information. Caltrans has additional responses to some of the comments in the July 29 e-mail and these are provided below.

1) How are we measuring groundwater re-charge, biomass, wildlife diversity, aquatic diversity. What is baseline for these functions (pages 2-3)?

The bypass project's mitigation plan identifies the functions that the Outlet Creek Basin provides – among them being groundwater re-charge, biomass, wildlife diversity, and aquatic diversity. Through the Clean Water Act Section 401 water quality certification Monitoring and Reporting Plan (MRP), aquatic diversity data under baseline, project, and post-project changes will be collected.

Groundwater re-charge will be measured through the use of groundwater monitoring wells, which will be placed in appropriate locations at each of the offsite mitigation parcels, including the establishment parcels and the Huff and Watson West preservation parcels. Some groundwater monitoring wells have been installed as part of hydrologic studies relating to North Coast semaphore grass (Goss, Huffman, and Lusher parcels). Additional wells are proposed to be installed and measurements will begin prior to the start of construction of the bypass and mitigation projects.

Biomass changes will be measured as a function of changes in vegetative cover. As per the MMP, the establishment of the target vegetative communities and meeting vegetation success criteria includes meeting the targeted increases in native plant and riparian cover at each mitigation site, as described in Chapters 9 and 10 of the MMP. Additionally, changes in plant cover will be noted by aerial photography. Aerial photographs will be taken the year that the mitigation areas meet their final success criteria and compared to pre-project photographs. Additional aerial photographs are proposed to be taken in years 5, 10 and 15, and then every ten years after mitigation areas meet their final success criteria in order to detect landscape level changes in vegetation patterns.

Aquatic diversity will be measured as part of baseline studies (currently in progress) and will be monitored throughout the bypass project and mitigation project implementation and reporting period, as described in the MMP and supporting documentation. Data will be collected using the following protocol, as directed by the RWB: *"Collecting Benthic Macroinvertebrate Samples and Associated Physical and Chemical Data for Ambient Bioassessments in California (updated 02/01/07)"*. This protocol includes a biological component (macro-invertebrate surveys) as well as physical components including measurements of wetted width, bank-full width, substrate measurements, cobble embeddedness, canopy cover, sinuosity and gradient, chemical composition, etc.

It should also be noted that the Upper Main Eel River TMDL states that: "*The primary purpose of the TMDL program for the California's Eel River is to assure that beneficial uses of water (such as salmonid habitat) are protected from adverse increases in natural sediment and temperature. <u>The water quality problems in the Upper Main Eel River and tributaries addressed in this report are related to the decline of west coast salmon and steelhead populations</u>.*" The extensive Monitoring Reporting Program (MRP) issued by the North Coast RWB will apply to both the onsite impact areas and to the offsite mitigation parcels; ultimately these measures intend to benefit west coast salmon and steelhead populations. Furthermore Caltrans' riparian mitigation strategy, developed in conjunction with the CDFG and National Marine Fisheries Service (NMFS), is also driven by the requirements of west coast salmon and steelhead populations.

2) MMP does not speak to what the watershed improvement will be (page 3)?

Part of the mitigation vision for the bypass project articulated in the June 2010 MMP is that, once mitigation construction is complete and after approximately 10 years of management and monitoring, the Valley as a whole will provide enhanced wetland functions and exhibit greater ecological value than existed prior to bypass project construction. The Valley will experience a long-term benefit to habitat because the offsite mitigation parcels will not be developed and will be managed for the benefit of biological resources in perpetuity. Existing wetlands and riparian and oak woodland will be increased (24.33 acres of wetland establishment are proposed), and physical barriers to wildlife passage and movement will be reduced or eliminated. The offsite mitigation parcels will be publicly owned in trust for the people of California and will be adaptively managed to benefit wildlife and water quality in the Valley. Functions to be improved by the mitigation plan are provided in the June 2010 MMP (Chapter 2, pages 2-16 through 2-23).

For example, the overall health of streams in Little Lake Valley will be guided by the Clean Water Act Section 401 water quality certification and Monitoring and Reporting Plan (MRP). The MRP requires that an extensive list of water quality constituents and bioassessment parameters be monitored to track watershed surface water quality improvement. As part of watershed surface water quality improvement efforts, it is expected that implementation of a grazing management plan will help to reduce sedimentation and organic nutrients in valley streams because access to stream/riparian corridors by cattle will be restricted except for a minimum number of controlled crossings (see mitigation construction plans and special provisions submitted on August 2).

3) Develop self sustaining ecosystems that allow for natural succession…. Is this (really) the goal of your mitigation (page 3)?

The mitigation plan's goal with respect to wetland establishment is to have both self-sustaining *target* ecosystems and *natural* ecosystems where succession is managed through adaptive grazing practices. At the proposed wetland establishment sites (i.e., Ford, Goss/MGC Plasma Middle/MGC Plasma North, Niesen, and Watson West), once the sites achieve success criteria they will be evaluated to determine when and what level of grazing intensity is appropriate as part of management actions to achieve a target ecosystem. At some wetland enhancement sites in the north (more mesic) section of the valley, grazing will be excluded from some wet meadow to support the natural succession of this habitat to riparian woodland wetland. For example, at the Brooke offsite mitigation parcels, grazing is proposed to be excluded on the eastern portion of the parcels to allow for the re-generation of Oregon ash and other riparian species that are starting to become established. Riparian planting is proposed to expedite this successional change. See the August 15 version of the Chapter 7 for more information.

Caltrans has worked diligently to respond to all agency questions. In addition, per the June 30 suggestion by Alexis Strauss of the USEPA, the services of former USEPA staff member Mike Monroe have been retained. Mr. Monroe is knowledgeable about the bypass project and mitigation plan due to his former involvement as a NEPA 404 team member. Given Mr. Monroe's past involvement, Caltrans further offers that resolution of any outstanding issues may be accelerated by using Mr. Monroe as moderator for future discussions.

We remain available to answer any further questions.

Please do not hesitate to contact me at (916) 274-0621, or by e-mail at Jeremy_Ketchum@dot.ca.gov, if you have any questions or concerns.

Thank you.

Sincerely,

Jeremy Ketchum, Chief
Environmental Management, S1

Cc: Ms. Melissa Scianni, EPA
Mr. Jeremiah Puget, NCRWQCB
Mr. Craig Martz, CDF&G
Ms. Janet Olave, MCRCD
Mr. David Drell, WEC

Attachments: TMDL Nexus, Willits Bypass Project
Potential Mitigation Properties, Hazardous Waste Clearance

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: 108-030-04
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 0 – 1
Soil Map Unit: GIELOW	Soil Series as Observed: GIELOW
General Comments:	
Dominant Plant Species: JUNCUS SP, MENPUL, DESCHAMPSIA SP, PHALARIS SP	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 21
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high N/A Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0 – 10	A	l	abk, 2	L	m, 2, P, Fe-x, M	MOD.	ROOT MAT AT BASE
10 – 16	C1	grsl	SG	VL	NONE	HIGH	
16 – 21	C2	s	SG	VL	"	HIGH	
21 +	2Ab	cl	m	L	m, 2, P, Fe-x, M	MOD	RELATIVELY MOIST

[1]**Texture and Coarse Fragment Content**

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]**Soil Structure**

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]**Redoximorphic Feature Morphology**

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: 108-030-04 2
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	
Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin	
	Slope Gradient (%): 1-2	
Soil Map Unit: GIELOW	Soil Series as Observed: ?	
General Comments:		
Dominant Plant Species: BROHOR, AVENA SP, LOLIUM SP, DESCHAMPSIA SP		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 24	
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-7	A	sl	sg	M	NONE	MOD	
7-13	C1	ls	sg	L	NONE	HIGH	
13-19	C2	sl/s	sg	L	NONE	HIGH	
19-24	2Ab/C3	sil	m	m	m, 2, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: 108-030-04 3
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	
Land Surface Shape: (slightly) planar concave convex SOMEWHAT DISTURBED, ESPECIALLY TO EAST	Landform: natural levee artificial levee swale floodplain* basin	
	Slope Gradient (%): 1 - 2	
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed:	
General Comments: ~~GLASS SHARD (SLIGHTLY WORN) AT 8"~~	* NEAR TOE OF NATURAL LEVEE (?)	
Dominant Plant Species: TAECAPMED, BROHOR, CENSOL, AVENA SP		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 28	
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: DIFFICULT TO ASSESS WITH REGARD TO REDOX BECAUSE OF GRAVELLY MATERIAL FROM 2 TO 26, WHICH DOES NOT PROMOTE REDOX	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
							1/4" ORGANIC MAT AT SURFACE*
0 - 2	A	l	M	LOW	C, 2, D, Fe-x, PL	MOD.	* FROM INUNDATION ?
2 - 11	AC	xgrsl	sg	LOW	NONE	HIGH	
11 - 26	C	vgrls	sg	LOW	NONE	HIGH	
26 - 28	2Ab/C	sil	M	MOD	C, 2, D, Fex-M	MOD	RELATIVELY MOIST

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
loos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name:	Pit No.: 108-030-04

4

Investigator(s): Joel Butterworth	Date: August 15, 2011
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number:
Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: natural levee artificial levee swale <u>floodplain</u> basin
	Slope Gradient (%): 1 – 2
Soil Map Unit: GIELOW	Soil Series as Observed: GIELOW

General Comments:

Dominant Plant Species: LOLIUM SP, HORMARGUS, DECNAMPSIA SP

Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): NONE TO 26

Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> <u>high</u> Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	m	MOD	m, 2, D, Fe-x, RC	MOD	
2-11	A2	l	m	LOW-MOD	m, 2, D, Fe-x, M	"	
11-22	AC	sl	m	LOW	NONE	"	
22-26	C	sl	sg	LOW	c, 2, D, Fe-x, M	"	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-010-06
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin (VERY SUBTLE)
	Slope Gradient (%): 2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments: STRATIFIED	
Dominant Plant Species: UNIDENTIFIABLE GRASSES, JUNCUS SP	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 27
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-7	A1	sl	m	MOD.	NONE	MOD	
7-15	A2	sl	m	MOD	C, 2, F, Fe-x, M	MOD	
15-19	C1	grsl	sg	LOW	NONE	HIGH	
19-27	C2	sil	m	LOW	M, 2, P, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-010-06 2
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	
Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin	
	Slope Gradient (%): 1-2	
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS	
General Comments:		
Dominant Plant Species: UNIDENTIFIABLE GRASSES, JUNCUS SP., MINOR PHALARIS		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 27	
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-9	A1	FSL	SG	HIGH	(NONE)	MOD	
9-20	A2	FSL	M	MOD	M, 2, D, Fe-x, M	MOD	
20-27	Bg	CL	M	LOW	M, 2, P, Fe-x + Mn-x, M	MOD	

[1]**Texture and Coarse Fragment Content**

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]**Soil Structure**

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]**Redoximorphic Feature Morphology**

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-010-06 3
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	
Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin	
	Slope Gradient (%): 1-2	
Soil Map Unit: HAPLAQUEPTS	Soil Series as Observed: HAPLAQUEPTS	
General Comments:		
Dominant Plant Species: UNIDENTIFIABLE GRASSES, MINOR JUNCUS		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 21	
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high N/A Comments:	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-7	A1	L	gr	HIGH	M, 1, P, Fe-x, RC	MOD	
7-15	A2	VFSL	M	MOD	M, 2, D, Fe-x, M	MOD	
15-21	Bg	SiCl	M	LOW	"	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: ~~108-010-06~~ 4
Investigator(s): Joel Butterworth	Date: August 16 , 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 2 (NEAR TOE)
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed:
General Comments:	
Dominant Plant Species: UNIDENTIFIABLE GRASSES (PASTURE)	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	VFSL	GR	MOD	NONE	MOD	
3-22	A2	VFSL	M	MOD	C, 2, D, Fe-X, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: ~~108-070-09~~ 1
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POAPRA (?), FESTUCA (?), MINOR JUNCUS	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 22
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	SG	HIGH	F, 1, D, Fe-x, RC	MOD	
2-16	A2	l	M	MOD	NONE	MOD	
16-22	Bg	sil	M	LOW	M, 2, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: 108-070-04 2
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POA PRA (?), FESTUCA (?), LEYTRI (?)	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 25
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	l	SG	HIGH	NONE	MOD	
1-12	A2	l	M	HIGH	M, 3, D, Fe-x, M	MOD	
12-25	C	FSL	M	LOW	ALONG STRATA: M, 2, D, Fe-x, M	MOD	STRATIFIED

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: 108-070-09 3
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex LOCAL, SMALL DEPRESSION	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 0-1
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POA PRA (?) FESTUCA (?), JUN PAT,	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	VFSL	GR	HIGH	M, 1, D, Fe-x, RC	MOD	
1-7	A2	VFSL	M	MOD	M, 2, D, Fe-x, M	MOD	
7-23	C	FSL	M	LOW	M, 3, P, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: 108-070-09 4
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin (TOE)
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POA PRA (?), FESTUCA (?) (PASTURE GRASSES)	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 23
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	SL	GR	HIGH	NONE	MOD	
1-9	A2	SL	SG	MOD	C, 2, D, Fe-x, M RC	MOD	1/2" GRAVEL LENS AT BASE
9-23	C	FSL	SG	LOW	M, 2, P, Fe-x, M	MOD	VERY FINELY STRATIFIED

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation — Parcel Name: WILDLANDS	Pit No.: 108-070-05 5
Investigator(s): Joel Butterworth	Date: August 16, 2011
Method of Excavation: backhoe **sharpshooter** hand auger	Photo Number:
Land Surface Shape: (slightly) planar **concave** convex	Landform: **natural levee** (SUBTLE) artificial levee swale **floodplain** basin
	Slope Gradient (%): 0-1
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: UNIDENTIFIABLE GRASSES, POA PRA(?), MINOR JUNPAT	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition **upland**	Depth to Soil Saturation (in.): NONE TO 27
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium **high** Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-7	A1	FSL	SG & M	MOD	NONE	MOD	
7-14	A2	FSL	M	LOW	C, 2, D, Fe-x, M	MOD	
14-27	C	FSL	M	LOW	M, 2, P, Fe-x, M	MOD	DISTINCT BOUNDARIES ON REDOX; MAY BE RELICTUAL.

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-021
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 2-3
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: GIFLOW
General Comments: APPARENT SURFACE INUNDATION	
Dominant Plant Species: BROHOR, DESCHAMPSIA SP, CHEINT	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 25
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A	l	m	L	c, 2, D, Fe-x, M	MOD.	
2-25	AC	vgrsl	sg	L	NONE	HIGH	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02-2
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 2-3
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: FESTUCA SP (?), CYNECH	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 28
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-5	A	sl	m	L/M	NONE	MOD	
5-26	AC	L & GRSL	sg	L	IN CERTAIN STRATIFICATIONS ONLY	MOD	
26-28	Ab/C	l	m	L/M	m,3,p,Fe-x,M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 3
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	
Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin	
	Slope Gradient (%): 2-3	
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed:	
General Comments:		
Dominant Plant Species: POAPRA, FESTUCA, MINOR RUMCRI		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 22	
Depth to Restrictive Layer (in.): NONE	Overall Soil and Site Suitability for Wetland Establishment: low medium high N/A Comments:	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-6	A1	l	m	M	NONE	MOD	
6-17	A2	l	m	L	c, 2, d, Fe-x, M	MOD	
17-22	Bg	vfsl	m	L	m, 3, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

- F - faint
- D - distinct
- P - prominent

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SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 4
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number:	
Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: natural levee artificial levee swale <u>floodplain</u> basin	
	Slope Gradient (%): 0 - 1	
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS	
General Comments: STRATIFIED		
Dominant Plant Species: FESTUCA SP (?), LOLIUM SP., MINOR RUMEX		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.):	
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high Comments:	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A	sl	m	L	f, 2, D, Fe-x, M	MOD	ROOT MAT AT BASE
4-19	A/C	vgrsl	sg	L	NONE	HIGH	
19-25	C	sl	m	L	m, 2, P, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ex. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FURD	Pit No.: ~~108-030-02~~ 5
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe **sharpshooter** hand auger	Photo Number:	

Land Surface Shape: (slightly) **planar** concave convex	Landform: natural levee artificial levee swale **floodplain** basin
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments: STRATIFIED	
Dominant Plant Species: LOLIUM SP, FESTUCA SP (?), BROHOR; MINOR RUMCRI, MENPUL, ↑ CHIINT	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition **upland**	Depth to Soil Saturation (in.): NONE TO 22
Depth to Restrictive Layer (in.): NONE	Overall Soil and Site Suitability for Wetland Establishment: low **medium high** Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-5	A1	sl	m	L	c, 3, D, Fe-x, M	MOD	
5-11	A2	vgrls	sg	VL	NONE	HIGH	
11-18	C1	s	sg	VL	"	HIGH	
18-22	C2/2Ab	sil	m	L	m, 3, P, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: ~~108-030-02~~ 6
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	
Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin	
	Slope Gradient (%): 1-2	
Soil Map Unit: GIELOW	Soil Series as Observed: FLUVAQUENTS	
General Comments:		
Dominant Plant Species: FESTUCA SP(?), POAPRA, PHALARIS SP.(?), MINOR RUMCRI		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.):	
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-8	A	vfsl	m	MOD	NONE	MOD	
8-19	ABg	l	sbk	LOW	c, 2, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 7
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments: NOT STRATIFIED	
Dominant Plant Species: FESTUCA SP. (?), BROHOR, DESCHAMPSIA (?), CYNECH, MINOR RUMCRI	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 25
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	sl	GR	HIGH	NONE	MOD	
3-11	A2	sl	M	MOD	c, 2, D, Fe-x, M PL	MOD	
11-23	AC	sl	m	LOW	f, 2, D, Fex - M	MOD	
23-25	C	fsl	m	LOW	m, 3, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: ~~108-030-02~~ P
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe <u>sharpshooter</u> hand auger	Photo Number:	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: natural levee artificial levee swale <u>floodplain</u> basin
	Slope Gradient (%): 1 – 2
Soil Map Unit: FLUVAQUENTS / GIELOW	Soil Series as Observed: FLUVAQUENTS

General Comments:

Dominant Plant Species: FESTUCA (?), POAPRA, MINOR CONVOLVULUS SP.

Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>

Depth to Soil Saturation (in.): NONE TO 25

Depth to Restrictive Layer (in.): (NONE)

Overall Soil and Site Suitability for Wetland Establishment: low medium <u>high</u>

Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0 - 2	A1	l	m	MOD	c, 2, D, Fe-x, M	MOD	
2 - 12	A2	sl	m	LOW	NONE	MOD	
12 - 25	Bg	l	m	LOW	m, 2, P, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 9
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 2
Soil Map Unit: GIELOW	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POA PRA, FESTUCA (?), MENPUL, CONVOLVULUS	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 24
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	l	gr	HIGH	c, 2, D, Fe-x, RC	MOD.	
3-10	A2	l	m	MOD	c, 2, D, Fe-x, M	MOD.	
10-20	AC	vfsl	m	LOW	"	"	
20-24	C	scl	m	LOW	"	"	RELATIVELY MOIST

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 10
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	
Land Surface Shape: (slightly) planar concave convex SPLAY?; TOE OF NATURAL LEVEE	Landform: natural levee artificial levee swale floodplain basin (GRADIENT) Slope Gradient (%): 2	
Soil Map Unit: GIELOW	Soil Series as Observed: GIELOW	
General Comments: GLASS SHARD (WORN) AT 10"; STRATIFIED THROUGHOUT PROFILE		
Dominant Plant Species: BROMUS, AVENA SP.		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 23	
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-20	A/C	LOAM TO VGRLS	M TO SG	L-M	ONLY IN LOAM, NON-GRAVELLY LAYERS	MOD - HIGH	STRATIFIED
20-23	C	SIL	M	L	C, 2, D, Fe-x, M	MOD	

[1]**Texture and Coarse Fragment Content**

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]**Soil Structure**

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]**Redoximorphic Feature Morphology**

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name:	Pit No.: 108-030-02
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

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Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 2
Soil Map Unit: GIELOW/ FLUVAQUENTS	Soil Series as Observed: GIELOW
General Comments: GLASS SHARD (SLIGHTLY WORN)	
Dominant Plant Species: BROHOR, HORMARGUS, LOLIUM SP., AND MINOR CHIINT AND JUNCKI	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 24
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
							1/4" THICK ORGANIC LAYER
0-2	A1	sl	m	M	C, 1, D, Fe-x, RC	MOD	
2-18	A2	sl	m	L	REDOX IN NON-GRAVELLY LAYERS	"	STRATIFIED
18-24	C	l	m	L		"	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 12
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 0 – 1
Soil Map Unit: GIELOW	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POA PRA, FESTUCA SP., JUNCUS SP.	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 25
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high N/A Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0 – 4	A1	vfsl	m	MED	f, 1, D, Fe-x, M	MOD	
4 – 17	A2	vfsl	m	LOW	NONE	MOD	
17 – 25	C	sl	m	LOW	c, 2, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

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Redox Size
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- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

Memorandum

Date:	January 4, 2012
To:	Shanna Zahner California Department of Transportation 703 B Street Marysville, CA 95901
Cc:	
From:	Harry Oakes
Subject:	**Willits Bypass Project – Soil Characteristics at Proposed Group 2 Wetland Establishment Sites**

Introduction and Background

The Willits Bypass Project (bypass project) has several compensatory mitigation components, including wetland establishment. As part of the Clean Water Act (CWA) Section 404 individual permit process for the bypass project, the U.S. Army Corps of Engineers (USACE) has requested information related to soils at the offsite mitigation parcels where Group 2 wetland establishment is proposed. Table 1 lists these parcels and the wetland establishment acreage planned at each parcel.

Table 1. Proposed Group 2 Wetland Establishment Sites on the Offsite Mitigation Parcels

Offsite Mitigation Parcel	APN	Planned Acreage of Wetland Establishment (less temporary wetland impact acreage)
Ford	108-020-04	6.48
Ford	108-030-02	1.86
Lusher	108-030-04	5.22
Wildlands	108-020-07	2.18
Benbow	108-020-06	1.34
Wildlands	108-060-01	4.80
Wildlands	108-070-09	4.27
Benbow	108-040-13	1.65

This memorandum presents soils information that was collected on August 15 and 16 and December 12 and 13, 2011 in response to concerns expressed by USACE in the form of response to comments (dated December 9, 2011) on the October 2011 MMP. Appendix A is composed of the soil data field forms for the August and December 2011 soil evaluations. Photographs of representative soil pits are presented in Appendix B.

Natural Resources Conservation Service Soil Survey Mapping

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil survey for parts of Mendocino and Trinity counties (Howard and Bowman 1991) provides the most recent mapping of soils at the offsite mitigation parcels where Group 2 wetland establishment is proposed. Table 2 summarizes the NRCS soil survey information for the three soil map units that occur at the offsite mitigation parcels.

Table 2. Summary of Soil Characteristics at the Offsite Mitigation Parcels as Mapped by USDA NRCS Soil Survey[a]

Soil Map Symbol	Soil Map Unit Name	Landform	Natural Drainage Class	Generalized Typical Profile (Surface, Subsurface, and Subsoil)	Parcel Occurrence (Wetland Establishment Area)
115	Cole clay loam, 0 to 2% slopes	Alluvial plains, basins	Somewhat poor	Clay loam over clay loam over clay	Benbow 108-040-13
127	Fluvaquents, 0 to 1% slopes	Floodplains	Poor and very poor	Very fine sandy loam over silt loam[b]	Ford 108-020-04 Lusher 108-030-04 Wildlands 108-060-01 Wildlands 108-070-09
128	Gielow sandy loam, 0 to 5% slopes	Alluvial plains, fans	Somewhat poor	Sandy loam and loam over sandy loam and fine sandy loam	Ford 108-020-04 Lusher 108-030-04 Wildlands 108-020-07 Benbow 108-020-06

Source: Howard and Bowman 1991.

Notes:

a. The characteristics described above for each soil map unit do not reflect map unit inclusions, whose drainage class and profile characteristics may be different than that of the primary soil component of the map unit.

b. Because of their variability, Fluvaquents have no typical profile. The profile described above occurs approximately 2,000 feet north of Ford parcel 108-020-04 along Outlet Creek.

Based on field observations within the offsite mitigation parcels where Group 2 wetland establishment is proposed, the Fluvaquents, 0 to 1 percent slopes map unit was observed to generally correspond to the low natural levees that straddle Outlet and Davis creeks. The soil survey shows the width of this map unit (and therefore roughly the width of the natural levee) ranging between nearly zero to 700 feet beyond the top of bank of the corresponding stream channel. The Gielow sandy loam, 0 to 8 percent slopes map unit appears to occupy nearly level alluvial plains and fans beyond the distal edge of the natural levee.

Topographic expression of the boundary between the Fluvaquents unit (natural levee areas) and adjoining areas of Gielow unit is very apparent within Wildlands parcels 108-070-09 and particularly 108-060-01, where a distinct slope break occurs. However, within the remaining offsite mitigation parcels where Group 2 wetland establishment is proposed, there is no clear topographic indication of the boundary between the two soil map units. Consequently, topographically, the Fluvaquents unit grades nearly imperceptivity into the Gielow unit.

For reference, a narrow artificial levee has been constructed along sections of Outlet and Davis creeks. Fill material placed to construct the artificial levee (where present) has increased the height of the natural levee by approximately one to three feet,

As mapped by the NRCS, the soils at the offsite mitigation parcels generally are weakly to weak-moderately developed, such that in many cases the surface, subsurface, and subsoil layer textures do not differ markedly within a given profile, at least as a result of soil-forming processes. Instead, the textural differences among the horizons for both the Fluvaquents and Gielow soils appear to be more a result of depositional variations, rather than clay weathering and significant clay illuviation. Because of the relatively recent deposition of their parent materials, neither of the mapped soils have profiles that contain a well-defined subsurface restrictive layer, such as a claypan or a duripan. The Gielow soil shows slightly more development than the Fluvaquents soil (because of its more stable landscape position), as evidenced by the BAt and Btg horizons.

The Cole soil is mapped only at Benbow parcel 108-040-13 and is the most developed of the three soil map units that occur within the parcels. There is no clear topographic indication of the boundary between the Cole soil and adjoining map unit (i.e., Feliz loam, 0 to 2 percent slopes) that exists along the unnamed tributary to Davis Creek to the east.

Following are descriptions of the horizons, textures, and permeability of the three soils.

Fluvaquents, 0 to 1 Percent Slopes

The representative profile described by the soil survey for the Fluvaquents unit occurs approximately 2,000 feet north of Ford parcel 108-020-04 along Outlet Creek. The profile is presented in Table 3. Despite the fact that the representative profile is located rather close to the Group 2 wetland establishment sites, the Fluvaquents profiles at the offsite mitigation parcels may differ markedly from it, which is a result of the variability in local depositional characteristics.

Because of the variability in the composition of Fluvaquents from place to place, the permeability ranges from moderately slow to moderately rapid (Howard and Bowman 1991).

Table 3. Soil Profile for Fluvaquents (0 to 1 Percent Slopes)

Horizon	Depth (inches	Texture
A1	0 – 2	Very fine sandy loam
A2	2 – 4	
Bg	4 – 25	Silt loam
C	25 – 30	Loamy sand
Ab	30 – 42	Silt loam
Cg1	42 – 56	Alternating sand and loamy sand
Cg2	56 – 63	Silt loam

Gielow Sandy Loam, 0 to 5 Percent Slopes

The representative profile described by the soil survey for the Gielow soil (which is located in Talmage) is presented in Table 4. The permeability of the Gielow soil is moderate (Howard and Bowman 1991).

Table 4. Soil Profile for Gielow Sandy Loam (0 to 5 Percent Slopes)

Horizon	Depth (inches	Texture
Ap1	0 – 4	Sandy loam
Ap2	4 – 8	Loam
A1	8 – 11	Loam
A2	11 – 18	Sandy loam
BAt	18 – 37	Fine sandy loam
Btg	37 – 48	Sandy loam
C	48 – 65	Sandy loam

Cole Clay Loam, 0 to 2 Percent Slopes

The representative profile described by the soil survey for the Cole soil (which is located in Potter Valley) is presented Table 5. The permeability of the Cole soil is slow (Howard and Bowman 1991).

Table 5. Soil Profile for Cole Clay Loam (0 to 2 Percent Slopes)

Horizon	Depth (inches	Texture
Ap	0 – 8	Clay loam
Bt1	8 – 15	Clay loam
Bt2	15 – 27	Clay
Bt3	27 – 41	Clay loam
C	41 – 60	Silty clay loam

Methods

The soil evaluations were conducted by an ICF soil scientist. A preliminary soil evaluation, using sharpshooter-excavated soil pits, was performed on August 15 and 16, 2011. A detailed soil evaluation, using backhoe pits, was performed on December 12 and 13, 2011.

Preliminary Soil Evaluation

The August 2011 soil pits were positioned in the proposed wetland establishment areas as well as in adjoining existing wetlands. The pits positioned in existing wetlands were intended to serve as a reference for assessing the suitability of the soils in the wetland establishment areas. Table 6 shows the number of profiles that were described within each parcel. Figure 1 shows the locations of the soil pits.

The pits were excavated to a depth of 19 to 28 inches and soil profile and site information was recorded on soil profile and site description forms. The profiles were described with respect to horizon; texture; coarse fragments (i.e., pebbles [>2 mm diameter] or larger-sized particles); structure; organic matter content (inferred from structure, color, and abundance of very fine roots); redoximorphic feature abundance, size, contrast, type, and location; and permeability (inferred from texture and coarse fragment content). Site characteristics that were described were landform, percent slope, slope shape, soil series as mapped and as observed (where apparent), dominant plant species, and depth to saturated soil. Based on these characteristics, particularly the depth to redoximorphic features, each evaluation site was rated (low, medium, or high, or intermediate levels between these primary ratings) with respect to its suitability for wetland establishment. (*Note: the existing wetlands in Little Lake Valley are supported by seasonal flooding and by shallow groundwater, rather than a shallow subsurface restrictive layer, such as a claypan. Accordingly, the factors considered in assessing the suitability of the establishment areas did not include the presence of a restrictive layer.*)

The soil profile information obtained during the preliminary evaluation was later used to supplement the profile information collected for the detailed evaluation by comparing the preliminary information to the designed finish grade at each soil pit site.

Table 6. Numbers of Soil Profiles Described in Existing Wetland Sites and Wetland Establishment Sites

	Number of Profiles	
Parcel	Backhoe-Excavated Pits	Sharpshooter-Excavated Pits
Ford 108-020-04		
Existing Wetland Sites	0	3
Wetland Establishment Sites	7	5
Ford 108-030-02		
Existing Wetland Sites	0	1
Wetland Establishment Sites	5	3
Lusher 108-030-04		
Existing Wetland Sites	0	1
Wetland Establishment Sites	4	3
Wildlands 108-020-07		
Existing Wetland Sites	0	0
Wetland Establishment Sites	4	0
Benbow 108-020-06		
Existing Wetland Sites	0	0
Wetland Establishment Sites	1	0
Wildlands 108-060-01		
Existing Wetland Sites	0	0
Wetland Establishment Sites	3	1
Wildlands 108-070-09		
Existing Wetland Sites	0	1
Wetland Establishment Sites	3	3
Benbow 108-040-13		
Existing Wetland Sites	0	0
Wetland Establishment Sites	1	0

Note: Not included in figures above are soil pit locations outside the area of grading: one backhoe pit excavated within Ford (108-020-04) and within Lusher (108-030-04), both in the natural levee/upland area along Outlet Creek.

Detailed Soil Evaluation

Nearly all the December 2011 soil pits were positioned in the proposed wetland establishment areas (Table 6); two were positioned on or adjacent to the artificial levee that separates the establishment areas from the nearby stream channel. The soils at these two pits were evaluated to assess the permeability of the soils adjacent to the stream channel and therefore whether significant subsurface hydrologic connectivity caused by rapidly permeable soils exists between the establishment area and the stream channel. (Significant subsurface hydrologic connectivity could cause a given establishment area to drain towards the adjoining stream channel when the water surface elevation in the channel is low, thereby causing the establishment area to not be supported by shallow saturated or inundated conditions for a duration sufficient to support wetlands.) Figure 1 shows the locations of the backhoe pits.

The pits were excavated to a depth of 29 to 51 inches, with all but two excavated to at least 41 inches. In all cases, the pits were excavated to at least 24 inches below the targeted finish grade of the established wetland at that location.

The profiles were described with respect to the same morphological characteristics as were recorded for the preliminary evaluation, but because the backhoe pits afforded a view of a larger section of the profile, it was possible to better assess the *in situ* characteristics of the soil and to assess the continuity of any relatively permeable, coarse-textured layers. The backhoe pits also better enabled an estimation of root diameter and abundance and the percent coarse fragment of each horizon[1]. The other site characteristics that were described were the same as that of the preliminary evaluation pits. Particular attention was directed to those characteristics that would indicate whether the soils in the establishment areas would lose excessive amounts of surface water to deep percolation or to excessive lateral movement of in-profile water (i.e., interflow) towards the adjoining creek (Outlet Creek and Davis Creek). The profile characteristics at each evaluation site, particularly the inferred permeability of a given horizon, were evaluated relative to the designed finish grade at that location (as shown on Figure 1) and rated with respect to its suitability for wetland establishment.

Results and Discussion

The soil profile and site description forms and photographs taken of representative backhoe pit profiles are provided at the end of this report.

In general, those profiles that were assigned a medium to high suitability rating were regarded as being overall suitable for wetland establishment. Those profiles that were assigned a low or low-medium suitability rating were regarded as being overall unsuitable for wetland establishment. Such profile sites and their surrounding areas were then excluded from the area proposed for wetland establishment. The associated grading plans have been revised accordingly.

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[1] Unless otherwise specified on the soil/site description forms, a given horizon had less than two percent coarse fragments.

Ford (APN 108-020-04)

Soils in this parcel were assigned suitability ratings ranging from low-medium to high. Some of the profiles were inferred to have moderate permeability at or just below finish grade (for example, profile Q as shown in Appendix B), and therefore suitable for wetland establishment. However, profiles N and O (see Appendix B) contained loamy sand or very gravelly sand layers that would exist at or just below the planned finish grade elevation. Such layers were determined to be excessively permeable, such that wetlands established in and near these locations could be subject to excessive lateral movement of in-profile water toward Outlet Creek.

Consequently, the grading plan that covers this parcel was revised to exclude areas in the vicinity of profiles N and O from the proposed mitigation.

Ford (APN 108-030-02)

Soils in this parcel were assigned suitability ratings ranging from low to high. Some of the profiles were inferred to have moderate permeability at or just below finish grade (for example, profile V) and therefore suitable for wetland establishment. However, profile Y (see Appendix B) contained loamy sand and pebbly layers that would exist at or just below the planned finish grade elevation. Such layers were determined to be excessively permeable, such that wetlands established in and near these locations could be subject to excessive lateral movement of in-profile water toward Outlet Creek.

Consequently, the grading plan that covers this parcel was revised to exclude areas in the vicinity of profile Y from the proposed mitigation.

Lusher (108-030-04)

Soils in this parcel were assigned suitability ratings ranging from low-medium to high. Some of the profiles were inferred to have moderate permeability at or just below finish grade (for example, profile Z) and therefore suitable for wetland establishment. However, profiles AA and BB (Figure 1) contained continuous gravelly sand, fine loamy sand, and very gravelly sand layers that would exist at or just below the planned finish grade elevation. Such layers were determined to be excessively permeable, such that wetlands established in and near these locations could be subject to excessive lateral movement of in-profile water toward Outlet Creek.

Consequently, the grading plan that covers this parcel was revised to exclude areas in the vicinity of profiles AA and BB from the proposed mitigation.

Wildlands (108-020-07)

All the soils in this parcel were assigned a suitability rating of high. All of the profiles were inferred to have moderate permeability at or just below finish grade (for example, profile I) and therefore suitable for wetland establishment.

Benbow (108-020-06)

The single detailed soil evaluation profile (K) described at this parcel was assigned a suitability rating of medium-high. The profile was inferred to generally have moderate permeability, but with a moderate to high permeability in part of the depth range of 11 to 19 inches because of the presence of fine loamy sand material. However, the soil will be a moderately permeable loam at and just below finish grade and therefore suitable for wetland establishment.

Wildlands (108-060-01)

Soils in this parcel were assigned suitability ratings of medium or high. With the exception of profile E (see Appendix B), the profiles were inferred to have moderate permeability at or just below finish grade and therefore suitable for wetland establishment. Profile E will have a gravelly loam layer at finish grade, but because that layer has only 20% gravel content, it is expected to be moderately permeable. The profile also contains a sand lens between 15 and 16 inches depth, but because it appears to not be continuous, it is not expected to cause significant losses of water from the profile. Because the soil will be a moderately permeable loam at and just below finish grade, it will therefore be suitable for wetland establishment.

Wildlands (108-070-09)

Soils in this parcel were assigned suitability ratings of medium-high or high. The profiles were inferred to have moderate permeability at or just below finish grade and therefore suitable for wetland establishment (Appendix B). Profile C will have a stratified silt loam and loamy sand layer 15 inches below finish grade and a continuous, one inch thick loamy sand layer 18 inches below finish grade. A clay loam Bg horizon below these stratified layers should prevent excessive deep percolation losses. Because the soil will be a moderately permeable loam at and just below finish grade, it will therefore be suitable for wetland establishment.

Benbow (108-040-13)

The single detailed soil evaluation profile (L) (see Appendix B) described at this parcel was assigned a suitability rating of high. The profile was inferred to have moderate permeability with loam or light clay loam textures throughout. The soil will be a light clay loam at and just below the planned finish grade and therefore will be suitable for wetland establishment.

Conclusion

Based on the soil/site data collected for this evaluation, the soils are suitable for wetland establishment at all the Group 2 wetland establishment sites except parts of Ford 108-020-04 , Ford, 108-030-02, and Lusher 108-030-04. These soils are unsuitable because of apparent rapidly permeable layers or horizons that could cause excessive deep percolation below the root zone or lateral movement of in-profile water toward the adjoining stream channels when the water surface elevation in the channels is lower than that of the soil water table.

Areas of unsuitable soils on these parcels have been excluded from the wetland mitigation program and the wetland grading and planting plans have been revised accordingly.

Citation

Howard, R.F. and R.H. Bowman. 1991. Soil survey of Mendocino County, eastern part, and Trinity County, southwestern part, California. USDA Soil Conservation Service in cooperation with the USDA Forest Service, USDI Bureau of Land Management and Bureau of Indian Affairs, and Regents of the University of California.

Appendix A Soil Data Collection Forms

SOIL PROFILE AND SITE
SUITABILITY DESCRIPTION
FORMS

FORD
108-020-04

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: M
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: **backhoe** sharpshooter hand auger	Photo Number: 5325 KNIFE AT TOP OF LOAMY SAND LAYER	
Land Surface Shape: (slightly) **planar** concave convex	Landform: **natural levee** artificial levee swale floodplain basin	
	Slope Gradient (%): 1-2%	
Soil Map Unit: 127	Soil Series as Observed: FLUVAQUENTS	
General Comments: THE FINISH GRADE IS 0.5' BELOW THE EXISTING GRADE, LOAMY SAND LAYER AT 29" to 33", CONTINUOUS, CHARCOAL AT 26", LOAMY SAND LAYER IS 2% SUBANGULAR GRAVEL		
Dominant Plant Species: FESTUCA, LOLIUM, PHALARIS		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition **upland**	Depth to Soil Saturation (in.): NONE TO 41"	
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium **high** n/a. Comments:	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-3"	A1	sil	2, gr	MOD	NONE	MOD	ROOTS COMMON FINE
3"-7"	A2	|	1, sbk	MOD	NONE	MOD	ROOTS COMMON FINE
7"-16"	B	|	1, sbk	LOW	NONE	MOD	ROOTS FEW FINE
16"-41"	Bg	|	0, M	LOW	m, 2, D, Fe-x, M	MOD	ROOTS FEW FINE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

F - faint
D - distinct
P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: N
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: #5326, KNIFE AT TOP OF B1	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1%
Soil Map Unit: 128	Soil Series as Observed: FLUVAQUENTS
General Comments: FINISH GRADE 0.4' BELOW EXISTING GRADE, CHARCOAL AT 14", PROFILE IS CRUDELY STRATIFIED BETWEEN 4" & 29"	
Dominant Plant Species: FESTUCA, LOLIUM, PHALARIS, GEDI, TRIFOLIUM	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 29"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a
☑ (Check if no restrictive layer)	Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-2"	A1	l	3 gr	HIGH	NONE	MOD	ROOTS MANY MEDIUM, MANY FINE
2"-4"	A2	l	2 sbk	HIGH	c, 1, D, Fe-x, PL	MOD	ROOTS COMMON MEDIUM, COMMON FINE
4"-7"	B1	l	0, M	LOW	c, 2, D, Fe-x, M	MOD	ROOTS FEW FINE
7"-14"	B2	ls	0, M	LOW	NONE	HIGH	ROOTS FEW FINE, GRAVEL CONTENT 5%
14"-17"	B3	sil	0, M	LOW	m, 2, D, Fe-x, M	MOD	ROOTS FEW FINE
17"-26"	Bg	sil	0, M	LOW	m, 2, D, Fe-x, M	MOD	ROOTS FEW VERY FINE
26"-29"	B	fls	0, M	LOW	NONE	MOD	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: O
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: **backhoe** sharpshooter hand auger	Photo Number: #5327, KNIFE @ BOTTOM OF C	

Land Surface Shape: (slightly) **planar** concave convex	Landform: natural levee artificial levee swale **floodplain** basin
	Slope Gradient (%): 1%
Soil Map Unit: 128	Soil Series as Observed: GIELO
General Comments: FINISH GRADE 0.8' BELOW EXISTING GRADE, GLASS SHARD CONTAINED IN THE C HORIZON, CHARCOAL @ 34", PROFILE CRUDELY STRATIFIED 9"-47", SANDY LAYERS CONTINUOUS	
Dominant Plant Species: GEDI, TRIFOLIUM, FESTUCA, LOLIUM, PHALARIS	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition **upland**	Depth to Soil Saturation (in.): NONE TO 47"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: **low** **medium** high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-9"	A	l	2, gr	MOD	NONE	MOD	ROOTS MANY FINE
9"-15"	C	vgrs	0, M	LOW	NONE	HIGH	ROOTS MANY VERY FINE, 60% GRAVEL, ROUNDED & SUBANGULAR
15"-17"	Cg1	sil	0, M	LOW	c, 1, D, Fe-x, PL	MOD	ROOTS NONE
17"-22"	Cg2	cos	0, M	LOW	m, 3, F, Fe-x, M	HIGH	ROOTS NONE
22"-26"	Cg3	sil	0, M	LOW	m, 3, D, Fe-x, M	MOD	ROOTS NONE
26"-30"	Cg4	cos	0, M	LOW	m, 3, F, Fe-x, M	HIGH	ROOTS NONE
30"-47"	Cg5	sl	0, M	LOW	m, 3, D, Fe-x, M	MOD HIGH	ROOTS - NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: P
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: #5329, KNIFE AT TOP OF C1	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin ADJACENT TO ARTIFICIAL LEVEE (LOW)
	Slope Gradient (%): 2%
Soil Map Unit: 127	Soil Series as Observed: FLUVAQUENTS

General Comments: FINISH GRADE 1.0' LOWER THAN EXISTING GRADE 35' FROM TOP OF BANK, SUBSURFACE TOPOGRAPHY OF Bw & C1 HORIZONS VARIES GREATLY

Dominant Plant Species: LOLIUM, FESTUCA, GEDI, TRIFOLIUM, PLANTAGO, ERODIUM

Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 51"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a
☑ (Check if no restrictive layer)	Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-7"	A	l	2, sbk	MOD	NONE	MOD	ROOTS COMMON FINE MEDIUM
7"-13"	Bw	sl	0, M	LOW	NONE	MOD	ROOTS FEW FINE
13"-32"	C1	vgrs	0, M	LOW	NONE	HIGH	ROOTS NONE, 65% GRAVEL ROUNDED & SUBANGULAR
32"-43"	C2	sl	0, M	LOW	NONE	HIGH	ROOTS NONE, CRUDELY STRATIFIED
43"-51"	Cg	sil	0, M	LOW	m, 2, D, Fe-x, M	MOD	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: Q
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: #5330, KNIFE @ TOP OF C	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin TRANSITIONAL
	Slope Gradient (%): 1 - 2 %
Soil Map Unit: 127/128 BOUNDARY	Soil Series as Observed: FLUVAQUENTS
General Comments: FINISH GRADE IS 1.0' BELOW EXISTING GRADE	
Dominant Plant Species: FESTUCA, LOLIUM, PHALARIS, TRIFOLIUM	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 48"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-3"	A1	sicl	3 gr	MOD	NONE	MOD	ROOTS FEW MEDIUM COMMON FINE
3"-8"	A2	sil	1 sbk	MOD	NONE	MOD	ROOTS COMMON FINE
8"-16"	Bw	l	0, M	LOW	m, 3, D, Fe-x, M	MOD	ROOTS FEW, VERY FINE
16"-29"	Bg	sil	0, M	LOW	c, 2, D, Fe-x, M	MOD	ROOTS FEW, VERY FINE
29"-37"	Cg	sil	0, M	LOW	c, 3, D, Fe-x, M	MOD	ROOTS FEW, VERY FINE
37"-48"	C	ls	0, M	LOW	NONE	HIGH	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: R
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: #5331, KNIFE @ TOP OF Bw2	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2%
Soil Map Unit: 127	Soil Series as Observed: FLUVAQUENTS
General Comments: FINISH GRADE IS 0.4' BELOW EXISTING GRADE,	
Dominant Plant Species: FESTUCA, LOLIUM, RANUNCULUS, TRIFOLIUM, JUN PAT	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 44"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a
☑ Check if no restrictive layer)	Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-4"	A	sicl-	1, sbk	MOD	NONE	MOD	ROOTS MANY VERY FINE
4"-15"	Bw1	l-	0, M	LOW	NONE	MOD	ROOTS FEW FINE
15"-18"	Bw2	sl	0, M	LOW	c, 2, D, Fe-x, M	MOD	ROOTS FEW FINE
18"-44"	Bg	sil	0, M	LOW	c, 1, P, Fe-x, PL	MOD	ROOTS FEW VERY FINE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 5
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: Ø	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: natural levee artificial levee swale <u>floodplain</u> basin
	Slope Gradient (%): 1%
Soil Map Unit: 127	Soil Series as Observed: GIELOW
General Comments: FINISH GRADE 0.4' BELOW EXISTING GRADE,	
Dominant Plant Species: FESTUCA, LOLIUM, GEDI, TRIFOLIUM	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): NONE TO 42"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-6"	A	l	1, sbk	MOD	NONE	MOD	ROOTS COMMON FINE AND MEDIUM, 5% GRAVEL
6"-15"	Bw	sil	0, M	LOW	NONE	MOD	ROOTS COMMON VERY FINE
15"-18"	C1	grfsl	0, M	LOW	NONE	HIGH	ROOTS FEW VERY FINE, 5% GRAVEL, ROUNDED
18"-22"	Bg	l	0, M	LOW	m, 3, D, Fe-x, M	MOD	ROOTS FEW VERY FINE
22"-31"	C2	ls	0, M	LOW	c, 3, F, Fe-x, M	HIGH	ROOTS NONE
31"-40"	Cg	sil	0, M	LOW	m, 3, D, Fe-x, M	MOD	ROOTS NONE
40"-42"	C3	grs	0, M	LOW	NONE	HIGH	ROOTS NONE, 25% GRAVEL, ROUNDED

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

- F - faint
- D - distinct
- P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: T
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: #5332, KNIFE @ BOTTOM OF BW	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1%
Soil Map Unit: 127	Soil Series as Observed:
General Comments: FINISH GRADE IS 0.5' BELOW EXISTING GRADE	
Dominant Plant Species: FESTUCA, LOLIUM, TRIFOLIUM	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): SAT @ 51"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a
☑ (Check if no restrictive layer)	Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-5"	A	sl	0, M	MOD	NONE	MOD	ROOTS COMMON FINE
5"-12"	Bw	gr sl	0, M	LOW	NONE	MOD HIGH	ROOTS FEW, VERY FINE, 20% GRAVEL ROUNDED
12"-24"	Bg1	sil	0, M	LOW	m, 3, D, Mn-x Fe-x, M	MOD	ROOTS FEW, VERY FINE
24"-28"	C	s	0, M	LOW	NONE	HIGH	ROOTS NONE
28"-37"	Bg2	l	0, M	LOW	m, 2, D, Fe-x, M	MOD	ROOTS NONE
37"-51"	C	s	0, M	LOW	NONE	HIGH	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

- F - faint
- D - distinct
- P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"5b"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: ~~108-030-02~~ 5
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments: STRATIFIED	
Dominant Plant Species: LOLIUM SP, FESTUCA SP (?), BROHOR; MINOR RUMCRI, MENPUL, 1 CHIINT	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 22
Depth to Restrictive Layer (in.): NONE	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-5	A1	sl	m	L	c, 3, D, Fe-x, M	MOD	
5-11	A2	vgr ls	sg	VL	NONE	HIGH	
11-18	C1	s	sg	VL	"	HIGH	
18-22	C2/2Ab	sil	m	L	m, 3, P, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"66"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: ~~108-030-02~~ 6
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe **sharpshooter** hand auger	Photo Number:	

Land Surface Shape: (slightly) **planar** concave convex	Landform: natural levee artificial levee swale **floodplain** basin
	Slope Gradient (%): 1-2
Soil Map Unit: GIELOW	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: FESTUCA SP(?) POAPRA, PHALARIS SP.(?) MINOR RUMCRI	
Jurisdictional Status at Pit: **existing wetland (reference)** wetland-upland transition upland	Depth to Soil Saturation (in.):
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-8	A	vfsl	m	MOD	NONE	MOD	
8-19	ABg	l	sbk	LOW	C, 2, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"76"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: ~~108-030-02~~ 7
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe **sharpshooter** hand auger	Photo Number:	

Land Surface Shape: (slightly) **planar** concave convex	Landform: natural levee artificial levee swale **floodplain** basin
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments: NOT STRATIFIED	
Dominant Plant Species: FESTUCA SP. (?), BROHOR, DESCHAMPSIA (?), CYNECH, MINOR RUMCRI	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition **upland**	Depth to Soil Saturation (in.): NONE TO 25
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium **high** Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	sl	GR	HIGH	NONE	MOD	
3-11	A2	sl	m	MOD	c, 2, D, Fe-x, M PL	MOD	
11-23	AC	sl	m	LOW	f, 2, D, Fex - M	MOD	
23-25	C	fsl	m	LOW	m, 3, D, Fe-x, M	MOD	

[1]**Texture and Coarse Fragment Content**

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]**Soil Structure**

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]**Redoximorphic Feature Morphology**

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"8b"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: ~~108-030-02~~ 8
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS / GIELOW	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: FESTUCA (?), POAPRA, MINOR CONVOLVULUS SP.	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 25
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	M	MOD	c, 2, D, Fe-x, M	MOD	
2-12	A2	sl	M	LOW	NONE	MOD	
12-25	Bg	l	M	LOW	M, 2, P, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"9b"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 9
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe **sharpshooter** hand auger	Photo Number:	

Land Surface Shape: (slightly) **planar** concave convex	Landform: natural levee artificial levee swale **floodplain** basin
	Slope Gradient (%): 2
Soil Map Unit: GIELOW	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POA PRA, FESTUCA (?), MENPUL, CONVOLVULUS SP.	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition **upland**	Depth to Soil Saturation (in.): NONE TO 24
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium **high** Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-3	A1	l	gr	HIGH	c, 2, D, Fe-x, RC	MOD.	
3-10	A2	l	m	MOD	c, 2, D, Fe-x, M	MOD.	
10-20	AC	vfsl	m	LOW	"	"	
20-24	C	scl	m	LOW	"	"	RELATIVELY MOIST

[1]**Texture and Coarse Fragment Content**

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]**Soil Structure**

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]**Redoximorphic Feature Morphology**

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"106"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 10
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe **sharpshooter** hand auger	Photo Number:	

Land Surface Shape: **(slightly)** planar concave **convex** SPLAY ?; TOE OF NATURAL LEVEE	Landform: **natural levee** artificial levee swale **floodplain** basin (GRADIENT)
	Slope Gradient (%): 2
Soil Map Unit: GIELOW	Soil Series as Observed: GIELOW
General Comments: GLASS SHARD (WORN) AT 10"; STRATIFIED THROUGHOUT PROFILE	
Dominant Plant Species: BROHOR, AVENA SP.,	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition **upland**	Depth to Soil Saturation (in.): NONE TO 23
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low **medium** high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-20	A/C	LOAM TO VGRLS	M TO SG	L-M	ONLY IN LOAM, NON-GRAVELLY LAYERS	MOD - HIGH	STRATIFIED
20-23	C	SIL	M	L	C, 2, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grein	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"116"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name:	Pit No.: ~~108-030-02~~ 11
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 2
Soil Map Unit: GIELOW/ FLUVAQUENTS	Soil Series as Observed: GIELOW
General Comments: GLASS SHARD (SLIGHTLY WORN)	
Dominant Plant Species: BROHOR, HORMARGUS, LOLIUM SP., AND MINOR CHLINT AND JUNCRI	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 24
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
							1/4" THICK ORGANIC LAYER
0-2	A1	sl	m	M	c, 1, D, Fe-x, RC	MOD	
2-18	A2	sl	m	L	REDOX IN NON-GRAVELLY LAYERS	"	STRATIFIED
18-24	C	l	m	L		"	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - engular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"126"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 12
Investigator(s): Joel Butterworth	Date: August 15 , 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 0 – 1
Soil Map Unit: GIELOW	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POA PRA, FESTUCA SP., JUNCUS SP.	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 25
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0 – 4	A1	vfsl	m	MED	f, 1, D, Fe-x, M	MOD	
4 – 17	A2	vfsl	m	LOW	NONE	MOD	
17 – 25	C	sl	m	LOW	c, 2, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

FORD

108-030-02

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: U
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1%
Soil Map Unit: 127	Soil Series as Observed: FLUVAQUENTS
General Comments: FINISH GRADE IS 0.25' LOWER THAN EXISTING GRADE	
Dominant Plant Species: FESTUCA, LOLIUM, TRIFOLIUM	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): SAT @ 50"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-2"	A1	l	1, gr	HIGH	NONE	MOD	ROOTS MANY FINE, 10% GRAVEL ROUNDED
2"-6"	A2	grl	1, sbk	LOW	NONE	MOD HIGH	ROOTS COMMON FINE 15% GRAVEL ROUNDED
6"-19"	BA	l	0, M	LOW	F, 2, D, Fe-x-M	MOD	ROOTS FEW FINE, 5% GRAVEL ROUNDED
19"-23"	Bg1	sil	0, M	LOW	m, 2, D, Fe-x, M	MOD	ROOTS NONE
23"-50"	Bg2	fsl	0, M	LOW	C, 3, F, Fe-x, M	MOD	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- O - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: V
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin TRANSITION
	Slope Gradient (%): 1%
Soil Map Unit: 127	Soil Series as Observed: FLUVAQUENTS
General Comments: FINISHED GRADE IS 0.3′ BELOW EXISTING GRADE	
Dominant Plant Species: FESTUCA, LOLIUM	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 42"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-4"	A′	l	1, sbk	MOD	NONE	MOD	ROOTS COMMON FINE
4"-12"	AB	l	0, M	LOW	NONE	MOD	ROOTS FEW FINE
12"-26"	Bw	sil	1, sbk	LOW	c, 2, F, Fe-x, M	MOD	ROOTS FEW FINE
26"-42"	Bg	sicl	0, M	LOW	m, 2, D, Fe-x, M	MOD	ROOTS FEW FINE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: W
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: #5334, KNIFE @ BOTTOM OF A2	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1%
Soil Map Unit: 127	Soil Series as Observed: FLUVAQUENTS
General Comments: FINISHED GRADE IS 0.25' BELOW EXISTING GRADE	
Dominant Plant Species: GEDI, TRIFOLIUM, FESTUCA, LOLIUM, PHALARIS	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): SAT @ 46"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-2"	A1	fsl	1,sbk	HIGH	NONE	MOD	ROOTS MANY VERY FINE
2"-4"	A2	fsl	1,sbk	MOD	NONE	MOD	ROOTS FEW VERY FINE
4"-9"	Bg1	sil	0,M	LOW	m,2,D,Fe-x,M	MOD	ROOTS FEW VERY FINE
9"-36"	Bg2	fsl	0,M	LOW	m,3,D,Fe-x,M	MOD	ROOTS FEW VERY FINE
36"-46"	C	ls	0,M	LOW	NONE	HIGH	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: X
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: #5335, KNIFE @ TOP OF C	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 2%
Soil Map Unit: 127	Soil Series as Observed: FLUVAQUENTS
General Comments: FINISH GRADE 0.75' LOWER THAN EXISTING	
Dominant Plant Species: TRIFOLIUM, ERODIUM, HYPOCRUS, PHALARIS, LOLIUM, FESTUCA	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 41"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"–2"	A1	l	1-sbk	MOD	NONE	MOD	ROOTS COMMON VERY FINE
2"–5"	A2	l	1-sbk	MOD	NONE	MOD	ROOTS COMMON VERY FINE, GRAVEL 5%
5"–13"	AB	l	0,M	LOW	NONE	MOD	ROOTS FEW FINE
13"–15"	C	S	0,M	LOW	NONE	HIGH	ROOTS NONE, DISCONTINUOUS, GRAVEL 5%
15"–41"	Bg	l	0,M	LOW	m, 2, D, Fe-x, M	MOD	ROOTS FEW VERY FINE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: Y
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: **backhoe** sharpshooter hand auger	Photo Number: #5338, KNIFE @ TOP OF PEBBLE LINE	

Land Surface Shape: (slightly) **planar** concave convex	Landform: **natural levee** artificial levee swale floodplain basin
	Slope Gradient (%): 1-2 %
Soil Map Unit: 127	Soil Series as Observed:
General Comments: FINISHED GRADE IS 0.2' LOWER THAN EXISTING GRADE	
Dominant Plant Species: BRASSICA, GEDI, FESTUCA, LOLIUM, ERODIUM, HYPOCRUS	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition **upland**	Depth to Soil Saturation (in.): NONE TO 35"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: **low** medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-3"	A	l	0, m	Low	None	Mod	ROOTS MANY VERY FINE
3"-6"	Bw	ls	0, m	Low	c, 3, F, Fe-x, M	HIGH	ROOTS FEW VERY FINE
6"-7"	—	PEBBLES	—	—	—	HIGH	ROOTS NONE, 90% PEBBLES, SMALL ROUNDED, DISCONTINUOUS
7"-35"	C	grls	0, m	Low	None	HIGH	ROOTS NONE, 15-65% GRAVEL, ROUNDED

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"16"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-021
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe **sharpshooter** hand auger	Photo Number:	

Land Surface Shape: (slightly) **planar** concave convex	Landform: natural levee artificial levee swale **floodplain** basin
	Slope Gradient (%): 2-3
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: GIELOW
General Comments: APPARENT SURFACE INUNDATION	
Dominant Plant Species: BROHOR, DESCHAMPSIA SP, CHEINT	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition **upland**	Depth to Soil Saturation (in.): NONE TO 25
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low **medium** high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A	l	m	L	c, 2, D, Fe-x, M	MOD.	
2-25	AC	vgrsl	sg	L	NONE	HIGH	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"26"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 2
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 2-3
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: FESTUCA SP (?), CYNECH	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 28
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-5	A	sl	m	L/M	NONE	MOD	
5-26	AC	L + GRSL	sg	L	IN CERTAIN STRATIFICATIONS ONLY	MOD	
26-28	Ab/C	l	m	L/A	m,3,P,Fe-x,M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coerse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"3b"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 3
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 2 - 3
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed:
General Comments:	
Dominant Plant Species: POAPRA, FESTUCA, MINOR RUMCRI	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 22
Depth to Restrictive Layer (in.): NONE	Overall Soil and Site Suitability for Wetland Establishment: low medium high N/A Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0 - 6	A1	l	m	M	NONE	MOD	
6 - 17	A2	l	m	L	C, 2, D, Fe-x, M	MOD	
17 - 22	Bg	vfsl	m	L	M, 3, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"4b"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: FORD	Pit No.: 108-030-02 4
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 0 - 1
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments: STRATIFIED	
Dominant Plant Species: FESTUCA SP (?), LOLIUM SP., MINOR RUMEX	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.):
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-4	A	sl	m	L	f, 2, D, Fe-x, M	MOD	ROOT MAT AT BASE
4-19	A/C	vgrsl	sg	L	NONE	HIGH	
19-25	C	sl	m	L	m, 2, P, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

F - faint
D - distinct
P - prominent

LUSHER

108 - 030 - 04

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: 2
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1%
Soil Map Unit: 128	Soil Series as Observed:
General Comments: FINISHED GRADE IS 0.7' LOWER THAN EXISTING GRADE	
Dominant Plant Species: LOLIUM, FESTUCA, PHALARIS, CAREX,	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 45"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a
☒ (Check if no restrictive layer)	Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-4"	A1	l	2, gr	HIGH	NONE	MOD	ROOTS MANY FINE
4-6"	A2	l	2, gr	MOD	m, 1, D, Fe-x, PL	MOD	ROOTS MANY FINE, OX RHIZ
6"-23"	BA	fsl	0, M	LOW	c, 2, D, Fe-x, M	MOD	ROOTS COMMON FINE
23"-45"	Bg	sil	0, M	LOW	m, 3, D, Fe-x, M	MOD	ROOTS FEW FINE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: AA
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex SLIGHTLY HUMMOCKY, DISTURBED LOOKING	Landform: natural levee artificial levee swale floodplain basin Slope Gradient (%): 1-2%
Soil Map Unit: 127	Soil Series as Observed: FLUVAQUENTS

General Comments: FINISH GRADE IS 1.4' BELOW EXISTING GRADE, ALL COARSE TEXTURED LAYERS ARE CONTINUOUS

Dominant Plant Species: TRIFOLIUM, FESTUCA, ERODIUM, HYPOCHAERIS, GEDI

Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland

Depth to Soil Saturation (in.): NONE TO 46"

Depth to Restrictive Layer (in.): N/A

☑ (Check if no restrictive layer)

Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a

Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-2"	A1	l	1-sbk	MOD	NONE	MOD	ROOTS COMMON FINE, CHARCOAL PRESENT
2"-9"	A2	sil	0, M	LOW	NONE	MOD	ROOTS FEW FINE
9"-18"	C1	grs	0, M	LOW	NONE	HIGH	ROOTS NONE, 35% GRAVEL
18"-20"	Bg1	fls	0, M	LOW	m, 2, D, Fe-x, M	HIGH	ROOTS NONE
20"-33"	Bg2	fls	0, M	LOW	m, 3, D, Fe-x, M	HIGH	ROOTS NONE
33"-37"	C2	xgrls	0, M	LOW	NONE	HIGH	ROOTS NONE, 70% GRAVEL
37"-46"	C3g	sil	0, M	LOW	m, 3, F, Fe-x, M	MOD	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: BB
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: #5340, KNIFE @ TOP OF C	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin TRANSITIONAL
	Slope Gradient (%): 1-2%
Soil Map Unit: 127	Soil Series as Observed: FLUVAQUENTS
General Comments: FINISHED GRADE IS 1.0' LOWER THAN EXISTING GRADE	
Dominant Plant Species: GEDI, LOLIUM, FESTUCA, PHALARIS, TRIFOLIUM	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 45"
Depth to Restrictive Layer (in.): N/A	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a
☒ (Check if no restrictive layer)	Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-4"	A	l	3 gr	MOD	NONE	MOD	ROOTS COMMON FINE
4"-11"	BA	fsl	0, M	LOW	NONE	MOD	ROOTS FEW FINE
11"-16"	B	ls	0, M	LOW	c, 2, F, Fe-x, M	HIGH	ROOTS FEW FINE
16"-21"	C	vgrs	0, M	LOW	NONE	HIGH	ROOTS NONE, 55% GRAVEL, ROUNDED, CONTINUOUS
21"-45"	Bg	sil	0, M	LOW	m, 3, D, Fe-x, M	MOD	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: CC
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: #5343, KNIFE @ TOP OF C3	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin LOW ARTIFICIAL LEVEE 30' +/- TO EAST, 85' +/- TO TOP OF BANK Slope Gradient (%): 1-2 %
Soil Map Unit: 127	Soil Series as Observed: FLUVAQUENTS
General Comments: FINISHED GRADE IS 0.2' LOWER THAN EXISTING GRADE	
Dominant Plant Species: GEDI, TRIFOLIUM, FESTUCA, LOLIUM, HYPOCRUS	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 47"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-2"	A1	l	2, gr	MOD	NONE	MOD	ROOTS COMMON FINE
2"-5"	A2	sil	1, sbk	LOW	c, 2, D, Fe-x-M	MOD	ROOTS FEW FINE
5"-11"	C1	fsl	0, M	LOW	NONE	HIGH	ROOTS FEW FINE
11"-14"	C2	l	0, M	LOW	NONE	MOD	ROOTS NONE
14"-30"	C3	cos	0, M	LOW	NONE	HIGH	ROOTS NONE, 10% GRAVEL ROUNDED, CONTINUOUS
30"-47"	Bg	sil, vfsl	0, M	LOW	m, 2, D, Fe-x, M & PL	MOD	ROOTS NONE,

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: DD
Investigator(s): Joel Butterworth, Paul Weller	Date: December 13, 2011	
Method of Excavation: <u>backhoe</u> sharpshooter hand auger	Photo Number: #5344, KNIFE @ TOP OF Bg	

Land Surface Shape: (slightly) <u>planar</u> concave convex	Landform: natural levee artificial levee swale <u>floodplain</u> basin
	Slope Gradient (%): 1-2%
Soil Map Unit: 127/128 BOUNDARY	Soil Series as Observed:
General Comments: FINISH GRADE IS 1.5' BELOW EXISTING GRADE	
Dominant Plant Species: FESTUCA, LOLIUM, TRIFOLIUM, GEDI, HYPOCRUS	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition <u>upland</u>	Depth to Soil Saturation (in.): NONE TO 50"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low <u>medium</u> <u>high</u> n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-3"	A1	l	3,gr	HIGH	NONE	MOD	ROOTS MANY, FINE
3"-7"	A2	l+	2,sbk	MOD	f, F, D, Fe-x, PL	MOD	ROOTS COMMON FINE
7"-15"	C1	ls	0,0	LOW	NONE	HIGH	ROOTS FEW, FINE
15"-18"	C2	grs	0,0	LOW	NONE	HIGH	ROOTS NONE, 15% GRAVEL ROUNDED, CONTINUOUS
18"-40"	Bg	l	0,0	LOW	m, 2, D, Fe-x, M	MOD	ROOTS NONE
40"-50"	Cg	sil+	0,0	LOW	c, 1, P, Fe-x, M	MOD	ROOTS NONE, GLEYED

[1] **Texture and Coarse Fragment Content**

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2] **Soil Structure**

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3] **Redoximorphic Feature Morphology**

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"1a"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: 108-030-04
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe **sharpshooter** hand auger	Photo Number:	
Land Surface Shape: (slightly) planar **concave** convex	Landform: natural levee artificial levee **swale floodplain** basin	
	Slope Gradient (%): 0 – 1	
Soil Map Unit: GIELOW	Soil Series as Observed: GIELOW	
General Comments:		
Dominant Plant Species: JUNCUS SP, MENPUL, DESCHAMPSIA SP, PHALARIS SP		
Jurisdictional Status at Pit: **existing wetland (reference)** wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 21	
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high N/A Comments:	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0–10	A	l	abk, 2	L	m, 2, P, Fe-x, M	MOD.	ROOT MAT AT BASE
10–16	C1	grsl	sg	VL	NONE	HIGH	
16–21	C2	s	sg	VL	"	HIGH	
21+	2Ab	cl	m	L	m, 2, P, Fe-x, M	MOD	RELATIVELY MOIST

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type

gr - granular
abk - angular blocky
pl - platy
pr - prismatic
sg - single grain
m - massive

Structure Grade

0 - structureless
1 - weak
2 - moderate
3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance

f - few
c - common
m - many

Redox Size

1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast

F - faint
D - distinct
P - prominent

Redox Type

Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location

M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"2a"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: 108-030-04 2
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: GIELOW	Soil Series as Observed: ?
General Comments:	
Dominant Plant Species: BROHOR, AVENA SP, LOLIUM SP, DESCHAMPSIA SP	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 24
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-7	A	sl	sg	M	NONE	MOD	
7-13	C1	ls	sg	L	NONE	HIGH	
13-19	C2	gr/s	sg	L	NONE	HIGH	
19-24	2Ab/C3	sil	m	M	m, 2, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granuler	0 - structureless
abk - angular blocky	1 - weak
pl - plety	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

- F - faint
- D - distinct
- P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"3a"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: 108-030-04 3
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex SOMEWHAT DISTURBED, ESPECIALLY TO EAST	Landform: natural levee artificial levee swale floodplain* basin
	Slope Gradient (%): 1 - 2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed:
General Comments: GLASS SHARD (SLIGHTLY WORN) AT 8"	* NEAR TOE OF NATURAL LEVEE (?)
Dominant Plant Species: TAECAPMED, BROHOR, CENSOL, AVENA SP	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 28
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: DIFFICULT TO ASSESS WITH REGARD TO REDOX BECAUSE OF GRAVELLY MATERIAL FROM 2 TO 26, WHICH DOES NOT PROMOTE REDOX

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
							1/4" ORGANIC MAT AT SURFACE*
0 - 2	A	l	M	LOW	C, 2, D, Fe-x, PL	MOD.	* FROM INUNDATION ?
2 - 11	AC	xgr sl	sg	LOW	NONE	HIGH	
11 - 26	C	vgr ls	sg	LOW	NONE	HIGH	
26 - 28	2Ab/C	sil	M	MOD	C, 2, D, Fe-x-M	MOD	RELATIVELY MOIST

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type
- gr - granular
- abk - angular blocky
- pl - platy
- pr - prismatic
- sg - single grain
- m - massive

Structure Grade
- 0 - structureless
- 1 - weak
- 2 - moderate
- 3 - strong

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"4a"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: LUSHER	Pit No.: 108-030-04 4
Investigator(s): Joel Butterworth	Date: August 15, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: GIELOW	Soil Series as Observed: GIELOW
General Comments:	
Dominant Plant Species: LOLIUM SP, HORMARGUS, DECHAMPSIA SP	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 26
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	m	MOD	m, 2, D, Fe-x, RC	MOD	
2-11	A2	l	m	LOW-MOD	m, 2, D, Fe-x, M	"	
11-22	AC	sl	m	LOW	NONE	"	
22-26	C	sl	sg	LOW	c, 2, D, Fe-x, M	"	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - vary cobbly
ls - loamy sand	cl - clay loam	xcb - extremaly cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with reletively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high cley content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
f - few
c - common
m - many

Redox Size
1 - fine (<2mm)
2 - medium 2–5mm)
3 - coarse (5–20mm)
4 - very coarse (20–76mm)
5 - extremely coarse (>76mm)

Redox Contrast
F - faint
D - distinct
P - prominent

Redox Type
Fe-x - iron concentration (soft mass)
Fe-nc - iron nodule or concretion
Mn-x - manganese concentration (soft mass)
Mn-nc - manganese nodule or concretion
D - depletion

Redox Location
M - soil matrix
P - ped face
PL - pore lining
RC - root channel (ox. rhizospheres)

WILDLANDS

108 - 020 - 07

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS/BENBOW	Pit No.: G
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: -0-	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1%
Soil Map Unit: 128	Soil Series as Observed: COLE
General Comments: FINISH GRADE 1' BELOW EXISTING GRADE	
Dominant Plant Species: LOLIUM, FESTUCA	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE to 49"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-4"	A1	l	1,sbk	MOD	NONE	MOD	ROOTS COMMON FINE
4"-11"	A2	sil	1,sbk	MOD	NONE	MOD	ROOTS FEW, VERY FINE
11"-20"	BA	sil	1,sbk	LOW	c, 1, D, Fe-x, PL	MOD	ROOTS FEW, VERY FINE
20"-46"	Bt	cl	2,sbk	LOW	m, 2, D, Fe-x, M	MOD	ROOTS FEW, VERY FINE
46"-49"	BtC	cl-	0,M	MOD	m, 2, F, Fe-x, M	MOD	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS/BENBOW	Pit No.: H
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: Ø	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1%
Soil Map Unit: 128	Soil Series as Observed: COLE
General Comments: FINISH GRADE 1.2' BELOW EXISTING GRADE	
Dominant Plant Species: LOLIUM, FESTUCA, CAREX	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 48"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-5"	A1	sil	2, gr	MOD	NONE	MOD	ROOTS MANY FINE, FEW MEDIUM
5-15"	A2	|	0, M	MOD	NONE	MOD	ROOTS FEW FINE, FEW MEDIUM
15"-30"	Bg	sil	0, M	LOW	m, 2, D, Mn-x Fe-x, M	MOD	ROOTS FEW VERY FINE
30"-48"	BgC	|	0, M	LOW	m, 3, D, Fe-x, M	MOD	ROOTS FEW VERY FINE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ex. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS / BENBOW	Pit No.: I
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: 5321 KNIFE @ TOP OF Btg	
Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin	
	Slope Gradient (%): 1%	
Soil Map Unit: 128	Soil Series as Observed: SIMULAR TO COLE	
General Comments: FINISH GRADE IS 1.4' BELOW EXISTING GRADE		
Dominant Plant Species: FESTUCA, LOLIUM		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 42"	
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-4"	A1	l	3, gr	MOD	NONE	MOD	ROOTS COMMON FINE
4"-14"	A2	l	1, sbk	LOW	NONE	MOD	ROOTS FEW FINE
14-21"	BA	vfsl	0, M	LOW	NONE	MOD	ROOTS FEW FINE
21-32"	Btg	sicl-	1, sbk	LOW	m, 2, D, Mn-x Fe-x, M	MOD	ROOTS FEW FINE
32-42"	Bg	cl	0, M	LOW	m, 3, D, Fe-x, M	MOD	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay texturel class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS/BENBOW	Pit No.: J
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: ~~0~~	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1%
Soil Map Unit: 128	Soil Series as Observed: UNDETERMINED
General Comments: FINISH GRADE 0.5' BELOW EXISTING GRADE	
Dominant Plant Species: FESTUCA, PHALARIS, LOLIUM	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 37"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-3"	A1	l+	2,gr	MOD	NONE	MOD	ROOTS COMMON FINE
3"-9"	A2	l	2,gr	MOD	NONE	MOD	ROOTS COMMON FINE
9"-26"	C	sil	0,M	LOW	NONE	MOD	ROOTS FEW FINE
26"-37"	Cg	l	0,M	LOW	c,3,F,Fe-x,M	MOD	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

BENBOW

108-020-06

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS/BENBOW	Pit No.: K
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: Ø	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1%
Soil Map Unit: 128	Soil Series as Observed:
General Comments: FINISH GRADE IS 0.5' LOWER THAN EXISTING GRADE	
Dominant Plant Species: FESTUCA, LOLIUM, CAREX, RUBUS (ON 3 SIDES OF PIT)	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 39"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-4"	A1	l	2 gr	MOD	NONE	MOD	ROOTS COMMON FINE, FEW MEDIUM
4"-11"	A2	l	0, M	MOD	c, 2, F, Fe-x, M	MOD	ROOTS COMMON FINE, FEW MEDIUM
11"-19"	BA	Fls&fsl	0, M	LOW	NONE	MOD-MH	ROOTS COMMON FINE
19"-39"	Bg	sicl	1 abk	LOW	m, 3, D, Fe-x, M	MOD	ROOTS FEW FINE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast

- F - faint
- D - distinct
- P - prominent

WILDLANDS

108-060-01

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation | Parcel Name: WILDLANDS | Pit No.: D

Investigator(s): Joel Butterworth, Paul Weller | Date: December 12, 2011

Method of Excavation: backhoe sharpshooter hand auger | Photo Number: 5318 KNIFE AT TOP OF C HORIZON

Land Surface Shape: (slightly) planar concave convex | Landform: natural levee artificial levee swale floodplain basin

Slope Gradient (%): 1%

Soil Map Unit: 127 | Soil Series as Observed:

General Comments: FINISH GRADE 0.3' BELOW EXISTING GRADE, UPPER 4" OF HORIZON C HAS LAMINATIONS

Dominant Plant Species: LOLIUM, FESTUCA, PHALARIS, JUN PAT, TRIFOLIUM

Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland | Depth to Soil Saturation (in.): NONE TO 63"

Depth to Restrictive Layer (in.): N/A | Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a

☑ (Check if no restrictive layer) | Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-9"	A	fsl	1, gr	HIGH	NONE	Mod	ROOTS MANY FINE
9-25"	Bg	sil	1, sbk	LOW	m, 2, D, Fe-x, M	Mod	ROOTS COMMON FINE
25"-63"	C	l	0, M	VERY LOW	m, 2, P, Fe-x, M	Mod	MODERATELY CONSOLIDATED FEW, VERY FINE ROOTS

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: E
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: #5319, KNIFE @ SAND LENSE	
Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin	
	Slope Gradient (%): 2%	
Soil Map Unit: 127	Soil Series as Observed:	
General Comments: FINISH GRADE 0.3' BELOW EXISTING GRADE, DISCONTINUOUS SANDLENSE AT 15-16"		
Dominant Plant Species: FESTUCA, LOLIUM, GEDI, JUN TEN		
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 55"	
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:	

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-4"	A1	l	3, gr	HIGH	NONE	MOD	ROOTS MANY FINE
4"-12"	A2	grl	3, gr	HIGH	c, 2, D, Fe-x, M	MOD TO HIGH	20% GRAVEL ROOTS COMMON FINE
12"-24"	Bg	sil	0, M	LOW	c, 3, P, Fe-X, M	MOD	ROOTS FEW VERY FINE
24"-55"	BgC	l	0, M	LOW	c, 3, P, Fe-x, M	MOD	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: F
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: 5320 KNIFE @ BOTTOM OF A HORIZON	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2%
Soil Map Unit: 127	Soil Series as Observed:
General Comments: FINISH GRADE 0.75' LOWER THAN EXISTING GRADE, CHARCOAL PRESENT @ 31"	
Dominant Plant Species: LOLIUM, FESTUCA, CAREX	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 57"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-14"	A	sl, ls	0, M	MOD	NONE	MOD TO HIGH	5% GRAVEL ROOTS MANY FINE & MEDIUM
14"-19"	B1	vfsl	0, M	LOW	NONE	MOD	ROOTS FEW MEDIUM
19-57"	B2	sil	0, M	LOW	m, 2, D, Fe-x, M	MOD	ROOTS FEW VERY FINE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"5c"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLAND	Pit No.: 108-070-09 5
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee (SUBTLE) artificial levee swale floodplain basin
	Slope Gradient (%): 0-1
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: UNIDENTIFIABLE GRASSES, POA PRA(?), MINOR JUNCAF	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 27
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-7	A1	FSL	SG & M	MOD	NONE	MOD	
7-14	A2	FSL	M	LOW	C, 2, D, Fe-x, M	MOD	
14-27	C	FSL	M	LOW	M, 2, P, Fe-x, M	MOD	DISTINCT BOUNDARIES ON REDOX; MAY BE RELICTUAL.

ok

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

WILDLANDS

108 - 070 - 09

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: A
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: 5314* KNIFE @ TOP OF Bg	

Land Surface Shape: (slightly) planar concave convex SLIGHTLY HUMMOCKY	Landform: natural levee artificial levee swale floodplain basin (TRANSITIONAL)
	Slope Gradient (%): 1–2%
Soil Map Unit: 127	Soil Series as Observed:
General Comments: FINISH GRADE = 1' BELOW EXISTING	
Dominant Plant Species: LOLIUM, FESTUCA, GEDI	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 63"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-6"	A1	l	2, gr	M	C, 1, D, Fe-x, M	M	ROOTS MANY FINE, MF
6"-23"	A2	sil	1, sbk	L	C, 2, D, Fe-x, M	M	ROOTS COMMON FINE
23"-43"	Bg1	l	0, M	L	M, 3, D, Fe-x, M	M	ROOTS FEW, VERY FINE
43"-63"	Bg2	l+	0, M	L	M, 3, D, Fe-x, M	M	NO ROOTS, DENSER THAN Bg1

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: B
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: Ø	

Land Surface Shape: (slightly) planar concave convex SLIGHTLY HUMMOCKY	Landform: natural levee artificial levee swale floodplain basin TRANSITIONAL
	Slope Gradient (%): 1 TO 2 %
Soil Map Unit: 127	Soil Series as Observed:
General Comments: FINISH GRADE 0.75' BELOW EXISTING	
Dominant Plant Species: FESTUCA, LOLIUM, POA PRAT(?), JUN PAT, JUN TEN	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): 70"
Depth to Restrictive Layer (in.): N/A ☑(Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments: ZONE FROM 40"-46" CONTAINS 15% ANGULAR GRAVEL

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-9"	A1	l	2, gr	MOD	NONE	MOD	MANY FINE ROOTS
9"-22"	A2	l	0, M	LOW	C, 2, D, Fe-x, M	MOD	ROOTS COMMON FINE
22"-37"	Bg1	vfsl	0, M	LOW	M, 2, D, Fe-x, M	MOD	ROOTS FEW FINE
37"-51"	Bg2	l+	0, M	LOW	M, 3, D, Fe-x, M	MOD	ROOTS NONE,
51"-70"	Ab	sicl	0, M	HIGH	C, 2, F, Fe-x, M	MOD	ROOTS NONE, BURIED SOIL

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: C
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: 5315 KNIFE @ TOP OF LOAMY SAND LENSE	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin TRANSITION
	Slope Gradient (%): 1-2%
Soil Map Unit: 127	Soil Series as Observed:
General Comments: FINISH GRADE 0.5' BELOW EXISTING STRATIFIED LOAMY SAND LAYER BETWEEN 22-23", CONTINUOUS	
Dominant Plant Species: LOLIUM, FESTUCA, POA, PHALARIS MINOR JUN PAT	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 47"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-6"	A1	l	1, gr	MOD	NONE	MOD	ROOTS MANY FINE
6"-18"	A2	l	0, M	MOD	c, 2, F, Fe-x, M	MOD	ROOTS COMMON FINE
18"-37"	B	sil & ls	0, M	LOW	m, 2, D, Fe-x, M	MOD-MOD-HIGH	STRATIFIED ROOTS FEW FINE
37"-47"	Bg	cl-	0, M	LOW	m, 2, D, Fe-x, M	MOD	ROOTS NONE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"1c"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: ~~108-070-09~~ 1
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POAPRA (?), FESTUCA (?), MINOR JUNCUS	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 22
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-2	A1	l	SG	HIGH	f, 1, D, Fe-x, RC	MOD	
2-16	A2	l	M	MOD	NONE	MOD	
16-22	Bg	sil	M	LOW	m, 2, D, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM:
WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"2c"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: ~~108-070-09~~ 2
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POAPRA (?), FESTUCA (?), LEYTRI (?)	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 25
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	l	SG	HIGH	NONE	MOD	
1-12	A2	l	M	HIGH	M, 2, D, Fe-x, M	MOD	
12-25	C	FSL	M	LOW	ALONG STRATA: M, 2, D, Fe-x, M	MOD	STRATIFIED

OK

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"3c"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: 108-070-09 3
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex LOCAL, SMALL DEPRESSION	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 0-1
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POAPRA (?), FESTUCA (?), JUNPAT,	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments: N/A

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	VFSL	GR	HIGH	M, 1, D, Fe-x, RC	MOD	
1-7	A2	VFSL	M	MOD	M, 2, D, Fe-x, M	MOD	
7-23	C	FSL	M	LOW	M, 3, P, Fe-x, M	MOD	

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay taxtural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coerse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT SUITABILITY ASSESSMENT

"4c"

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: WILDLANDS	Pit No.: 108-070-09 4
Investigator(s): Joel Butterworth	Date: August 16, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number:	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin (TOE)
	Slope Gradient (%): 1-2
Soil Map Unit: FLUVAQUENTS	Soil Series as Observed: FLUVAQUENTS
General Comments:	
Dominant Plant Species: POA PRA (?), FESTUCA (?) (PASTURE GRASSES)	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 23
Depth to Restrictive Layer (in.): (NONE)	Overall Soil and Site Suitability for Wetland Establishment: low medium high Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0-1	A1	SL	GR	HIGH	NONE	MOD	
1-9	A2	SL	SG	MOD	C, 2, D, Fe-x, M RC	MOD	1/2" GRAVEL LENS AT BASE OK
9-23	C	FSL	SG	LOW	M, 2, P, Fe-x, M	MOD	VERY FINELY STRATIFIED

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance
- f - few
- c - common
- m - many

Redox Size
- 1 - fine (<2mm)
- 2 - medium 2–5mm)
- 3 - coarse (5–20mm)
- 4 - very coarse (20–76mm)
- 5 - extremely coarse (>76mm)

Redox Contrast
- F - faint
- D - distinct
- P - prominent

Redox Type
- Fe-x - iron concentration (soft mass)
- Fe-nc - iron nodule or concretion
- Mn-x - manganese concentration (soft mass)
- Mn-nc - manganese nodule or concretion
- D - depletion

Redox Location
- M - soil matrix
- P - ped face
- PL - pore lining
- RC - root channel (ox. rhizospheres)

BENBOW

108 - 040 - 13

ICF INTERNATIONAL SOIL PROFILE AND SITE DESCRIPTION FORM: WETLAND ESTABLISHMENT/RESTORATION SUITABILITY ASSESSMENT

Client/Project: Caltrans/Willits Bypass Wetland Mitigation	Parcel Name: BENBOW 13	Pit No.: L
Investigator(s): Joel Butterworth, Paul Weller	Date: December 12, 2011	
Method of Excavation: backhoe sharpshooter hand auger	Photo Number: 5323, KNIFE ON EXISTING GRADE	

Land Surface Shape: (slightly) planar concave convex	Landform: natural levee artificial levee swale floodplain basin
	Slope Gradient (%): 0-3%
Soil Map Unit: 115	Soil Series as Observed: Cole
General Comments: FINISH GRADE IS 1.0' LOWER THAN EXISTING GRADE	
Dominant Plant Species: FESTUCA, LOLIUM, PLANTAGO	
Jurisdictional Status at Pit: existing wetland (reference) wetland-upland transition upland	Depth to Soil Saturation (in.): NONE TO 40"
Depth to Restrictive Layer (in.): N/A ☑ (Check if no restrictive layer)	Overall Soil and Site Suitability for Wetland Establishment: low medium high n/a Comments:

Depth (in.)	Horizon	Texture[1]	Structure[2]	Organic Matter - inferred	Redox Features[3]	Permeability - inferred	Comments
0"-4"	A1	l	3-gr	HIGH	NONE	MOD	ROOTS MANY COMMON
4"-9"	A2	cl-	2-sbk	HIGH	NONE	MOD	ROOTS MANY COMMON
9"-24"	Bt1	cl-	1-sbk	LOW	c, 2, F, Fe-x, M	MOD	ROOTS FEW FINE
24"-36"	Bt2	cl-	2-sbk	LOW	c, 2, D, Fe-x, M	MOD	ROOTS FEW VERY FINE
36"-40"	C	l	0, M	LOW	m, 3, F, Fe-x, M	MOD	ROOTS FEW VERY FINE

[1]Texture and Coarse Fragment Content

Texture		Coarse Fragments
cos - coarse sand	vfsl - very fine sandy loam	gr - gravelly
s - sand	l - loam	vgr - very gravelly
fs - fine sand	sil - silt loam	xgr - extremely gravelly
vfs - very fine sand	si - silt	cb - cobbly
lcos - loamy coarse sand	scl - sandy clay loam	vcb - very cobbly
ls - loamy sand	cl - clay loam	xcb - extremely cobbly
lfs - loamy fine sand	sicl - silty clay loam	st - stony
lvfs - loamy very fine sand	sc - sandy clay	vst - very stony
cosl - coarse sandy loam	sic - silty clay	xst - extremely stony
sl - sandy loam	c - clay	
fsl - fine sandy loam		

"-" = "light" (as in a clay textural class with relatively low clay content)
"+" = "heavy" (as in a clay textural class with relatively high clay content)

[2]Soil Structure

Structure Type	Structure Grade
gr - granular	0 - structureless
abk - angular blocky	1 - weak
pl - platy	2 - moderate
pr - prismatic	3 - strong
sg - single grain	
m - massive	

[3]Redoximorphic Feature Morphology

Redox Abundance	Redox Type
f - few	Fe-x - iron concentration (soft mass)
c - common	Fe-nc - iron nodule or concretion
m - many	Mn-x - manganese concentration (soft mass)
	Mn-nc - manganese nodule or concretion
	D - depletion

Redox Size	Redox Location
1 - fine (<2mm)	M - soil matrix
2 - medium 2–5mm)	P - ped face
3 - coarse (5–20mm)	PL - pore lining
4 - very coarse (20–76mm)	RC - root channel (ox. rhizospheres)
5 - extremely coarse (>76mm)	

Redox Contrast
F - faint
D - distinct
P - prominent

Appendix B Representatiave Photographs of Soil Pits

Photo at Profile C, Wildlands parcel 108-070-09. Overview of pit vicinity

Photo of Profile Q, Ford parcel 108-020-04. Profile is silty clay loam, silt loam, and loam to a depth of 37 inches. Knife is at the top of the loamy sand C horizon, which is well below the finish grade elevation. The soil was determined to be suitable for wetland establishment.

00635.09 Willits MMP (1-2012) JD

Photo of Profile O, Ford parcel 108-020-04. Profile contains very gravelly sand and coarse sand layers at or near the finish grade elevation. These layers were continuous through the pit and were assumed to extend to Outlet Creek. Knife is at the top of the very gravelly sand C horizon.

Photo of Profile Y, Ford parcel 108-030-02. Profile contains loamy sand layer and a discontinuous and undulating pebbly layer at or near the finish grade elevation, with a thick zone of gravelly loamy sand below seven inches depth. All but the pebbly layer was continuous through the pit and were assumed to extend to Outlet Creek. Knife is at the top of the pebbly layer.

Photo of Profile BB, Lusher parcel 108-030-04. Profile contains loamy sand layer at or near the finish grade elevation, with a five inch thick very gravelly sand layer beginning at 16 inches depth. This layer was continuous through the pit and were assumed to extend to Outlet Creek. Knife is at the top of the very gravelly loamy sand layer.

Photo of Profile I, Wildlands parcel 108-020-07. Profile is very fine sandy to silty clay loam throughout, with a thin very fine sandy loam layer to remain at the finish grade elevation. Knife is at the top of the silty clay loam Btg horizon.

00635.09 Willits MMP (1-2012) JD

Photo of Profile E, Wildlands parcel 108-060-01. Profile is silt loam to gravelly loam with a one inch thick, discontinuous sand lens beginning at 15 inches depth. A moderately permeable gravelly loam (20% gravel content) will remain at the finish grade elevation. Knife is at the top of the sand lens.

Photo of Profile A, Wildlands parcel 108-070-09. Profile is silt loam to heavy loam throughout. A moderately permeable silt loam will remain at the finish grade elevation. Knife is at the top of the loam Bg1 horizon.

Photo of Profile L, Benbow parcel 108-040-13. Profile is silt loam to light clay loam throughout. A moderately permeable light clay loam will remain at the finish grade elevation. Knife is at ground level.

Appendix C Soil Pit Location Map

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	MEN	101	R69.4/78.9		

LICENSED LANDSCAPE ARCHITECT

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

LICENSED LANDSCAPE ARCHITECT
(Name & License No.)
Signature
Renewal Date
Date
STATE OF CALIFORNIA

MATCH TO SHEET G-2

Soil Pits

1a August 2011 Soil Pits

BB December 2011 Soil Pits

SOIL PIT LOCATIONS GROUP 2 WETLANDS SHEET 1

SCALE 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans® LANDSCAPE ARCHITECTURE

CONSULTANT SENIOR LANDSCAPE ARCHITECT

CALCULATED-DESIGNED BY | CHECKED BY

REVISED BY | DATE REVISED

DATE PLOTTED => 09-JAN-2012
TIME PLOTTED => 12:30

LAST REVISION 00-00-00

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	MEN	101	R69.4/78.9		

LICENSED LANDSCAPE ARCHITECT

PLANS APPROVAL DATE

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LICENSED LANDSCAPE ARCHITECT
Name & License No.
Signature
Renewal Date
Date
STATE OF CALIFORNIA

Soil Pits

1a August 2011 Soil Pits

BB December 2011 Soil Pits

SOIL PIT LOCATIONS
GROUP 2 WETLANDS
SHEET 2

SCALE 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans® LANDSCAPE ARCHITECTURE

CONSULTANT SENIOR LANDSCAPE ARCHITECT

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES

0 1 2 3

USERNAME => 19016

DGN FILE => Soil-2.dgn

CU 00000

EA 000000

LAST REVISION 00-00-00

DATE PLOTTED => 09-JAN-2012

TIME PLOTTED => 11:19

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	MEN	101	R69.4/78.9		

LICENSED LANDSCAPE ARCHITECT

PLANS APPROVAL DATE

LICENSED LANDSCAPE ARCHITECT (Name & License No.) Signature Renewal Date Date STATE OF CALIFORNIA

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SOIL PIT LOCATIONS
GROUP 2 WETLANDS
SHEET 3

SCALE 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans® LANDSCAPE ARCHITECTURE

CONSULTANT SENIOR LANDSCAPE ARCHITECT

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

DATE PLOTTED => 09-JAN-2012
TIME PLOTTED => 11:45

LAST REVISION 00-00-00

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	MEN	101	R69.4/78.9		

LICENSED LANDSCAPE ARCHITECT

PLANS APPROVAL DATE

LICENSED LANDSCAPE ARCHITECT
(Name & License No.)
Signature
Renewal Date
Date
STATE OF CALIFORNIA

SOIL PIT LOCATIONS GROUP 2 WETLANDS SHEET 4

SCALE 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans® LANDSCAPE ARCHITECTURE

CONSULTANT SENIOR LANDSCAPE ARCHITECT

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DATE REVISED

DATE PLOTTED => 09-JAN-2012
TIME PLOTTED => 12:29

LAST REVISION 00-00-00

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	MEN	101	R69.4/78.9		

LICENSED LANDSCAPE ARCHITECT

PLANS APPROVAL DATE

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LICENSED LANDSCAPE ARCHITECT (Name & License No.) Signature Renewal Date Date STATE OF CALIFORNIA

Soil Pits

1a August 2011 Soil Pits

BB December 2011 Soil Pits

SOIL PIT LOCATIONS
GROUP 2 WETLANDS
SHEET 5

SCALE 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans® LANDSCAPE ARCHITECTURE

CONSULTANT SENIOR LANDSCAPE ARCHITECT

CALCULATED-DESIGNED BY

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DATE REVISED

LAST REVISION 00-00-00

DATE PLOTTED => 09-JAN-2012
TIME PLOTTED => 11:52

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => 19016
DGN FILE => Soil-5.dgn

CU 00000

EA 000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	MEN	101	R69.4/78.9		

LICENSED LANDSCAPE ARCHITECT

PLANS APPROVAL DATE

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LICENSED LANDSCAPE ARCHITECT
Signature
Renewal Date
Date
STATE OF CALIFORNIA

SOIL PITS LOCATIONS
GROUP 2 WETLANDS
SHEET 6

SCALE 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans® LANDSCAPE ARCHITECTURE

CONSULTANT SENIOR LANDSCAPE ARCHITECT

CALCULATED-DESIGNED BY

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REVISED BY

DATE REVISED

DATE PLOTTED => 09-JAN-2012
TIME PLOTTED => 12:32

LAST REVISION 00-00-00

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	MEN	101	R69.4/78.9		

LICENSED LANDSCAPE ARCHITECT

PLANS APPROVAL DATE

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LICENSED LANDSCAPE ARCHITECT
Name & License No.
Signature
Renewal Date
Date
STATE OF CALIFORNIA

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans® LANDSCAPE ARCHITECTURE

CONSULTANT SENIOR LANDSCAPE ARCHITECT
CALCULATED-DESIGNED BY
CHECKED BY
REVISED BY
DATE REVISED

SOIL PITS LOCATIONS GROUP 2 WETLANDS SHEET 7

SCALE 1"=50'

DATE PLOTTED => 09-JAN-2012
TIME PLOTTED => 12:34
LAST REVISION 00-00-00

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => 19016
DGN FILE => Soil-7.dgn

CU 00000

EA 000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	MEN	101	R69.4/78.9		

LICENSED LANDSCAPE ARCHITECT

PLANS APPROVAL DATE

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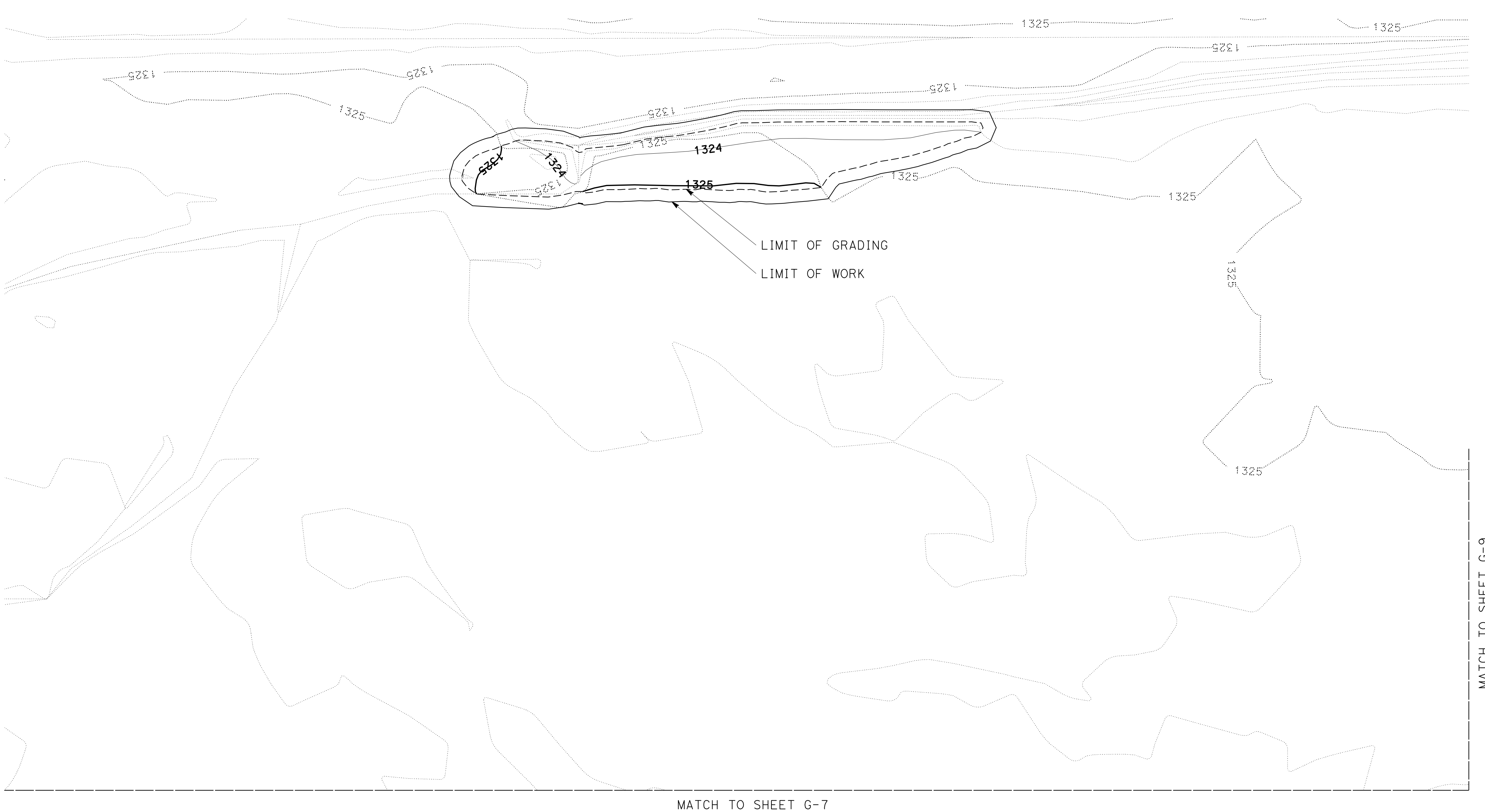

Soil Pits

1a August 2011 Soil Pits

BB December 2011 Soil Pits

SOIL PITS LOCATIONS GROUP 2 WETLANDS SHEET 8

SCALE 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans® LANDSCAPE ARCHITECTURE

CONSULTANT SENIOR LANDSCAPE ARCHITECT | CALCULATED-DESIGNED BY | CHECKED BY | REVISED BY | DATE REVISED

LAST REVISION 00-00-00 | DATE PLOTTED => 09-JAN-2012 | TIME PLOTTED => 12:35

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	MEN	101	R69.4/78.9		

LICENSED LANDSCAPE ARCHITECT

PLANS APPROVAL DATE

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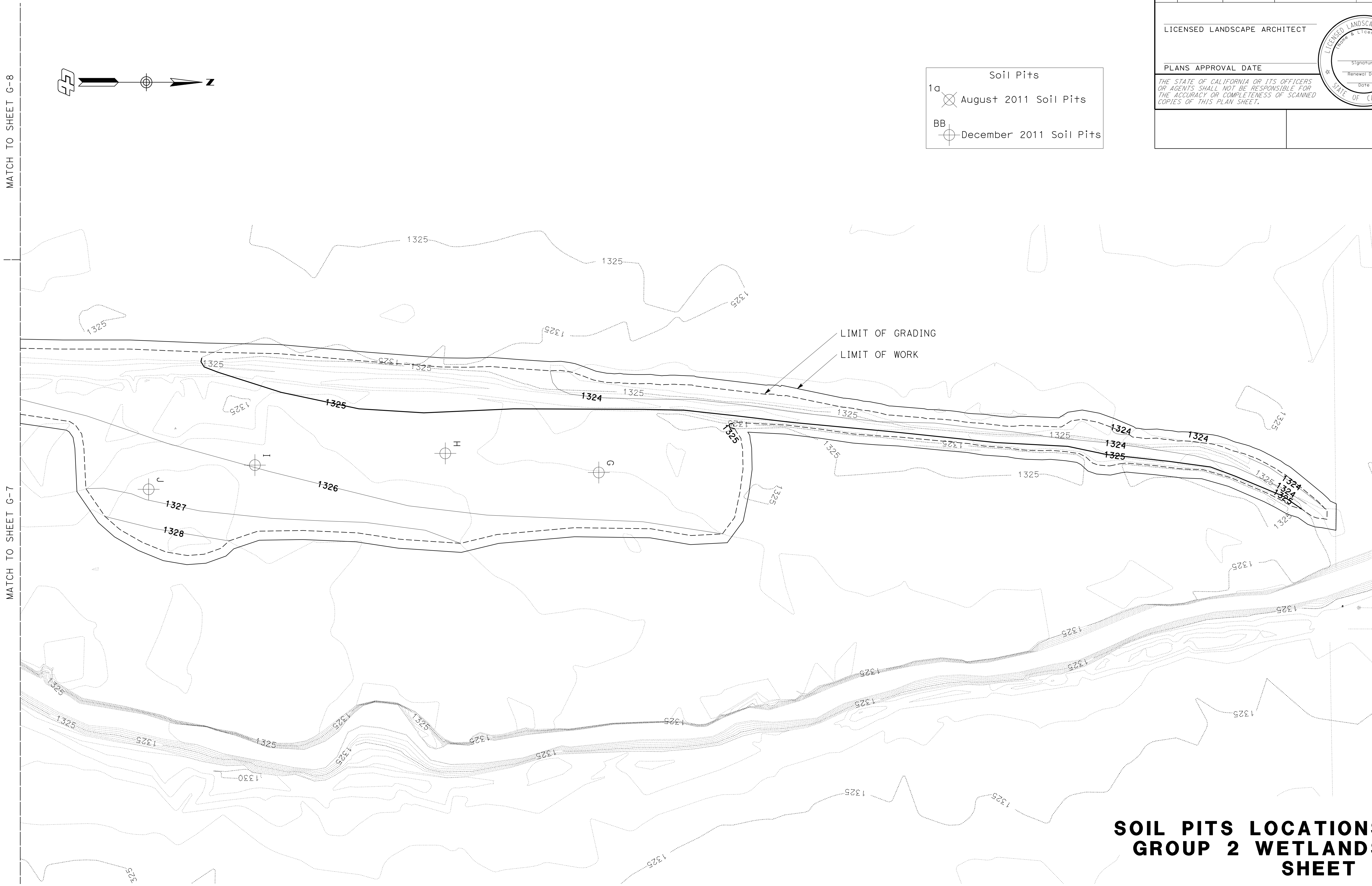

SOIL PITS LOCATIONS
GROUP 2 WETLANDS
SHEET 9

SCALE 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans® LANDSCAPE ARCHITECTURE

CONSULTANT SENIOR LANDSCAPE ARCHITECT
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DATE PLOTTED => 09-JAN-2012
TIME PLOTTED => 12:20
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BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => 19016
DGN FILE => Soil-9.dgn

CU 00000

EA 000000

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
01	MEN	101	R69.4/78.9		

LICENSED LANDSCAPE ARCHITECT

PLANS APPROVAL DATE

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Soil Pits

1a August 2011 Soil Pits

BB December 2011 Soil Pits

SOIL PITS LOCATIONS
GROUP 2 WETLANDS
SHEET 10

SCALE 1"=50'

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

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BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

USERNAME => 19016
DGN FILE => Soil-10.dgn

CU 00000

EA 000000

LAST REVISION 00-00-00

DATE PLOTTED => 09-JAN-2012
TIME PLOTTED => 12:23