



736 F Street Arcata, California 95521

City Council  
822-5953

City Manager  
822-5953

Public Works  
822-5957

Police  
822-2428

Community Development  
822-5955

Environmental Services  
822-8184

A&MRTS  
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Finance  
822-5951

Recreation Division  
822-7091

FAX  
822-8018

## **CITY OF ARCATA MCDANIEL SLOUGH WETLAND ENHANCEMENT PROJECT STATUS FINAL REPORT - JANUARY 2013 - DECEMBER 2013**

### **Attention – Bruce Joab**

CDFW OSPR

### **Julia Royster**

NOAA

### **Project Manager:**

Julie Neander -Resource Specialist  
City of Arcata – Environmental Services  
736 F Street  
Arcata, CA 95521  
(707) 825-2151

### **Background**

The goal of the McDaniel Slough Marsh Enhancement Proposed Project, as specified by the City of Arcata (City), the California Department of Fish and Game (CDFW), and California Coastal Conservancy is:

“To restore and enhance coastal and riparian wetland habitats on the northern portion of Humboldt Bay by integrating City and State held lands. The Proposed Project will create a self-sustaining tidal marsh through the restoration of natural geomorphic and biologic processes and create brackish and freshwater wetlands on the eastern portion of the site.”

The City and CDFW plan to restore tidal wetland functions to 212 of 280 acres of former tidal salt/brackish marsh and freshwater wetlands adjacent to Humboldt Bay in northern California. The remaining acreage will be enhanced and managed as freshwater and brackish wetlands, and grassland/riparian areas. The marsh enhancement project includes the following features:

- Wetland tidal habitat restoration on 212 acres of CDFW and City lands surrounding McDaniel Slough;
- Creation of 35 acres of brackish and freshwater wetlands at the Arcata Marsh & Wildlife Sanctuary; 10 acres of brackish wetlands and enhance 23 acres of seasonal wetlands on CDFW lands.
- Construction of trails and interpretative features;
- Increasing storm water storage capacity and improving drainage;
- Constructing eco-levees, flood levees, and wetland perimeter levees to protect surrounding land;
- Maintaining PG&E transmission tower access; and
- Providing access for anadromous fish to McDaniel Slough/Janes Creek.
- Floodplain aquatic habitat improvements
- Native plantings

### **Tidal Restoration Levee Construction & Channel Enhancement**

Three types of levees will be constructed around the project site perimeter to provide improved flood protection for surrounding properties, create a transition from low to high salt marsh to upland habitat, and contain constructed wetlands. The following levees were constructed:

- flood levees,

- ❑ eco-levees with benched upland slopes, and
- ❑ brackish wetland perimeter levees.

### **2008 Levee & Channel Enhancement Work Completed**

During summer/fall 2008 levee construction continued on City of Arcata lands and was initiated on California Department of Fish and Game lands. 462' of levee was constructed on City of Arcata lands and 1894' of levee was completed on DFW lands. Portions of the existing levee along McDaniel Slough/Janes Creek channel on the City side were removed in September/October 2008 to improve marsh-plain drainage and habitat transition. The portions of the levee remaining will serve as roosting islands (approximately 1.6 acres) and break up wave fetch within the project area to promote deposition of suspended sediment.

Aquatic habitat improvements during 2008 included construction of a new tidal channel to connect remnant channels with McDaniel Slough (0.7 acres). Soil generated from levee removal and channel construction was graded onto 5 acres (out of a proposed total of 23 acres) of low elevation subsided areas within the Project area to build up the marsh plain and accelerate the development of the desirable pickleweed habitat. Soil was also used to fill an existing drainage channel located just east of McDaniel Slough. A portion of this drainage channel was left to provide low-tide refugia for aquatic species.

### **2009 Levee & Channel Enhancement Completed**

Completed 1695' of eco levee on CDFW lands.

Completed Coastal Development Permit (CDP) Amendment to allow for 12 additional acres of salt marsh and additional seasonal wetland enhancement on DFW lands.

Additional marsh plain enhancement occurred on 5.6 acres City of Arcata lands to help break up the wind fetch potential within the project area.

The plug for the tidal channel constructed on City of Arcata lands last year was removed allowing unrestricted flow between the new channel and McDaniel Slough.

### **2010 Levee & Channel Enhancement Work Completed**

Construction of western levee DFW section - 3528' of levee to four foot elevation- City engineer estimates this section of levee is 75% completed.

Isolated borrow ditch area, de-watered, installed culvert/tide gate & connected to bayfront levee - completed to elevation 7'.

Initiated pre project in-stream monitoring for fish utilization in McDaniel Slough/Janes Creek. Monitoring will continue through the duration of the NOAA grant (2014).

### **2011 Levee & Channel Enhancement Work Completed**

Construction of western levee DFW section - 1000' of levee completed; 2528' of levee to seven foot elevation- City engineer estimates this section of levee is 85% completed. Fill in excess of the original design has been required.

Connection to bayfront levee - completed

Completed one year of pre project in-stream monitoring for fish utilization in McDaniel Slough/Janes Creek. Monitoring will continue through the duration of the NOAA grant (2014).

Completed first year of avian use monitoring on City of Arcata for freshwater ponds, future brackish wetland and existing conditions of future tidal area.

### **2012 Levee & Channel Enhancement Work**

Complete final section of levee (1395') on City of Arcata lands

Complete western levee DFW section - 3528' of levee to 9' elevation

Complete 23 acre DFW wetland enhancement earth work.

Complete 10 acre DFW brackish wetland earth work  
Complete DFW marsh plain goby enhancements  
Complete final section DFW levee

### **2013 Levee & Channel Enhancement Work**

Completed connections to Caltrans Right of Way  
Opened tide gates on McDaniel Slough to allow muted tidal action  
Planted salt marsh vegetation in brackish wetland on CDFW  
Bayfront levee breached September 26, 2013 to restore tidal action to 212 acres of former tidelands.

## **Freshwater Wetlands**

Two freshwater wetlands, totaling 5.5 acres, were excavated to 6- to 10-foot depths to expose groundwater and provide year round wetland habitat.

### **2008 Freshwater Wetland Work Completed**

The eastern 2.3 acre freshwater wetland construction was completed in 2007. Approximately 60% of the second larger freshwater wetland was completed in 2008. The upland and wetland areas around the 2.3 acre freshwater wetland and the islands in the brackish wetland were planted with native willow cuttings, red alder and native shrubs early in 2008 (January – March) by community volunteers and Redwood Community Action Agency. Revegetated freshwater wetland edges with locally collected *Scirpus acutus*, *Scirpus microcarpus*, and other suitable native wetland plants.

**2009 Freshwater Wetland Work Completed** -Completed excavation of 6 acre wetland and revegetated upland area adjacent to wetland using locally collected seed of *Juncus patens*, *Lupinus pollyphyllus*, *Achillea millefolium*, *Deschampsia caespitosa*. Both wetlands are being used by the local Canadian goose population as well as other water fowl.

**2010 Freshwater Wetland Work Completed** -Initiated CDFW 23 acre palustrine wetland enhancement by excavation of the area to 18" below existing ground surface elevation. Estimated 60% complete.

**2011 Freshwater Wetland Work** - Continued CDFW 23 acre palustrine wetland enhancement by excavation of the area to 18" below existing ground surface elevation. 136% of originally estimated fill has been removed from the combined fresh and brackish wetland for fill for levee construction. Estimated 95% complete.

**2012 Freshwater Wetland Work-** Completed CDFW 23 acre palustrine wetland enhancement.

## **Brackish Wetlands**

The brackish wetland will eventually utilize a mix of treated wastewater and bay water. The brackish marsh and the approximately 2 acres of upland islands were completed in 2007. The brackish wetland levees, wetland bottom contouring, island construction and revegetation and erosion control were completed in 2007.

**2008 Brackish Wetland Work Completed** -The MTR tidegate was installed in this wetland in 2008 in preparation for tidal input. This tide gate allows the City to adjust the level of tidal input for adaptive management of the brackish wetland. This wetland is currently being operated as a seasonal fresh water wetland.

**2009 Brackish Wetland Work Completed** -The interior of the wetland was seeded with locally collected *Deschampsia caespitosa*, *Scirpus maritimus*, and *Carex Lyngbyei*.

**2010 Brackish Wetland Work Completed** -Began excavation of future 10 acre tidal brackish habitat on CDFW lands to 24 " below surface elevation - estimated 80%completed.

**2011 Brackish Wetland Work Completed** – Continued excavation of future 10 acre tidal brackish habitat on CDFW lands to 24 " below surface elevation - estimated 90% completed. More fill than anticipated is required for levee construction.

**2012 Brackish Wetland Work** -Completed construction of 10 acre brackish habitat on CDFW lands. Initiated design for input of treated wastewater in preparation for installing infrastructure for moving treated wastewater to the wetland in 2014-15.

## **Trails and Interpretive Facilities**

The Project includes trails, wildlife viewing structures, benches, and information kiosks.

**2008 Trail & Interpretive Work Completed** - A 925' trail was constructed along the eastern portion on the bay front levee trail that provides access from the Arcata Marsh to what will eventually be the McDaniel Slough main levee breach. In the future a wildlife viewing structure and information signs describing the Project will be located at the mouth of McDaniel Slough. A second 2267' trail was constructed along the eco-levee that separates the wetlands and the McDaniel Slough tidal marsh and along the top of the brackish marsh levees in 2007. Wildlife viewing structures, benches, and interpretative signs will also be installed along the eco-levee trail. The levee trails enhance views to and along Humboldt Bay.

**2009 Trail & Interpretive Work Completed** - Wildlife viewing structure was built and is being stored at the City Corporation Yard for installation in 2011. Project interpretive materials are currently displayed at the Arcata Marsh Interpretive Center

**2011 Trail & Interpretive Work Completed** - Wildlife viewing structure installed along the levee/trail with views to both freshwater wetlands, brackish habitat and future tidal area.

### **2013 Planned Trail & Interpretive Work** –

Provide trail access from South I Street to the McDaniel Slough breach. Installed interpretive kiosks, and bench on the levee trail to the breach.

## **Stormwater Storage Capacity and Drainage**

Drainage of properties adjacent to the restoration project will be controlled by the installation of drain pipes equipped with tidal flap gates. The drainpipes and tidegates allow adjacent properties to drain to the Project site at lower tides and prevent tidal flooding of the adjacent properties during extreme high tides. A larger tidegate at the southwest corner of the project site, which serves to drain the area to the west, will remain. The culvert located at the southeast corner of the project site will be removed. In 2007 a 48" culvert and tide gate was installed in the City ecolevee.

### **2008 Drainage Work Completed**

Approximately 1900' of the drainage swale on DFW lands adjacent to V Street was constructed in 2008.

### **2009 Drainage Work Completed**

Installed one 48" culvert with tide gate during construction of California Department of Fish and Game ecolevee to provide continued drainage for the agricultural lands north of the McDaniel Slough Area. Completed remaining 922' of the drainage swale on DFW lands adjacent to V Street.

### **2010 Drainage Work Completed**

Completed drainage swale connecting South I wetland and drainage area to freshwater wetlands on City owned land

Completed remaining drainage swale on CDFW lands directing water to 23 acre enhanced wetland area.

Installed 36” culvert/tide gate connecting the new levee to the bay front levee to provide continued drainage for the agricultural lands west of the McDaniel Slough Area.

**2012 Drainage Work**

Installed tide gates on City side to provide continued drainage for the agricultural lands north of the McDaniel Slough Area

**2013 Drainage Work**

Installed culverts and tide gates on City and CDFW properties to provide continued drainage along Route 255.

**Transmission Tower Access**

The Project includes features to accommodate PG&E power transmission line tower access. A PG&E access leading south from Old Samoa Road to a PG&E power tower will be constructed. Another access will be provided from the existing levee east of the breach. A third tower that is located in the middle of the site will be reinforced and will also be provided access.

**2008 Tower access Work Completed**

The access way on City of Arcata lands east of the breach site was constructed using material generated when portions of the existing levee along McDaniel Slough were removed.

**2012 and 2013 Tower Access Work**

Completed access to PG&E towers on City and DFW lands including access way for the tower closest to McDaniel Slough.

**Project Accomplishments Synopsis**

<b>Task</b>	<b><u>2007</u></b>	<b><u>2008</u></b>	<b><u>2009</u></b>	<b><u>2010</u></b>	<b><u>2011</u></b>	<b><u>2012</u></b>	<b><u>2013</u></b>
2.3 acre freshwater wetland excavation and construction	Completed						
6 acre freshwater wetland excavation and construction		60% completed	Completed construction	Revegetated			
Enhance historic slough channels on the Eastern portion of the site		Completed	Plug removed				
Remove portions of levee bordering McDaniel Slough		Completed City Side				Completed on DFW Side	
Construct and plant vegetation on levees on eastern portion of site – includes brackish wetland levees and levees along east side of V Street	Completed 4976’	Completed 465’	Completed 1695’	Initiated 3528’	Completed 1000’ of 3528’	Completed remaining 2528’ on far west and Xx’ parallel to 255	
Contour bottom of future brackish wetland, build and vegetate islands in brackish wetland – initial phase of wetland operation will be as a seasonal fresh water wetland	Completed	Installed MTR Tide gate	Revegetated with native seed				
PG & E to reinforce tower structures – access road and turn around City side		Completed City access				Completed DFW tower access	
Construct trails, viewing structures, kiosks	Completed 3192’ trails				Installed viewing structure		Completed remaining trail, and

							interpretive sign
Plant upland areas with native vegetation		Completed 2.3 acre wetland area	Completed 6 acre wetland & adjacent uplands		Installed native trees and shrubs north of east City freshwater wetland		
<b>Phase II</b>							
Mute open culvert by controlling the outlet to allow western area to dry out while – maintaining water in lower reaches of western remnant channels		<b>Completed</b>					
Construct and plant vegetation on new levees on western portion of site – south side of V Street area and westward.		Completed 1894' levee & 1900' drainage swale	Completed 922' drainage swale & 1695' levee section		Completed - Fully vegetated		
Install tide gates in levees to continue to provide drainage for adjacent lands	<b>Installed in City ecolevee</b>		Installed 1 in DFW eco-levee			Installed 1 of 2 in City levees	Install second
Isolate borrow ditch area, dewater, install culvert w/ tide gate & connect existing levee				<b>Completed to 7'</b>	Completed to 9" – final		
Modify western remnant channels to enhance post project habitat for goby		Began 2008	Removed plug on City side			Completed USFWS designs on CDFW	
Complete design infrastructure for brackish wetland							Finalize design for wastewater input & complete infrastructure in 2014/2015
<b>Phase III</b>							
Construct western Levee Section - 3528'				Initiated western levee section 3528'	Completed western levee section 1000'	Completed western levee section 2528'	Completed
Construct seasonal 23 acre seasonal wetland – CDFW				Initiated - estimate 60% completed	95% complete	Completed remaining 5%	Completed
Construct 10 acre brackish wetland – CDFW				Initiated - estimate 80% completed	90% complete	Completed remaining 10%	Completed
Remove tide gates					Remove		Breached 9/29/13
Collect/propagate Salt Marsh Vegetation			Begin	Continue	Continue		
Install salt marsh vegetation						Began vegetation	Complete
Remove culverts - breach bay front levee							Complete

**Attachments**

McDaniel Slough Project Area Amendment Map

Project Boundary Map -2009 Imagery

McDaniel Slough Project Site Air Photo - January 2010

2009 -2011 Photos

Avian Survey Map

**Prior submittals - Not attached to 2011 Report**

Project Map –submitted with 2008 report

Construction Bid Documents 2007 – submitted with 2008 Report

Construction Bid Documents 2008 - submitted with 2008 Report

Current Trail Map – submitted with 2008 Report

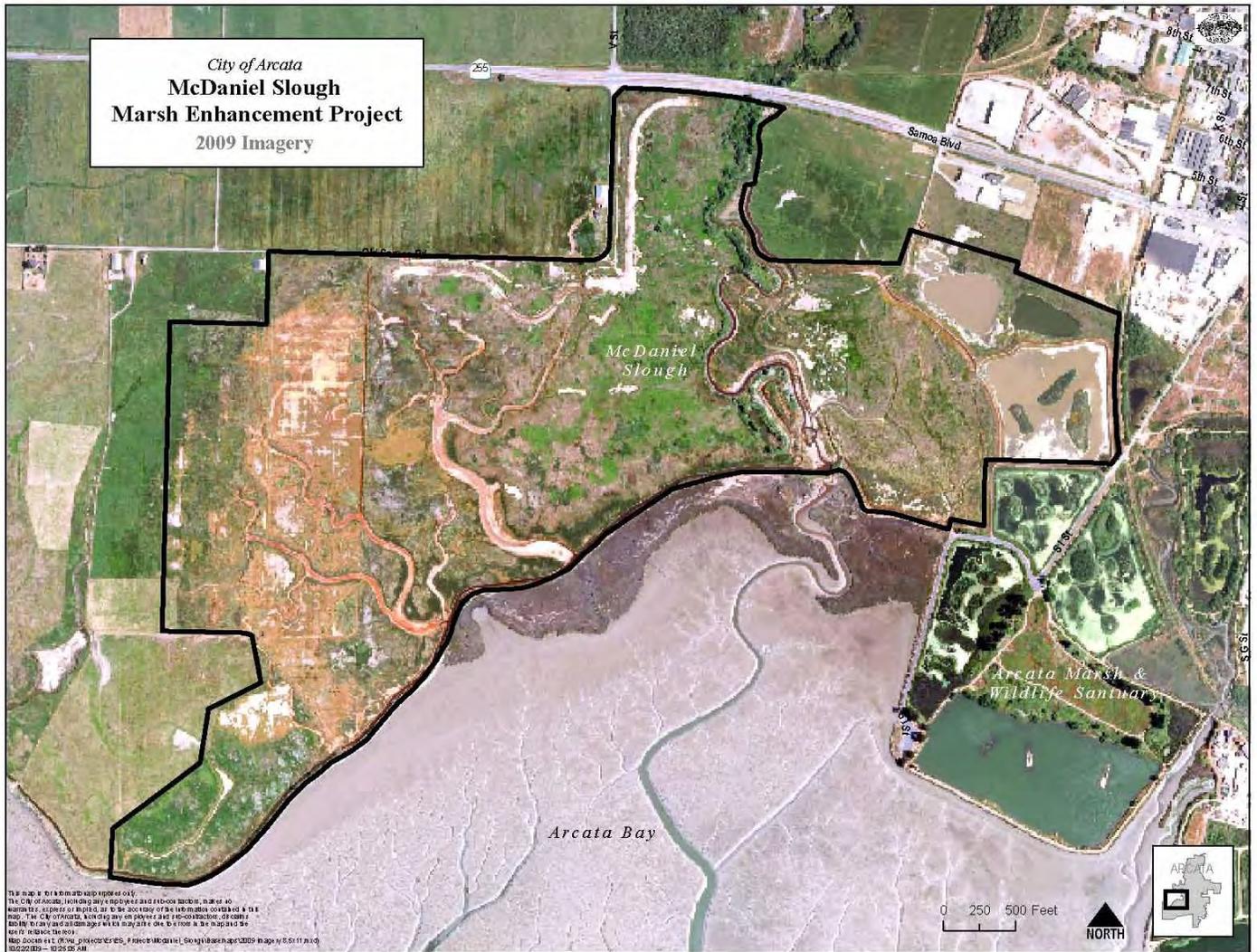


City of Arcata  
 McDaniel Slough  
**McDANIEL SLOUGH  
 PROJECT AREA  
 AMENDMENT**

<b>Boundaries</b> Project Boundary Project Boundary Amendment Area Arcata City Limits	<b>Recreation</b> Trail Information Kiosk Bird Blind Boat Launch
<b>Levee Types</b> Flood Levee Eco-Levee Pond Perimeter Levee Former Flood Levee Alignment	<b>Water Features</b> Streams Freshwater Marsh Brackish Pond
<b>Transportation</b> Access Road Railroad	<b>Other Features</b> Potential wastewater flow Surface Water Flow Drainage Ditch Remove Culvert/Tide gate Drainage pipe

PG & E Tower  
 Trees  
 Remove Levee  
 Roosting Island  
 Parcel

Source: City of Arcata



**June 2009 Imagery**

## 2012 Completed Project Sites



**August 2012 Imagery**

## 2013 Completed Project Sites



August 2012 Imagery

# Progress Report Monitoring Sites



August 2012 Imagery



**Photo by Bob Brown 1-31-2010**



**Photo by Dave Kenworthy (Post breach at outgoing tide) 10-4-2013**



**Photo by Dave Kenworthy (Post breach at high tide) 12-1-2013**



**Photo by Dave Kenworthy  
(Post breach at high tide) 12-1-2013**

Freshwater wetland  
(with islands) created  
2009-2012

Brackish Wetland  
(with island) created  
2009-2012

Historic Levee Breach Site  
Breachd 9-26-2013



**Site 1: City brackish wetland (12.4 acres) - Dec. 2009 – West view**



**Site 1: City brackish wetland (12.4 acres) - Nov. 2010 - West view**



**Site 1: City brackish wetland (12.4) - Jan. 2012 - West view**



**Site 1: City brackish wetland (12.4 acres): Shorebird & waterfowl use - Dec. 2010 - North view**



**Site 1: City brackish wetland (12.4 acres) - Jan. 2012 - North view**



**Site 1: City brackish wetland (12.4 acres): Shorebird & waterfowl use - Jan. 2012 - North view**

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**Site 1: City brackish wetland (12.4 acres) (with American Bittern) – Feb. 2013 - West view**



**Site 1: City brackish wetland (w/shorebird use) (12.4 acres) –Dec. 2013 – West View**



**Site 1.1: City brackish wetland (12.4 acres) – Dec. 2013 – Southwest view panoramic**



**Site 1.2: City brackish wetland (12.4 acres): Tide gate installation – June 2008 – Southwest view**



**Site 1.2: City brackish wetland (12.4 acres): Completed tide gate inlet– Jan. 2009 – Southeast view**



**Site 1.2: City brackish wetland (12.4 acres):Tide gate outlet into developing salt marsh–Dec 2013-SE view**



**Site 2: City freshwater east wetland (2.2 acres) – Oct. 2008 – Northeast view**



**Site 2: City freshwater east wetland (2.2 acres) - Dec. 2010 – Northeast view**



**Site 2: City freshwater east wetland (2.2 acres) - Jan. 2012 – Northeast view**



**Site 2: City freshwater east wetland (2.2 acres) – March 2013 – North view**



**Site 2: City freshwater east wetland (2.2 acres) – March 2013 – North view panoramic**



**Site 3: City freshwater west wetland (5.7 acres) – Oct. 2008 – Northeast view**



**Site 3: City freshwater west wetland (5.7 acres) – Dec. 2009 – Northeast view**



**Site 3: City freshwater west wetland (5.7 acres) – Nov. 2010 – Northeast view**



**Site 3.0: City freshwater west wetland (5.7 acres) – Jan. 2012 – Northeast view**



**Site 3.1: Freshwater west wetland (5.7 acres) – Dec. 2010 – Northeast view**



**Site 3.1: Freshwater west wetland (5.7 acres) – Nov. 2010 – North view**



**Site 3.1: Freshwater west wetland (5.7 acres) – Feb. 2011 – North view**



**Site 3.1: Freshwater west wetland (5.7 acres) (during avian surveys) – March 2012 – North view**



**Site 3.1: Freshwater west wetland (5.7 acres) (w/ otter use) – Oct. 2013 – North view**



**Site 3.2: Viewing structure installed in 2011 – Jan. 2012 – Northeast view**



**Site 4: V Street levee construction - Oct. 2012 – East view**



**Site 4: V Street levee rocking and continued construction – Jan. 2013 – East view**



**Site 4: V Street levee continued construction – Jan. 2013 – East view panoramic**



**Site 4: V Street levee completed with tidal influence on southern field –Dec. 2013- East view panoramic**



**Site 4.1: V Street levee & Hwy 255 tie in – Dec.2013- Northeast view**



**Site 5: CDFW eastern ecolevee re-vegetation/surfacing – Sept. 2009 - North view**



**Site 5: CDFW eastern ecolevee – Jan. 2012 – North view**



**Site 5: CDFW completed eastern ecolevee – Dec. 2013 – North view**



**Site 5: Tidal influence with outgoing high tide – Dec. 2013 – South view panoramic**



**Site 5.1: CDFW eastern ecolevee drainage swale - Oct. 2009 - North view**



**Site 5.1: CDFW eastern ecolevee drainage swale – Dec. 2010 - North view**



**Site 5.1: CDFW eastern ecolevee drainage swale – Feb. 2013 – North view**



**Site 5.1: CDFW eastern ecolevee drainage swale – Dec. 2013 – North view**



**Site 6: Surfacing CDFW northern ecolevee – Oct. 2009 – East view**



**Site 6: Completed CDFW northern ecolevee (with Site 6.1 tide gate) – Feb. 2013 –East view**



**Site 6: Completed CDFW northern ecolevee (outgoing tide) (with Site 6.1 tide gate) – Dec. 2013–East view**



**Site 6.1: CDFG culvert/tide gate installed in 2009 – Dec. 2009 – South view**



**Site 6.1: CDFW culvert/tide gate installed in 2009 – Dec. 2010 – South view**



**Site 6.1: CDFW culvert/tide gate installed 2009 – Jan. 2012 - South view**



**Site 6.1: CDFW culvert/tide gate installed in 2009 – Feb. 2013 – South view**



**Site 6.1: CDFW 2009 culvert/tide gate (with northern ecolevee drainage swale) – Feb. 2013 – SE view**



**Site 6.2: CDFW northern ecolevee sod placement/rock surfacing – Oct. 2009 - West view**



**Site 6.2: CDFW northern ecolevee – Jan. 2012 – West view**



**Site 6.2: CDFW northern ecolevee – Feb. 2013 –West view**

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**Site 6.2: CDFW northern ecolevee – Feb. 2013 –West view**



**Site 6.3: New tidal influence adjacent north ecolevee (during outgoing high tide) –Dec. 2013 –South view**



**Site 7: CDFW northern ecolevee – Dec 2010 – East view**



**Site 7: CDFW northern ecolevee – Feb 2013 – East view**



**Site 7: CDFW northern ecolevee with new tidal influence (outgoing high tide) –Dec. 2013 – East view**



**Site 7.1: CDFW western flood levee completed (with sod placement) – Oct. 2012 – South view**



**Site 7.1: CDFW western flood levee completed – Feb. 2013 – South view**



**Site 8: CDFW freshwater wetland area (partially completed) – Dec. 2010 – Southwest view  
(Shorebirds are loafing in the area between the levee and new wetland)**



**Site 8: CDFW freshwater wetland area – March 2012 – Southwest view  
(Long billed curlews and Coots feeding on wetland edges)**



**Site 8: CDFW freshwater wetland - Jan. 2012 - Northwest view**



**Site 8: CDFW freshwater wetland –Feb. 2013 - Northwest view**



**Site 8: CDFW freshwater wetland –Dec. 2013 – Northwest view**



**Site 8: CDFW freshwater wetland area – Feb. 2013 – Southwest view panoramic**



**Site 8: CDFW freshwater wetland – Feb. 2013 –Northwest view panoramic**



**Site 8: CDFW freshwater wetland area –Dec. 2013 – Southwest view panoramic**



**Site 8: CDFW freshwater wetland – Dec. 2013 –Northwest view panoramic**



**Site 9: CDFW western levee constructed to 4' elevation – Nov. 2010 – North view**



**Site 9: CDFW western levee constructed to 7-8' elevation - Jan. 2012 – North view**

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**Site 9: CDFW western levee completed at 9' elevation and rocked – Feb. 2013 – North view**



**Site 9: CDFW western levee completed at 9' elevation and rocked – Dec. 2013 – North view**



**Site 9: Northern remnant slough channel at CDFW western levee –March 2013 – North view (High tide, ~6.8')**



**Site 9: Northern remnant slough channel at CDFW western levee – Dec. 2013 – North view (Outgoing Tide, ~6.0')**



**Site 9: Northern remnant slough channel at CDFW western levee – Feb. 2013 – South view (Incoming tide)**



**Site 9: Northern remnant slough channel at CDFW western levee – Dec. 2013 – South view (Outgoing tide, ~6.0')**



**Site 9.1: Southern remnant slough channel at CDFW western levee – Feb. 2013 –Northeast view (Incoming Tide)**



**Site 9.1: Southern remnant slough channel at CDFW western levee – Mar. 2013 – Northeast view (During high tide, ~6.8')**



**Site 9.1: Southern remnant slough channel at CDFW western levee – Dec. 2013 – Northeast view (Outgoing tide, ~6.0')**



**Site 9.1: Southern end of CDFW freshwater wetland where it meets brackish wetland at distant weir -Feb. 2013 – Southwest view**



**Site 9.1: Southern end of CDFW freshwater wetland where it meets brackish wetland at distant weir -Dec. 2013 – Southwest view**



**Site 10: CDFW freshwater wetland (with weir) – Oct. 2012 – Northwest view**



**Site 10: CDFW freshwater wetland (with weir) – Feb. 2013 – North view**



**Site 10: CDFW freshwater wetland (with weir) – Feb. 2013 – North view panoramic**



**Site 10: CDFW freshwater wetland's weir outlet toward CDFW brackish wetland –Feb. 2013 – South view**



**Site 10: CDFW freshwater wetland (with weir) – Dec. 2013 – North view**



**Site 10: CDFW freshwater wetland (with weir) – Dec. 2013 – North view panoramic**



**Site 10: CDFW freshwater wetland's weir outlet toward CDFW Brackish wetland –Dec. 2013 – South view**



**Site 11: CDFW freshwater wetland outlet as viewed from CDFW brackish wetland – Feb. 2013 - North view**



**Site 11: CDFW freshwater wetland outlet as viewed from CDFW brackish wetland – Dec. 2013 - North view**



**Site 11: CDFW excavated brackish wetland – Oct. 2012 – South view**



**Site 11: CDFW excavated brackish wetland – Feb 2013 – South view**



**Site 11: Completed CDFW brackish wetland – Dec. 2013 – South view**



**Site 11.1: Excavated CDFW brackish wetland - Jan. 2012 – Northwest view**



**Site 11.1: Excavated CDFW brackish wetland – Sept. 2012 –Northwest view**



**Site 11.1: Digging CDFW brackish pond input channel from slough –Oct. 2012 – Northwest view**



**Site 11.1: Saltwater breach from slough into CDFW brackish pond –Oct. 2012 – southwest view**



**Site 12: Partially excavated CDFW brackish wetland – Nov. 2010 – Northwest view**



**Site 12: CDFW brackish wetland during avian surveys– March 2012 – Northwest view**



**Site 12: CDFW completed brackish wetland (incoming tide) – Feb. 2013 – West view**



**Site 12: CDFW completed brackish wetland with palustrine habitat (incoming tide) – Feb. 2013 –West view**



**Site 12: CDFW completed brackish wetland (high tide, ~7.4')**



**Site 12: CDFW completed brackish wetland with palustrine habitat (high tide, ~7.4') –Dec. 2013 –West view**



**Site 12.1: CDFW completed brackish wetland (high tide, ~7.4') – Feb. 2013 – Northwest view**



**Site 12.1: CDFW completed brackish wetland (high tide, ~7.4') – Feb. 2013 – Northwest view**



**Site 13: Tide gate & slough crossing installed connecting CDFW flood levee to bay front levee – Nov. 2010 – North view**



**Site 13: Completed tide gate and levee tie-in with vehicle turn around/helipad –Jan. 2012 – North view**



**Site 13: Completed tide gate (closed with incoming tide) – Feb. 2013 – North view**



**Site 13: Tide gate under water at ~7.4' high tide – Dec. 2013 – North view**



**Site 13: Tidal influence east of 2010 tidegate at ~7.4' high tide –Dec. 2013 –North view**



**Site 13.1: Tidal influence east of CDFW flood levee at ~7.4' high tide –Dec. 2013 – Northeast view**



**Site 13.1: Remnant tidal channels east of CDFW flood levee at ~7.4' outgoing tide –Dec. 2013 – Northeast**



**Site 13.1: Palustrine habitat and CDFW brackish pond in distance –Dec. 2013- Southeast view**



**Site 14: Island enhancement area (pre-conditions) – June 2012 – North view**



**Site 14: Completed CDFW island area (west side) – Feb. 2013 – North view panoramic**



**Site 14: Completed island enhancement area (west side) – June 2012 – North view**



**Site 14: Completed island enhancement area (west side) – Dec. 2013 – North view panoramic**



**Site 14.1: Island enhancement area (pre-conditions) –June 2013- Northeast view**



**Site 14.1: Completed island enhancement –Dec. 2013 –North east view**



**Site 14.1: Completed island enhancement area (north side) –Dec. 2013 – South view panoramic**



**Site 14.2: CDFW island enhancement area (east side) (during construction) – Sept. 2012 – North view**



**Site 14.2: Completed CDFW island enhancement area (east side) – Dec. 2013 – North view**



**Site 14.2: CDFW island enhancement area (east side) (during construction) – Sept. 2012 –South view**



**Site 14.2: Completed CDFW island enhancement area (east side) – Dec. 2013 – South view**



**Site 14.2: Volunteer workday planting native salt marsh vegetation on the enhanced island – Nov. 2012**



**Site 14.2: Volunteer workday planting native salt marsh vegetation on the enhanced island – Nov. 2012**



**Site 14.2: Volunteer workday planting native salt marsh vegetation on the enhanced island – Nov. 2012**



**Site 14.2: Volunteer workday planting native salt marsh vegetation on the enhanced islands – Nov. 2012**



**Site 14.2: Completed CDFW island area (east side) – Feb. 2013 – Northwest view**

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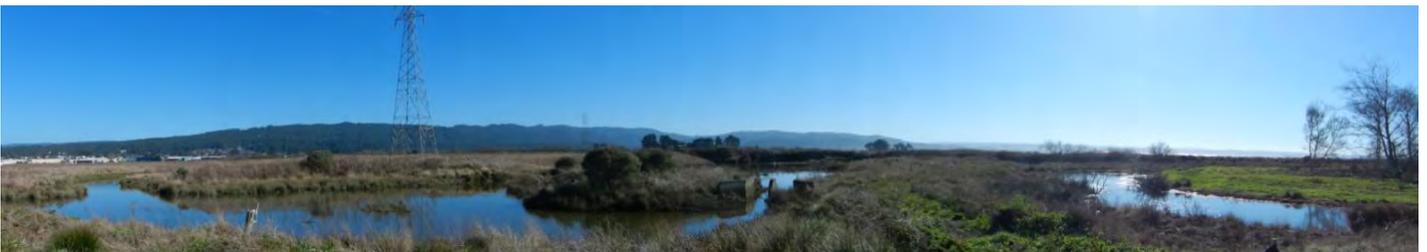
**Site 14.2: Completed CDFW island area (east side) – Feb. 2013 – Northwest view**



**Site 14.2: Completed CDFW island area (east side) (outgoing tide, ~4.5') – Dec. 2013 – Northwest view**



**Site 14.2: Completed CDFW island area (east side) (outgoing tide, ~4.5') – Dec. 2013 – Northwest view**



**Site 14.2: McDaniel Slough adjacent to east side of CDFW island area – Feb. 2013 – Southeast view**



**Site 14.2: McDaniel Slough adjacent to east side of CDFW island area – Dec. 2013 – Southeast view (Breached levee can now be seen in center of photo post breach. Breach date 9/26/13)**



**Site 14.2: McDaniel Slough levee breach site (breached 9/26/13) –Dec. 2013 – Southeast view**



**Site 14.3: McDaniel Slough breach site (breached 9/26/13) (outgoing tide, 4.5') –Dec. 2013 – Southeast view**



**Site 14.3: View toward CDFW island enhancement area (outgoing tide, ~4.5') –Dec. 2013 – Northwest view**



**Site 15: Newly constructed McDaniel Slough northwestern side channel – Nov. 2012 – North view**



**Site 15: Completed McDaniel Slough northwestern side channel – Jan. 2013 – North view**



**Site 15: Northwestern side channel and McDaniel Slough connection – Feb. 2013 –Northeast view**



**Site 15: Northwestern side channel and McDaniel Slough connection – Dec. 2013 –Northeast view**



**Site 15: Completed McDaniel Slough northwestern side channel – Dec. 2013 – North view**



**Site 16: Water quality/ fish sampling in thick reed canary grass in McDaniel Slough  
–Feb. 2011 –East view**



**Site 16: Water quality/ fish sampling in thick reed canary grass – March. 2011 –West view**



**Site 16: Thick reed canary grass dominates McDaniel Slough – Sept. 2012 – South view**



**Site 16: McDaniel Slough channel with partial construction of City flood levee –Feb. 2013 – South view**



**Site 16: McDaniel Slough at Hwy 101 crossing with adjacent partially completed City flood levee –Feb. 2013 – Southeast view**



**Site 16: Mostly completed City flood levee at east bank of McDaniel Slough – Feb. 2013 - South view**



**Site 16: Water quality/fish sampling in thick reed canary grass within McDaniel Slough –March 2013 – Southeast view**



**Site 16: Water quality/fish sampling in thick reed canary grass within McDaniel Slough –March 2013 – Southwest view**



**Site 16: Thick reed canary grass dominates McDaniel Slough channel –May 2013 – Southwest view**



**Site 16: Thick reed canary grass dominates McDaniel Slough channel –May 2013 – South view**



**Site 16: McDaniel Slough channel one week before levee breach –Sept. 2013 – South view**



**Site 16: Completed Hwy 255 and flood levee tie in with rip rap installation. One week before levee breach. –Sept. 2013 – East view**



**Site 16: CDFW staff inspects site conditions one week before levee breach –Sept. 2013 –West view**



**Site 16: Post levee breach tidal influence starts to reach upper McDaniel Slough – Oct. 2013 – West view**



**Site 16: Post levee breach McDaniel Slough tidal influence starts killing reed canary grass and expanding its channel –Nov. 2013- South view**



**Site 16: Post levee breach McDaniel Slough tidal influence starts killing reed canary grass and expanding its channel –Early Dec. 2013- South view**



**Site 16: Post levee breach McDaniel Slough tidal influence starts killing reed canary grass and expanding its channel –Early Dec. 2013- Southwest view**



**Site 16: Post levee breach McDaniel Slough tidal influence starts killing reed canary grass and expanding its channel –Dec. 2013- South view**



**Site 16: Water quality/Fish sampling of post breach McDaniel Slough –Dec. 2013 – Southeast view**



**Site 16: Water quality/Fish sampling of post breach McDaniel Slough –Dec. 2013 – South view**



**Site 17: Sheepsfoot compacting surface of City flood levee –Aug. 2012 –Southwest view**



**Site 17: City flood levee construction and rip rap installation – Aug. 2012 –Southwest view**



**Site 17: Completed City flood levee rip rap installation –Aug. 2012 –Southwest view**



**Site 17: McDaniel Slough channel conditions –Nov. 2012 – North view**



**Site 17: McDaniel Slough channel conditions (~1.5 months pre levee breach) –Aug. 2013 –North view**



**Site 17: McDaniel Slough conditions (~2 months post levee breach) –Dec. 2013 – North view**



**Site 17: McDaniel Slough channel conditions (~1.5 months pre levee breach) –Aug. 2013 –Southwest view**



**Site 17: McDaniel Slough conditions (~2 months post levee breach) –Dec. 2013 – Southwest view**



**Site 17: McDaniel Slough conditions (with connection of Site 15 side channel constructed in 2012) –Dec. 2013- West view**



**Site 17.1: New City flood levee east of McDaniel Slough - Nov. 2012 – North view**



**Site 17.1: City flood levee east of McDaniel Slough – March 2013 – North view**



**Site 17.1: City flood levee toe re-enforcement –Aug. 2013- Southeast view**

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**Site 17.1: Completed City flood levee re-enforcement & re-vegetation –Dec.2013- Southeast view**



**Site 17.1: McDaniel Slough vegetation dying off with muted tidal influence –Aug. 2013- West view**



**Site 17.1: McDaniel Slough channel conditions (outgoing tide, ~7.5') –Dec. 2013- West view**



**Site 17.1: Expanding McDaniel Slough channel post levee breach (outgoing tide, ~7.5') –Dec. 2013- Southeast view**



**Site 18: Before levee reconstruction and tide gate/drainage pipe installation –Nov. 2010 - Northwest view**



**Site 18: Completed 2012 City reconstructed levee tie in with 2008 levee – March 2013 - West view  
(with completed installation of tide gate/drainage pipe)**



**Site 18: Tide gate/drainage pipe installed in 2012 - March 2013 - Northwest view  
(with reconstructed City levee in background)**



**Site 18: Completed tide gate/drainage pipe installed in 2012 – Dec. 2013 - Northwest view**



**Site 18: Tide gate/drainage pipe installed in 2012 - March 2013 - South view**



**Site 18: Tide gate/drainage pipe installed in 2012 (Outgoing tide, ~7.5') –Dec. 2013 - South view**



**Site 19: Tide gate breach area at McDaniel Slough – Apr. 1010 – West view**



**Site 19: McDaniel Slough tide gates outlet area into Humboldt Bay – Nov. 2012 – South view**



**Site 19: Site 19: McDaniel Slough tide gates inlet area – Nov. 2012 – North view**



**Site 19: McDaniel Slough tide gate breach area (during high tide) – Dec. 2012 – West view**



**Site 19: McDaniel Slough tide gate breach area (during high tide) –Dec. 2012 – East view**



**Site 19: Two of McDaniel Slough tides gates being chained open –Dec 2012 –West view**



**Site 19: Two of McDaniel Slough tides gates being chained open –Dec 2012 –West view**



**Site 19: McDaniel Slough tidegate breach area with opened tide gates (incoming tide) – Feb. 2013**



**Site 19: McDaniel Slough chained open tidegates (incoming tide) – Aug. 2013 –Southwest view**



**Site 19: Rip rap removal completed around McDaniel Slough tide gate area –Aug. 2013 - West view**



**Site 19: McDaniel Slough outlet & breach area – Aug. 2013 –West view panoramic  
(Two opened tide gates & rip rap removed)**



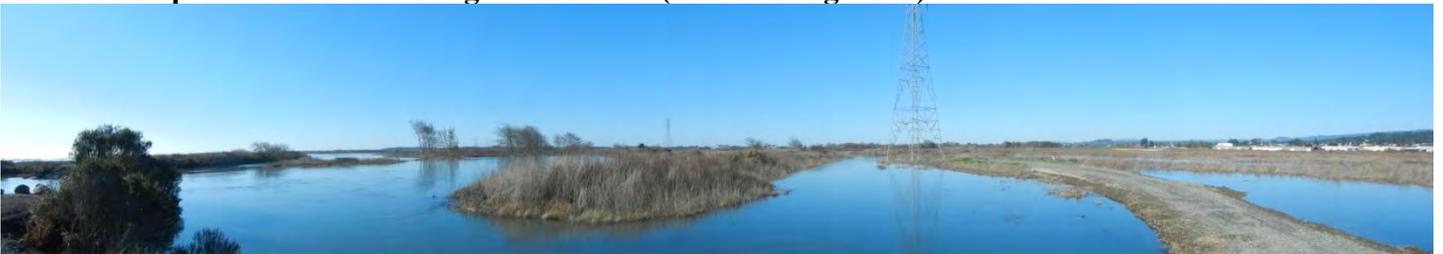
**Site 19: Initial excavation for McDaniel Slough levee breach –Sept. 2013- West view**



**Site 19: Breaching McDaniel Slough and Humboldt Bay levee -Sept. 2013- Southwest view**



**Site 19: Completed McDaniel Slough breach site (at ~8.10' high tide) -Dec. 2013 -West view**



**Site 19: McDaniel Slough and side channel with PG&E tower access road (at ~8.10 High tide) -Dec.2013- North view**



**Site 19.1: Fish sampling in McDaniel Slough (upstream of breach location) - March 2011 - North view**



**Site 19.1 McDaniel Slough tide gates breach area (during low tide) – Feb. 2013 – South view**



**Site 19.1 Completed McDaniel Slough breach area – Dec. 2013 – South view**



**Site 20: New tidal inundation after opening McDaniel Slough tide gates (high tide) –Dec. 2012 –East view**

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**Site 20: Tidal influence after opening McDaniel Slough tide gates (high tide) – Mar. 2013 –Northeast view**



**Site 20: Tidal influence postMcDaniel Slough levee breach (at ~8.10' high tide) – Dec. 2013 –Northeast view**



**Site 21: Tidal influence after opening McDaniel Slough tidegates (high tide) –Feb. 2013 – North view**



**Site 21: Tidal influence after opening McDaniel Slough tidegates (high tide) – March 2013 –North view**



**Site 21: Tidal influence post McDaniel Slough levee breach (at ~8.10' high tide) – Dec. 2013 –North view**