United States Department of the Interior

NATIONAL PARK SERVICE
Water Resources Division
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IN REPLY REFER TO:
L54(2380)
PWR/CHIS

July 6, 2005

Memorandum

To: Superintendent, Channel Islands National Park (CHIS)

Through: Bill Jackson, Acting Chief, Water Resources Division (WRD)
Mark Flora, Chief, Planning and Evaluation Branch, WRD

From: Kevin Noon, PhD, Wetland Scientist, WRD
Mike Martin, Hydrologist, WRD
Joel Wagner, Wetland Program Lead, WRD

Subject: Report for Travel to Channel Islands National Park during December 6-10, 2004

Purpose

Our purpose was to install ground water monitoring wells and to collect soils, hydrology, topography, vegetation and related data needed to prepare a restoration plan for the lower floodplain of Canada Del Puerto Creek at Prisoners Harbor, Santa Cruz Island.

Canada Del Puerto Creek at Prisoners Harbor (12/10/04)

Participants

Kate Faulkner, Chief, Natural Resources Division CHIS
Sarah Chaney, Restoration Ecologist, CHIS
Kelly Minas, Archeologist, CHIS
Paula Power, Ecologist, CHIS
Tim Jones, Maintenance Division, CHIS
Marie Denn, Aquatic Ecologist, Pacific West Region
Tom Culhane, Hydrologist, Pacific West Region
Rob Young, Coastal Geomorphologist, Western Carolina University

Discussion

The following tasks were completed during our site visit.

We installed a network of 18 shallow ground-water monitoring wells throughout the proposed restoration area (see attached map: Well and Test Pit Locations) and into adjacent wetland reference areas to evaluate the ranges of diurnal, seasonal, and annual ground water table fluctuations. Tim Jones used a backhoe to excavate holes for most of the well installations, and Kelly Minas provided onsite supervision for archeological compliance. We recorded soil stratigraphy at each hole (with particular interest in identifying former soil and fill horizons, see attached data sheets), placed the well casings in the holes, and then backfilled around the wells.

Installation of Well #18

We identified the elevations of any relict (buried) soil layers in each well hole and in 13 additional soil test pits to determine depths and areal extent of fill. Rob Young and his students utilized Ground Penetrating Radar (GPR) to help determine the depth of fill over the entire site. He will use the stratigraphy information at the well holes and soil pits to calibrate their GPR readings.

We surveyed the locations and elevations of the wells, collected topographic data, and surveyed channel and floodplain cross-sections.

We established a “reference wetland” transect through a range of relatively undisturbed wetland community types (e.g., saltgrass, tule marsh, willow thicket) adjacent to the filled area. We established three observation wells along the transect (wells 15-17 on the attached map) and flagged vegetation community boundaries. We then surveyed ground surface elevations along the entire transect, and identified the locations of the wells and boundary flags. By understanding the seasonal fluctuations of the water table in relation to the ground surface elevations in these reference communities, we will be able to develop a model for how to create the same types of wetland habitats in the areas to be restored.

We collected samples from the buried soils for green-house seed germination testing. This may give us some important hints as to the plant communities that existed at the site prior to deposition of fill.

Installation of Well #3

Tasks to Restore the Prisoners Harbor Wetland

- Install a staff gauge on the pier for measuring tide levels and then establish a datum elevation, relative to the staff gauge height. Begin collecting tide elevations while measuring ground water levels in the wells, on a bi-weekly basis. (CHIS)
- Determine relationship between published tide charts with data extrapolated to Prisoners Harbor and tide stage data collected for this project to create a continuous tide record at Prisoners. (WRD)
- Analyze and account for tidal effects on monitoring well readings. (WRD and Rob Young)
- Map the soil stratigraphy based on well and test-pit records (WRD).
- Use soil stratigraphy data to calibrate GPR results and produce a map of fill deposits and depth of organic layer throughout the site. (Rob Young)
- Compare hydrologic data to buried soil characteristics and elevations. Determine if the hydrologic conditions still exist to support the pre-disturbance habitat types indicated by the buried soils. (WRD)
- Identify restoration alternatives. (All)
- Select the best restoration alternative based on comparisons to historic conditions, wetland functional lift to be produced by the effort, floodplain and flood regime alterations, and positive and adverse impacts to cultural and archeological features. (All)
- Create a conceptual restoration design plan. (All)
- Calculate cut and fill volumes for the proposed alternative and costs including the transport and disposal of the dredged material. (All)
- Identify restoration funding sources. (CHIS and WRD)
- Create the Restoration Implementation Plan (based on well data, test-pit/GPR data, hydrologic and hydraulic analyses, seed bank data, and the topographic map) that describes the design, construction process, costs, and monitoring plan. (WRD and CHIS)
- Complete a series of construction drawings (accuracy based on 90% completion). Develop grading plans that will achieve the hydrologic conditions that will support the target wetland, riparian, and upland plant communities. (WRD, CHIS, and an Engineering Contractor)
- Complete the construction process including excavation, fill disposal, corral reconstruction, and planting. (WRD, CHIS, and an Engineering Contractor)
- Implement a Restoration Monitoring Plan to evaluate success and identify any needed post-implementation treatments. (CHIS and WRD)

If you have any questions regarding this report please call Kevin Noon at (303) 969-2815.

cc: (by e-mail only)
2380 - Jackson, Flora, Rosenlieb, J. Wagner, Noon, M. Martin, Parker (file)
CHIS - Faulkner, Chaney, Minas, Power, Jones
GOGA - Steve Ortega
PWR - Kolipinski, Denn, Culhane
Western Carolina U. - Rob Young

Well and Test Pit Data

General Notes

We analyzed material at each well and test pit location for signs of anthropogenic influence such as fill and natural features including relict soil horizons and channel/overbank deposits. Most of the holes contained a fairly thick layer of fine sand and/or silt near the surface with varying layers of rounded cobble at depth. Additionally some holes contained obvious fill rock quarried from the hillside and in some cases we found trash, such as tin cans, brick, mortar, etc., at certain elevations. In roughly half the holes we identified a thin organic rich layer.

Well and Test Pit Locations

Overall it appears that the proposed restoration area contains a mixture of anthropogenic fill and natural channel overbank and eolian deposits. We believe that there were two sources that supplied fill to the floodplain. One is dredged material from the creek channel which would resemble natural channel deposits. We noted numerous zones of rounded cobble, gravel, and

sand with no discernable sedimentary layering. We know from historical accounts and photographs that the channel was routinely dredged and aligned to maintain and control its flow. From that we assumed that some material was dredged from the active river channel and deposited as fill in the floodplain. In other pits we found that the material was angular, small cobble sized native rock, which appeared to be the same rock type found at the hillsides adjacent to the site. There is obvious evidence that the slopes adjacent to the floodplain were mined. We surmised that this material was excavated from the hillsides and used as fill in the floodplain.

In the notes below we describe the types of fill as either "channel deposit fill" or "excavated hill-slope fill." However, it is important to remember that the active channel likely passed through the proposed restoration area and consequently some of the zones identified as "channel deposit fill" may in fact be naturally derived channel deposits.

In 15 of the 31 well and test pits, we found a distinct layer of clay loam with a fairly high organic matter content colored 10yr 2/1 when saturated. We found this horizon at depths ranging from about three to five feet. Most of us agreed that this is a pre-disturbance surface which is likely a former estuarine surface. This layer is referred to as the "black layer" in the notes below.

Well #1 - Located inside fence about 150 ft due N of warehouse SE corner. Elevation relative to the warehouse SE corner: about 12"

PH1	Interval	Material	Other Data
		Sand and small-med cobbles well rounded.	water table -
	0-48"	Probably **channel deposit fill to 48"**	4.7 (bls)
			specific
		clay loam, organic, **black layer (color 10yr**	conductance -
	48-52"	**2/1 saturated) starts at 48"**	1360
	52" ++	pebble and small-med cobble, well rounded	Salinity - 0.7

Well #2 - Located inside fence about 50 ft due east of the SE corner of the warehouse. Elevation relative to warehouse SE corner: about -1.3 ft

PH2	Interval	Material	Other Data
	0-24"	fine grained; silty, some organic	water table
		Angular rock (hillslope material), and med.	specific
		sand. Probably **excavated hill-slope fill to**	conductance -
	12-42"	**39"**	1500
		clay loam, organic, **black layer starts at**	
	42"+	**42"**	Salinity - 0.9

Well #3 - Located about 175 ft due SE of warehouse SE corner
Elevation relative to warehouse SE corner: about -0.2 ft

PH3	Interval	Material	Other Data
		mixed fill material: brick fragments,	water table - 6.4
	0-30”	angular rock.	(bls)
			specific
	30”	shell material	conductance - 900
		angular rock (likely fill from hillslope). Probably **excavated hill-slope fill to 36”** Interpretation: about 36” of anthropogenic	
	30 – 36”	fill on overbank deposits.	Salinity - 0.5
	36-60”	silt and clay, mottled	
	60-75”	silt and clay, gleyed	

Well #4 - Located about 220 ft ENE of warehouse SE corner
Elevation relative to warehouse SE corner: about -1.5 ft

PH4	Interval	Material	Other Data
		Mixed **excavated hill-slope fill to 48”**: angular hill slope material, sand, sub-angular	water table - 4.5
	0-48”	to sub-round med to large cobbles	(bls) specific conductance (maybe not adjusted for T) - 742
		fine grained. Probably **channel deposit fill**	
	48-54”	**to 54”**	Salinity - 0.4
		Thin (1") clay loam, organic, **black layer**	
	54-56”	starts at 54”	
		sub-round to well rounded, moderately	
	55-60”	sorted gravels	

Well # 5 - Located about 250 feet due E of warehouse SE corner
Elevation relative to warehouse SE corner: about -1.5 ft

PH5	Interval	Material	Other Data
	0-24”	fine grained silty topsoil	water table - 7.5 (bls)
	24-42”	mottled sand	specific conductance - 897
	42-48”	clay, gleyed	Salinity - 0.4
	48-90”	mixed sand and clay, gleyed	
		Interpretation: about 24” of very recent channel deposits on overbank deposits. Water table fluctuation may be up to 48”	

Well # 6

PH6	Interval	Material
	0-6"	sandy loam topsoil, color 4/2
	0-30"	**Channel deposit fill to 30”**, angular cobble in gravelly sand, color 4/2
	30" +	saturated gray uniform sand, color 3/1

Well #7 Central corral area

PH7	Interval	Material
	0-21"	sandy loam, color brown 4/3, uniform consistency, Probably fill to 36"(?)
	21-36"	gray loamy sand, piece of brick, **excavated hill-slope fill to 36”**
	36"+	clay loam, organic, **black layer starts at 36”**

Well #8

PH8	Interval	Material	
	0-24"	loamy sand, brown 4/2	
	24-36"	gray sand, 3/1, **channel deposit fill to 36”**	
	36-38"	2" layer of hydrocarbon material,	Fill or alluvial wash to 36"
	38"+	gray sand, 3/1	

Well #9 - Located adjacent levee

PH9	Interval	Material
	0-76"	sand, gravel, cobble (sub angular), probably **channel deposit fill to 76"**
	76-84"	clay loam, organic, **black layer starts at 76”**
	84"+	cobbly gravel

Well #10 - Road and levee intersection

PH10	Interval	Material
	0-26"	sandy loam, 3/2
	26-31"	cobble layer with an old iron nail, **channel deposit fill to 31"**
	31-75"	sandy loam, blue gleyed
	75"+	clay loam, organic, **black layer starts at 75”**

Well #11 - Located back of corral in Kikuyu grass

PH11	Interval	Material
	0-12"	Loam topsoil
	12-24"	gray sand, mottled (red)
	24-36"	gleyed sand
	36-48"	clay loam, organic, **black layer starts at 36”**
	48"+	beach sand, black/gray Water table fluctuation may be up to 4 feet

Well #12 - Triangle inside corral chute

PH12	Interval	Material
	0"+	dune sand with large cobble, likely natural

Well #13 In the levee terrace, 100' from the midden mound

PH13	Interval	Material
	0-12"	loamy sand, .75" pvc irrigation pipe buried at 12"
	12-72"	sand, gravel, cobble, river material, Ground water at 72" **channel deposit fill to 72**"
	72-84"	clay loam, organic, **black layer starts at 72"**
		Took sample for seed germination, see Sarah

Well #14 - Just beyond little shed in corral area

PH14	Interval	Material
	0-42"	sand, gravel, cobble (sorted, subangular river bed material) Probably **channel deposit fill to 42"**
	42+	stratified sand and gravel, Ground water at 42" Fill to 42"

Well #15 - End of reference transect, near the beach

No data.

Well #16 - Reference Transect well 2, in Scripus californicus

PH16	Interval	Material
	0-6"	organic surface horizon
	6-30"	mottled sand
	30"+	clay/sand pure gleyed

Well #17 - in the willows, end of reference transect

PH17	No Data

Well #18 - located 55' from the warehouse building

PH18	Interval	Material
	0-60"	Brick and charred brick foundry material, obvious **excavated hill-slope fill to 60”**
	60-72"	Clay loam, organic, **black layer starts at 60”**, bagged sample available at WRD, Denver

Test Pit #1 - No well - located inside the corral chute, near the dock

TP1	Interval	Material
	0-21"	obvious angular **excavated hill-slope fill to 21”** fragments matching material from adjacent hillside
	21"+	beach sand dune and cobble material appears to be natural dune deposits

Test Pit #2 - no well - located near concrete pads in the levee

TP2	Interval	Material
	0-60"+	obvious river material, unsorted, **channel deposit fill to at least 60",** Ground water at 60"

Test Pit #3 - no well - at the end of the concrete pads, near the cultural mound

TP3	Interval	Material
	0-24"	sand and coarse cobble, sub angular river material, **Probably channel deposit fill to 24”**
	24-48"	fine grain sand and river gravel, small cobble, rounded
	48-72"	loamy sand, gleyed and mottled, clay loam, organic, **black layer starts at 48”**

Test Pit #4 - located near the cultural mound

TP4	Interval	Material
	0-84"	cobble and sand, unsorted, **channel deposit fill to 84" (**Soda can circa 1970 at 72")
	84"+	loamy sand and cobble, gleyed

Test Pit #5 - in the corral near well 4

TP5	Interval	Material
	0-36"	cobble and sand, unsorted, **channel deposit fill to** 36"

Test Pit #6 - The end of a long transect of connected test pits dug through what we thought was a terrace.

TP6	Interval	Material
	0-24"	loamy sand, brown 4/2
	24-36"	loamy sand, gray mottled (orange)
	36-62"	sand, gleyed, **black layer starts at 36"**
	62"	water

Test Pit #7

TP7	Interval	Material
	0-36"	sand, gray/mottled (orange), someone noted that the sand looks fluvial or trucked in.
	36-60"	sand, gleyed, **black layer starts at 36"**
	60"	ground water, first appearance of large cobble

Test Pit #8

TP8	Interval	Material
	0-36"	sand, gray, mottled (orange)
	36+	sand, gleyed
		no distinct clay layer, no cobble

Test Pit #9

TP9	Interval	Material
	0-6"	loamy sand
	6-36"	sand, gleyed, with cobble (rounded)
	36"+	clay loam, organic, **black layer starts at 36”**

Test Pit #10

TP10	Interval	Material
	0-6"	loamy sand, mottled (orange)
	6"+	loamy sand, gleyed (blue/gray)

Test Pit #11 - end of the long string of test pits, inside the willows

TP11	Interval	Material
	0-6"	organic loam
	6-18"	loamy sand, gleyed, mottled (orange)
	18"+	clay loam, organic, **black layer starts at 18”**

Test Pit #12 - located near well PH18, 25 feet from the brick building

TP12	Interval	Material
	0-50"	E**xcavated hill-slope fill to 50,”** brick, mortar
	50-58"	sand, dark gray
	58"+	clay loam, organic, **black layer starts at 58”**, Took sample for seed germination, see Sarah

Test Pit #13 - Located across the stream along the road leading to the navy pump.
40 meters from the gate, 19 meters from the road

TP13	Interval	Material
		Loamy sand, unconsolidated, angular and decomposing rock, no sign of alluvium. Probably erosion deposits from hill slope over cultural material.
	0-24"	
		Encountered cultural material at 24"