Hanalei Stream Bank Restoration Project and In-Water BMP Design
Introduction

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Background

- Stream bank breach first occurred during a November 1995 flood event
- Continuous soil erosion occurred at the breach and along the breach channel
- Reduction of water at the existing USFWS irrigation intake system
- Less water available to taro farmers and wildlife refuge
- Emergency Proclamation 2012 and 2018
- Restoration construction completed November 2015
- Multiple flooding events
- Existing stream bank overtops naturally
Project Location
City and County of Honolulu July 2018 | Construction

Stormwater Quality Workshops

USFWS Diversion Structure

Existing Taro Fields (Hanalei Wildlife Refuge)

Breach Channel

Limits of 2015 Restoration

Location of Breached River Bank
Problems

- Soil erosion
- Environmental pollution
- Stream and reef degradation
- Reduction of water at irrigation intake system
- Loss of water for taro
- Loss of water for wildlife refuge
- Loss of property
- Formation of breach channel
Soil Erosion

- Erosion along breach channel has deposited an estimated 28,000 tons of sediment into Hanalei Bay.
Breach Channel
Solution

- Repair the streambank at the breach and restore the main river channel
- Vegetated reinforced earth construction
- Match the estimated pre-breach bank elevation
- Utilize native and other vegetation suitable for the area
- Rock rip-rap protection along water line
- Bank spurs within main river
Solution

Geotextile fabric and geogrid reinforcement, see lift detail below.

Plant "ahu'owc along stream face.

Zone 1 fill

Zone 2 fill

Vertical drains, see detail below.

12" dia. OHP drain line.

Finish grade

Blended native species ground cover throughout ("ilie'e, 'ole'ai, neka, me'u la'aki).
Permits

- Army Corp of Engineers CWA Section 404 Permit
- Section 401 Water Quality Certification
- Coastal Zone Management Federal Consistency Review
- National Pollutant Discharge Elimination Permit (NPDES)
- Conservation District Use Permit
- Stream Channel Alteration Permit
- State Historic Preservation Division Consultation
CWA § 404 Permit Conditions

- Permit Project Description
  - Purpose, volume, and area of each specific type of fill
    - Earthen berm = 1,288 CY of fill (684 CY rock and 604 CY soil) within 0.625 acres of the river
    - Rock vane and bank spurs = 36 CY of fill within 0.04 acres of the river
    - Temporary cofferdam of large boulders collected on-site and reused for construction of permanent improvements
Construction Challenges

- Dynamic river conditions with large flows
- Limited work area
- Remote project location
- Heavy rainfall
- Permitting
- Delays
- Revisions to BMPs
BMPs

- Selected based on agency expectations and previous success
- Manage sediment by removing flow from the work area
- Understand project site conditions
- Minimize discharge
- Minimize exposure
BMPs

- Work during low stream flows
- Clean equipment and vehicles
- Earthen cofferdam
- Type III Turbidity barriers
- Compost filter socks
- Stockpile protection
- Other alternatives
  - Pump around systems
  - Divert only a portion of the channel
  - Work in wet
  - Rapid construction
In-water BMPs: Turbidity Barriers

- Never allowed to fully block stream flow
- Backup Curtains

- Best in slow, calm water
- Source of turbidity if improperly used
In-water BMPs: Cofferdam and Turbidity Curtains

- Type I – calm water
- Type II – 1.5 ft/s
- Type III – 2.5 ft/s
- Challenging to install in moving water
- Difficult to anchor into stream bed
In-water BMPs: Cofferdam and Turbidity Curtains

- Cofferdam construction
June 2015 storm event
Construction 2015

- Steel sheet piles
Construction 2015
Construction 2015
Construction 2015
Construction 2015

- Performed in-stream work during low flows
- Constructing bank spur
- Restoring river channel
Construction 2015
Construction 2015
Construction 2015
Thank You!

Questions?

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