

NAPA RIVER RUTHERFORD REACH RESTORATION PROJECT

2011 MONITORING REPORT

Appendices

Monitoring Studies and Project Summaries

August 31, 2011

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A. Regulatory Permit Summary

Regulatory Permit Summary

Permitting Agency	Agency Contact	Permit Number	Permit Expiration
Permits Obtained for Entire Project			
U.S. Army Corps of Engineers (Corps), San Francisco District 1455 Market Street San Francisco CA 94103-1398	Sahrye Cohen (415) 503-6779 sahrye.e.cohen@usace.army.mil	2008-00366N Covers entire project	July 20, 2019 Extension may be granted if requested at least one month before expiration date
U.S. Fish and Wildlife Service (USFWS or Service), Sacramento Office 2800 Cottage Way, Room W-2605 Sacramento CA 95825-1846	Ben Solvesky, ben_solvesky@fws.gov Ryan Olah, ryan_olah@fws.gov (916) 414-6600	81420-2009-F-0266-1 Biological Opinion for entire project: California freshwater shrimp California red-legged frog	Expires upon completion of the project
NOAA-NMFS, Southwest Region 325 Sonoma Avenue, Room 325 Santa Rosa CA 95404-6515	Joshua Fuller (707) 575-6096 Joshua.fuller@noaa.gov	Tracking Number 2008/08010 Biological Opinion for entire project: Central California Coast steelhead	2019
Permits Obtained by Implementation Phase			
San Francisco Bay Regional Water Quality Control Board (RWQCB) 1515 Clay Street, Suite 1400 Oakland CA 94612	Ann Riley (510) 622-2420 alriley@waterboards.ca.gov	Phase 1: Reaches 1 and 2 Site No. 02-28-C0338 CIWQS Place No. 735511	2019
		Phase 2: Reach 3 Site No. 02-28-C0338 CIWQS Place No. 735511	2020
		Phase 3: Reach 4 Site No. 02-28-C0377 CIWQS Place No. 763994	2021
California Department of Fish and Game (DFG), Bay Delta Region PO Box 47 Yountville CA 94599 7329 Silverado Trail Napa CA 94558	Suzanne Gilmore (707) 944-5536 Sgilmore@dfg.ca.gov	Phase 1: Reaches 1 and 2 Notification No. 1600-2009-0206-3	December 31, 2013
		Phase 2: Reach 3 Notification No. 1600-2010-0021-R3	December 31, 2014
		Phase 3: Reach 4 Notification No. 1600-2011-0036-R3	December 31, 2014

B. Restoration Reaches, Phases, and Construction Schedule

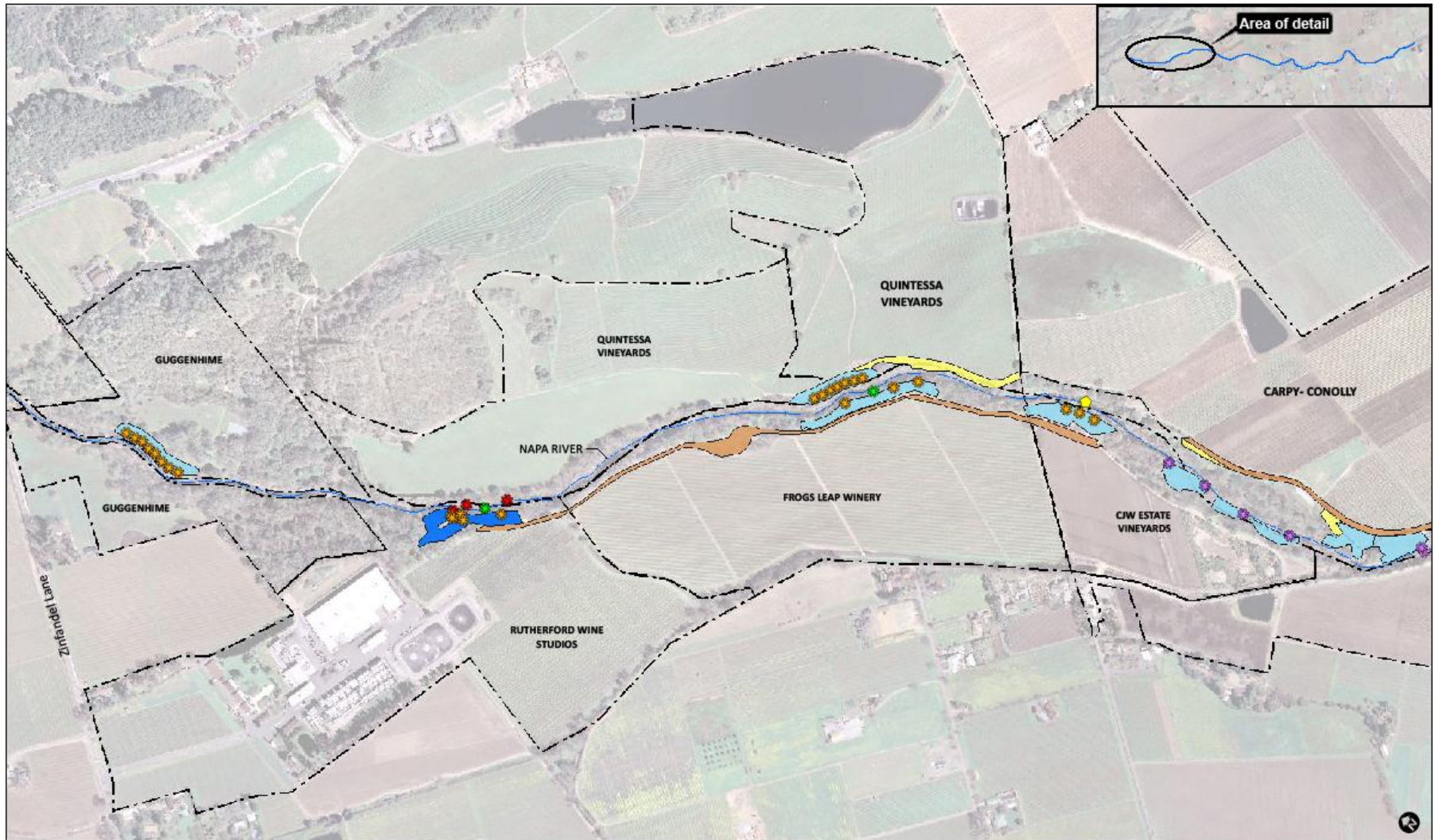
Restoration Reaches, Phases, and Construction Schedule

The Rutherford Reach of the Napa River spans between river stations 0 and 24,857, starting at the Oakville Cross Road Bridge and extending upstream to the Zinfandel Lane Bridge. As of the writing of this document, the anticipated schedule for the construction of the Napa River Rutherford Reach Restoration Project is as follows:

Construction Phase	Reaches	River Stations	Year
Zinfandel Lane Bridge	Upstream Limit Project Reach	24,857	
Phase 1-East Bank	Reach 1 and 2	24,857 - 18,600	2009
Phase 1-West Bank	Reach 1 and 2	24,857 - 18,600	2010
Phase 2	Reach 3	18,600 - 16,000	2010
Phase 3-East Bank	Reach 4	16,000 - 12,000	2011
Phase 3-West Bank	Reach 4	16,000 - 12,000	2012
Rutherford Cross Road Bridge	Middle of Project Reach	12,000	
Phase 4	Reach 8	7,800 - 3,400	2012 - 2013
Phase 5	Reach 9	3,400 - 0	2014
Phase 6	Reach 5	12,000 - 11,000	2015
Phase 6	Reach 6	11,000 - 9,200	2015
Phase 6	Reach 7	9,200 - 7,800	2015
Oakville Cross Road Bridge	Downstream Limit Project Reach	0	

C. Restoration Elements

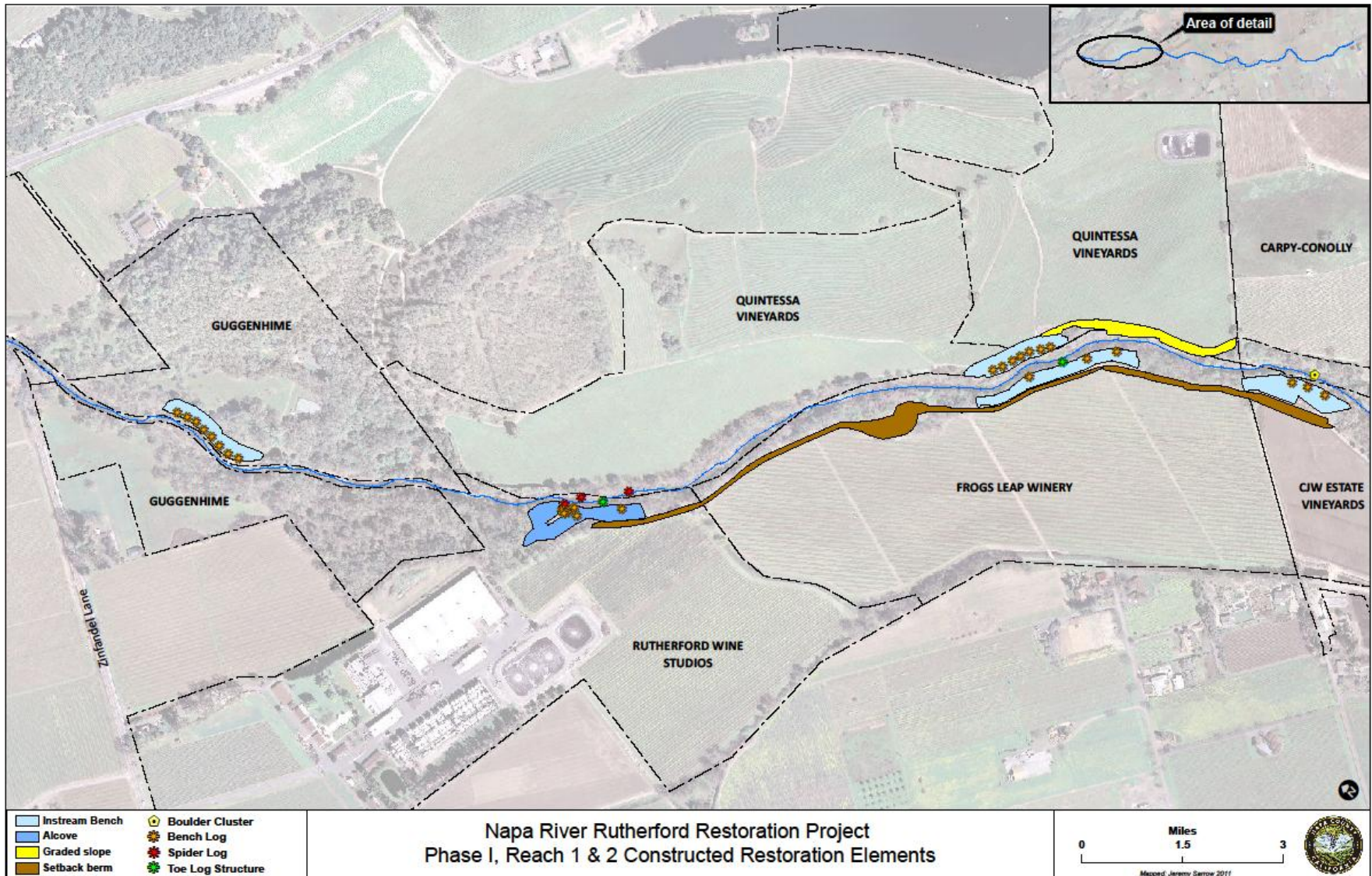
Restoration Element Maps

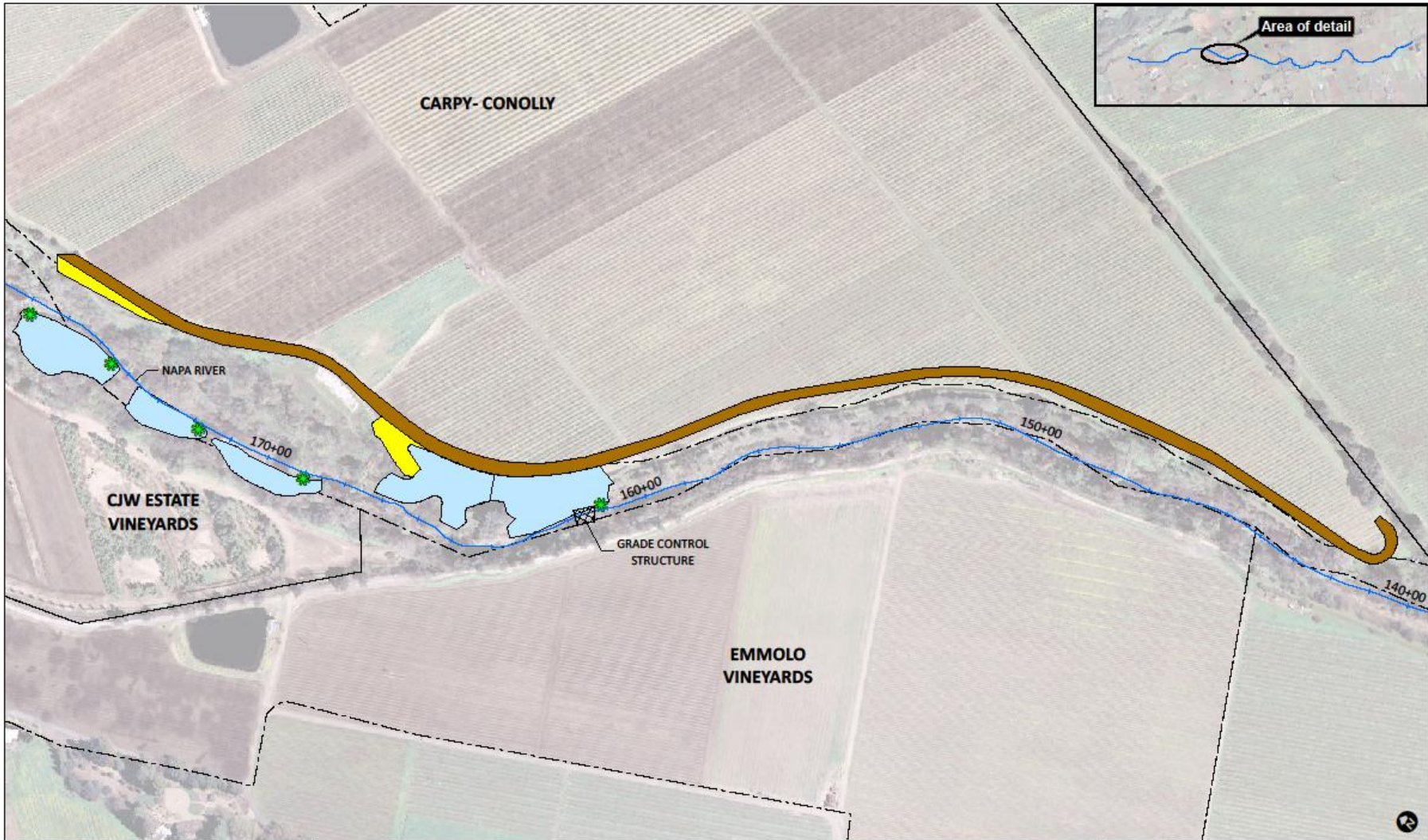


- | | |
|----------------|-------------------|
| Instream Bench | Boulder Cluster |
| Alcove | Bench Log |
| Graded slope | Root Wad |
| Setback berm | Spider Log |
| | Toe Log Structure |

Napa River Rutherford Restoration Project
Phase I & II, Reaches 1 - 3 Constructed Restoration Elements

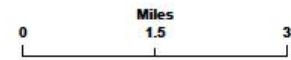


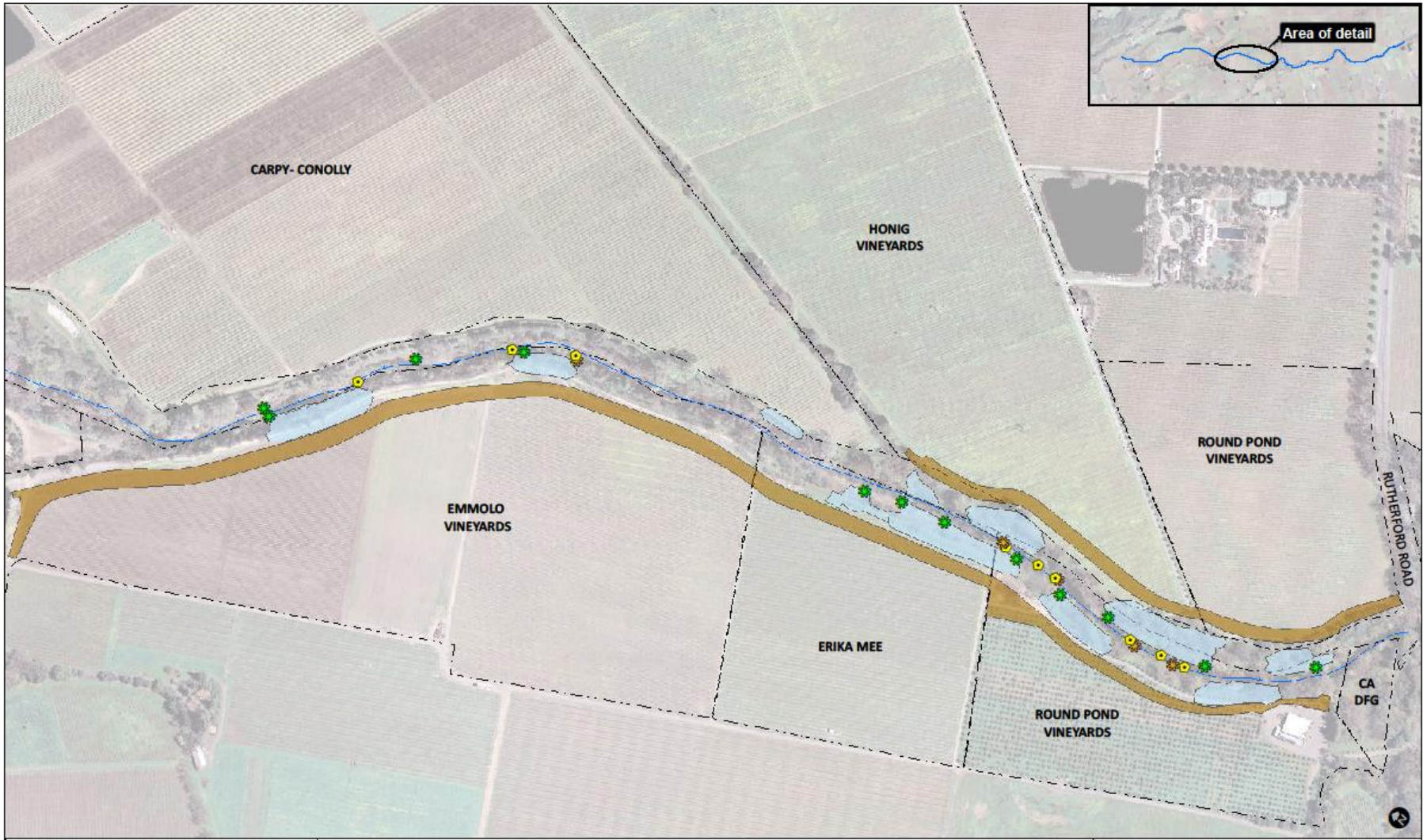




- Instream Bench
- Graded slope
- Setback berm
- Root Wad

Napa River Rutherford Restoration Project
Phase II, Reach 3 Constructed Restoration Elements






- Instream Bench
- Setback berm
- Root Wad
- Low Profile Log
- Boulder Cluster

**Napa River Rutherford Restoration Project
Phase III, Reach 4 Construction Restoration Elements**

0 Miles 3
 1.5

Mapped: Jeremy Sarno 2011



Restoration Elements: Graded Habitat Features

Year	Graded Structure by Project Phase	Rutherford Subreach	Designer / Bank	Upstream River Station (feet)	Downstream River Station (feet)	Channel Length by Phase (feet)	Channel Length Cumulative (feet)	Project Completion (%)	Treated Bank Length by Phase (feet)	Total Bank Length by Phase (feet)	Treated Bank Length Cumulative (feet)	Total Bank Length Cumulative (feet)	Treated Banks Cumulative (%)
2009	Phase 1a	Reaches 1-2 East Bank	ICF JAS, RSA	24,857	18,000	6,857	6,857	28%	1,900	13,714	1,900	13,714	14%
	Bench	Guggenhime	Left / East	23,950	23,450				500				
	Bench	Quintessa	Left / East	20,000	19,400				600				
	Bank Stabilization	Quintessa	Left / East	19,400	18,600				800				
2010	Phase 1b	Reaches 1-2 West Bank	ICF JAS, NHC	24,857	18,000	6,857	6,857	28%	1,975	13,714	3,875	13,714	28%
	Alcove	Ranch Winery/Sutter Home	Right / West	22,225	21,875				350				
	Bench	Ranch Winery/Sutter Home	Right / West	21,875	21,625				250				
	Bench	Frogs Leap	Right / West	19,900	19,100				800				
	Bench	Caymus	Right / West	18,600	18,025				575				
2010	Phase 2	Reaches 1-3	ESA PWA	18,600	16,000	2,600	9,457	38%	1,265	5,200	5,140	18,914	27%
	Bench 1	Caymus	Right / West	17,700	17,425				275				
	Bench 2	Caymus	Right / West	17,350	17,160				190				
	Bench 3	Caymus	Right / West	17,150	16,850				300				
	Bench 4	Carpy Conolly	Left / East	16,725	16,475				250				
	Bench 5	Carpy Conolly	Left / East	16,350	16,100				250				
2011	Phase 3a	Reach 4 East Bank	ESA PWA	16,000	12,000	4,000	13,457	54%	1,249	8,000	6,389	26,914	24%
	Bench 7	Carpy Conolly	Left / East	15,814	15,600				214				
	Bank Stabilization	Carpy Conolly	Left / East	14,450	14,300				150				
	Bank Stabilization	Honig	Left / East	13,925	13,800				125				
	Bench 11	Honig	Left / East	13,685	13,450				235				
	Bench 13	Honig	Left / East	13,150	12,775				375				
	Bench 14	Round Pond East	Left / East	12,575	12,425				150				
2012	Phase 3b	Reach 4 West Bank	ESA PWA	16,000	12,000	4,000	13,457	54%	1,330	8,000	7,719	26,914	29%
	Bench 6	Emmolo	Right / West	16,125	15,800				325				
	Bench 8	Emmolo	Right / West	15,275	15,075				200				
	Bench 9	Mee	Right / West	14,015	14,085				(70)				
	Bench 10	Mee	Right / West	13,915	13,500				415				
	Bench 12	Round Pond West	Right / West	13,300	13,100				200				
	Bank Stabilization	Round Pond West	Right / West	12,800	12,540				260				
2012 & After	Phase 4	Reach 8	ESA PWA	7,800	3,400	4,400	17,857	72%	5,025	8,800	12,744	35,714	36%
	Tributary	Sawyer	Right / West	7,725									
	Bench 1	Sawyer	Right / West	7,700	7,300				400				
	Bench 2	Wilsey	Left / East	7,100	6,400				700				
	Bank Stabilization 1	Wilsey	Left / East	6,250	5,800				450				
	Bank Stabilization	Sequoia Grove	Right / West	7,050	6,525				525				
	Bench 3	Davis	Right / West	6,475	5,900				575				
	Bench 4	Gmelch / Laird	Left / East	5,400	4,800				600				
	Bank Stabilization 2	Glos	Right / West	4,750	4,350				400				
	Bench 5	Laird	Left / East	4,525	4,475				50				
	Bench 6	Laird	Left / East	4,300	3,900				400				
	Bench 7	Laird	Left / East	3,675	3,250				425				
	Tributary Alcove	Cakebread	Right / West	3,750	3,400				350				
	Tributary Alcove	Nickel & Nickel	Right / West	3,400	3,250				150				
	Project	Reaches 1 - 9		24,857	0		24,857				12,744	49,714	26%

Restoration Elements: Instream Habitat Structures

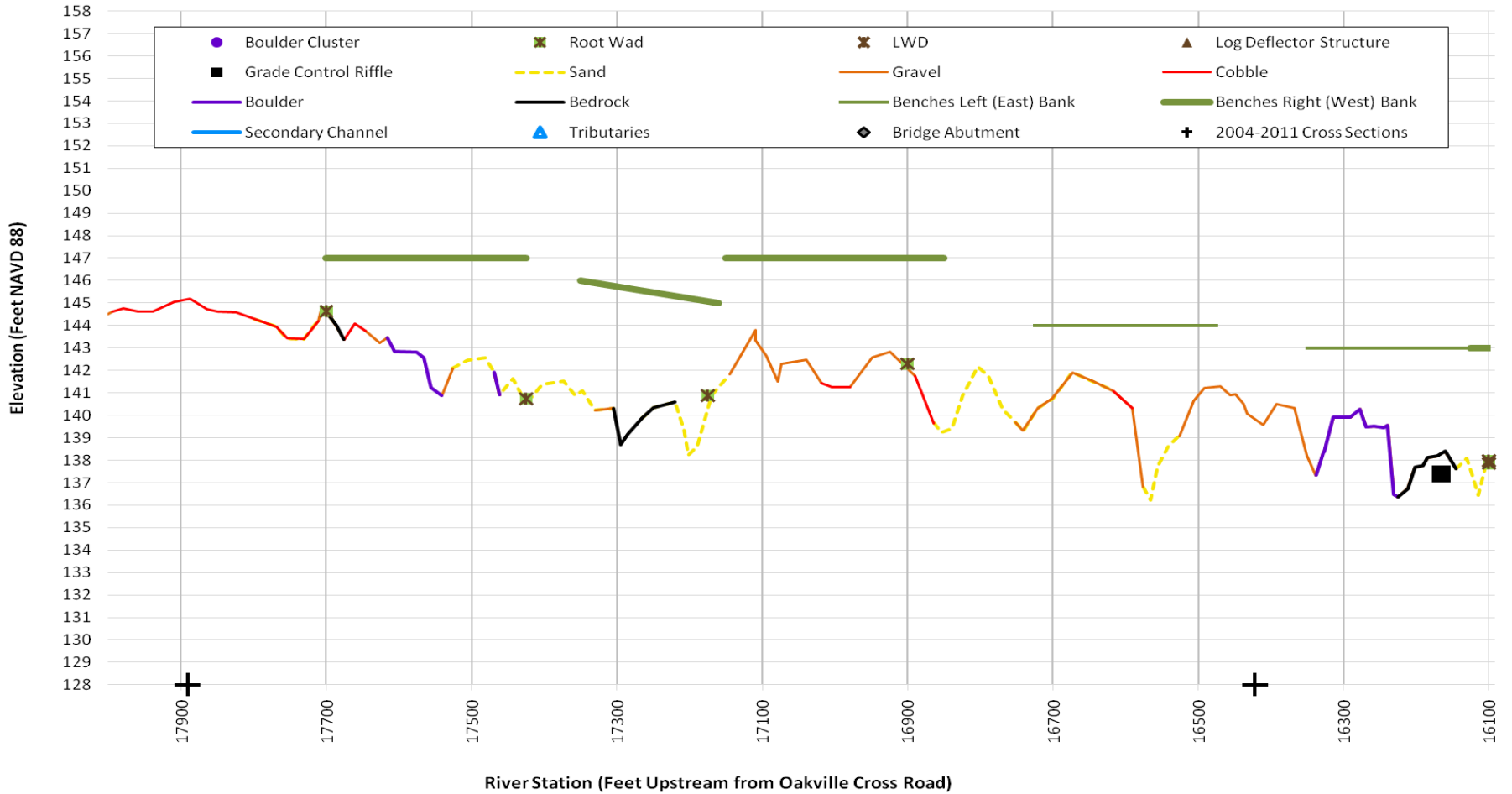
Year	Instream Habitat Structure by Phase	Rutherford Subreach	Designer / Bank	US River Station (feet)	DS River Station (feet)	Label ID	Associated Graded Structure or Nickname	US Station Associated Graded Structure	DS Station Associated Graded Structure
2009	Phase 1a	Reaches 1-2 East Bank	ICF JAS, RSA	24,857	18,000				
2009	Bench Log	Guggenhime	Left / East	23,920		WD-23920-L	Guggenhime Bench	23,950	23,450
2009	Bench Log	Guggenhime	Left / East	23,880		WD-23880-L	Guggenhime Bench	23,950	23,450
2009	Bench Log	Guggenhime	Left / East	23,830		WD-23830-L	Guggenhime Bench	23,950	23,450
2009	Bench Log	Guggenhime	Left / East	23,780	18,000	WD-23780-L	Guggenhime Bench	23,950	23,450
2009	Bench Log	Guggenhime	Left / East	23,730		WD-23730-L	Guggenhime Bench	23,950	23,450
2009	Bench	Guggenhime	Left / East	21,875	21,625	WD-23730-L	Guggenhime Bench	23,950	23,450
2009	Bench Log	Guggenhime	Left / East	23,680		WD-23680-L	Guggenhime Bench	23,950	23,450
2009	Bench Log	Guggenhime	Left / East	23,620		WD-23620-L	Guggenhime Bench	23,950	23,450
2009	Bench Log	Guggenhime	Left / East	23,560		WD-23560-L	Guggenhime Bench	23,950	23,450
2009	Bench Log	Quintessa	Left / East	19,780		WD-19780-L	Quintessa Bench	20,000	19,400
2009	Bench Log	Quintessa	Left / East	19,730		WD-19730-L	Quintessa Bench	20,000	19,400
2009	Bench Log	Quintessa	Left / East	19,685		WD-19685-L	Quintessa Bench	20,000	19,400
2009	Bench Log	Quintessa	Left / East	19,650		WD-19650-L	Quintessa Bench	20,000	19,400
2009	Bench Log	Quintessa	Left / East	19,610		WD-19610-L	Quintessa Bench	20,000	19,400
2009	Bench Log	Quintessa	Left / East	19,560		WD-19560-L	Quintessa Bench	20,000	19,400
2009	Bench Log	Quintessa	Left / East	19,505		WD-19505-L	Quintessa Bench	20,000	19,400
2010	Phase 1b	Reaches 1-2 West Bank	ICF JAS, NHC	24,857	18,600				
2010	Alcove Log	Sutter Home/The Ranch	Right / West	22,010		WD-22010-R	Ranch Winery / Sutter Home Alcove	22,225	21,900
2010	Alcove Log	Sutter Home/The Ranch	Right / West	22,000		WD-22000-R	Ranch Winery / Sutter Home Alcove	22,225	21,900
2010	Alcove Log	Sutter Home/The Ranch	Right / West	21,950		WD-21950-R	Ranch Winery / Sutter Home Alcove	22,225	21,900
2010	Alcove Log	Sutter Home/The Ranch	Right / West	21,915		WD-21915-R	Ranch Winery / Sutter Home Alcove	22,225	21,900
2010	Alcove Log	Sutter Home/The Ranch	Right / West	21,910		WD-21910-R	Ranch Winery / Sutter Home Alcove	22,225	21,900
2010	Alcove Log	Sutter Home/The Ranch	Right / West	21,900		WD-21905-R	Ranch Winery / Sutter Home Alcove	22,225	21,900
2010	Spider Log	Sutter Home/The Ranch	Right / West	22,100		WD-22100-R	Alcove Spider Log US		
2010	Spider Log	Sutter Home/The Ranch	Left / East	21,900		WD-21900-L	Alcove Spider Log DS		
2010	Spider Log	Quintessa	Left / East	21,700		WD-21700-L	Quintessa Spider Log		
2010	Toe Log Structure	Sutter Home/The Ranch	Right / West	21,850		WD-21850-R	Ranch Winery Bench Toe Log Structure	21,850	21,800
2010	Bench Log	Sutter Home/The Ranch	Right / West	21,710		WD-21710-R	Sutter Home/The Ranch Winery Bench	21,900	21,625
2010	Bench Log	Frogs Leap	Right / West	19,650		WD-19650-R	Frog's Leap Bench	19,900	19,100
2010	Bench Log	Frogs Leap	Right / West	19,375		WD-19375-R	Frog's Leap Bench	19,900	19,100
2010	Bench Log	Frogs Leap	Right / West	19,200		WD-19200-R	Frog's Leap Bench	19,900	19,100
2010	Toe Log Structure	Frogs Leap	Right / West	19,525		WD-19525-R	Frog's Leap Bench toe Log Structure	19,525	19,450
2010	Boulder Cluster	Frogs Leap	Mid Channel	18,250		BC-18250	Frog's Leap Bench	19,900	19,100
2010	Bench Log	Caymus	Right / West	18,350		WD-18350-R	Caymus Bench	18,600	18,025
2010	Bench Log	Caymus	Right / West	18,260		WD-18260-R	Caymus Bench	18,600	18,025
2010	Bench Log	Caymus	Right / West	18,175		WD-18175-R	Caymus Bench	18,600	18,025

Restoration Elements on Longitudinal Profile

Napa River Rutherford Reach Thalweg Profile 2009-2010

Phase 2: Reach 3

Restoration Elements Installed 2010



D. Monitoring Studies

Monitoring Parameter Protocols, References, and Frequency by Category Table
Sediment Load Reductions and Channel Morphology

Monitoring Parameter	Protocols	Reference Sources	Frequency
Sediment Delivery to the Channel: Length and Height (Surface Area) of Actively Eroding Banks (Failing graded slopes, mass wasting, slumps, flows, etc)	Mapping and Measurement of Height and Length of Actively Eroding Streambanks, Photodocumentation	Gerstein and Harris (2005) Harrelson et al. (1994) Nossaman et al. (2007)	Annually
Channel Adjustment / Incision: Bed Deposition or Scour in Control Versus Treated Reaches	Cross Section Transects, Local Longitudinal Thalweg Survey, Photodocumentation	Flosi et al / CDFG. (1998) Gerstein (2005) Harrelson et al (1994) Gerstein (2005) Harrelson et al (1994)	Pre-and Post-Construction, and/or Post Significant Channel Forming Event
Bankfull Width to Depth Ratio: Entrenchment	Cross Section Transects	Fitzpatrick et al (1998) Rosgen (1996)	Pre-and Post-Construction, and/or Post Significant Channel Forming Event
Flood Stage / High Water Mark	Cross Section Transects	Fitzpatrick et al (1998)	Pre-and Post-Construction, and/or Post Significant Channel Forming Event
Bank Stability <i>(Rates of Widening at reference vs. restored cross sections)</i>	Cross Section Transects	Gerstein and Harris (2005) Nossaman et al. (2007)	Pre-and Post-Construction, and/or Post Significant Channel Forming Event
Channel Planform Network (Primary and Secondary Channels)	Photodocumentation of Constructed Alcoves Air Photo Analysis (As Available)	Fitzpatrick et al (1998)	Post Significant Channel Forming Event; As Available

Aquatic Habitat

Monitoring Parameter	Reference Sources	Protocols	Frequency
Large Woody Debris Logs and Jams (>12 inch diameter, or clump of >4 pieces)	Gerstein (2005) Flosi et al / CDFG. (1998)	Mapping and Categorization of LWD by geomorphic unit, salmonid habitat function, and risk to bank stability; Photodocumentation	Annually
Channel Geomorphic Heterogeneity: Riffle Habitat Frequency and Distribution		Mapping of Riffle Crests with GPS	Annually
Installed Habitat Structure (LWD/Boulder/Other) Affect on Increasing Pool Depth and Habitat Complexity	Lisle (1987)	Measurement of Residual Pool Depth at Locations of Installed Habitat Structures (LWD/Boulder/Other)	Annually
Installed Habitat Structure Persistence (LWD/Boulder/Other)	Lisle (1987)	Evaluation of Persistence and Status at Locations of Installed Habitat Structures	Annually
Areas requiring trash removal		Mapping,Photodocumentation	Annually
Channel Geomorphic Heterogeneity: Riffle, Pool and Glide Habitat Distribution	Flosi et al / CDFG (1998) Gerstein (2005) Harrelson et al. (1994); USDA R-5s Bulletin Number One	Cross Section Transects,Local Longitudinal Thalweg Survey or Habitat Unit Mapping at Locations of Installed Structures.	Pre-and Post-Construction, and Post Significant Channel Forming Event
Spawning Gravel Recruitment: Channel Substrate Size Distribution / Riffle Median Grain Size (D50)	Bunte & Abt (2001) Cover et al (2008) Fitzpatrick et al (1998) USDA (2003) Wolman (1954)	Modified Wolman Pebble Count, and/or Grid Pebble Count at Riffle Crests near Cross Section Transects	Pre-and Post-Construction, and Post Significant Channel Forming Event
Area of Low Velocity High Flow Refugia Within Bankfull at Constructed Alcoves and Bankfull Benches	USDA (2003) Gerstein (2005) Flosi et al / CDFG. (1998) Fisheries Biologist Expert Opinion	Habitat Unit Mapping and/or Sketch of River Flow Pattern; Description of Restoration Feature Affect on River Flow Pattern and Relative Velocity; Photodocumentation; Velocity Flow Measurements in Constructed High Flow Refugia Habitat	Representational Seasonal River Flow Stages (Winter and Spring)

Riparian Habitat

Monitoring Parameter	Protocols	Reference Sources	Frequency
Areas requiring weed control, including infestations of Pierce's disease host species	Mapping, Photodocumentation, Land Owner Request Forms	Harris (1999, 2005) Herrick et al (2005 a) Interagency Technical Reference (1996)	Annually
Areas requiring trash removal	Mapping, Photodocumentation		Annually
Riparian Vegetation Buffer Width	Cross Section Transects, Vegetation Surveys Air Photo Analysis (As Available)	Harris (1999, 2005)	Pre-and Post-Construction, and/or Post Significant Channel Forming Event
Riparian Vegetation Buffer Width for first five years after planting	As Built Surveys Air Photo Analysis (As Available)	Harris (1999, 2005)	Post Construction
Number of Pierce Disease Host Plant Infestations for first five years after planting	Area Mapping Vegetation Survey; Direct Count Vegetation Survey; Photodocumentation	Herrick et al (2005 a) Interagency Technical Reference (1996)	Establishment Years, 1,2,3 by contractor; Years 5 and 7 by Maintenance Assessment District
Restoration Planting Survival (80% in first five years after planting)	Cross Section Transect Vegetation Survey; Direct Count Vegetation Survey; Photodocumentation	Nossaman et al. (2007) Harris (1999, 2005) Gaffney (2008)	Establishment Years, 1,2,3 by contractor; Years 5 and 7 by Maintenance Assessment District

Stakeholder Participation

Monitoring Parameter	Protocols	Reference Sources	Frequency
Landowner participation in adaptive monitoring and management	Landowner maintenance requests and access agreements	FISRWP (2001)	As Events Occur
Landowner Advisory Committee (LAC) participation	Meeting minutes; Surveys of participation; Opinion surveys of effectiveness	FISRWP (2001)	As Events Occur

Monitoring Parameter Protocols, References, and Category by Frequency Table

Annual Stream Reach Survey

Monitoring Parameter	Protocols	Reference Sources	Category
Sediment Delivery to the Channel: Length and Height (Surface Area) of Actively Eroding Banks (Failing graded slopes, mass wasting, slumps, flows, etc)	Mapping and Measurement of Height and Length of Actively Eroding Streambanks, Photodocumentation	Gerstein and Harris (2005) Harrelson et al. (1994) Nossaman et al. (2007)	Sediment Load Reductions & Channel Morphology
Large Woody Debris Logs and Jams (>12 inch diameter, or clump of >4 pieces)	Mapping and Categorization of LWD by geomorphic unit, salmonid habitat function, and risk to bank stability; Photodocumentation	Gerstein (2005) Flosi et al / CDFG. (1998)	Aquatic Habitat Quality
Channel Geomorphic Heterogeneity: Riffle Habitat Frequency and Distribution	Mapping of Riffle Crests with GPS		Aquatic Habitat Quality
Installed Habitat Structure (LWD/Boulder/Other) Affect on Increasing Pool Depth and Habitat Complexity: Residual Pool Depth (Change in Pool Storage of Fines)	Measurement of Residual Pool Depth at Locations of Installed Habitat Structures (LWD/Boulder/Other)	Lisle (1987)	Aquatic Habitat Quality
Installed Habitat Structure Persistence (LWD/Boulder/Other)	Evaluation of Persistence and Status at Locations of Installed Habitat Structures	Lisle (1987)	Aquatic Habitat Quality
Areas requiring weed control, including infestations of Pierce's disease host species	Mapping, Photodocumentation, Land Owner Request Forms	Harris (1999, 2005) Herrick et al (2005 a) Interagency Technical Reference (1996)	Riparian / Floodplain Habitat Quality
Areas requiring trash removal	Mapping, Photodocumentation		Aquatic & Riparian Habitat Quality

Repeat Channel Transect Surveys and Local Longitudinal Profiles

Monitoring Parameter	Protocols	Reference Sources	Category
Channel Adjustment: Bed Deposition or Scour in Control Versus Treated Reaches	Cross Section Transects, Local Longitudinal Thalweg Survey, Photodocumentation	Flosi et al / CDFG. (1998) Gerstein (2005) Harrelson et al (1994) Gerstein (2005) Harrelson et al (1994)	Sediment Load Reductions & Channel Morphology
Bankfull Width to Depth Ratio: Entrenchment	Cross Section Transects	Fitzpatrick et al (1998) Rosgen (1996)	Sediment Load Reductions & Channel Morphology
Flood Stage / High Water Mark	Cross Section Transects	Fitzpatrick et al (1998)	Sediment Load Reductions & Channel Morphology
Bank Stability <i>(Rates of Widening at reference vs. restored cross sections)</i>	Cross Section Transects	Gerstein and Harris (2005) Nossaman et al. (2007)	Sediment Load Reductions & Channel Morphology
Channel Planform Network (Primary and Secondary Channels)	Photodocumentation of Constructed Alcoves, Local Longitudinal Thalweg Profile; Velocity Profile; Photodocumentation Air Photo Analysis (As Available)	Fitzpatrick et al (1998)	Sediment Load Reductions & Channel Morphology
Channel Geomorphic Heterogeneity: Riffle, Pool and Glide Habitat Distribution	Cross Section Transects, Local Longitudinal Thalweg Survey or Habitat Unit Mapping at Locations of Installed Structures.	Flosi et al / CDFG (1998) Gerstein (2005) Harrelson et al. (1994); USDA R-5s Bulletin Number One	Pre-and Post-Construction, and Post Significant Channel Forming Event
Spawning Gravel Recruitment: Channel Substrate Size Distribution / Riffle Median Grain Size (D50)	Modified Wolman Pebble Count, and/or Grid Pebble Count at Riffle Crests near Cross Section Transects	Bunte & Abt (2001) Cover et al (2008) Fitzpatrick et al (1998) USDA (2003) Wolman (1954)	Aquatic Habitat Quality
Riparian Vegetation Buffer Width	Cross Section Transects, Vegetation Surveys Air Photo Analysis (As Available)	Harris (1999, 2005)	Riparian / Floodplain Habitat Quality

Seasonal Aquatic Habitat Surveys of Constructed Alcoves and Bankfull Instream Benches

Monitoring Parameter	Protocols	Reference Sources	Category
Area of Low Velocity High Flow Refugia Within Bankfull at Constructed Alcoves and Bankfull Benches	Habitat Unit Mapping and/or Sketch of River Flow Pattern; Narrative Description of Restoration Feature Affect on River Flow Pattern and Relative Velocity; Photodocumentation; Velocity Flow Measurements in Accessible Areas of High Flow Refugia Habitat in Constructed Alcoves and Bankfull Benches	USDA (2003) Gerstein (2005) Flosi et al / CDFG. (1998) Fisheries Biologist Expert Opinion	Aquatic Habitat Quality

Phased Vegetation Establishment Years 1,2,3,5 and 7

Monitoring Parameter	Protocols	Reference Sources	Category
Riparian Vegetation Buffer Width for first five years after planting	As built survey; Air Photo Analysis (As Available)	Harris (1999, 2005)	Riparian / Floodplain Habitat Quality
Number of Pierce Disease Host Plant Infestations for first five years after planting	Area Mapping Vegetation Survey; Direct Count Vegetation Survey; Photodocumentation	Herrick et al (2005 a) Interagency Technical Reference (1996)	Riparian / Floodplain Habitat Quality
Restoration Planting Survival (80% in first five years after planting)	Cross Section Transect Vegetation Survey; Direct Count Vegetation Survey; Photodocumentation	Nossaman et al. (2007) Harris (1999, 2005) Gaffney (2008)	Riparian / Floodplain Habitat Quality

As Air Photos Become Available

Monitoring Parameter	Protocols	Reference Sources	Category
Channel Planform Network (Primary and Secondary Channels)	Photodocumentation of Constructed Alcoves Air Photo Analysis	Fitzpatrick et al (1998)	Stream Channel Geometry, Capacity, & Stability
Riparian Vegetation Buffer Width	Cross Section Transects, Vegetation Surveys Air Photo Analysis	Harris (1999, 2005)	Riparian / Floodplain Habitat Quality

As Events Occur

Monitoring Parameter	Protocols	Reference Sources	Category
Landowner participation in adaptive monitoring and management	Landowner maintenance requests and access agreements	FISRWP (2001)	Stakeholder Participation
Landowner Advisory Committee (LAC) participation	Meeting minutes; Surveys of participation; Opinion surveys of effectiveness	FISRWP (2001)	Stakeholder Participation

I. Stream Flow Measurements

Stream Flow Measurements

Annual Survey Results

2010

Peak discharge in the winter of 2010 following the first season of project construction in 2009 in Phase 1a, Reaches 1-2 east bank was 2,800 cfs on January 20, 2010. The bankfull instream benches on the Guggenime and Quintessa properties inundated at the 1.25 year recurrence interval flood.

2011

The Phase 1a benches, and all of the benches constructed in 2010 in Phase 1b, reaches 1-2 West bank, and Phase 2, Reach 3, were inundated several times during the winter of 2011. In 2011 the peak winter flood event occurred on March 20, 2011 and was 4,080 cfs, which is between a 1.5 year and 2 year recurrence interval flood.

Annual Peak Flows

Hydrologic Unit Code 18050002 Latitude 38°30'41", Longitude 122°27'17" NAD27

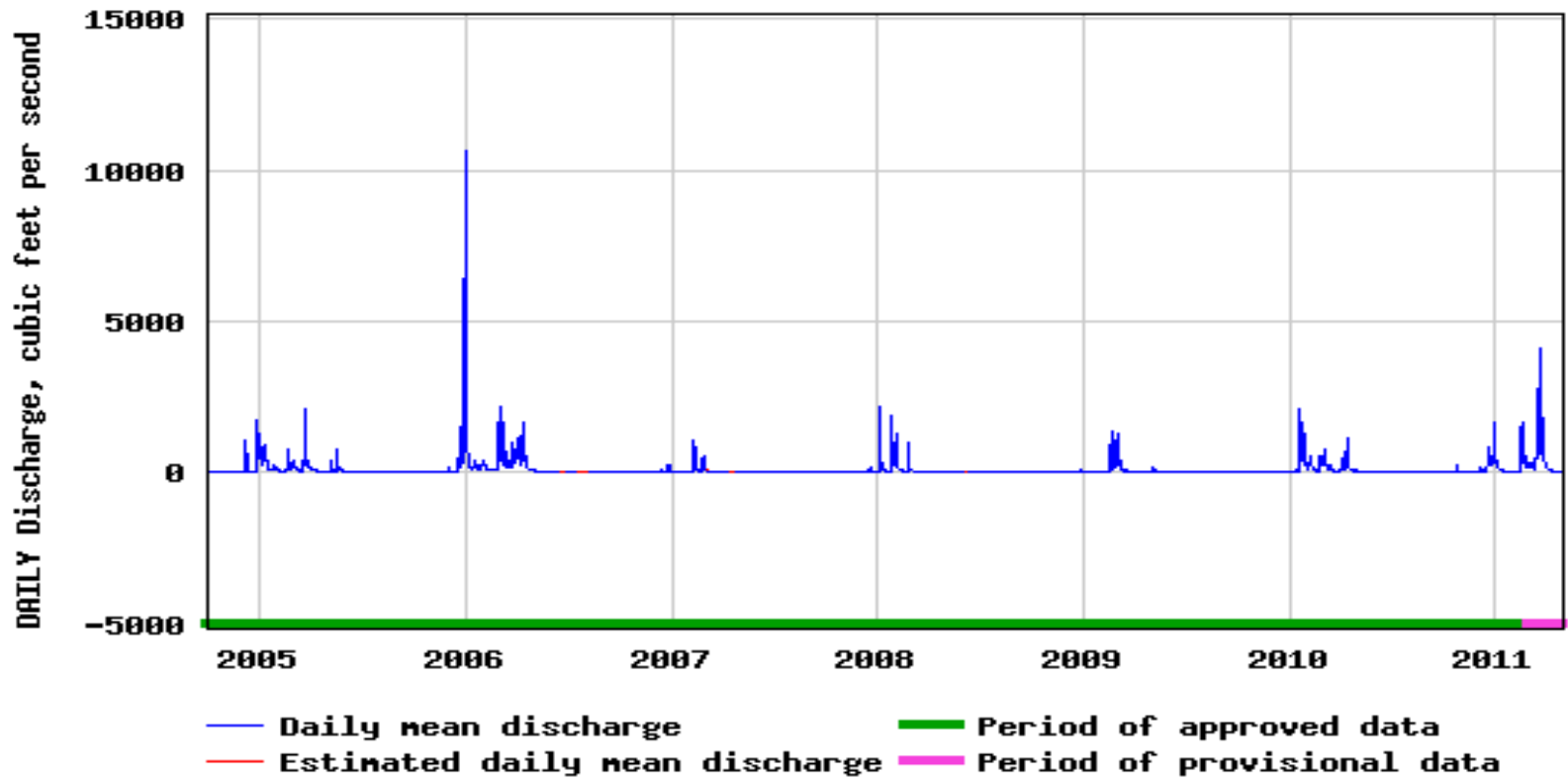
Drainage Area 78.8 square miles Gage Datum 193.21 feet above NGVD29

$Q_{1.25} = 2,870$ cfs $Q_{1.5} = 3,843$ cfs $Q_2 = 5,790$ cfs $Q_5 = 10,100$ cfs $Q_{10} = 13,000$ cfs $Q_{100} = 21,000$ cfs

Water Year	Peak Discharge (cfs)	Peak Discharge Date	Gage Height (feet)
2004	7,760	December 29, 2003	14.92
2005	3,890	March 22, 2005	10.80
2006	18,300	December 31, 2005	23.61
2007	1,350	December 26, 2006	6.87
2008	4,460	January 04, 2008	14.08
2009	2,800	February 22, 2009	11.06
2010	3,950	January 20, 2010	13.31
2011	4,080	March 20, 2011	



USGS 11456000 NAPA R NR ST HELENA CA



2011 High Water Mark and Water Surface Elevations for Velocity Monitoring of High Flow Refugia

	Discharge Napa River Near St. Helena at Pope Street Bridge (cfs)	Water Surface Elevation (ft NAVD88)					
		Sutter Alcove	Frogs Leap Bench 1	Caymus Bench 0	Caymus Bench 1	Caymus Bench 2	Caymus Bench 3
River Station		21950	19680	18300	17500	17290	17050
HWM 2/16/2011	2,930		160.31	157.22	155.94	155.36	154.74
WSEL 2/16/2011 10:36	1,150	159.96					
WSEL 2/16/2011 11:03	1,120		156.13				
WSEL 2/16/2011 11:22	1,100			152.40			
WSEL 2/16/2011 11:42	1,070				150.18		
WSEL 2/16/2011 12:11	1,030						149.20
HWM 2/17/2011	3,160	165.38	160.92	157.89	156.81	156.30	155.75
WSEL 2/23/2011	228	155.52	151.61	148.34	145.49	145.52	144.76

II. Eroding Streambank Survey

Eroding Streambanks

Annual Results

The Annual Stream Reach Survey is conducted each spring prior to the start of the summer construction season. The reduction of eroding bank length in a given construction phase is evaluated for the first time the following June, after one winter stream flow season.

The target goal is to reduce the surface area of eroding banks in the entire Rutherford Reach (Reaches 1-9) by 75%, which is measured annually under the channel monitoring survey conducted by Napa County each June. Comparison of eroding banks mapped during the first two annual channel maintenance surveys, shows that eroding bank length was reduced in the Rutherford Reach (Reaches 1-9) by 38% from 14,674 to 9,032 feet. Approximately 1,900 feet of this reduction was due to treatment of eroding banks with restoration construction in Phase 1 Reaches 1 and 2 in 2009.

2009

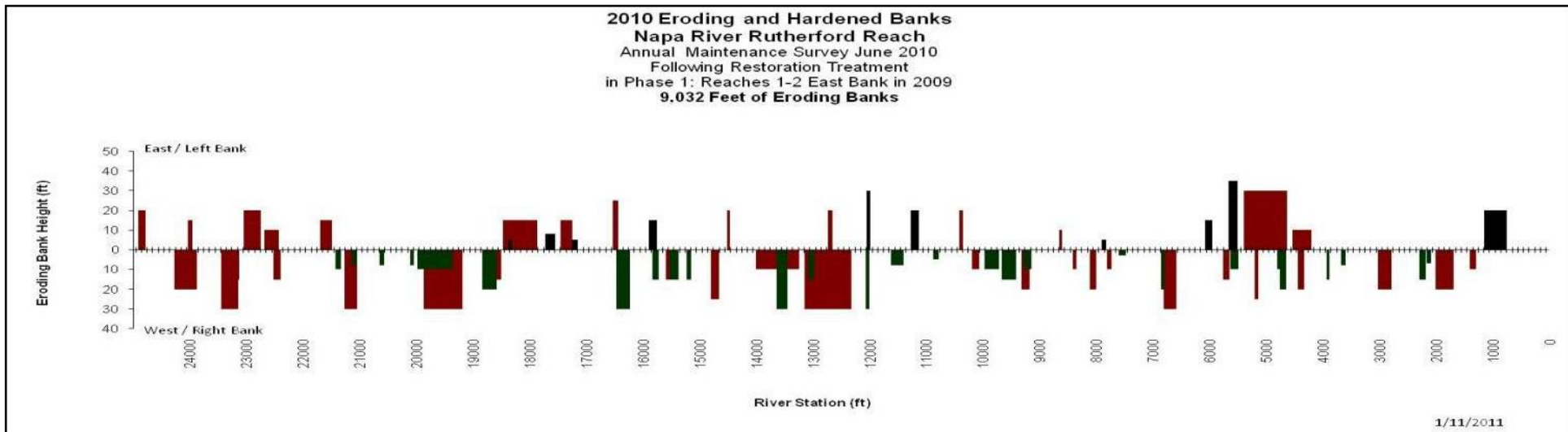
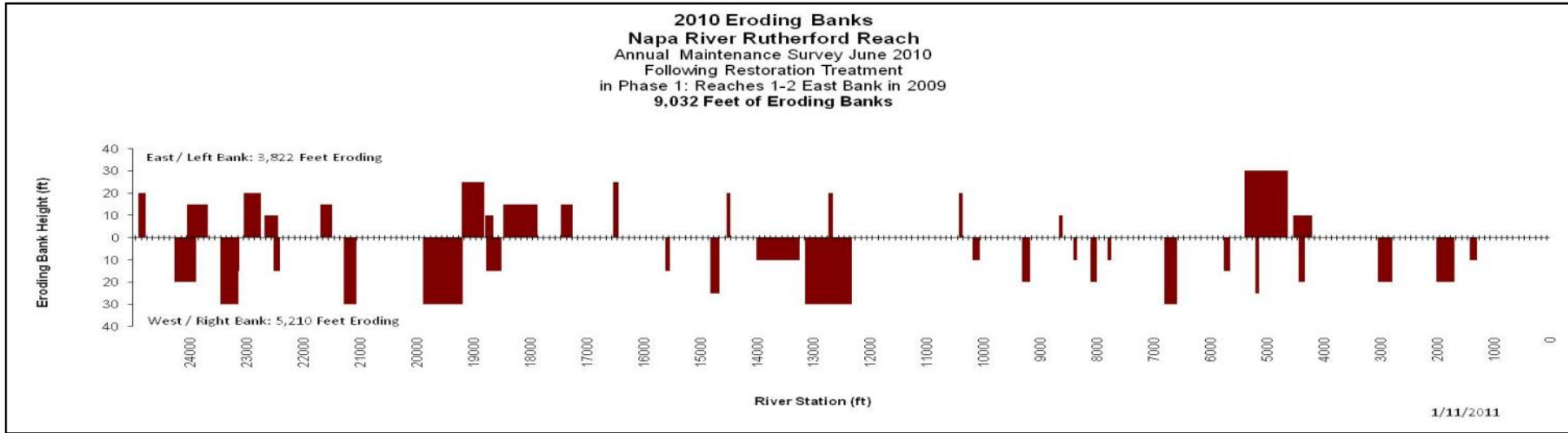
In 2009, 14,674 feet of channel banks were eroding, or 30% of the channel bank length in the Rutherford Reach. A 75% reduction in eroding bank length by 2017 would require that no more than 7.5% of the channel bank length in the Rutherford Reach was eroding. This requires that no more than 3,700 total linear feet of the 49,714 feet of left (east) and right (west) banks are eroding to meet the sediment source reduction goal of the Project.

The baseline survey conducted in June 2009 mapped 14,674 linear feet of eroding banks throughout the Rutherford Reach: 8,538 linear feet on the left (east) bank, and 6,136 feet on the right (west) bank. Eroding bank sections ranged from 20 to 35 feet high. The longest contiguous sections of eroding bank on the right (west) bank spanned 140 feet between stations 21,500 - 21,360 (20 feet high) on the Guggenhime property; and 1,470 feet between stations 5,475 – 4,005 (20 feet high) on the Laird property, and on the left bank spanned 680 feet between stations 12,690 – 12,010 (35 feet high) on the Round Pond West property; and spanned a nearly contiguous stretch of 1,450 feet over three sections between stations 2,680 – 1,230 (feet high) on the Opus One property. The most rapidly eroding section of the river spanned 270 feet between right (east) bank river stations 6900 – 6,630 on the Sequoia Grove property. According to air photo analysis, and field observations since 2004, the 20 foot high bank at Sequoia Grove has been retreating at an average rate of 2 feet per year. This section of the channel is devoid of riparian vegetation buffer and is a high priority for restoration, to curb fine sediment delivery to the stream channel, and because rapid bank collapse is migrating downstream and threatening a residential home on the adjacent Frostfire/Davis (previously Mueller) property.

2010

In June 2010, 9,032 linear feet of eroding banks were mapped throughout the Rutherford Reach: 3,822 linear feet on the left (east) bank, and 5,210 feet on the right (west) bank constituting 18% of the channel bank length in the Rutherford Reach. This constitutes a reduction of 12% compared to the 2009 baseline. A minimum further reduction of 11% in total eroding bank length is required to meet the goals of the project. Eroding bank sections ranged from 10 to 30 feet high.

Eroding Streambanks Chart

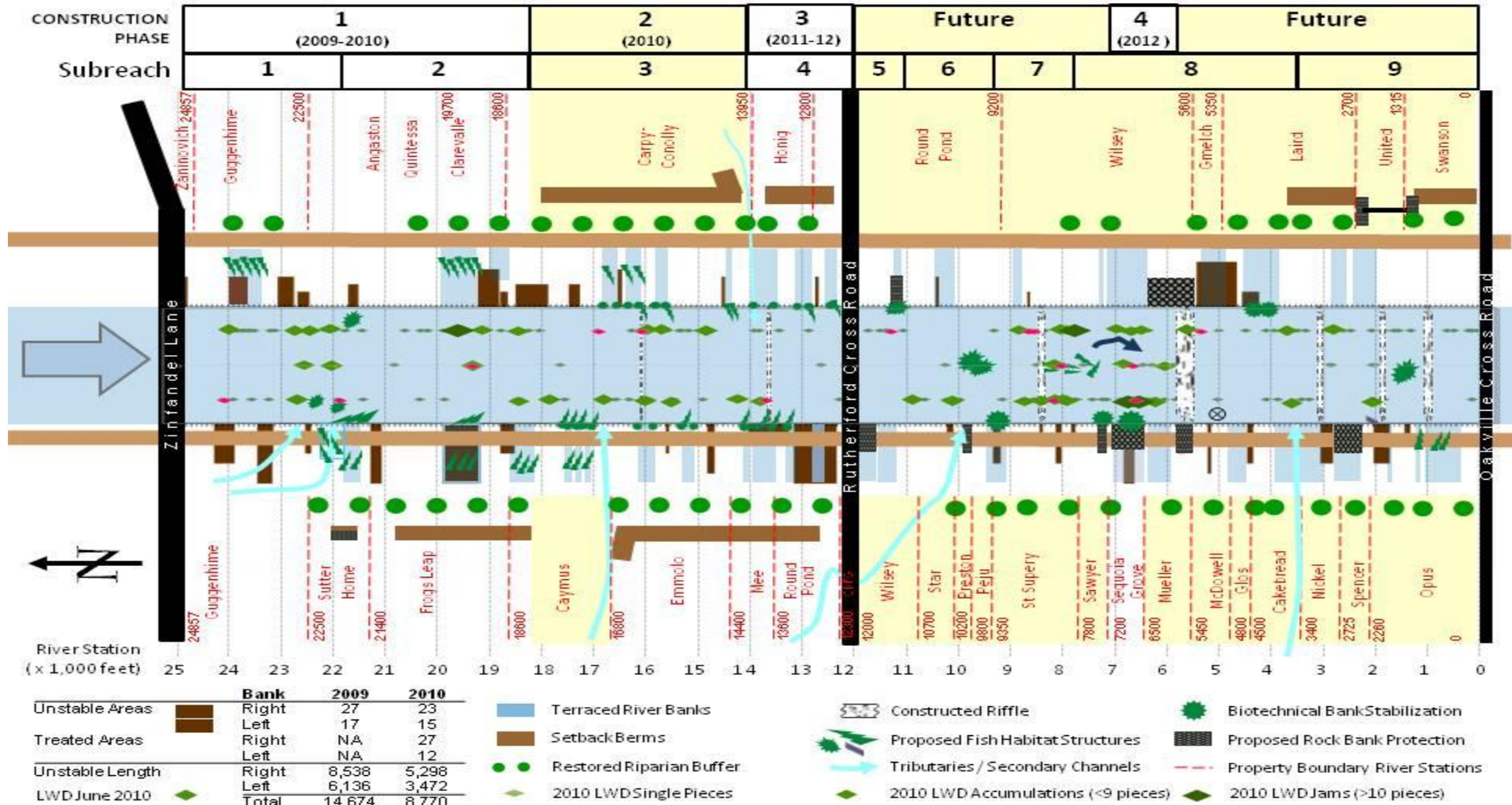


Eroding Streambanks Table
Linear Feet of Unstable or Potentially Unstable Eroding Banks Table

	2009 Annual Stream Survey	2010 Annual Stream Survey
Rutherford Reach	14,674 feet	9,032 feet

Restoration Project Schematic with 2010 Eroding Banks and Large Woody Debris

Napa River Rutherford Reach Restoration Project



	Bank	2009	2010
Unstable Areas	Right	27	23
	Left	17	15
Treated Areas	Right	NA	27
	Left	NA	12
Unstable Length	Right	8,538	5,298
	Left	6,136	3,472
LWD June 2010	Total	14,674	8,770

III. Sediment Source Reduction Calculations

SEDIMENT SOURCE REDUCTION

Annual Results Summary

2010

Implementation of Phases 1-2 combined will reduce fine sediment loading by 5,337 metric tons/year for twenty years, or 28% of the total target reduction for the Napa River watershed from mainstem channel incision and bank erosion sources.

2011

It is estimated that implementation of Phase 3 restoration will increase the reduction in fine sediment loading to 9,950 metric tons/year, or 52% of the total target sediment reduction on the Napa River.

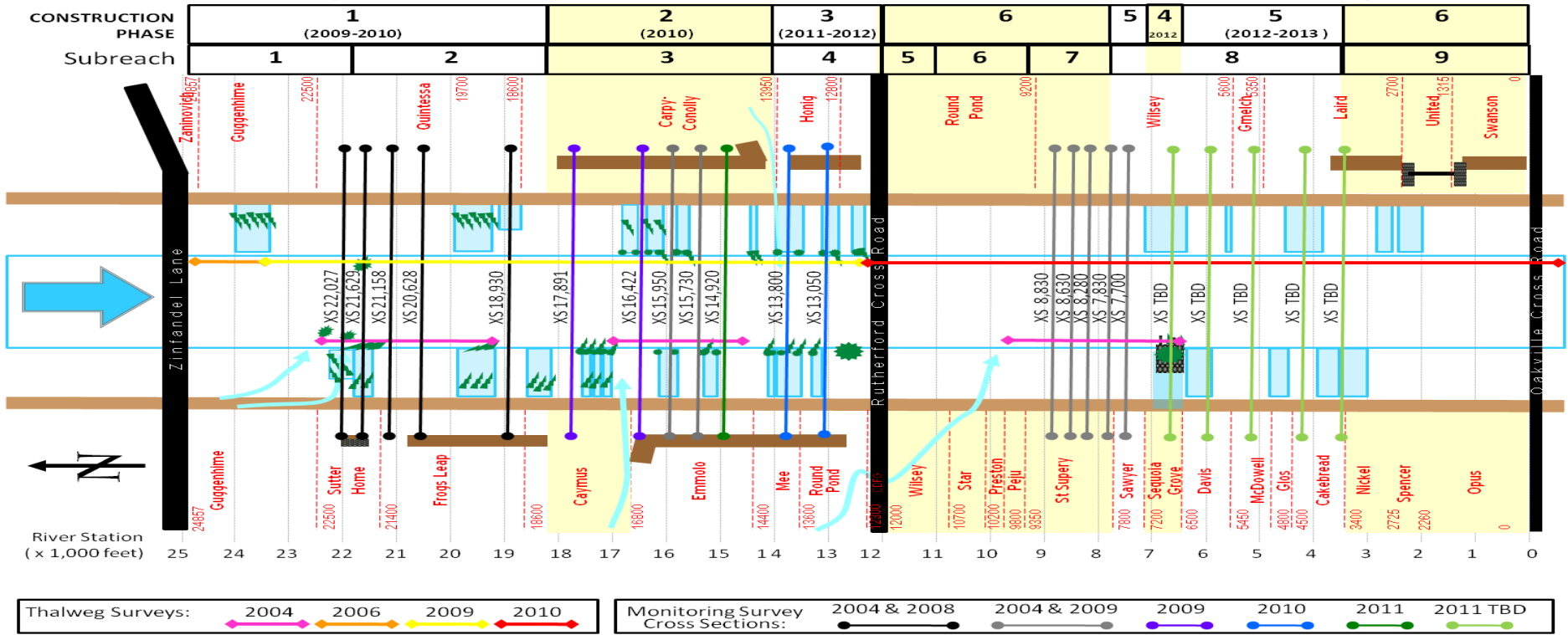
Annual Results Summary Table

Phase	Phase Upstream Station (feet)	Phase Downstream Station (feet)	Drainage Area (square miles)	Linear Feet	Miles	Cubic Yards Cut from Channel Banks	Cubic Meters Cut from Channel Banks	Metric Tons Cut from Channel Banks (Bulk Density of 1.6 metric tons/cubic meter)	Metric Tons/ Year (over 20 years) Reduced Sedimentation due to Cut from Channel Banks	Metric Tons/Mile/ Year (over 20 years) Reduction in Yearly Bank Erosion Rates (Assuming 750 tons/ mile/year)	TOTAL ANNUAL REDUCTION IN SEDIMENT DELIVERY TO THE CHANNEL (Metric tons/year)	RWQCB GRTS Reporting Year
1	24,857	18,600	83	6257	1.19	48,041	36,730	58,768	2,938	889	3,827	2010
2	18,600	16,000	85	2600	0.49	18,639	14,251	22,801	1,140	369	1,509	2010
1 -2	24,857	16,000	85	8857	1.68	66,680	50,981	81,569	4,078	1,258	5,337	2010

IV. Longitudinal Profile Thalweg Surveys

Longitudinal Profile Thalweg Survey Location Schematic

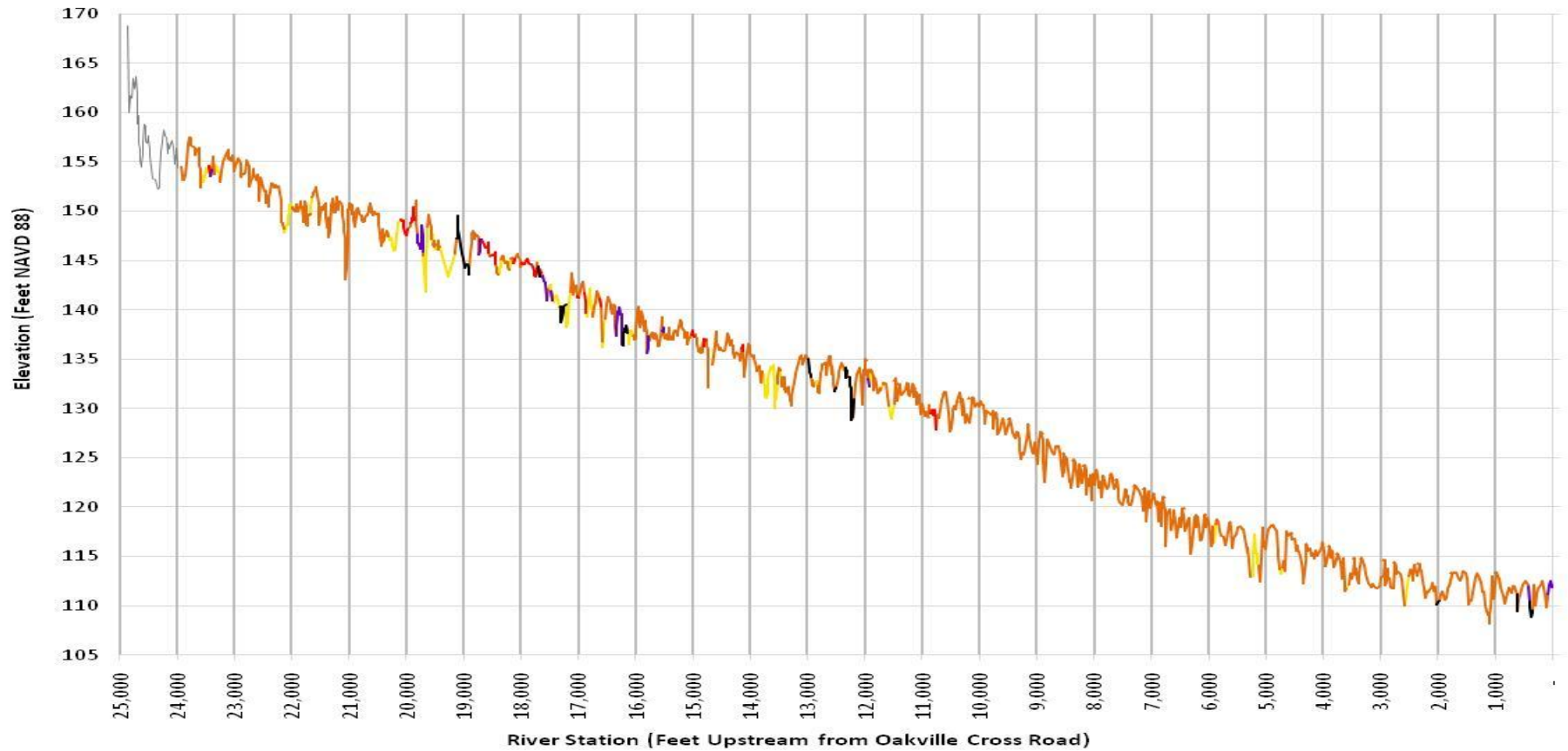
Napa River Rutherford Reach Restoration Project



Longitudinal Profile Thalweg Survey

Napa River Rutherford Reach Thalweg Profile 2009-2010
Zinfandel Lane to Oakville Cross Road

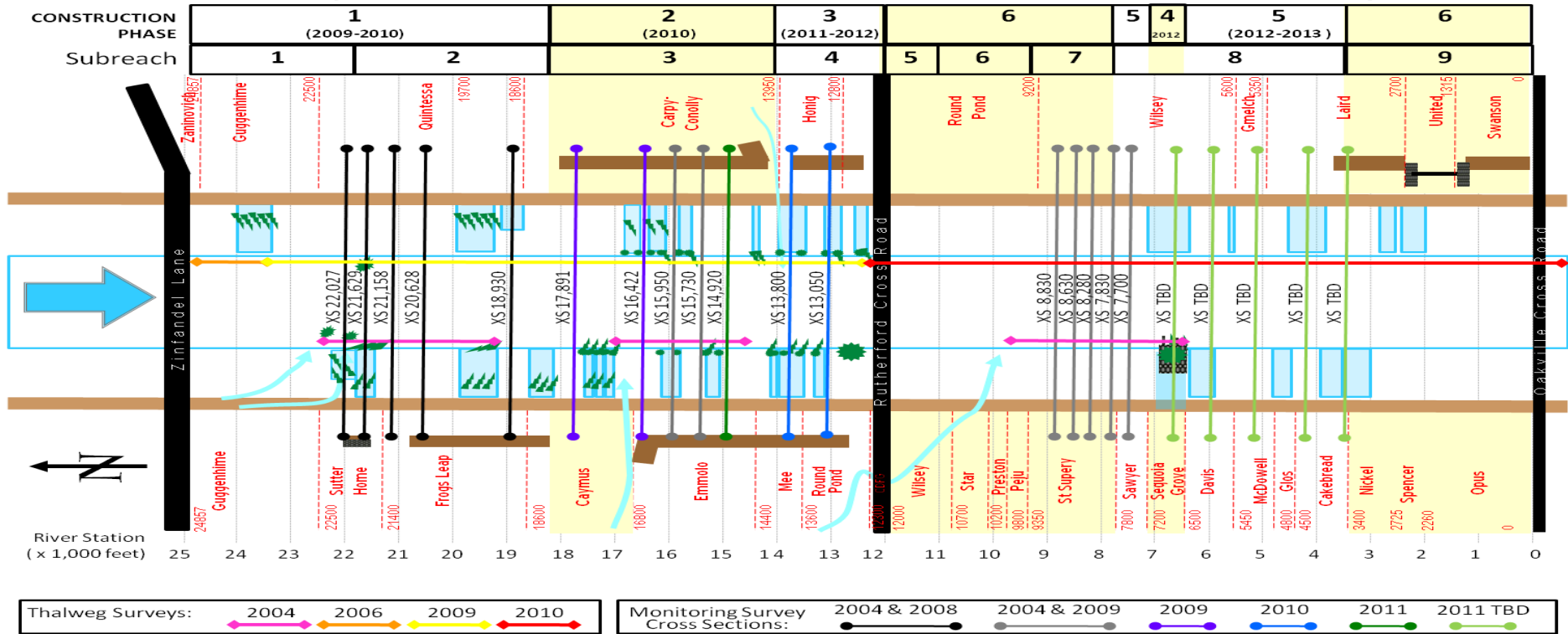
— Sand — Gravel — Cobble — Boulder — Bedrock — 2006 (No Substrate Data)



V. Channel Transect Surveys

Cross Section Transect Survey Location Schematic

Napa River Rutherford Reach Restoration Project



Monitoring Cross Section Map

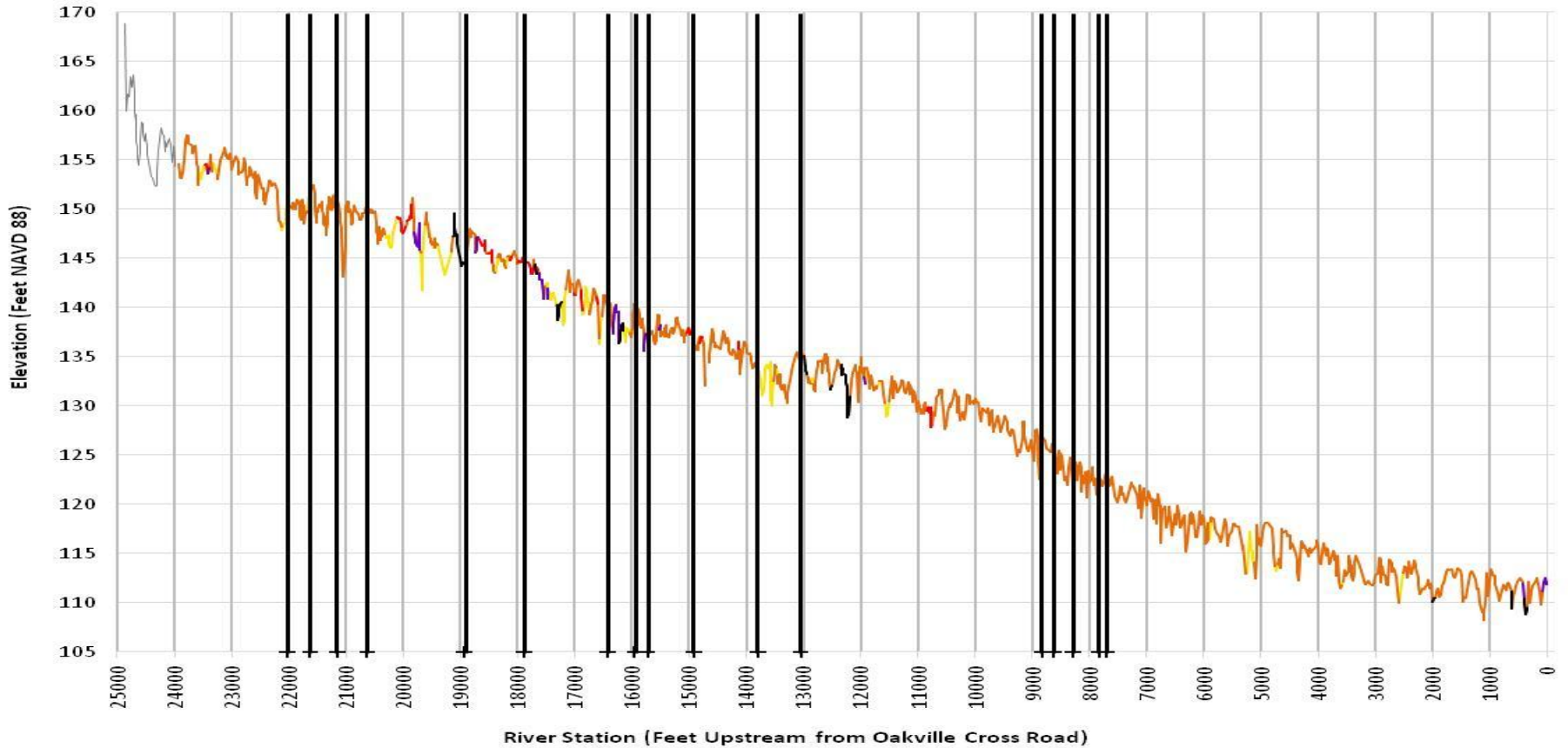


Monitoring Cross Sections on Longitudinal Profile

Napa River Rutherford Reach Thalweg Profile 2009-2010

Zinfandel Lane to Oakville Cross Road

+ 2004-2011 Cross Sections Sand Gravel Cobble Boulder Bedrock 2006 (No Substrate Data)



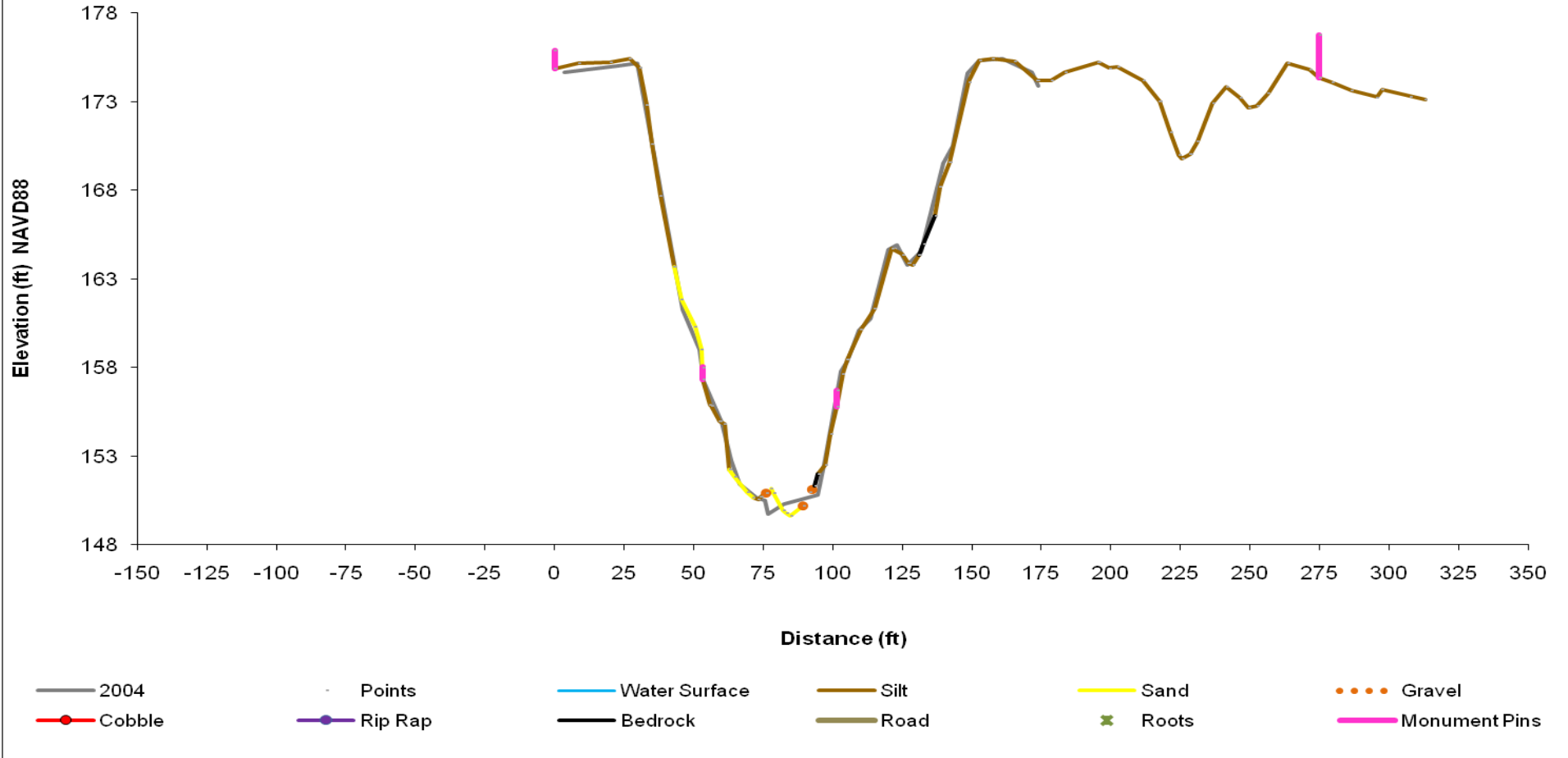
Monitoring Cross Section Substrate Key

The distribution of substrate size classes along the cross section and longitudinal transects is indicated by coloring the cross section plot according to relative gravel size determined by eye during the survey.

brown	silt, soil	(<.062mm median diameter)
yellow	sand	(.062-2 mm median diameter)
orange	gravel	(2-64 mm median diameter)
red	cobble	(>64 mm median diameter)
purple	Boulder / Rip Rap	(>128 mm median diameter)
grey	bedrock	
green	roots	

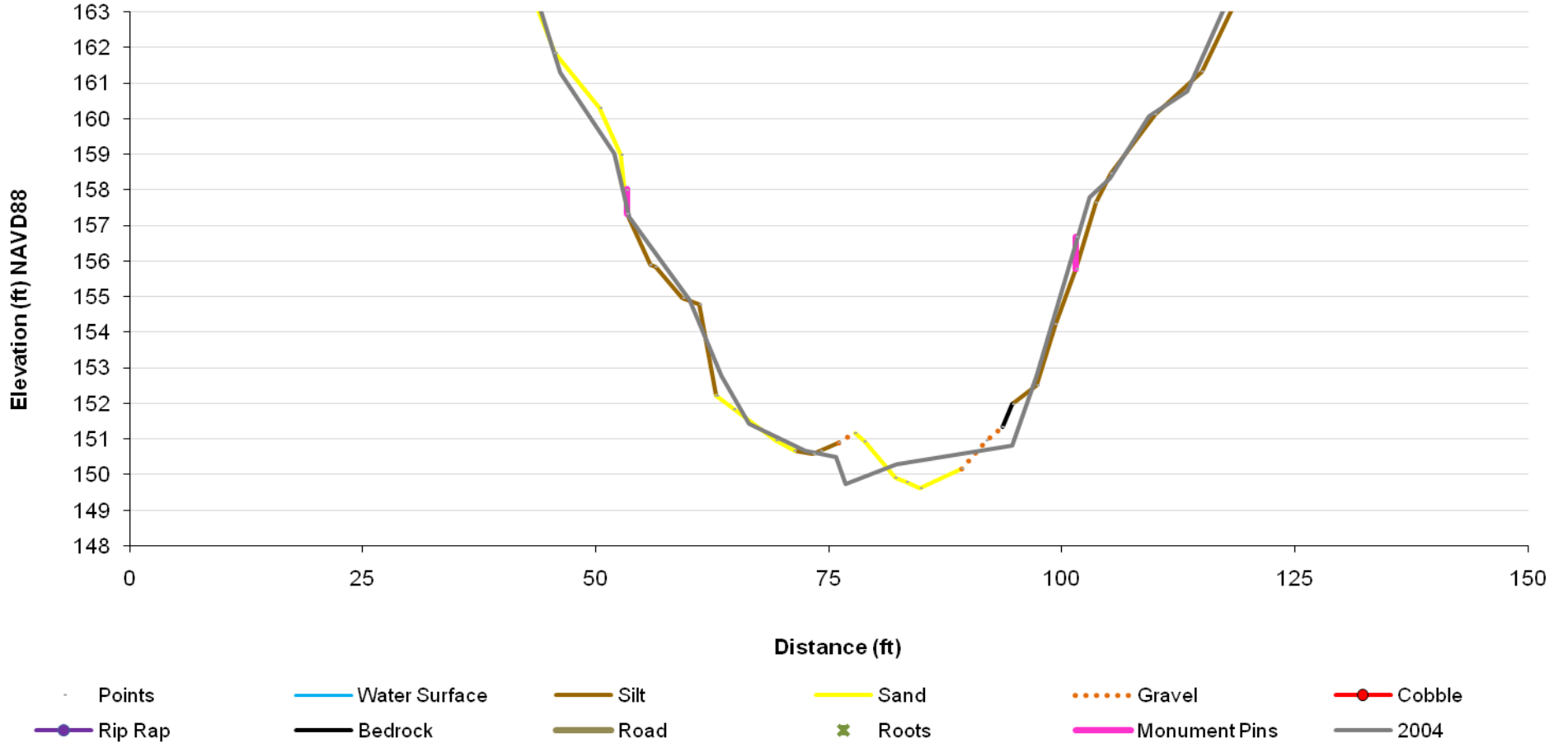
Monitoring Cross Section 22,027

22,027
Phase 1, Reach 2
October 2005 & October 2008



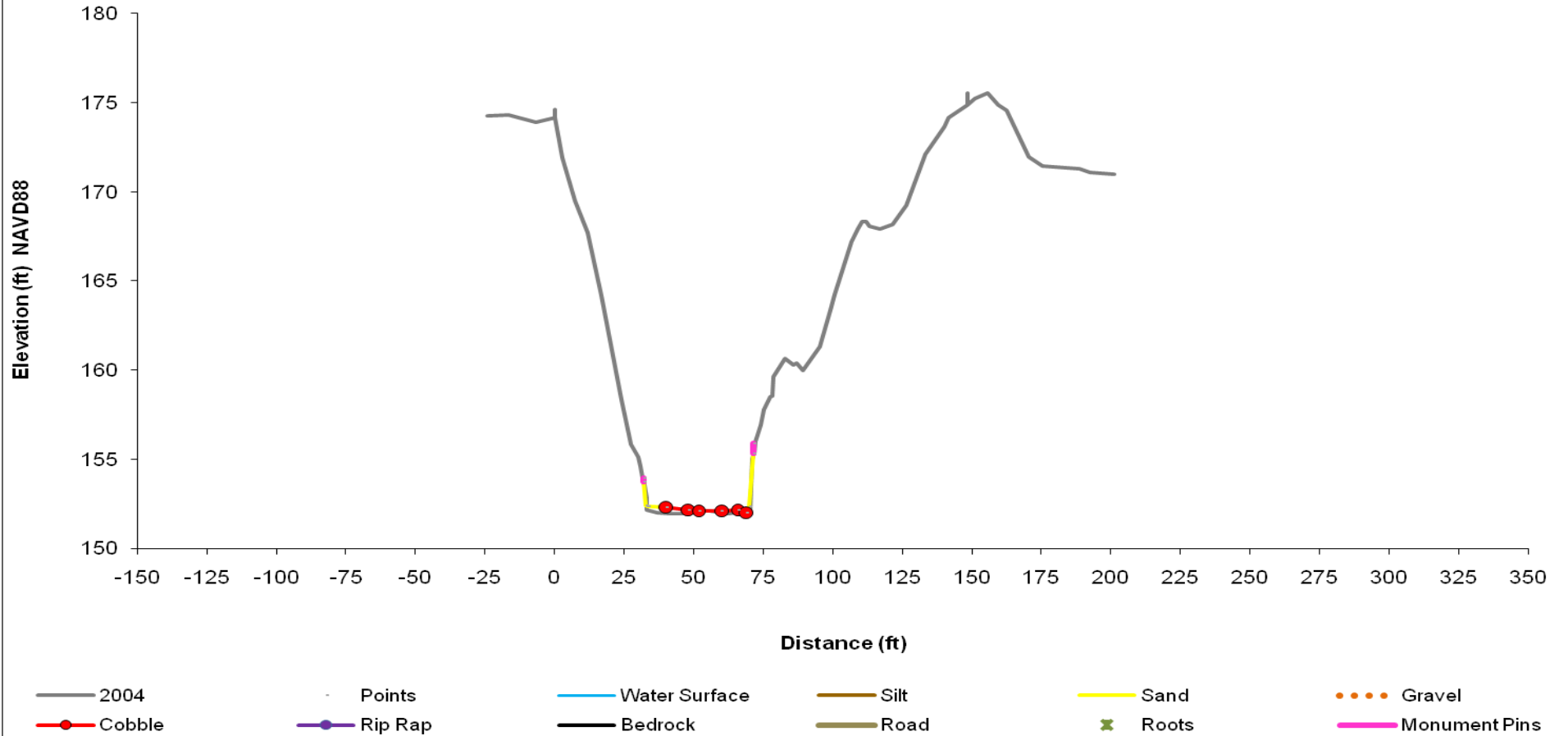
Monitoring Cross Section 22,027 (Channel Bed)

22,027
Phase 1, Reach 2
October 2005 & October 2008



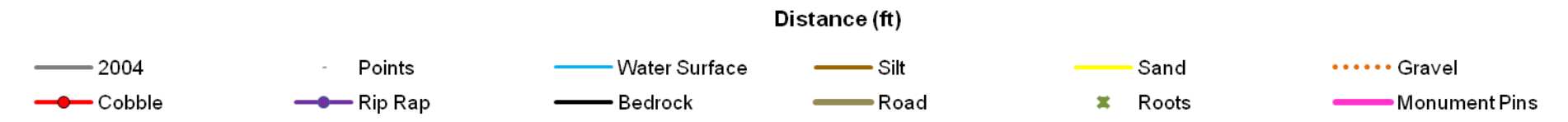
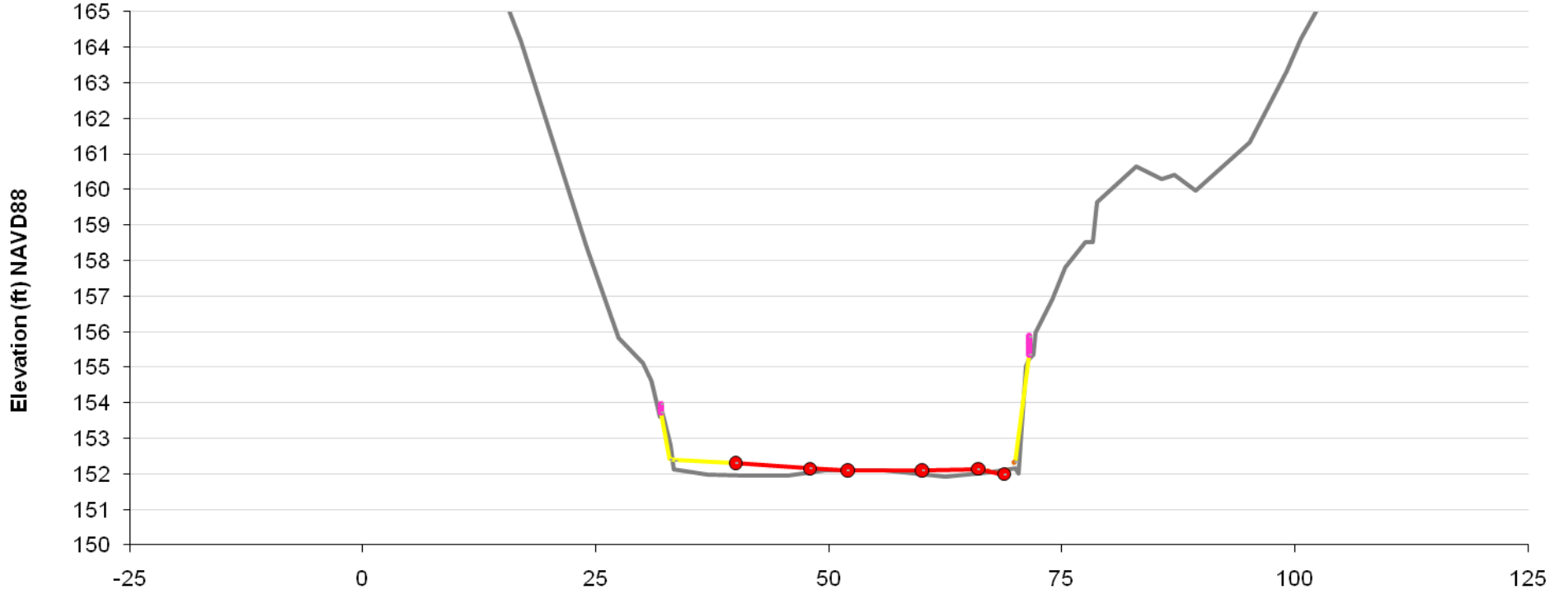
Monitoring Cross Section 21,629

21,629
Phase 1, Reach 2
October 2004 & October 2008



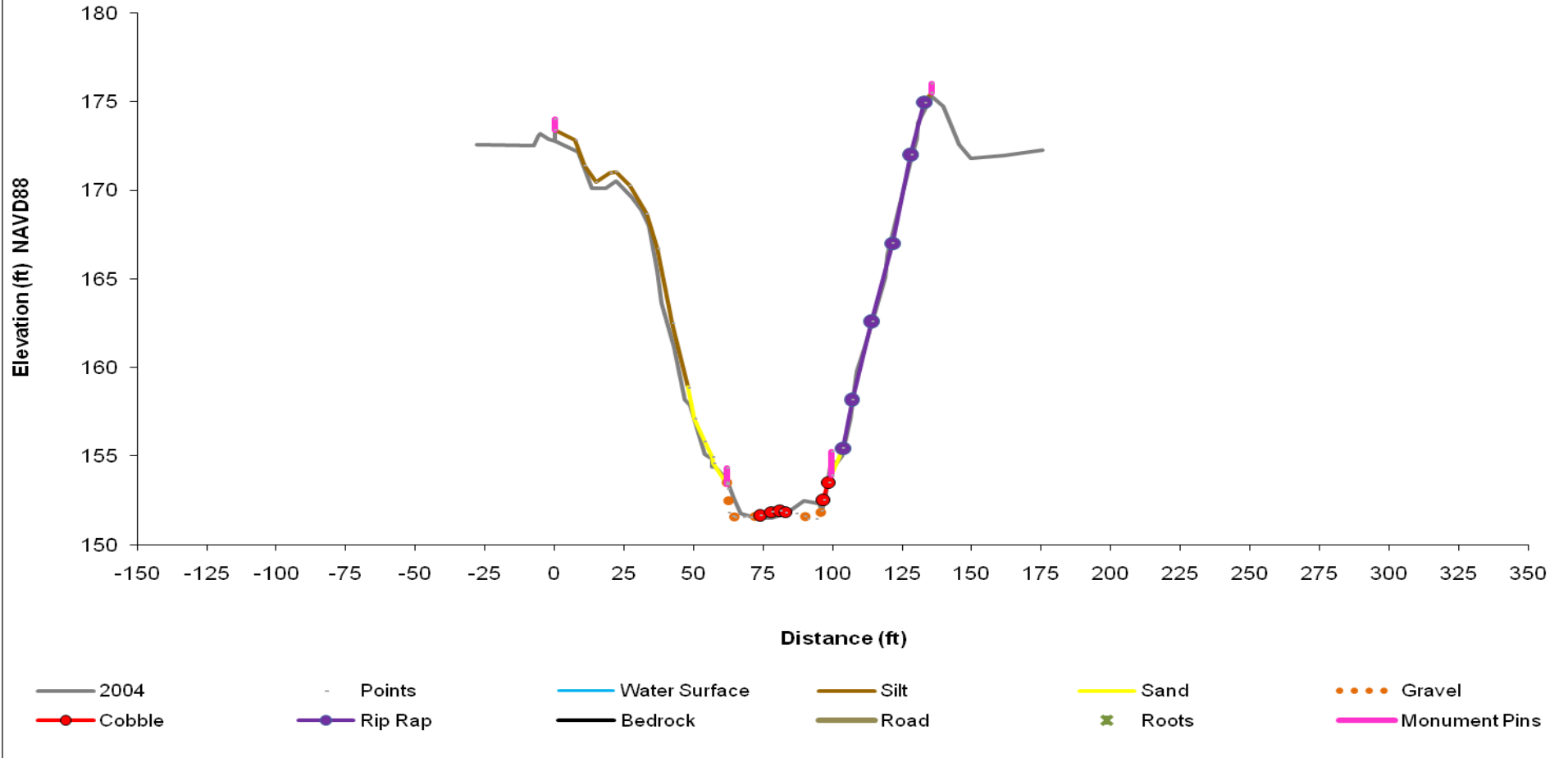
Monitoring Cross Section 21,629 (Channel Bed)

21,629
Phase 1, Reach 2
October 2004 & October 2008



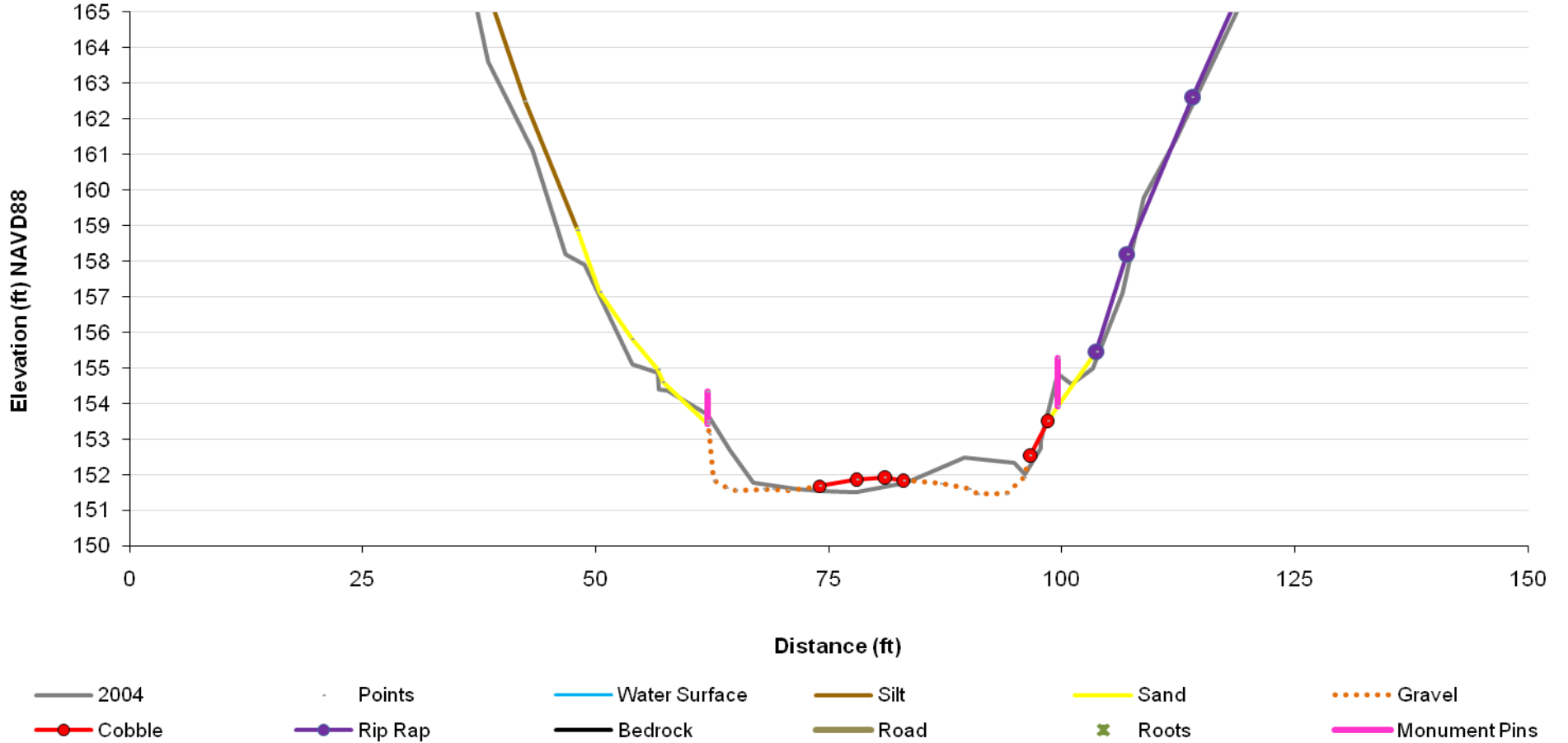
Monitoring Cross Section 21,158

21,158
Phase 1, Reach 2
October 2004 & October 2008



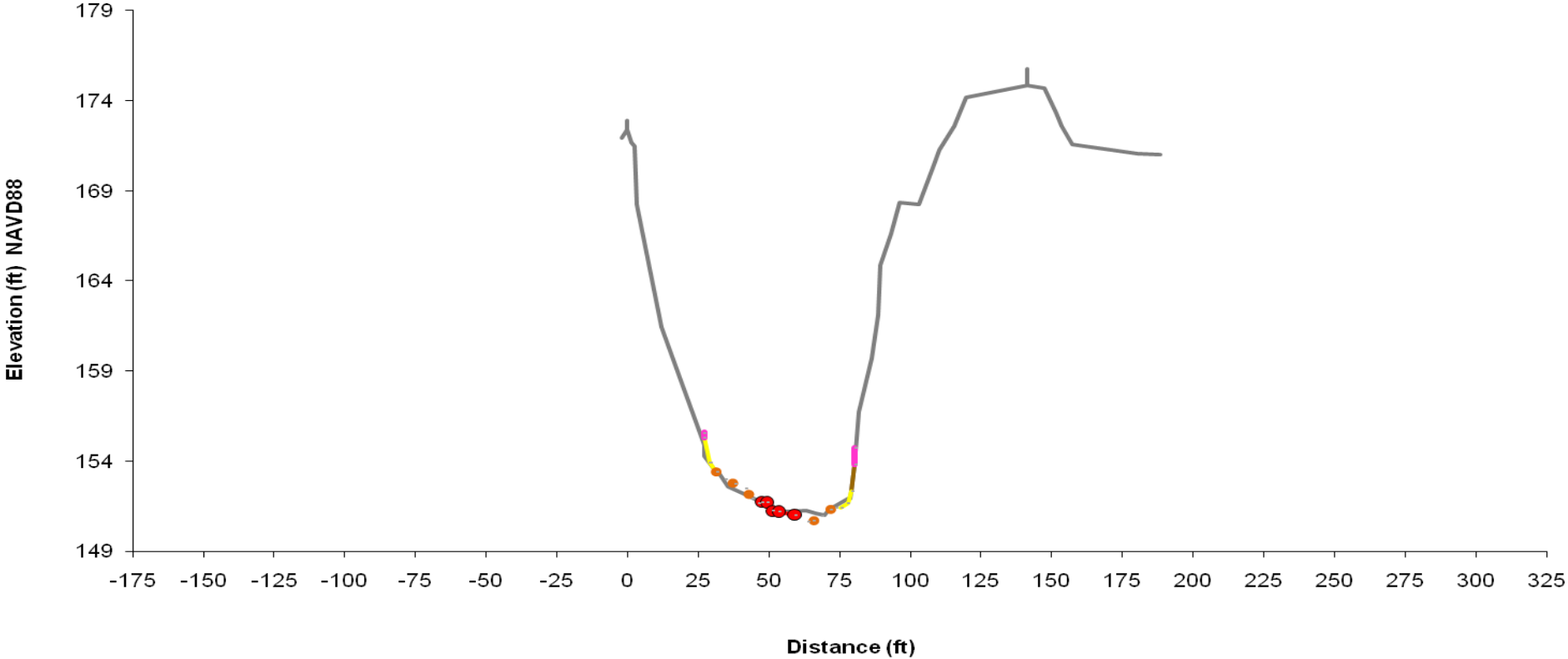
Monitoring Cross Section 21,158 (Channel Bed)

21,158
Phase 1, Reach 2
October 2004 & October 2008



Monitoring Cross Section 20,628

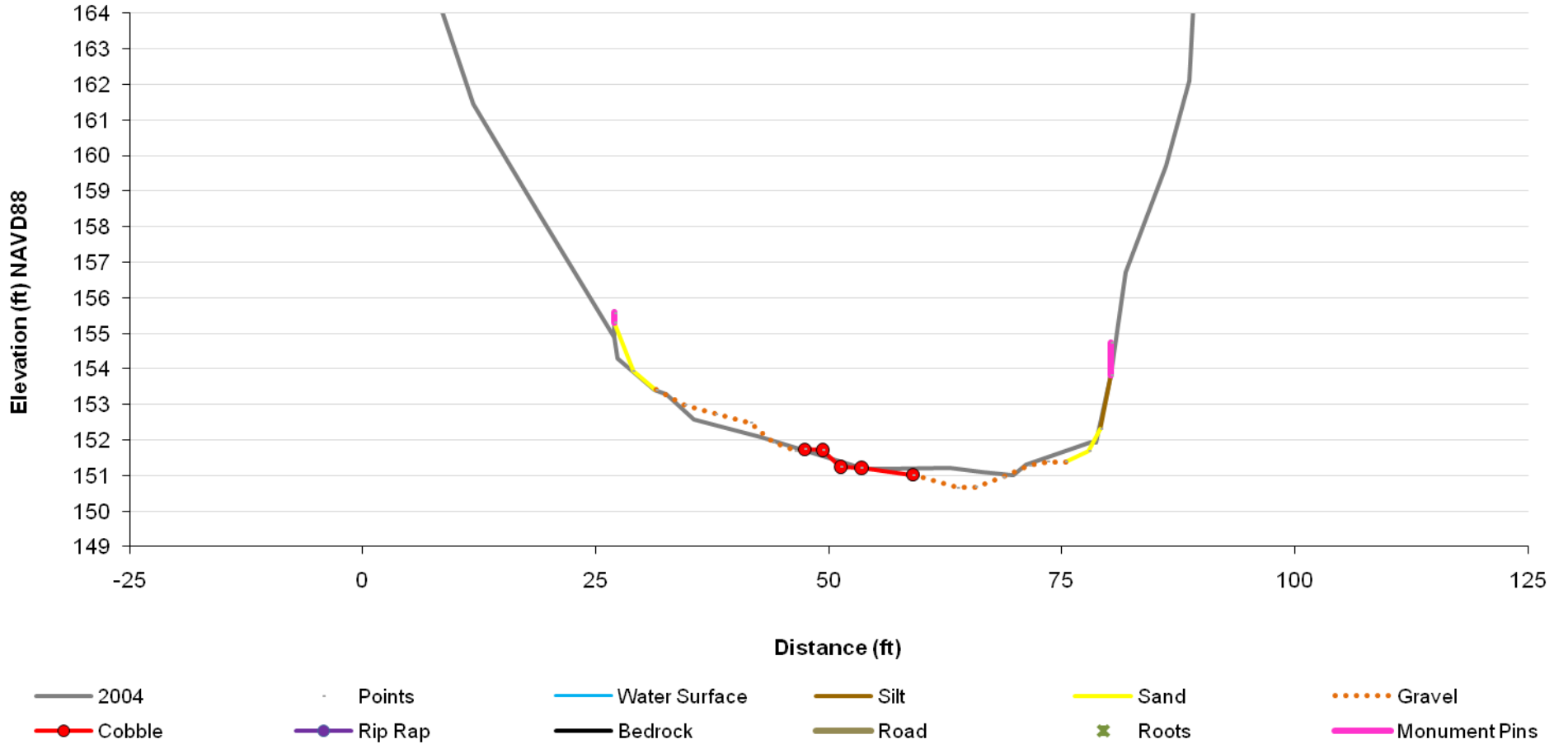
20,628
Phase 1, Reach 2
October 2004 & October 2008



- | | | | | | |
|----------|-----------|-----------------|--------|---------|-----------------|
| — 2004 | - Points | — Water Surface | — Silt | — Sand | •••• Gravel |
| ● Cobble | ● Rip Rap | — Bedrock | — Road | ✕ Roots | — Monument Pins |

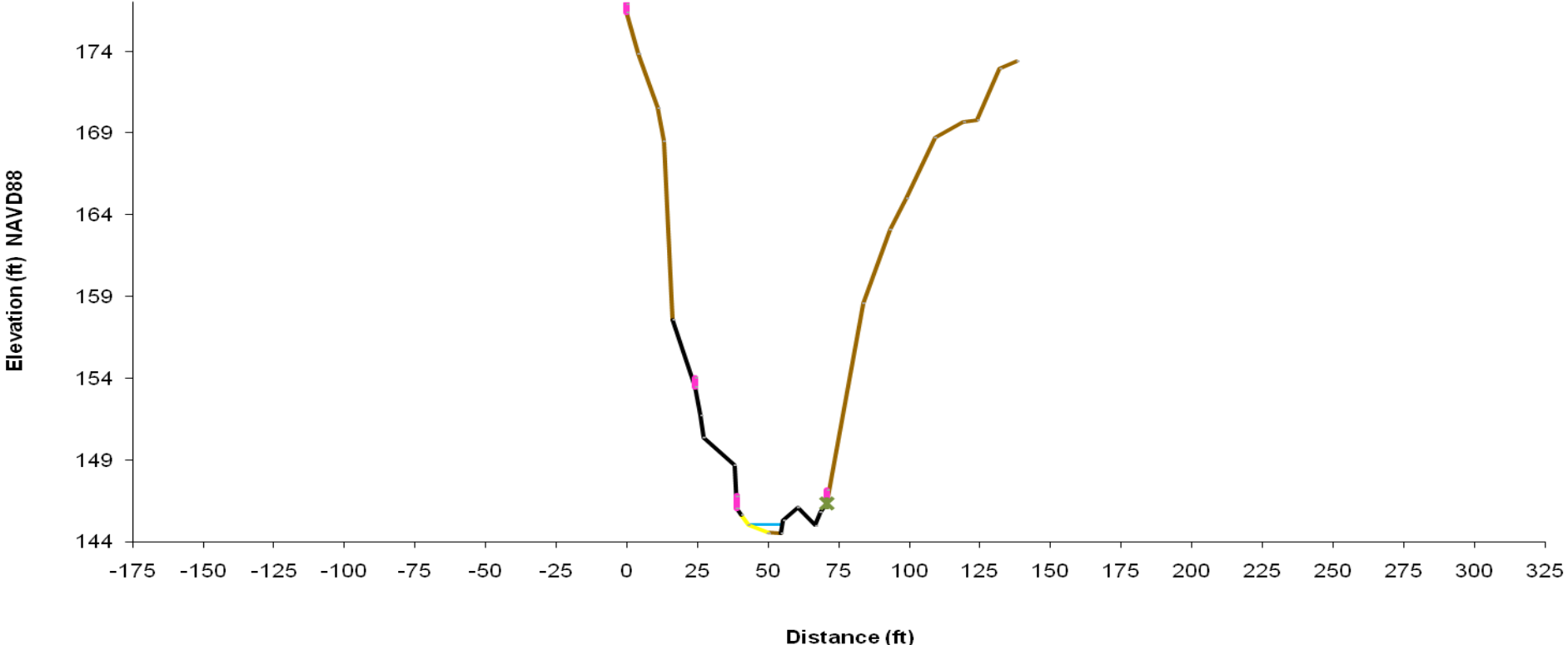
Monitoring Cross Section 20,628 (Channel Bed)

20,628
Phase 1, Reach 2
October 2004 & October 2008



Monitoring Cross Section 18,930

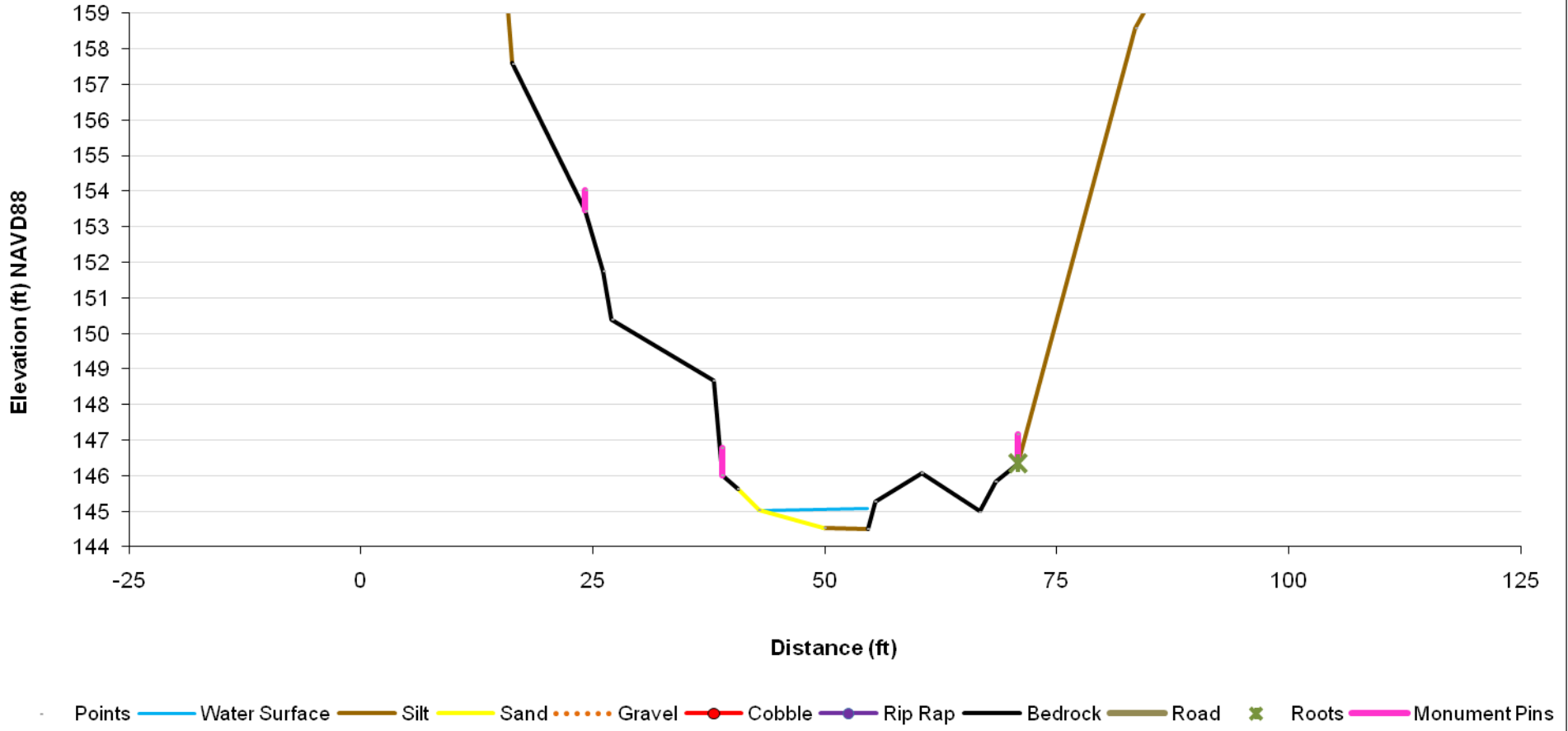
18,930
Phase 1, Reach 2
October 2008



Points Water Surface Silt Sand Gravel Cobble Rip Rap Bedrock Road Roots Monument Pins

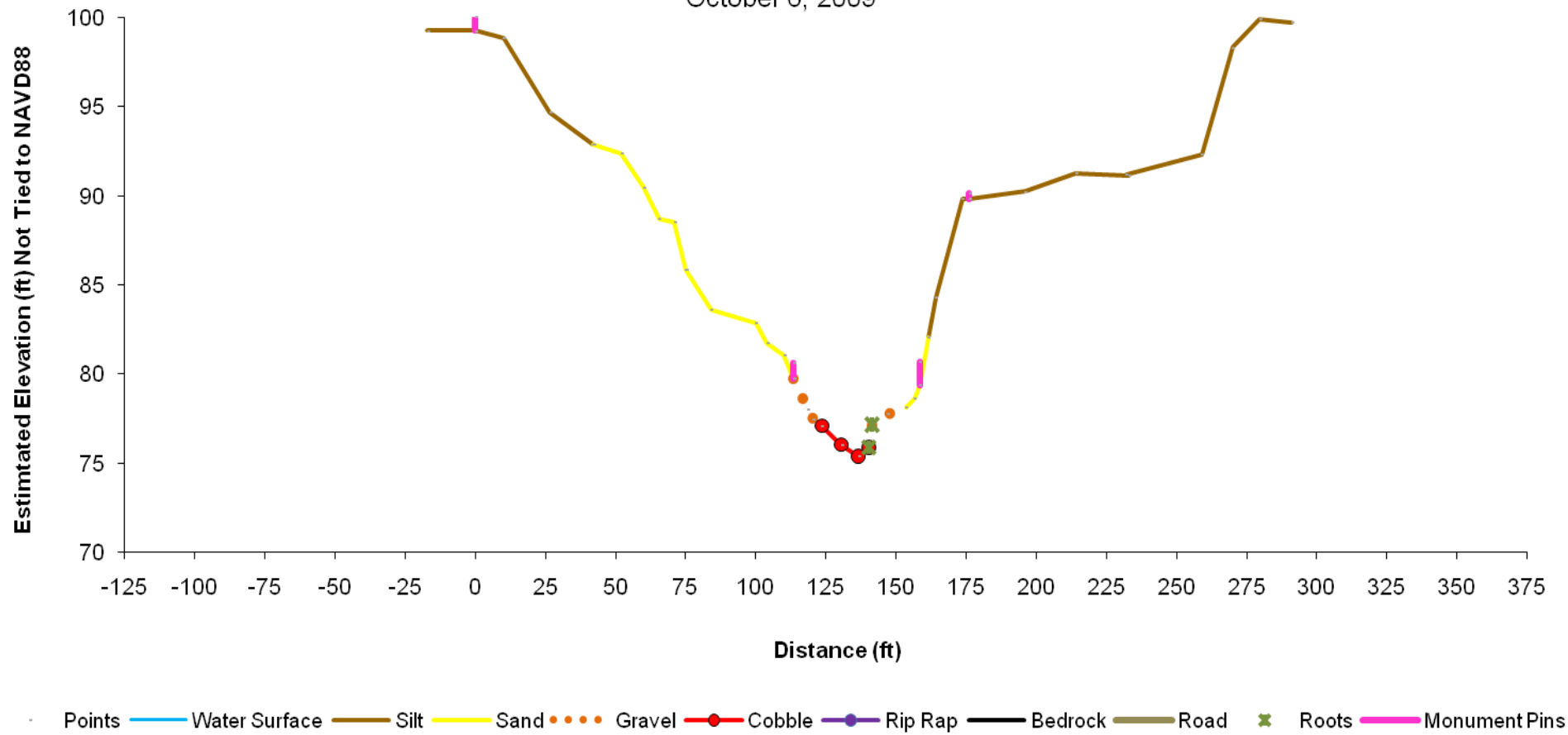
Monitoring Cross Section 18,930 (Channel Bed)

18,930
Phase 1, Reach 2
October 2008



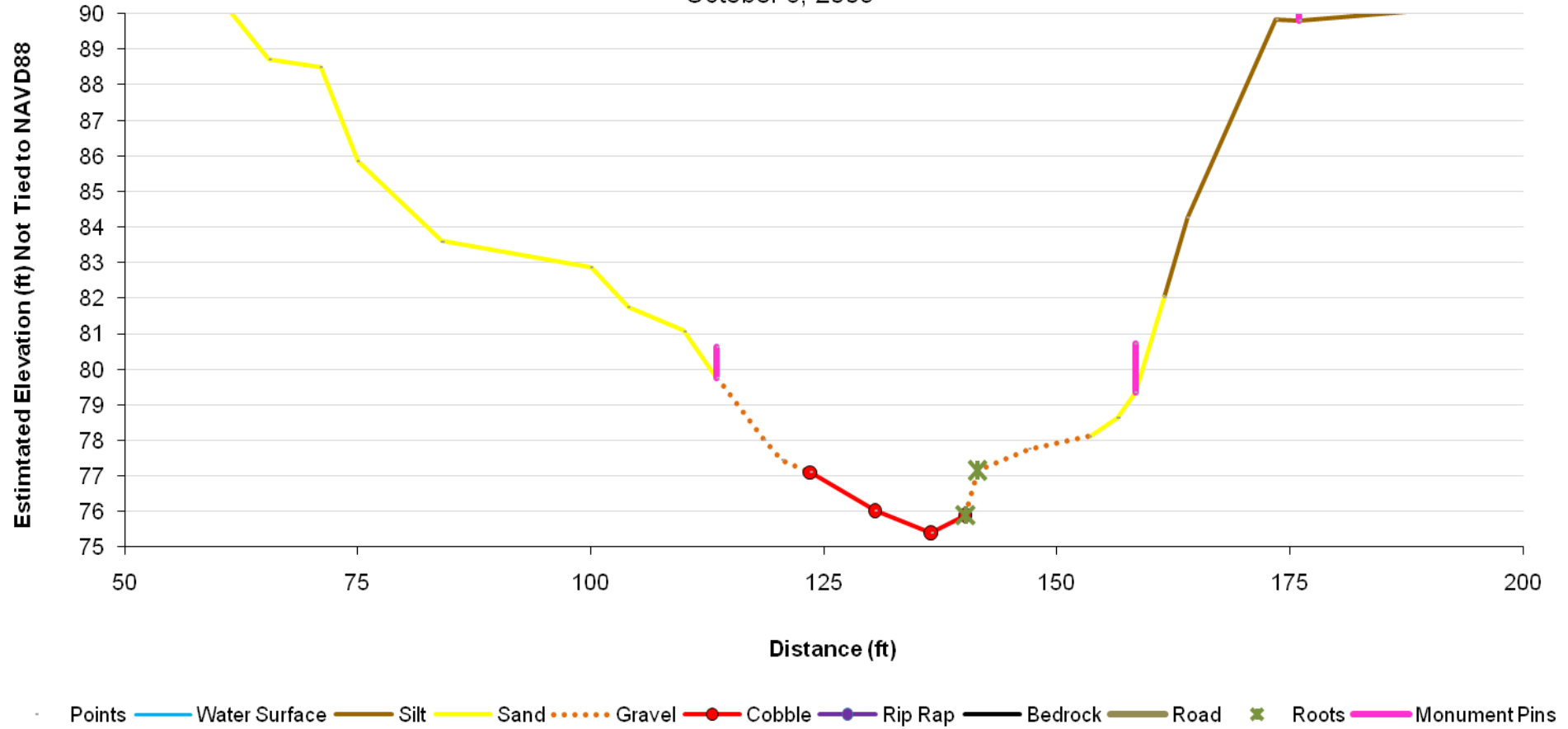
Monitoring Cross Section 17,891

17,891
Phase 2, Reach 3
October 6, 2009



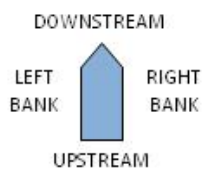
Monitoring Cross Section 17,891 (Channel Bed)

17,891
Phase 2, Reach 3
October 6, 2009



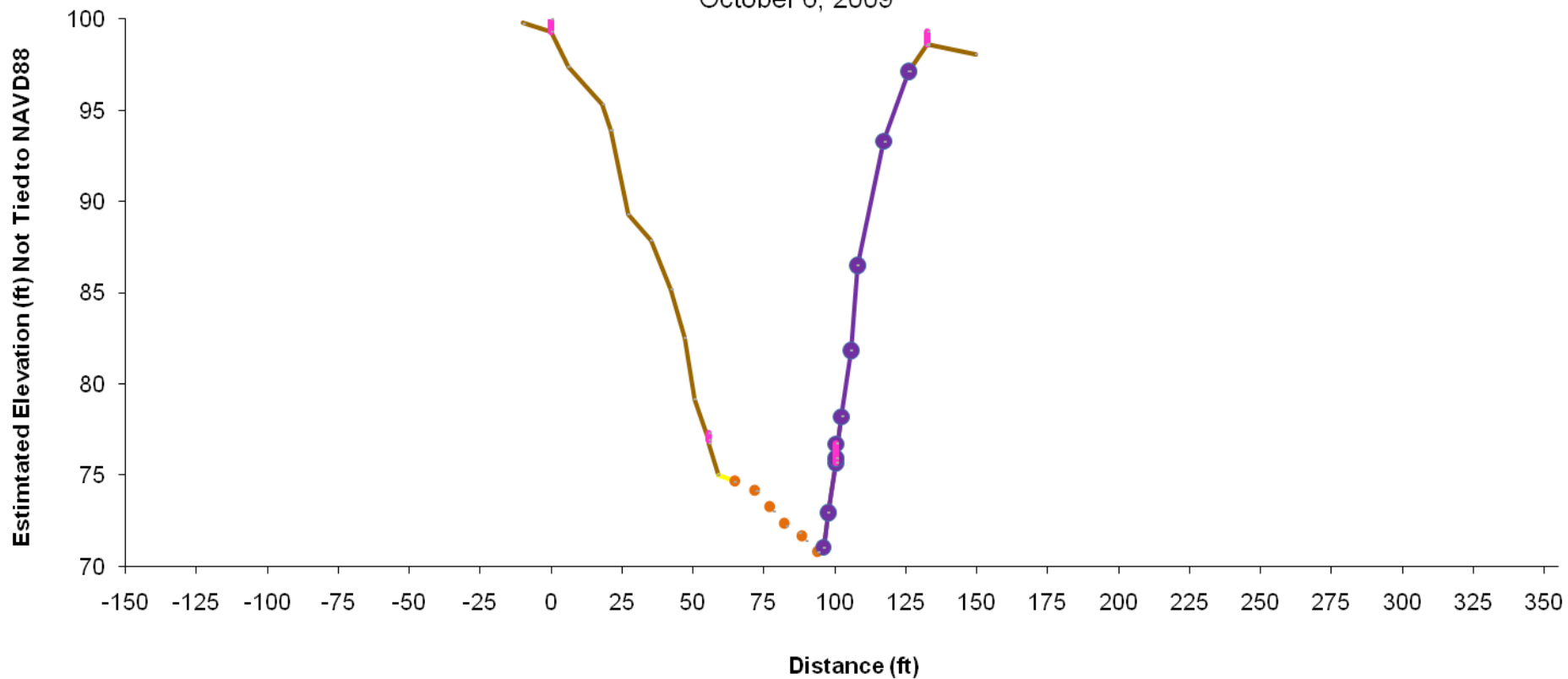


17,891 October 2009



Monitoring Cross Section 16,422

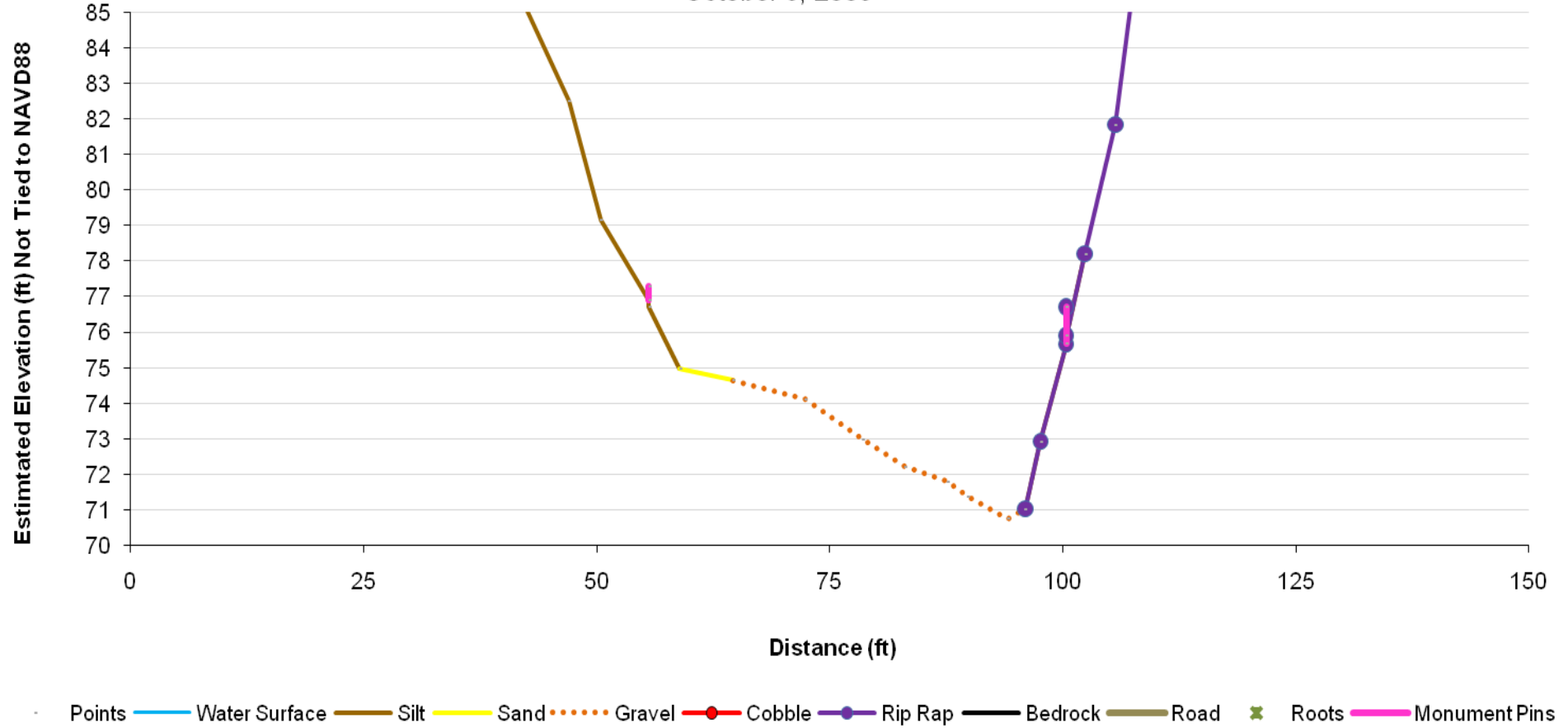
16,422
Phase 2, Reach 3
October 6, 2009



Points Water Surface Silt Sand Gravel Cobble Rip Rap Bedrock Road Roots Monument Pins

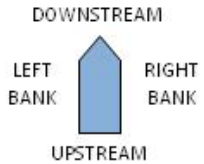
Monitoring Cross Section 16,422 (Channel Bed)

16,422
Phase 2, Reach 3
October 6, 2009





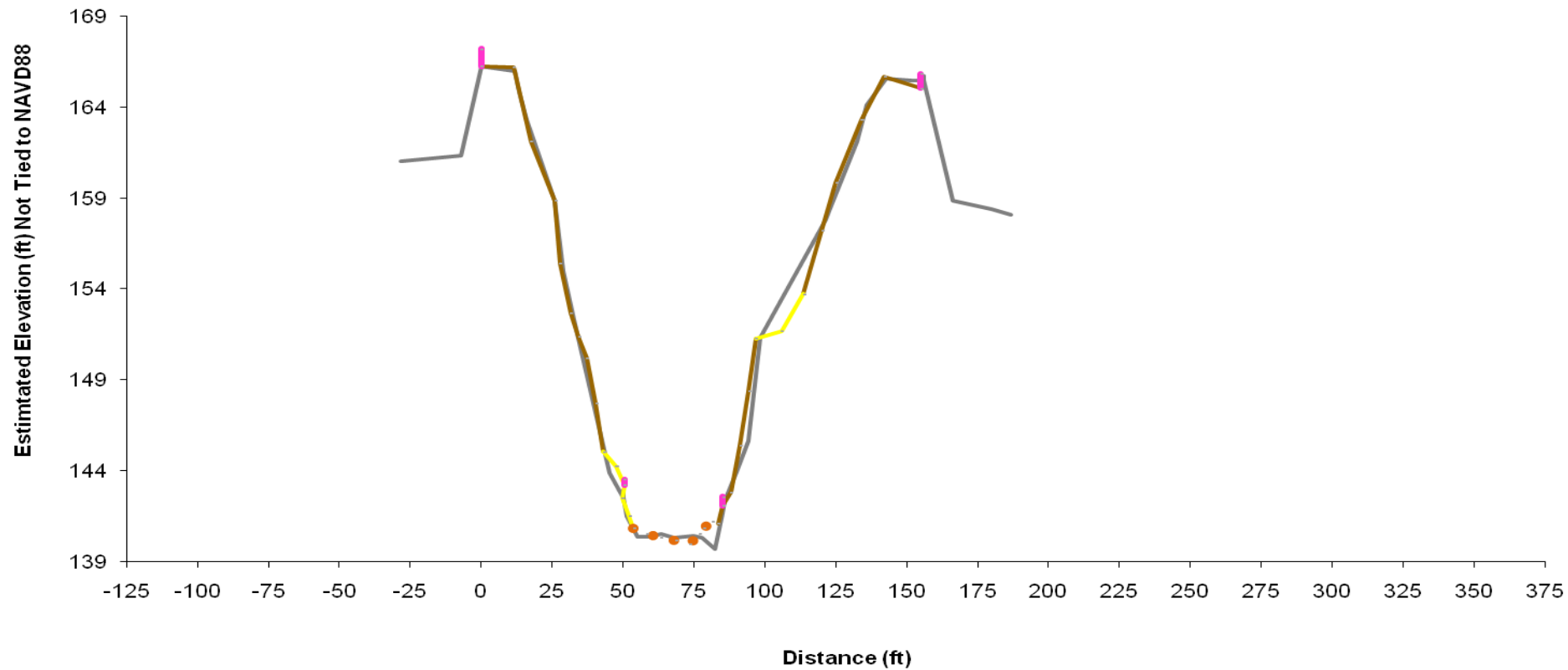
16,422 October 2009



Monitoring

Cross Section 15,950

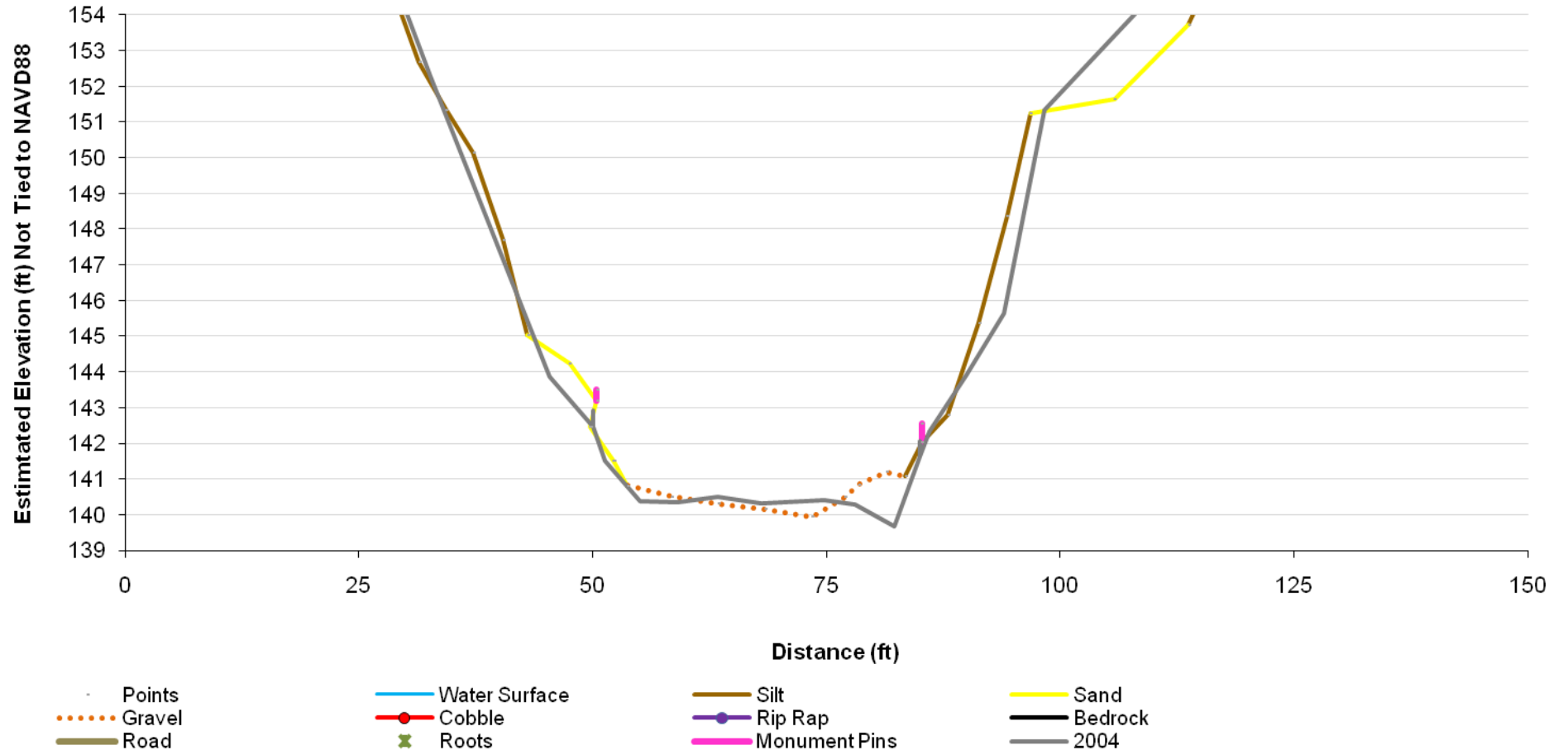
15,950
Phase 3, Reach 4
October 21, 2004 & October 5, 2009



- 2004
- Sand
- Bedrock
- Points
- Gravel
- Road
- Water Surface
- Cobble
- Roots
- Silt
- Rip Rap
- Monument Pins

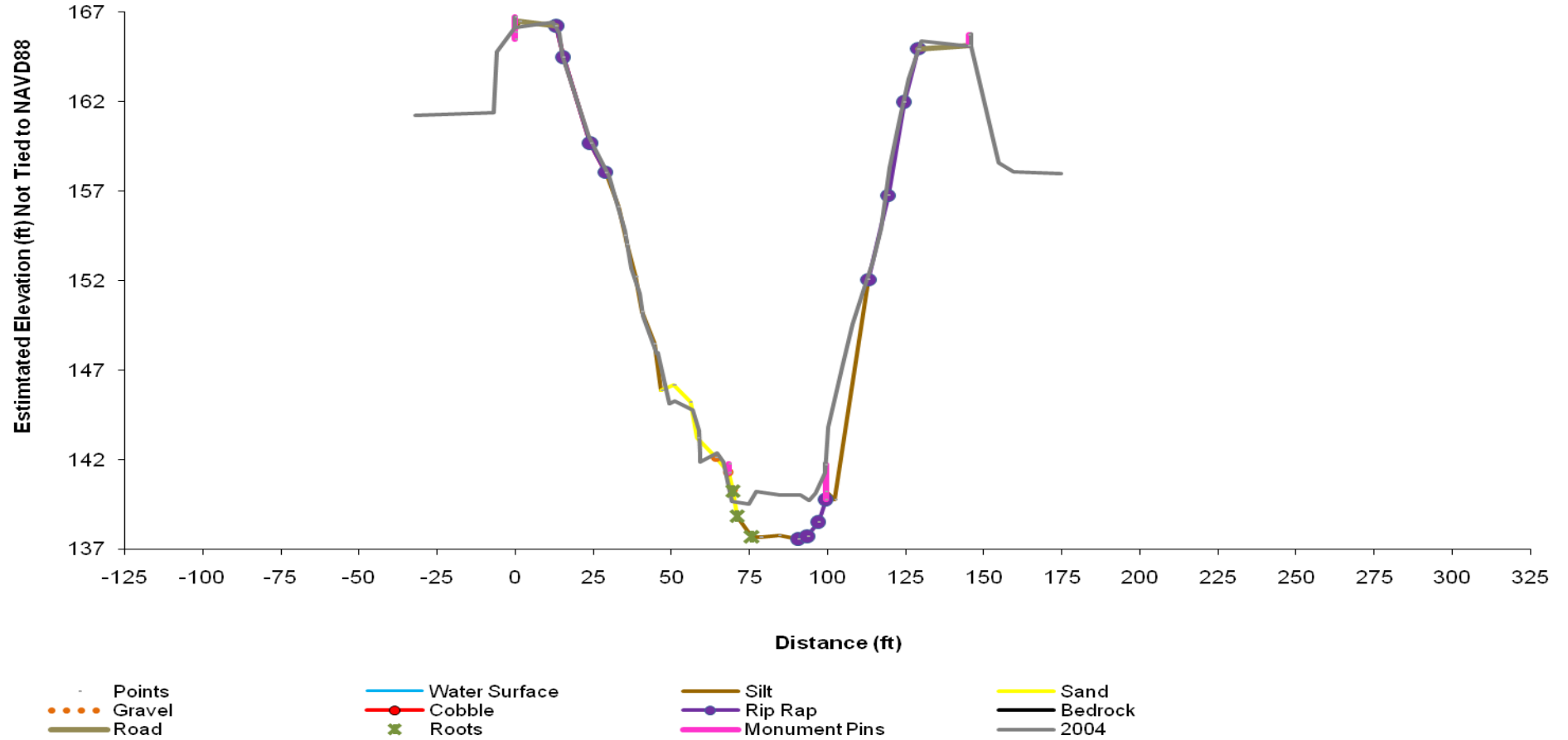
Monitoring Cross Section 15,950 (Channel Bed)

15,950
Phase 3, Reach 4
October 21, 2004 & October 5, 2009



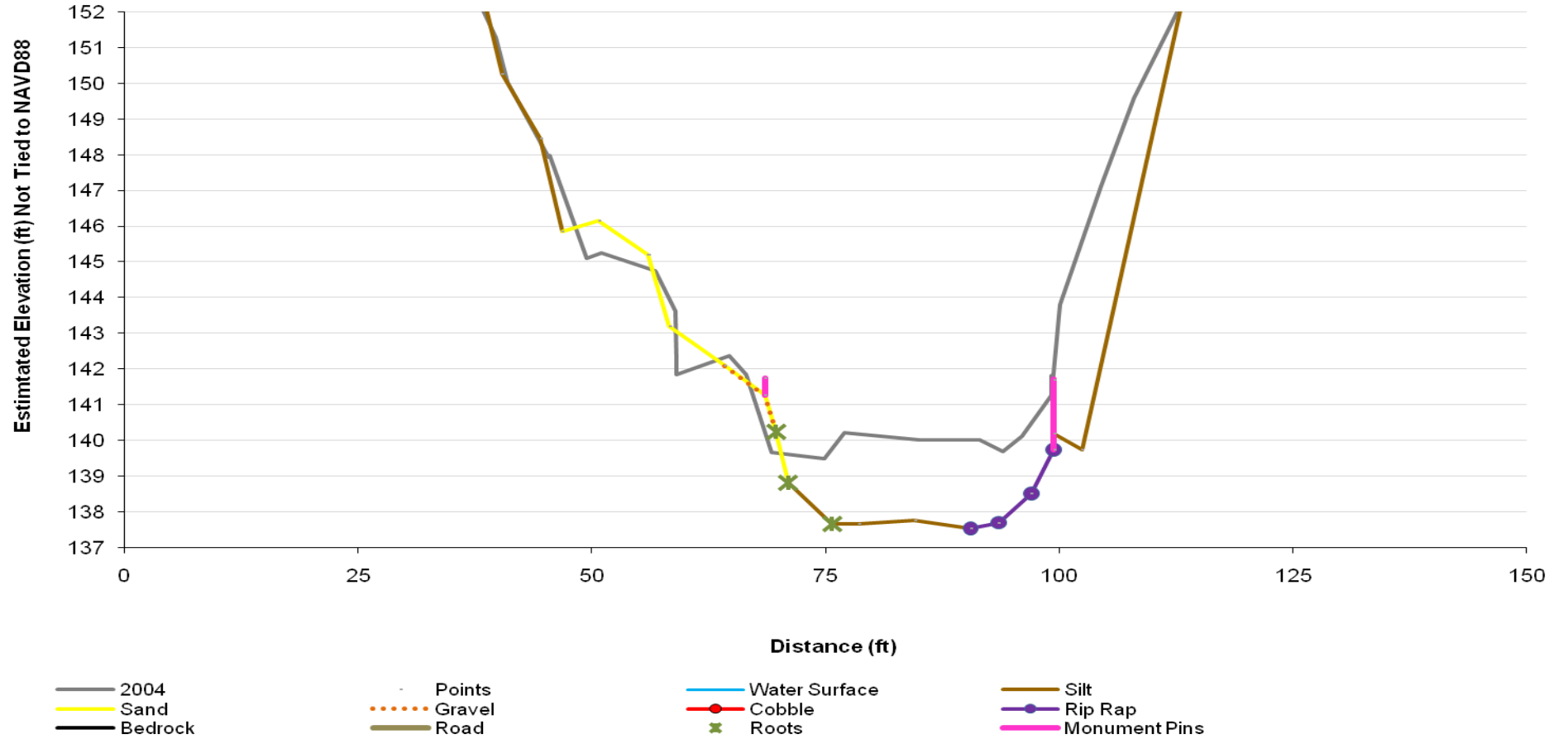
Monitoring Cross Section 15,730

15,730
Phase 3, Reach 4
October 21, 2004 and October 7, 2009



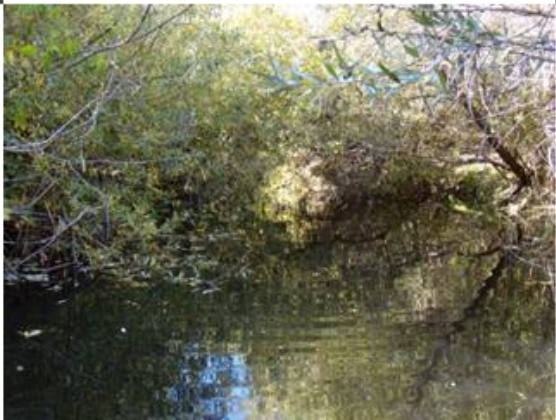
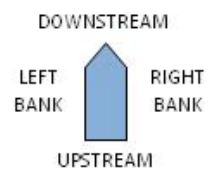
Monitoring Cross Section 15,730 (Channel Bed)

15,730
Phase 3, Reach 4
October 21, 2004 and October 7, 2009





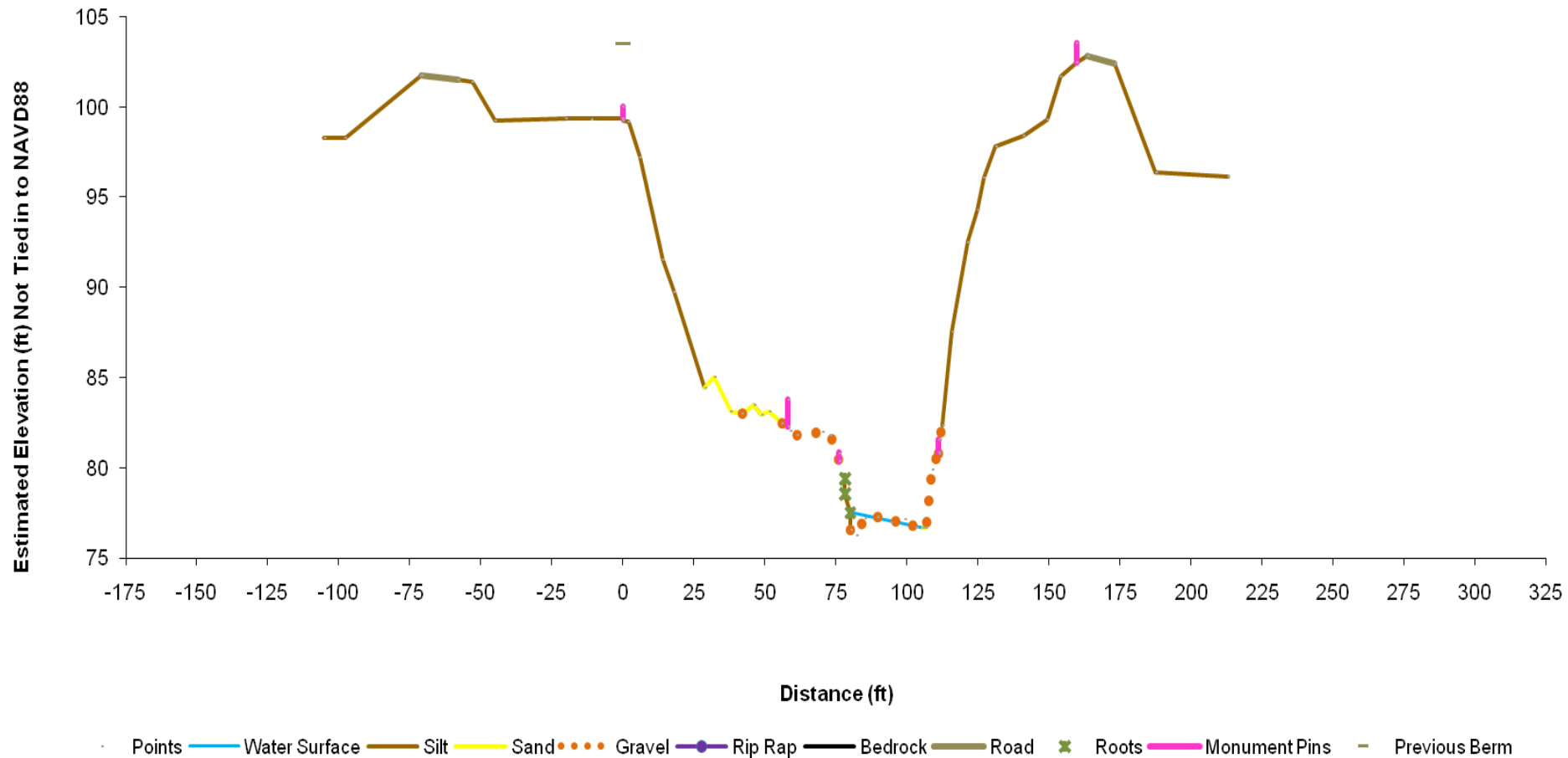
15,730 October 6, 2009



Monitoring

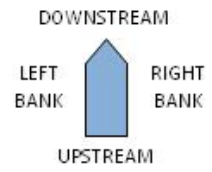
Cross Section 14,920

14,920
May 3, 2011
Phase 3, Reach 4



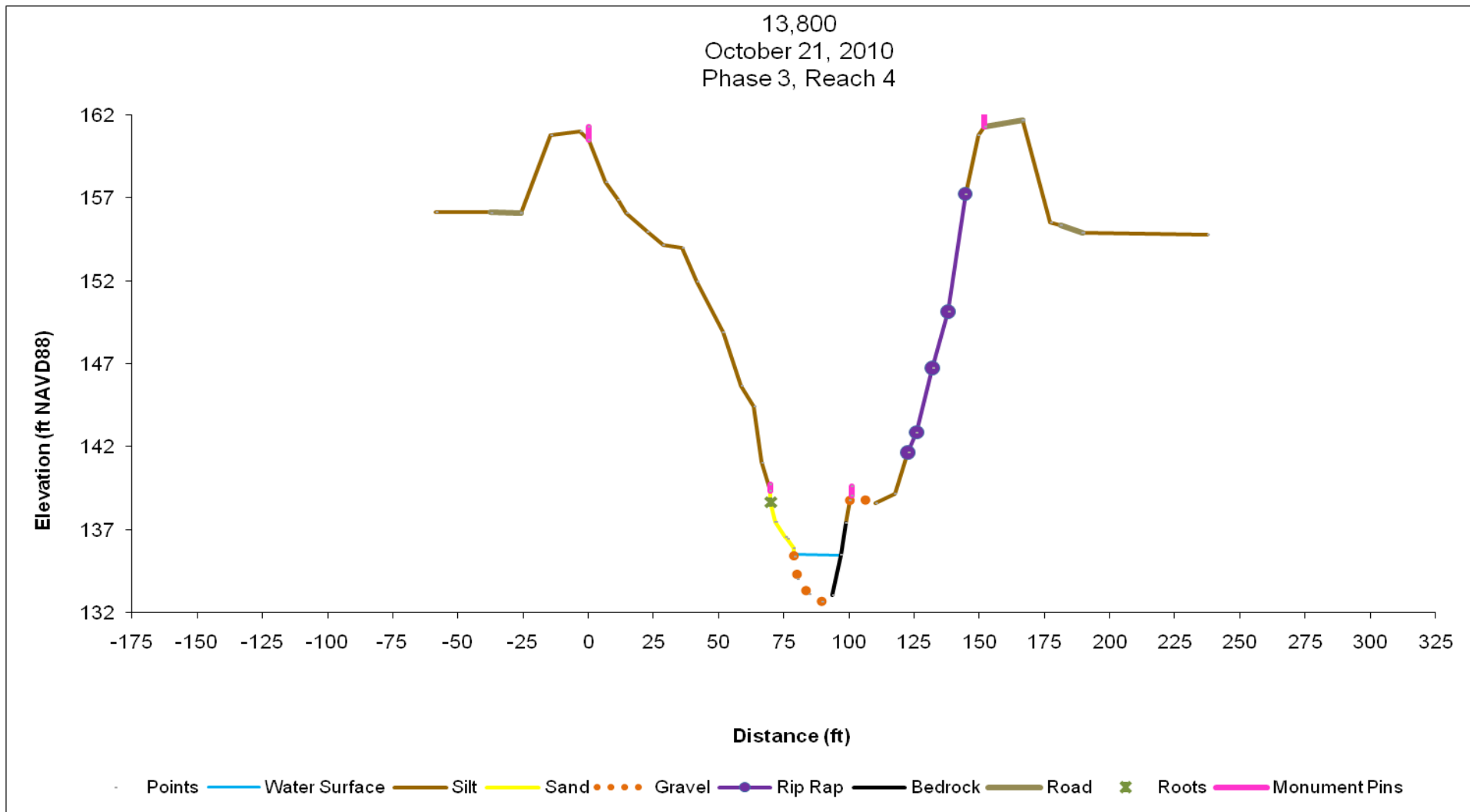


14,920 May 3, 2011



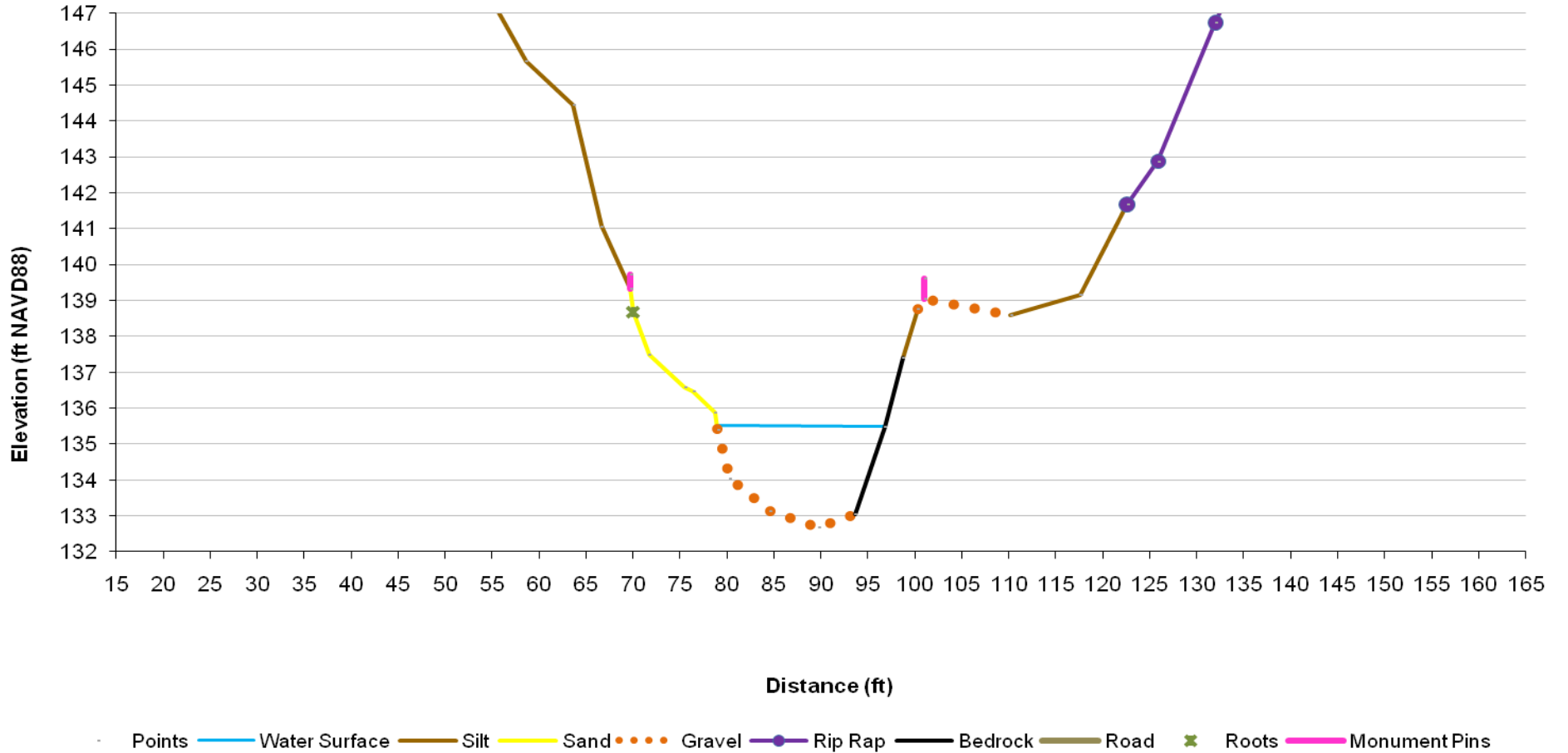
Monitoring Cross Section 13,800

13,800
October 21, 2010
Phase 3, Reach 4



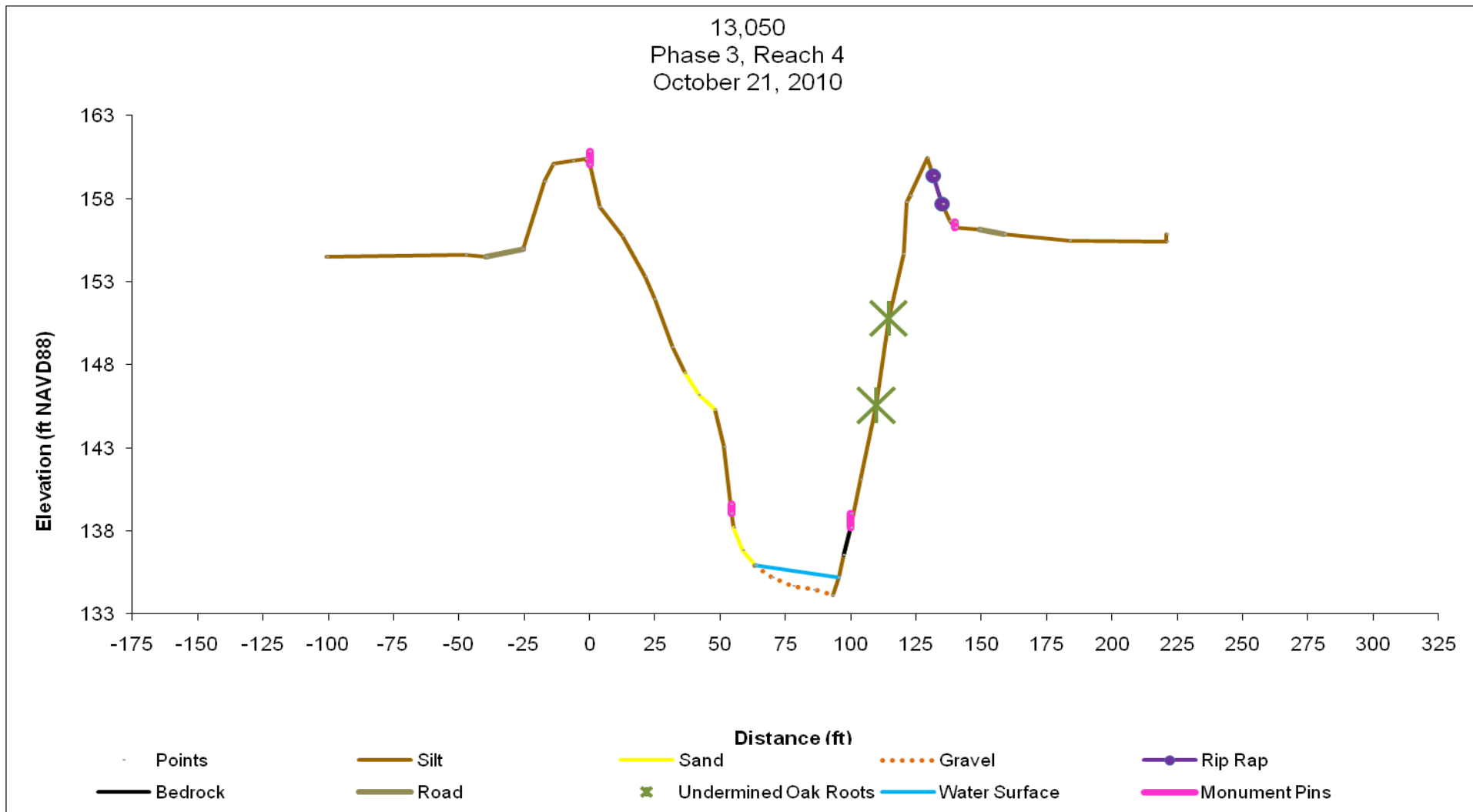
Monitoring Cross Section 13,800 (Channel Bed)

13,800
Phase 3, Reach 4
October 21, 2010



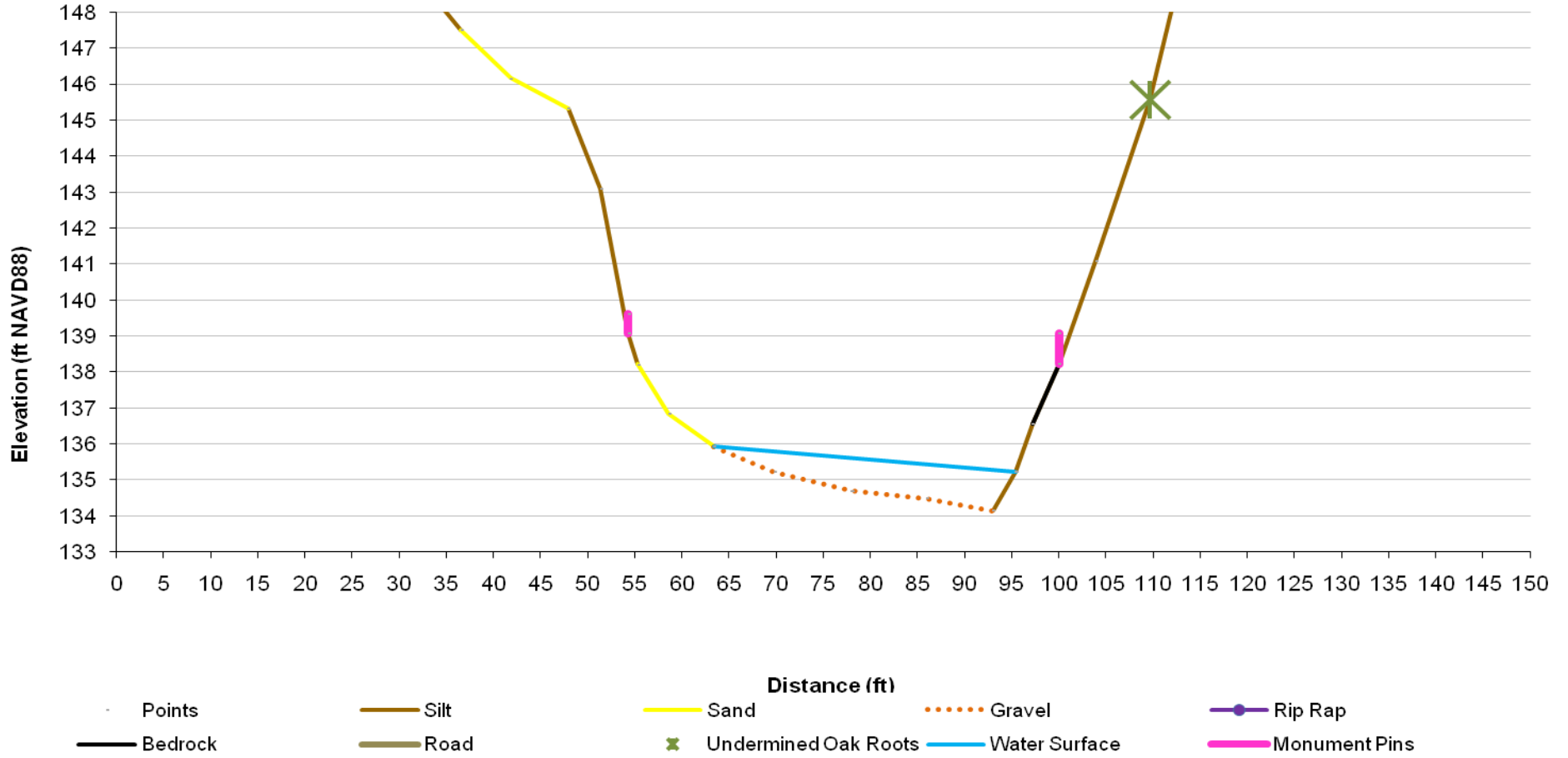
Monitoring Cross Section 13,050

13,050
Phase 3, Reach 4
October 21, 2010



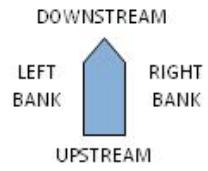
Monitoring Cross Section 13,050 (Channel Bed)

13,050
Phase 3, Reach 4
October 21, 2010



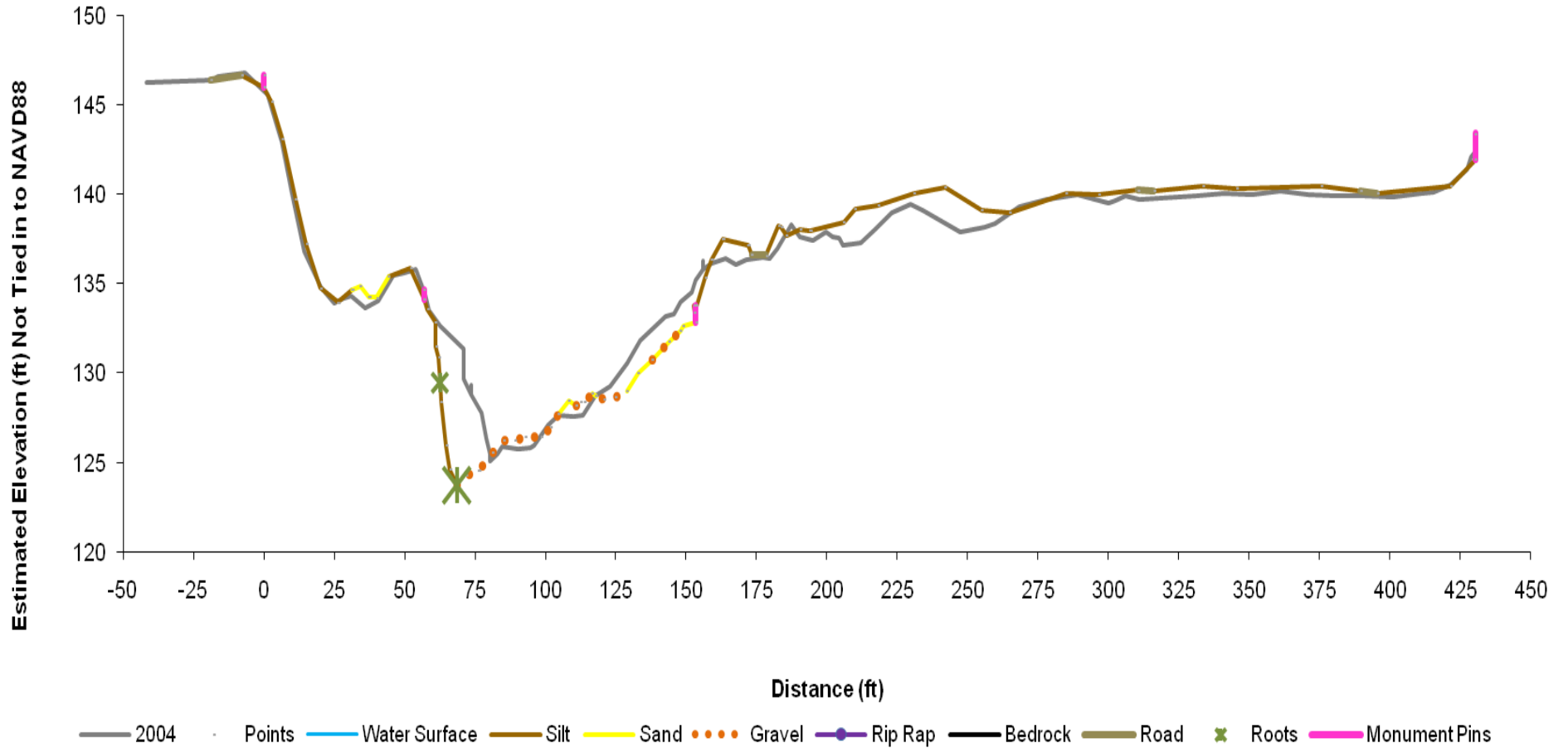


13,050 June 4, 2010



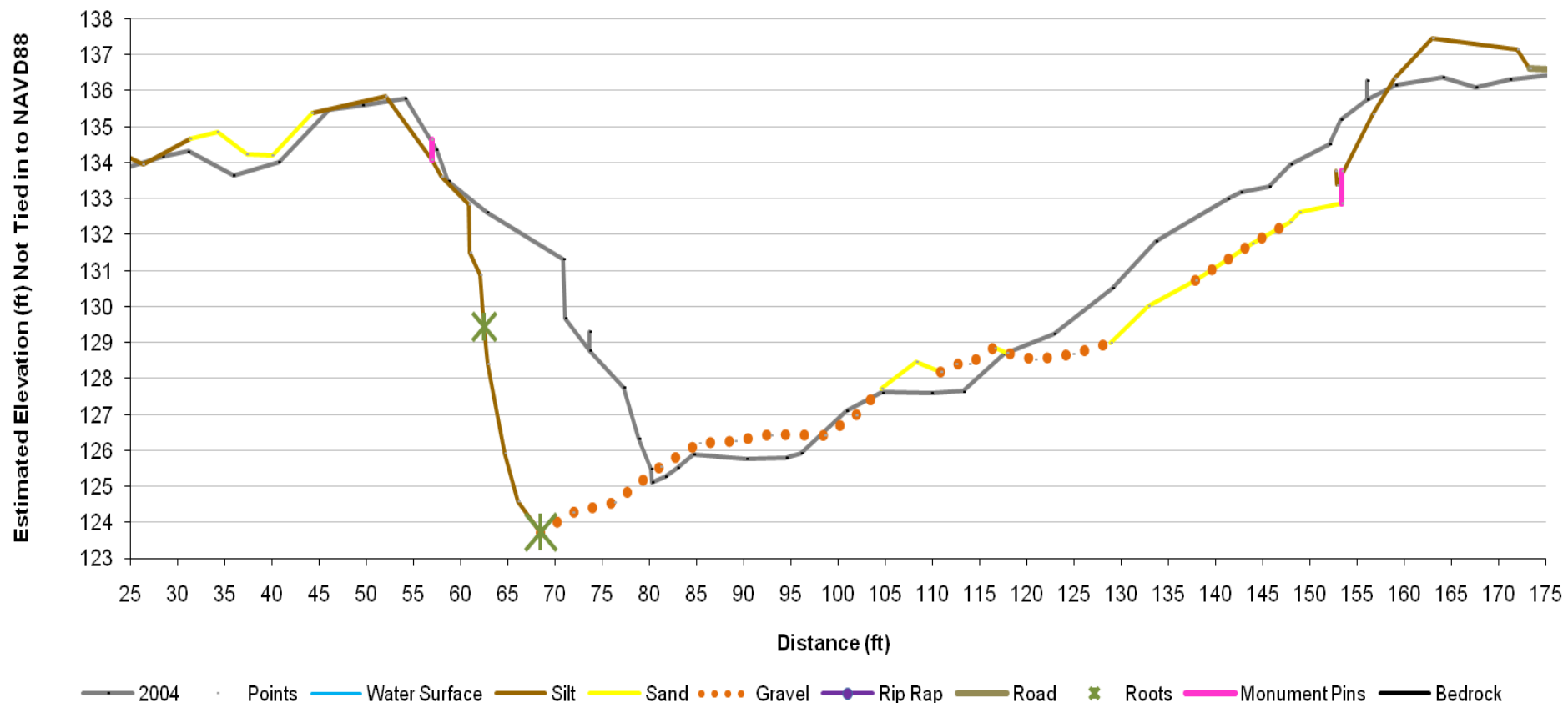
Monitoring Cross Section 8,830

8,830
October 29, 2004 & November 17, 2009
Reach 7



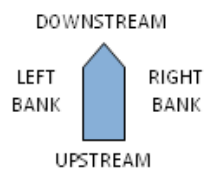
Monitoring Cross Section 8,830 (Channel Bed)

8,830
 October 29, 2004 & November 17, 2009
 Reach 7





8,830 November 16, 2009



STATION 8,830

October
2004



October
2009

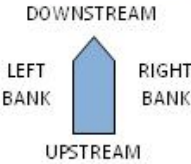


STATION 8,830

October
2004



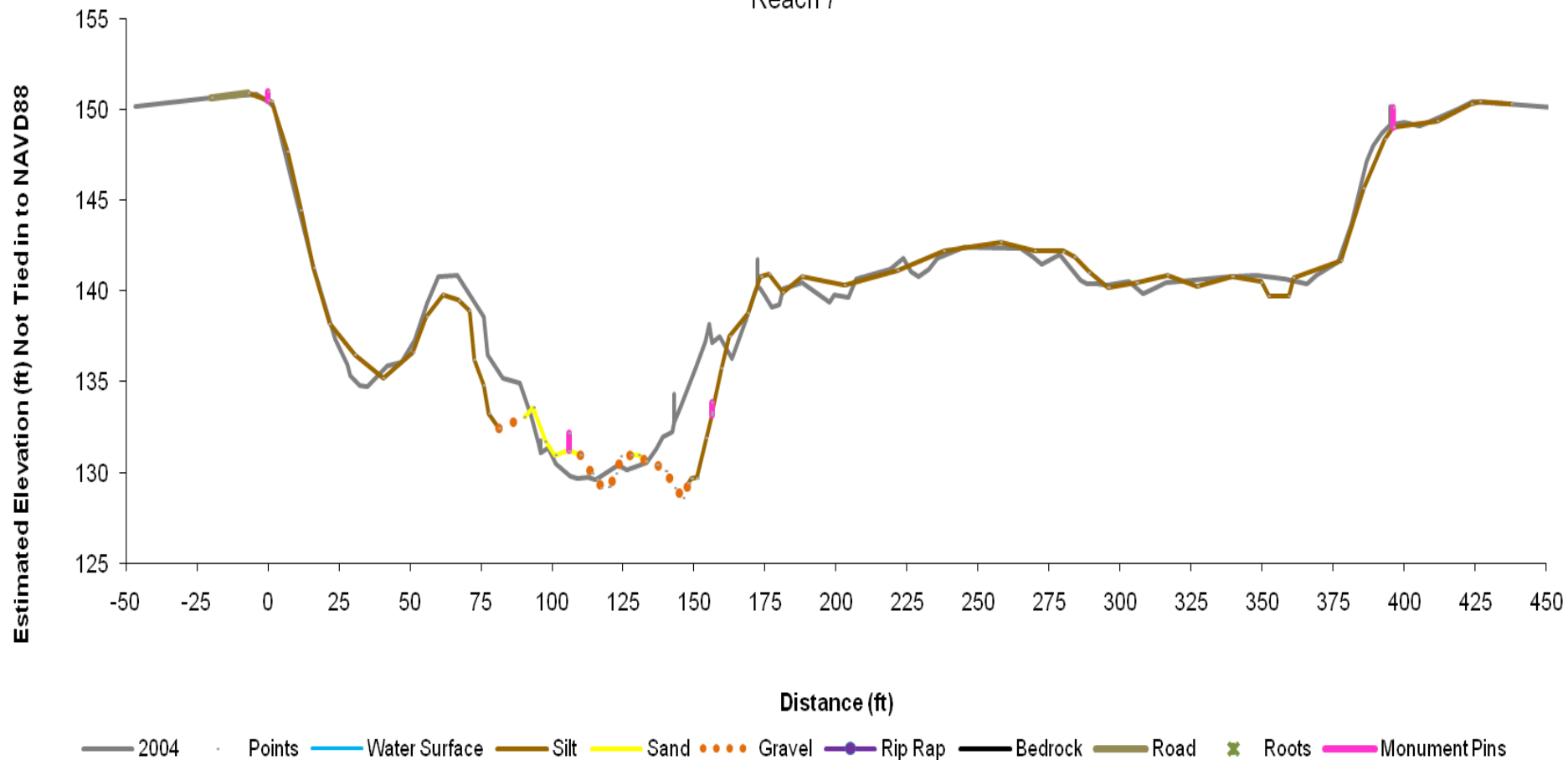
October
2009



Monitoring

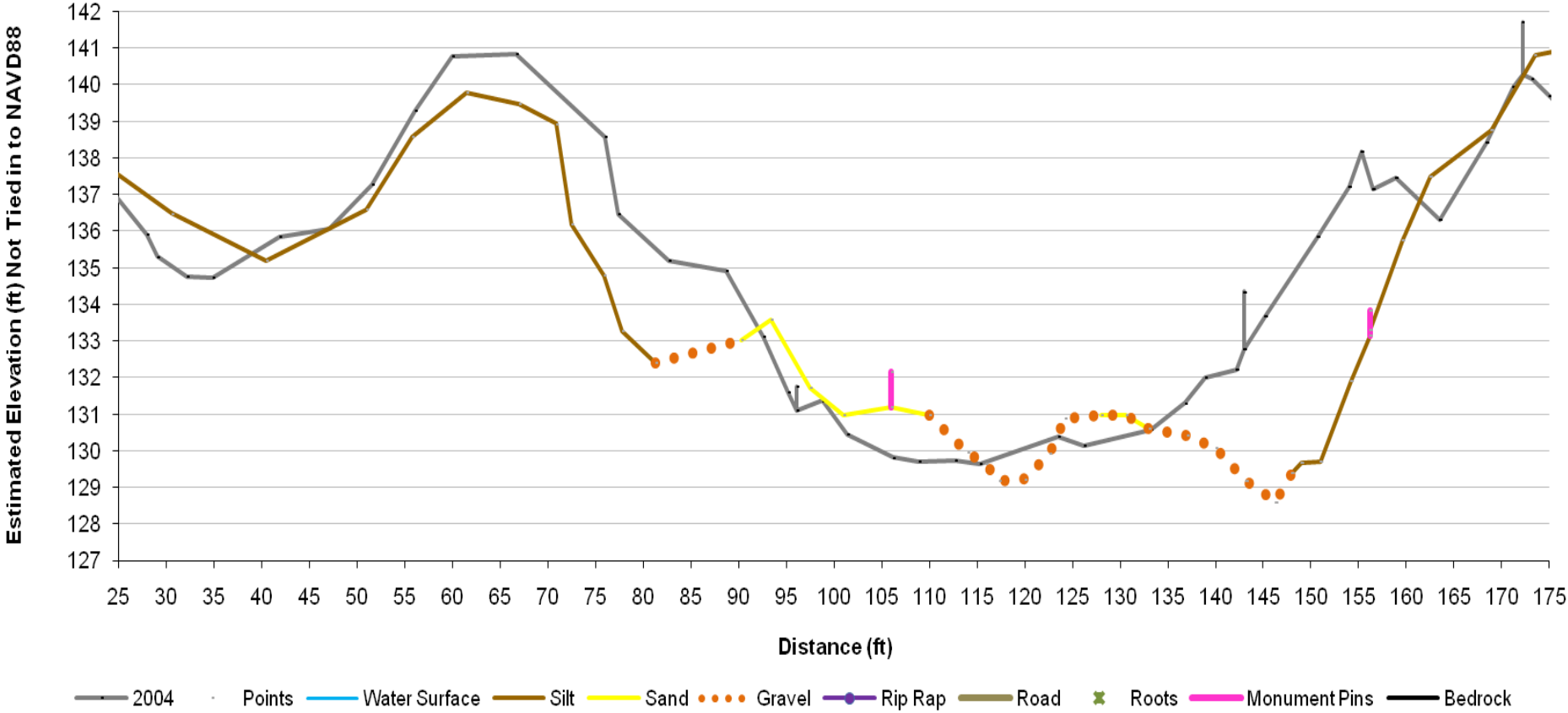
Cross Section 8,630

8,630
October 29, 2004 & November 17, 2009
Reach 7



Monitoring Cross Section 8,630 (Channel Bed)

8,630
 October 29, 2004 & November 17, 2009
 Reach 7

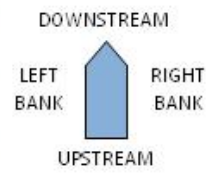


October
2004



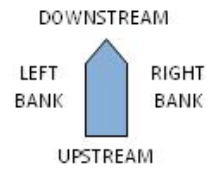
October
2009

8,630





8,630 November 16, 2009



October
2004



October
2009

8,630

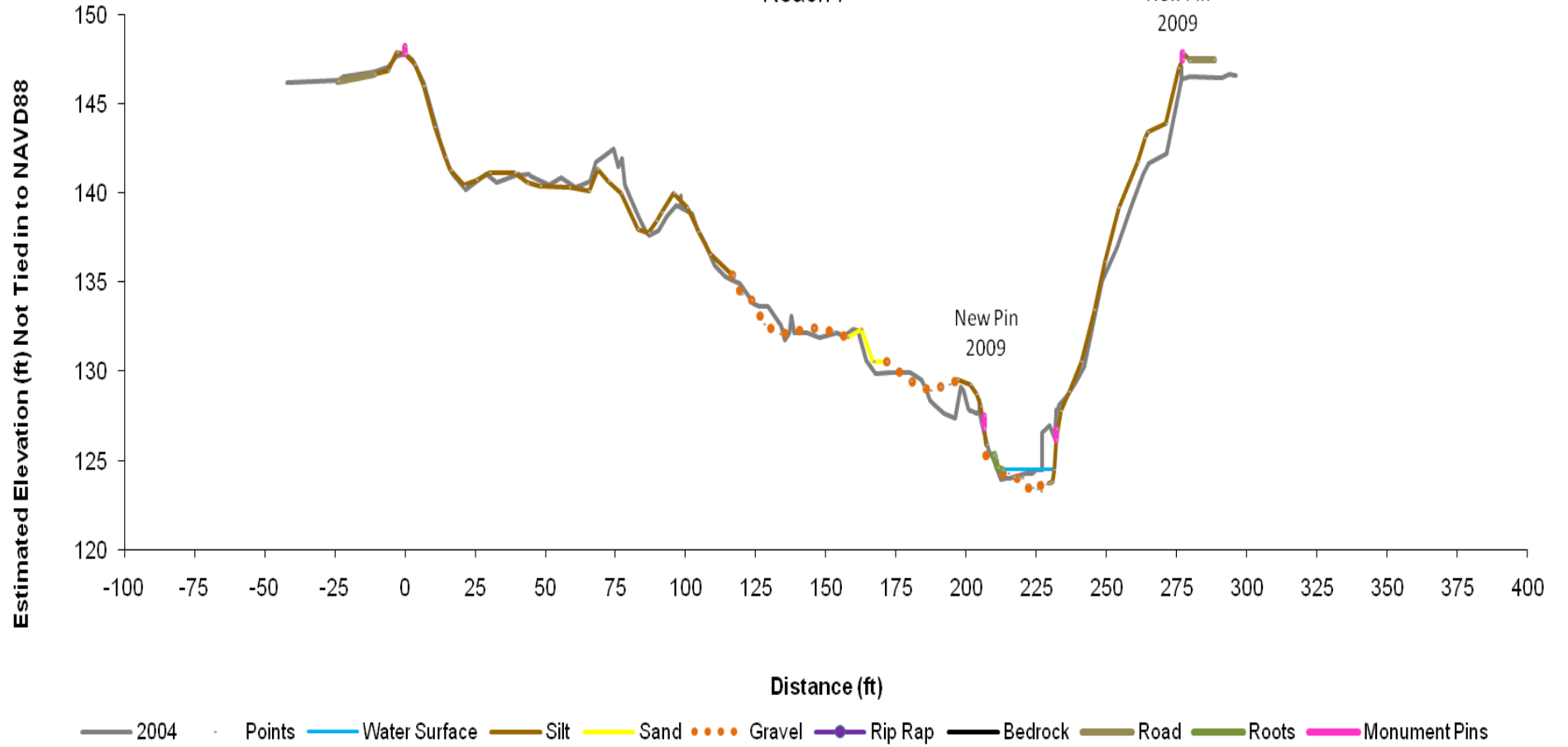


Monitoring Cross Section 8,280

8,280
October 28, 2004 & November 17, 2009
Reach 7

New Pin
2009

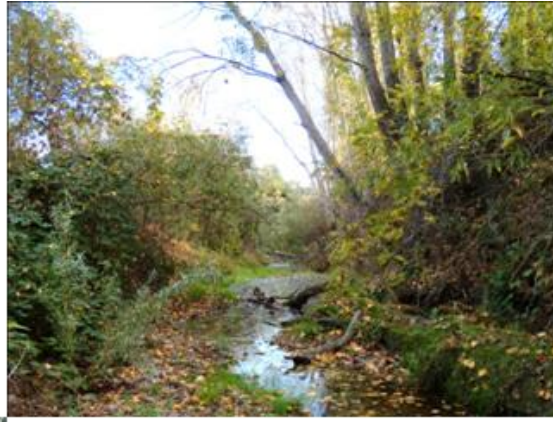
New Pin
2009



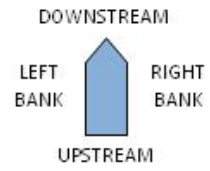
Monitoring Cross Section 8,280 (Channel Bed)

8,280
 October 28, 2004 & November 17, 2009
 Reach 7





8,280 November 17, 2009



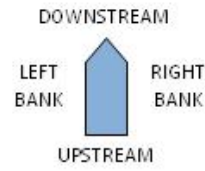
October
2004



November
2009

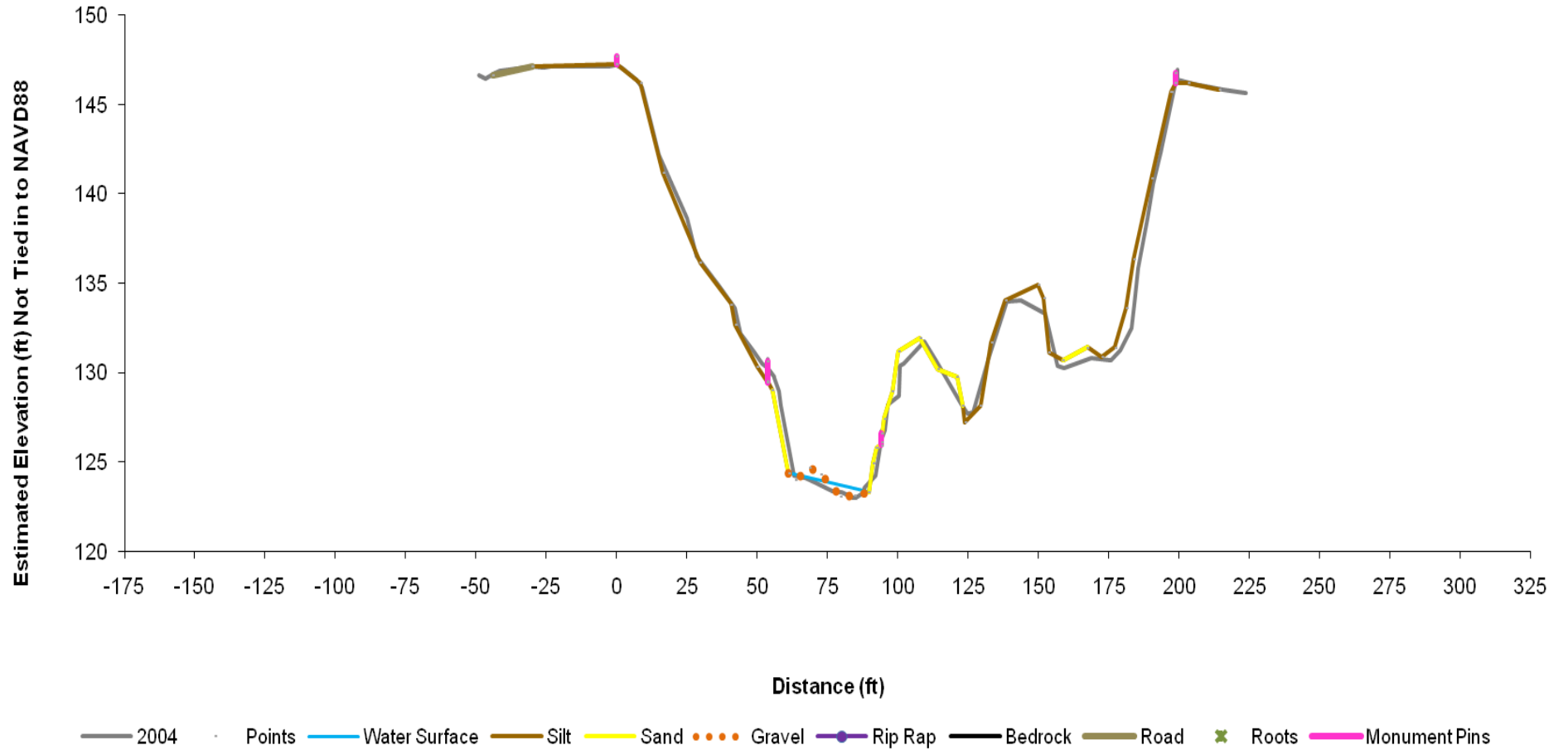


8,280



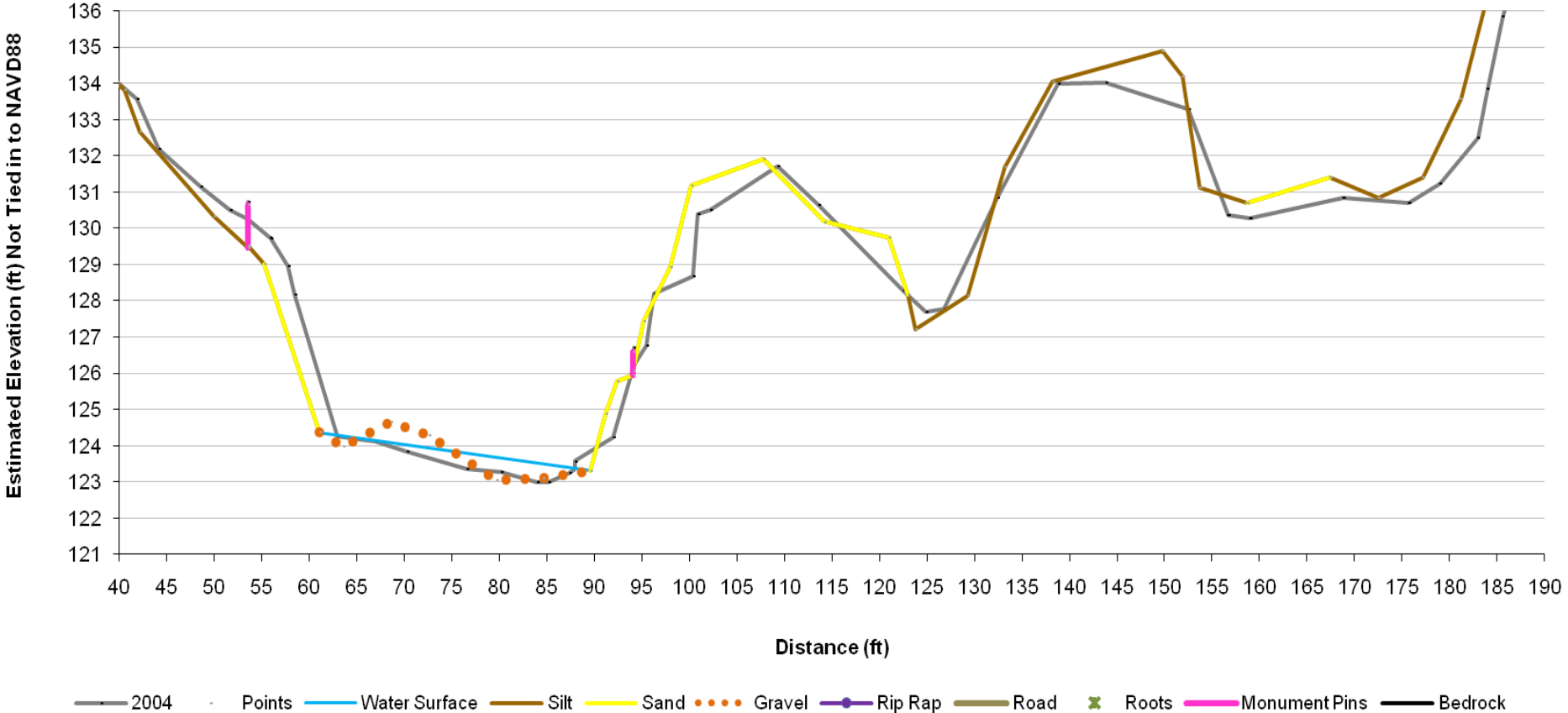
Monitoring Cross Section 7,830

7,830
 October 29, 2004 & October 7, 2009
 Reach 7



Monitoring Cross Section 7,830 (Channel Bed)

7,830
 October 29, 2004 & October 7, 2009
 Reach 7



October
2004



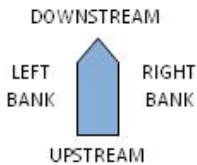
October
2009

7,830





7,830 October 2009

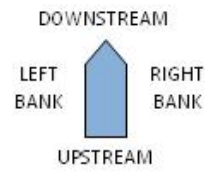


October
2004



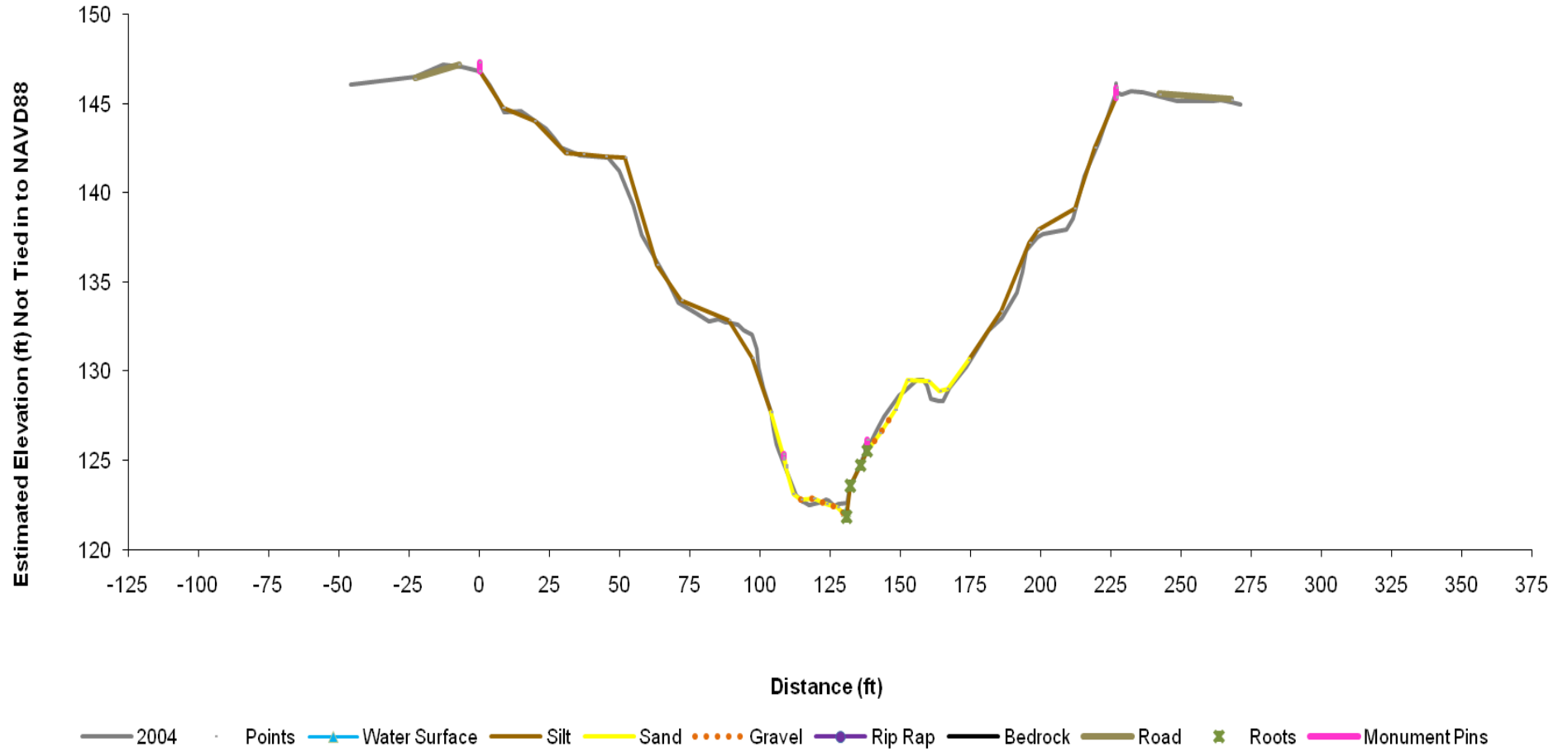
October
2009

7,830



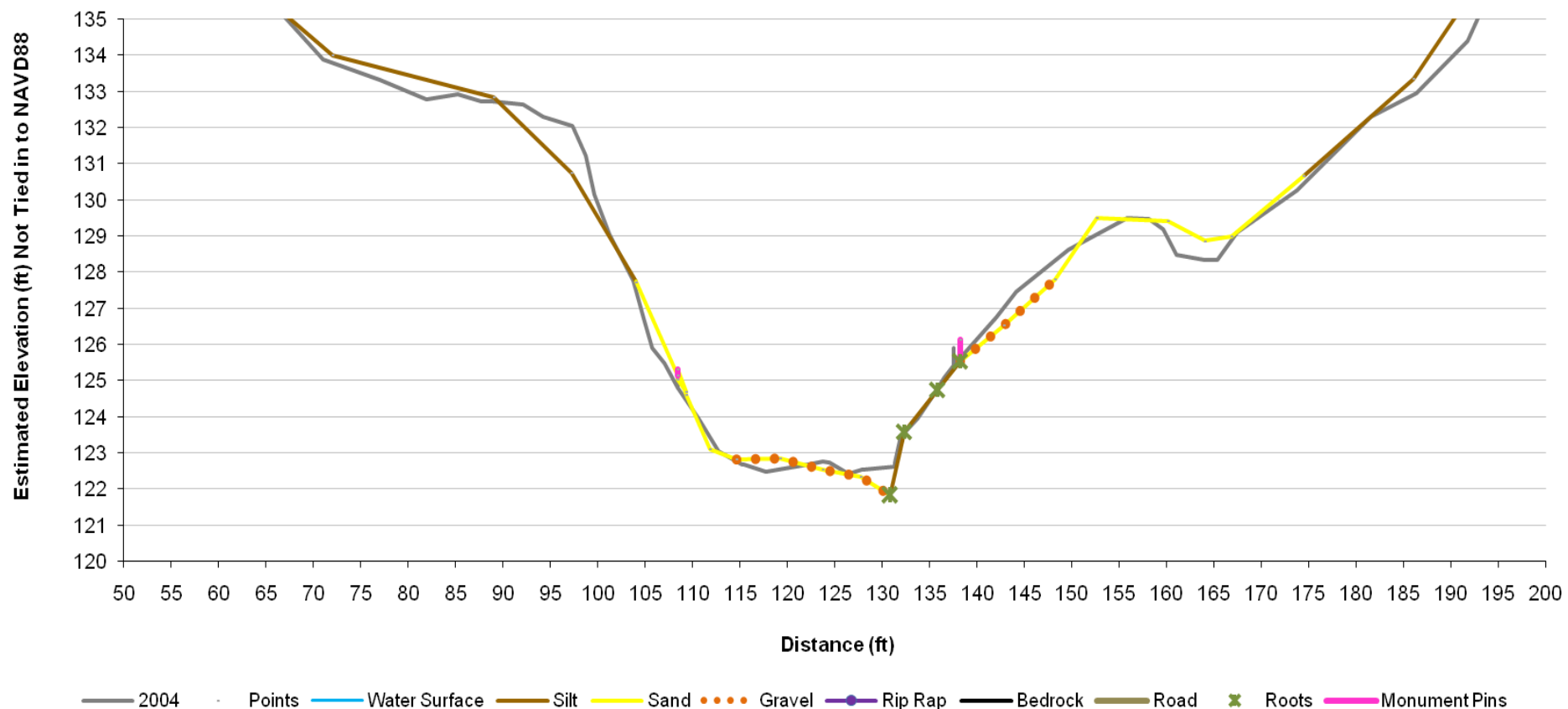
Monitoring Cross Section 7,700

7,700
October 29, 2004 & October 7, 2009
Reach 8



Monitoring Cross Section 7,700 (Channel Bed)

7,700
 October 29, 2004 & October 7, 2009
 Reach 8



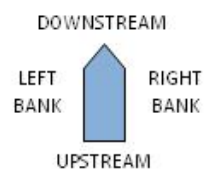


7,700 October 2009





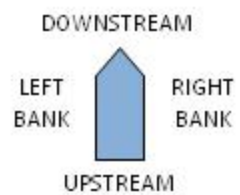
7,700 October 2004



October
2004

STATION 7,700

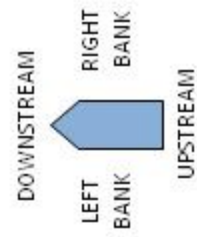
October
2009



October 2004

STATION 7,700

October 2009



VI. Pebble Counts

Median Grain Size (D50) on Riffles

Particle Size D50 (mm)																													
Reach	1 & 2				3			4						5	6	7				8			9						
River Station	22,027	21,629	21,158	20,628	18,930	17,891	17,000	16,422	15,950	15,730	14,920	13,800	13,050	12,060	PEAK CFS	11,800	9,500	8,830	8,630	8,280	7,830	7,700	7,300	5,050	2,850	1,250			
2004	8	16	16						16	8								16	8	8	8	8							
Peak Discharge 2005-03-22															3,890 cfs														
2005 (ICF J&S)	XS Only					XS Only		50	19					21		18	19						23	20	12	8			
Peak Discharge 2005-12-31															18,300 cfs														
Peak Discharge 2006-12-26															1,350 cfs														
Peak Discharge 2008-01-04															4,460 cfs														
2008	15	25	11	25	30																								
Peak Discharge 2009-02-22															2,800 cfs														
2009						45		21	23	7								14	19	21	25	10							
POST 2005 FLOOD CHANGE		Coarser	Finer	Same		Finer			Coarser	Finer								Finer	Coarser	Coarser	Coarser	Same							
2009 Construction																													
Peak Discharge 2010-01-20															2080 cfs														
2010													XS Only	14															
2010 Construction																													
Peak Discharge 2011-03-20															4,080 cfs														
2011											19																		
2011-2012 Construction																													
Peak Discharge																													
POST CONSTRUCTION CHANGE																													
Particle Size D84 (mm)																													
River Station	22,027	21,629	21,158	20,628	18,930	17,891	17,000	16,422	15,950	15,730	14,920	13,800	13,050	12,060		11,800	9,500	8,830	8,630	8,280	7,830	7,700	7,300	5,050	2,850	1,250			
2004	-	32	32	32	-	-	-	-	32	32	-	-	-	-		-	-	32	32	16	16	16	-	-	-	-			
Pre-Construction 2008-2011	32	32	32	32	32	90	-	32	45	23	32	-	32	-		-	-	32	32	32	32	16	-	-	-	-			
POST 2005 FLOOD CHANGE		Same	Same	Same					Coarser	Finer								Same	Same	Coarser	Coarser	Same							

VII. Spawning Gravel Permeability

Spawning Gravel Permeability

The summarized results of the permeability analysis and the mortality index calculation performed by the Napa County Resource Conservation District for the riffle crest cross sections surveyed in 2004 are given in the table below.

DATE	River Station	MEDIAN A (cm/hr)	MEDIAN B (cm/hr)	SITE PERMEABILITY (cm/hr)	SURVIVAL INDEX	D50 (mm)	D84 (mm)	RANK
11/23/2004	21,629	3000	1581	2290.5	33%	8	32	poor
11/23/2004	21,158	2544	3936	3240.0	38%	16	32	fair
11/23/2004	20,628	11618	6967	9292.5	53%	16	32	good
11/30/2004	15,950	6794	3183	4988.5	44%	16	32	fair
11/30/2004	15,730	5112	5304	5208.0	45%	8	32	fair
11/30/2004	8,830	2465	3171	2818.0	36%	16	32	fair
12/1/2004	8,630	2518	1640	2079.0	31%	8	32	poor
12/1/2004	8,280	1288	1636	1462.0	26%	8	16	poor
12/1/2004	7,830	2058	4351	3204.5	38%	8	16	fair
12/1/2004	7,700	2809	2755	2782.0	35%	8	16	poor

Aggregated gravel permeability results with calculated survival rates and qualitative ranking. Sites are listed in downstream order.

VIII. Channel Morphology Survey

Riffle Length and Frequency

Jones & Stokes mapped a total of 155 gravel bars in the 4.5 mile Rutherford Reach in 2005, which are depicted in the Field Assessments Maps in the *Final Basis of Design Report for the Napa River Rutherford Reach Restoration Project* (Jones & Stokes, October 2008), and enumerated by reach in the table below. As of the writing of this report, only the baseline distribution and extent of gravel bars have been mapped.

Number of Gravel Bars per Subreach (Jones & Stokes, 2005 survey, 2008 Report)

Reach	Bars Mapped	Bar Types
1	17	Lateral; Lateral Point
2	17	Lateral; Lateral Point; Mid-Channel
3	7	Lateral; Lateral Point; Mid-Channel
4	20	Lateral; Mid-Channel
5	5	Lateral; Lateral Point; High Bar/Terrace
6	24	Lateral; Lateral Point; Mid-Channel; High Bar / Terrace
7	17	Lateral; Lateral Point; Mid-Channel; High Bar / Terrace
8	32	Lateral; Lateral Point; Mid-Channel; High Bar / Terrace
9	16	Lateral; Lateral Point; Mid-Channel

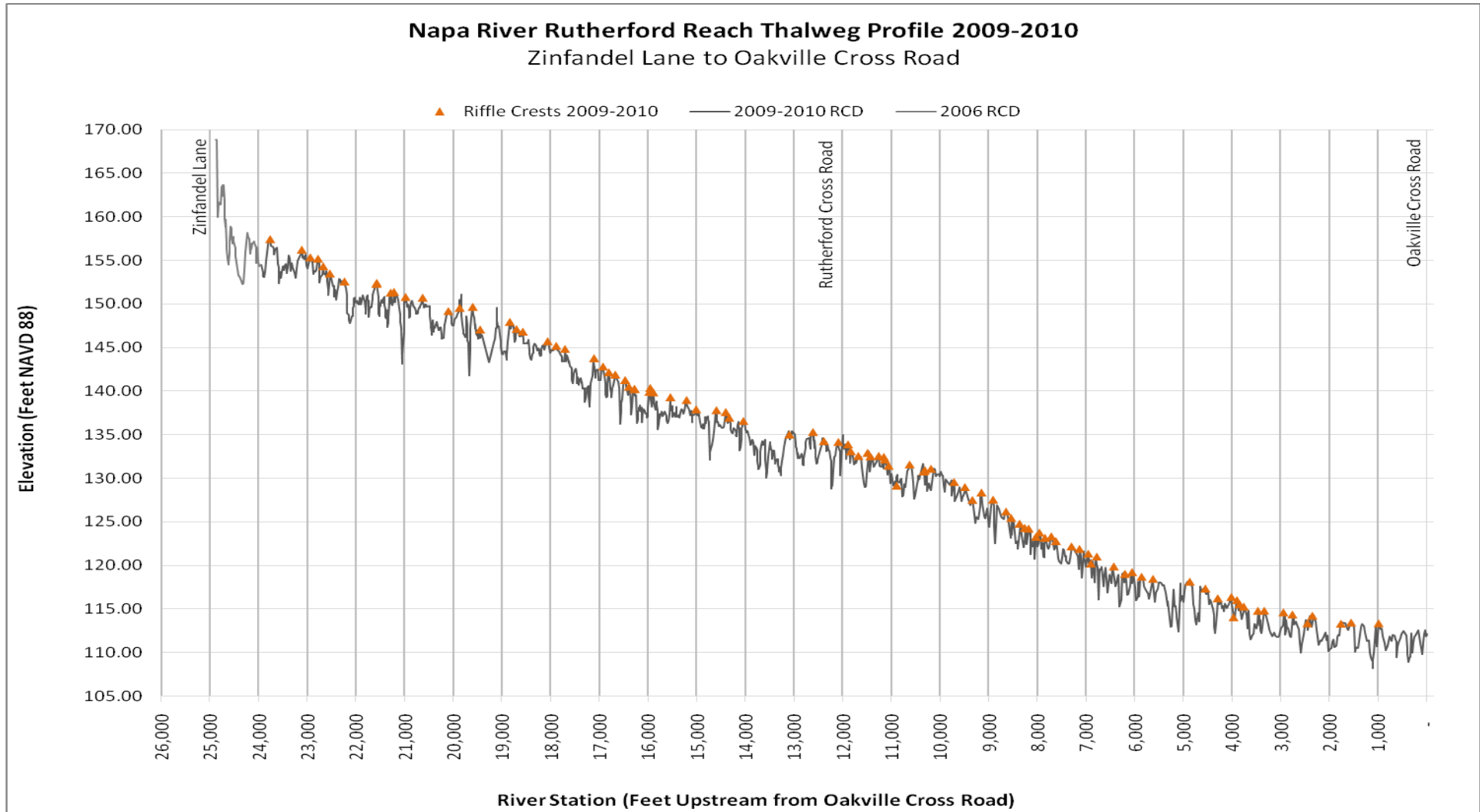
Riffle Crest Distribution 2009-2010

The longitudinal thalweg survey completed in 2009-2010 documents the channel geometry of the Rutherford Reach, including pools riffles and glides. At the same time as the thalweg was surveyed, all riffle crests were mapped with a GPS. Riffle crests will be re-mapped as part of the annual stream survey starting in June 2011 to track the changes in riffle crest distribution and density along the project reach. During the long profile survey in 2009-2010, a total of 101 riffle crests were mapped throughout the Rutherford Reach. The performance standard is a 30% increase in riffle length or riffle frequency in treated locations.



Riffle Crest Distribution

The longitudinal thalweg survey completed in 2009-2010 documents the channel geometry of the Rutherford Reach, including riffles, pools and glides.



IX. Residual Pool Depth Associated with Installed Instream Habitat Structures

Residual Pool Depth Associated with Instream Structures

Annual Survey Results

2011

Residual pool depth associated with instream structures will be measured for the first time in June 2011 during the annual stream survey. Instream structures will have experienced one year of winter flows at that time.

X. Large Woody Debris Surveys

Large Woody Debris

Annual Survey Results

2009

In 2009 155 occurrences of LWD were mapped, with 62% (96) being single pieces, 30% (47) being accumulations of between 2-9 pieces, and the remaining 8% (12) being jams of greater than 10 pieces. In 2010, 73% (148) of the 201 occurrences of LWD were single pieces, while 25% (49) were accumulations of 2-9 pieces, and the remaining 2% consisted of four (4) jam accumulations of greater than 10 pieces of wood. In 2010, there were about 50% more single pieces of LWD mapped in the channel versus 2009 (148 versus 96), while accumulations of 2-9 pieces remained relatively steady (49 versus 47). Jams of greater than 10 pieces of LWD reduced from 12 to 4 occurrences from 2009 to 2010 indicating that channel flows disseminated and dispersed some of the jams.

2010

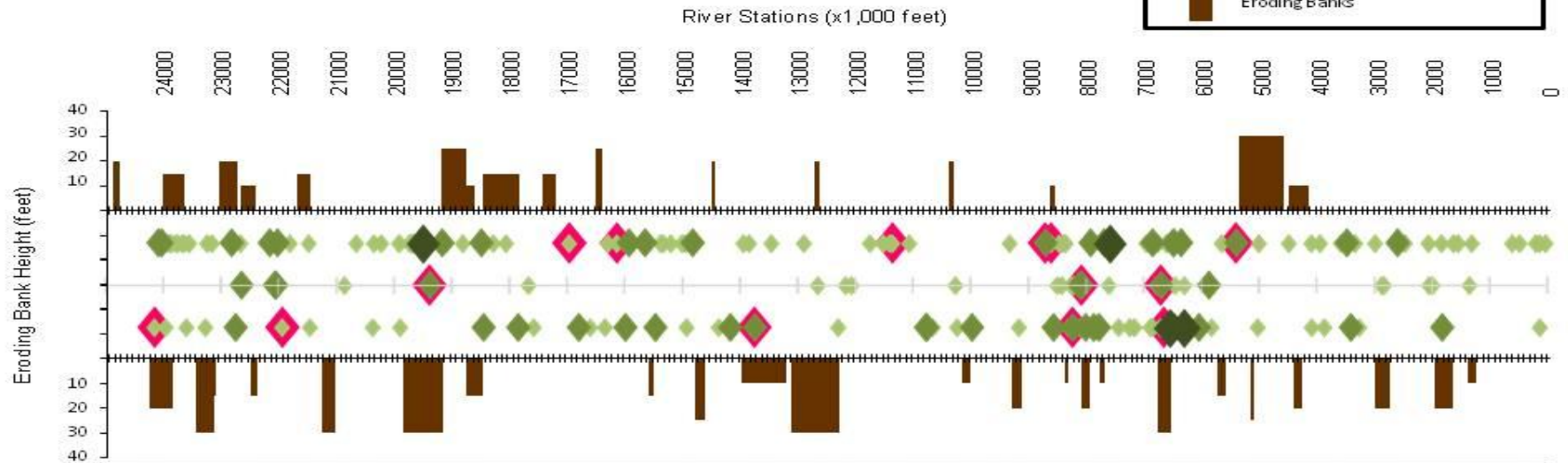
Multiple locations and bedform association attributes were collected for each occurrence of mapped LWD. In 2010 fifty-four percent (54%) of the LWD were located on the left side of the channel, while a third were located on the right side of the channel. The remaining 10% were located mid-channel. Fifty-Four (54%) of LWD DBH were about 12 inches long; while 30% were over a foot-and-a-half long. Almost all (95%) of the LWD was dead, with 5% rooted and alive. Ninety percent (90%) of the debris were flood deposited while 7% were placed in the channel. Over one-third of the LWD functioned as winter high flow refugia (34%), while 24% of the LWD provided bank stability. Pool scour was at 14% and summer refugia at 12%, and hydraulic constriction and other round out the remaining 10%. The majority of LWD were nearly equally split between pools (36%) and terraces (31%), with the remaining 33% associated with other bedforms. Thirty-five percent (35%) of the LWD were located in pool scour; while 25% provided in summer refugia. Fourteen percent and 11%, respectively, of the LWD functioned as hydraulic constriction and for bank stability. The primary function of 68% of LWD located on terraces was to provide winter high flow refugia, while 30% provided bank stability, and 15% provided summer refugia. The primary function of 43% of LWD located on gravel bars was to provide bank stability, while 27% provided winter high flow refugia, and 12% served primarily to recruit spawning gravel. The primary function of 47% of the LWD located in cut banks was to provide bank stability, while 29% provided winter high flow refugia, and 18% provided summer refugia. Forty percent (40%) of the LWD function on Riffle Crests are for 'Pool Scour'. The remaining 60% are evenly divided between 'Spawning Gravel Recruitment; Spawning Gravel Recruitment; Spawning Gravel Recruitment. The primary function of all LWD located in side channels was to provide winter high flow refugia.

Large Woody Debris Structure Persistence (# years, % persisting);

Instream structures were first installed in the summer of 2010 as part of Phase 1b: Reaches 1-2 West, and Phase 2: Reach 3 construction. The status of Large Woody Debris (LWD) structures will be assessed for the first time in June 2011. The performance standard is 75% persistence of installed instream habitat enhancement structures. Evaluation of the habitat function during winter and spring 2011 stream flows is provided in Appendix D. Study IX..

Large Woody Debris Survey 2010 Chart and Map

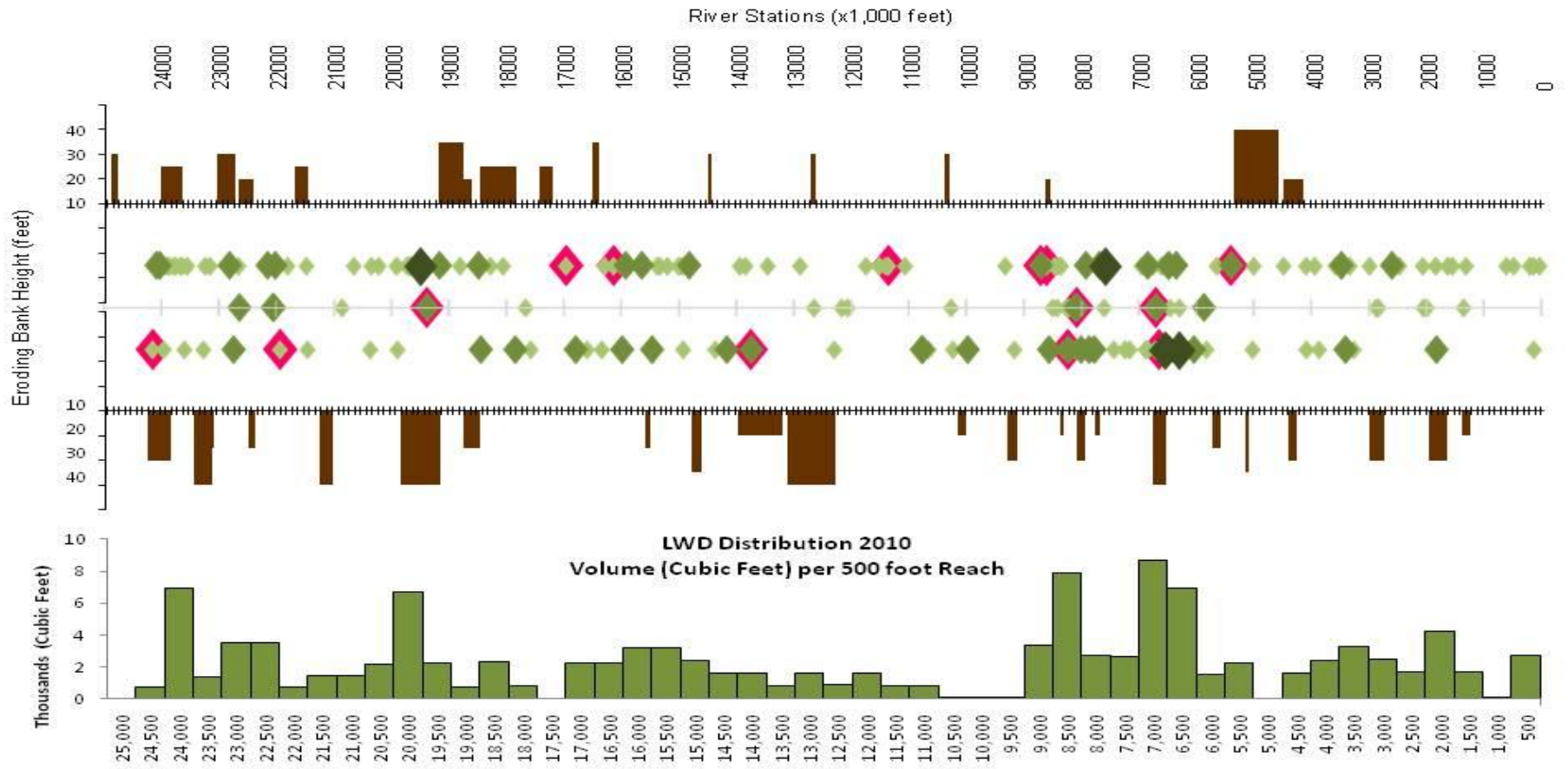
Napa River Rutherford Reach June 2010 Monitoring Survey Large Woody Debris & Eroding Banks



Large Woody Debris Survey 2010 Chart and Graph

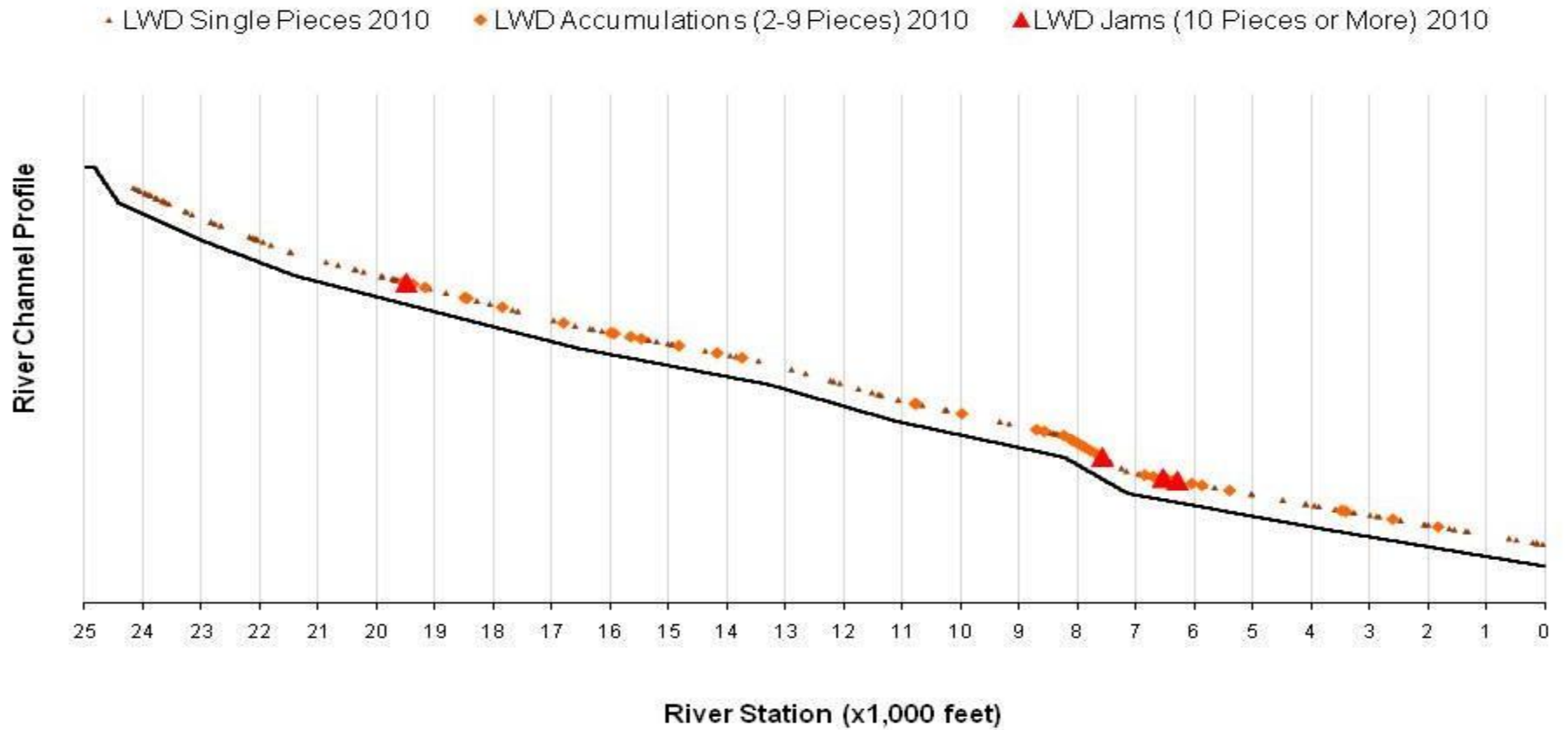
 LWD that has Erosion Potential

Napa River Rutherford Reach June 2010 Monitoring Survey Large Woody Debris & Eroding Banks



Large Woody Debris Survey 2010 Distribution on Longitudinal Profile

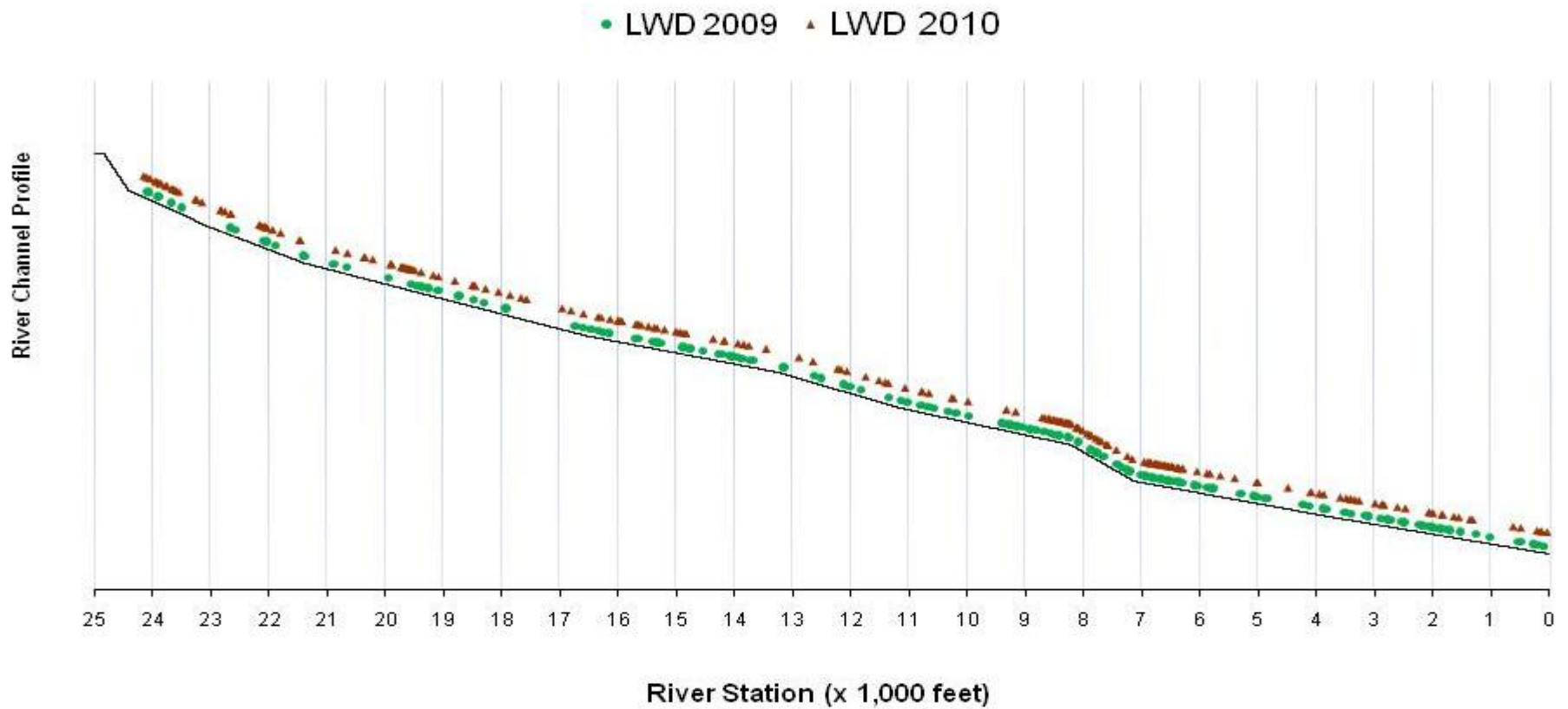
LWD Distribution Napa River Rutherford Reach Annual Maintenance Survey June 2010



Large Woody Debris Survey 2010 and 2009 Distribution on Longitudinal Profile

LWD Distribution

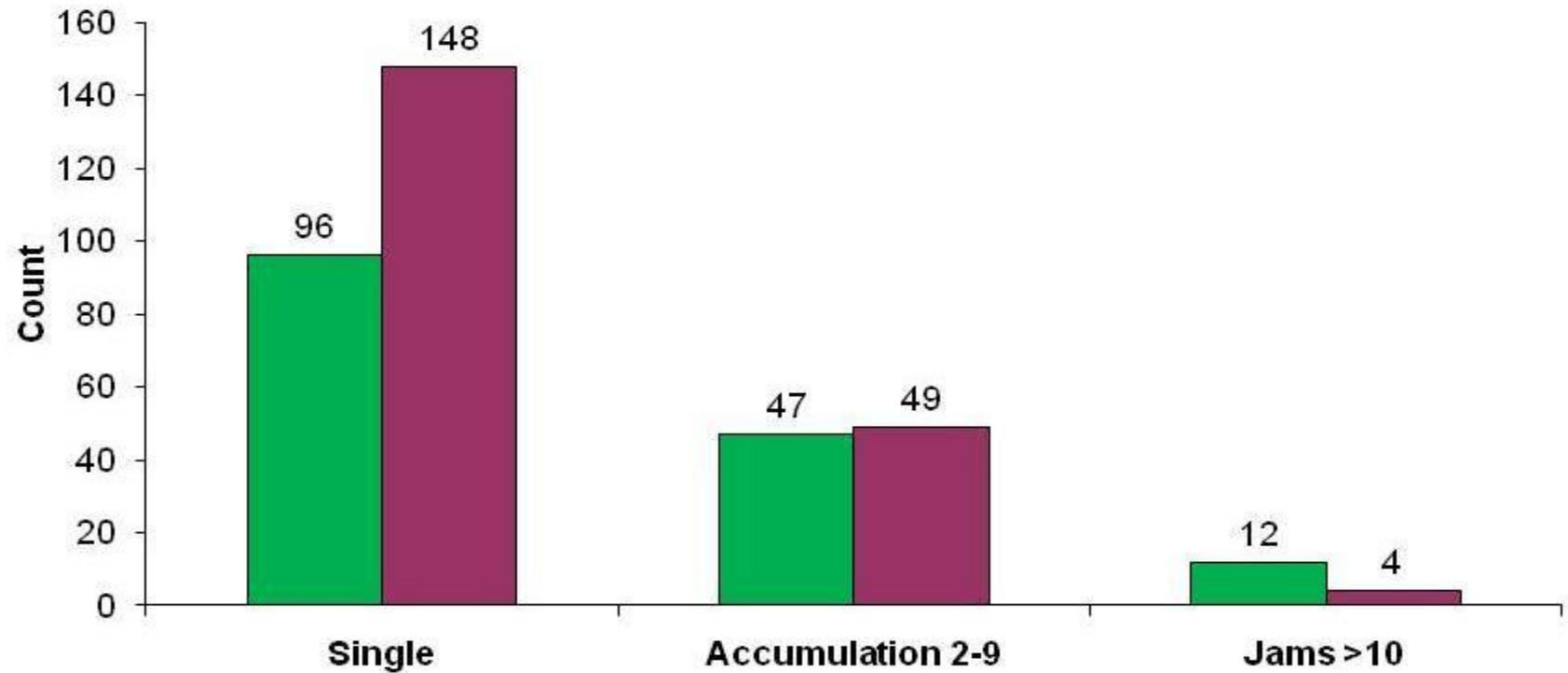
Napa River Rutherford Reach
Annual Maintenance Surveys
June 2009 and 2010



Large Woody Debris Survey 2010 and 2009 Configurations

LWD Configurations Napa River Rutherford Reach Annual Maintenance Surveys

■ 2009 (155 Occurrences)
■ 2010 (201 Occurrences)



Large Woody Debris Photos of Examples Persisting from 2009-2010



24100 CH-LB 2009



24100 CH-RB 2010



19390 CH-DS 2009



19390 CH-DS 2010



15650 CH-LB 2009



15650 CH-LB 2010



9950 CH-RB 2009



9950 CH-RB 2010



8100 CH-DS 2009



8100 CH-DS 2010

XI. Seasonal Salmonid Habitat Surveys

Flow Velocities in Constructed High-Flow Refugia Areas

The performance standard is high flow refugia with velocities less than 6 feet per second (FPS) for flows 500 cfs and above at constructed alcoves and instream bankfull benches, with specific target velocities for salmonid life stages as per the table below.

Target Salmonid Habitat Criteria

Species / Life Stage	Depth (feet)	Substrate	Velocity (fps)
Steelhead Fry	0.0 – 1.5	substrate > sand organic cover	0.0 – 0.5
Small Juvenile Steelhead	0.5 – 1.5	tennis ball substrate deeper w/ organic cover	0.5 – 1.5
Large Juvenile Steelhead	> 1.5		1.0 - 2.5
Adult Spawning	0.5 – 2.0		1.0 - 2.5
BMI-Riffle	0.1 – 1.5	> golf ball substrate	> 1.5

Source: NOAA/NMFS Criteria for MicroHabitat Mapping on Alameda Creek

2011 High Water Mark and Water Surface Elevation for Velocity Monitoring of High Flow Refugia

	Discharge Napa River Near St. Helena at Pope Street Bridge (cfs)	Water Surface Elevation (ft NAVD88)					
		Sutter Alcove	Frogs Leap Bench 1	Caymus Bench 0	Caymus Bench 1	Caymus Bench 2	Caymus Bench 3
River Station		21950	19680	18300	17500	17290	17050
HWM 2/16/2011	2,930		160.31	157.22	155.94	155.36	154.74
WSEL 2/16/2011 10:36	1,150	159.96					
WSEL 2/16/2011 11:03	1,120		156.13				
WSEL 2/16/2011 11:22	1,100			152.40			
WSEL 2/16/2011 11:42	1,070				150.18		
WSEL 2/16/2011 12:11	1,030						149.20
HWM 2/17/2011	3,160	165.38	160.92	157.89	156.81	156.30	155.75
WSEL 2/23/2011	228	155.52	151.61	148.34	145.49	145.52	144.76

Fall and Winter Rearing Habitat for 0-1+ Steelhead, and Immigrating/Emigrating Salmonids

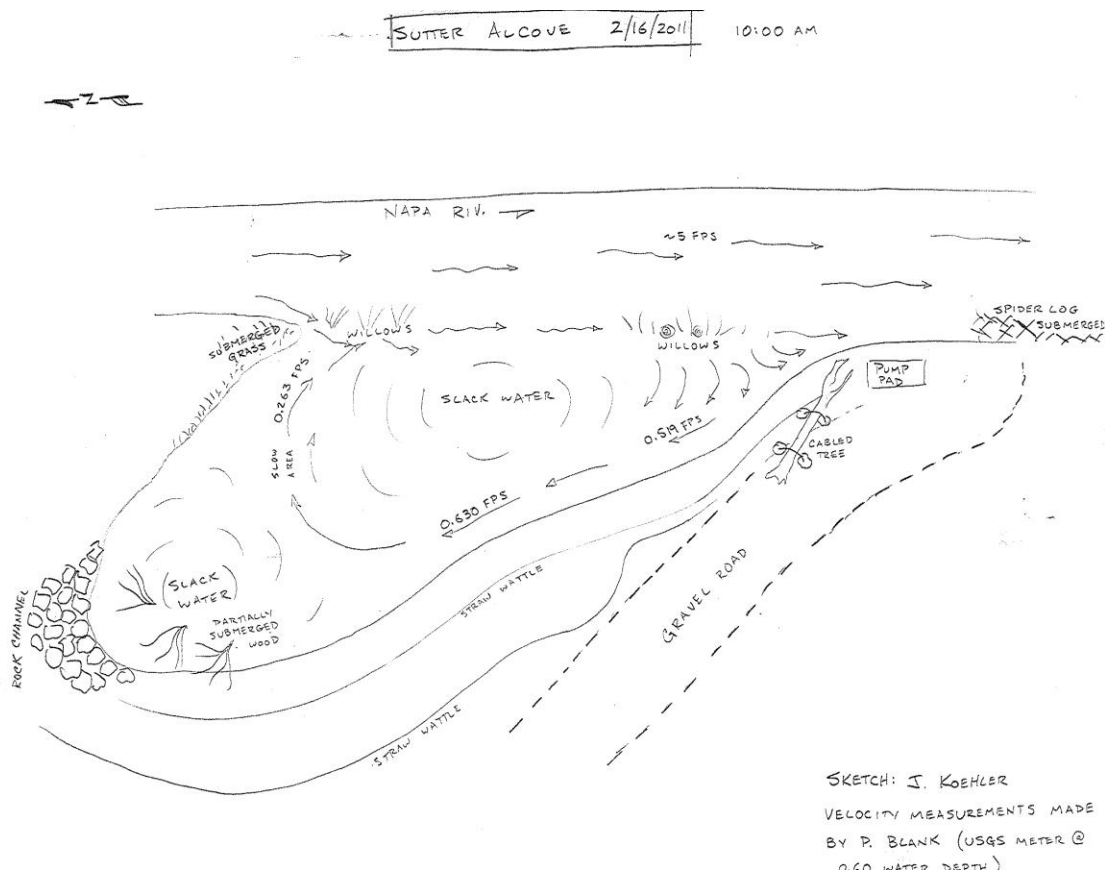
Alcove: Ranch Winery / Sutter Home: Right Bank Stations 22,225-21,900 Sketch

February 16, 2011

Discharge: 1,150 cfs (Napa River Near St. Helena at Pope Street)

Water Surface Elevation: 159.96 ft (NAVD 88)

Monitored velocities of 0.26 – 0.63 fps at 0.6 ft water depth in this created alcove are suitable for steelhead fry and small juvenile rearing.



Alcove: Ranch Winery / Sutter Home: Right Bank Stations 22,225-21,900 Photos

February 16, 2011

Discharge: 1,150 cfs (Napa River Near St. Helena at Pope Street)

Water Surface Elevation: 159.96 ft (NAVD 88)



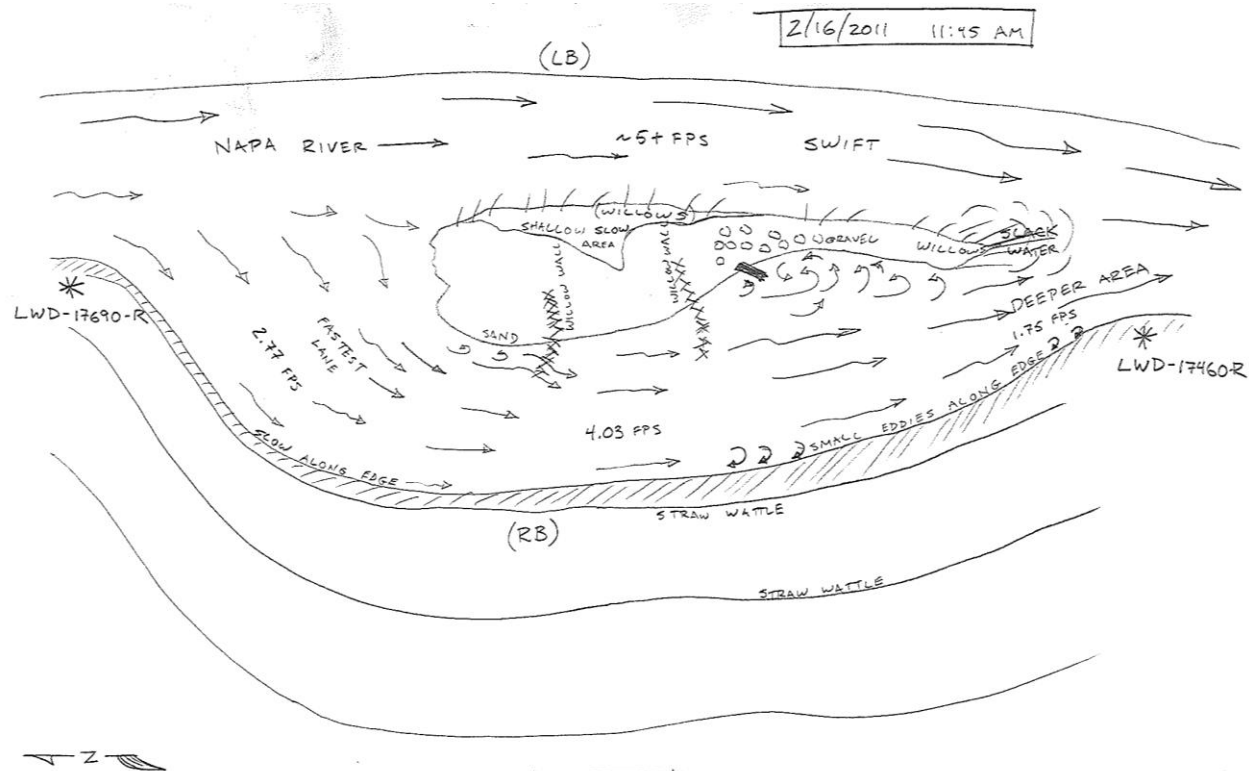
Bench 1: Caymus: Right/West Bank Stations 17,700-17,425 Sketch

February 16, 2011

Discharge: 1,070 cfs (Napa River Near St. Helena at Pope Street)

Water Surface Elevation: 150.18 ft (NAVD 88)

Monitored velocities of 1.75 fps at 0.6 ft water depth in the downstream end of this created secondary channel are suitable for small and large juvenile steelhead rearing. Gravel recruitment at the downstream end may create BMI riffle habitat.



CAYMUS

BENCH 1 - BETWEEN LWD-17,690-R &
LWD-17,460-R

SKETCH: J. KOEHLER
VELOCITY: P. BLANK (USGS METER @ 0.6 WATER DEPTH)

Bench 1: Caymus: Right/West Bank Stations 17,700-17,425 Photos

February 16, 2011

Discharge: 1,070 cfs (Napa River Near St. Helena at Pope Street)

Water Surface Elevation: 150.18 ft (NAVD 88)



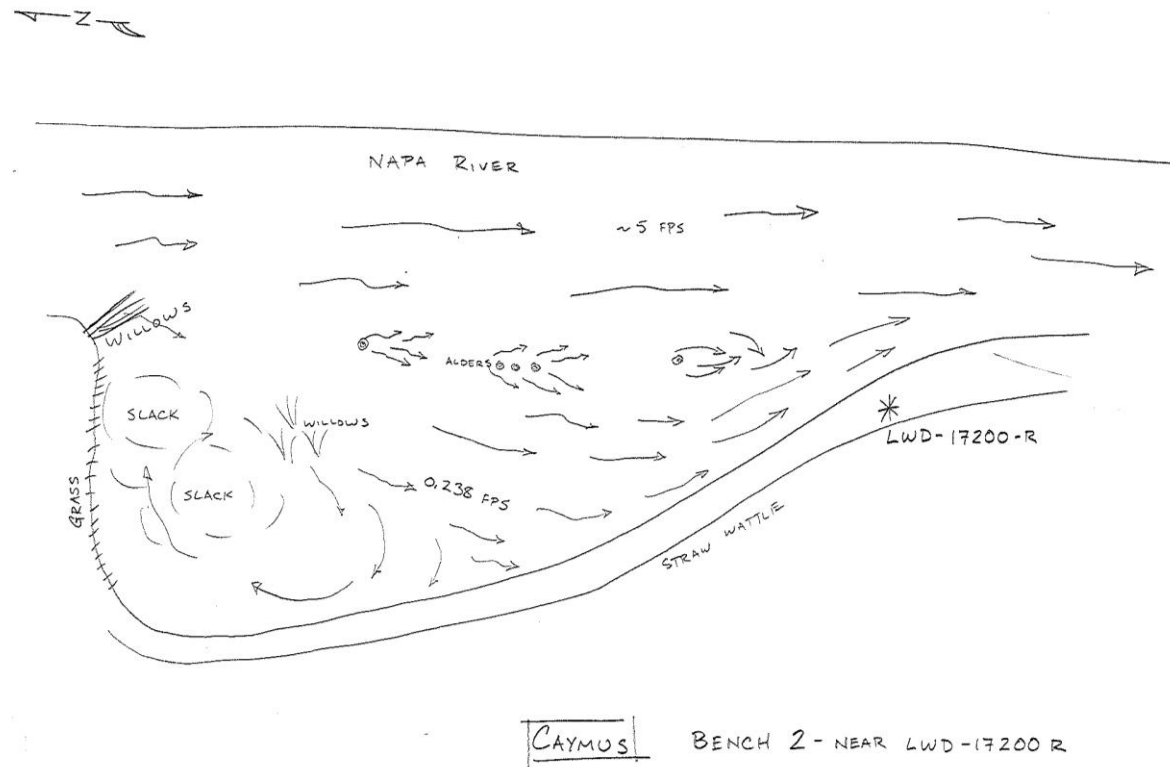
Bench 2: Caymus: Right/West Bank Stations 17,350-17,160 Sketch

February 16, 2011

Discharge: 1,030 cfs (Napa River Near St. Helena at Pope Street)

Monitored velocities of 0.24 fps and slack water at 0.6 ft water depth in this created edgewater habitat are suitable for steelhead fry.

12/16/2011 12:00 PM



CAYMUS BENCH 2 - NEAR LWD-17200 R

SKETCH: J. KOEHLER
VELOCITY: P. BLANK (USGS METER @ 0.6 WATER DEPTH)

Bench 2: Caymus: Right/West Bank Stations 17,350-17,160 Photos

February 16, 2011

Discharge: 1,030 cfs (Napa River Near St. Helena at Pope Street)



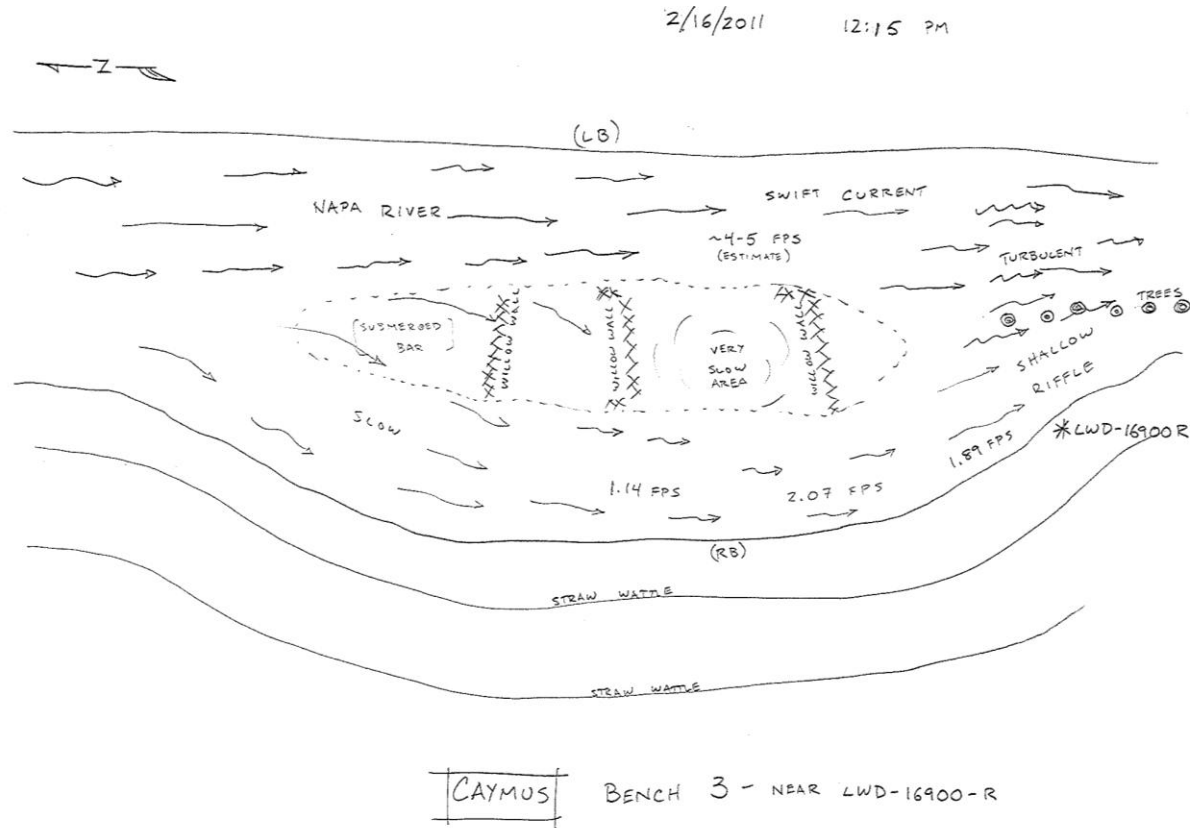
Bench 3: Caymus: Right/West Bank Stations 17,150-16,850 Sketch

February 16, 2011

Discharge: 1,030 cfs (Napa River Near St. Helena at Pope Street)

Water Surface Elevation: 149.2 ft (NAVD 88)

Monitored velocities of 1.14-1.89 fps at 0.6 ft water depth in this created edgewater habitat are suitable for small and large juvenile steelhead rearing.



SKETCH: J. KOEHLER
VELOCITY: P. BLANK (USGS METER @ 0.6 WATER DEPTH)

Bench 3: Caymus: Right/West Bank Stations 17,150-16,850 Photos

February 16, 2011

Discharge: 1,030 cfs (Napa River Near St. Helena at Pope Street)

Water Surface Elevation: 149.2 ft (NAVD 88)



XII. Vegetation Establishment Surveys

Vegetation Establishment Surveys

Annual Survey Results

2011

Results from vegetation establishment surveys performed will be reported for the first time in the 2011 Monitoring Report.

XIII. Stakeholder Participation Documentation

Landowner Access Agreements

Property (28 Total)	Parcel No.	Bank	Phase	Construction Year	Reach										Right of Entry for Final Design Signed	Temporary Construction Easement Signed	20 Year Maintenance Access Agreement Signed	
					1	2	3	4	5	6	7	8	9	10				
1	030250017000	East	1a	2009	1											Yes	2009	Pending
2	030060025000	West	1b	2010	1	2										Yes	2010	Yes
3	030060049000	East	1a	2009	1	2										Yes	2009	Yes
3	030060059000	East	1a	2009	1	2										Yes	2009	Yes
4	030060021000	West	1b	2010		2										Yes	2010	Yes
5	030230013000	West	2	2010		2	3									Yes	2010	Yes
6	030090002000	East	2	2010			3	4								Yes	2010	Yes
7	030230019000	West	3	2012			3	4								Yes	2011	Yes
8	030090003000	East	3	2011				4								Yes	2011	Yes
9	030230004000	West	3	2012				4								Yes	2011	Yes
10	030230021000	West	3	2012				4								Yes	2011	Yes
11	030140004000	East	3	2011				4								Yes	2011	Yes
12	030190005000	West	4	2012										8		Yes	2010	Yes
13	030190004000	West	4	2012										8		Yes		Pending
14	030140019000	East	4	2012						7				8		Yes		Pending
15	030190013000	West	4	TBD										8		Yes		Yes
16	030190012000	West	4	TBD										8		Yes		Yes
17	031010005000	West	4	TBD										8		Yes		Yes
18	031030014000	East	4	TBD										8		Yes		Pending
19	031010006000	West	4	TBD										8		Yes		Yes
20	031030017000	East	4	TBD										8	9	Yes		Pending
20	031030018000	East	4	TBD										8	9	Yes		Pending
21	031010009000	West	4	TBD										8		Yes		Yes
22	031010003000	West	4	TBD										9		Pending		Pending

Maintenance Requests

Records of landowner maintenance requests are maintained by the Napa County Flood Control and Water Conservation District. Annual maintenance activities are reported in a separate Annual Channel Maintenance and Monitoring Report for the Rutherford Reach of the Napa River produced by the Napa County Flood Control and Water Conservation District.

XIV. Photomonitoring